PROJECT MANUAL
FOR

BUTTE REGIONAL TRANSIT OPERATIONS CENTER PROJECT

326 HUSS DRIVE CHICO, CALIFORNIA, 95928

JULY 14TH, 2014

PREPARED BY THE BUTTE COUNTY ASSOCIATION OF GOVERNMENTS
2580 Sierra Sunrise Terrace, Suite 100
Chico, California 95928

BCAG
BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

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Notice Is Hereby Given that the Butte County Association of Governments, ("Owner"), hereinafter referred to as the Owner or BCAG, will accept sealed bids from prequalified Contractors for the award of the contract for the following public work:

Butte Regional Transit Operations Center
326 Huss Drive
Chico, California 95928

Each bid must conform to and be responsive to the contract documents and be submitted on bid forms furnished by the Owner.

The BCAG Butte Regional Transit Operations Center project, located at 326 Huss Drive in Chico, California, consists of the construction of four new buildings on a ten acre parcel housing the current operations center. The project will serve a variety of uses including public functions, and seeks to be an exemplary public facility that will serve the community for many years to come. The project will house the transit system and BCAG staff. It will be a model steward of the site by integrating environmental planning principles as well as implementing numerous sustainable strategies with the requirement to achieve LEED Silver certification from the USGBC.

The project buildings include cast-in-place concrete, masonry, steel and metal wall panel construction. The use of natural light has been achieved throughout with large clerestory windows. The project includes over 300 pieces of maintenance equipment, as well as fueling systems, standby emergency generator system, and energy efficient mechanical, electrical and plumbing systems and extensive landscaping of the grounds.

A separate BRTOC Off-site contract which consists of improvements to Aztec Drive, storm drain and outfalls to the Comanche creek, and all street improvement immediately adjacent to the site will begin July 2014. This off-site project will be bid under a separate contract and it is expected there will be a period of overlap of the two separate projects when both contractor's will be required to coordinate as multi-prime contractors on the same site.

Description of the work, The Work generally consists of furnishing all labor, materials, equipment, and performing all work necessary and incidental to the construction of the project known as the "**Butte Regional Transit Operations Center**". Bidding documents contain the full description of the Work. Bids are required for the entire work described herein. Contractors are encouraged to contact small businesses and disadvantaged business enterprises for subcontract work that they might otherwise perform with their own forces.

Bids due: Hand delivered sealed Bids will be received from prequalified General Contractors at the BCAG offices at 2580 Sierra Sunrise Terrace, Suite 100, Chico CA 95928 from noon onwards but **no later than 2:00 pm** on **Tuesday, August 19th, 2014,** at which time they will be publicly opened and read aloud. **No faxed / email (or other electronic bids in any format) bids will be accepted.** Bids shall be marked: **Bid of (Contractor name) for "Butte Regional Transit Operations Center",** along with date and time of bid opening.

Important Dates:
- First day of advertisement and plan availability: July 14, 2014
- Questions from Contractors must be received by in writing before: 5:00 PM July 31, 2014
- Final Bid addendum will be issued before: 5:00 PM August 8, 2014
- Bids must be received @ BCAG offices **before**: 2:00 PM August 19, 2014

The DBE Contract goal is; **7.0 %**
Bidders are advised that, as required by federal law, BCAG has established a DBE goal. This Agency contract is considered to be part of the DBE goal. The Agency is required to calculate and report DBE usage for all Federal - aid contracts each year so that attainment efforts may be evaluated. The Butte County Association of Governments affirms that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises (DBE) will be afforded full opportunity to submit bids in response to this invitation.

THIS PROJECT IS SUBJECT TO THE "BUY AMERICA" PROVISIONS OF THE SURFACE TRANSPORTATION ASSISTANCE ACT OF 1982 AS AMENDED BY THE INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT OF 1991.

Procurement of bidding documents: Interested parties may download copies of bid documents related attachments and all future communication and correspondence regarding this bid process from the County's website at http://www.bcag.org/RFPs/index.html **(**follow the prompts for RFP's/Bid Notices). The Butte County Association of Governments will not be a distribution point for plans. Plans and bid documents may be obtained for a **NONREFUNDABLE FEE of $ 531.00** for 24" x 36" size and will be available through ARC Document Solutions, 801 Broadway, Sacramento, CA 95818. Phone: 916-443-1322. Fax: 916-442-5305. E-mail: sac.planwell@e-arc.com. Inquire with Plan-well Department or order direct via the internet; http://www.e-arc.com/ca/sacramento . Shipping and Handling Charges are not included in the price of the Plans and Bid documents, and will apply if mailed and are determined by ARC Document Solutions at the time of ordering. The documents included in the set will consist of one hard copy of each of the Bid Documents and Plan set. A compact disc only of all plans, bid documents and "Supplemental Information" are also available through ARC Document Solutions for **$ 324 .00**. All addendums will be posted through ARC Document Solutions and on the BCAG website.

There will not be a Pre-Bid Conference for this project. Inquiries or questions based on alleged patent ambiguity of the plans, specifications or estimate must be communicated as a bidder inquiry prior to bid opening. Any such inquiries or questions, submitted after bid opening, will not be treated as a bid protest.

Contractors are required to submit any questions in writing, via e-mail, to Kitchell, the Owner's Project Manager's no later than **5 P.M. PDT on Thursday, July 31st, 2014.** No other questions will be received after the deadline. Only written inquiries will be permitted. Copies of all questions and answers will then be posted on the Owner's web site on or around **Friday, August 8th, 2014** in a written document; http://www.bcag.org/index.html. Main contact for this project is the Owner's Project Manager from Kitchell, Kirk Sheeley, telephone (916) 648-9700, and email: ksheeley@kitchell.com. ***Email submissions must be addressed to all three of the following individuals:***

ksheeley@kitchell.com
kevin.teel@tlcd.com
anewsum@bcag.org

A certified check or bid bond for not less than ten percent (10%) of the proposal shall be submitted with each bid as a guarantee that the bidder, if awarded the Contract, will fulfill the terms of the bid. The Owner reserves the right to refuse any or all proposals or bids or portions thereof.

NOTE: Only the General Building Contractors who have been prequalified by the Owner for this project can submit bids. All subcontractors, suppliers and vendors are instructed to contact the listed General Contractors for interest in bidding on this project. The prequalified General Building Contractors are;

1. Broward Builders Inc.
   1200 E. Kentucky Ave, Woodland CA 95776
   Contact: Randy Cantrel
   Phone: 530-666-5635; Fax: 530-666-5723; E-mail: randy@browardbuilders.com

2. Clark & Sullivan Construction
   2024 Opportunity Drive, Suite 150, Roseville, CA 95678
   Contact: Jerry Hogan
   Phone: 916-338-7707; Fax: 916-338-7701; E-mail: jhogan@clarksullivan.com

3. Diede Construction, Inc.
   P.O. Box 1007, Woodbridge, CA 95258
   Contact: Brett Diede
   Phone: 209-369-8255; Fax: 209-368-0600; E-mail: estimating@diedeconstruction.com

4. F & H Construction

1115 E. Lockeford Street, Lodi, CA 95240
Contact: Stephen Seibly
Phone: 209-931-2728, Fax: 209-931-4427; E-mail: sseibly@f-hconst.com

5. Flint Builders, Inc.
401 Derek Place, Roseville, CA 95678
Contact: John Stump
Phone: 916-757-1000; Fax: 916-797-7400; E-mail: jstump@flintbuilders.com

6. Gifford Construction, Inc.
P.O. Box 492618, Redding, CA 96049
Contact: Rob Barr
Phone: 530-226-6000; Fax: 530-226-6005; E-mail: rbarr@giffordinc.com

7. McCarthy Building Companies, Inc.
2241 Douglas Blvd, Suite 200, Roseville, CA 95661
Contact: Aaron Alhady
Phone: 916-786-3833; Fax: 916-786-3234; E-mail: aalhady@mccarthy.com

8. Modern Building Company, Inc.
3083 Southgate Lane, Chico, CA 95928
Contact: James Seegert
Phone: 530-891-4533; Fax: 530-891-6834; E-mail: james@modernbuildinginc.com

9. Roebbelen
1241 Hawks Flight Court, El Dorado Hills, CA 95762
Contact: Robert Kjome
Phone: 916-939-4000; Fax: 916-939-4028; E-mail: estimating@roebbelen.com

10. Swinerton Builders
15 Business Park Way, Suite 101, Sacramento, CA 95828
Contact: Alan Wolf
Phone: 916-383-4825; Fax: 916-383-6014; E-mail: awolf@swinerton.com

Bidding procedures are prescribed in the Project Manual. Bids shall be executed upon the forms bound and made a part of said Manual. Bid guaranty in an amount not less than ten percent (10%) of the total bid dollar amount and conforming to the prescribed bidding procedures is required to be submitted with each bid, as a guaranty to be forfeited should the bidder, if awarded the contract, fail to enter into the same, or fail to furnish in a timely manner the bonds and/or proof of insurance.

Pursuant to the provisions of California Labor Code Section 6707, each bid submitted in response to this Invitation to Bid shall contain, as a bid item, adequate sheeting, shoring, and bracing, or equivalent method, for the protection of life and limb in trenches and open excavation, which shall conform to applicable safety orders. By listing this sum, the bidder warrants that its action does not convey tort liability to the Owner, the Design Consultant, the Construction Manager, and their employees, agents, and sub consultants.

The successful bidder must insure that its policies and practices provide equal opportunity to all applicants and employees without regard to race, color, creed, sex, age, religion, ancestry, citizenship, national origin, handicap, mental condition, veteran or marital status. The successful bidder must comply with the Americans with Disabilities Act (ADA).

This contract is subject to state contract nondiscrimination and compliance requirements pursuant to Government Code, Section 12990.

All bidders shall be licensed under the provisions of Chapter 9, Division 3 of the Business and Professions Code of the State of California to do the type of work contemplated in the project. In accordance with provisions of California Public Contract Code Section 3300, the Owner has determined that the Contractor shall possess a valid Class B License at the time that the bid is submitted. Failure to possess the specified license shall render the bid as non-responsive.

The successful bidder will be required to furnish a Construction Labor and Material Payment Bond in the amount equal to one hundred percent (100%) of the Contract price, as well as a Faithful Performance Bond in the amount equal to one hundred percent (100%) of the Contract price.

Bids shall not expire for a period of one hundred and twenty (120) days from the bid date.

Bidders are hereby notified that provisions of the Labor Code of the State of California and the Federal Transit Administration, regarding the prevailing wages shall be applicable to the work to be performed under this contract. Pursuant to Labor Code Section 1773, the general prevailing wage rates have been determined by the Director of the California Department of Industrial Relations and appear in the California Prevailing Wage Rates, which are available from the California Department of Industrial Relations' Internet web site at http://www.dir.ca.gov . The bidder may contact the Director of the Department of Industrial Relations; phone number (415) 703-4774, to obtain a schedule of the general prevailing wages applicable to the locations and work to be done. The contractor and the contractor's subcontractors are responsible for compliance with the requirements of Section 1777.5 and 1777.6 of the Labor Code of the State of California regarding employment of apprentices.

The Federal minimum wage rates for this project as predetermined by the United States Secretary of Labor are set forth elsewhere in this book and in copies of this book that may be examined at the offices described above where project plans, special provisions, and proposal forms may be seen. Future effective general prevailing wage rates, which have been predetermined and are on file with the California Department of Industrial Relations are referenced but not printed in the general prevailing wage rates. Pursuant to Section 1773 of the Labor Code, the general prevailing wage rates in the county, or counties, in which the work is to be done have been determined by the Director of the California Department of Industrial Relations.

Attention is directed to the Federal minimum wage rate requirements elsewhere in this book. If there is a difference between the minimum wage rates predetermined by the Secretary of Labor and the general prevailing wage rates determined by the Director of the California Department of Industrial Relations for similar classifications of labor, the Contractor and subcontractors shall pay not less than the higher wage rate. BCAG will not accept lower State wage rates not specifically included in the Federal minimum wage determinations. This includes "helper" (or other classifications based on hours of experience) or any other classification not appearing in the Federal wage determinations. Where Federal wage determinations do not contain the State wage rate determination otherwise available for use by the Contractor and subcontractors, the Contractor and subcontractors shall pay not less than the Federal minimum wage rate, which most closely approximates the duties of the employees in question.

The U.S. Department of Transportation (DOT) provides a toll-free "hotline" service to report bid rigging activities. Bid rigging activities can be reported Mondays through Fridays, between 8:00 a.m. and 5:00 p.m., Eastern Time, Telephone No. 1-800-424-9071. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use the "hotline" to report these activities. The "hotline" is part of the DOT's continuing effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General. All information will be treated confidentially and caller anonymity will be respected.

The Owner will make a bid selection based on the lowest responsible and responsive bidder meeting the minimum qualifications. If only one bid is received, the Owner reserves the right to negotiate with the responding Contractor. If no bids are received, the Owner reserves the right to identify interested Contractor(s) and negotiate directly without re-bidding. **The BCAG reserves the right to reject any and all bids, to waive any informality in a bid, and to make award as the interests of the Owner may require. This notice is given by order of the Butte County Association of Governments of Chico, California.**

The Butte County Association of Governments is an equal opportunity employer.

BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

Jon A. Clark

_____ _____7-14-14

EXECUTIVE DIRECTOR DATE

-END OF DOCUMENT-

00 21 13 - INSTRUCTIONS TO BIDDERS

Bids are requested for a general construction contract, or work described in general, as follows:

BUTTE REGIONAL TRANSIT OPERATIONS CENTER

1. **RECEIPT OF BIDS.** Hand delivered sealed Bids will be received from prequalified General Contractors at the BCAG offices at 2580 Sierra Sunrise Terrace, Suite 100, Chico, CA 94928 from noon onwards but **no later than 2:00 pm on Tuesday, August 19th, 2014,** at which time they will be publicly opened and read aloud. **No faxed/email (or other electronic bids in any format) bids will be accepted.** Bids shall be delivered in an envelope that is clearly labeled with the name of the project. The Owner will reject all Bids received after the specified time and will return such Bids to Bidders unopened.

2. **CONTACT INFORMATION:**

   Mailing address:
   Kirk Sheeley, Project Manager
   Kitchell
   2750 Gateway Oaks Drive, Suite 300
   Sacramento, CA 95833
   Telephone: (916) 648-9700
   Fax: (916) 648-6534
   Email: ksheeley@kitchell.com

3. **BID SUBMISSION.** Bidder should mark Bid envelopes as**: "BID FOR BUTTE REGIONAL TRANSIT OPERATIONS CENTER"**. Bids shall be deemed to include the written responses of the Bidder to any questions or requests for information of the Owner made as part of Bid prior to submission of Bid. Bidder's failure to submit all required documents strictly as required entitles the BCAG to reject the Bid as non-responsive.

4. **SECTION DELETED.**

5. **CONTENTS OF BID ENVELOPE**. Bid Envelope shall include:
   A. SECTION 00 41 13 (Bid Form) completed in accordance with paragraph 6 of this Section.
   B. Bid security supplied and completed in accordance with paragraph 7 of this Section.
   C. SECTION 00 43 36 (Proposed Subcontractors List) in accordance with paragraph 8 of this Section.
   D. SECTION 00 45 19 (Non-collusion Affidavit).

6. **REQUIRED BID FORMS.** All Bidders must submit Bids using, where applicable, documents supplied in this Project Manual, including without limitation;
   - Section 00 41 13 (Bid Form),
   - Section 00 43 13 (Bond Accompanying Bid) if applicable,
   - Section 00 43 16 (Work Performed by Bidder),
   - Section 00 43 36 (Proposed Subcontractors List),
   - Section 00 45 19 (Non-collusion Affidavit) and
   - Section 00 45 30 (Bidder Certifications).

   The Owner will reject as non-responsive any Bid not submitted on the required forms. Bids must be full and complete. Bidders must complete all Bid items and supply all information required by Bidding Sections. The Owner reserves the right in its sole discretion to reject any Bid as non-responsive as a result of any error or omission in the Bid. Bidders may not modify the Bid Form or qualify their Bids. Bidders must submit clearly and distinctly written Bids. Bidders must clearly make any changes in their Bids by crossing out original entries, entering new entries, and initialing new entries. The Owner reserves the right to reject any Bid not clearly written.

7. **REQUIRED BID SECURITY.** Bidders must submit with their Bids either cash, a cashier's check, or certified check from a responsible bank in the United States, or corporate surety bond furnished by a surety authorized to do business in the State of California, of not less than ten percent of amount of Bid, payable to; Butte County Association of Governments. All Bidders choosing to submit a surety bond must submit it on the required form, Section 00 43 13 (Bond Accompanying Bid). The Owner will reject as non-responsive any Bid submitted without the necessary Bid security.

   The Owner may retain Bid securities and Bid bonds of other than the Apparent Low Bidder for a period of 90 Days after award or full execution of the Contract, whichever first occurs. Upon full execution of the Contract, and upon request by Bidder, the Owner will return to the respective unsuccessful Bidders their Bid securities and Bid bonds.

8. **REQUIRED SUBCONTRACTORS LIST.** All Bidders must submit with their Bids the required information on all Subcontractors in Section 00 43 36 (Proposed Subcontractors List) for those Subcontractors who will perform any portion of the Work, including labor, rendering of service, or specially fabricating and installing a portion of the Work or improvement according to detailed drawings confined in the plans and specifications, in excess of one half of one percent of total Bid. Violation of this requirement may result in Bid being deemed non-responsive and not being considered.

9. **BIDDER PREQUALIFICATION.** Only the General Building Contractors who have been prequalified by the Owner for this project can submit bids. All subcontractors, suppliers and vendors are instructed to contact the listed General Contractors for interest in bidding on this project. The prequalified General Building Contractors are listed in Section 00 11 16 (Invitation to Bid).

10. **PRE-BID SITE VISIT & ADJACENT OFF-SITE CONSTRUCTION.** There will NOT be a pre-bid conference. Bidders are encouraged to make site visits during the bid period as needed to assure themselves of the site conditions. All bidders are to be aware of the **Off-site plans for Aztec Drive Extension & Commanche Creek Storm Drainage Outfall** project which will be occurring immediately adjacent to this project concurrently. Bidders are made aware of this project and requirements to coordinate and cooperate with that project in the manner of multi-prime contractors working on the same site. Access and deliveries to both of these projects will be congested and a high degree of cooperation by both contractors is made a requirement of this agreement. Project plans for that project are available for review by all bidders at the Owner's website; http://www.bcag.org/index.html

11. **BID QUESTIONS:**
    Contractors are required to submit any questions in writing on the Bidding Questions form, see **Appendix F**, via e-mail, to both the Owner's Construction Manager and Architect no later than **5 P.M. PDT on Thursday, July 31st , 2014.** The Owner's Construction Manager and Architect are:

    Kirk Sheeley, Project Manager
    Kitchell
    2750 Gateway Oaks Drive, Ste. 300
    Sacramento, CA 95833
    Tel: (916) 648-9700
    Fax: (916) 648-6534
    Email: ksheeley@kitchell.com

    Kevin Teel, Project Manager
    TLCD Architecture
    111 Santa Rosa Ave, #300
    Santa Rosa, CA 95404
    Tel: (707) 525-5600
    Fax: (707) 525-5616
    Email: kevin.teel@tlcd.com

    No other questions will be received after the deadline. Only written inquiries will be permitted. Copies of all questions and answers will then be posted on the Owner's web site on or around **Friday, August 8th, 2014** in a written document to all parties who are registered planned holders on the Owner's website.

Registered Plan Holders for:
Butte Regional Transit Operations Center

The Owner will only respond to written inquiries. Under no circumstance should any prospective general contractors or anyone receiving these bid documents, contact, discuss with, or inquire of any Butte County Association of Governments consultant, employee, or elected official on any matter relating to this bid process. This requirement is to ensure that the same information is communicated to all parties and that no inconsistent, incomplete, or inaccurate information is transmitted separately.

12. **OTHER REQUIREMENTS PRIOR TO BIDDING.** Submission of Bid signifies Bidder's careful examination of Bidding Documents and complete understanding of the nature, extent, and location of Work to be performed. Submission of Bid shall constitute Bidder's express representation to the Owner that Bidder has fully reviewed and is in agreement with all requirements of Section 00 52 13 (Agreement).

13. **EXISTING SOIL REPORTS AND GEOTECHNICAL DATA.** Bidders may examine any available existing conditions information, as well as applicable environmental assessment information regarding the Project by giving the Owner reasonable advance notice. Section 00 31 00 (Geotechnical Data, Existing Conditions) applies to all supplied existing conditions information and geotechnical reports and all other information supplied regarding existing conditions either above ground or below ground. Interested parties may download copies of bid documents related attachments and all future communication and correspondence regarding this bid process from the BCAG's website at www.bcag.org. The Owner will not be a distribution point for plans.

14. **ADDENDA.** Bidders must direct all questions about the meaning or intent of Bidding Documents to the Owner's Representative in writing. Interpretations or clarifications considered necessary by the Owner in response to such questions will be issued by Addenda and made available to all parties recorded by the Owner as having received Bidding Documents via the BCAG's website. Addenda will be written and posted on the Owner's website at www.bcag.org. The Owner will not answer questions received after the deadline for bid questions noted above. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
    A. Addenda may also be issued to modify the Bidding Documents as deemed advisable by the Owner.
    B. Addenda shall be acknowledged by number with signature in Section 004113 (Bid Form) and shall be part of the Contract Documents.

15. **SUBSTITUTIONS.** Bidders must base Bids on products and systems specified in Contract Documents or listed by name in Addenda.
    A. To assess "or equal" acceptability of product or system, submittals of substitutions shall contain the information set forth in Section 01 25 00 (Substitution Procedures). Insufficient information will be grounds for rejection of substitution. The Owner shall, within a reasonable period of time after having received a request for substitution, issue in writing its decision as to whether the proposed substitute item is an "or equal" item. The Owner's decision shall be conclusive on all Bidders.
    B. No substitution requests will be accepted or considered by the Owner prior to the bid opening date.
    C. Substitutions may be requested after submitting Bids and Award of contact only in accordance with requirements specified in Section 01 25 00 (Substitution Procedures).

16. **WAGE RATES.** Bidders are hereby notified that provisions of the Labor Code of the State of California and the Federal Transit Administration Davis Bacon Act, regarding the prevailing wages shall be applicable to the work to be performed under this contract. Pursuant to Labor Code Section 1773, the general prevailing wage rates have been determined by the Director of the California Department of Industrial Relations and appear in the California Prevailing Wage Rates. The bidder may contact the

Director of the Department of Industrial Relations; phone number (415) 703-4774, to obtain a schedule of the general prevailing wages applicable to the locations and work to be done. Contractor shall post the applicable prevailing wage rates at the site. The contractor and the contractor's subcontractors are responsible for compliance with the requirements of Section 1777.5 and 1777.6 of the Labor Code of the State of California regarding employment of apprentices.

17. **EQUAL EMPLOYMENT OPPORTUNITY.** Contractor shall comply with all applicable federal, site, and local laws, rules, and regulations in regard to nondiscrimination in employment because of race, color, ancestry, national origin, religion, sex, marital status, age, medical conditions, disability, or any other reason.

18. **BID OPENING.** The Owner will open all Bidders' Envelopes immediately following bid, initially evaluate them for responsiveness, and determine an Apparent Low Bidder as specified herein.

19. **DETERMINATION OF APPARENT LOW BIDDER.** The low bidder will be determined by the Total Bid Price that must include the Base Bid as outlined in Specification Section 00 41 13 – Bid Form.

20. **BID BREAKDOWN.**

    A. Submission of Base Bid Breakdown: The three lowest bidders announced at the public bid opening shall submit Base Bid Breakdown on Section 00 45 53 (Base Bid Breakdown Form). Complete forms on ink or by typing.

    B. Completion of Forms: Each Base Bid Breakdown shall be completed in detail listing cost and responsible party for every line item category on Base Bid Breakdown Form. Total Base Bid amount must match the amount shown on the Bid Form originally submitted.

    C. Time and place of delivery of Bid Breakdowns: Bid Breakdowns shall be received within two (2) working days after the date for opening bids. The Base Bid Breakdown Forms must be submitted to the BCAG Project/Construction Manager, Kirk Sheeley of Kitchell, at 2750 Gateway Oaks Drive, Suite 300, Sacramento, CA 95833; facsimile: (916) 648-6534; and email: ksheeley@kitchell.com. **Base Bid Breakdown Forms received late may be cause for disqualification of Bidders as non-responsive.**

21. **BID EVALUATION.** The Owner may reject any or all Bids and waive any informalities or minor irregularities in the Bids. The Owner also reserves the right, in its discretion, to reject any or all Bids and to re-bid the Project. The Owner reserves the right to reject any or all nonconforming, non-responsive, unbalanced, or conditional Bids, and to reject the Bid of any Bidder if the BCAG believes that it would not be in the best interest of Project to make an award to that Bidder, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by the Owner. For purposes of this paragraph, an "unbalanced Bid" is one having nominal prices for some work items and enhanced prices for other work items.

    A. In evaluating Bids, the BCAG will consider Bidders' qualifications, whether or not the Bids comply with the prescribed requirements, omit prices and other data, as may be requested in Section 00 41 13 (Bid Forms) and Section 00 45 53 (Base Bid Breakdown) or prior to the Notice of Award.

    B. The Owner may conduct reasonable investigations and reference checks of Bidder, proposed Subcontractors, suppliers and other persons and organizations as the Owner deems necessary to assist in the evaluation of any Bid; ability qualifications, financial ability of proposed Subcontractors, suppliers, and to establish Bidder's responsibility, and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to the Owner's satisfaction within the prescribed time. Submission of a Bid constitutes Bidder's consent to the foregoing. The Owner shall have the right to consider information provided by sources other than Bidder. The Owner shall also have the right to communicate directly with Bidder's surety regarding Bidder's bonds.

    C. Discrepancies between the multiplication of units of Work and limit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the

correct sum thereof will be resolved in favor of the correct sum. Discrepancies between written words and figures will be resolved in favor of the words.

D. Quantities stated in the Bidding Documents are approximate only and are subject to correction upon final measurement of the Work, and are subject further to the rights reserved by the Owner to increase or diminish the amount of work under any classification as advantages to design or construction needs require.

E. The Owner may determine whether a Bidder is qualified in its sole discretionary judgment.

22. AWARD.

If the contract is to be awarded, it will be awarded to the lowest responsible responsive Bidder. Following completion of all required, BCAG procedures and receipt of all the BCAG approvals, the BCAG will issue Section 00 51 00 (Notice of Award) to successful Bidder.

23. BID PROTEST. All bid protests shall be governed by the following procedures:

A. **Eligibility to Protest**. Protests may be submitted only by a prequalified contractor that has submitted a bid in response to the invitation to bid. A subcontractor of a bidder may not submit a protest. A party may not rely on a protest submitted by another party, but must timely pursue its own protest. Only bidders who the Authority otherwise determines are responsive and responsible are eligible to protest a bid; protests from any other bidder will not be considered. In order to determine whether a protesting bidder is responsive and responsible, the BCAG may conduct the same investigation and evaluation as the Owner is entitled to take regarding an Apparent Low Bidder.

B. **To Whom Protest is Submitted**. All bid protests must be submitted to the BCAG's Project/Construction Manager, Kirk Sheeley, of Kitchell, at 2750 Gateway Oaks Drive., Suite 300, Sacramento CA 95833; facsimile: (916) 648-6534; and e-mail: ksheeley@kitchell.com.

C. **Time to Submit Protest**. All protests must be received before 5:00 p.m. on the third calendar day following the opening of bidders' envelopes. The protester shall bear the risk of non-delivery within the time period specified above regardless of the method of delivery it selects (facsimile, electronic mail, delivery service, U.S. mail service).

D. **Form of Protest**. All protests shall be in writing and shall contain a complete statement of: the specific portion of the document that forms the basis for the protest; the legal grounds for the protest; all facts relevant to the protest; and the form of relief requested and the legal basis for such relief. All protests shall be accompanied by all documentation supporting the grounds for the protest. The protest shall include the name, address, telephone number and e-mail address of the person representing the protesting party. The party filing the protest must concurrently transmit a copy of its initial protest document and any attached documentation to all other parties with a direct financial interest that may be adversely affected by the outcome of the protest. Such parties shall include all other bidders who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.

E. **Effect of Failure to Comply with Protest Procedures**. The procedures set forth in this section (including the time limits for filing a protest and required information) are mandatory, and are the sole and exclusive remedy of a bidder to dispute the award of a contract subject to these procedures. A protest that does not comply with these procedures may be summarily rejected. Failure to comply with these procedures shall constitute a waiver of any right to further pursue the protest including the filing of a Government Code Claim or other legal proceedings.

F. **Investigation of Protest**. Upon timely filing of a protest that contains all the required information, the Authority shall notify the party whose bid or proposal is subject to the protest and shall investigate the protest. If additional information is requested by the Owner, the party from whom it

is requested shall deliver the information to the Owner within the time period specified by the BCAG.

G. **Review of Protest**. The BCAG's staff and consultants, in a written report, shall make a recommendation regarding the bid protest to the awarding body. As used in this section, awarding body means the Butte County Association of Governments (BCAG).

H. **Protest Hearing.** The BCAG committee, at a hearing held within twenty-one (21) calendar days after receipt of any proper bid protest, shall consider and determine the protest based upon the written information provided by the parties, the recommendations of staff, and oral presentations at the BCAG hearing at which the protest is considered. Grounds for the protest that are not set forth in the written protest may not be considered by the BCAG. The BCAG committee shall render its decision within five (5) calendar days of the hearing. Protest determinations made in accordance with this section by the BCAG committee shall be final and conclusive, and shall be subject only to such judicial review as may be available under the California Code of Civil Procedure. The filing of a protest shall not preclude the BCAG committee from rejecting all bids and directing staff to perform a new solicitation for a contract.

24. POST-NOTICE OF AWARD REQUIREMENTS. After Notice of Award, the successful Bidder must execute and submit the following documents as indicated below.

A. Submit the following documents to the Owner by 5:00 p.m. of the 10th day following Notice of Award. Execution of Contract by the BCAG depends upon approval of these documents:
   1) Section 00 52 13 (Agreement): To be executed by successful Bidder. Submit five originals, each bearing an original signature.
   2) Section 00 61 13 (Construction Performance Bond): To be executed by successful Bidder and surety, in the amount set forth in Section 00 61 13 (Construction Performance Bond). Submit five originals.
   3) Section 00 61 16 (Construction Labor and Material Payment Bond): To be executed by successful Bidder and surety, in the amount set forth in Section 00 61 16 (Construction Labor and Material Payment Bond). Submit five originals.
   4) Insurance certificates and endorsements required by Section 00 72 13 (General Conditions) Article 13 and Section 00 73 16 (Insurance). Submit five original sets.
   5) The Guaranty in the form set forth in Section 00 65 36 (Guaranty). Submit five originals, each bearing an original signature.

B. The Owner shall have the right to communicate directly with Apparent Low Bidder's proposed performance bond surety, to confirm the performance bond. The Owner may elect to extend the time to receive performance and labor and material payment bonds.

C. Successful Bidder's failure to submit the documents required herein, in a proper and timely manner, entitles the BCAG to rescind its award, and to cause Bidder's Bid security to be forfeited as provided herein.

25. FAILURE TO EXECUTE AND DELIVER DOCUMENTS. If Bidder to whom contact is awarded shall, within the period described in paragraph 24a of this Section 00 21 13, fail or neglect to execute and deliver all required Contract Documents and file all required bonds, insurance certificates, and other documents, the Owner may, in its sole discretion, foreclose on Bidder's deposit surety bond, or deposit Bidder's cashier's check or certified check for collection, and retain the proceeds thereof as liquidated damages for Bidder's failure to enter into the Contract Documents. Bidder agrees that calculating the damages the Owner may suffer as a result of Bidder's failure to execute and deliver all required Contract Documents would be extremely difficult and impractical and that the amount of Bidder's required Bid security shall be the agreed and presumed amount of the Owner's damages. In addition, upon such failure the Owner may determine the next Apparent Low Bidder and proceed accordingly.

26. MODIFICATION OF COMMENCEMENT OF WORK. The Owner expressly reserves the right to modify the date for the Commencement of Work under the Contact and to independently perform and

complete work related to the Project.

27. WITHDRAWAL OF BIDS. Bidders may withdraw their Bids at any time prior to the Bid opening time fixed in this Section 00 21 13, only by written request for the withdrawal of Bid filed with the BCAG representative. Bidder or its duly authorized representative shall execute request to withdraw Bid. The submission of a Bid does not commit the Owner to award a contract for the Project, to pay costs incurred in the preparation of a Bid, or to procure or contract for any goods or services.

28. PUBLIC RECORDS ACT REQUESTS.

A. Per the Public Records Acts the Owner will make available to the public all correspondence and written questions submitted during the Bid Period; all Bid submissions opened in accordance with the procedures of this Section 00 21 13, and all subsequent Bid evaluation information. All submissions not opened will remain sealed and eventually be returned to the submitter. Except as otherwise required by law, the Owner will not disclose trade secrets or proprietary financial information submitted that has been designated confidential by Bidder. Any such trade secrets or proprietary financial information that a Bidder believes should be exempted from disclosure shall be specifically identified and identified as such. Blanket-type identification by designating whole makes or section shall not be permitted and shall be invalid. The specific information must be clearly identified as such.

B. Upon a request for records regarding this Bid, the Owner shall notify Bidder involved within ten Days from receipt of the request of a specific date when the records will be made available for inspection. lf the Bidder timely identifies any impropriety, trade secret, or confidential commercial or financial information that Bidder determines is not subject to public discloses and requests the Owner to refuse to comply with the records request, Bidder shall take all appropriate legal action and defend the BCAG's refusal to produce the information in all forums; otherwise, the Owner will make such information available to the extent required by applicable law, without restriction.

C. Information disclosed in the Bid documents and the attendant submissions are the property of the Owner unless Bidder makes specific reference to data that is considered proprietary. Subject to the requirements in the Public Records Act, reasonable efforts will be made to prevent the disclosure of information except on a need-to-know basis during the evaluation process.

29. CONFORMED CONSTRUCTION DOCUMENTS. Following Award of Contract, the Owner may prepare a conformed set of Contract Documents reflecting Addenda issued during bidding, which will, failing objection, constitute the approved set of Contract Documents.

30. DEFINITIONS. All abbreviations and definitions of terms used in this Section 002113 are set forth in Section 01 42 00 (References and Definitions).

END OF SECTION

00 22 10 - INDEMNITY AND RELEASE AGREEMENT

Dated _____

POTENTIAL BIDDER:

_____

LOCATION: BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

SITE: 326 HUSS DRIVE, CHICO, CALIFORNIA 95928

PROJECT: BUTTE REGIONAL TRANSIT OPERATIONS CENTER

In consideration of the above-referenced Authority's permitting the undersigned potential bidder ("Bidder") to have access to, and to conduct investigations, tests and/or inspections on, the Site, Bidder hereby agrees as follows:

1. To the greatest extent permitted by law, Bidder hereby releases, and shall defend, indemnify and hold harmless the BCAG, and its officers, employees, consultants (including without limitation Consulting Architect/Engineer (TLCD Architecture) and the Project and Construction Manager (Kitchell), representatives, and agents, and all other parties having any other interest in the Site, against any claim or liability, including attorney's fees, arising from or relating to any Site-related access, investigation, tests, inspection and/or other activity conducted by Bidder or any of Bidder's officers, employees, consultants, representatives, and/or agents, regardless of whether claim or liability is caused in part by the negligence of the Owner or by any released and indemnified party.
2. Bidder shall repair any damage to the Site or adjacent property resulting from activities authorized hereunder, and comply with and be subject to all other requirements and obligations described or referenced in Section 00 31 00 (Geotechnical Data and Existing Conditions).
4. Attached hereto (or to be delivered separately before Bidder's visit to the Site) is a certificate for comprehensive general liability insurance satisfying the requirements of Section 00 72 13 (General Conditions)
5. Although this Indemnity and Release Agreement is not a Contract document (see Section 00 52 13 [Agreement]), it shall be fully effective and binding regardless of whether Bidder submits a Bid for the subject Project, is awarded a contract for the Project or otherwise.

_____
Name of Bidder

By: _____
Signature

Its: _____
Title (If Corporation: Chairman, President or Vice President)

By: _____
Signature

Its: _____
Title (If Corporation: Secretary, Assistant Secretary, Chief Financial Officer or Assistant Treasurer)

-END OF SECTION-

00 31 13 – CONSTRUCTION DURATIONS, PHASING AND MILESTONES

1. SUMMARY

Contractor's Construction Schedule shall identify start and completion dates for significant activities and milestones shown in Paragraph 2 below during the construction period. Substantial completion of an activity is considered to be attained when the work of subsequent activities can proceed or the activity is complete and able to be utilized by the Owner for its intended use.

2. PHASING / MILESTONE CONSTRUCTION COMPLETION DATES

A. GENERAL PHASING DESCRIPTION: The project requires the work to be phased to accommodate existing ongoing operations located in Phase 2. Phase 1 must be completed to allow the Owner to move from the existing facilities into the new Administration/Operations and Maintenance Buildings and associated parking identified in Phase 1 (collectively identified as 'Phase 1'). Upon substantial completion of Phase 1 and approval by all local and State agencies allowing occupancy, the Owner will relocate from the existing facilities identified in Phase 2 into Phase 1 facilities. Once Owner has relocated all operations into Phase 1, Phase 2 area will be released to Contractor to complete remaining work. Contractor shall not obstruct or interfere with Owner's operations at any time during project without prior approval and written authorization.

B. The designated milestone construction start and completion durations are as follows:

Project Start date:	Notice To Proceed (NTP) date.
Milestone 1 -	458 CD's from NTP date.
Milestone 2 -	518 CD's from NTP date
Milestone 3 -	547 CD's from NTP date.
Milestone 4 -	644 CD's from NTP date.
Final Completion date Contract Time :	665 CD's from NTP date.

C. Reference 00 73 00 (Special Conditions) for Adverse Weather days which are included in the construction durations identified in paragraph 2.B of this section. Also reference Tire Derived Aggregate deadlines required at section 00 73 00 (Special Conditions), paragraph 3.

D. Reference 00 55 00 (Notice to Proceed) for additional requirements which are included in the construction durations identified in paragraph 2.B of this section.

3. TIME OF COMPLETION

A. The contractor is required to achieve the Intermediate Milestones for the Building Construction by the dates specified in Section 2.B above and shall achieve Final Completion of the entire project no later than 665 calendar days (CD's) from the date of the Notice to Proceed (NTP).

B. Milestone #1 – Substantial Completion of the MDF and IDF Rooms and all horizontal pathways in the Administration/Operations and Maintenance Buildings; and Data and Security Conduit Connecting Each Building:

a. The Owner's separate Telecom and Security Contractors and AT&T will require all MDF/IDF rooms be completed and turned over to them exclusively no later than 60 CD's prior to the Milestone #2 – Admin/Op's/Maint Bldg Certificate Of Occupancy (COO) and Substantial Completion (SC) can be achieved. Contractor is required to schedule their work to include the requirements of the Owner's separate Telecom and Security Contractors and AT&T to ensure they are both 100% complete with their work in the MDF/IDF rooms. AT&T requires the MDF/IDF rooms are done which includes all ceilings, finishes, HVAC & temperature control active, lighting, final doors/hardware & final keying, final cleaning, racks, grounding, low voltage cabling; to ensure a secure and dust free environment inside and outside the MDF/IDF rooms. All horizontal and site cable infrastructure identified in Phase 1 must be installed and accepted. The Contractor must achieve this before AT&T will start the fiber order and to ensure the Telecom and Security Contractors and AT&T work is completed prior to the COO milestone, see **Appendix G**.

C. Milestone #2 – Substantial Completion of the Administration/Operations and Maintenance Buildings, and Site Improvements identified in Phase 1 including Certificate(s) of Occupancy:
   a. The Administration/Operations and Maintenance Buildings must be completed including SC and COO achieved to allow the Owner's staff and operations to move from the Existing Building into the two new buildings and Phase 1 site parking. The Contractor shall not work in the Phase 2 limits or disrupt the Owner's existing operations in the Phase 2 limits for any reason without prior approval or written authorization. Contractor shall maintain a secure perimeter around the existing yard while it is in use, with either the existing permanent fencing or contractor furnished temporary fencing.

D. Owner Move Period:
   a. After the Contractor has achieved a Certificate of Occupancy (COO) from the Chico Building Department for the Administration/Operations and Maintenance Buildings and parking areas, contractor will allow 28 CD's for the Owner to move out of the Existing Building/Yard.

E. Milestone #3 - Phase 2 Work:
   a. After move is completed, the Existing Building, Yard and driveway access off Huss Lane will be turned over to the Contractor to start work collectively known as Phase 2. The Contractor shall complete work identified in Phase 2 limits which is the Existing Yard and in the City of Chico right of way in Huss Lane with a COO issued by Chico Building Dept. for this work no later than 98 CD's after starting Milestone 3. The new bus yard will become operational including all security and gate requirements, and contractor shall work around the bus operations throughout remaining contract duration and completion.

F. Milestone #4 - Substantial Completion date;
   a. All work, including work identified in Phase 1 and 2, must be completed and Substantial Completion achieved no later than 644 CD's after the NTP date.

G. Final Completion Date;
   a. Following the Substantial Completion date recognized and issued by the Architect, the Contractor shall achieve a Final Completion date no later than 21 CD's after Substantial Completion date. All work identified in the Contract Documents shall be complete and approved by Owner team including: final sitework and landscaping, punch lists, Commissioning documentation, LEED documentation, As-built construction drawings and record documents, Operations and Maintenance Manuals, Permit Card sign-offs, Agency sign-offs (such as AQMD, Butte County Public Health, CDF&G, USF&WS, Etc.), final cost proposals and contractor change orders, Warranty Request procedures, etc. must be completed 100% to achieve Final Completion. Reference each specification section for specific requirements.

4. LIQUIDATED DAMAGES

A. Failure on the part of the Contractor to achieve Substantial Completion and COO of each intermediate milestone and/or phase of the work and or the entire project by the dates and within the time periods specified in Section 2 and 3 above, including any approved extensions thereof, shall subject the Contractor to Liquidated Damages as provided in Article 3.2 of the contract (Section 00 52 13 – AGREEMENT) and Item 4.B below.

B. The amount of Liquidated Damages assessed under Section 4.A above will be **$3,000.00 (Three Thousand Dollars)** per Calendar Day.

END OF SECTION

GEOTECHNICAL ENGINEERING INVESTIGATION REPORT for the BUTTE REGIONAL TRANSIT OPERATIONS CENTER 326 Huss Drive, Chico, California

Prepared for:
TLCD Architecture
111 Santa Rosa Avenue, Suite 300
Santa Rosa, California 95404
Phone (707) 525-5600

Prepared by:
HOLDREGE & KULL
8 Seville Court, Suite 100
Chico, California, 95928
Phone: (530) 894-2487
Fax: (530) 894-2437

Project No. 70395-01
May 17, 2012

HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS

May 17, 2012
Project No.: 70395-01

Mr. Don Tomasi, AIA
TLCD Architecture
111 Santa Rosa Avenue, Suite 300
Santa Rosa, California 95404
Phone (707) 525-5616

Reference: ***Butte Regional Transit Operations Center***
326 Huss Drive
Chico, Butte County, California

Subject: ***Geotechnical Engineering Investigation Report***

Dear Mr. Tomasi,

Holdrege & Kull (H&K) is pleased to have had this opportunity to provide geotechnical engineering services for development of the proposed Butte Regional Transit Operations Center to be located at 326 Huss Drive, Chico, California. Our geotechnical engineering investigation of the site was performed consistent with the scope of services presented in our December 27, 2012 proposal (PC11.077).

The findings, conclusions, and recommendations presented in this report are based on the following relevant information collected and evaluated by H&K: literature review, surface observations, subsurface exploration, laboratory test results, and our experience with similar projects, sites and conditions in the area. The proposed project will provide a new bus maintenance building, bus wash, bus parking lot, employee and visitor parking lot, operations building, and administration office. The new construction will utilize conventional design and construction practices. H&K has determined that the site is suitable for the proposed construction, as long as our recommendations for earthwork grading and structural improvements are followed.

It is our opinion that the site is suitable for the proposed construction provided the geotechnical engineering recommendations presented in this report are incorporated into the earthwork and structural improvements. This report should not be relied upon without review by H&K if a period of 24 months elapses between the issuance report date shown above and the date when construction commences.

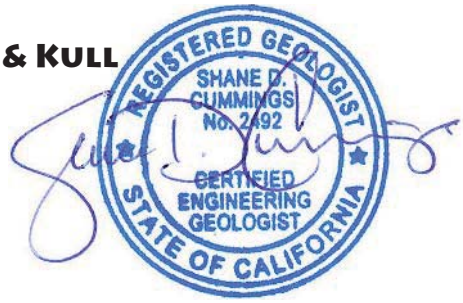
Our experience, and that of the civil engineering profession, clearly indicates that during the construction phase of a project the risks of costly design, construction, and maintenance problems can be significantly reduced by retaining the geotechnical engineering firm to review the project plans and specifications and to provide geotechnical engineering construction quality assurance (CQA) observation and testing services. Upon your request we will prepare a CQA geotechnical engineering services proposal that will present a work scope, tentative schedule, and fee estimate for your consideration and authorization.

If H&K is not retained to provide geotechnical engineering CQA services during the construction phase of the project, then H&K will not be responsible for geotechnical engineering CQA services provided by others nor any aspect of the project that fails to meet your or a third party's expectations in the future.

H&K appreciates the opportunity to provide geotechnical engineering services for this important project. If you have questions or need additional information, please do not hesitate to contact the undersigned at 530-894-2487.

Sincerely,

HOLDREGE & KULL



Shane D. Cummings, CEG 2492
Senior Engineering Geologist

Chuck R. Kull, G.E. 2359, CEG 1622
Principal Engineer

Copies To: Addressee (4 copies)

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Appendices:
A Proposal for Geotechnical Engineering Services, Butte County Association of Governments, Butte Regional Transit Operations Center, dated December 27, 2011 (PC11.077) (excluding fee and contract sections).
B Important Information About Your Geotechnical Investigation Report (Included with permission of ASFE, Copyright 2004).
C Exploratory Boring Logs.
D Soil Laboratory Test Sheets.

1 INTRODUCTION

Holdrege & Kull (H&K) performed a geotechnical engineering investigation of the proposed Butte Regional Transit Operations Center (BRTOC) located at 326 Huss Drive in Chico, California consistent with the scope of services presented in our Geotechnical Engineering Investigation Proposal (PC11.077), dated December 27, 2011 and in general accordance with the 2010 California Building Code (CBC). A copy of the proposal, excluding the fee and contract sections, is included in Appendix A. Our findings, conclusions, and recommendations are presented herein.

For your review, Appendix B presents a document prepared by ASFE entitled *Important Information About Your Geotechnical Engineering Report.* This document summarizes project specific factors, limitations, content interpretation, responsibilities, and other pertinent information. Please read this document carefully.

1.1 SCOPE-OF-SERVICES

H&K performed a specific scope-of-services to develop geotechnical engineering design recommendations for earthwork and structural improvements. A brief description of each work scope task performed is presented below. A detailed description of each work scope task is presented in Section 2 (Site Investigation) of this report.

- **Task 1 Site Investigation:** H&K performed a site investigation to characterize the existing surface and subsurface soil, rock, and groundwater conditions encountered to the maximum depth excavated. H&K's field engineer/geologist made observations, collected representative soil samples, and performed field tests at a limited number of subsurface exploratory locations. H&K performed laboratory tests on selected soil samples to evaluate their geotechnical engineering material properties.
- **Task 2 Data Analysis and Engineering Design:** H&K evaluated the field and laboratory site data, proposed site improvements, and used this information to develop geotechnical engineering design recommendations for earthwork and structural improvements. Engineering judgment was used to extrapolate our observations and conclusions regarding the field and laboratory data to other areas located between and beyond the locations of our subsurface exploratory excavations.
- **Task 3 Report Preparation:** H&K prepared this report to present our findings, conclusions and recommendations.

1.2 SITE LOCATION AND DESCRIPTION

The proposed BRTOC site is located at 326 Huss Drive, in Chico, California, on a vacant unimproved lot north of the current B-line Transit Facility location. Our site investigation was performed on March 7 and 8, 2012 and at that time the property was flat with very little to no topographic relief and covered in native grasses and weeds. The surrounding property use includes developed industrial and commercial buildings and mixed agricultural plots. Figure 1 shows the site location and near vicinity.

1.3 PROPOSED IMPROVEMENTS

Although preliminary or final design and improvement plans were not available for review for preparation of this report, H&K was able to review the February 24, 2012 Site Concept G.2 to get an understanding of the proposed layout of each building and parking lot location. Based on our understanding go the project, H&K assumes that the construction of the BRTOC may consist of the following improvements: one story and two story buildings with steel column and/or wood framing, continuous spread and isolated foundations for the buildings, interior and exterior concrete slab-on-grade floors; drilled pier foundation for parking lot light poles, asphalt concrete (AC), permeable concrete, and rigid concrete paved roadway and parking lots, and landscaped areas. Figure 2 is a site sketch showing the site layout and proposed locations of the new buildings and improvements.

Earthwork grading may include general site preparation and minor cuts and fills required to balance the site to meet the proposed building and improvement grades.

1.4 INVESTIGATION PURPOSE

The purpose of our investigation is to obtain sufficient on-site information about the soil, rock, and groundwater conditions at the site to allow us to prepare a geotechnical engineering recommendations for construction of the proposed earthwork and structural improvements described in the preceding. H&K did not evaluate the site for the presence of hazardous waste, mold, asbestos, and radon gas. Therefore, the presence, removal, or mitigation of these hazardous materials are not discussed in this report.

2 SITE INVESTIGATION

H&K performed a site investigation to characterize the existing subsurface conditions beneath the proposed transit center to develop geotechnical engineering recommendations for earthwork and structural improvements. Each component of our site investigation is presented below.

2.1 LITERATURE REVIEW

H&K performed a limited review of available literature that was pertinent to the project site. The following summarizes our findings.

2.1.1 Site Improvement Plan Review

The preliminary and final site improvement plans were not available for review at the time this report was prepared. H&K was able to review a Site Concept G.2 plan (February 24, 2012) showing the proposed buildings and parking lot locations. The site concept plan was used to locate our exploratory borings during the site investigation. Prior to implementing grading and site improvements, H&K should be allowed to review the final plans to determine whether our recommendations have been implemented, and if necessary, to provide additional and/or modified recommendations.

2.1.2 Geologic Setting and Regional Faulting

The geology of the Chico and BRTOC area is comprised of Modesto Formation alluvium and fluvial sediments deposited during the Pleistocene Epoch (1.5 Million Years to 11,000 before present). According to the *Geologic Map of the Chico Monocline and Northeastern Part of the Sacramento Valley, California* (Harwood, et al. 1981) the alluvium fluvial sediments are composed of gravel, sand, silt and clay derived from the Tuscan Formation.

Regional faulting is associated with the northern extent of the Foothill Fault System which includes the Chico Monocline, Cohasset Ridge Fault, Paradise Fault, Magalia Fault, and the Cleveland Hill Fault. The Foothill Fault System is a broad zone of northwest trending east dipping normal faults formed along the margin of the Great Valley and the Sierra Nevada geologic provinces on the western flank of the Sierra Nevada and southern Cascade mountain ranges. The northern part of the fault zone is split in three branches: the Melones fault zone to the east, the Cleveland Hill fault to the south, and Chico Monocline to the north and northeast. The Based on review of the California Geological Survey Open File Report 96-08, *Probabilistic Seismic Hazard Assessment for the State of California*, and the 2002 update entitled *California Fault Parameters* no known active or inactive faults traces have been identified on site or adjacent to the project site. The closest fault identified on the Geologic Map of the Chico Quadrangle, published by the California Division of Mines and Geology, is the Chico Monocline Fault is located approximately 5 miles east of

the project site. The fault is identified as a major tectonic boundary with late Cenozoic displacement responsible for the formation of the Chico monocline. The fault is listed as Quaternary age and may have experienced anomalous aftershocks soon after the 1975 Oroville earthquake (Harwood and Helley, 1987).

According to the *Fault Activity Map of California and Adjacent Areas* (Jennings, 1994), the closest known active fault which has surface displacement within Holocene time (about the last 11,000 years) is the Cleveland Hill Fault. The Cleveland Hill Fault is located approximately 25 miles south of the subject site and is associated with ground rupture during the Oroville earthquakes of 1975.

2.2 FIELD INVESTIGATION

H&K performed a field investigation of the site on March 7 and 8, 2012. H&K's Field Engineer/Geologist described the surface and subsurface soil, rock, and groundwater conditions observed at the site using the procedures cited in the American Society for Testing and Materials (ASTM), Volume 04.08,*"Soil and Rock; Dimension Stone; and Geosynthetics"* as general guidelines for our field and laboratory procedures. The Field Engineer/Geologist described the soil color using the general guideline procedures presented in the Munsel Soil Color Chart. Engineering judgment was used to extrapolate the observed surface and subsurface soil, rock, and groundwater conditions to areas located between and beyond our subsurface exploratory locations. The surface, subsurface, and groundwater conditions observed during our field investigation are summarized below.

2.2.1 Surface Conditions

H&K observed the following surface conditions during our field investigation of the property. Figure 2 shows the project site boundaries and our subsurface exploration locations. The site has flat lying (≤ 1 degree slope angle) improved surfaces consisting of native grass. There were no surface conditions of concern identified during our site investigation.

2.2.2 Subsurface Conditions

The subsurface soil, rock and groundwater conditions were investigated by drilling exploratory borings at the site. The subsurface information obtained from these investigation methods are described herein.

2.2.2.1 Exploratory Boring Information

H&K provided engineering oversight for the advancement of 6 exploratory soil borings at the project site with a truck mounted CME 75 drill rig equipped with 7.25-inch outside diameter solid stem augers. Figure 2 shows the approximate locations of the subsurface exploratory excavations. The borings were advanced to depths ranging from 16 feet to 19.5 feet below ground surface (bgs) where refusal in very dense, gravel and cobbles occurred. Engineering judgment was used to extrapolate

the observed soil, rock, and groundwater conditions to areas located between and beyond our subsurface exploratory excavations.

H&K's Field Engineer/Geologist logged each exploratory boring using the Unified Soils Classification System (USCS) as guidelines for soil descriptions and the American Geophysical Union guidelines for rock descriptions. Representative relatively undisturbed soil samples were generally collected from the following depth intervals: 2.5-feet, 5-feet, 10-feet, and 15-feet bgs. Relatively undisturbed soil samples were collected with a 2.5-inch inside-diameter split-spoon sampler equipped with steel liner sample tubes and an unlined standard penetration test (SPT) split barrel sampler. The samplers were driven into the soil using a 140-pound automatic trip hammer with a 30-inch free fall. The steel liner tube samples were sealed with end-caps, labeled and transported to our soil laboratory facility.

A representative disturbed bulk soil sample was also collected from the upper five feet of boring B12-3. The bulk soil sample was placed in a plastic sack, labeled and transport to our soil laboratory facility. Selected soil samples were tested in our laboratory to determine their engineering material properties which included: natural moisture content, density, particle size gradation, plasticity, resistance value, unconfined shear strength, cohesion, and volume change potential. These soils engineering material properties are used to develop geotechnical engineering recommendations for: foundation, concrete slab-on-grade floors, continuous spread and isolated foundation footings, and asphalt concrete pavement design.

Detailed descriptions of the soil, rock, and groundwater conditions that were encountered in each subsurface exploratory location are presented on the exploratory boring logs included in Appendix C. The soil and rock descriptions are based on visual field estimates of the particle size percentages (by dry weight), color, relative density or consistency, moisture content, and cementation that comprise each soil material encountered.

A generalized profile of the soil, rock, and groundwater conditions encountered to the maximum depth drilled (19.5 feet) for the proposed BRTOC area is presented below. The soil and/or rock units encountered in our subsurface exploratory excavations were generally stratigraphically continuous across the site; however, the units may slightly vary in thickness. The units encountered in general stratigraphic sequence during our subsurface investigation of the site are described below.

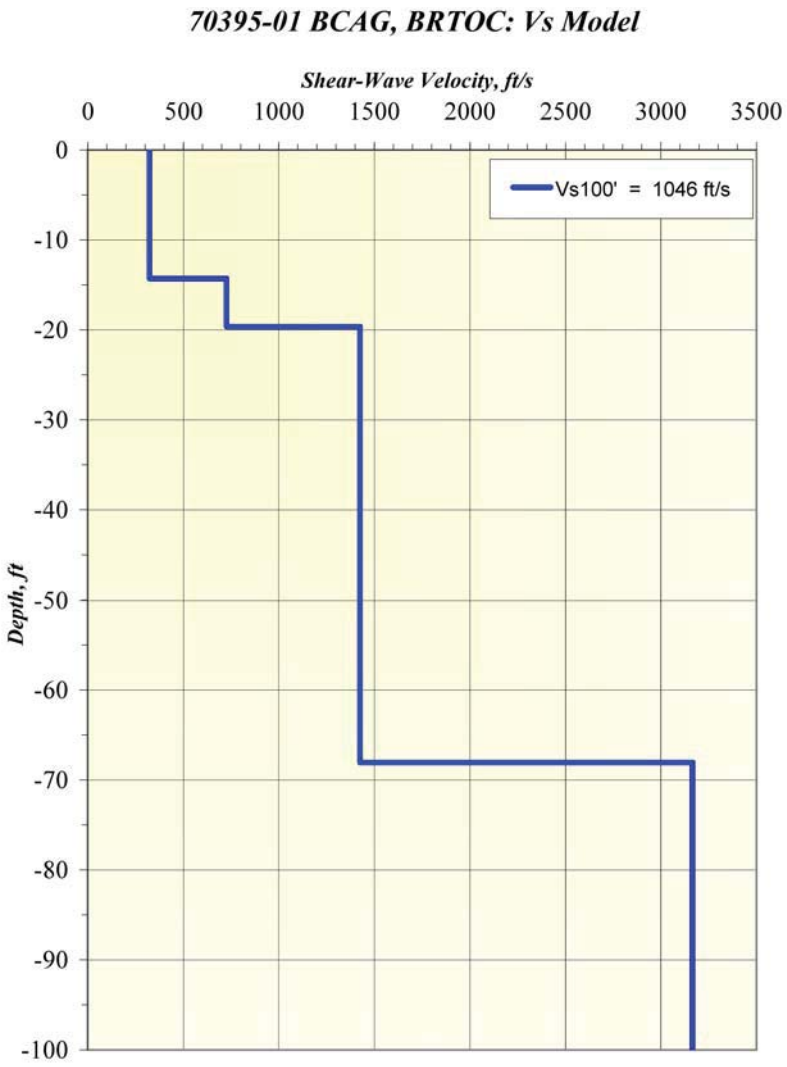
- **CL, Low Plasticity Clay Soil:** This soil consists of the following field estimated particle size percentages 65 percent low plasticity silt and clay size particles and 30 percent very fine to fine sand. This soil is predominantly dark brown with a Munsel Color Chart designation of (7.5YR 3/4). This soil was stiff and damp at the time of our subsurface investigation.
- **SM, Silty Sand Soil:** This soil consists of the following field estimated particle size percentages 60 percent very fine sand and 40 percent low plasticity fines.

This soil is predominantly brown with a Munsel Color Chart designation of (7.5YR 5/4). This soil was medium dense and dry to damp,a nd slightly cemented at the time of our subsurface investigation.

- **GM, Silty Gravel Soil:** This soil consists of the following field estimated particle size percentages 40 percent coarse gravel with cobbles, 30 percent fine to medium sand, and 30 percent low plasticity clay and silt size particles. This soil is predominantly brown with a Munsel Color Chart designation of (7.5YR 5/4). This soil was dense to very dense and dry at the time of our subsurface investigation.

2.2.2.2 Seismic Refraction Survey

H&K performed a seismic refraction microtremor survey at the BRTOC site using the SeisOpt® ReMi™ Vs30 method to determine the in-situ shear-wave (S-wave) velocity profile of the first 100-feet of soil beneath the site. H&K is using this ReMi™ Vs30 evaluation as additional support for our Site Class determination.



Based on the known subsurface geologic conditions at the BRTOC this evaluation was selected to determine the 2010 California Building Code (CBC) Site Class in accordance with Chapter 16, Section 1613.5.2. The seismic refraction survey was performed at the surface using conventional seismograph and vertical P-wave geophones used for refraction surveys. The seismic source consists of ambient seismic microtremors which were constantly being generated by cultural and natural noise in the area. H&K recorded the seismic vibrations generated by the drill rig, vehicle traffic along Huss Drive and Hagan Lane, and industrial operations in the area during the site investigation. The data was collected during a series of 25 recording periods that were each 30 seconds in duration. The Vs Model (depicted on this page) shows the subsurface shear-wave velocity profile that was developed for the site from the SeisOpt® ReMi™ data.

The resulting subsurface shear wave model for the site indicates that the harmonic mean seismic shear wave velocity for the upper 100 feet of the subsurface was 1,046 feet per second. This weighted shear wave velocity corresponds to the upper range of Site Class D, as described in Table 1613.5.2 of the 2010 CBC.

2.2.2.3 Groundwater Conditions

Groundwater not was encountered in the exploratory borings drilled at the site. Seasonal fluctuations in the local groundwater table at the project site and vicinity are unknown at this time; however it is generally understood that the groundwater table elevation is highest at the end of the winter rainy season and lowest at the end of the summer dry season. Therefore, H&K does not expect the construction activities to encountered shallow groundwater. Seasonal infiltration water may be encountered during the winter months in deep trenches.

3 LABORATORY TESTING

H&K performed laboratory tests on selected soil samples taken from the subsurface exploratory excavations to determine their engineering material properties. These engineering material properties were used to develop geotechnical engineering design recommendations for earthwork and structural improvements. The following laboratory tests were performed using the cited American Society for Testing and Materials (ASTM) and Caltrans Test Method (CTM) guideline procedures:

- ASTM D422 Particle Size Gradation (Sieve Only, Hydrometer Only or Both)
- ASTM D2266 Unconfined Compression
- ASTM D2216 Moisture Content
- ASTM D2844 Resistance (R) Value Test (CTM 301)
- ASTM D2937 Dry Density
- ASTM D3080 Direct Shear Test
- ASTM D4318 Atterberg Plasticity Indices
- ASTM D4829 Expansion Index (UBC Expansion Index)

Table 3-1 presents a summary of the laboratory test results. Appendix D presents the laboratory test data sheets.

Table 3-1. Laboratory Test Results

			Results											
ASTM Test Method			D2487 D2488	D2216	D2937	D422		D4318(1)		D4829(1)	D2844	D2166	D3080(2)	
Boring No.	Sample No.	Sample Depth (feet)	USCS (sym)	Moisture Content (%)	Dry Density (pcf)	Passing No. 4 (%)	Passing No. 200 (%)	Plasticity Index (%)	Liquid Limit (%)	Expansion Index (dim)	R-Value (dim)	Unconfined Shear Strength (psf)	Cohesion (psf)	Friction Angle (degree)
B12-3	030812A	0-5	CL			99.9	72.7	14	34	29	6			
B12-2	L1-1/1	2.5	CL										668 (P) 605 (R)	34.9 (P) 35.5 (R)
B12-2	L1-1/2	5	CL	16.4	92.5							2,835		
B12-2	L3-1/2	10	SM	26.6	91.4									
B12-1	L1-2/2	5	CL	17.6	88.7									
B12-1	L2-1/1	10	SM	9.9	107.5									

Notes:
(1) Corrected to 50% saturation.
(2) P indicates peak shear strength values and R indicates residual shear strength values.

ASTM = American Society for Testing and Materials
dim = dimensionless units
No. = number
pcf = pounds per cubic foot
psf = pounds per square foot
sym = symbol
% = percent

4 SEISMIC HAZARDS

To meet the requirements of the 2010 building code, the following seismic hazards evaluation was performed.

4.1.1 Liquefaction

Our determination of the potential for liquefaction occurring at this site is based on our subsurface exploratory boring SPT blow count and field data, probabilistic seismic expected ground acceleration analysis and literature review. Based on this information, H&K believes that the site soil and groundwater conditions make the probability of liquefaction occurring during a nearby earthquake to be very low.

Soil liquefaction results when the shear strength of a saturated soil decreases to zero during cyclic loading that is generally caused by machine vibrations or earthquake shaking. Generally, clean, loose, uniformly graded sand and loose, silty sand soils that are saturated are the most prone to undergo liquefaction; however, gravelly soil, and some clay-rich soil may be prone to liquefaction under certain conditions. The onsite soil is primarily composed of stiff to very stiff, dry to damp, cohesive soil and medium dense to very dense, damp, granular soil. During our site investigation shallow groundwater was not encountered within our exploratory borings advanced up to 19.5 feet bgs. The subsurface shear-wave velocities measured below 19.5 feet bgs exceed 1,400 feet/second. H&K evaluated the shear-wave velocity data and used the methods described in their paper *Liquefaction Resistance of Soils from Shear-Wave Velocity*, in the Journal of Geotechnical and Geoenvironmental Engineering, November 2000, by Andrus and Stokoe. The limiting upper value of the shear-wave velocity in gravelly soils was determined to be approximately 656 ft/s (200 m/s) for Holocene soils, such as sands and gravels (Andus & Stokoe, 2000). The site soil conditions make the probability of liquefaction occurring during the Maximum Creditable Earthquake to be very low for the proposed structural foot-print area.

We expect any seismically induced settlement of saturated and partially saturated soils at this site to be less than 1-inch with less than ½-inch differential settlement across the building pad.

5 CONCLUSIONS

The conclusions presented below are based on information developed from our field and laboratory investigations.

1. It is our opinion that the site is suitable for the proposed construction improvements provided that the geotechnical engineering design recommendations presented in this report are incorporated into the earthwork and structural improvement project plans.
2. Prior to construction, H&K should be allowed to review the proposed final earthwork grading plan and structural improvement plans to determine if our geotechnical engineering recommendations are applicable or need modifications.
3. Based on the site geology, the observations of our exploratory borings, and the SeisOpt ReMi Vs30 shear-wave profile analysis, the site soil profile can be modeled, according to the 2010 CBC, Chapter 16, Table 1613.5.2, and Section 1613.5.2, as a Site Class D (Stiff Soil Profile) designation for the purposes of establishing seismic design loads for the proposed improvements.
4. Based on our literature review and knowledge of the geology in the Chico area, no active or potentially active faults are known to underlie the BRTOC site.
5. Based on the subsurface exploratory boring SPT blow counts, field data, and literature review, H&K believes that the site soil and groundwater conditions makes the probability of liquefaction occurring during a nearby earthquake to be extremely low.
6. At the time of our investigation the site consisted of flat lying unimproved surface (grass and a few trees). The surrounding land use is mixed commercial and industrial.
7. The soil conditions observed to a maximum depth of 19.5 feet below the existing ground surface in our subsurface exploratory excavations generally consisted of (described relative to the existing ground surface): approximately 0 to 9-feet of dark brown, stiff to very stiff, damp, sandy clay (CL), underlain by up to 5 feet of dark brown, medium dense, damp silty sand (SM), underlain by brown, medium dense to very dense, moist to wet, silty gravel (GM). Based on the seismic refraction survey (ReMi) performed on the site, the estimated the total depth of the silty gravel (GM) unit is approximately 45 to 50 feet thick and is underlain by the Tuscan Formation measured at a depth of approximately 68 feet bgs.
8. Our field and laboratory test data indicates that the low plasticity sandy clay (CL) soil unit encountered beneath the site has the following general geotechnical engineering properties: stiff, moderate bearing capacity, a low expansion potential (volume change), and a low resistance (R) value .
9. At the time of our subsurface site investigation, no groundwater was encountered within our exploratory borings drilled to a depth of 19.5 feet bgs.

6 RECOMMENDATIONS

H&K developed geotechnical engineering design recommendations for earthwork and structural improvements from our field and laboratory investigation data. Our recommendations are presented hereafter.

6.1 EARTHWORK GRADING

Our earthwork grading recommendations include: clearing and grubbing, native soil preparation, fill construction, cut-fill transitions, fill slope grading, cut slope grading, erosion controls, underground utility trenches, construction de-dewatering, soil corrosion potential, subsurface drainage, surface water drainage, review of construction plans, and construction quality assurance/quality control (QA/QC) monitoring. Our earthwork grading recommendations are presented below.

6.1.1 Import Fill Soil

Import fill soil should meet the geotechnical engineering material properties described in Section 6.1.5.1 (Engineered Fill Construction With Non-Expansive Soil) of this report. Prior to importation to the site, the project geotechnical engineer should approve all proposed imported fill soil for use in constructing engineered fills at the site.

6.1.2 Temporary Excavations

All temporary excavations must comply with applicable local, state and federal safety regulations, including the current Occupational Safety and Hazards Administration (OSHA) excavation and trench safety standards. Construction site safety is the responsibility of the contractor, who is solely responsible for the means, methods, and sequencing of construction operations. Under no circumstances should the findings, conclusions and recommendations presented herein be inferred to mean that H&K is assuming any responsibility for temporary excavations, or for the design, installation, maintenance, and performance of any temporary shoring, bracing, underpinning or other similar systems. H&K could provide temporary cut slope gradients, if required.

6.1.3 Stripping and Grubbing

The site should be stripped and grubbed of vegetation and other deleterious materials as described below.

1. Strip and remove the top 2 to 4 inches of soil containing shallow vegetation roots and other deleterious materials. This highly organic topsoil can be stockpiled on-site and used for surface landscaping, but should not be used for constructing compacted engineered fills. Grub the underlying 6 to 8 inches of soil to remove any large vegetation roots or other deleterious material while leaving the soil in place. The project geotechnical engineer or his/her representative should

approve the use of any soil materials generated from the clearing and grubbing activities.

2. Remove all large shrub and tree roots and tree stumps. Excavate the remaining cavities or holes to a sufficient width so that an approved backfill soil can be placed and compacted in the cavity or holes. Sufficient backfill soil should be placed and compacted in order to match the surrounding elevations and grades. The project geotechnical engineer or his/her representative should observe and approve the preparation of the cavities and holes prior to placing and compacting engineered fill soil in the cavities and holes.
3. Remove all rocks greater than 3 inches in greatest dimension from the top 12 inches of the soil. Rocks with a greatest dimension larger than 6 inches will be referred to in this report as "over sized" rock materials. Over sized rock materials can be stockpiled on-site and used to construct engineered fills; however they must be placed at or near the bottom of deep fills but not shallower than 3 feet from the finished subgrade surface. The oversized rock should be placed with enough space between them to avoid clustering and the creation of void space. The project engineer or his/her representative should approve the use and placement of all over sized rock materials prior to constructing compacted engineered fills.
4. Excessively large amounts of vegetation, other deleterious materials, and over sized rock materials should be removed from the site.

6.1.4 Native Soil Preparation For Engineered Fill Placement

After completing site clearing and grubbing activities, the exposed native soil should be prepared for placement and compaction of engineered fills as described below.

1. The native soil should be scarified to a minimum depth of 8 inches below the existing land surface or cleared and grubbed surface and then uniformly moisture conditioned. If the soil is classified as a coarse-grained soil by the USCS (i.e., GP, GW, GC, GM, SP, SW, SC or SM) then it should be moisture conditioned to within $\pm$ 3 percentage points of the ASTM D1557 optimum moisture content. If the soil is classified as a fine-grained soil by the USCS (i.e., CL, ML) then it should be moisture conditioned between 2 to 4 percentage points greater than the ASTM D1557 optimum moisture content.
2. The native soil should then be compacted to achieve a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry unit weight (density). The moisture content, density, and relative percent compaction should be tested by the project engineer or the project engineer's field representative to evaluate whether the compacted soil meets or exceeds this minimum percent compaction and moisture content requirements. The earthwork contractor shall assist the project engineer or the project engineer's field representative by excavating test pads with the on-site earth moving equipment. Native soil preparation beneath concrete slab-on-grade structures (i.e., floors, sidewalks, patios, etc.), asphalt

concrete (AC) pavement should be prepared as specified in Section 6.2 (Structural Improvements).

3. The prepared native soil surface should be proof rolled with a fully loaded 4,000 gallon capacity water truck with the rear of the truck supported on a double-axel, tandem-wheel, undercarriage or approved equivalent. The proof rolled surface should be visually observed by the project engineer or the project engineer's field representative to be firm, competent and relatively unyielding. The project engineer or the project engineer's field representative may also evaluate the surface material by hand probing with a ¼-inch-diameter steel probe; however, this evaluation method should not be performed in place of proof rolling as described in the preceding.
4. Construction quality assurance (CQA) tests should be performed using the minimum testing frequencies presented in Table 6.1.4-1 or as modified by the project engineer to better suit the site conditions.

Table 6.1.4-1. Minimum Testing Frequencies

ASTM Number	Test Description	Minimum Test Frequency(1)
D1557	Modified Proctor Compaction Curve	1 per 40,000 sf Or Material Change (2)
D2922	Nuclear Moisture Content	1 per 5,000 sf
D3017	Nuclear Density	1 per 5,000 sf

Notes:
(1) These are minimum testing frequencies that may be increased or decreased at the project engineer's discretion on the basis of the site conditions encountered during grading.
(2) Whichever criteria provide the greatest number of tests.

ASTM = American Society for Testing and Materials
sf = square feet

5. The native soil surface should be graded to minimize ponding of water and to drain surface water away from the building foundations and associated structures. Where possible surface water should be collected, conveyed, and discharged into natural drainage courses, storm sewer inlet structures, permanent engineered storm water runoff percolation/evaporation basins, or engineered infiltration subdrain systems.

6.1.5 Engineered Fill Construction With Testable Earth Materials

Engineered fills are constructed to support structural improvements. Engineered fills should be constructed using non-expansive soil as described in Section 6.1.5.1. If possible, the use of expansive soil for constructing engineered fills should be avoided. If the use of expansive soil cannot be avoided then engineered fills should be constructed as described in Section 6.1.5.2 or as modified by the project engineer. If soil is to be imported to the site for constructing engineered fills, then H&K should be allowed to evaluate the suitability of the borrow soil source by taking representative soil samples for laboratory testing. Testable earth materials are generally considered to be soils with gravel and larger particle sizes retained on the

No. 4 mesh sieve that make up less than 30 percent by dry weight of the total mass. The relative percent compaction of testable earth materials can readily be determined by the following ASTM test procedures: laboratory compaction curve (D1557), field density (D2922) and field moisture content (D3017). Construction of engineered fills with non-expansive and expansive testable earth materials are described below.

6.1.5.1 Engineered Fill Construction With Non-Expansive Soil

Construction of engineered fills with non-expansive soil should be performed as described below.

1. Non-expansive soil used to construct engineered fills should consist predominantly of materials less than 1/2 inch in greatest dimension and should not contain rocks greater than 3 inches in greatest dimension (over sized material). Non-expansive soil should have a plasticity index (PI) of less than or equal to PI ≤ 15 as determined by ASTM D4318 Atterberg Indices test. Over sized materials should be spread apart to prevent clustering so that void spaces are not created. The project engineer or project engineer's field representative should approve the use of over sized materials for constructing engineered fills.
2. Non-expansive soil used to construct engineered fills should be uniformly moisture conditioned. If the soil is classified by the USCS as coarse grained (i.e., GP, GW, GC, GM, SP, SW, SC or SM), then it should be moisture conditioned to within ± 3 percentage points of the ASTM D1557 optimum moisture content. If the soil is classified by the USCS as fine grained (i.e., CL, ML), then it should be moisture conditioned to between 2 to 4 percentage points greater than the ASTM D1557 optimum moisture content.
3. Engineered fills should be constructed by placing uniformly moisture-conditioned soil in maximum 8-inch-thick loose lifts (layers) prior to compacting.
4. The soil should then be compacted to achieve a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density.
5. The field and laboratory CQA tests should be performed consistent with the testing frequencies presented in Table 6.1.5.1-1 or as modified by the project engineer to better suit the site conditions.

Table 6.1.5.1-1 Minimum Testing Frequencies For Non-Expansive Soil

ASTM Number	Test Description	Minimum Test Frequency(1)
D1557	Modified Proctor Compaction Curve	1 per 1,500 cy Or Material Change (2)
D2922	Nuclear Moisture Content	1 per 250 cy
D3017	Nuclear Density	1 per 250 cy

Notes:
(1) These are minimum testing frequencies that may be increased or decreased at the project engineer's discretion on the basis of the site conditions encountered during grading.
(2) Whichever criteria provide the greatest number of tests.

cy = cubic yards

6. The moisture content, density, and relative percent compaction of all engineered fills should be tested by the project engineer's field representative during construction to evaluate whether the compacted soil meets or exceeds the minimum compaction and moisture content requirements. The earthwork contractor shall assist the project engineer's field representative by excavating test pads with the on-site earth moving equipment.
7. The prepared finished grade or finished subgrade soil surface should be proof rolled as mentioned above in Section 6.1.4, Paragraph 3.

6.1.5.2 Engineered Fill Construction With Expansive Soil

H&K did not observe moderately or highly expansive soil at the site during our subsurface investigation. If moderately or highly expansive soils are encountered during grading of the site and if the property owner desires to use expansive soil to construct engineered fills, then H&K should be notified to prepare recommendation options for constructing fills with potentially expansive soil.

6.1.6 Engineered Fill Construction With Non-Testable Earth Materials

The subsurface conditions beneath the site consisted of sandy clay (CL) soil. H&K anticipates that the majority of grading on site will not encounter cobbles during construction. However, if soil is encountered that meets the requirement of non-testable earth materials, and if these materials are used to construct engineered aerial fills and/or engineered utility trench backfills, then a performance (procedural) based CQA method shall be used to evaluate the compaction work performed by the earthwork contractor. If this occurs, H&K should be notified to prepare recommendation options for constructing fills with non-testable earth materials (i.e. cobbles).

6.1.7 Cut-Fill Transitions

H&K has not reviewed the final grading plan; however, we don't anticipate that site conditions during construction will generate a cut-fill transition with fills greater than 3 feet thick. If this condition does occur, H&K will provide additional

recommendations to properly construct the fill pad beneath the building location so that a cut-fill transition is not constructed that my be subject to differential settlement in the future.

6.1.8 Cut and Fill Slope Grading

We don't anticipate that grading of cut and fill slopes will be greater than 3 feet at the site. In general, both cut and fill slopes should be graded at a maximum slope gradient of 2H:1V (horizontal to vertical slope ratio). Surface water should not be allowed to flow over the cut and fill slopes graded at the site.

6.1.9 Erosion Controls

Erosion controls should be installed as described below.

1. Erosion controls should be installed on all cut and fill slopes to minimize erosion caused by surface water run off.
2. Install on all slopes either an appropriate hydroseed mixture compatible with the soil and climate conditions of the site as determined by the local U.S. Soil Conservation District or apply an appropriate manufactured erosion control mat.
3. Install surface water drainage ditches at the top of cut and fill slopes, (as necessary) to collect and convey both sheet flow and concentrated flow away from the slope face.
4. The intercepted surface water should be discharged into natural drainage course or into other collection and disposal structures.

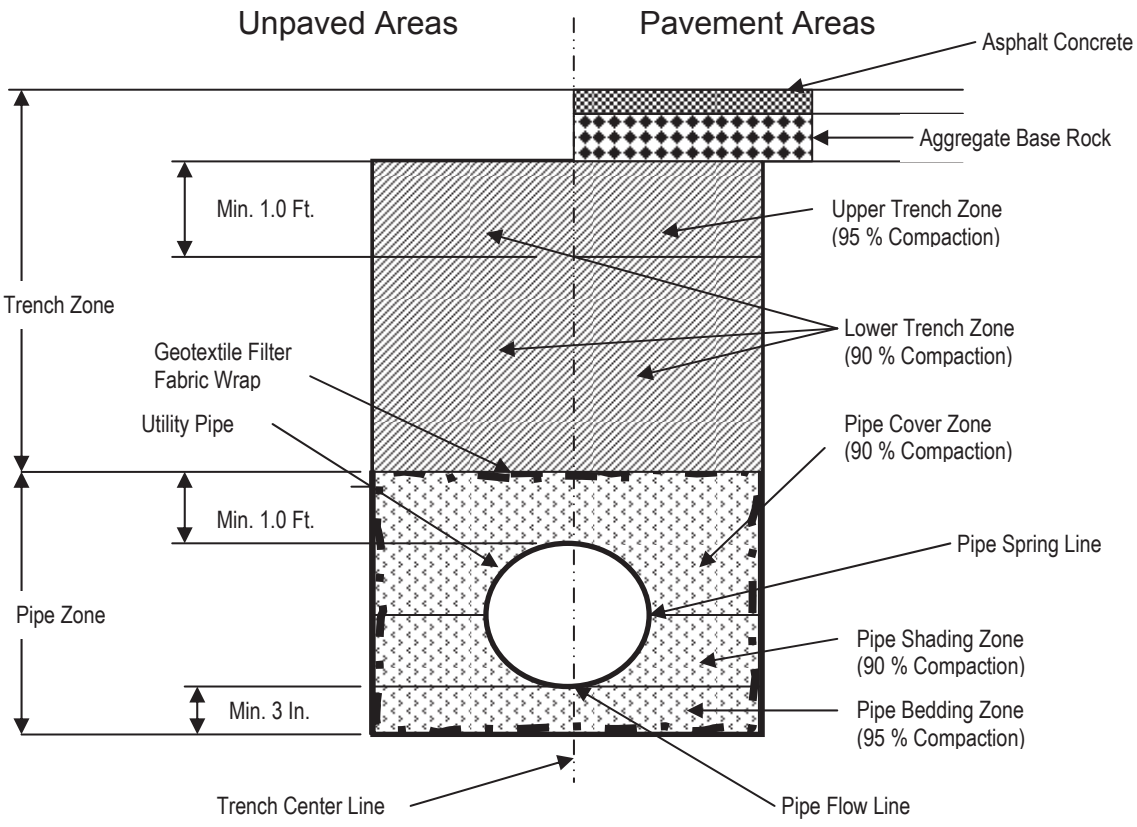
6.1.10 Underground Utility Trenches

Underground utility trenches should be excavated and backfilled as described below for each trench zone as shown in the figure below.

1. **Trench Excavation Equipment:** H&K anticipate that the contractor will be able to excavate all shallow underground utility trenches with a Case 580 Backhoe or equivalent, however, deeper utility trenches (10-feet or greater) may require larger equipment.
2. **Trench Shoring:** All utility trenches that are excavated deeper than 4 feet below the surrounding ground surface are required by the California Occupational Safety and Health Administration (OSHA) to be shored with bracing equipment or sloped back to an appropriate slope gradient prior to being entered by any individuals.
3. **Trench Dewatering:** H&K does not anticipate that the proposed underground utility trenches will encounter shallow groundwater. However, if the utility trenches are excavated during the winter rainy season, then shallow or perched groundwater may be encountered. The earthwork contractor may need to employ de-watering methods as discussed in Section 6.1.11 in order to excavate, place and compact the trench backfill materials.

4. **Pipe Zone Backfill Type and Compaction Requirements:** The backfill material type and compaction requirements for the pipe zone which includes the bedding zone, shading zone and cover zone as shown in the Figure 6.1.11-1 are described below.

FIGURE 6.1.11-1. TYPICAL TRENCH BACKFILL



- **Pipe Zone Backfill Material Type:** Trench backfill used within the pipe zone which includes the bedding zone, shading zone and cover zone should consist of ¾-inch minus, washed, and crushed rock. The crushed rock particle size gradation should meet the following requirements (percents are expressed as dry weights using ASTM D422 test method): 100 percent passing the 1.0 inch sieve, 80 to 100 percent passing the 3/4 inch sieve, 60 to 100 percent passing the 3/8 inch sieve, 0 to 30 percent passing the No. 4 sieve, 0 to 10 percent passing the No. 8 sieve, and 0 to 3 percent passing the No. 200 sieve.

  If groundwater is encountered within the trench during construction or if it is expected to rise during the rainy season due to the intended use as a storm

water infiltration trench to a elevation that will infiltrate the pipe zone within the trench, then the pipe zone material should be wrapped with a minimum 6 ounce per square yard, non-woven, geotextile filter fabric such as Amoco 4506 manufactured by Amoco Fabrics and Fibers Company or equivalent should be used. The geotextile seam should be located along the trench centerline and have a minimum 1-foot overlap. If the utility pipes are coated with a corrosion protection material, then the pipes should be wrapped with a minimum 6 ounce per square yard, non-woven, geotextile cushion fabric such as Amoco 4506 manufactured by Amoco Fabrics and Fibers Company or equivalent should be used. The geotextile cushion fabric should have a minimum 6-inch seam overlap. The geotextile cushion fabric will protect the pipe from being scratched by the crushed rock backfill material.

- **Pipe Bedding Zone Compaction:** Trench backfill soil placed in the pipe bedding zone (beneath the utilities) should be a minimum 3-inches thick, moisture conditioned to within $\pm$ 3 percentage points of the ASTM D1557 optimum moisture content and compacted to achieve a minimum relative compaction of 95 percent of the ASTM D1557 maximum dry density.
- **Pipe Shading Zone Compaction:** Trench backfill soil placed within the pipe-shading zone (above the bedding zone and to a height of one pipe radius length above the pipe spring line) should be moisture conditioned to within $\pm$ 3 percentage points of the ASTM D1557 optimum moisture content and compacted to achieve a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density. The pipe shading zone backfill material should be **shovel sliced** to remove voids and to promote compaction.
- **Pipe Cover Zone Compaction:** Trench backfill soil placed within the pipe cover zone (above the pipe shading zone to one foot over the pipe top surface) should be moisture conditioned to within $\pm$ 3 percentage points of the ASTM D1557 optimum moisture content and compacted to achieve a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density.

5. **Trench Zone Backfill And Compaction Requirements:** The trench zone backfill materials consists of both lower and upper zones as discussed below.
   - **Trench Zone Backfill Material Type:** Soil used as trench backfill within the lower and upper intermediate zones as shown on the preceding figure should consist of non-expansive soil with a plasticity index (PI) of less than or equal to PI $\leq$ 15 (based on ASTM D4318) and should not contain rocks greater than 3 inches in greatest dimension.
   - **Lower Trench Zone Compaction:** Soil used to construct the lower trench zone backfills should be uniformly moisture conditioned to within 0 to 4 percentage points of the ASTM D1557 optimum moisture content, placed in maximum 12-inch-thick loose lifts (layers) prior to compacting and compacted

to achieve a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density.

- **Upper Trench Zone Compaction (Road And Parking Lot Areas):** Soil used to construct the upper trench zone backfills should be uniformly moisture conditioned to within 0 to 4 percentage points greater than the ASTM D1557 optimum moisture content, placed in maximum 8-inch-thick loose lifts (layers) prior to compacting and compacted to achieve a minimum relative compaction of 95 percent of the ASTM D1557 maximum dry density.
- **Upper Trench Zone Compaction (Non-Road And Non Parking Lot Areas):** Soil used to construct the upper trench zone backfills should be uniformly moisture conditioned to within 0 to 2 percentage points greater than the ASTM D1557 optimum moisture content, placed in maximum 6-inch-thick loose lifts (layers) prior to compacting and compacted to achieve a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density.

6. **CQA Testing And Observation Engineering Services:** The moisture content, dry density, and relative percent compaction of all engineered utility trench backfills should be tested by project engineer's field representative during construction to evaluate whether the compacted trench backfill material meet or exceed the minimum compaction and moisture content requirements presented in this report. The earthwork contractor shall assist the project engineer's field representative by excavating test pads with the on-site earth moving equipment.

   - **Compaction Testing Frequencies:** The field and laboratory CQA tests should be performed consistent with the testing frequencies presented in Table 6.1.10-1 or as modified by the project engineer to better suit the site conditions.

Table 6.1.10-1. Minimum Testing Frequencies For Utility Trench Backfill

ASTM Number	Test Description	Minimum Test Frequency(1)
D1557	Modified Proctor Compaction Curve	1 per 500 cy Or Material Change (2)
D2922	Nuclear Moisture Content	1 per 100 lf per 24-Inch-Thick Compacted Backfill Layer (3) The maximum loose lift thickness shall not exceed 12-inches prior to compacting.
D3017	Nuclear Density	1 per 100 lf per 24-Inch-Thick Compacted Backfill Layer (3) The maximum loose lift thickness shall not exceed 12-inches prior to compacting.

Notes:
(1) These are minimum testing frequencies that may be increased or decreased at the project engineer's discretion on the basis of the site conditions encountered during grading.
(2) Whichever criteria provide the greatest number of tests
cy = cubic yards
lf = linear feet

- **Final Proof Rolling:** The prepared finished grade aggregate base (AB) rock surface and/or finished subgrade soil surface of utility trench backfills should be proof rolled as mentioned above in section 6.1.4, Paragraph 3.

6.1.11 Construction De-watering

H&K does not anticipate the need to perform de-watering of the site during earthwork grading. However, the earthwork contractor should be prepared to de-water the utility trench excavations and any other excavations if perched water or the groundwater table are encountered during grading. The following recommendations are preliminary and are not based on performing a groundwater flow analysis. A detailed de-watering analysis was not a part of our proposed work scope. It should be understood that it is the earthwork contractor's sole responsibility to select and employ a satisfactory de-watering method for each excavation.

1. H&K anticipates that de-watering of utility trenches can be performed by constructing sumps to depths below the trench bottom and removing the water with sump pumps.
2. Additional sump excavations and pumps should be added as necessary to keep the excavation bottom free of standing water and relatively dry when placing and compacting the trench backfill materials.
3. If groundwater enters the trench faster than it can be removed by the de-watering system thereby allowing the underlying compacted soil to become unstable while compacting successive soil lifts, then it may be necessary to remove the unstable soil and replace it with free draining, granular drain rock. Native backfill soil can again be used after placing the granular rock to an elevation that is higher than the groundwater table.
4. If granular rock is used it should be wrapped in a non-woven geotextile fabric such as Amoco 4506 manufactured by Amoco Fabrics and Fibers Company or equivalent should be used. The geotextile filter fabric should have minimum 1-foot overlap seems. The granular rock should meet or exceed the following gradation specifications (all percents are expressed as dry weights using ASTM D422 test method): 100 percent passing the 3/4 inch sieve, 80 to 100 percent passing the ½ inch sieve, 60 to 100 percent passing the 3/8 inch sieve, 0 to 30 percent passing the No. 4 sieve, 0 to 10 percent passing the No. 8 sieve, and 0 to 3 percent passing the No. 200 sieve.
5. H&K recommends that the utility trench excavations be performed as late in the summer months as possible to allow the groundwater table to reach its' lowest seasonal elevation.

6.1.12 Soil Corrosion Potential

The selected materials used for constructing underground utilities should be evaluated by a corrosion engineer for compatibility with the onsite soil and groundwater conditions. H&K did not perform a corrosion potential evaluation of the onsite soil and groundwater as part of our scope-of-services. In general, corrosive or

reactive soils, such as soils with high sulfate and chloride concentrations or pH below 5.5 are not common in the Chico area.

6.1.13 Subsurface Groundwater Drainage

H&K does not anticipate encountering prolonged perched groundwater or a shallow local groundwater table during the wet weather season construction. If groundwater is encountered during grading, then H&K should be allowed to observe the conditions and provide site-specific de-watering recommendations.

6.1.14 Surface Water Drainage

H&K recommends the following surface water drainage mitigation measures:

1. Grade all slopes drain away from building areas with a minimum 4 percent slope for a distance of not less than 10 feet from the building foundations.
2. Grade all landscape areas near and adjacent to buildings to prevent ponding of water.
3. Direct all building downspouts to solid pipe collectors which discharge to natural drainage courses, storm sewers, catchment basins, infiltration subdrains, or other drainage facilities.

6.1.15 Grading Plan Review and Construction Monitoring

Construction quality assurance includes review of plans and specifications and performing construction monitoring as described below.

1. H&K should be allowed to review the final earthwork grading improvement plans prior to commencement of construction to determine whether our recommendations have been implemented, and if necessary, to provide additional and/or modified recommendations.
2. H&K should be allowed to perform CQA monitoring of all earthwork grading performed by the contractor to determine whether our recommendations have been implemented, and if necessary, to provide additional and/or modified recommendations.
3. Our experience, and that of our engineering profession, clearly indicates that during the construction phase of a project the risks of costly design, construction and maintenance problems can be significantly reduced by retaining the design geotechnical engineering firm to review the project plans and specifications and to provide geotechnical engineering CQA observation and testing services. If H&K is not retained to provide geotechnical engineering CQA services during the construction phase of the project, then H&K will not be responsible for geotechnical engineering CQA services provided by others nor any aspect of the project that fails to meet your or a third party's expectations in the future.

6.2 STRUCTURAL IMPROVEMENTS

Our structural improvement design criteria recommendations include: seismic design parameters, shallow continuous strip and isolated foundations, retaining walls, concrete slab-on-grade floors, sidewalks, and pavement designs. These recommendations are presented here after.

6.2.1 Seismic Design Parameters

We used Section 1613 of the 2010 CBC and the USGS, *Java Ground Motion Parameter Calculator, Earthquake Ground Motion Tools, Version 5.1.0* to develop the code-based seismic design parameters listed in Table 6.2.1-1.

Table 6.2.1-1. 2010 CBC Seismic Design Parameters

Description	Value	Reference
Latitude	39.705 deg	Google Earth
Longitude	-121.821 deg	Google Earth
Site Coefficient, F_A	1.323	*2010 CBC, Table 1613.5.3(1), USGS, UHRS, v 5.1.0, 2011*
Site Coefficient, F_V	1.944	*2010 CBC, Table 1613.5.3(2), USGS, UHRS, v 5.1.0, 2011*
Site Class (Very Dense Soil and Soft Rock)	D	*2010 CBC, Section 1613.5.2, Table 1613.5.2*
Short (0.2 sec) Spectral Response, S_S	0.596 *g*	*2010 CBC, Figure 1613.5(3), USGS, UHRS, v 5.1.0, 2011*
Long (1.0 sec) Spectral Response, S_1	0.228 *g*	*2010 CBC, Figure 1613.5(4), USGS, UHRS, v 5.1.0, 2011*
Short (0.2 sec) MCE Spectral Response, S_{MS}	0.788 *g*	*2010 CBC, Section 1613.5.3, USGS, UHRS, v 5.1.0, 2011*
Long (1.0 sec) MCE Spectral Response, S_{M1}	0.443 *g*	*2010 CBC, Section 1613.5.3, USGS, UHRS, v 5.1.0, 2011*
Short (0.2 sec) Design Spectral Response, S_{DS}	0.525 *g*	*2010 CBC, Section 1613.5.4, USGS, UHRS, v 5.1.0, 2011*
Long (1.0 sec) Design Spectral Response, S_{D1}	0.295 *g*	*2010 CBC, Section 1613.5.4, USGS, UHRS, v 5.1.0, 2011*

Notes:
CBC = California Building Code
MCE = *Maximum Considered Earthquake*
UHRS = *Uniform Hazard Response Spectra*
USGS = *United States Geological Survey*

6.2.2 Shallow Foundations

Shallow foundations for load bearing walls should be designed as follows:

1. The base of all shallow foundations should bear on firm competent non-expansive native soil, or either non-expansive engineered fill or expansive engineered fill compacted consistent with the earthwork recommendations of Section 6.1.

2. Continuous strip foundations should be constructed with the following dimensions:
   a. Minimum Width = 12 Inches
   b. Minimum Embedment Depth below the lowest adjacent exterior surface grade as shown in Table 6.2.2.
3. The allowable bearing capacities to be used for structural design of shallow foundations founded in either non-expansive native soil or non-expansive engineered fill are presented in Table 6.2.2-1.

Table 6.2.2-1. Foundation Maximum Allowable Bearing Pressures

Minimum Foundation Embedment Depth (inches)	Maximum Bearing Pressures For Live + Dead Loads (pounds per square foot)	Maximum Bearing Pressures For Live + Dead + Wind or Seismic Loads (pounds per square foot)
12	2,500	3,300
18	2,750	3,600
24	3,000	4,000
30	3,500	4,700

4. Foundation lateral resistance may be computed from passive pressure along the side of the foundation and sliding friction resistance along the foundation base; however the larger of the two resistance forces should be reduced by 50 percent when combining these two forces. The passive pressure can be assumed to be equal to an equivalent fluid pressure per foot of depth. The passive pressure force and sliding friction coefficient for computing lateral resistance are as follows:
   a. Passive pressure = 275 (H), where H = foundation depth below lowest adjacent soil surface.
   b. Foundation bottom sliding friction coefficient = 0.40 (dimensionless).
5. Minimum steel reinforcement for continuous strip foundations should consist of two No. 4 bars with one bar placed near the top and one bar placed near the bottom of each foundation or as designated by a California licensed engineer.
6. The concrete should have a minimum 2,500 pounds per square inch compressive break strength after 28-days of curing and have a maximum water to cement ration of 0.50. Since, water is often added to uncured concrete to increase workability, it is important that strict quality control measured be employed during placement of the foundation concrete to insure that the water to cement ratio is not altered prior to or during placement.
7. Concrete coverage over steel reinforcements should be a minimum of 3 inches as recommended by the American Concrete Institute (ACI).
8. Prior to placing concrete in any foundation excavations the contractor shall remove all loose soil, rock, wood, and debris, or other deleterious materials from the foundation excavations.

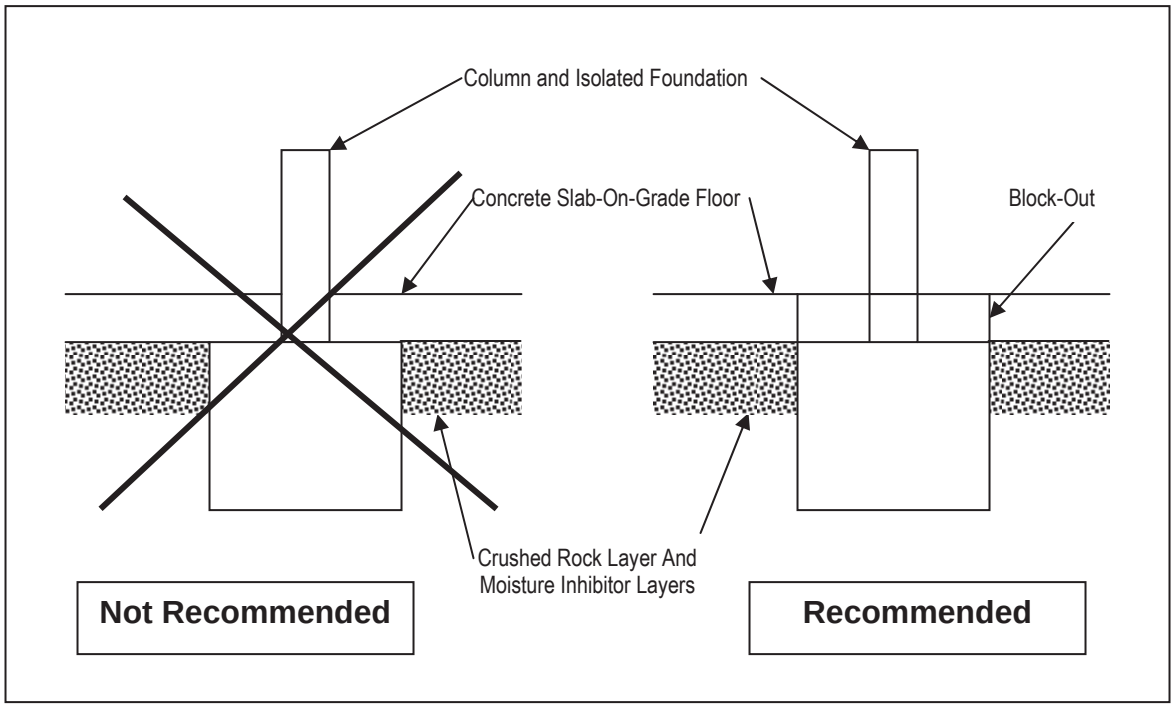
9. Foundation excavations should be saturated prior to placing concrete to aid the concrete curing process; however, concrete should not be placed in standing water.

10. Total settlement of individual foundations will vary depending on the plan dimensions of the foundation and actual structural loading. Based on the anticipated foundation dimensions and loads, we estimated that the total post-construction settlement of foundations designed and constructed in accordance with our recommendations will be on the order of 1/2 inch. Differential settlement between similarly loaded, adjacent foundations is expected to be about 1/4 inch, provided the foundations are founded into similar materials (e.g., all on competent and firm engineered fill, native soil or rock).

11. Prior to placing concrete in any foundation excavation the project geotechnical engineer or his/her field representative should observe the excavations to document that the following requirements have been achieved: minimum foundation dimensions, minimum reinforcement steel placement, and dimensions, removal of all loose soil, rock, wood, and debris, or other deleterious materials, and that firm and competent native or engineered fill soil is exposed along the entire foundation excavation bottom. Strict adherence to these requirements is paramount to the satisfactory behavior of a building foundation. Minor deviations of these requirements can cause the foundations to undergo minor to severe amounts of settlement which can result in cracks developing in the foundation and adjacent structural members such as concrete slab-on-grade floors.

12. We do not recommend that concrete slab-on-grade floors be placed in direct contact with the top surface of isolated column concrete foundations. Our experience is that during the curing period of the concrete slab-on-grade floors, a significant thermal gradient may develop between the portions of the slab placed directly on the typically more massive isolated column concrete foundations and the portions of the slab placed over the vapor-moisture retarder membrane and crushed rock of the slab support layers. **The development of adverse thermal gradients may cause the development of significant orthogonal and/or circular shrinkage cracks in the floor slab around the isolated column foundations.**

    Our opinion is that the slab can be cast over the footing by providing a block out of the slab around the footing, casting the slab, and then filling the block out void with concrete after the slab has cured. Another option would be to cast the footing and slab as shown on the detail and provide felt or an expansion joint between the entire steel column and slab. A thin (1- to 2-inch) sand layer should be placed in the bottom of the void created by the column (on top of the footing). The slab should be cured so that temperature and shrinkage are controlled. We recommend that the slab be moisture cured for a period of seven days after casting.



6.2.3 Concrete Slab-On-Grade Floors

In general, H&K recommends that subgrade elevations on which the concrete slab-on-grade floors are constructed be a minimum of 6 inches above the elevation of the surrounding parking driveway and landscaped areas. Elevating the building will reduce the potential for subsurface water to enter beneath the concrete slab-on-grade floors and exterior surfaces and underground utility trenches.

The concrete slab-on-grade building floors, patios and sidewalks, and driveway areas should be evaluated by a California licensed civil engineer for expected live and dead loads to determine if the minimum slab thickness and steel reinforcement recommendations presented in this report should be increased or redesigned.

H&K recommends using the guideline procedures, methods and material properties that are presented in the following ASTM and ACI documents for construction of concrete slab-on-grade floors:

- ACI 302.1R-04, Guide For Concrete Floor And Slab Construction, reported by ACI Committee 302.
- ASTM E1643-98 (Reapproved 2005), Standard Practice For Installation Of Water Vapor Retarders Used In Contact With Earth Or Granular Fill Under Concrete Slabs.
- ASTM E1745-97 (Reapproved 2004), Standard Specifications For Plastic Water Vapor Retarders Used In Contact With Soil Or Granular Fill Under Concrete Slabs.

- ASTM F710-5, Standard Practice For Preparing Concrete Floors To Receive Resilient Flooring.

6.2.3.1 Interior Floors with Non-Vehicle Traffic

The interior office concrete slab-on-grade floor components are described below from top to bottom. If static or intermittent live floor loads greater than 250 psf are anticipated, then a California licensed structural engineer should design the necessary concrete slab-on-grade floor thickness and steel reinforcements.

1. Minimum 4-Inch-Thick Concrete Slab: should be installed with a minimum 2,500 pounds per square inch (psi) compressive strength after 28 days of curing. H&K recommends that the concrete design uses a water to cement ratio between 0.40 and 0.50 and should be placed with minimum and maximum slumps of 4 and 6 inches, respectively. The concrete mix design is the responsibility of the concrete supplier.
2. Prior to applying construction loads, all exposed concrete slab-on-grade floors should be moisture cured for a minimum of 7 days following placement of the concrete. If concrete is placed during the hot summer months when the ambient air temperatures may be as low as 50 to 60 degrees Fahrenheit (F) in the early morning and in excess of 90 degrees F in the afternoon, then the contractor may need to implement special curing measures to reduce the development of shrinkage cracks. The concrete contractor is responsible for determining the appropriate curing process to be applied to the slab-on-grade floor.

   Concrete Slabs In Contact With Isolated Concrete Foundations: We do not recommend that concrete slab-on-grade floors be placed in direct contact with the top surface of isolated column concrete foundations. Our experience is that during curing period of the concrete slab-on-grade floors a significant thermal gradient may develop between the portions of the slab placed directly on the typically more massive isolated column concrete foundations and the portions of the slab placed over the vapor-moisture retarder membrane and crushed rock of the slab support layers. **The development of adverse thermal gradients may cause the development of significant orthogonal and/or circular shrinkage cracks around the isolated column foundations.**

3. Steel Reinforcement: should be used to improve the load carrying capacity and to reduce cracking caused by shrinkage during curing and from both differential and repeated loadings. It should be understood that it is nearly impossible to prevent all cracks from development in concrete slabs; in other words, it should be expected that some cracking will occur in all concrete slabs no matter how well they are reinforced. Concrete slabs that will be subjected to heavy loads should be designed with steel reinforcements by a California licensed structural engineer.

   Steel Rebar: As a minimum, use No. 3 ribbed steel rebar (ASTM A615/A 615M-04 Grade 60 deformed for reinforcement in concrete), tied and placed with 18-inch

centers in both directions (perpendicular) and supported on concrete "dobies" to position the rebar in the center of the slab during concrete pouring.

4. Underslab Vapor-Moisture Retarder Membrane: should be placed as a floor component that will minimize transmission of both liquid water and water vapor transmission through the concrete slab-on-grade floor. H&K recommends using at a minimum a Class A (ASTM E1745-97 [Reapproved 2004]), minimum 10-mil-thick, plastic, vapor-moisture, retarder membrane material such as: Stego Wrap® underslab vapor retarder membranes or equivalents. Additionally, the following materials are recommended: Stego® Tape and Stego® Mastic or equivalents to seal membrane joints and any utility penetrations.

   Regardless of the type of moisture-vapor retarder membrane used, moisture can wick up through a concrete slab-on-grade floor. Excessive moisture transmission through a concrete slab floor can cause adhesion loss, warping, and peeling of resilient floor coverings, deterioration of adhesive, seam separation, formation of air pockets, mineral deposition beneath flooring, odor and both fungi and mold growth. Slabs can be tested for water transmissivity in areas that are moisture sensitive. Commercial sealants, polymer additives to the concrete at the batch plant, entrained air, flyash, and reduced water to content ratio can be incorporated into the concrete slab-on-grade floor mix design to reduce its permeability and water-vapor transmissivity properties. A waterproofing consultant should be contacted to provide detailed recommendations if moisture sensitive flooring materials will be installed on the concrete slab-on-grade floors.

5. Minimum 6-Inch-Thick Crushed Rock Layer: should be placed and compacted to a minimum of 95 percent of the ASTM D1557 dry density with a moisture content of ± 3 percentage points of the ASTM D1557 optimum moisture content. The crushed rock should be washed to produce an ASTM D422 test particle size distribution of 100 percent (by dry weight) passing the ¾ inch sieve and 0 to 5 percent passing the No. 4 sieve and 0 to 3 percent passing the No. 200 sieve. This relatively clean (washed) crushed rock will act as a capillary break for free water moisture transmission, as well as, provide a uniform bearing surface for the concrete slab-on-grade floor.

6. Subgrade Soil Preparation: The subgrade soil should be prepared and compacted consistent with the recommendations of Section 6.1. The top 12 inches of the non-expansive soil should be compacted to a minimum of 90 percent of the ASTM D1557 dry density with relatively uniform moisture content within ± 3 percentage points of the ASTM D1557 optimum moisture content.

   Prior to placing concrete and the moisture barrier membrane, but after placing the overlying crushed rock layer, the subgrade soil must be moisture conditioned to achieve a uniform moisture content of between 2 and 6 percentage points greater than the ASTM D1557 optimum moisture content to a depth of 12 inches below the finished subgrade surface. Moisture conditioning should be performed for a minimum of 24 hours prior to concrete placement. If the soil is not moisture

conditioned prior to placing concrete, moisture could be wicked (transmitted) out of the concrete by the underlying potentially dryer soil, which could cause shrinkage cracks to develop in the concrete slab during the curing period.

Additionally, our opinion is that moisture conditioning the subgrade soil will reduce the swell (heave) potential of fine-grained soil with moderate to high expansion properties. Typically, concrete slabs impart relatively small loads on the order of about 50 pounds per square foot (psf) on the underlying subgrade soil. Therefore, some vertical movement of the concrete slab should be anticipated from possible expansion of the underlying subgrade soil, regardless of subgrade preparation.

7. Crack Control Grooves: should be installed during placement or saw cuts should be made in accordance with the ACI and Portland Cement Association (PCA) specifications. Generally, H&K recommends that expansion joints be provided between the slab and perimeter footings, and that crack control groves or saw cuts are installed on maximum 10-foot-centers in both directions (perpendicular).
8. Field Observations: should be made by an H&K construction monitor of all concrete slab-on-grade subgrade surfaces and installed steel reinforcements prior to placing concrete.

6.2.3.2 Interior Floors with Vehicle Traffic

The interior shop and maintenance building concrete slab-on-grade floor components for vehicle traffic areas are described below from top to bottom. If static or intermittent live floor loads greater than 250 psf are anticipated, then a California licensed structural engineer should design the necessary concrete slab-on-grade floor thickness and steel reinforcements.

1. Minimum 6-Inch-Thick Concrete Slab: should be installed with a minimum 4,000 pounds per square inch (psi) compressive strength after 28 days of curing. H&K recommends that the concrete design uses a water to cement ratio between 0.40 and 0.50 and should be placed with minimum and maximum slumps of 4 and 6 inches, respectively. The concrete mix design is the responsibility of the concrete supplier.
2. Prior to applying construction loads, all exposed concrete slab-on-grade floors should be moisture cured for a minimum of 7 days following placement of the concrete. If concrete is placed during the hot summer months when the ambient air temperatures may be as low as 50 to 60 degrees Fahrenheit (F) in the early morning and in excess of 90 degrees F in the afternoon, then the contractor may need to implement special curing measures to reduce the development of shrinkage cracks. The concrete contractor is responsible for determining the appropriate curing process to be applied to the slab-on-grade floor.

   Concrete Slabs In Contact With Isolated Concrete Foundations: We do not recommend that concrete slab-on-grade floors be placed in direct contact with the

top surface of isolated column concrete foundations. Our experience is that during curing period of the concrete slab-on-grade floors a significant thermal gradient may develop between the portions of the slab placed directly on the typically more massive isolated column concrete foundations and the portions of the slab placed over the vapor-moisture retarder membrane and crushed rock of the slab support layers. **The development of adverse thermal gradients may cause the development of significant orthogonal and/or circular shrinkage cracks around the isolated column foundations.**

3. Steel Reinforcement: should be used to improve the load carrying capacity and to reduce cracking caused by shrinkage during curing and from both differential and repeated loadings. It should be understood that it is nearly impossible to prevent all cracks from development in concrete slabs; in other words, it should be expected that some cracking will occur in all concrete slabs no matter how well they are reinforced. Concrete slabs that will be subjected to heavy loads should be designed with steel reinforcements by a California licensed structural engineer.

   Steel Rebar: As a minimum, use No. 4 ribbed steel rebar (ASTM A615/A 615M-04 Grade 60 deformed for reinforcement in concrete), tied and placed with 12-inch centers in both directions (perpendicular) and supported on concrete "dobies" to position the rebar in the center of the slab during concrete pouring.

4. Underslab Vapor-Moisture Retarder Membrane: should be placed as a floor component that will minimize transmission of both liquid water and water vapor transmission through the concrete slab-on-grade floor. H&K recommends using at a minimum a Class A (ASTM E1745-97 [Reapproved 2004]), minimum 10-mil-thick, plastic, vapor-moisture, retarder membrane material such as: Stego Wrap® underslab vapor retarder membranes or equivalents. Additionally, the following materials are recommended: Stego® Tape and Stego® Mastic or equivalents to seal membrane joints and any utility penetrations.

   Regardless of the type of moisture-vapor retarder membrane used, moisture can wick up through a concrete slab-on-grade floor. Excessive moisture transmission through a concrete slab floor can cause adhesion loss, warping, and peeling of resilient floor coverings, deterioration of adhesive, seam separation, formation of air pockets, mineral deposition beneath flooring, odor and both fungi and mold growth. Slabs can be tested for water transmissivity in areas that are moisture sensitive. Commercial sealants, polymer additives to the concrete at the batch plant, entrained air, flyash, and reduced water to content ratio can be incorporated into the concrete slab-on-grade floor mix design to reduce its permeability and water-vapor transmissivity properties. A waterproofing consultant should be contacted to provide detailed recommendations if moisture sensitive flooring materials will be installed on the concrete slab-on-grade floors.

5. Minimum 6-Inch-Thick Crushed Rock Layer: should be placed and compacted to a minimum of 95 percent of the ASTM D1557 dry density with a moisture content

of ± 3 percentage points of the ASTM D1557 optimum moisture content. The crushed rock should be washed to produce an ASTM D422 test particle size distribution of 100 percent (by dry weight) passing the ¾ inch sieve and 0 to 5 percent passing the No. 4 sieve and 0 to 3 percent passing the No. 200 sieve. This relatively clean (washed) crushed rock will act as a capillary break for free water moisture transmission, as well as, provide a uniform bearing surface for the concrete slab-on-grade floor.

6. Subgrade Soil Preparation: The subgrade soil should be prepared and compacted consistent with the recommendations of Section 6.1. The top 12 inches of the non-expansive soil should be compacted to a minimum of 90 percent of the ASTM D1557 dry density with relatively uniform moisture content within ± 3 percentage points of the ASTM D1557 optimum moisture content.

   Prior to placing concrete and the moisture barrier membrane, but after placing the overlying crushed rock layer, the subgrade soil must be moisture conditioned to achieve a uniform moisture content of between 2 and 6 percentage points greater than the ASTM D1557 optimum moisture content to a depth of 12 inches below the finished subgrade surface. Moisture conditioning should be performed for a minimum of 24 hours prior to concrete placement. If the soil is not moisture conditioned prior to placing concrete, moisture could be wicked (transmitted) out of the concrete by the underlying potentially dryer soil, which could cause shrinkage cracks to develop in the concrete slab during the curing period.

   Additionally, our opinion is that moisture conditioning the subgrade soil will reduce the swell (heave) potential of fine-grained soil with moderate to high expansion properties. Typically, concrete slabs impart relatively small loads on the order of about 50 pounds per square foot (psf) on the underlying subgrade soil. Therefore, some vertical movement of the concrete slab should be anticipated from possible expansion of the underlying subgrade soil, regardless of subgrade preparation.

7. Crack Control Grooves: should be installed during placement or saw cuts should be made in accordance with the ACI and Portland Cement Association (PCA) specifications. Generally, H&K recommends that expansion joints be provided between the slab and perimeter footings, and that crack control groves or saw cuts are installed on maximum 10-foot-centers in both directions (perpendicular).

8. Field Observations: should be made by an H&K construction monitor of all concrete slab-on-grade subgrade surfaces and installed steel reinforcements prior to placing concrete.

6.2.3.3 Exterior Sidewalks And Patios

The exterior concrete slab-on-grade surface components are described below from top to bottom. If static or intermittent live loads greater than 250 psf are anticipated, or if heavy traffic loads are anticipated, then a California licensed structural engineer should design the necessary concrete slab-on-grade floor thickness and steel reinforcements.

1. Minimum 4-Inch-Thick Concrete Slab: should be installed with a minimum 2,500 pounds per square inch (psi) compressive strength after 28 days of curing. H&K recommends that the concrete design uses a water to cement ratio between 0.40 and 0.45 and should be placed with minimum and maximum slumps of 4 and 6 inches, respectively. The concrete mix design is the responsibility of the concrete supplier.

2. Prior to applying construction loads, all exposed concrete slab-on-grade floors should be moisture cured for a minimum of 7 days following placement of the concrete. If concrete is placed during the hot summer months when the ambient air temperatures may be as low as 50 to 60 degrees F in the early morning and in excess of 90 degrees F in the afternoon, then the contractor may need to implement special curing measures to minimize the development of shrinkage cracks. The concrete contractor is responsible for determining the appropriate curing process to be applied to the slab-on-grade floors.

   Concrete Slabs In Contact With Isolated Concrete Foundations: We do not recommend that concrete slab-on-grade floors be placed in direct contact with the top surface of isolated column concrete foundations. Our experience is that during curing period of the concrete slab-on-grade floor a significant thermal gradient may develop between the portions of the slab placed directly on the typically more massive isolated column concrete foundations and the portions of the slab placed over a vapor-moisture retarder membrane and crushed rock layers. **The development of adverse thermal gradients may cause the development of significant orthogonal and/or circular shrinkage cracks around the isolated column foundations.**

3. Steel Reinforcement: should be used to improve the load carrying capacity and to reduce cracking caused by shrinkage during curing and from both differential and repeated loadings. It should be understood that it is nearly impossible to prevent all cracks from development in concrete slabs; in other words, it should be expected that some cracking will occur in all concrete slabs no matter how well they are reinforced or cured. Concrete slabs that will be subjected to heavy loads should be designed with steel reinforcements by a California licensed structural engineer.

   If the current property owner (developer) elects to eliminate the steel reinforcements from the exterior concrete slabs-on-grade for economic reasons, then there will be an inherent greater risk assumed by the developer for the development of both shrinkage and bearing related cracks in the associated slabs.

   Steel Rebar: As a minimum, use No. 3 ribbed steel rebar (ASTM A615/A 615M-04 Grade 60 deformed for reinforcement in concrete), tied and placed with 18-inch centers in both directions (perpendicular) and supported on concrete “dobies” to position the rebar in the center of the slab during concrete pouring.

4. Minimum 4-Inch-Thick Crushed Rock Layer: should be placed and compacted to a minimum of 95 percent of the ASTM D1557 dry density with a moisture content of ± 3 percentage points of the ASTM D1557 optimum moisture content. The crushed rock should be washed to produce a particle size distribution of 100 percent (by dry weight) passing the ¾ inch sieve and 5 percent passing the No. 4 sieve and 0 to 3 percent passing the No. 200 sieve. Just prior to pouring the concrete slab, the crushed rock layer should be moistened to a saturated surface dry (SSD) condition. This measure will reduce the potential for water to be withdrawn from the bottom of the concrete slab while it is curing and will help minimize the development of shrinkage cracks.

   If the current property owner (developer) elects to eliminate the crushed rock layer beneath the exterior concrete slabs-on-grade for economic reasons, then there will be an inherent greater risk assumed by the developer for the development of both shrinkage and bearing related cracks in the associated slabs.

5. Subgrade Soil Preparation: The subgrade soil should be prepared and compacted consistent with the recommendations of Section 6.1. The top 12 inches of the non-expansive soil should be compacted to a minimum of 90 percent of the ASTM D1557 dry density with a moisture content within ± 3 percentage points of the ASTM D1557 optimum moisture content.

   Prior to placing concrete and the moisture barrier membrane, but after placing the overlying crushed rock layer, the subgrade soil must be moisture conditioned to achieve a uniform moisture content of between 2 and 6 percentage points greater than the ASTM D1557 optimum moisture content to a depth of 18 inches below the finished subgrade surface. Moisture conditioning should be performed for a minimum of 24 hours prior to concrete placement. If the soil is not moisture conditioned prior to placing concrete, moisture could be wicked (transmitted) out of the concrete by the underlying potentially dryer soil, which could cause shrinkage cracks to develop in the concrete slab during the curing period. Prior to placing concrete, but after placing the overlying crushed rock layer, the subgrade soil must be moisture conditioned to achieve a saturation of

   Additionally, our opinion is that moisture conditioning the subgrade soil will reduce the swell (heave) potential of fine-grained soil with moderate to high expansion properties. Typically, concrete slabs impart relatively small loads on the order of about 50 pounds per square foot (psf) on the underlying subgrade soil. Therefore, some vertical movement of the concrete slab should be anticipated from possible expansion of the underlying subgrade soil, regardless of subgrade preparation.

6. Crack Control Grooves: should be installed during placement or saw cuts should be made in accordance with the ACI and PCA specifications. Generally, H&K recommends that expansion joints be provided between the slab and perimeter

footings, and that crack control groves or saw cuts are installed on 10-foot-centers in both directions (perpendicular).

7. Field Observations: should be made by an H&K construction monitor of all concrete slab-on-grade surfaces and installed steel reinforcements prior to pouring concrete.

6.2.4 Rigid Pavement Design and Construction

Recommendations for the design and construction of exterior concrete pavements for the project site should follow the California Department of Transportation (Caltrans) Design Manual, Chapter 620, Rigid Pavement.

Because the Caltrans Design Manual is intended for highway pavement design, Chapter 620 specifies the minimum limit Traffic Index (TI) of 9 for JPCP design purposes, which H&K considers very conservative for representing vehicle traffic for parking lots, industrial/commercial streets, minor arterial streets, major arterial streets, and truck route arterial streets. The actual TI for the project pavement areas should be determined in accordance with.

H&K obtained one sample of the on-site soil and rock during our field investigation that we anticipate will be representative of the subgrade soil for the roads, driveways and parking areas. The Resistance Value (R-Value) test results are included in Appendix D. Laboratory test results indicate an R-Value of 6 for the on-site materials tested. The actual subsurface soil conditions exposed at the finished subgrade surface of the roadways may be different from this R-Value. In accordance with Table 623.1A Relationship Between Subgrade Type of Chapter 620 of the Caltrans Highway Design Manual, the subgade is classified as Subgrade Type III (R-vlaue <10).

6.2.4.1 Permeable Concrete Pavement Design

Permeable concrete designs will be performed by others. The shallow subsurface soil is classified as stiff, low plasticity, sandy clay (CL). Sieve analysis indicate that 72% by dry weight pass a No.200 sieve with a Plasticity Index of 14. The soil has a low expansive potential and a very low Resistance Value of 6 for pavement design. Based on the soil type and consistency, the hydraulic conductivity of the shallow native subgrade soil is expected to be within the typical range for clay of $1x10^{-5}$ centimeters per second (cm/s) for undisturbed soil and as low as $1x10^{-9}$ cm/s following compaction. Based on the expected permeability range, vertical infiltration of storm water through the native subsurface soil will be slow. The subgrade soil and AB rock should be placed and compacted as described below.

1. The subgrade soil to a depth of 12 inches from the finished grade surface should be compacted to a minimum relative compaction of 95 percent of the ASTM D1557 maximum dry density and moisture conditioned between 2 to 4 percentage points greater than the ASTM D1557 optimum moisture content. The stability of the compacted subgrade soil should be evaluated by wheel rolling prior to placing

the overlying crushed rock drainage layer. Wheel rolling should be performed with a fully loaded water truck with tire pressures between 60 and 95 psi. The subgrade soil surface should exhibit only minor deflections as the wheel load passes by. Any unstable areas should be reworked and then retested for percent relative compaction and percent moisture content and then proof rolled again. This process should be repeated until the area appears to be relatively stable.

2. H&K recommends the the use of a minimum 8 ounce per square yard, woven, geotextile fabric between the subgrade soil and base rock material designed below the permeable concrete pavement. The geotextile fabric should be pulled tight to remove any folds or wrinkles and staked according to manufacture recommendations. A minimum 18 inch overlap is recommended along adjoining seams.
3. The clean (washed) crushed rock should be compacted to a minimum relative compaction of 95 percent of the ASTM D1557 maximum dry density with a moisture content of ± 3 percentage points of the ASTM D1557 optimum moisture content. Refer to the geotextile manufacture recommendations and limitations for the proper gradation (maximum size) of a crushed rock product.
4. The stability of the compacted crushed rock should be evaluated by wheel rolling prior to placing the overlying AC layer. Wheel rolling should be performed with a fully loaded water truck with tire pressures between 60 and 95 psi. The AB rock surface should exhibit only minor deflections as the wheel load passes by. Any unstable areas should be reworked and then retested for percent relative compaction and percent moisture content and then proof rolled again. This process should be repeated until the area appears to be relatively stable.
5. H&K recommends the the use of a minimum 8 ounce per square yard, woven, geosynthetic fabric between the subgrade soil and base rock material designed below the permeable concrete pavement. Based on the particle size distribution of the sandy clay (CL) subgrade soil the

6.2.4.2 Jointed Plain Concrete Pavement (JPCP) Design

Recommendations for the design and construction of JPCP should follow the Caltrans Design Manual. If JPCP is selected for use onsite, lime treatment of the subgrade soil will be necessary to improve the R-Value of the soil. The design should follow Table 623.1G Rigid Pavement Catalog (Inland Valley, Type II Subgrade Soil) for the appropriate TI listed. The following presented the minimum recommendations for subgrade treatment to increase the R-Value

The subgrade soil and AB rock should be placed and compacted as described below.

1. The subgrade soil to a depth of 12 inches from the finished grade surface should be stabilized by mixing non-hydrated high calcium lime (commonly referred to as quick-lime). Assuming that the dry unit weight of the untreated soil is about 115 pounds per cubic foot (pcf); the application rate of 3 percent by dry weight will require about 3.5 pounds per square foot of lime to be applied to each 12 inch

thick layer of soil to be treated. Each application of lime should be checked prior to mixing by measuring the weight of lime applied to a pan that is placed in line with the direction of the applicator truck. Each 12 inch thick soil layer and applied lime should be uniformly mixed together using a rototiller type mixer and then allowed to cure for a minimum of 16 hours. Following the 16 hour curing period the treated soil should be uniformly mixed again and then compacted.

2. The subgrade soil should be compacted to a minimum relative compaction of 93 percent of the ASTM D1557 maximum dry density with a moisture content of ± 3 percentage points of the ASTM D1557 optimum moisture content. The stability of the compacted subgrade soil should be evaluated by wheel rolling prior to placing the overlying AB rock layer. Wheel rolling should be performed with a fully loaded water truck with tire pressures between 60 and 95 psi. The subgrade soil surface should exhibit only minor deflections as the wheel load passes by. Any unstable areas should be reworked and then retested for percent relative compaction and percent moisture content and then proof rolled again. This process should be repeated until the area appears to be relatively stable.
3. The Caltrans Class II AB rock should be compacted to a minimum relative compaction of 95 percent of the ASTM D1557 maximum dry density with a moisture content of ± 3 percentage points of the ASTM D1557 optimum moisture content. The stability of the compacted AB rock should be evaluated by wheel rolling prior to placing the overlying rigid pavement layer, as detailed above. The AB rock surface should exhibit only minor deflections as the wheel load passes by. Any unstable areas should be reworked and then retested for percent relative compaction and percent moisture content and then proof rolled again. This process should be repeated until the area appears to be relatively stable.
4. Concrete cut-off curbs should be constructed around all landscaped areas that are adjacent to AC paved driveways and parking areas. The curbs should extend to a minimum depth of 8 inches into the underlying subgrade soil. The extended curbs will reduce migration of irrigation and rain waters originating in the landscaped areas form entering the AB rock materials underlying the rigid pavement material. This design is intended to minimize failures of the paved areas due to saturation of the underlying AB rock and subgrade soils.

6.2.4.3 Continuously Reinforced Concrete Pavement (CRCP) Design

Recommendations for the design and construction of CRCP are described below from top to bottom. If static or intermittent live floor loads greater than 250 psf are anticipated, then a California licensed structural engineer should design the necessary concrete slab-on-grade floor thickness and steel reinforcements.

1. Minimum 6-Inch-Thick Concrete Slab: should be installed with a minimum 4,000 pounds per square inch (psi) compressive strength after 28 days of curing. H&K recommends that the concrete design uses and water to cement ratio between 0.40 and 0.45 and should be placed with minimum and maximum slumps of 4 and

6 inches, respectively. Air entrainment should be approximately 4%. The concrete mix design is the responsibility of the concrete supplier.

Prior to applying construction loads all exposed concrete slab-on-grade floors should be moisture cured for a minimum of 7 days following placement of the concrete. If concrete is placed during the hot summer months when the ambient air temperatures may be as low as 50 to 60 degrees F in the early morning and in excess of 90 degrees F in the afternoon, then the contractor may need to implement special curing measures to minimize the development of shrinkage cracks. The concrete contractor is responsible for determining the appropriate curing process to be applied to the slab-on-grade floor.

2. Steel Reinforcements: should be used to improve the load carrying capacity and to minimize cracking caused by shrinkage during curing and from both differential and repeated loadings. It should be understood that it is nearly impossible to prevent all cracks from development in concrete slabs; in other words, it should be expected that some cracking will occur in all concrete slabs no matter how well they are reinforced. Concrete slabs that will be subjected to heavy loads should be designed with steel reinforcements by a California licensed structural engineer.

   If the property owner (developer) elects to eliminate the steel reinforcements from the exterior concrete slabs-on-grade for economic reasons, then there will be an inherent greater risk assumed by the developer for the development of both shrinkage and bearing related cracks in the associated slabs.

   Steel Rebar: Use No. 4 ribbed steel rebar (ASTM A615/A 615M-04 Grade 60 deformed for reinforcement in concrete), tied and placed with 12-inch centers in both directions (perpendicular) and supported on concrete “dobies” to position the rebar in the center of the slab during concrete pouring.

3. Minimum 6-Inch-Thick Crushed Rock Layer: should be placed and compacted to a minimum of 95 percent of the ASTM D1557 dry density with a moisture content of ± 3 percentage points of the ASTM D1557 optimum moisture content. The crushed rock should be washed to produce an ASTM D422 test particle size distribution of 100 percent (by dry weight) passing the ¾ inch sieve and 0 to 5 percent passing the No. 4 sieve and 0 to 3 percent passing the No. 200 sieve. This relatively clean (washed) crushed rock will act as a capillary break for free water moisture transmission, as well as, provide a uniform bearing surface for the concrete slab-on-grade floor.
4. Subgrade Soil Preparation: The subgrade soil should be prepared and compacted consistent with the recommendations of Section 6.1. The top 12 inches of the non-expansive soil should be compacted to a minimum of 95 percent of the ASTM D1557 dry density with relatively uniform moisture content of from 0 to 4 percentage points greater than the ASTM D1557 optimum moisture content.

After placing the overlying crushed rock layer, the subgrade soil must be moisture conditioned to achieve uniform moisture content of between 2 and 6 percentage points greater than the ASTM D1557 optimum moisture content to a depth of 12 inches below the finished subgrade surface. Moisture conditioning should be performed for a minimum of 24 hours prior to concrete placement. If the soil is not moisture conditioned prior to placing concrete, moisture could be wicked (transmitted) out of the concrete by the underlying potentially dryer soil, which could cause shrinkage cracks to develop in the concrete slab during the curing period.

Additionally, we believe that moisture conditioning the subgrade soil will reduce the swell (heave) potential of fine-grained soil with moderate to high expansion properties. Typically, concrete slabs impart relatively small loads on the order of about 50 pounds per square foot (psf) on the underlying subgrade soil. Therefore, some vertical movement of the concrete slab should be anticipated from possible expansion of the underlying subgrade soil, if it is not properly moisture conditioned as describe in the preceding.

5. Crack Control Grooves: should be installed during placement or saw cuts should be made in accordance with the ACI and PCA specifications. Generally, H&K recommend that expansion joints be provided between the slab and perimeter footings, and that crack control groves or saw cuts are installed on no greater than 10-foot-centers in both directions (perpendicular).
6. Field Observations: should be made by an H&K construction monitor of all concrete slab-on-grade subgrade surfaces and installed steel reinforcements prior to placing concrete.

6.2.5 Flexible Pavement Design and Construction

Recommendations for the design and construction of asphalt concrete (AC) pavements for the project site are discussed below.

6.2.5.1 Asphalt Concrete Pavement Design

H&K used the Caltrans Design Method D301 to develop several asphalt concrete (AC) pavement and aggregate base (AB) rock design alternatives to allow for different traffic loading conditions. H&K used a Traffic Index (TI) of from 4 to 8 which represents typical vehicle traffic for parking lots, residential streets, collector streets, industrial/commercial streets, minor arterial streets, major arterial streets, and truck route arterial streets. The actual TI for the project pavement areas should be determined in accordance with Chapter 600 of the Caltrans Highway Design Manual.

H&K obtained one sample of the on-site soil and rock during our field investigation that we anticipate will be representative of the subgrade soil for the roads, driveways and parking areas. The R-Value test results are included in Appendix D. Laboratory test results indicate an R-Value of 6 for the on-site materials tested. The actual

subsurface soil conditions exposed at the finished subgrade surface of the roadways may be different from this R-Value. Please note that the Caltrans design method requires that the maximum R-Value of the subgrade soil not exceed 50.

H&K assumed that the pavement layers will be constructed with Class 2 Aggregate Base Rock (Minimum R-Value = 78) and Type A Asphalt Concrete in accordance with the requirements of Section 26 of the Caltrans Standard Specifications. Table 6.2.4.1-1 presents the road, driveway, and parking pavement design section. H&K recommends that the AB rock layer be constructed with a minimum thickness of 6-inches for constructability issues and to achieve a higher level of confidence that the road will achieve the expected service life.

Table 6.2.4.1-1 Flexible Pavement Design

Parameters	Design Values				
Traffic Description (approximate)	Light Autos	Light to Medium Autos and Trucks	Medium to Heavy Trucks	Heavy Trucks	Very Heavy Trucks
Traffic Index (TI)	4	5	6	7	8
Design R-Values Class II AB Rock Subgrade Soil	 78 6	 78 6	 78 6	 78 6	 78 6
AC Thickness (inch)(1)	2.50	3.00	3.50	4.00	4.5
AB Rock Thickness (inch)(2) (95% Relative Compaction)	8.0	10.5	13.0	15.5	18.0
Subgrade Soil Thickness (inch) (95% Relative Compaction)	12.0	12.0	12.0	12.0	12.0

Notes:
(1) The asphalt concrete thickness includes the Caltrans safety factor.
(2) H&K recommends a minimum thickness of 6 inches of AB rock, regardless of what the Caltrans design method indicates. This minimum thickness is necessary for constructability issues and will increase the level of confidence that the roads will achieve the expected service life

The subgrade soil and AB rock should be placed and compacted as described below.

1. The subgrade soil to a depth of 12 inches from the finished grade surface should be compacted to a minimum relative compaction of 95 percent of the ASTM D1557 maximum dry density with a moisture content of ± 3 percentage points of the ASTM D1557 optimum moisture content. The stability of the compacted subgrade soil should be evaluated by wheel rolling prior to placing the overlying AB rock layer. Wheel rolling should be performed with a fully loaded water truck with tire pressures between 60 and 95 psi. The subgrade soil surface should exhibit only minor deflections as the wheel load passes by. Any unstable areas should be reworked and then retested for percent relative compaction and percent moisture content and then proof rolled again. This process should be repeated until the area appears to be relatively stable.

2. The Caltrans Class II AB rock should be compacted to a minimum relative compaction of 95 percent of the ASTM D1557 maximum dry density with a moisture content of ± 3 percentage points of the ASTM D1557 optimum moisture content.
3. The stability of the compacted AB rock should be evaluated by wheel rolling prior to placing the overlying AC layer. Wheel rolling should be performed with a fully loaded water truck with tire pressures between 60 and 95 psi. The AB rock surface should exhibit only minor deflections as the wheel load passes by. Any unstable areas should be reworked and then retested for percent relative compaction and percent moisture content and then proof rolled again. This process should be repeated until the area appears to be relatively stable.
4. Concrete cut-off curbs should be constructed around all landscaped areas that are adjacent to AC paved driveways and parking areas. The curbs should extend to a minimum depth of 8 inches into the underlying subgrade soil. The extended curbs will reduce migration of irrigation and rain waters originating in the landscaped areas form entering the AB rock materials underlying the AC pavement material. This design is intended to minimize failures of the paved areas due to saturation of the underlying AB rock and subgrade soils.

6.2.5.2 Asphalt Concrete Pavement Construction

1. Asphalt concrete (AC) pavement should be constructed as required in Section 39 of the Caltrans Standard Specifications and these requirements.
2. Asphalt Concrete Materials: Asphalt concrete should comply with the following criteria:
   - An asphalt concrete mix design should be submitted for review and approval by the project geotechnical engineering prior to placement of the asphalt concrete at the site. The mix design should include the following information at a minimum: asphalt viscosity AR grade designation, aggregate particle size gradation (CTM202), percentage crushed particles (CTM205), LA abrasion (CTM211), Kc, Kf and surface area (CTM303), coarse aggregate specific gravity (CTM206) fine aggregate specific gravity (CTM208), fine aggregate sand equivalent (CTM217), optimum asphalt content (CTM367), percent air voids (CTM 367), stabilometer value (CTM366 and 308/309), swell (CTM305), unit weight (CTM308), and maximum theoretical density (CTM309).
   - Asphalt concrete should be a Type "A" Medium gradation. The maximum nominal aggregate size should be 1/2 inch for residential collector and 3/4 inch for arterial streets.
   - Asphalt concrete samples should be taken for mixture verification testing in accordance with CTM 125. The location of each sample should be noted on the test report.

- Asphalt concrete mixture verification tests should be performed at the rate of one set of tests per each 250-tons of AC placed and compacted. A minimum of one test should be performed for each day of paving.
- The following mixture tests should be performed on each AC bulk sample:

Table 6.2.4.2-1. Asphalt Concrete Testing

Test Method	Description	Requirement
CTM202	Sieve Analysis Of Fine And Coarse Aggregates	Operating Range And Contract Compliance Range
CTfM304	Preparation Of Bituminous Mixtures For Testing	Not Applicable
CTM308	Bulk Specific Gravity And Density	Maximum Values
CTM309	Theoretical Maximum Specific Gravity And Density	Maximum Values
CTM310	Asphalt And Moisture Content(1)	±0.5 percent of design mix
CTM366	Stabilometer Value	Minimum = 35
CTM367	Optimum Bitumen Content	Mix Voids = 3 to 5 percent
CTM375	In-Place Density And Relative Compaction	Field Test Values
CTM382	Asphalt Binder Content(1)	±0.5 percent of design mix

Note:
(1) Asphalt content may be determined by test methods CTM310 or CTM382.

3. Minimum Thickness and Grade Tolerances: The minimum AC grade thickness and grade tolerances are described below.
   - The minimum AC construction placement lift thickness should be 1½-inch for ½-inch material and 2-inches for ¾-inch material. The average finished AC pavement thickness should be equal to or greater than the design thickness.
   - Layer thickness should be verified either by continuous inspection or by coring. If continuous visual inspection is used, a minimum lay-down thickness of 1.25 times the design layer thickness should be used. If the thickness is verified by coring, then randomly selected core sample will be required as described in “Compaction Testing” below.
4. Compaction Testing: Compaction testing of asphalt concrete should be performed using both field and laboratory test methods as described below.
   - Compaction testing of asphalt concrete should be performed consistent with CTM 375 using a both a nuclear gauge and core samples. Core sample density should be taken consistent with CTM308. If a core correlation correction factor is applied to the nuclear test method compaction test results, then core sample correlation test results should be provided with each set of test material results.
   - Compaction of asphalt concrete should comply with the following criteria:

Table 6.2.4.2-2. Asphalt Concrete Relative Compaction Criteria				
Street Area Description	CTM 309 Percent Compaction		CTM 308 Percent Compaction	
Residential, Collector Or Arterial Roads	93.0 % Average	91.5 % Minimum	96.0 % Average	95.0 % Minimum
Shoulders, Non-Traffic Areas And Trench Patches Less Than 5-Feet-Wide	91.5 % Average	90.0 % Minimum	94.5 % Average	93.5 % Minimum

- Asphalt concrete cores should be collected at the rate of one test per 2,500-square feet of pavement area with a minimum of 3 core samples for any street segment or cul-de-sac. The location of each sample should be noted on the test report. Sample location should include at a minimum the following locations: 1-foot from left lip of gutter, 1-foot from crown (either side), and 1-foot from right lip of gutter.
- One density test should be taken for each 2,500-square feet of pavement area with a minimum of 3 tests per street segment. Each street segment may be averaged if the minimum numbers of tests per pavement area are met as shown below.

Table 6.2.4.2-3. Asphalt Concrete Pavement Testing Criteria	
Pavement Area	Minimum Number Of Density Tests
0 to 5,000-square feet (sf)	3
>5,000-sf to 10,000-sf	5
>10,000-sf to 15,000-sf	8
Over 15,000-sf	10 or 1 per 2,500-sf (whichever is greater)

- If the average pavement compaction test results, obtained by the nuclear gauge method, fail to meet the requirements of presented in the above, then cores samples of the AC should be taken approximately 10-feet away from the original failing test location. If the average of these three tests fail to meet the minimum compaction requirements, then the pavement area should be cold planed (grind) to the depth of the underlying pavement course layer or aggregate base layer and replaced with new asphalt concrete.
- The core test results should govern when compaction is being determined by both core samples and nuclear gauge tests. If the average test results obtained from the cores fail to meet the minimum average compaction requirement, because one specific area has low test results, then the asphalt concrete pavement in the area of low test results should be removed and replaced. If no one distinct area can be identified, then the entire pavement layer should be removed and replaced for the full width of the pavement and to the limits of the failing areas.

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Martin, G.R., and Lew, M., 1999, Recommended Procedures for the Implementation of DMG Special Publication 117-A, Guidelines for Analyzing and Mitigating Liquefaction Hazard in California, March.

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8 LIMITATIONS

The following limitations apply to the findings, conclusions and recommendations presented in this report:

1. This report should not be relied upon without review by H&K if a period of 24 months elapses between the issuance report date shown above and the date when construction commences.
2. Our professional services were performed consistent with the generally accepted geotechnical engineering principles and practices employed in northern California. This warranty is in lieu of all other warranties, either expressed or implied.
3. H&K provided engineering services for the site project consistent with the work scope and contract agreement presented in our proposal and agreed to by our client. The findings, conclusions and recommendations presented in this report apply to the conditions existing when H&K performed our services and are intended only for our client, purposes, locations, time frames, and project parameters described herein. H&K are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to completing our services. H&K do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report. This report is solely for the use of our client unless noted otherwise. Any reliance on this report by a third party is at the party's sole risk.
4. If changes are made to the nature or design of the project as described in this report, then the conclusions and recommendations presented in this report should be considered invalid by all parties. The validity of the conclusions and recommendations presented in this report can only be made by our firm; therefore, H&K should be allowed to review all project changes and prepare written responses with regards to their impacts on our conclusions and recommendations. However, additional fieldwork and laboratory testing may be required for us to develop any modifications to our recommendations. The cost to review project changes and perform additional fieldwork and laboratory testing necessary to modify our recommendations is beyond the scope-of-services presented in this report. Any additional work will be performed only after receipt of an approved scope-of-work, budget and written authorization to proceed.
5. The analyses, conclusions an recommendations presented in this report are based on the site conditions as they existed at the time H&K performed the surface and subsurface field investigations. H&K have assumed that the subsurface soil and groundwater conditions encountered at the location of the exploratory borings are generally representative of the subsurface conditions throughout the entire project site. However, if the actual subsurface conditions encountered during construction are different than those described in this report, then H&K should be notified immediately so that we can review these differences and, if necessary, modify our recommendations.

6. The elevation or depth to the groundwater table underlying the project site may differ with time and location. Therefore, the depth to the groundwater table encountered in our exploratory borings is only representative of the specific time and location where it was observed.
7. The project site map shows approximate exploratory boring and/or boring locations as determined by pacing distances from identifiable site features; therefore, their locations should not be relied upon as being exact nor located with the accuracy of a California licensed land surveyor.
8. Our geotechnical investigation scope-of-services did not include an evaluation of the project site for the presence of hazardous materials. Although, H&K did not observe the presence of hazardous materials at the time of our field investigation all project personnel should be careful and take the necessary precautions should hazardous materials be encountered during construction.
9. Our geotechnical investigation scope-of-services did not include an evaluation of the project site for the presence of mold nor for the future potential development of mold at the project site. If an evaluation of the presence of mold and/or for the future potential development of mold at the site is desired, then the property owner should contact a consulting firm specializing in these types of investigations. Holdrege & Kull does not perform mold evaluation investigations.
10. Our experience and that of the civil engineering profession clearly indicates that during the construction phase of a project the risks of costly design, construction and maintenance problems can be significantly reduced by retaining the design geotechnical engineering firm to review the project plans and specifications and to provide geotechnical engineering CQA observation and testing services. Upon your request we will prepare a CQA geotechnical engineering services proposal that will present a work scope, tentative schedule and fee estimate for you consideration and authorization. If H&K is not retained to provide geotechnical engineering CQA services during the construction phase of the project, then H&K will not be responsible for geotechnical engineering CQA services provided by others nor any aspect of the project that fails to meet your or a third party's expectations in the future.

FIGURES:

Figure 1 Site Location Map
Figure 2 Site Sketch and Exploratory Boring Location Map

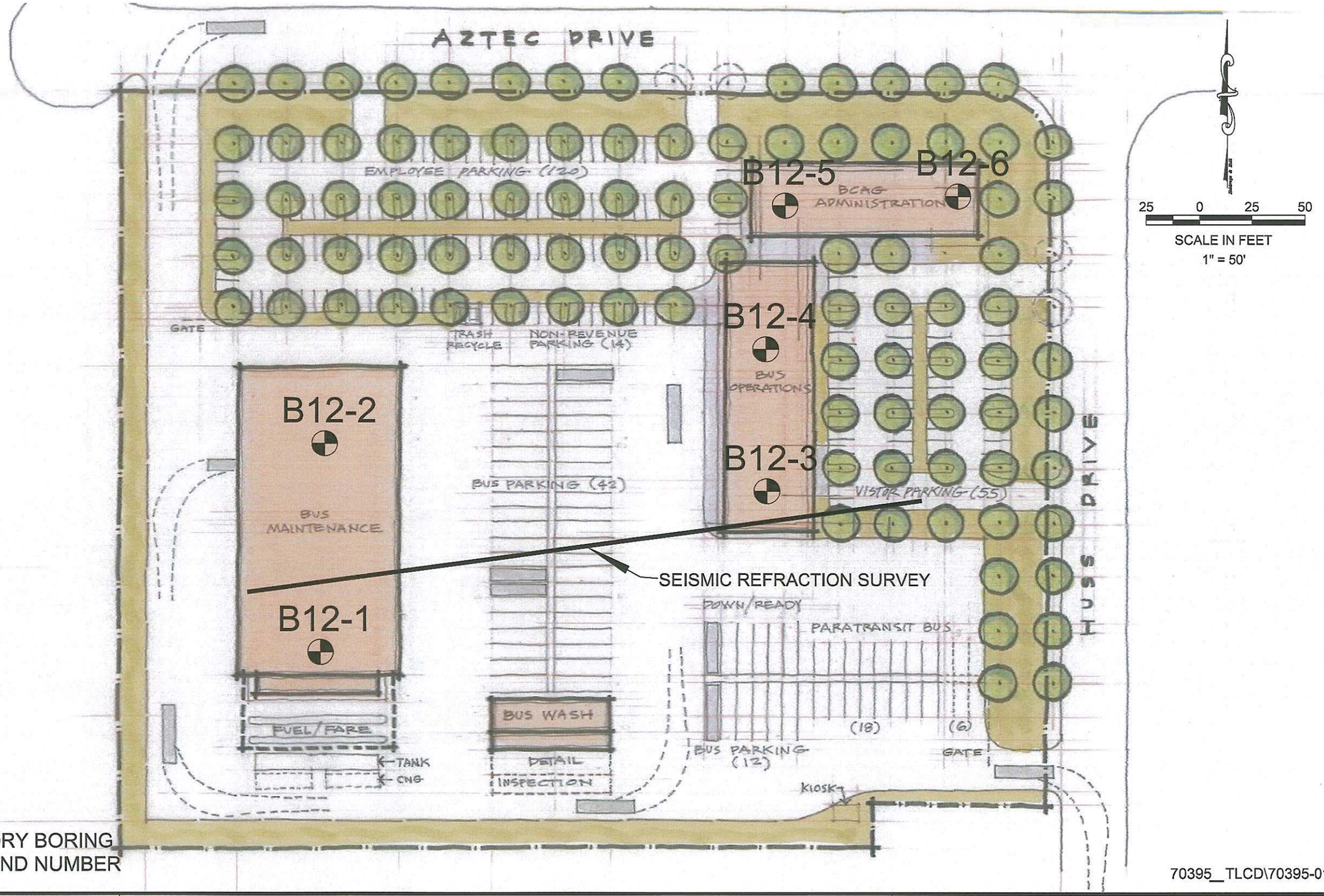
HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS
8 SEVILLE CT., SUITE 100
CHICO, CA 95928
(530) 894-2487 FAX 894-2437

SITE LOCATION MAP
BUTTE REGIONAL TRANSIT
OPERATIONS CENTER
CHICO, BUTTE COUNTY, CALIFORNIA

PROJ NO.: 70395-01

DATE: MAY,2012

FIGURE NO.: 1



LEGEND

B12-1 — EXPLORATORY BORING LOCATION AND NUMBER

70395_TLCD\70395-01.FIG2

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CHICO, CA 95928
530-894-2487 FAX 894-2437

SITE SKETCH AND
EXPLORATORY BORING LOCATION MAP
BUTTE REGIONAL TRANSIT OPERATIONS CENTER
CHICO, BUTTE COUNTY, CALIFORNIA

DRAWN BY:	SDC
CHECKED BY:	SDC
PROJECT NO.:	70395-01
DATE:	MAY,2012

FIGURE NO.: 2

APPENDIX A:

Proposal for Geologic Hazards Evaluation and Geotechnical Engineering Services for the Butte Regional Transit Operations Center (fee and contract agreement sections excluded).

HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS

December 27, 2011
Proposal No.: PC11.077

Mr. Don Tomasi, AIA
TLCD Architecture
111 Santa Rosa Avenue, Suite 300
Santa Rosa, California 95404
Phone (707) 525-5616

REFERENCE: ***Butte County Association of Governments, Butte Regional Transit Operations Center***
Chico, Butte County, California

SUBJECT: ***Proposal for Geotechnical Engineering Services***

Dear Mr. Tomasi,

In accordance with your request, Holdrege & Kull (H&K) prepared this proposal to provide geotechnical engineering services for the development of the above referenced transit center project. As part of our geotechnical engineering services, H&K will prepare a geotechnical engineering investigation report addressing the proposed development and present our findings, conclusions, and recommendations for earthwork grading and structural improvements. The following presents our understanding of the project and our proposed engineering services.

1.0 PROJECT DESCRIPTION

The site for the proposed transit facility will include the surrounding 10 acre vacant property located adjacent B-Line Transit Facility, 326 Huss Drive, Chico, California. Details of the proposed project can be founding the September 30, 2011, *Consultant Request for Proposals to Develop Plans, Specifications, Estimate and Environmental Documents fro Butte Regional Transit Operations Center, City of Chico, CA*. H&K understands that the proposed development will include the construction of multiple buildings including offices, maintenance shops, and bus wash. H&K assumes that the expansion will consist of the following improvements: one story and two story buildings with steel column and/or wood framing, continuous spread and isolated foundations for the buildings, interior and exterior concrete slab-on-grade floors; drilled pier foundation for parking lot light poles, asphalt concrete (AC) paved roadway and parking lots, and landscaped areas. Earthwork grading will include minor cuts and engineered fills to meet the proposed building grade.

2.0 SCOPE OF SERVICES

H&K proposes to perform the following tasks as basic services with no other additional services included: Task 1 Site Investigation and Laboratory Testing, Task 2 Data Analysis and Engineering Design, Task 3 Report Preparation, and Task 4 Final Design Review. Each task is described in the following:

2.1 Task 1 Site Investigation

H&K will perform a site investigation to characterize the soil, rock and groundwater conditions encountered at the surface and beneath the site to the maximum depth explored. The site investigation information will be used to prepare geotechnical engineering recommendations for earthwork and structural improvements. Our site investigation will include the following components, which are described below: Surface Reconnaissance Investigation, Subsurface Investigation, and Laboratory Testing. This surface and subsurface investigations does not include the evaluation of the site for the presence of hazardous waste materials, groundwater pollutants nor the presence of geologic hazards included in a California Geologic Survey regulated geologic hazards investigation (i.e., hazards from earthquake induced faulting, shaking, liquefaction, landslides, settlement, tsunamis, and sieches, nor hazards from flooding, volcanic activity, naturally occurring asbestos, past and present mining activities, and compressive and expansive soils). Regional faulting and liquefaction potential will be addressed in our report and if other geologic hazards are identified during our site investigation. If a complete geologic hazards evaluation is needed, or geologic conditions are encountered that warrant further investigation and delineation, H&K can revise our proposal to include the hazards listed above.

2.1.1 Surface Reconnaissance Investigation

H&K will perform a surface reconnaissance of the project site to identify surface conditions that may impact the proposed site development plans. In general, H&K's field engineer/geologist will observe and describe surface exposures of the following existing site conditions:

- Site and surrounding land uses.
- Surface soil conditions.
- Existing site improvements including earthwork grading and structures.
- Site topography and drainage.
- Vegetation.

2.1.2 Subsurface Investigation

A minimum of 48 hours prior to performing the subsurface investigation H&K will mark the proposed subsurface exploratory locations with white paint and notify Underground Services Alert (USA) as required by California state law. USA members will inspect each proposed subsurface exploratory location to determine if any underground utilities are present at these locations. The property owner is responsible for marking all known utilities inside the subject property. If USA

identifies the presence of underground utilities at any of the proposed exploratory locations then we will move the excavation location to an area that is clear of underground utilities.

H&K will perform a subsurface investigation to obtain an understanding of the soil, rock and groundwater conditions underlying the project site to the maximum depth drilled. As deemed necessary by our field geologist, up to a maximum of 6 exploratory borings will be advanced using a hollow stem auger drill rig. Each boring will be excavated up to a depth of 20 feet below the existing surface or until refusal is encountered, which ever occurs first. H&K will attempt to locate the exploratory borings at the approximate location of proposed building footprints or where deep foundations may be required and spaced across the site to provide an extrapolated representation of the site subsurface geology. Each exploratory boring will be backfilled immediately after logging and sampling activities are completed using drill cuttings.

H&K' field engineer/geologist will collect both relatively undisturbed and disturbed soil samples from each exploratory trench. Relatively undisturbed soil samples will be collected with a standard penetration test (SPT) sampler and a 2.5-inch-diameter (inside diameter) split-spoon barrel sampler equipped with brass liner tubes. Generally, soil samples will be collected at the following depths below the existing ground surface: 0 feet, 2.0 feet, 5 feet, 10 feet, and continuing on five foot intervals, or change in geologic material, until the boring is terminated. Additional soil samples may be collected and/or the sample intervals may be changed depending upon the soil conditions encountered. The soil samples will be labeled, sealed, and transported to our laboratory facility where selected samples will be tested to determine their engineering material properties. If the groundwater table is encountered, the depth to groundwater below the existing ground surface will be measured.

H&K will perform an in-situ shear-wave velocity profile of the upper 30 meters of the site using SeisOpt® ReMi™ Vs30 Method for shear-wave profiling. The shear wave velocity data will be used to determine a Site Class and seismic design parameters in accordance with Chapter 16 of the 2010 CBC (2009 IBC), and for evaluating the liquefaction potential of the subsurface soil. Each seismic survey line will include 12 geophones on approximate 8-meter spacing, for a total seismic line length of 96 meters. A 48-channel, microprocessor control signal enhancement seismograph will be used to record ambient seismic noise, or micro-tremors, which are constantly being generated by cultural and natural noise. Additional ambient noise will be initiated from vehicles and during exploratory excavations on site.

2.1.3 Laboratory Testing Investigation

H&K will perform laboratory tests on selected soil samples to determine their engineering material properties. All laboratory tests will be performed consistent with the guidelines of the American Society for Testing and Materials (ASTM). The ASTM soil characterization tests may include:

- D2487, Unified Soil Classification System
- D2488, Soil Description Visual Manual Method
- D2937 & D2216, Density and Moisture Content
- D422, Particle Size Distribution, Sieve and Hydrometer Analysis
- D3080, Direct Shear Strength
- D4318, Atterberg Plasticity Indices
- D4829, Expansion Index
- D2844, Resistance Value (R-Value)

If soil is encountered with a high potential for volume change (i.e., expansion or consolidation), then H&K may recommend additional laboratory testing to evaluate expansion or consolidation impacts and provide appropriate recommendations on the proposed earthwork and structural improvements. Additional testing may include ASTM D2435 one-dimensional consolidation, ASTM D4546 one-dimensional swell, and ASTM D4767 consolidated-undrained triaxial shear strength. The costs to perform these additional tests are not included in the fee estimate presented herein. H&K will not perform these additional tests without written authorization to proceed and a budget augmentation to cover the cost of performing these additional laboratory tests.

2.2 Task 2, Data Analysis and Engineering Design

H&K will use the state-of-the practice geotechnical engineering analyses methods to evaluate the on-site soil properties. These analyses methods may include but will not be limited to the following:

2.2.1 Data Analysis Methods

- Soil and rock stratigraphy.
- Soil bearing capacity for shallow and deep foundations.
- Lateral earth pressures.
- Soil-Concrete friction coefficients.
- Soil shear strength.
- Soil plasticity indices.
- Soil expansion potential.
- Building and surcharge loads.
- Groundwater seepage and drainage controls
- Pavement design for driveway and parking areas

H&K will develop geotechnical engineering recommendations for earthwork and structural improvements and provide applicable recommendations. The geotechnical engineering recommendations may include but not be limited to the following:

2.2.2 Earthwork Improvement Recommendations

- Site clearing and soil subgrade preparation.
- Exclusion of over size fill soil materials.
- Aerial fill moisture conditioning and compaction requirements.
- Fill soil loose lift (layer) thickness requirements.
- Utility trench backfill material placement and compaction requirements.
- Surface water drainage.
- Expansive soil mitigation (not including lime, flyash or cement treatment details).
- Temporary construction de-watering methods.
- Subdrain systems (if necessary).

2.2.3 Structural Improvements

- Shallow foundation types, dimensions and embedment depths.
- Shallow foundation soil bearing capacity pressures.
- Foundation-soil sliding friction coefficients.
- Concrete slab-on-grade floors.
- Design criteria for roads and parking lot area asphalt concrete pavement.
- Seismic (earthquake shaking) design parameters.

2.3 Task 3 Report Preparation

H&K will prepare a geotechnical engineering report that will present our findings, conclusions, and recommendations. Our geotechnical engineering investigation report will meet or exceed the requirements of the 2010 California Building Code and the accepted geotechnical engineering principals and practices performed in northern California. This report will include descriptions of the site conditions, field investigation, laboratory testing, and geotechnical engineering design recommendations for the proposed earthwork and structural improvements. The report will also include a site plan showing the approximate locations of the exploratory borings, proposed building, parking lot areas, and property boundaries. The report appendices will present the exploratory boring logs and laboratory test data.

H&K will deliver four bound copies of the final report to the address shown on page one of this proposal. The report will be signed and stamped a responsible California licensed civil engineer for this project.

2.3 Task 3 Report Preparation

H&K will review the final earthwork grading and foundation improvement plans and project specifications prior to final submittal for plan review and commencement of construction to determine whether our geotechnical engineering recommendations have been implemented, and if necessary, to provide additional and/or modified recommendations.

3.0 SCHEDULE

Our proposed work schedule is based on our present and expected workload. H&K is prepared to commence work on this project following receipt of a sign contract and notice to proceed. H&K understands that time may be of the essence in the performance of this work, therefore, we will perform our field investigation within two weeks of receiving authorization to proceed, weather and subcontractor availability permitting. H&K can provide verbal preliminary design recommendations immediately following the site investigation based on the field investigation data; however, the final recommendations will be developed from both the field and laboratory data. Therefore, the final recommendations will govern the design. The final report will be submitted within three weeks following completion of our field investigation.

The time required to complete our geotechnical investigation field work may be increased as a result of encountering unforeseen subsurface conditions, adverse weather conditions, soil stability, property access agreement delays or issues, or scheduling of exploratory equipment.

4.0 COST ESTIMATE

H&K proposes to perform the geotechnical investigation for a **lump sum cost of $ ** , in accordance with the attached 2011 fee schedule and the professional services agreement between TLCD and H&K. This fee includes the cost of a truck mounted drill rig and operator. If the site is not accessible with a truck mounted drill rig due to wet weather, a track mounted drill rig would be required to complete the investigation. An additional fee of $ would be required above and beyond the cost estimate presented above. Invoices will be prepared on a monthly basis as a percent complete, payment terms are NET 30 days. Full payment is due upon completion of the work and issuance of the report.

This cost estimate may require modification if unusual or unexpected site conditions are encountered which significantly change the work scope and increase the associated costs, if the client requests an expansion of the work scope, or if the City of Chico or Butte County requires the purchase of any additional permits. H&K will not perform additional work outside the scope of services presented above until a written authorization to proceed and an approved budget augmentation is received.

4.0 CLOSING

Please sign with blue ink both copies of the attached contract agreement form to indicate your acceptance of this proposed work scope, schedule, and fee estimate. **Return two original signature copies to H&K.** Your signature indicates that you accept the terms and conditions of this contract agreement and is a written authorization for us to proceed with the work scope presented in this proposal and authorizations to enter the proposed properties and perform the subsurface exploration work. H&K will sign the agreement forms and return one fully executed copy to the client.

Holdrege & Kull appreciates the opportunity to provide you with a proposal on this important project. If you should have questions or comments, please do not hesitate to contact the undersigned at (530) 894-2487.

Sincerely,

Holdrege & Kull

Shane D. Cummings, PG, CHG, CEG
Operations Manager

Attachments:

Attachment 1, Holdrege & Kull 2011 Fee Schedule
Attachment 2, Terms & Conditions Contract Agreement Form

APPENDIX B:

Important Information About Your Geotechnical Engineering Investigation Report (Presented with permission of ASFE, Copyright 2004)

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

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IIGER06045.0M

APPENDIX C:

Exploratory Boring Logs

HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS

EXPLORATORY BORING LOG

8 SEVILLE COURT, SUITE 100, CHICO, CA 95928
(530) 894-2487 FAX 894-2437

Boring No. B12-1

Project Name: BCAG BRTOC | **Project No.:** 70395-01 | **Task:** 1 | **Start:** 03/07/12 | **Sheet:** 1 of 2

Location: HUSS DRIVE, CHICO, CA | **Ground Elev. (Ft. MSL):** | **Finish:** 03/07/12

Logged By: CUMMINGS, SHANE | **Drilling Cmpny:** PC EXPLORATION | **Drill Rig Type:** CME 75

Driller: NATE | **Drilling Method:** HOLLOW STEM AUGER | **Hammer Type:** 140 LB AUTO HAMMER

Boring Diam (In.): 7.25 | **Total Depth (Ft.):** 19 | **Backfill or Well Casing:** NATIVE CUTTINGS

Ground Water Information

Date	03/07/12			
Time	14:45			
Depth (ft)	NONE			

Time (H:M)	Pocket Penetrometer (TSF)	Uncorrected Blow Counts (Blows / 6-inch)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log	Soil and/or Rock Descriptions
14:05			HSA			1				(CL) SANDY CLAY, FLD. EST: 65% LOW PLASTICITY FINES , 35% VERY FINE TO FINE SAND, DARK BROWN (7.5YR 3/4), STIFF, DAMP
						2				
						3				
						4				
						5				
		7	2.5SS			6				
		9			2/2					
14:10	>4.75	10		0.8	L-1	7				
			HSA							
						8				(SM) SILTY SAND, FIELD ESTIMATE: 60% VERY FINE TO FINE SAND , 40% LOW PLASTIC FINES; BROWN (7.5YR, 5/4), MEDIUM DENSE, DRY TO DAMP, SLIGHTLY CEMENTED
						9				
						10				
14:15		6	2.5SS			11				
		17			1/1					
	>4.75	28		1.2	L-2	12				(GM) SITLY GRAVEL, FLD. EST: 40% FINE TO COURSE GRAVEL, 30% FINE TO MEDIUM SAND, 30% LOW PLASTICITY FINES; BROWN (7.5YR 5/4), DENSE, DRY
			HSA							
						13				
						14				SLOW DRILLING
						15				60% GRAVEL, 20% SAND, 20% LOW PLASTICITY FINES
14:30		27	SPT			16				COBBLES
		30								
	>4.75	19		0.5	--	17				
			HSA							
						18				
14:45						19				REFUSAL @ 19 FEET
						20				

NOTES:

HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS

EXPLORATORY BORING LOG

8 SEVILLE COURT, SUITE 100, CHICO, CA 95928
(530) 894-2487 FAX 894-2437

Boring No. B12-2

Project Name: BCAG BRTOC | **Project No.:** 70395-01 | **Task:** 1 | **Start:** 03/07/12 | **Sheet:** 1 of 1

Location: HUSS DRIVE, CHICO, CA | **Ground Elev. (Ft. MSL):** | **Finish:** 03/07/12

Logged By: CUMMINGS, SHANE | **Drilling Cmpny:** PC EXPLORATION | **Drill Rig Type:** CME 75

Driller: NATE | **Drilling Method:** HOLLOW STEM AUGER | **Hammer Type:** 140 LB AUTO HAMMER

Boring Diam (In.): 7.25 | **Total Depth (Ft.):** 16 | **Backfill or Well Casing:** NATIVE CUTTINGS

Ground Water Information

Date	03/07/12			
Time	15:30			
Depth (ft)	NONE			

Time (H:M)	Pocket Penetrometer (TSF)	Uncorrected Blow Counts (Blows / 6-inch)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log	Soil and/or Rock Descriptions
15:00			HSA			1				(CL) SANDY CLAY, FLD. EST: 65% LOW PLASTICITY FINES , 35% VERY FINE TO FINE SAND, DARK BROWN (7.5YR 3/4), STIFF, DAMP
						2				
15:05		6	2.5SS			3				
		12			1/2					
	2.5	11		1.2	L-1	4				
			HSA			5				
15:10		9	2.5SS							
		10			1/1	6				
	2.5	12		0.9	L-2	7				
			HSA							
						8				(SM) SILTY SAND, FIELD ESTIMATE: 60% VERY FINE TO FINE SAND , 40% LOW PLASTIC FINES; BROWN (7.5YR, 5/4), MEDIUM DENSE, DRY TO DAMP, SLIGHTLY CEMENTED
						9				
						10				
15:20		6	2.5SS							
		16			2/2	11				
	4.5	15		1.1	L-3	12				
			HSA							
						13				
						14				
						15				
15:30			SPT							(GM) SITLY GRAVEL, FLD. EST: 40% FINE TO COURSE GRAVEL, 30% FINE TO MEDIUM SAND, 30% LOW PLASTICITY FINES; BROWN (7.5YR 5/4), DENSE, DRY
		13				16				VERY HARD DRILLING, COBBLES
	>4.75	25		1.0	--					REFUSAL @ 16 FEET
						17				
						18				
						19				
						20				

NOTES:

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EXPLORATORY BORING LOG

8 SEVILLE COURT, SUITE 100, CHICO, CA 95928
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Boring No. B12-3

Project Name: BCAG BRTOC | **Project No.:** 70395-01 | **Task:** 1 | **Start:** 03/08/12 | **Sheet:** 1 of 1

Location: HUSS DRIVE, CHICO, CA | **Ground Elev. (Ft. MSL):** | **Finish:** 03/08/12

Logged By: CUMMINGS, SHANE | **Drilling Cmpny:** PC EXPLORATION | **Drill Rig Type:** CME 75

Driller: NATE | **Drilling Method:** HOLLOW STEM AUGER | **Hammer Type:** 140 LB AUTO HAMMER

Boring Diam (In.): 7.25 | **Total Depth (Ft.):** 19.5 | **Backfill or Well Casing:** NATIVE CUTTINGS

Ground Water Information

Date	03/08/12			
Time	09:50			
Depth (ft)	NONE			

Time (H:M)	Pocket Penetrometer (TSF)	Uncorrected Blow Counts (Blows / 6-Inch)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log	Soil and/or Rock Descriptions
09:20			HSA			1				(CL) SANDY CLAY, FLD. EST: 65% LOW PLASTICITY FINES , 35% VERY FINE TO FINE SAND, DARK BROWN (7.5YR 3/4), STIFF, DAMP
						2				BULK SAMPLE ID: 030712A, COLLECTED FROM 0 TO 5 FEET
09:25		5	SPT			3				
		2								
	1.5	3		1.5	--	4				
			HSA			5				
09:30		2	SPT							
		5				6				
	2.0	4		1.5	--	7				
			HSA							
						8				
						9				
						10				
09:35		5	SPT							
		8				11				
	2.0	10		1.5	--					(SM) SILTY SAND, FIELD ESTIMATE: 60% VERY FINE TO FINE SAND , 40% LOW PLASTIC FINES; BROWN (7.5YR, 5/4), MEDIUM DENSE, DRY TO DAMP, SLIGHTLY CEMENTED
			HSA			12				
						13				
						14				
						15				
09:40		4	SPT							
		7				16				
	3.75	11		1.5	--					
			HSA			17				
						18				
						19				(GM) SITLY GRAVEL, FLD. EST: 40% FINE TO COURSE GRAVEL, 30% FINE TO MEDIUM SAND, 30% LOW PLASTICITY FINES; BROWN (7.5YR 5/4), DENSE, DRY
09:50						20				REFUSAL @ 19.5 FEET

NOTES:

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EXPLORATORY BORING LOG

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(530) 894-2487 FAX 894-2437

Boring No. B12-4

Project Name: BCAG BRTOC | **Project No.:** 70395-01 | **Task:** 1 | **Start:** 03/08/12 | **Sheet:** 1 of 1

Location: HUSS DRIVE, CHICO, CA | **Ground Elev. (Ft. MSL):** | **Finish:** 03/08/12

Logged By: CUMMINGS, SHANE | **Drilling Cmpny:** PC EXPLORATION | **Drill Rig Type:** CME 75

Driller: NATE | **Drilling Method:** HOLLOW STEM AUGER | **Hammer Type:** 140 LB AUTO HAMMER

Boring Diam (In.): 7.25 | **Total Depth (Ft.):** 18 | **Backfill or Well Casing:** NATIVE CUTTINGS

Ground Water Information

Date	03/08/12			
Time	10:35			
Depth (ft)	NONE			

Time (H:M)	Pocket Penetrometer (TSF)	Uncorrected Blow Counts (Blows / 6-inch)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log	Soil and/or Rock Descriptions
10:00			HSA			1				(CL) SANDY CLAY, FLD. EST: 65% LOW PLASTICITY FINES , 35% VERY FINE TO FINE SAND, DARK BROWN (7.5YR 3/4), STIFF, DAMP
						2				
10:05		4	SPT			3				
		3								
	0.5	4		0.8	--	4				
			HSA			5				
10:10		3	SPT							
		4				6				
	2.0	10		1.2	--					
			HSA			7				
						8				
						9				
						10				
10:20		4	SPT							
		6				11				
	2.0	8		1.5	--					(SM) SILTY SAND, FIELD ESTIMATE: 60% VERY FINE TO FINE SAND , 40% LOW PLASTIC FINES; BROWN (7.5YR, 5/4), MEDIUM DENSE, DRY TO DAMP, SLIGHTLY CEMENTED
			HSA			12				
						13				
						14				
						15				
10:25		2	SPT							
		8				16				
	2.5	10		1.5	--					
			HSA			17				
										(GM) SITLY GRAVEL, FLD. EST: 40% FINE TO COURSE GRAVEL, 30% FINE TO MEDIUM SAND, 30% LOW PLASTICITY FINES; BROWN (7.5YR 5/4), DENSE, DRY
10:35						18				REFUSAL @ 18 FEET
						19				
						20				

NOTES:

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EXPLORATORY BORING LOG

8 SEVILLE COURT, SUITE 100, CHICO, CA 95928
(530) 894-2487 FAX 894-2437

Boring No. B12-5

Project Name: BCAG BRTOC | **Project No.:** 70395-01 | **Task:** | **Start:** 03/08/12 | **Sheet:** 1 of 1

Location: HUSS DRIVE, CHICO, CA | **Ground Elev. (Ft. MSL):** | **Finish:** 03/08/12

Logged By: CUMMINGS, SHANE | **Drilling Cmpny:** PC EXPLORATION | **Drill Rig Type:** CME 75

Driller: NATE | **Drilling Method:** HOLLOW STEM AUGER | **Hammer Type:** 140 LB AUTO HAMMER

Boring Diam (In.): 7.25 | **Total Depth (Ft.):** 18 | **Backfill or Well Casing:** NATIVE CUTTINGS

Ground Water Information

Date	03/08/12			
Time	11:20			
Depth (ft)	NONE			

Time (H:M)	Pocket Penetrometer (TSF)	Uncorrected Blow Counts (Blows / 6-inch)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log	Soil and/or Rock Descriptions
10:45			HSA			1				(CL) SANDY CLAY, FLD. EST: 65% LOW PLASTICITY FINES , 35% VERY FINE TO FINE SAND, DARK BROWN (7.5YR 3/4), STIFF, DAMP
						2				
10:50		3	SPT			3				
		3								
	2.5	3		1.5	--	4				
			HSA			5				
10:55		3	SPT							
		6				6				
	2.25	4		0.7	--	7				
			HSA							
						8				
						9				
						10				
11:05		4	SPT							
		4				11				
	2.5	5		1.5	--	12				(SM) SILTY SAND, FIELD ESTIMATE: 60% VERY FINE TO FINE SAND , 40% LOW PLASTIC FINES; BROWN (7.5YR, 5/4), MEDIUM DENSE, DRY TO DAMP, SLIGHTLY CEMENTED
			HSA			13				
						14				
						15				(GM) SITLY GRAVEL, FLD. EST: 40% FINE TO COURSE GRAVEL, 30% FINE TO MEDIUM SAND, 30% LOW PLASTICITY FINES; BROWN (7.5YR 5/4), DENSE, DRY
11:10		35	SPT							
	--	50/4		--	--	16				REFUSAL @ 16.5 FEET
11:20			HSA			17				
						18				
						19				
						20				

NOTES:

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EXPLORATORY BORING LOG

8 SEVILLE COURT, SUITE 100, CHICO, CA 95928
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Boring No. B12-6

Project Name: BCAG BRTOC | **Project No.:** 70395-01 | **Task:** | **Start:** 03/08/12 | **Sheet:** 1 of 1

Location: HUSS DRIVE, CHICO, CA | **Ground Elev. (Ft. MSL):** | **Finish:** 03/08/12

Logged By: CUMMINGS, SHANE | **Drilling Cmpny:** PC EXPLORATION | **Drill Rig Type:** CME 75

Driller: NATE | **Drilling Method:** HOLLOW STEM AUGER | **Hammer Type:** 140 LB AUTO HAMMER

Boring Diam (In.): 7.25 | **Total Depth (Ft.):** 17.5 | **Backfill or Well Casing:** NATIVE CUTTINGS

Ground Water Information

Date	03/08/12			
Time	12:05			
Depth (ft)	NONE			

Time (H:M)	Pocket Penetrometer (TSF)	Uncorrected Blow Counts (Blows / 6-inch)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log	Soil and/or Rock Descriptions
11:30			HSA			1				(CL) SANDY CLAY, FLD. EST: 65% LOW PLASTICITY FINES , 35% VERY FINE TO FINE SAND, DARK BROWN (7.5YR 3/4), STIFF, DAMP
						2				
11:35		5	SPT			3				
		2								
	1.5	4		1.5	--	4				
			HSA			5				
11:40		4	SPT							
		6				6				
	1.5	5		1.5	--					
			HSA			7				
						8				
						9				
						10				(SM) SILTY SAND, FIELD ESTIMATE: 60% VERY FINE TO FINE SAND , 40% LOW PLASTIC FINES; BROWN (7.5YR, 5/4), MEDIUM DENSE, DRY TO DAMP, SLIGHTLY CEMENTED
11:45		4	SPT							
		5				11				
	--	3		--	--					
			HSA			12				
						13				
						14				
						15				
12:00		3	SPT							
		4				16				
	--	8		--	--					
			HSA			17				
12:05						18				(GM) SITLY GRAVEL, FLD. EST: 40% FINE TO COURSE GRAVEL, 30% FINE TO MEDIUM SAND, 30% LOW PLASTICITY FINES; BROWN (7.5YR 5/4), DENSE, DRY
										REFUSAL @ 17.5 FEET
						19				
						20				

NOTES:

APPENDIX D:

Soil Laboratory Test Sheets

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Moisture & Density

ASTM D2216 & D2937

DSA File #:
DSA Appl #:

Project No.:	70395-01	Project Name:	BCAG-Butte Regional Operation Transit Center	Date:	3/14/2012
Lab No.:	15-12-026	Performed By:	MLH	Checked By:	JHA

Boring/Trench No.	Units	B12-1	B12-1	B12-2	B12-2					
SAMPLE LOCATION DATA										
Sample No.		L1-1/2	L2-1/1	L2-1/1	L3-1/2					
Depth Interval	(ft.)	5	10	5	10					
Sample Description		Reddish Brown (5YR 4/3) Lean Clay with Sand	Reddish Brown (5YR 4/4) Silty Sand with Gravel	Reddish Brown (5YR 4/3) Lean Clay with Sand (unconfined test performed on sample)	Reddish Brown (5YR 4/3) Silty Sand					
USCS Symbol										
SAMPLE DIMENSION AND WEIGHT DATA										
Sample Length	(in)	5.940	6.000	5.490	6.000					
Sample Diameter	(in)	2.430	2.430	2.430	2.430					
Sample Volume	(cf)	0.0159	0.0161	0.0147	0.0161					
Wet Soil + Tube Wt.	(gr)	906.00	1135.30	873.20	1118.90					
Tube Wt.	(gr)	151.82	272.80	154.20	273.50					
Wet Soil Wt.	(gr)	754.18	862.50	719.00	845.40					
MOISTURE CONTENT DATA										
Tare No.		B2	EZ1	nb	OJ					
Tare Wt.	(gr)	151.82	155.26	154.20	166.11					
Wet Soil + Tare Wt.	(gr)	269.20	313.50	288.10	245.10					
Dry Soil + Tare Wt.	(gr)	251.64	299.30	269.24	228.49					
Water Wt.	(gr)	17.56	14.20	18.86	16.61					
Dry Soil Wt.	(gr)	99.82	144.04	115.04	62.38					
Moisture Content	(%)	17.6	9.9	16.4	26.6					
TEST RESULTS										
Wet Unit Wt.	(pcf)	104.3	118.1	107.6	115.7					
Moisture Content	(%)	17.6	9.9	16.4	26.6					
Dry Unit Wt.	(pcf)	88.7	107.5	92.4	91.4					
MOISTURE CORRECTION DATA										
Gauge Moisture	(%)									
K Value Correction Factor										
COMPACTION CURVE DATA (ASTM D698, ASTM D1557, or CAL216)										
Test Method										
Curve No.										
Max Wet Unit Wt.	(pcf)									
Max Dry Unit Wt.	(pcf)									
Optimum Moisture	(%)									
Wet Relative Comp.	(%)									
Dry Relative Comp.	(%)									

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Atterberg Indices

ASTM D4318

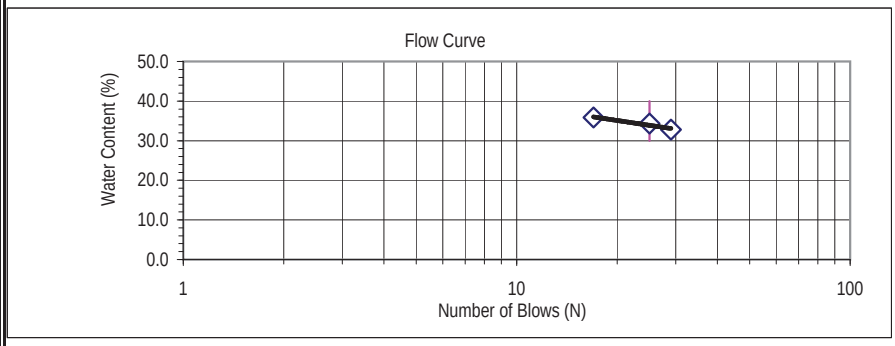
DSA File #:
DSA Appl #:

Project No.:	**70395-01**	Project Name:	**BCAG-Butte Regional Operation Transit Center**	Date:	**3/14/2012**
Sample No.:	**030812A**	Boring/Trench:	**B12-3**	Depth, (ft.): **0-5**	Tested By: **MLH**
Description:	**Reddish Brown (5YR 4/3) Lean Clay with Sand**			Checked By:	**JHA**
Sample Location:				Lab. No.:	**15-12-026**

Estimated % of Sample Retained on No. 40 Sieve: <10% Sample Air Dried: yes

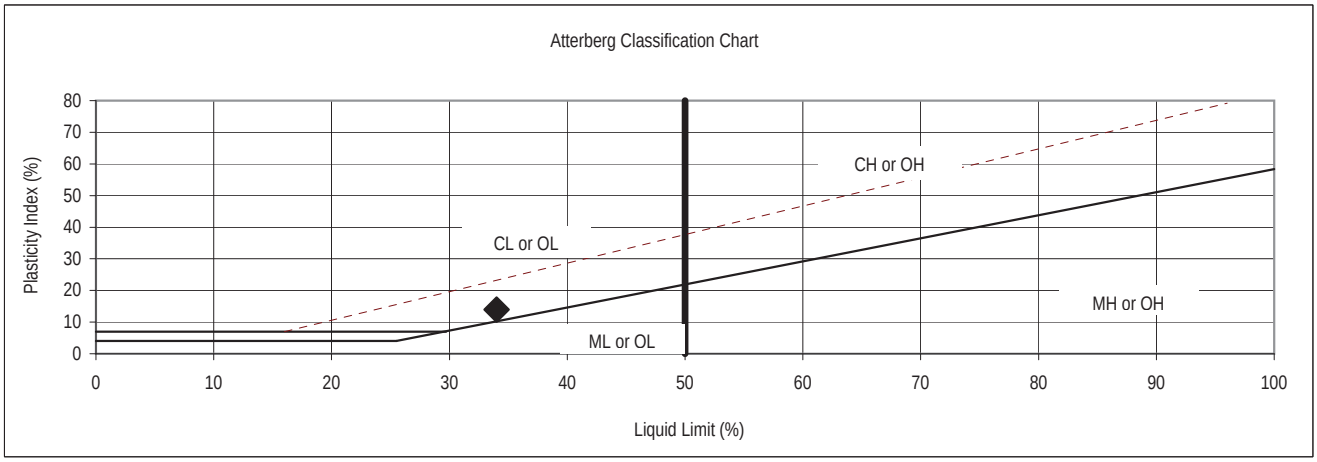
Test Method A or B: A

LIQUID LIMIT:						PLASTIC LIMIT:		
Sample No.:	1	2	3	4	5	1	2	3
Pan ID:	LC	HK	AT			25	LD	
Wt. Pan (gr)	15.01	14.92	15.27			15.29	15.20	
Wt. Wet Soil + Pan (gr)	27.41	27.09	28.30			20.53	20.82	
Wt. Dry Soil + Pan (gr)	24.35	23.98	24.86			19.65	19.90	
Wt. Water (gr)	3.06	3.11	3.44			0.88	0.92	
Wt. Dry Soil (gr)	9.34	9.06	9.59			4.36	4.70	
Water Content (%)	32.8	34.3	35.9			20.2	19.6	
Number of Blows, N	29	25	17					
				LIQUID LIMIT =	34		PLASTIC LIMIT =	20



Plasticity Index = 14

Group Symbol = CL



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PARTICLE SIZE DISTRIBUTION TEST WORK SHEET

ASTM D422

DSA File #:
DSA Appl #:

Sieve Only Analysis Worksheet

Project No.:	**70395-01**	Project Name:	**BCAG-Butte Regional Operation Transit Center**			Date:	**3/14/2012**
Sample No.:	**030812A**	Boring/Trench:	**B12-3**	Depth, (ft.):	**0-5**	Tested By:	**MLH**
Description:	**Reddish Brown (5YR 4/3) Lean Clay with Sand**					Checked By:	**JHA**
Sample Location:						Lab. No.:	**15-12-026**

Moisture Content Data:

Pan ID	17B	
Pan Weight	50.59	(gm)
Wet Soil + Pan	111.11	(gm)
Dry Soil + Pan	109.69	(gm)
Water Weight	1.42	(gm)
Dry Soil Weight	59.10	(gm)
Moisture Content	2.4	(%)

Total Material Sample Data:

Pan ID	0	
Pan Weight	0.00	(gm)
Wet Soil + Pan Wt.	1,178.58	(gm)
Total Wet Weight	1,178.58	(gm)
Total Dry Weight	1,150.94	(gm)
Total Dry Wt. >#4 Sieve	0.78	(gm)
Total Dry Wt.<#4 Sieve	1,150.16	(gm)
Total Dry Wt. <#200 Sieve	836.57	(gm)
Total Percent <#200 Sieve	72.69	(%)

GRAVEL PORTION SIEVE ANALYSIS
(Portion Retained On > #4 Sieve)

Sieve Size	Particle Diameter		Wet Weight	Dry Weight			
	Inches (in.)	Millimeter (mm)	Retained On Sieve (gm)	Retained On Sieve (gm)	Accum. On Sieve (gm)	Passing Sieve (gm)	Percent Passing (%)
6 Inch	6.0000	152.40			0.00	1,150.94	100.0
3 Inch	3.0000	76.20			0.00	1,150.94	100.0
2 Inch	2.0000	50.80			0.00	1,150.94	100.0
1.5 Inch	1.5000	38.10			0.00	1,150.94	100.0
1.0 Inch	1.0000	25.40			0.00	1,150.94	100.0
3/4 Inch	0.7500	19.05			0.00	1,150.94	100.0
1/2 Inch	0.5000	12.70			0.00	1,150.94	100.0
3/8 Inch	0.3750	9.53	0.00	0.00	0.00	1,150.94	100.0
#4	0.1870	4.75	0.78	0.78	0.78	1,150.16	99.9
PAN			1,177.80	1,150.16	1,150.94	0.00	

SAND PORTION SIEVE ANALYSIS
(Portion Retained On < #4 Sieves)

Representative Sample Data:

Pan ID	X1	
Pan Weight	151.88	(gm)
Wet Soil + Pan	204.95	(gm)
Wet Soil	53.07	(gm)
Dry Soil	51.82	(gm)

#200 Wash Data:

Portion >#200 Sieve:	14.13	(gm)
Portion <#200 Sieve:	37.69	(gm)
Percent <#200 Sieve	72.74	(%)
Total Wt. <#200 Sieve	836.57	(gm)

Sieve Size	Particle Diameter		Dry Weight Rep. Sample		Total Sample Weight Retained (gm)	Accum. Grand Total On Sieve (gm)	Total Percent Passing (%)
	Inches (in.)	Millimeter (mm)	Retained On Sieve (gm)	Percent Retained (%)			
#10	0.079	2.000	0.19	0.37	4.22	5.00	99.6
#20	0.033	0.850	0.35	0.68	7.77	12.76	98.9
#40	0.017	0.425	0.78	1.51	17.31	30.08	97.4
#60	0.010	0.250	1.74	3.36	38.62	68.69	94.0
#100	0.006	0.150	3.71	7.16	82.34	151.03	86.9
#200	0.003	0.075	7.36	14.20	163.34	314.37	72.7
PAN			Discard				

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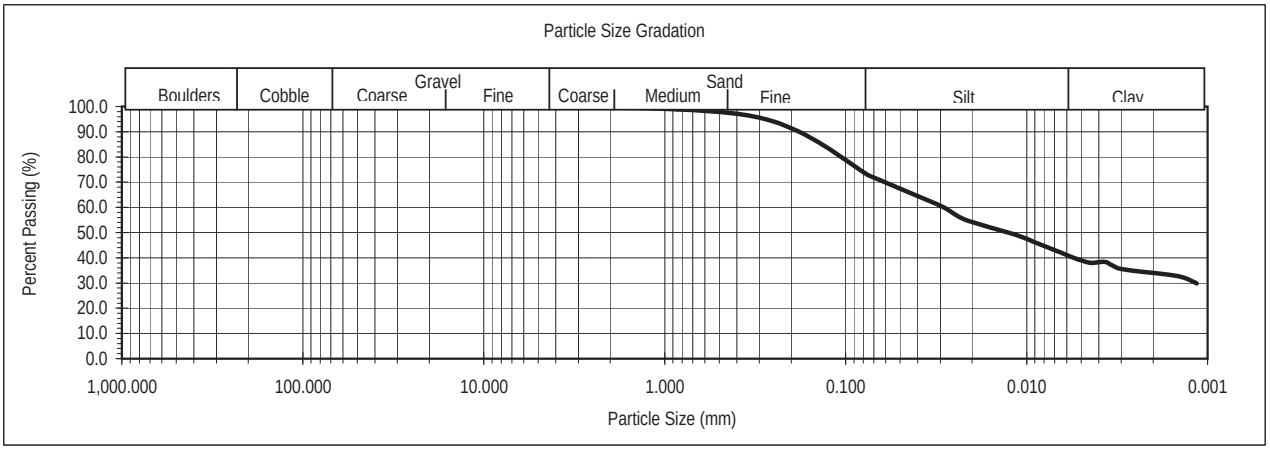
Particle Size Distribution

ASTM D422

Project No.:	**70395-01**	Project Name:	**BCAG-Butte Regional Operation Transit Center**	Date:	**3/14/2012**
Sample No.:	**030812A**	Boring/Trench:	**B12-3**	Depth, (ft.): **0-5**	Tested By: **MLH**
Description:	**Reddish Brown (5YR 4/3) Lean Clay with Sand**			Checked By:	**JHA**
Sample Location:				Lab. No.:	**15-12-026**

Sieve Size	Particle Diameter		Dry Weight on Sieve			Percent
	Inches	Millimeter	Retained On Sieve	Accumulated On Sieve	Passing Sieve	Passing
(U.S. Standard)	(in.)	(mm)	(gm)	(gm)	(gm)	(%)
6 Inch	6.0000	152.4		0.0	1,150.9	100.0
3 Inch	3.0000	76.2		0.0	1,150.9	100.0
2 Inch	2.0000	50.8		0.0	1,150.9	100.0
1.5 Inch	1.5000	38.1		0.0	1,150.9	100.0
1.0 Inch	1.0000	25.4		0.0	1,150.9	100.0
3/4 Inch	0.7500	19.1		0.0	1,150.9	100.0
1/2 Inch	0.5000	12.7		0.0	1,150.9	100.0
3/8 Inch	0.3750	9.5	0.00	0.0	1,150.9	100.0
#4	0.1870	4.7500	0.78	0.8	1,150.2	99.9
#10	0.0787	2.0000	4.22	5.0	1,145.9	99.6
#20	0.0335	0.8500	7.77	12.8	1,138.2	98.9
#40	0.0167	0.4250	17.31	30.1	1,120.9	97.4
#60	0.0098	0.2500	38.62	68.7	1,082.3	94.0
#100	0.0059	0.1500	82.34	151.0	999.9	86.9
#200	0.0030	0.0750	163.34	314.4	836.6	72.7
Hydrometer		0.0300				60.6
		0.0218				55.1
		0.0119				49.5
		0.0094				46.7
		0.0075				43.9
		0.0047				38.3
		0.0037				38.3
		0.0030				35.5
		0.0015				32.7
		0.0011				29.9



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Expansion Index/Swell

ASTM D4829

DSA File #:
DSA Appl #:

Project No.:	70395-01	Project Name:	BCAG-Butte Regional Operation Transit Center	Date:	3/14/2012
Sample No.:	030812A	Boring/Trench No.:	B12-3	Depth (ft.) 0-5	Tested By: MLH
Soil Description:	Reddish Brown (5YR 4/3) Lean Clay with Sand				Checked By: JHA
Estimated % of sample retained on #4:	<10%	Notes:	Initial % saturation outside guidelines		Lab. No.: 15-12-026

Specimen Type:	Undisturbed:		Disturbed:		Remolded to:		ASTM Guidelines	
Tube Dia. (Inch) =		Ring Dia. (Inch) =	4	Ring Height (Inch) =	1.00			

FIELD DATA Tube Sample Moisture & Density			LAB DATA		Test wt. 144 Initial	Final	Test wt. Initial	Final	Test wt. Initial	Final
Tare Tube Number			Tare Number		NB					
Tare Weight	(gr)		Tare Ring Weight	(gr)	200.93	200.93				
Wet Soil + Tare	(gr)		Tare Pan Weight	(gr)	0.00	154.29				
Dry Soil + Tare	(gr)		Wet Soil + Tare	(gr)	554.61	758.85				
Weight of Water	(gr)	0.00	Dry Soil + Tare	(gr)	513.73	668.02	0.00		0.00	
Dry Soil Weight	(gr)	0.00	Weight of Water	(gr)	40.88	90.83	0.00	0.00	0.00	0.00
Moisture Content	(%)	0.00	Dry Soil Weight	(gr)	312.80	312.80	0.00	0.00	0.00	0.00
Soil Height	(In.)		Moisture Content	(%)	13.07	29.04	0.00	0.00	0.00	0.00
Wet Unit Weight	(pcf)		Wet Unit Weight	(pcf)	107.23	118.62				
Dry Unit Weight	(pcf)		Dry Unit Weight	(pcf)	94.84	91.92				
			Sample Height	(Inches)	1.00	1.032				
Specific Gravity		2.7	Percent Saturation		45.44	94.14				

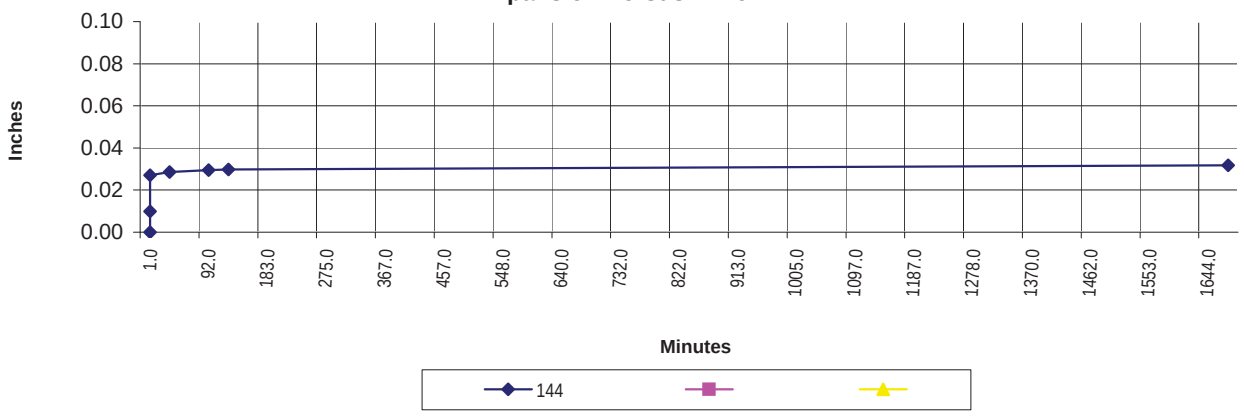
Expansion Index Number

Surcharge (psf)	Uncorrected	Corrected to 50% Saturation
Test wt. 144	32	29
Test wt.		
Test wt.		

Elapsed Time (m:s)	Change in Height (Inches)	Elapsed Time (m:s)	Change in Height (Inches)	Elapsed Time (m:s)	Change in Height (Inches)
2.0	0.0000				
4.0	0.0099				
20.0	0.0270				
44.0	0.0285				
107.0	0.0295				
150.0	0.0298				
1693.0	0.0317				

Expansion Index Values and Descriptions	
Expansion Index	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
Above 130	Very High

Expansion Versus Time



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UNCONFINED COMPRESSION

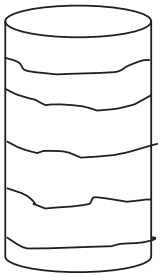
ASTM D2166

DSA File #:
DSA Appl #:

Project No.:	70395-01	Project Name:	BCAG-Butte Regional Operation Transit Center			Date:	3/14/2012
Sample No.:	L2-1/1	Boring/Trench No.:	B12-2	Depth (ft.)	5	Tested By:	MLH
Soil Description:	Reddish Brown (5YR 4/3) Lean Clay with Sand					Check By:	JHA
Sample Location:						Lab No.:	15-12-026

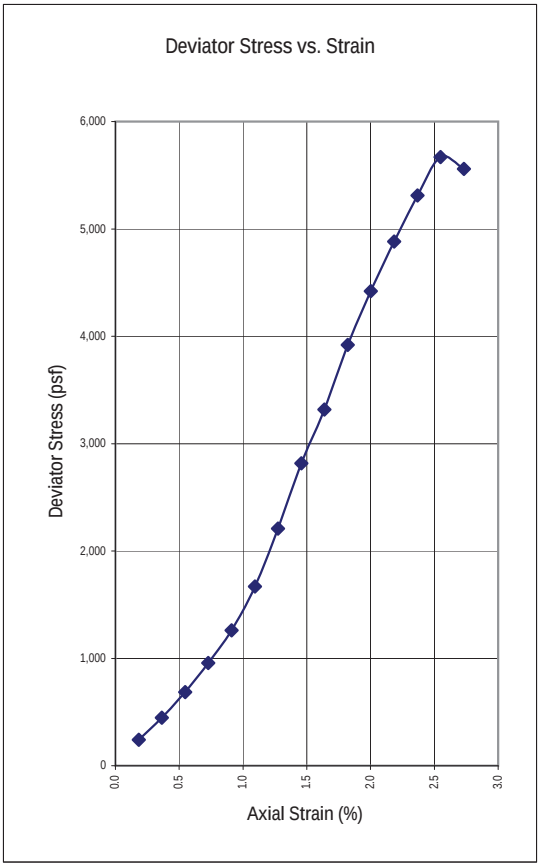
Sample Data		
Tare Tube Number	I.D.	NB
Tare Weight	(gm)	154.20
Wet Soil + Tare	(gm)	873.20
Dry Soil + Tare	(gm)	771.90
Weight of Water	(gm)	101.30
Dry Soil Weight	(gm)	617.70
Moisture Content	(%)	16.40
Soil Height	(cm)	13.95
Sample Diameter	(cm)	6.17
Wet Unit Weight	(pcf)	107.62
Dry Unit Weight	(pcf)	92.46
Specific Gravity	(dim)	2.70
Saturation	(%)	53.85
Strain Rate	(%)	0.01
Proving Ring Constant	(lbs/unit)	1.108

Sample Sketch At Failure



Unconfined Shear Strength = 2,835.0 psf

Elapsed Time (Minutes)	Strain Units (0.001in/unit)	Strain Percent (%)	Area (cm^2)	Load Dial (units)	Load Force (lbs)	Deviator Stress (psf)
12:00:00	10	0.18	29.95	7	7.76	240.6
12:00:30	20	0.36	30.01	13	14.40	445.9
12:01:00	30	0.55	30.06	20	22.16	684.8
12:01:30	40	0.73	30.12	28	31.02	957.0
12:02:00	50	0.91	30.17	37	41.00	1262.2
12:02:30	60	1.09	30.23	49	54.29	1668.5
12:03:00	70	1.27	30.29	65	72.02	2209.3
12:03	80	1.46	30.34	83	91.96	2815.9
12:04:00	90	1.64	30.40	98	108.58	3318.6
12:04:30	100	1.82	30.45	116	128.53	3920.9
12:05:00	110	2.00	30.51	131	145.15	4419.7
12:05:30	120	2.18	30.57	145	160.66	4883.0
12:06:00	130	2.37	30.62	158	175.06	5310.8
12:06:30	140	2.55	30.68	169	187.25	5670.0
12:07	150	2.7311828	30.738776	166	183.93	5558.9



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DIRECT SHEAR TEST

ASTM D3080

DSA File #:

DSA Appl #:

Project No.:	70395-01	Project Name:	BCAG-BRTC			Date:	3/14/2012
Sample No.:	L1-1/1	Boring/Trench No.:	B12-2	Depth (ft.)	2.5	Tested By:	MLH
Soil Description:	Reddish Brown (5YR 4/3) Lean Clay with Sand					Checked By:	JHA
Sample Location:						Lab. No.:	15-12-026

Specimen Type:	Undisturbed:		Disturbed:		Remolded to:		
Tube Dia. (In.) =		Ring Dia. (In.) =	2.43	Ring Height (In.) =	1.00		

FIELD DATA Tube Sample Moisture & Density		LAB DATA	Test No. 1		Test No. 2		Test No. 3	
			Initial	Final	Initial	Final	Initial	Final
Tare Tube Number		Tare Number	TK		TC		ST	
Tare Weight (gr)		Tare Ring Weight (gr)	35.80	0.00	35.79	0.00	42.27	0.00
Wet Soil + Tare (gr)		Tare Pan Weight (gr)	50.66	50.66	50.66	50.66	50.82	50.82
Dry Soil + Tare (gr)		Wet Soil + Tare (gr)	212.56	184.51	219.07	189.01	233.60	192.20
Weight of Water (gr)	0.00	Dry Soil + Tare (gr)	187.30	151.50	196.39	160.60	207.54	165.27
Dry Soil Weight (gr)	0.00	Weight of Water (gr)	25.26	33.01	22.68	28.41	26.06	26.93
Moisture Content (%)		Dry Soil Weight (gr)	100.84	100.84	109.94	109.94	114.45	114.45
Soil Height (In.)		Moisture Content (%)	25.05	32.74	20.63	25.84	22.77	23.53
Wet Unit Weight (pcf)		Wet Unit Weight (pcf)	103.59	116.36	108.95	120.27	115.43	122.91
Dry Unit Weight (pcf)		Dry Unit Weight (pcf)	82.84	87.66	90.32	95.58	94.02	99.50

Normal	psf	500	1000	2000	3000	4000	5000	Other Test Parameters
Loading	2.0"	10.26	20.53	41.05	61.58	82.11	102.64	
Legend	2.5"	16.10	32.21	64.41	96.62	128.82	161.03	

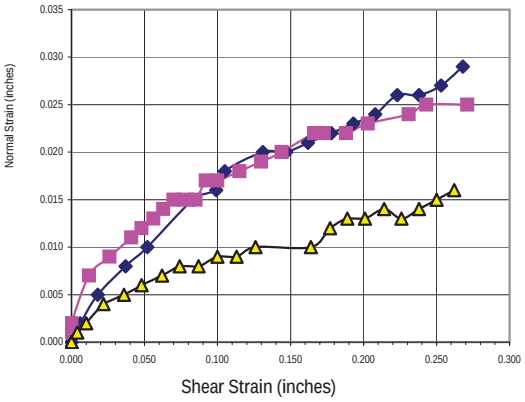
Test No. 1	N. Load 1000	Test No. 2	N. Load 2000	Test No. 3	N. Load 4000

SATURATION & CONSOLIDATION				SATURATION & CONSOLIDATION				SATURATION & CONSOLIDATION			
Time (m:s)	Deflect. (Inch)	Time (m:s)	Deflect. (Inch)	Time (m:s)	Deflect. (Inch)	Time (m:s)	Deflect. (Inch)	Time (m:s)	Deflect. (Inch)	Time (m:s)	Deflect. (Inch)
0:00	0.000	4	0.054	0:00	0.000	4	0.093	0:00	0.000	4	0.074
1	0.050	5	0.055	1	0.086	5	0.095	1	0.071	5	0.075
2	0.053			2	0.091			2	0.072		
3	0.053			3	0.092			3	0.073		
Total Deflection =			0.055	Total Deflection =			0.095	Total Deflection =			0.075

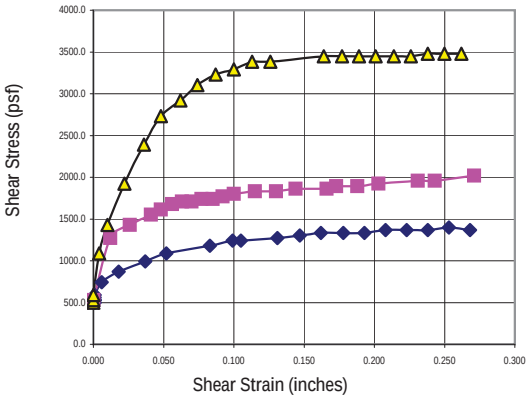
SHEAR DATA				SHEAR DATA				SHEAR DATA			
Elapsed Time (m:s)	Shear Strain Inches	Normal Strain Inches	Shear Load (lbs.)	Elapsed Time (m:s)	Shear Strain Inches	Normal Strain Inches	Shear Load (lbs.)	Elapsed Time (m:s)	Shear Strain Inches	Normal Strain Inches	Shear Load (lbs)
12:00:00	0	0	16	12:02:00	0	0.001	17	12:00:00	0	0	16
12:01:00	0.001	0.001	16	12:04:00	0	0.002	17	12:02:00	0	0	17
12:02:00	0.001	0.001	17	12:09:00	0.012	0.007	41	12:05:00	0	0	19
12:04:00	0.001	0.001	17	12:10:00	0.026	0.009	46	12:07:00	0.004	0.001	35
12:05:00	0.001	0.001	18	12:11:00	0.041	0.011	50	12:08:00	0.01	0.002	46
12:06:00	0.001	0.001	19	12:11:30	0.048	0.012	52	12:09:00	0.022	0.004	62
12:07:00	0.006	0.002	24	12:12:00	0.056	0.013	54	12:10:00	0.036	0.005	77
12:08:00	0.018	0.005	28	12:12:30	0.063	0.014	55	12:11:00	0.048	0.006	88
12:10:00	0.037	0.008	32	12:13:00	0.07	0.015	55	12:12:00	0.062	0.007	94
12:11:00	0.052	0.01	35	12:13:30	0.077	0.015	56	12:13:00	0.074	0.008	100
12:13:00	0.083	0.015	38	12:14:00	0.085	0.015	56	12:14:00	0.087	0.008	104
12:14:00	0.099	0.016	40	12:14:30	0.092	0.017	57	12:15:00	0.1	0.009	106
12:15:00	0.105	0.018	40	12:15:00	0.1	0.017	58	12:16:00	0.113	0.009	109
12:16:00	0.131	0.02	41	12:16:00	0.115	0.018	59	12:17:00	0.126	0.01	109
12:17:00	0.147	0.02	42	12:17:00	0.13	0.019	59	12:20:00	0.164	0.01	111
12:18:00	0.162	0.021	43	12:18:00	0.144	0.02	60	12:21:00	0.177	0.012	111
12:19:00	0.178	0.022	43	12:19:30	0.166	0.022	60	12:22:00	0.189	0.013	111
12:20:00	0.193	0.023	43	12:20:00	0.173	0.022	61	12:23:00	0.201	0.013	111
12:21:00	0.208	0.024	44	12:21:00	0.188	0.022	61	12:24:00	0.214	0.014	111
12:22:00	0.223	0.026	44	12:22:00	0.203	0.023	62	12:25:00	0.226	0.013	111
12:23:00	0.238	0.026	44	12:24:00	0.231	0.024	63	12:26:00	0.238	0.014	112
12:24:00	0.253	0.027	45	12:25:00	0.243	0.025	63	12:27:00	0.25	0.015	112
12:25:00	0.268	0.029	44	12:27:00	0.271	0.025	65	12:28:00	0.262	0.016	112

DIRECT SHEAR
TEST RESULTS

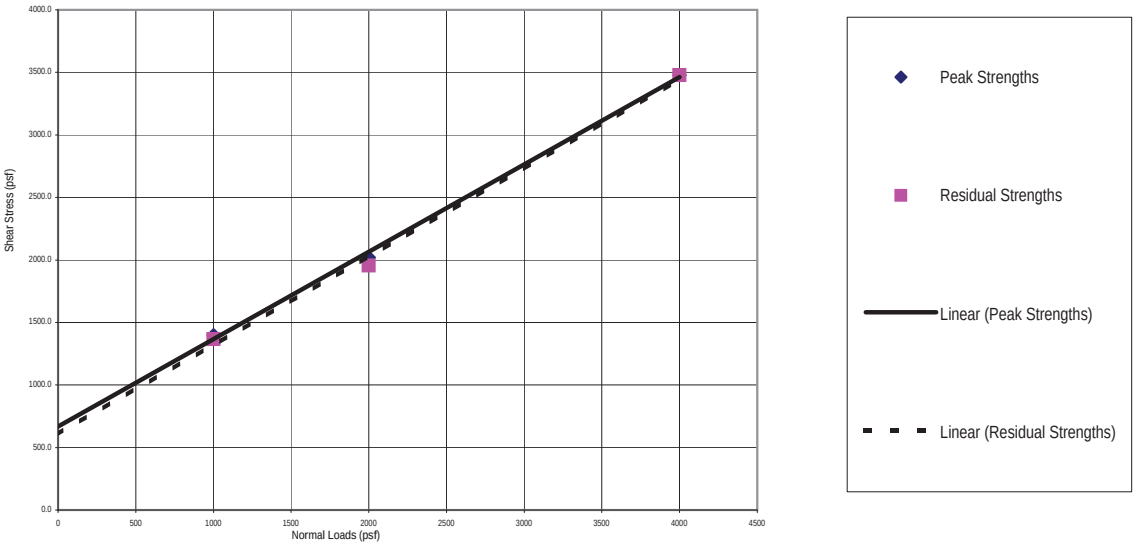
Shear Strain vs. Normal Strain



Shear Strain vs. Shear Stress



Mohr-Coulomb Failure Envelope



SHEAR STRENGTH TEST RESULTS		
PARAMETERS	PEAK STRENGTH:	RESIDUAL STRENGTH:
FRICTION ANGLE, (Degree)	34.9	35.5
COHESION, (psf)	668.0	605.0

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792 SEARLS AVENUE
NEVADA CITY, CA 95959
(530) 478-1305 FAX 478-1019

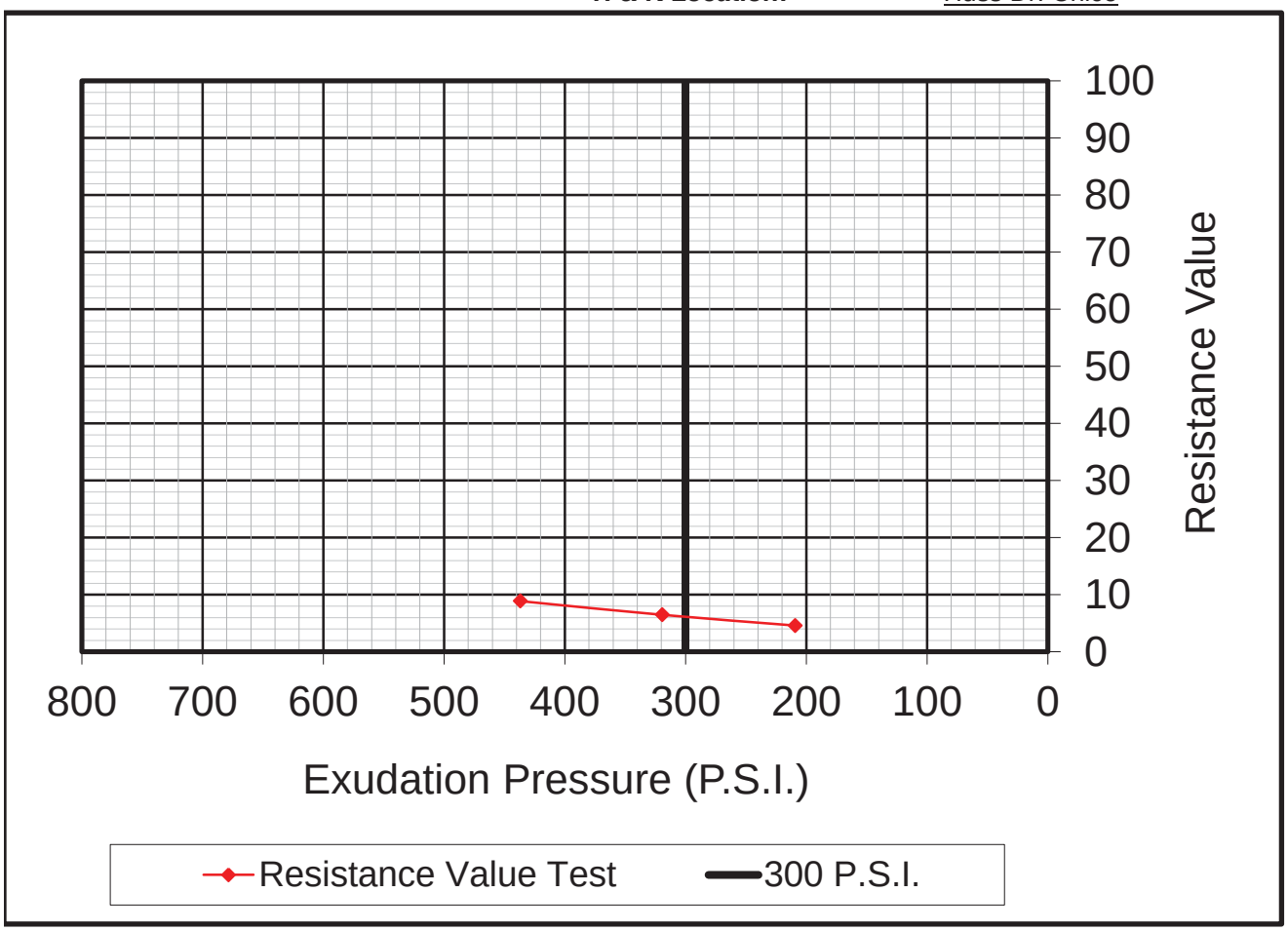
PROJECT NAME: BCAG-BRTC
PROJECT NO.: 70395-01 DATE: 3/14/2012
BORING / TRENCH NO.: B12-2 **LAB NO.** 15-12-026
SAMPLE NO.: L1-1/1 **SAMPLE DEPTH (ft.):** 2.5
DESCRIPTION: Reddish Brown (5YR 4/3) Lean Clay with Sand

Pavement Engineering Inc.
Civil Engineering • Landscape Architecture
CalTrans/AMRL QC/QA • Construction Management

RESISTANCE (R) VALUE TEST

ASTM D 2844

PEI Laboratory No.:	L120115	**H & K Project Name:**	BCAG-BRTC
PEI Client:	Holdrege and Kull-Chico	**H & K Project No.:**	70395
PEI Project Name:	H&K 2012 Laboratory Tes	**H & K Task No.:**	01
PEI Project No.:	120013-02	**H & K Office:**	Chico
Report Date:	February 16, 2012	**H & K Engineer:**	Shane Cummings
Sample Description:	Brown Clay	**H & K Sample No.:**	030812A
		H & K Location:	Huss Dr. Chico



Specimen No.	1	2	3
Moisture Content (%)	20.7	21.4	21.9
Dry Density (PCF)	106.4	106.4	106.6
Resistance Value (R)	9	6	5
Exudation Pressure (PSI)	437	319	209
Expansion Pressure	17	4	0

RESISTANCE VALUE AT 300 P.S.I. 6

AASHTO R18

Reviewed By: _____

Brandon Howard
Assistant Laboratory Manager

00 41 13 - BID FORM

To be submitted as part of bid by the time and date specified in Section 00 21 13 (Instructions to Bidders), paragraph 1.

TO THE BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

THIS BID IS SUBMITTED BY:

_____
(Firm/Company Name)

Re: **BCAG, Butte Regional Transit Operations Center**

1. The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an agreement with the Butte County Association of Governments ("Owner") in the form included in the Contract Documents, Section 00 52 13 (Agreement), to perform and furnish all Work as specified or indicated in the Contract Documents for the Contract Sum and within the Contract Time indicated in this Bid and in accordance with all other terms and conditions of the Contract Documents.

2. Bidder accepts all of the terms and conditions of the Contract Documents, Section 00 11 13 (Advertisement for Bids), and Section 00 21 13 (Instructions to Bidders), including, without limitation, those dealing with the disposition of Bid Security. This Bid will remain subject to acceptance for ninety (90) Days after the day of Bid opening.

3. In submitting this Bid, Bidder represents:

   (a) Bidder has examined all of the Contract Documents and the following Addenda (receipt of all of which is hereby acknowledged).

Addendum No.	Addendum Date	Signature of Bidder

   (b) Bidder has visited the Site and performed tasks, reviews, examinations, and analysis and given notices, regarding the Project and the Site, as set forth in Section 00 52 13 (Agreement), Article 5.

   (c) Bidder has received and examined copies of the geotechnical data, existing conditions and hazardous material surveys listed in Section 00 31 00.

   (d) Bidder has given the Owner prompt written notice of all conflicts, errors, ambiguities, or discrepancies that it has discovered in or among the Contract Documents, geotechnical data, existing conditions and hazardous material surveys, and actual conditions. The written resolution thereof through Addenda issued by the Owner is acceptable to Contractor.

4. Based on the foregoing, Bidder proposes and agrees to fully perform the Work within the time stated and in strict accordance with the Contract Documents for the following sums of money listed in the following Schedule of Bid Prices:

SCHEDULE OF BID PRICES

All Bid items must be filled in completely or will be considered non-responsive. Section 01 10 00 (Summary of Work) describes the scope of work to be performed under this contract. Section 01 23 00 (Alternates) describes the scope of work for the alternates. Quote in figures only, unless words are specifically requested.

Unit Price No. 1 – Tire Derived Aggregate (TDA) bio-swales per Section 31 23 23. : $_____ / lump sum. Unit price shall include all trenching, filter fabric, TDA aggregate, delivery costs, placement including compaction, sample wells, and testing for the complete system. The undersigned Bidder certifies they have reviewed and agree to meet all their obligations to comply with the CalRecycle Grantee obligations identified at Section 00 73 00 – Special Conditions. Include Unit Price in Base Bid below, amount listed here for accounting purposes only with Grantor.

Unit Price No. 2 – Steel allowance of 3%: $_____ / lump sum.
Contractor shall provide an allowance equal equal to 3% of the Bid for Structural Steel, Misc Iron and Reinforced steel to be used at the discretion of the Owner. Unit price shall include all detailing, estimating, small tools, welding power, materials, labor, equipment including hoisting, etc. in anticipation of Owner changes made on the project. Allowance shall be consumed with prior agreement of Architect and Owner only. Unused amount to revert to the Owner upon project closeout.

Bid Prices:

ITEM	DESCRIPTION	PRICE
1.	Lump Sum Base Bid Price: All Work of Contract Documents other than Work separately provided for under other Bid items	$
2.	Alternate No. 1 – Add Standby Engine Generator	$
3.	Alternate No. 2 – Add planting and irrigation in lieu of hydroseeding	$

Lump Sum Base Bid Price:_____
(Words)

5. The Owner will determine the low Bidder on the basis of the sum of the Lump Sum Base Bid plus the daily rate for Compensable Delay multiplied by the “multiplier” as stated in the Bid Form, plus the amounts of all Alternates to be included in the Contract Sum at the time of award. The Contract Sum will be the sum of the Lump Sum Base Bid and the additive amounts for all Alternates that Owner has selected to be included in the Contract Sum as of the time of award.

6. DAILY RATE OF COMPENSATION FOR COMPENSABLE DELAYS
Bidder shall determine and provide below the daily rate of compensation for any Compensable Delay caused by Owner at any time during the performance of the Work:

$ ☐☐ , ☐☐☐ . ☐☐ X 30 days multiplier

Failure to fill in a dollar figure for the daily rate for Compensable Delay shall render the bid nonresponsive. Owner will perform the extension of the daily rate times the multiplier.

The daily rate shown above will be the total amount of Contractor entitlement for each day of Compensable Delay caused by Owner at any time during the performance of the Work and shall constitute payment in full for all delay costs, direct or indirect, of the Contractor and all subcontractors, suppliers, persons and entities under Contractor on the Project, including without limitation all subcontractors added by Contract Amendment. The number of days of Compensable Delay shown as a "multiplier" above is not intended as an estimate of the number of days of compensable delay anticipated by the Owner. The Owner will pay the daily rate of compensation only for the actual number of days of Compensable Delay, as defined in the General Conditions; the actual number of days of compensable delay may be greater or lesser than the "multiplier" used above for bid analysis.

7. The undersigned Bidder understands that the Owner reserves the right to reject this Bid. The undersigned Bidder acknowledges that the Butte County Association of Governments reserves the right to include any or none of the alternates in the contract.

8. If written notice of the acceptance of this Bid, hereinafter referred to as Notice of Award, is mailed or delivered to the undersigned Bidder within the time described in paragraph 2 of this Section 00 41 13 or at any other time thereafter before it is withdrawn, the undersigned Bidder will execute and deliver the documents required by Section 00 21 13 (Instructions to Bidders) within the times specified therein.

9. Notice of Award or request for additional information may be addressed to the undersigned idder at the address set forth below.

10. The undersigned Bidder herewith encloses cash, a cashier’s check, or certified check of or on a responsible bank in the United States, or a corporate surety bond furnished by a surety authorized to do a surety business in the State of California, in form specified in Section 00 21 13 (Instructions to Bidders), in the amount of ten percent (10%) of the Total Bid Price and made payable to the “Butte County Association of Governments”.

11. The undersigned Bidder agrees to commence Work under the Contract Documents on the date established in Section 00 55 00 (Notice to Proceed) and to complete all work within the time specified in Section 00 55 00 (Notice to Proceed). The undersigned Bidder acknowledges that the Owner has reserved the right to delay or modify the commencement date. The undersigned Bidder further acknowledges the Owner has reserved the right to perform independent work at the Site, the extent of such work may not be determined until after the opening of the Bids, and that the undersigned Bidder will be required to cooperate with such other work in accordance with the requirements of the Contract Documents.

12. The undersigned Bidder agrees that, in accordance with Section 00 72 13 (General Conditions) and Section 00 73 00 (Supplementary Conditions), liquidated damages for failure to complete all Work in the Contract within the time specified shall be as set forth in Section 00 31 13 (Construction Durations, Phasing and Milestones).

13. The names of all persons interested in the foregoing Bid as principals are:

(IMPORTANT NOTICE: If Bidder or other interested person is a corporation, give the legal name of corporation, state where incorporated, and names of president and secretary thereof; if a partnership, give name of the firm and names of all individual co-partners composing the firm; if Bidder or other interested person is an individual, give first and last names in full).

NAME OF BIDDER: _____

Licensed in accordance with the act for the registration of Contractors, and with

License Number: _____

Expiration: _____

_____ _____

Where incorporated, if applicable

_____

_____

Principals

I certify (or declare) under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

_____

Signature of Bidder

NOTE: If Bidder is a corporation, set forth the legal name of the corporation together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation. If Bidder is a partnership, set forth the name of the firm together with the signature of the partner or partners authorized to sign contracts on behalf of the partnership.

Business Address: _____

_____

_____

Officers authorized to sign contracts: _____

_____

Telephone Number(s): _____

Fax Number(s): _____

E-Mail address: _____

Federal ID Number: _____

Date of Bid: _____

END OF SECTION

00 43 13 - BOND ACCOMPANYING BID

BIDDER'S BOND
BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

We, *All Men by These Presents*, That we _____

_____ as Principal, and

_____

as SURETY are bound unto the Butte County Association of Governments, State of California, hereafter referred to as "Obligee", in the penal sum of TEN PERCENT (10%) OF THE TOTAL AMOUNT OF THE TOTAL BID of the Principal above named and submitted by said Principal to the Obligee for the Work described below, for the payment of which sum we bind ourselves, our heirs, executors administrators and successors, jointly and severally, firmly by these present, in no case shall the liability of the surety hereunder exceed the sum of:

$_____

THE CONDITION OF THIS OBLIGATION IS SUCH, THAT:

WHEREAS, the Principal is submitted the above-mentioned bid to the Obligee, for ***BUTTE REGIONAL TRANSIT OPERATIONS CENTER*** for which bids are to be opened at *The Butte County Association of Governments, 2580 Sierra Sunrise Terrace, Suite 100, Chico, CA 95928 2:00 pm on Tuesday, August 19, 2014 .*

NOW, THEREFORE, if the aforesaid Principal is awarded the contract and, within the time and manner required under the specifications, after the prescribed forms are presented to him for signature, enters into a written contract, in the prescribed form, in conformance with the bid, and files two bonds with the Obligee, one to guarantee faithful performance of the contract and the other to guarantee payment for labor and materials as required by law, then this obligation shall be null and void; otherwise, it shall remain in full force and virtue. In the event suit is brought upon this bond by the Obligee and judgement is recovered, the Surety shall pay all costs incurred by the Obligee in such suit, including a reasonable attorney's fee to be fixed by the court.

IN WITNESS WHEREOF, We have hereunto set our hands and seal on this _____Day of _____,

_____

_____
Principal

_____
Surety

By_____
Attorney-in-fact

CERTIFICATE OF ACKNOWLEDGEMENT

State of California
City/County of SS

On this _____ day of _____ in the year 20_____ before me

_____, personally appeared _____ ,
Attorney-in-fact

personally known to me (or proved to me on the basis of satisfactory evidence) to be the person whose name is subscribed to this instrument as the attorney-in-fact of _____, and acknowledged to me that he (she) subscribed the name of the said company thereto as surety, and his (her) own name as attorney-in-fact.

(SEAL) _____

Notary Public

END OF SECTION

00 43 16 - WORK TO BE PERFORMED BY BIDDER

Each Bidder shall provide complete and accurate information in the form below regarding the portions of the work which the Bidder intends to complete with its own forces. The failure of any Bidder to provide complete and accurate information in the following form will render the Bid Proposal of such Bidder to be non-responsive and rejected. This Page of the Bid proposal may be reproduced as necessary to identify all portion of the Work which the Bidder intends to perform with its own forces.

Portion of Work to be Performed by the Bidder's Own Forces (Describe by reference to Plan Sheets or Specifications Sections; Limit Information on Each Line to Discrete Portions of the Work)	**Dollar Value of Portion of Work to be Performed by the Bidder's Own Forces**

_____
Name of Bidder

END OF SECTION

00 43 36 - PROPOSED SUBCONTRACTORS LIST

Bidder shall submit the following information as to the subcontractors Bidder intends to employ if awarded the Contract with the Bid Form. The Bidder shall list the name and address of each subcontractor to whom the Bidder proposes to subcontract portions of the work. ***Table must be filled out completely for Bid to be Responsive.***

Pursuant to California Public Contracting Code, Section 4100 et. seq., the following list gives the name, business address, and portion of work (description of work to be done) for each subcontractor that will be used in the work if the bidder is awarded the Contract. (Additional supporting data may be attached to this page.) Each page shall be sequentially numbered, and headed "Proposed Subcontractors" and shall be signed.

Name and location of the place of business of each subcontractor who will perform work or labor or render service to the prime contractor in or about the construction of the work or the improvement, or a subcontractor licensed by the State of California who, under subcontract of the prime contractor, specially fabricates and installs portions of the work or improvements according to detailed drawings contained in the plans and specifications in an amount in excess of one-half of one percent (0.5%) of the general contractor's total bid.

Contractor will not be permitted to change this listing without prior written approval of the Owner. If the bidder fails to stipulate a subcontractor for any portion of the work under this contract, it shall be understood that the Contractor will perform such work without subcontracting the same, and they will not be permitted to subcontract said work without prior written approval of the Owner. Contractor will be required to show a sample of the proposed subcontract to the owner prior to executing any subcontracts. The Owner will require that each subcontract have a provision where the subcontractor is assignable to the Owner.

The percentage of work, labor, or services which will be done or rendered by each subcontractor shall be provided by the Contractor

Name of Subcontractor	Address of Business	License No. *	DBE Yes / No	Percentage of Work

(Bidder to attach additional sheets if necessary)

BIDDERS INITIALS: _____

END OF SECTION

00 45 11 - BIDDER REGISTRATION AND SAFETY EXPERIENCE FORM

INSTRUCTIONS

In order to register to undertake work for the Butte County Association of Governments (BCAG), Bidder must provide the following:

1) Fill out this registration form completely; do not leave blanks.
2) Provide certificates of insurance complying with paragraph 13 of Section 00 72 13 (General Conditions).

INDEPENDENT CONTRACTOR REGISTRATION

Contractor's License #: _____

Date: _____ Fed I.D. # _____

Full Corporate Name of Company:

_____

Street Address: _____

Mailing Address: _____

Phone: _____ Fax: _____

Name of Principal Contact: _____

Type of Business: _____ Sole Proprietor _____ Partnership

_____ Non-Profit 501 C3 _____ Corporation

_____ Other (please explain_____)

INSURANCE

Workers' Compensation:

Carrier: _____

Address: _____

Phone and Fax: _____

Policy Number: _____

General Liability:

Carrier: _____

Address: _____

Phone and Fax: _____

Policy Number: _____

Automotive Liability:

Carrier: _____

Address: _____

Phone and Fax: _____

Policy Number: _____

Policy Limit $: _____

A.M. Best Rating: _____

All-Risk Course of Construction:

Carrier: _____

Address: _____

Phone and Fax: _____

Policy Number: _____

Policy Limit $: _____

A.M. Best Rating: _____

Professional Liability (if applicable):

Carrier: _____

Address: _____

Phone and Fax: _____

Policy Number: _____

Policy Limit $: _____

A.M. Best Rating: _____

Environmental Impairment Liability (if applicable):

Carrier: _____

Address: _____

Phone and Fax: _____

Policy Number: _____

Policy Limit $: _____

A.M. Best Rating: _____

SAFETY EXPERIENCE

The following statements as to safety experience of Bidder are submitted with Bid, as part thereof, and Bidder guarantees the truthfulness and accuracy of the information.

1. List Bidder's Interstate Experience Modification Rate for the last three years.

   2012: _____
   2011: _____
   2010: _____

2. Use Bidder's last year's Cal/OSHA 200 log to fill in the following:

   a. Number of lost workday cases _____

   b. Number of medical treatment cases _____

   c. Number of fatalities _____

3. Employee hours worked last year _____

4. State the name of Bidder's safety engineer/manager or Site Safety Officer:

   _____

Attach a resume or outline of this individual's safety and health qualifications and experience.

STAFFING PLAN

At the time of bid, the bidder will provide a proposed Project Staffing Plan that identifies all proposed staff that bidder will assign to this Project if successful. Key Personnel should be listed as indicated below.

Superintendent: _____

Project Manager: _____

Project Engineer: _____

On-Site Safety Coordinator: _____

Quality Control Manager: _____

CALGreen/LEED Coordinator: _____

The General Contractor acknowledges the importance of each individual personnel listed above and agrees not to remove personnel from the Project, nor will their level of involvement decrease, unless agreed in writing by the Butte County Association of Governments (BCAG). In addition, BCAG and its agents and authorized representatives, at its sole discretion, have the right to request the removal and replacement of the General Contractor's personnel from the Project.

BIDDER CERTIFIES, UNDER PENALTY OF PERJURY, THAT THE FOREGOING INFORMATION IS CURRENT AND ACCURATE AND AUTHORIZES THE BCAG AND ITS AGENTS AND REPRESENTATIVES TO OBTAIN A CREDIT REPORT AND/OR VERIFY ANY OF THE ABOVE INFORMATION.

_____
SIGNATURE

_____
DATE

END OF SECTION

00 45 19 - NON-COLLUSION AFFIDAVIT

TITLE 23 UNITED STATES CODE SECTION 112 AND PUBLIC CONTRACT CODE §7106
NON-COLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

STATE OF CALIFORNIA)
) ss.
COUNTY OF _____)

To: the *BUTTE COUNTY ASSOCIATION OF GOVERNMENTS*
[_____**]**, being first duly sworn, deposes and says that he or she is _____ **[Office of Affiant]** of _____ **[Name of Bidder]**, In conformance with Title 23 United States Code Section 112 and Public Contract Code 7106 the bidder declares that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the Bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

Note: The above Non-collusion Affidavit is part of the Proposal. Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution. Executed under penalty of perjury under the laws of the State of California:

_____
(Name of Bidder)

_____
(Signature of Principal)

Subscribed and sworn before me _____

This _____ day of _____, 20___

Notary Public of the State of _____
In and for the County of_____
My Commission expires_____ (Seal)

(If Bidder is a partnership or a joint venture, this affidavit must be signed and sworn to by every member of the partnership or venture.)

(If Bidder [including any partner or venturer of a partnership or joint venture] is a corporation, this affidavit must be signed by the Chairman, President, or Vice President and by the Secretary, Assistant Secretary, Chief Financial Officer, or Assistant Treasurer.)

(If Bidder's affidavit on this form is made outside the State of California, the official position of the person taking such affidavit shall be certified according to law.)

END OF SECTION

00 45 30 BIDDER CERTIFICATIONS

TO BE EXECUTED BY ALL BIDDERS AND SUBMITTED WITH BID

CERTIFICATE OF NON-DISCRIMINATION

On behalf of the bidder making this Bid, the undersigned certifies that there will be no discrimination in employment with regard to race, color, religion, sex, sexual orientation, disability or national origin; that all federal, state, and local directives and executive orders regarding non-discrimination in employment will be complied with; and that the principle of equal opportunity in employment will be demonstrated positively and aggressively.

_____
BIDDER'S SIGNATURE

STATEMENT OF CONVICTIONS, Public Contract Code Section 10285.1

"I hereby swear, under penalty of perjury, that no more than one final, un-appealable finding of contempt of court by a Federal Court has been issued against me within the past two years because of failure to comply with an order of a Federal Court to comply with an order of the National Labor Relations Board."

In conformance with Public Contract Code Section 10285.1 (Chapter 376, Stats. 1985), the bidder hereby declares under penalty of perjury under the laws of the State of California that the bidder has ___ , has not ___ been convicted within the preceding three years of any offenses referred to in that section, including any charge of fraud, bribery, collusion, conspiracy, or any other act in violation of any state or Federal antitrust law in connection with the bidding upon, award of, or performance of, any public works contract, as defined in Public Contract Code Section 1101, with any public entity, as defined in Public Contract Code Section 1100, including the Regents of the University of California or the Trustees of the California State University. The term "bidder" is understood to include any partner, member, officer, director, responsible managing officer, or responsible managing employee thereof, as referred to in Section 10285.1.

Note: The Bidder must place a check mark after “has” or “has not” in one of the blank spaces provided. The above Statement is part of the Bid. Signing this Bid on the signature portion thereof shall also constitute signature of this Statement. Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution.

_____
BIDDER'S SIGNATURE

PREVIOUS DISQUALIFICATIONS

In conformance with Public Contract Code Section 10162, the Bidder shall complete, under penalty of perjury, the following questionnaire:

Has the bidder, any officer of the bidder, or any employee of the bidder who has a proprietary interest in the bidder, ever been disqualified, removed, or otherwise prevented from bidding on, or completing a federal, state, or local government project because of a violation of law or a safety regulation?

Yes _____ No _____

If the answer is yes, explain the circumstances on the separate sheet attached hereto entitled "Previous Disqualifications." If such exceptions are attached, please explain the circumstances.

_____
BIDDER'S SIGNATURE

CERTIFICATION OF WORKER’S COMPENSATION INSURANCE

By my signature hereunder, as CONTRACTOR, I certify that I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with the provisions of that Code, and I will comply with such provisions before commencing the performance of the work of this Contract.

_____
BIDDER'S SIGNATURE

CERTIFICATION OF PUBLIC CONTRACT CODE SECTION 10232

In conformance with Public Contract Code Section 10232, the Contractor, by signing this bid hereby states under penalty of perjury, that no more than one final unappealable finding of contempt of court by a federal court has been issued against the Contractor within the immediately preceding two year period because of the Contractor's failure to comply with an order of a federal court which orders the Contractor to comply with an order of the National Labor Relations Board.

Note: The above Statement and Questionnaire are part of the Proposal. Signing this Proposal on the signature portion thereof shall also constitute signature of this Statement and Questionnaire.
Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution

_____
BIDDER'S SIGNATURE

CERTIFICATION OF DEBARMENT AND SUSPENSION, TITLE 49, CODE OF FEDERAL REGULATIONS, PART 29

The Bidder, under penalty of perjury, certifies that, except as noted, he/she or any other person associated therewith in the capacity of owner, partner, director, officer, manager:

- is not currently under suspension, debarment, voluntary exclusion, or determination of ineligibility by any Federal agency;
- has not been suspended, debarred, voluntarily excluded or determined ineligible by any Federal agency within the past 3 years;
- does not have a proposed debarment pending; and
- has not been indicted, convicted, or had a civil judgment rendered against it by a court of competent jurisdiction in any matter involving fraud or official misconduct within the past 3 years.

If there are any exceptions to this certification, explain on the separate sheet attached hereto entitled "Certificate of Debarment & Suspension, Title 49 CFR, Part 29." If such exceptions are attached, please explain the circumstances. Exceptions will not necessarily result in denial of award, but will be considered in determining bidder responsibility. For any exception noted, indicate to whom it applies, initiating agency, and dates of action.

Note: Providing false information may result in criminal prosecution or administrative sanctions. The above certification is part of the Proposal. Signing this Proposal on the signature portion thereof shall also constitute signature of this Certification.

_____
BIDDER'S SIGNATURE

NON-LOBBYING CERTIFICATION FOR FEDERAL-AID CONTRACTS

The prospective participant certifies, by signing and submitting this bid or bid, to the best of his or her knowledge and belief, that:

1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in conformance with its

instructions.

3) The prospective participant also agrees by submitting his or her bid or bid that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such sub-recipients shall certify and disclose accordingly

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Note: Pursuant to 31 U.S.C. Section 1352(c)(1)-(2)(A), any person who makes a prohibited expenditure or fails to file or amend a required certification or disclosure form shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such expenditure or failure.

The prospective participant certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the prospective participant understands and agrees that the provisions of 31 U.S.C A 3801 et seq., apply to this certification and disclosure, if any.

DISCLOSURE OF LOBBYING ACTIVITIES

COMPLETE THIS FORM TO DISCLOSE LOBBYING ACTIVITIES PURSUANT TO 31 U.S.C. 1352

1. Type of Federal Action:

☐ a. contract
b. grant
c. cooperative agreement
d. loan
e. loan guarantee
f. loan insurance

2. Status of Federal Action:

☐ a. bid/offer/application
b. initial award
c. post-award

3. Report Type:

☐ a. initial
b. material change

For Material Change Only:
year _____ quarter _____
date of last report _____

4. Name and Address of Reporting Entity

☐ Prime ☐ Subawardee
Tier _____, if known

Congressional District, if known

5. If Reporting Entity in No. 4 is Subawardee, Enter Name and Address of Prime:

_____
_____

Congressional District, if known

6. Federal Department/Agency:

_____
_____

7. Federal Program Name/Description:

_____

CFDA Number, if applicable _____

8. Federal Action Number, if known:

_____
_____

9. Award Amount, if known:

10. a. Name and Address of Lobby Entity
(If individual, last name, first name, MI)

_____
_____
_____

b. Individuals Performing Services (including address if different from No. 10a)
(last name, first name, MI)

_____
_____
_____

(attach Continuation Sheet(s) if necessary)

11. Amount of Payment (check all that apply)

$_____ ☐ actual ☐ planned

12. Form of Payment (check all that apply):

☐ a. cash
☐ b. in-kind; specify: nature_____
value _____

13. Type of Payment (check all that apply)

☐ a. retainer
☐ b. one-time fee
☐ c. commission
☐ d. contingent fee
☐ e deferred
☐ f. other, specify_____

14. Brief Description of Services Performed or to be performed and Date(s) of Service, including officer(s), employee(s), or member(s) contacted, for Payment Indicated in Item 11:

_____
_____
_____

(attach Continuation Sheet(s) if necessary)

15. Continuation Sheet(s) attached: **Yes** ☐ **No** ☐

16. Information requested through this form is authorized by Title 31 U.S.C. Section 1352. This disclosure of lobbying reliance was placed by the tier above when his transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to Congress semiannually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Signature:_____

Print Name: _____

Title:_____

Telephone No.:_____ Date: _____

Authorized for Local Reproduction
Standard Form – LLL Rev. 09-12-97

Federal Use Only:

INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime Federal recipient, at the initiation or receipt of covered Federal action or a material change to previous filing pursuant to title 31 U.S.C. section 1352. The filing of a form is required for such payment or agreement to make payment to lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress an officer or employee of Congress or an employee of a Member of Congress in connection with a covered Federal action. Attach a continuation sheet for additional information if the space on the form is inadequate. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered Federal action for which lobbying activity is and/or has been secured to influence, the outcome of a covered Federal action.

2. Identify the status of the covered Federal action.

3. Identify the appropriate classification of this report. If this is a follow-up report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last, previously submitted report by this reporting entity for this covered Federal action.

4. Enter the full name, address, city, state and zip code of the reporting entity. Include Congressional District if known. Check the appropriate classification of the reporting entity that designates if it is or expects to be a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the first tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.

5. If the organization filing the report in Item 4 checks "Subawardee" then enter the full name, address, city, state and zip code of the prime Federal recipient. Include Congressional District, if known.

6. Enter the name of the Federal agency making the award or loan commitment. Include at least one organization level below agency name, if known. For example, Department of Transportation, United States Coast Guard.

7. Enter the Federal program name or description for the covered Federal action (item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans and loan commitments.

8. Enter the most appropriate Federal identifying number available for the Federal action identification in item 1 (e.g., Request for Proposal (RFP) number, Invitation for Bid (IFB) number, grant announcement number, the contract grant. or loan award number, the application/proposal control number assigned by the Federal agency). Include prefixes, e.g., "RFP-DE-90-001."

9. For a covered Federal action where there has been an award or loan commitment by the Federal agency, enter the Federal amount of the award/loan commitments for the prime entity identified in item 4 or 5.

10. (a) Enter the full name, address, city, state and zip code of the lobbying entity engaged by the reporting entity identified in item 4 to influenced the covered Federal action.
    (b) Enter the full names of the individual(s) performing services and include full address if different from 10 (a). Enter Last Name, First Name and Middle Initial (MI).

10. Enter the amount of compensation paid or reasonably expected to be paid by the reporting entity (item 4) to the lobbying entity (item 10). Indicate whether the payment has been made (actual) or will be made (planned). Check all boxes that apply. If this is a material change report, enter the cumulative amount of payment made or planned to be made.

11. Check the appropriate box(es). Check all boxes that apply. If payment is made through an in-kind contribution, specify the nature and value of the in-kind payment.

12. Check the appropriate box(es). Check all boxes that apply. If other, specify nature.

13. Provide a specific and detailed description of the services that the lobbyist has performed or will be expected to perform and the date(s) of any services rendered. Include all preparatory and related activity not just time

spent in actual contact with Federal officials. Identify the Federal officer(s) or employee(s) contacted or the officer(s) employee(s) or Member(s) of Congress that were contacted.

14. Check whether or not a continuation sheet(s) is attached.

16. The certifying official shall sign and date the form, print his/her name title and telephone number.

Public reporting burden for this collection of information is estimated to average 30 minutes per response, including time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0046), Washington, D.C. 20503. SF-LLL-Instructions Rev. 06-04-90

SF-LLL-Instructions Rev. 06-04-90

CERTIFICATION OF PREVAILING WAGE RATES AND RECORDS

By my signature hereunder, as CONTRACTOR, I certify that I am aware of the provisions of Section 1773 of the Labor Code which requires the payment of prevailing wage on public projects. Also, that the CONTRACTOR and any subcontractors under the Contractor shall comply with Section 1776, regarding wage records, and with Section 1777.5, regarding the employment and training of apprentices, of the Labor Code. It is the CONTRACTOR'S responsibility to ensure compliance by any and all subcontractors performing work under this Contract. This project includes funding by the Federal Transit Administration (FTA) and is subject to federal prevailing wage requirements established by the Davis-Bacon Act (DBA) also. The Contractor is required to pay the higher of State or Federal prevailing wages as may apply.

Contractor agrees to provide certified payrolls for it's own forces and subcontractor forces every two (2) weeks throughout the duration of the project. Contractor will provide a Statement of Non-Performance Payroll Form for all periods when no labor is provided.

The information below applies to the above sections.

_____
BIDDER'S SIGNATURE

Name of Bidder _____

Signed by (printed) _____

Title _____

Dated _____

Local Agency Bidder DBE Commitment Form

NOTE: PLEASE REFER TO INSTRUCTIONS ON THE REVERSE SIDE OF THIS

AGENCY: Butte County Association of Governments LOCATION: 326 HUSS LANE, Chico CA

PROJECT DESCRIPTION: BUTTE REGIONAL TRANSIT OPERATIONS CENTER ON-SITE PLANS, Butte County, CA

TOTAL CONTRACT AMOUNT: $_____

BID DATE: _____

BIDDER'S NAME:_____

CONTRACT DBE GOAL: $_____ AND %

CONTRACT ITEM NO.	ITEM OF WORK AND DESCRIPTION OR SERVICES TO BE SUBCONTRACTED OR MATERIALS TO BE PROVIDED	DBE Cert. No. AND EXPIRATION DATE	NAME OF DBEs (Must be certified on the date bids are opened - include DBE address and phone number)	DOLLAR AMOUNT DBE

For Local Agency to Complete:

Contract Award Date: TBD

Total Claimed Participation $_____

_____%

Local Agency certifies that the DBE certification(s) has been verified and all information is complete and accurate.

Andy Newsum

_____ _____ _____

Print Name Signature Date

Local Agency Representative

(Area Code) Telephone Number: 530-879-2468

_____

Signature of Bidder

_____

Date (Area Code) Tel. No.

_____

Person to Contact (Please Type or Print)

For State/Federal Agency Review:

_____ _____ _____

Print Name Signature Date

Caltrans District Local Assistance Engineer

INSTRUCTIONS – LOCAL AGENCY BIDDER – DBE INFORMATION

SUCCESSFUL BIDDER:

The form requires specific information regarding the construction contract: Agency, Location, Project Description, Federal Aid Project Number (assigned by Federal Transit Administration Caltrans-Local Assistance), Total Contract Amount, Bid Date, Bidder's Name, and Contract Goal.

The form has a column for the Contract Item Number (or Item No's) and Item of Work and Description or Services to be Subcontracted or Materials to be provided by DBEs. The DBE should provide a certification number to the Contractor and expiration date. The DBE contractors should notify the Contractor in writing with the date of the decertification if their status should change during the course of the contract. The form has a column for the Names of DBE certified contractors to perform the work (must be certified on the date bids are opened and include DBE address and phone number). Enter DBE prime and subcontractors certification number. Prime contractors shall indicate all work to be performed by DBEs including work performed by its own forces if a DBE.

IMPORTANT: Identify **all** DBE firms participating in the project- regardless of tier. Names of the First Tier DBE Subcontractors and their respective item(s) of work listed should be consistent, where applicable, with the names and items of work in the "List of Subcontractors" submitted with your bid.

There is a column for the total DBE dollar amount. Enter the Total Claimed DBE Participation dollars and percentage amount of items of work submitted with your bid pursuant to the Special Provisions. (If 100% of item is not to be performed or furnished by the DBE, describe exact portion of time to be performed or furnished by the DBE.) See Section "Disadvantaged Business Enterprise (DBE)," of the Special Provisions (construction contracts); to determine how to count the participation of DBE firms.

must be signed and dated by the successful bidder. Also list a phone number in the space provided and print the name of the person to contact.

Local agencies should complete the Contract Award Date, Federal Share, Contract and Project Number fields, and verify that all information is complete and accurate before signing and sending a copy of the form to the Federal or State Agency within 15 days of contract execution. Failure to submit a completed and accurate form within the 15-day time period may result in the de-obligation of funds on this project.

DBE INFORMATION—GOOD FAITH EFFORTS
(First, Second and Third Low Bidder)

Federal-aid Project No. CA-0040089 Bid Opening Date _____

The Butte County Association of Governments established an Disadvantaged Business Enterprise (DBE) goal of **7.0%** for this project. The information provided herein shows that a good faith effort was made.

Lowest, second lowest and third lowest bidders shall submit the following information to document adequate good faith efforts. Bidders should submit the following information even if the "Local Agency Bidder – DBE Commitment" form indicates that the bidder has met the DBE goal. This will protect the bidder's eligibility for award of the contract if the administering agency determines that the bidder failed to meet the goal for various reasons, e.g., a DBE firm was not certified at bid opening, or the bidder made a mathematical error.

Submittal of only the form may not provide sufficient documentation to demonstrate that adequate good faith efforts were made.

The following items are listed in the Section entitled "Submission of DBE Commitment" of the Special Provisions:

A. The names and dates of each publication in which a request for DBE participation for this project was placed by the bidder (please attach copies of advertisements or proofs of publication):

Publications	Dates of Advertisement

B. The names and dates of written notices sent to certified DBEs soliciting bids for this project and the dates and methods used for following up initial solicitations to determine with certainty whether the DBEs were interested (please attach copies of solicitations, telephone records, fax confirmations, etc.):

Names of UDBEs Solicited	Date of Initial Solicitation	Follow Up Methods and Dates

_____

_____

_____

_____

_____

C. The items of work which the bidder made available to DBE firms, including, where appropriate, any breaking down of the contract work items (including those items normally performed by the bidder with its own forces) into economically feasible units to facilitate DBE participation. It is the bidder's responsibility to demonstrate that sufficient work to facilitate DBE participation was made available to DBE firms.

Items of Work	Bidder Normally Performs Item (Y/N)	Breakdown of Items	Amount ($)	Percentage Of Contract

D. The names, addresses and phone numbers of rejected DBE firms, the reasons for the bidder's rejection of the DBEs, the firms selected for that work (please attach copies of quotes from the firms involved), and the price difference for each DBE if the selected firm is not a DBE:

Names, addresses and phone numbers of rejected DBEs and the reasons for the bidder's rejection of the DBEs:

_____

_____

_____

_____

Names, addresses and phone numbers of firms selected for the work above:

_____

_____

_____

_____

E. Efforts made to assist interested DBEs in obtaining bonding, lines of credit or insurance, and any technical assistance or information related to the plans, specifications and requirements for the work which was provided to DBEs:

_____
_____
_____
_____

F. Efforts made to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services, excluding supplies and equipment the DBE subcontractor purchases or leases from the prime contractor or its affiliate:

_____
_____
_____
_____

G. The names of agencies, organizations or groups contacted to provide assistance in contacting, recruiting and using DBE firms (please attach copies of requests to agencies and any responses received, i.e., lists, Internet page download, etc.):

Name of Agency/Organization	Method/Date of Contact	Results

H. Any additional data to support a demonstration of good faith efforts (use additional sheets if necessary):

_____
_____
_____
_____

NOTE: USE ADDITIONAL SHEETS OF PAPER IF NECESSARY.

END OF SECTION

00 45 53 - BASE BID BREAKDOWN

The **Three Lowest Bidders** announced at the bid opening shall deliver to the Butte County Association of Governments, c/o the Construction Manager, the form below **within two (2) working days after the bid opening date.** Bid Breakdowns received late may be cause for disqualification of Bidders as non-responsive. Each line shall be filled in completely. Leaving blank lines or combining lines may be considered non-responsive.

The undersigned, doing business under the firm name of: _____
having submitted a Bid in accordance with the Invitation to Bid and Instructions to Bidders in the following amount;

Lump Sum Base Bid: ($_____) _____Dollars

is herewith providing the required Base Bid Breakdown as follows:

Item	Portion of Work to be Performed	Subcontractor Or Bidder	Dollar Value of Portion of Work to be Performed
1	Existing Conditions		
2	Concrete Forming		
3	Concrete Reinforcing		
4	Cast-In-Place Concrete		
5	Polished Concrete Finishing		
6	Concrete Unit Masonry Assemblies (CMU)		
7	Structural Steel Framing		
8	Steel Joist Framing		
9	Steel Deck		
10	Cold Formed Metal Framing		
11	Metal Fabrications		
12	Metal Floor Plate Stairs		
13	Pipe and Tube Railings		
14	Decorative Formed Metal (Sunshades)		
15	Rough Carpentry		
16	Sheathing		
17	Exterior Finish Carpentry		
18	Interior Architectural Woodwork		
19	Plam Architectural Cabinets		
20	Plastic Paneling		
21	Self-adhering sheet Waterproofing		
22	Water Repellants		
23	Thermal Insulation		
24	Foamed-in-place Insulation		
25	Weather Barriers		
26	Below-Grade Vapor Retarder		
27	Asphalt Shingles		
28	Formed Metal Wall Panels		
29	Insulated Metal Wall Panels		
30	Sheet Metal Flashing and Trim		
31	Roof Accessories		
32	Joint Sealants		

33	Hollow Metal Doors and Frames		
34	Flush Wood Doors		
35	FRP Doors and Aluminum Frames		
36	Access Doors and Frames		
37	Overhead Coiling Grilles		
38	Sectional Doors		
39	Aluminum Framed Entrances and Storefronts		
40	Service Windows		
41	Door Hardware		
42	Glazing		
43	Fixed Louvers		
44	Non-Structural Metal Framing		
45	Gypsum Board		
46	Tiling		
47	Acoustic Panel Ceilings		
48	Water Vapor Control for Flooring		
49	Resilient Base and Accessories		
50	Static control Resilient Flooring		
51	Tile Carpeting		
52	Painting		
53	High Performance Coatings		
54	Visual Display Units		
55	Dimensional Letter Signage		
56	Panel Signage		
57	Toilet Compartments		
58	Cubicle Curtains and Track		
59	Wall and Door Protection		
60	Toilet, Bath and Laundry Accessories		
61	Emergency Key Cabinets		
62	Fire Protection Cabinets		
63	Fire Extinguishers		
64	Metal Lockers		
65	Storage Equipment		
66	Metal Storage Shelving		
67	Vehicle Service Equipment		
68	Vehicle Wash Equipment		
69	Vehicle Shop Equipment		
70	Vacuum Equipment		
71	Residential Appliances		
72	Audio-Visual Equipment		
73	Material Handling		
74	Roller Window Shades		
75	Metal Countertops		
76	Plastic-Laminate-Clad Countertops		
77	Solid Surfacing Countertops		
78	Entrance Floor Mats and Frames		
79	Entrance Floor Grilles		
80	Site Furnishings		
81	Vehicle Lifts		
82	Fire Suppression		
83	Plumbing Systems Complete		

84	HVAC Systems – Dry Side		
85	HVAC Systems – Wet Side		
86	HVAC Instrumentation and Controls		
87	Facility Fueling Systems Complete		
88	Electrical System Complete		
89	Low Voltage System Complete		
90	Transfer Switch		
91	Communications Systems Complete		
92	Access Control System Complete		
93	Fire Detection & Alarm System Complete		
94	Earthwork		
95	Shoring and Trench Safety		
96	Site Clearing and Grubbing		
97	Trench Excavation and Backfill		
98	Dewatering		
99	Tire Derived Aggregate (TDA) bio-swale		
100	Erosion Control & SWPPP		
101	Lime Soil Stabilization		
102	HMA Paving		
103	Rigid Concrete Paving and C&G		
104	Decorative Concrete Paving		
105	Decorative Fences and Gates and Chain Link		
106	Painted Pavement Markings (no spec)		
107	Planting Irrigation		
108	Soil Prep		
109	Landscape Installation and Maintenance		
110	Water Utilities& Disinfection		
111	Sanitary Sewer Utilities		
112	Flow Bypass Systems		
113	Storm Drainage Utilities		
114	Hoists & Cranes		
115	Fabricated Equipment		
116	Other		
117	Other		
118	Other		
119	Other		
120	Other		
121	Other		
122	Other		
123	General Conditions		
124	General Requirements		
125	Bonds/Insurance		
126	Fee/Overhead & Profit		
127	**LUMP SUM BASE BID:**		
	Alt No. 1 – Add Standby Engine Generator		
	Alt No. 2 – Add planting and irrigation in lieu of hydroseeding		

END OF SECTION

00 49 00 - EXECUTION OF CONTRACT

1.0 EXECUTION OF AGREEMENT AND BONDS

The Apparent Low Bidder must execute and submit the following documents after bids have been opened and duly inspected. The Apparent Low Bidder's failure to properly and timely submit these documents entitles Owner to reject the bid as non-responsive.

a. Submit the following documents by 5 pm of the tenth (10th) calendar day following NOTICE OF AWARD. Award of contract depends upon approval of these documents:

i. Section 00 52 13, **AGREEMENT**: After Notice of Award, the Owner will mail to the Contractor five (5) copies of the Agreement, bond and insurance forms. Within ten (10) calendar days after receiving the forms, the Contractor must execute and return them to:

BCAG, Butte Regional Transit Operations Center project
c/o Andy Newsum, BCAG
2580 Sierra Sunrise Terrace, Suite 100
Chico, California 94928

ii. Section 00 61 13, **CONSTRUCTION PERFORMANCE BOND**: To be executed by successful Bidder and surety in the sum not less than one hundred percent (100%) of amount of contract.

iii. Section 00 61 16, **CONSTRUCTION LABOR AND MATERIAL PAYMENT BOND**: To be executed by successful Bidder and surety in the sum not less than one hundred percent (100%) of amount of contract.

iv. Insurance Certificates and Endorsements required by Section 00 73 16, **INSURANCE REQUIREMENTS**.

b. All five (5) copies of the Agreement and bonds must be signed by the Contractor. If the Contractor is a corporation, the contract and bonds must be signed by the corporate officers authorized to do so and the corporate seal must be affixed to each document.

c. Corporate sureties on bonds accompanying Bids must be executed by a surety company legally authorized to do business in the State of California, and its corporate seal shall be affixed to each document, together with notary acknowledgment of the execution of the bonds by the surety's representative. If the contract price is more than $100,000.00, the surety company must furnish the Owner a certified copy of the authorization of its agent to execute the bonds. If the bonds are executed outside the State of California, all copies must be countersigned by a California representative of the surety. Sureties must be satisfactory to the Owner. Contractor shall provide a certificate confirming that the corporate sureties' insurers are admitted surety insurers in the State of California. Upon request of the Owner, Contractor shall provide (1) a certified copy of the unrevoked appointment, power of attorney, bylaws, or other instrument entitling or authorizing the person who executed the bond to do so; (2) a certified copy of the certificate of authority of the surety insurer issued by the California State Insurance Commissioner; and/or (5) copies of the surety insurer's most recent annual statement and quarterly statement filed with the California Department of Insurance.

d. After the contract is executed on behalf of the Owner, one copy will be returned to the Contractor for its files.

e. Upon receipt of the Notice of Award, the contractor and each of its subcontractors who employs workers in any apprenticeable craft or trade shall apply to the joint apprenticeship committee administering the apprenticeship standards of the craft or trade for a certificate approving the contractor or subcontractor under the apprenticeship standards for the employment and training of apprentices, in accordance with section 1777.5 of the California Labor Code.

f. Owner shall have the right to directly contact the performance bond surety proposed by the Apparent Low Bidder to confirm the performance bond.

2.0 **RELEASE OF BONDS**

a. Faithful performance bond shall remain in effect for 365 days after the Notice of Completion is filed by the Owner. The bond will remain in effect as a guarantee to repair or replace any defective workmanship or materials for the one-year guaranty period. The Owner may release the Faithful Performance Bond upon receipt of a separate Maintenance Bond.

b. Labor and material payment bond shall remain in effect until the Notice of Completion is filed by the Owner and any stop notices received by the Owner have been released.

3.0 **INSURANCE**

a. After award of the contract, the Contractor shall promptly obtain the insurance certificates required by Section 00 73 16 (Insurance) and shall submit them to the Owner as specified.

b. Insurance requirements must be met within the same ten (10) calendar day period allowed for execution of the contract and bonds.

4.0 **NOTICE TO PROCEED**

The Notice to Proceed will not be issued until the contract is properly executed, good and approved bonds are furnished, and all insurance requirements have been met and the certificates have been approved by the Owner.

END OF SECTION

00 51 00 - NOTICE OF AWARD

Dated _____

TO: _____

ADDRESS: _____

CONTRACT NO.: _____

CONTRACT FOR:

BCAG, Butte Regional Transit Operations Center Project

The Contract Sum of your contract will be _____

_____ Dollars ($_____).

1. Five (5) copies of each of the proposed Contract Documents (except Specifications and Drawings) accompany this Notice of Award. Five sets of Specifications and Drawings will be delivered separately or otherwise made available to you immediately. Additional copies are available for purchase from the BCAG copy service; ARC Document Solutions, 801 Broadway, Sacramento, CA 95818. Phone: 916-443-1322. Fax: 916-442-5305. E-mail: sac.planwell@e-arc.com, Inquire with Plan-well Department or order direct via the internet; http://www.e-arc.com/ca/sacramento .

2. You must comply with the following conditions by 5:00 p.m. 10 days following the issuance date of this Notice of Award

    a. Deliver to the BCAG five fully executed counterparts of Section 00 52 13 (Agreement). Each of the Contract Documents must bear your signature on the cover page.
    b. Deliver to the BCAG five original Section 00 61 13 (Construction Performance Bond), executed by you and your surety.
    c. Deliver to the BCAG five original Section 00 61 16 (Construction Labor and Material Payment Bond), executed by you and your surety.
    d. Deliver to the BCAG five original set of the insurance certificates with endorsements required under Section 00 72 13 (General Conditions).
    e. Deliver to the BCAG five original copies of Section 00 65 36 (Guaranty), each executed by you.

3. Failure to comply with these conditions within the time specified will entitle the BCAG to consider your Bid abandoned, to annul this Notice of Award, and to declare your Bid security forfeited.

4. Within 10 Days after you comply with the conditions in paragraph 2 of this Section 00 51 00, the BCAG will return to you one fully signed counterpart of Section 00 52 13 (Agreement) with the Contract Documents.

5. Bidders are hereby notified that provisions of the Labor Code of the State of California and the Federal Transit Administration Davis-Bacon Act, regarding the prevailing wages shall be applicable to the work to be performed under this contract. Pursuant to Labor Code Section 1773, the general prevailing wage rates have been determined by the Director of the California Department of Industrial Relations and appear in the California Prevailing Wage Rates. The bidder may contact the Director of the Department of Industrial Relations; phone number (415) 703-4774, to obtain a

schedule of the general prevailing wages applicable to the locations and work to be done. Contractor shall post the applicable prevailing wage rates at the site. The contractor and the contractor's subcontractors are responsible for compliance with the requirements of Section 1777.5 and 1777.6 of the Labor Code of the State of California regarding employment of apprentices.

Upon commencement of the Work, you and each of your Subcontractors shall provide certified payroll reports including Statements of Non-Performance every two (2) weeks, and make available for inspection payroll records on forms provided by the Division of Labor Standards Enforcement, in accordance with Section 1776 of the California Labor Code and/or the Federal Transit Administration as may be required to comply with.

6. Return all of the required above listed items to the BCAG, c/o Andy Newsum, Deputy Director, 2580 Sierra Sunrise Terrace, Suite 100, Chico, CA 94928.

BCAG, Butte Regional Transit Operations Center project

BY: _____

END OF SECTION

00 52 13 - AGREEMENT

AGREEMENT

THIS AGREEMENT is entered into as of the _____ day of _____, by and between the Butte County Association of Governments, a municipal corporation, County of Butte, State of California, hereinafter called "BCAG" and

_____

_____

_____

_____

hereinafter called the "Contractor."

1. WORK. For and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by BCAG and under the conditions expressed in the two bonds bearing even date with these presents, and hereunto annexed, the Contractor agrees with BCAG at the Contractor's own proper cost and expense to do all the work and furnish all the materials, except such as are mentioned in the specifications to be furnished by BCAG, necessary to construct and complete in a good, workmanlike, and substantial manner, and to the satisfaction of Butte County Association of Governments, the work described in the Contract Documents, including the Project Plans and Project Manual (where the Project Manual is defined as Specifications Sections (Divisions 0 thru 45)), including any appendix and addenda thereto, and also in accordance with the Labor Surcharge and Equipment Rental Rates in effect on the date the work is accomplished, and the General Prevailing Wage Rates referenced in the Project Manual. The Project Plans, Project Manual, Labor Surcharge and Equipment Rental Rates, and General Prevailing Wage Rates are hereby specially referred to and by such reference made a part hereof.

The Project Manual is entitled:

_____Butte Regional Transit Operations Center_____

_____326 Huss Lane, Chico CA 95928_____

_____

The Project Plans are entitled:

_____Butte Regional Transit Operations Center, Sheets T0 thru QS5.1

_____326 Huss Lane, Chico CA 95928_____

_____

2. TERMS AND CONDITIONS. BCAG hereby promises and agrees with the Contractor to employ, and does hereby employ, the Contractor to provide the materials and to do the work according to the terms and conditions herein contained and referred to, for the prices set forth in the Contractor's proposal dated _____, and hereby contracts to pay the same at the time, in the manner, and upon the conditions herein set forth; and the said parties for themselves, their heirs, executors, administrators, successors, and assigns do hereby agree to the full performance of the covenants herein contained.

3. WAGES. The statement of prevailing wages appearing in the General Prevailing Wage Rates is hereby specifically referred to and by this reference is made a part of this contract. It is further expressly agreed by and between the parties hereto that should there be any conflict between the terms of this instrument and the bid or proposal of said Contractor, then this instrument shall control and nothing herein shall be considered as an acceptance of the said terms of said proposal conflicting herewith. Notwithstanding anything to the contrary stated herein or in any of the writings specified in paragraph 1, above, the work covered by this agreement is a "public work" as defined in chapter 1, Part 7 of Division 2 of the California Labor Code.

4. WORKERS COMPENSATION. By my signature hereunder, as Contractor, I certify that I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for Workers Compensation or to undertake self insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract.

5. PRICES. The Contractor agrees to receive and accept the prices set forth in the Contractor's Bid Form 00 41 13 dated _____, as full compensation for furnishing all materials and for doing all the work contemplated and embraced in this agreement; also for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements, or from any difficulties or obstructions which may arise or be encountered in the prosecution of the work until its acceptance by the Butte County Association of Governments, and for all risks of every description connected with the work; also, for all expenses incurred by or in consequence of the suspension or discontinuance of work and for well and faithfully completing the work, and the whole thereof, in the manner and according to the plans and specifications, and the requirements of the Butte County Association of Governments.

6. ATTORNEY'S FEES. California Civil Code Section 1717 permits the parties to a contract to determine if attorney's fees shall be recoverable in any dispute, conflict, or controversy between the parties arising out of the terms of the agreement or either party's performance or alleged failure to perform or keep any term, covenant, or condition of the agreement. The parties expressly decline to include an attorney's fees clause in this contract. Notwithstanding anything to the contrary stated in this Agreement or stated in those documents incorporated by reference into section 1 of this Agreement (hereinafter referred to as "contract documents"), Labor and Materials Bonds, Performance Bonds, Bid Bonds, and Guaranty, neither party to this Agreement shall be entitled to recover attorney's fees as a prevailing party under: 1) California Civil Code Section 1717; 2) any other provision of the law that permits parties to determine when attorney fees may be recovered; and/or 3) any other provision of the contract documents pertinent to the work to be performed under this Agreement in any claim, suit, action, or other formal or informal proceeding arising out of, or connected with, this Agreement, this Project or Contractor's performance hereunder. Notwithstanding the foregoing, nothing herein stated shall modify or affect the indemnification provisions (or the right to recover attorney's fees in enforcing said indemnification provisions) of the special provisions or other provisions of the contract documents, pertinent to the work to be performed under this Agreement, nor shall any of the provisions of this section apply to any action that seeks to enforce any provision of the Bid Bond(s), Performance Bond(s), Labor and Materials Bond(s), or any other bond(s), guarantee, or

instrument of credit issued in favor of BCAG to assure or pay for Contractor's performance under this Agreement. Should any action be filed that seeks to enforce: 1) any provision of the above-referenced bonds, guarantee, or instrument of credit; and 2) any provision of this Agreement, the contract documents and/or special or other provisions incorporated into this Agreement (with the exception of indemnification provisions described in this section), a prevailing party shall only be entitled to recover those attorney's fees that were expended to enforce the provisions of the documents specified in sub-paragraph 1) referenced hereinabove (i.e., bonds, guarantee, or instrument of credit) and not the provisions of the documents specified in sub-paragraph 2) referenced hereinabove.

IN WITNESS WHEREOF, the said BCAG has, by order of its Director, caused these presents to be subscribed by the BCAG and the seal of said County to be affixed and attested by the County Clerk, and the said Contractor has subscribed his name hereto the day and year first above written.

Butte County Association of Governments

_____
Director

Approved as to form:

_____ _____
BCAG Attorney Date

ATTEST:

_____
County Clerk

CONTRACTOR

By _____

Licensed in accordance with an act providing for the registration of contractors:

License No. _____

Federal Employer Identification No. _____

END OF SECTION

00 55 00 - NOTICE TO PROCEED

Dated: _____, 2014

To: _____
(Contractor)

Address: _____

_____

CONTRACT FOR:

BCAG, Butte Regional Transit Operations Center project

You are notified that the Contract Time under the above Contract will commence to start on _____ 20____.

Contractor shall immediately apply for necessary approvals and permits, prepare required documents and submittals, and mobilize personnel and equipment to commence construction of the BCAG Butte Regional Transit Operations Center project within 10 calendar days from the date when this Notice to Proceed is issued. The BCAG reserves the right to modify or alter the Commencement Date of the Work.

Contractor shall achieve all intermediate milestone dates and allow for occupancy of the Admin/Ops, Maintenance Buildings and Bus Yard no later than **518** Calendar Days, and Final Completion of the BCAG Butte Regional Transit Operations Center project portion within **665** calendar days from the date when the Contract Time commences to run as provided in Section 00 31 13 (Preliminary Construction Schedule) and 00 72 13 (General Conditions). Contractor shall achieve Final Completion of the entire Work and be ready for Final Payment Application in accordance with Section 01 77 00 (Contract Closeout) within **21** calendar days from the date of acceptance of Substantial Completion of the entire Building Construction work as provided in Section 00 31 13 (Preliminary Construction Schedule) and Section 007213 (General Conditions).

Before you may start any Work at the Site, you must:

1. Provide all documents required at Section 00 51 00 (Notice of Award).

2. Fully execute and return Agreement Section 00 52 13 including all required documents.

3. Submit certified Safety Program and related information, and comply with all requests of/by, the Owner.

4. Submit copies of applicable permits and/or approvals, including but not limited to:
    - Contractor to submit to and receive approval from the City of Chico, a Grading and Hauling Plan prior to commencement of work.
    - Contractor to submit to and receive approval from the City of Chico, a Traffic Management Plan.

- All necessary “General Approval & Permits” Requirements, including but not limited to: City of Chico Business License, Chico Fire District, Butte Sanitary District, and California Water District.

5. Submit approved fire protection plan, as required.

6. Attend preconstruction conference. The preconstruction conference shall be arranged by the BCAG Representative.

Butte County Association of Governments

By: _____

Milestone Date Requirements

Milestone No.	Description	Calendar Day Duration	Date Required **
1	Project Start date	Notice To Proceed (NTP) date	
2	Admin/Op’s/Maint Bldg MDF/IDF	458 CD’s from NTP date	
3	Admin/Op’s/Maint Bldg. COO	518 CD’s from NTP date	
4	Start Existing Bldg. Phase 2	547 CD’s from NTP date	
5	Finish Existing Bldg Phase 2	644 CD’s from NTP date	
6	Substantial Completion date	644 CD’s from NTP date	
7	Final Completion date	665 CD’s from NTP date	

****** Actual Date Required will be determined and completed at the time the NTP is issued.

END OF SECTION

00 61 13 - CONSTRUCTION PERFORMANCE BOND

(***INFORMATION ONLY, NOT TO BE COMPLETED WITH BID, TO ACCOMPANY CONTRACT)***

BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

SAMPLE PERFORMANCE BOND

Bond No. _____

WHEREAS, the Butte County Association of Governments, acting by and through its Executive Director, has awarded to Contractor _____, hereafter designated as the "Contractor", a contract for the work described as follows:

Onsite Plans for Butte Regional Transit Operations Center

AND WHEREAS, the Contractor is required to furnish a bond in connection with said contract, guaranteeing the faithful performance thereof:

NOW, THEREFORE, we the undersigned Contractor and Surety are held firmly bound to the Butte County Association of Governments in the sum of $ _____ dollars ($ _____), to be paid to said Butte County Association of Governments or its certain attorney, its successors and assigns: for which payment, well and truly to be made, we bind ourselves, our heirs, executors and administrators, successors or assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH,

That if the above bound Contractor, its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and agreements in the foregoing contract and any alteration thereof made as therein provided, on his or their part to be kept and performed at the time and in the manner therein specified, and in all respects according to their intent and meaning, and shall indemnify and save harmless the Butte County Association of Governments, its officers and agents, as therein stipulated, then this obligation shall become and be null and void; otherwise it shall be and remain in full force and virtue.

As a part of the obligation secured hereby and in addition to the face amount specified therefore, there shall be included costs and reasonable expenses and fees, including reasonable attorney's fees, incurred by ~~City~~ Owner in successfully enforcing such obligation, all to be taxed as costs and included in any judgment rendered.

The surety hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the agreement or to the work to be performed thereunder or the specifications accompanying the same shall in anywise affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the agreement or to the work or to the specifications.

IN WITNESS WHEREOF, We have hereunto set our hands and seals on this _____ day of _____, 20___.

Correspondence or claims relating to this bond should be sent to the surety at the following address:

_____

_____

_____

_____

_____

_____

Contractor

_____

Name of Surety **(SEAL)**

_____

By : Attorney-in-Fact

NOTE: Signatures of those executing for the surety must be properly acknowledged.

CERTIFICATE OF ACKNOWLEDGEMENT

State of California, City / County of _____ SS, On this _____ day of _____ in the year 2014 before me _____, a notary public in and for the City / County of _____, personally appeared _____, known to me to be the person whose name is subscribed to this
Attorney-in-fact
instrument and known to me to be the attorney-in-fact of _____ and acknowledged to me that he/she subscribed the name of the said company thereto as surety, and his/her own name as attorney-in-fact.

_____

(SEAL) **Notary Public**

END OF SECTION

00 61 16 - CONSTRUCTION LABOR AND MATERIAL PAYMENT BOND

(*INFORMATION ONLY, NOT TO BE COMPLETED WITH BID, TO ACCOMPANY CONTRACT)*

BUTTE COUNTY ASSOCIATION OF GOVERNMENTS
SAMPLE PAYMENT BOND
(Section 3247, Civil Code)

WHEREAS, The Butte County Association of Governments acting by and through its Executive Director, hereafter referred to as "Obligee", has awarded to Contractor _____, hereafter designated as the "Principal", a contract for the work described as follows:

Onsite Plans for Butte Regional Transit Operations Center

AND WHEREAS, said Principal is required to furnish a bond in connection with said contract, to secure the payment of claims of laborers, mechanics, materialmen and other persons as provided by law.

NOW, THEREFORE, we the undersigned Principal and Surety are bound unto the Obligee in the sum of _____ dollars ($ _____), for which payment, we bind ourselves, jointly and severally.

THE CONDITION OF THIS OBLIGATION IS SUCH,

That if said Principal or its subcontractors shall fail to pay any of the persons named in Civil Code Section 3181, or amounts due under the Unemployment Insurance Code with respect to work or labor performed by such claimant, or any amounts required to be deducted, withheld, and paid over to the Franchise Tax Board for the wages of employees of the Principal and his subcontractors pursuant to Section 18806 of the Revenue and Taxation Code, with respect to such work and labor, that the surety herein will pay for the same in an amount not exceeding the sum specified in this bond, otherwise the above obligation shall be void. In case suit is brought upon this bond, the surety will pay a reasonable attorney's fee fixed by the court.

This bond shall inure to the benefit of any of the persons named in Civil Code Section 3181 as to give a right of action to such persons or their assigns in any suit brought upon this bond.

Dated: _____, 20 ____

Correspondence or claims relating to this bond should be sent to the surety at the following address:

_____
_____
_____

_____
_____
_____

_____
Principal

_____
Surety **(SEAL)**

_____
By : Attorney-in-Fact

NOTE: Signatures of those executing for the surety must be properly acknowledged.

CERTIFICATE OF ACKNOWLEDGEMENT

State of California
City / County of _____ SS

On this _____ day of _____ in the year 20_____, before me _____,
personally appeared _____, personally known to me (or proved to me
Attorney-in-fact
on the basis of satisfactory evidence) to be the person whose name is subscribed to this instrument as the attorney-in-fact of _____ and acknowledged to me that he/she subscribed the name of the said company thereto as surety, and his/her own name as attorney-in-fact.

(SEAL)

_____
Notary Public

-END OF SECTION-

00 65 19 - AGREEMENT AND RELEASE OF ANY AND ALL CLAIMS

THIS AGREEMENT AND RELEASE OF ANY AND ALL CLAIMS ("Agreement and Release"), made and entered into this _____ day of _____, 201_, by and between the Butte County Association of Governments (BCAG), and _____("Contractor"), whose place of business is at:
_____.

RECITALS

A. Butte County Association of Governments and Contractor entered into Contract (the "Contract").

B. The Work under the Contract has been completed.

Now, therefore, it is mutually agreed between Butte County Association of Governments and Contractor as follows:

AGREEMENT

1. Contractor will not be assessed liquidated damages except as detailed below:

Original Contract Sum	$ _____
Modified Contract Sum	$ _____
Payment to Date	$ _____
Liquidated Damages	$ _____
Payment Due Contractor	$ _____

2. Subject to the provisions of this Agreement and Release, Butte County Association of Governments will forthwith pay to Contractor the sum of $_____ Dollars and _____ Cents ($_____) under the Contract, less any amounts withheld under the Contract or represented by any Notice to Withhold Funds on file with City of Chico as of the date of such payment.

3. Contractor acknowledges and hereby agrees that there are no unresolved or outstanding claims in dispute against Butte County Association of Governments arising from the Contract, except for the claims described in paragraph 4 of this Section 00 65 19. It is the intention of the parties in executing this Agreement and Release that this Agreement and Release shall be effective as a full, final and general release of all claims, demands, actions, causes of action, obligations, costs, expenses, damages, losses and liabilities of Contractor against Butte County Association of Governments, and all if its agents, employees, consultants (including without limitation Consulting Engineers), inspectors, representatives, assignees and transferees except for the Disputed Claims set forth in paragraph 4 of this Section 00 65 19. Nothing in this Agreement and Release shall limit or modify Contractor's continuing obligations described in paragraph 6 of this Section 00 65 19.

4. The following claims are disputed (hereinafter, the "Disputed Claims") and are specifically excluded from the operation of this Agreement and Release:

Claim No.	Date Submitted	Description of Claim	Amount of Claim

5. Consistent with California Public Contract Code Section 7100, Contractor hereby agrees that, in consideration of the payment set forth in paragraph 2 of this Section 00 65 19, Contractor hereby releases and forever discharges Butte County Association of Governments, and all of its agents, employees, consultants, inspectors, assignees and transferees from any and all liability, claims, demands, actions or causes of action of whatever kind or nature arising out of or in any way concerned with the Work under the Contract.

6. Guarantees and warranties for the Work, and any other continuing obligation of Contractor, shall remain in full force and effect as specified in the Contract Documents.

7. Contractor shall immediately defend, indemnify and hold harmless the Butte County Association of Governments, any of its Representatives, Architects/Engineers, and all of their agents, employees, consultants, inspectors, assignees and transferees, from any and all claims, demands, actions, causes of action, obligations, costs, expenses, damages, losses and liabilities that may be asserted against them by any of Contractor's suppliers and/or Subcontractors of any tier and/or any suppliers to them for any and all labor, materials, supplies and equipment used, or contemplated to be used in the performance of the Contract, except for the Disputed Claims set forth in paragraph 4 of this Section 00 65 19.

8. Contractor hereby waives the provisions of California Civil Code Section 1542, which provides as follows:

> A general release does not extend to claims which the creditor does not know or suspect to exist in his favor at the time of executing the release, which if known by him, must have materially affected his settlement with the debtor.

9. The provisions of this Agreement and Release are contractual in nature and not mere recitals and shall be considered independent and severable, and if any such provision or any part thereof shall be at any time held invalid in whole or in part under any federal, state, county, municipal or other law, ruling, or regulation, then such provision, or part thereof shall remain in force and effect only to the extent permitted by law, and the remaining provisions of this Agreement and Release shall also remain in full force and effect, and shall be enforceable.

10. Contractor represents and warrants that it is the true and lawful owner of all claims and other matters released pursuant to this Agreement and Release, and that it has full right, title and authority to enter into this instrument. Each party represents and warrants that it has been represented by counsel of its own choosing in connection with this Agreement and Release.

11. All rights of Butte County Association of Governments shall survive completion of the Work or termination of the Contract, and execution of this Agreement and Release.

*** * * CAUTION: THIS IS A RELEASE - READ BEFORE EXECUTING * * ***

Butte County Association of Governments

By: _____
Director

By: _____
BCAG Attorney

[CONTRACTOR]

By: _____

Name: _____

Its: _____

-END OF SECTION-

00 65 36 - GUARANTEE

To the BUTTE COUNTY ASSOCIATION OF GOVERNMENTS for construction of

BUTTE REGIONAL TRANSIT OPERATIONS CENTER PROJECT

The undersigned guarantees all construction performed on this Project and also guarantees all material and equipment incorporated therein.

Contractor hereby grants to the BCAG for a period of one year following the date of Notice of Completion, or such longer period specified in the Contract Documents, its unconditional warranty of the quality and adequacy of all of the Work including, without limitation, all labor, materials and equipment provided by Contractor and its Subcontractors of all tiers in connection with the Work.

Neither final payment nor use or occupancy of the Work performed by the Contractor shall constitute an acceptance of Work not done in accordance with this Guaranty or relieve Contractor of liability in respect to any express warranties or responsibilities for faulty materials or workmanship. Contractor shall remedy any defects in the Work and pay for any damage resulting therefrom, which shall appear within two (2) years, or longer if specified, from the date of Final Completion.

If within one year after the date of Final Completion, or such longer period of time as may be prescribed by laws or regulations, or by the terms of Contract Documents, any Work is found to be defective, Contractor shall promptly, without cost to the BCAG and in accordance with the BCAG written instructions, correct such defective Work. Contractor shall remove any defective Work rejected by the BCAG and replace it with Work that is not defective, and satisfactorily correct or remove and replace any damage to other Work or the work of others resulting therefrom. If Contractor fails to promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, the BCAG may have the defective Work corrected or the rejected Work removed and replaced. Contractor shall pay for all claims, costs, losses and damages caused by or resulting from such removal and replacement. Where Contractor fails to correct defective Work, or defects are discovered outside the correction period, the BCAG shall have all rights and remedies granted by law.

Inspection of the Work shall not relieve Contractor of any of its obligations under the Contract Documents. Even though equipment, materials, or Work required to be provided under the Contract Documents have been inspected, accepted, and estimated for payment, Contractor shall, at its own expense, replace or repair any such equipment, material, or Work found to be defective or otherwise not to comply with the requirements of the Contract Documents up to the end of the guaranty period.

All abbreviations and definitions of terms used in this Agreement shall have the meanings set forth in the Contract Documents, including, without means of limitation, Section 01 42 00 (References). The foregoing Guaranty is in addition to any other warranties of Contractor contained in the Contract Documents, and not in lieu of, any and all other liability imposed on Contractor under the Contract Documents and at law with respect to Contractor's duties, obligations, and performance under the Contract Documents. In the event of any conflict or inconsistency between the terms of this Guaranty and any warranty or obligation of the Contractor under the Contract Documents or at law, such inconsistency or conflict shall be resolved in favor of the higher level of obligation of the Contractor.

_____	_____
Firm/Company	Address
_____	_____
Signature	City/State/Zip
_____	_____
Name and Title	Date

END OF SECTION

00 72 13 - GENERAL CONDITIONS

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SECTION 00 70 00

GENERAL CONDITIONS

1. CONTRACT TERMS AND DEFINITIONS

1.1. Definitions

Wherever used in the Contract Documents, the following terms shall have the meanings indicated, which shall be applicable to both the singular and plural thereof:

1.1.1. Adverse Weather: Shall be only weather that satisfies all of the following conditions: (1) unusually severe precipitation, sleet, snow, hail, heat, or cold conditions in excess of the norm, (2) unanticipated, and (3) at the Project site.

1.1.2. Approval, Approved, and/or Accepted: Refer to written authorization, unless stated otherwise.

1.1.3. Architect: The individual, partnership, corporation, joint venture, or any combination thereof, named as Architect, who will have the rights and authority assigned to the Architect in the Contract Documents. The term Architect means the Owner's Architect on this Project or the Architect's authorized representative.

1.1.4. Bidder: A contractor who intends to provide a proposal to the Owner to perform the Work of this Contract.

1.1.5. Change Order: A written order to the Contractor authorizing an addition to, deletion from, or revision in the Work, and/or authorizing an adjustment in the Contract Price or Contract Time.

1.1.6. Construction Change Directive: A written order prepared and issued by the Owner, the Construction Manager, and/or the Architect and signed by the Owner, directing a change in the Work.

1.1.7. Construction Manager: The individual, partnership, corporation, joint venture, or any combination thereof, or its authorized representative, named as such by the Owner. The Owner has selected Kitchell as the Construction Manager and Owner's On-site Representative.

1.1.8. Construction Schedule: The schedule of construction of the Project as provided by Contractor and accepted by the Owner.

1.1.9. Contract, Contract Documents: The Contract consists exclusively of the documents evidencing the agreement of the Owner and Contractor, identified as the Contract Documents. The Contract Documents consist of and means all documents listed in Article 1 of the Agreement, as modified by Change Order, including but not limited to the Drawings and Specifications, including any and all addenda to any of the above documents

1.1.10. Contract Price: The total monies payable to the Contractor under the terms and conditions of the Contract Documents.

1.1.11. Contract Time: The time period stated in the section 00 55 00 (Notice to Proceed) and 00 31 13 (Construction Duration, Phasing and Milestones) for the completion of the Work.

1.1.12. Contractor: The person or persons identified in the Agreement as contracting to perform the Work to be done under this Contract, or the legal representative of such a person or persons.

1.1.13. Daily Job Report(s): Daily Project reports prepared by the Contractor's employee(s) who are present on Site, which shall include the information required herein.

1.1.14. Day(s): Unless otherwise designated, day(s) means calendar day(s).

1.1.15. Owner: The public agency for which the Work is performed, to wit The Butte County Association of Governments (BCAG). The Director of the BCAG, or its designees will act for the Owner in all matters pertaining to the Contract.

1.1.15.1. Direct the Contractor to communicate with or provide notice to the Construction Manager or the Architect on matters for which the Contract Documents indicate the Contractor will communicate with or provide notice to the Owner.

1.1.15.2. Direct the Construction Manager or the Architect to communicate with or direct the Contractor on matters for which the Contract Documents indicate the Owner will communicate with or direct the Contractor.

1.1.16. Drawings: (or “Plans”) The graphic and pictorial portions of the Contract Documents showing the design, location, scope and dimensions of the work, generally including plans, elevations, sections, details, schedules, sequence of operation, and diagrams.

1.1.17. Not Used

1.1.18. Force Account Directive: A process that may be used when the Owner and the Contractor cannot agree on a price for a specific portion of work or before the Contractor prepares a price for a specific portion of work and whereby the Contractor performs the work as indicated herein on a time and materials basis.

1.1.19. Labor Compliance Program: Owner program requiring the Contractor to provide Certified Payroll reports and other reporting forms to confirm payment of State prevailing wages as determined by the Director of the Department of Industrial Relations (“DIR”) (“Director”) and / or Federal Davis Bacon Act current wage rates. Contractor is required to provide all reporting forms required by Owner.

1.1.20. Premises: The real property owned by the Owner on which the Site is located, to wit 326 Huss Drive, Chico, CA 95928.

1.1.21. Product(s): New material, machinery, components, equipment, fixtures and systems forming the Work, including existing materials or components required and approved by the Owner for reuse.

1.1.22. Product Data: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate a material, product, or system for some portion of the Work.

1.1.23. Project: The planned undertaking as provided for in the Contract Documents.

1.1.24. Project Inspector: (or “Inspector”) The individual(s) retained by the Owner in accordance with title 24 of the California Code of Regulations to monitor and inspect the Project.

1.1.25. Program Manager: The individual, partnership, corporation, joint venture, or any combination thereof, or its authorized representative, named as such by the Owner. The owner has designated Kitchell as the Program Manager.

1.1.26. Provide: Shall include "provide complete in place," that is, "furnish and install," and "provide complete and functioning as intended in place" unless specifically stated otherwise.

1.1.27. Request for Information (RFI): A written request prepared by the Contractor requesting that the Architect provide additional information necessary to clarify or amplify an item in the Contract Documents that the Contractor believes is not clearly shown or called for in the Drawings or Specifications or other portions of the Contract Documents, or to address problems that have arisen under field conditions.

1.1.28. Request for Substitution: A request by Contractor to substitute an equal or superior material, product, thing, or service for a specific material, product, thing, or service that has been designated in the Contract Documents by a specific brand or trade name.

1.1.29. Safety Orders: Written and/or verbal orders for construction issued by the California Division of Industrial Safety ("Cal OSHA") or by the United States Occupational Safety and Health Administration ("OSHA").

1.1.30. Safety Plan: Contractor's safety plan specifically adapted for the Project. Contractor's Safety Plan shall comply with all provisions regarding Project safety, including all applicable provisions in these General Conditions.

1.1.31. Samples: Physical examples that illustrate materials, products, equipment, finishes, colors, or workmanship and that, when approved in accordance with the Contract Documents, establish standards by which portions of the Work will be judged.

1.1.32. Shop Drawings: All drawings, prints, diagrams, illustrations, brochures, schedules, and other data that are prepared by the Contractor, a subcontractor, manufacturer, supplier, or distributor, that illustrate how specific portions of the Work shall be fabricated or installed.

1.1.33. Site: The Project site as shown on the Drawings.

1.1.34. Specifications: That portion of the Contract Documents, Division 1 through Division 45, and all technical sections, and addenda to all of these, if any, consisting of written descriptions and requirements of a technical nature of materials, equipment, construction methods and systems, standards, and workmanship.

1.1.35. Subcontractor: A contractor and/or supplier who is under contract with the Contractor or with any other subcontractor, regardless of tier, to perform a portion of the Work of the Project.

1.1.36. Submittal Schedule: The schedule of submittals as provided by Contractor and approved by Owner.

1.1.37. Surety: The person, firm, or corporation that executes as surety the Contractor's Performance Bond and Payment Bond, and must be a California admitted surety insurer as defined in the Code of Civil Procedure section 995.120.

1.1.38. Work: All labor, materials, equipment, components, appliances, supervision, coordination, and services required by, or reasonably inferred from, the Contract Documents, that are necessary for the construction and completion of the Project.

1.2. Laws Concerning The Contract

Contract is subject to all provisions of the Constitution and laws of California governing, controlling, or affecting Owner, or the property, funds, operations, or powers of Owner, and such provisions are by this reference made a part hereof. Any provision required by law to be included in this Contract shall be deemed to be inserted.

1.3. No Oral Agreements

No oral agreement or conversation with any officer, agent, or employee of Owner, either before or after execution of Contract, shall affect or modify any of the terms or obligations contained in any of the documents comprising the Contract.

1.4. No Assignment

Contractor shall not assign this Contract or any part thereof including, without limitation, any services or money to become due hereunder without the prior written consent of the Owner. Assignment without Owner's prior written consent shall be null and void. Any assignment of money due or to become due under this Contract shall be subject to a prior lien for services rendered or material supplied for performance of work called for under this Contract in favor of all persons, firms, or corporations rendering services or supplying material to the extent that claims are filed pursuant to the Civil Code, Code of Civil Procedure, Government Code, Labor Code, and/or Public Contract Code, and shall also be subject to deductions for liquidated damages or withholding of payments as determined by Owner in accordance with this Contract. Contractor shall not assign or transfer in any manner to a Subcontractor or supplier the right to prosecute or maintain an action against the Owner.

1.5. Notice And Service Thereof

1.5.1. Any notice from one party to the other or otherwise under Contract shall be in writing and shall be dated and signed by the party giving notice or by a duly authorized representative of that party. Any notice shall not be effective for any purpose whatsoever unless served in one of the following manners:

1.5.1.1. If notice is given by personal delivery thereof, it shall be considered delivered on the day of delivery.

1.5.1.2. If notice is given by overnight delivery service, it shall be considered delivered on one (1) day after date deposited, as indicated by the delivery service.

1.5.1.3. If notice is given by depositing same in United States mail, enclosed in a sealed envelope, it shall be considered delivered three (3) days after date deposited, as indicated by the postmarked date.

1.5.1.4. If notice is given by registered or certified mail with postage prepaid, return receipt requested, it shall be considered delivered on the day the notice is signed for.

1.5.1.5. If notice is given via e-mail.

1.6. No Waiver

The failure of Owner in any one or more instances to insist upon strict performance of any of the terms of this Contract or to exercise any option herein conferred shall not be construed as a waiver or relinquishment to any extent of the right to assert or rely upon any such terms or option

on any future occasion. No action or failure to act by the Owner, Architect, or Construction Manager shall constitute a waiver of any right or duty afforded the Owner under the Contract, nor shall any action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

1.7. Substitutions For Specified Items

1.7.1. See Section 01 25 00 (Substitution Procedures)

1.8. Materials and Work

1.8.1. Except as otherwise specifically stated in this Contract, Contractor shall provide and pay for all materials, labor, tools, equipment, transportation, superintendence, temporary constructions of every nature, and all other services, management, and facilities of every nature whatsoever necessary to execute and complete this Contract within the Contract Time.

1.8.2. Unless otherwise specified, all materials shall be new and the best of their respective kinds and grades as noted or specified, and workmanship shall be of good quality.

1.8.3. Materials shall be furnished in ample quantities and at such times as to insure uninterrupted progress of Work and shall be stored properly and protected as required.

1.8.4. For all materials and equipment specified or indicated in the Drawings, the Contractor shall provide all labor, materials, equipment, and services necessary for complete assemblies and complete working systems, functioning as intended. Incidental items not indicated on Drawings, nor mentioned in the Specifications, that can legitimately and reasonably be inferred to belong to the Work described, or be necessary in good practice to provide a complete assembly or system, shall be furnished as though itemized here in every detail. In all instances, material and equipment shall be installed in strict accordance with each manufacturer's most recent published recommendations and specifications.

1.8.5. Contractor shall, after award of Contract by Owner and after relevant submittals have been approved, place orders for materials and/or equipment as specified so that delivery of same may be made without delays to the Work. Contractor shall, upon demand from Owner, present documentary evidence showing that orders have been placed.

1.8.6. Owner reserves the right but has no obligation, for any neglect in complying with the above instructions, to place orders for such materials and/or equipment as it may deem advisable in order that the Work may be completed at the date specified in the Agreement, and all expenses incidental to the procuring of said materials and/or equipment shall be paid for by Contractor or withheld from payment(s) to Contractor.

1.8.7. Contractor warrants good title to all material, supplies, and equipment installed or incorporated in Work and agrees upon completion of all Work to deliver the Site to Owner, together with all improvements and appurtenances constructed or placed thereon by it, and free from any claims, liens, or charges. Contractor further agrees that neither it nor any person, firm, or corporation furnishing any materials or labor for any work covered by the Contract shall have any right to lien any portion of the Premises or any improvement or appurtenance thereon, except that Contractor may install metering devices or other equipment of utility companies or of political subdivision, title to which is commonly retained by utility company or political subdivision. In the event of installation of any such metering device or equipment, Contractor shall advise Owner as to owner thereof.

1.8.8. Nothing contained in this Article, however, shall defeat or impair the rights of persons furnishing materials or labor under any bond given by Contractor for their protection or any rights under any law permitting such protection or any rights under any law permitting such persons to look to funds due Contractor in hands of Owner (e.g., Stop Notices), and this provision shall be inserted in all subcontracts and material contracts and notice of its provisions shall be given to all persons furnishing material for work when no formal contract is entered into for such material.

1.8.9. Title to new materials and/or equipment for the Work of this Contract and attendant liability for its protection and safety shall remain with Contractor until incorporated in the Work of this Contract and accepted by Owner. No part of any materials and/or equipment shall be removed from its place of storage except for immediate installation in the Work of this Contract. Contractor shall keep an accurate inventory of all materials and/or equipment in a manner satisfactory to Owner or its authorized representative and shall, at the Owner's request, forward it to the Owner.

2. OWNER

2.1. Occupancy

Owner reserves the right to occupy portions of the Project at any time before completion. Neither the Owner 's Final Acceptance, the making of Final Payment, any provision in Contract Documents, nor the use or occupancy of the Work, in whole or in part, by Owner shall constitute acceptance of Work not in accordance with the Contract Documents nor relieve the Contractor or the Contractor's Performance Bond Surety from liability with respect to any warranties or responsibility for faulty or defective Work or materials, equipment and workmanship incorporated therein.

2.2. Owner's Right to Perform Work

2.2.1. If the Contractor should neglect to prosecute the Work properly or fail to perform any provisions of this contract, the Owner, after **FORTY-EIGHT (48)** hours written notice to the Contractor, may, without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor.

2.2.2. If it is found at any time, before or after completion of the Work, that Contractor has varied from the Drawings and/or Specifications, including, but not limited to, variation in material, quality, form, or finish, or in the amount or value of the materials and labor used, Owner may require at its option:

2.2.2.1. That all such improper Work be removed, remade or replaced, and all work disturbed by these changes be made good by Contractor at no additional cost to the Owner;

2.2.2.2. That the Owner deduct from any amount due Contractor the sum of money equivalent to the difference in value between the work performed and that called for by the Drawings and Specifications; or

2.2.2.3. That the Owner exercise any other remedy it may have at law or under the Contract Documents, including but not limited to the Owner hiring its own forces or another contractor to replace the Contractor's nonconforming Work, in which case the Owner shall either issue a deductive Change Order, a Construction Change Directive, or invoice the Contractor for the cost of that work. Contractor shall pay any invoices within thirty (30) days of receipt of same or Owner may withhold those amounts from payment(s) to Contractor.

3. ARCHITECT

3.1. The Architect shall represent the Owner during the Project and will observe the progress and quality of the Work on behalf of the Owner. Architect shall have the authority to act on behalf of Owner to the extent expressly provided in the Contract Documents and to the extent determined by Owner. Architect shall have authority to reject materials, workmanship, and/or the Work whenever rejection may be necessary, in Architect's reasonable opinion, to ensure the proper execution of the Contract.

3.2. Architect shall, with the Owner and on behalf of the Owner, determine the amount, quality, acceptability, and fitness of all parts of the Work, and interpret the Specifications, Drawings, and shall, with the Owner, interpret all other Contract Documents.

3.3. Architect shall have all authority and responsibility established by law, including title 24 of the California Code of Regulations.

3.4. Contractor shall provide Owner and the Construction Manager with a copy of all written communication between Contractor and Architect at the same time as that communication is made to Architect, including, without limitation, all RFIs, correspondence, submittals, claims, and proposed change orders.

4. CONSTRUCTION MANAGER

4.1. The construction manager used on this Project ("Construction Manager" or "CM") will provide administration of the Contract on the Owner's behalf. After execution of the Contract and Notice to Proceed, all correspondence and/or instructions from Contractor and/or Owner shall be forwarded through the Construction Manager. The Construction Manager will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences, or procedures or for safety precautions in connection with the Work, which shall all remain the Contractor's responsibility.

4.2. The Construction Manager, however, will have authority to reject materials and/or workmanship not conforming to the Contract Documents, as determined by the Owner, the Architect, and/or the Project Inspector. The Construction Manager shall also have the authority to require special inspection or testing of any portion of the Work, whether it has been fabricated, installed, or fully completed. Any decision made by the Construction Manager, in good faith, shall not give rise to any duty or responsibility of the Construction Manager to the Contractor, any Subcontractor, their agents, employees, or other persons performing any of the Work. The Construction Manager shall have free access to any or all parts of Work at any time.

5. INSPECTOR, INSPECTIONS, AND TESTS

5.1. Project Inspector

5.1.1. One or more Project Inspector(s), including special Project Inspector(s), as required, will be assigned to the Work by Owner, in accordance with requirements of title 24, part 1, of the California Code of Regulations, to enforce the building code and monitor compliance with Plans and Specifications for the Project previously approved by the Butte County Association of Governments (BCAG).

5.1.2. No Work shall be carried on except with the knowledge and under the inspection of the Project Inspector(s). The Project Inspector(s) shall have free access to any or all parts of Work at any time. Contractor shall furnish Project Inspector(s) reasonable opportunities for obtaining such information as may be necessary to keep Project Inspector(s) fully informed respecting

progress and manner of work and character of materials. Inspection of Work shall not relieve Contractor from an obligation to fulfill this Contract. Project Inspector(s) and BCAG are authorized to stop work whenever the Contractor and/or its Subcontractor(s) are not complying with the Contract Documents. Any work stoppage by the Project Inspector(s) and/or BCAG shall be without liability to the Owner. Contractor shall instruct its Subcontractors and employees accordingly.

5.1.3. If Contractor and/or any Subcontractor requests that the Project Inspector(s) perform any inspection off-site, this shall only be done if it is allowable pursuant to applicable regulations and BCAG, if the Project Inspector(s) agree to do so, and at the expense of the Contractor.

5.2. Tests and Inspections

5.2.1. Tests and Inspections shall comply with title 24, part 1, California Code of Regulations, and with the provisions of the Plans and Specifications.

5.2.2. The Owner will select an independent testing laboratory to conduct the tests. Selection of the materials required to be tested shall be by the laboratory or the Owner's representative and not by the Contractor. The Contractor shall notify the Owner's representative a sufficient time in advance of its readiness for required observation or inspection.

5.2.3. The Contractor shall notify the Owner's representative a sufficient time in advance of the manufacture of material to be supplied under the Contract Documents, that must by terms of the Contract Documents be tested, in order that the Owner may arrange for the testing of same at the source of supply. This notice shall be, at a minimum, seventy-two (72) hours prior to the manufacture of the material that needs to be tested.

5.2.4. Any material shipped by the Contractor from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said representative that such testing and inspection will not be required, shall not be incorporated into and/or onto the Project.

5.2.5. The Owner will select and pay testing laboratory costs for all tests and inspections. Costs of tests of any materials found to be not in compliance with the Contract Documents shall be paid for by the Owner and reimbursed by the Contractor or deducted from the Contract Price.

5.3. Costs for After Hours and/or Off Site Inspections

If the Contractor causes delay(s) on the Project and performs Work outside the Inspector’s regular working hours or requests the Inspector to perform inspections off Site, costs of any of those inspection(s) shall be borne by the Contractor and may be at the Contractor’s expense and the Owner may deduct those expenses from the next Progress Payment.

6. CONTRACTOR

Contractor shall construct the Work for the Contract price including any adjustment(s) to the Contract Price pursuant to provisions herein regarding changes to the Contract Price. Except as otherwise noted, Contractor shall provide and pay for all labor, materials, equipment, permits, fees, licenses, facilities, transportation, taxes, and services necessary for the proper execution and completion of the Work, except as indicated herein.

6.1. Status of Contractor

6.1.1. Contractor is and shall at all times be deemed to be an independent contractor and shall be wholly responsible for the manner in which it performs the services required of it by the Contract Documents. Nothing herein contained shall be construed as creating the relationship of employer and employee, or principal and agent, between the Owner, or any of the Owner's employees or agents, and Contractor or any of Contractor's agents or employees. Contractor assumes exclusively the responsibility for the acts of its employees as they relate to the services to be provided during the course and scope of their employment. Contractor, its agents, and its employees shall not be entitled to any rights or privileges of Owner employees. Owner, Construction Manager and Architect shall be permitted to monitor the Contractor's activities to determine compliance with the terms of this Contract.

6.1.2. As required by law, Contractor and all Subcontractors shall be properly licensed and regulated by the Contractors State License Board, 3132 Bradshaw Road, Post Office Box 2600, Sacramento, California 98826, http://www.cslb.ca.gov.

6.2. Contractor's Supervision

6.2.1. During progress of the Work, Contractor shall keep on the Premises, and at all other locations where any Work related to the Contract is being performed, a competent project manager and construction superintendent who are employees of the Contractor, to whom the Owner does not object and at least one of which shall be fluent in English, written and verbal.

6.2.2. The project manager and construction superintendent shall both speak fluently the predominant language of the Contractor's employees.

6.2.3. Before commencing the Work herein, Contractor shall give written notice to the BCAG, the name of its listed personnel as referenced in 00 45 11 – Registration and Safety Experience Form. None of the listed personnel shall be changed except with prior written notice to BCAG and subsequent approval by the BCAG. If the listed personnel proves to be unsatisfactory to the BCAG, their employees, agents/consultants; the BCAG, at its sole discretion, has the right to request the removal and replacement of the General Contractor's personnel from the project. The Contractor's listed personnel shall each represent the Contractor, and all directions given to Contractor's listed personnel shall be as binding as if given to Contractor.

6.2.4. Contractor shall give efficient supervision to Work, using its best skill and attention. Contractor shall carefully study and compare all Contract Documents, Drawings, Specifications, and other instructions and shall at once report to Owner, Construction Manager, and Architect any error, inconsistency, or omission that Contractor or its employees and Subcontractors may discover, in writing, with a copy to Owner 's Project Inspector(s). The Contractor shall have responsibility for discovery of errors, inconsistencies, or omissions.

6.3. Duty to Provide Fit Workers

6.3.1. Contractor and Subcontractor(s) shall at all times enforce strict discipline and good order among their employees and shall not employ or work any unfit person or anyone not skilled in work assigned to that person. It shall be the responsibility of Contractor to ensure compliance with this requirement. Owner may require Contractor to permanently remove unfit persons from Project Site.

6.3.2. Any person in the employ of Contractor or Subcontractor(s) whom Owner may deem incompetent or unfit shall be excluded from working on the Project and shall not again be employed on the Project except with the prior written consent of Owner.

6.3.3. The Contractor shall furnish labor that can work in harmony with all other elements of labor employed or to be employed in the Work.

6.3.4. If Contractor intends to make any change in the name or legal nature of the Contractor's entity, Contractor must first notify the Owner. The Owner shall determine if Contractor's intended change is permissible while performing this Contract.

6.4. Purchase of Materials and Equipment

The Contractor is required to order, obtain, and store materials and equipment sufficiently in advance of its Work at no additional cost or advance payment from Owner to assure that there will be no delays.

6.5. Documents On Work

6.5.1. Contractor shall keep on the Work Site at all times one legible copy of all Contract Documents, including Addenda and Change Orders, and titles 19 and 24 of the California Code of Regulations, the specified edition(s) of the Uniform Building Code, all approved Drawings, Plans, Schedules, and Specifications, and all codes and documents referred to in the Specifications, and made part thereof. These documents shall be kept in good order and available to Owner, Construction Manager, Architect, Architect's representatives, the Project Inspector(s), and all authorities having jurisdiction. Contractor shall be acquainted with and comply with the provisions of these titles as they relate to this Project. (See particularly the duties of Contractor, title 24) Contractor shall also be acquainted with and comply with all California Code of Regulations provisions relating to conditions on this Project, particularly titles 8 and 17. Contractor shall coordinate with Architect and Construction Manager and shall submit its verified report(s) according to the requirements of title 24.

6.5.2. Daily Job Reports.

6.5.2.1. Contractor shall maintain, at a minimum, at least one (1) set of Daily Job Reports on the Project. These must be prepared by the Contractor's employee(s) who are present on Site, and must include, at a minimum, the following information:

6.5.2.1.1. A brief description of all Contract Work performed on that day.
6.5.2.1.2. A brief description of all Change Order Work performed that day with a list of each employee working on Change Order Work and the total hours worked on Change Order Work for each employee.
6.5.2.1.3. A summary of all other pertinent events and/or occurrences on that day.
6.5.2.1.4. The weather conditions on that day.
6.5.2.1.5. A list of all Subcontractor(s) working on that day,
6.5.2.1.6. A list of each Contractor employee working on that day and the total hours worked for each employee.
6.5.2.1.7. A complete list of all equipment on Site that day, whether in use or not.
6.5.2.1.8. A complete list of all materials, supplies, and equipment delivered on that day.
6.5.2.1.9. A complete list of all inspections and tests performed on that day.
6.5.2.1.10. Each day Contractor shall provide a copy of the previous day's Daily Job Report to the Owner or the Owner's Construction Manager by no later than 12:00 pm,

PST. Contractor shall upload all reports to the Web-Based Project Information Management System, Architrek.com

6.6. Preservation of Records

The Owner shall have the right to examine and audit all Daily Job Reports or other Project records of Contractor's project manager(s), project superintendent(s), and/or project foreperson(s), all certified payroll records and/or related documents including, without limitation, payroll, payment, timekeeping and tracking documents; all books, estimates, records, contracts, documents, bid documents, bid cost data, subcontract job cost reports, and other data of the Contractor, any Subcontractor, and/or supplier, including computations and projections related to bidding, negotiating, pricing, or performing the Work or Contract modification, in order to evaluate the accuracy, completeness, and currency of the cost, manpower, coordination, supervision, or pricing data at no additional cost to the Owner. These documents may be duplicative and/or be in addition to any Bid Documents held in escrow by the Owner. The Contractor shall make available at its office at all reasonable times the materials described in this paragraph for the examination, audit, or reproduction until three (3) years after final payment under this Contract. Notwithstanding the provisions above, Contractor shall provide any records requested by any governmental agency, if available, after the time set forth above.

6.7. Integration of Work

6.7.1. Contractor shall do all cutting, fitting, patching, and preparation of Work as required to make its several parts come together properly, to fit it to receive or be received by work of other contractors, and to coordinate tolerances to various pieces of work, showing upon, or reasonably implied by, the Drawings and Specifications for the completed structure, and shall conform them as Owner and/or Architect may direct.

6.7.2. All cost caused by defective or ill-timed Work shall be borne by Contractor, inclusive of repair work.

6.7.3. Contractor shall not endanger any work performed by it or anyone else by cutting, excavating, or otherwise altering work and shall not cut or alter work of any other contractor except with consent of Owner.

6.8. Obtaining of Permits and Licenses

Contractor shall secure and pay for all permits, licenses, encroachment permits and certificates necessary for prosecution of Work before the date of the commencement of the Work or before the permits, licenses, and certificates are legally required to continue the Work without interruption. The Contractor shall obtain and pay, only when legally required, for all licenses, permits, inspections, and inspection certificates required to be obtained from or issued by any authority having jurisdiction over any part of the Work included in the Contract. All final permits, licenses, and certificates shall be delivered to Owner before demand is made for final payment.

6.9. Work to Comply With Applicable Laws and Regulations

6.9.1. Contractor shall give all notices and comply with the following specific laws, ordinances, rules, and regulations and all other applicable laws, ordinances, rules, and regulations bearing on conduct of Work as indicated and specified, including but not limited to the appropriate statutes and administrative code sections. If Contractor observes that Drawings and Specifications are at variance therewith, or should Contractor become aware of the development of conditions not covered by Contract Documents that will result in finished Work being at variance therewith,

Contractor shall promptly notify Owner in writing and any changes deemed necessary by Owner shall be made as provided in Contract for changes in Work.

6.9.1.1. National Electrical Safety Code, U. S. Department of Commerce
6.9.1.2. National Board of Fire Underwriters' Regulations
6.9.1.3. Uniform Building Code, latest addition, and the California Code of Regulations, title 24, including amendments
6.9.1.4. Manual of Accident Prevention in Construction, latest edition, published by A.G.C. of America
6.9.1.5. Industrial Accident Commission's Safety Orders, State of California
6.9.1.6. Regulations of the Pertinent Local Fire Safety Codes
6.9.1.7. American with Disabilities Act
6.9.1.8. Government Code of the State of California
6.9.1.9. Labor Code of the State of California, division 2, part 7, Public Works and Public Agencies
6.9.1.10. Public Contract Code of the State of California
6.9.1.11. California Art Preservation Act
6.9.1.12. U. S. Copyright Act
6.9.1.13. U. S. Visual Artists Rights Act

6.9.2. Contractor shall comply will all applicable mitigation measures, if any, adopted by any public agency with respect to this Project pursuant to the California Environmental Quality Act (Public Resources Code section 21000 et. Seq.). See Section 00 73 00 Special Conditions for Mitigation Measures required by contractor.

6.9.3. If Contractor performs any Work that it knew, or through exercise of reasonable care should have known, to be contrary to any applicable laws, ordinance, rules, or regulations, Contractor shall bear all costs arising there from.

6.9.4. Where Specifications or Drawings state that materials, processes, or procedures must be approved by the BCAG, City of Chico Fire Dept., State Fire Marshall, or other body or agency, Contractor shall be responsible for satisfying requirements of such bodies or agencies.

6.10. Safety/Protection of Persons and Property

6.10.1. The Contractor will be solely and completely responsible for conditions of the Work Site, including safety of all persons and property during performance of the Work. This requirement will apply continuously and not be limited to normal working hours.

6.10.2. The wearing of hard hats will be mandatory at all times for all personnel on Site. Contractor shall supply sufficient hard hats to properly equip all employees and visitors.

6.10.3. Any construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures in, on, or near the Work Site.

6.10.4. Implementation and maintenance of safety programs shall be the sole responsibility of the Contractor.

6.10.5. The Contractor shall furnish to the Owner a copy of the Contractor's safety plan within the time frame indicated in the Contract Documents and specifically adapted for the Project.

6.10.6. Contractor shall be responsible for all damages to persons or property that occur as a result of its fault or negligence in connection with the prosecution of this Contract and shall take all necessary measures and be responsible for the proper care and completion and final

acceptance by Owner. All Work shall be solely at Contractor's risk with the exception of damage to the Work caused by "acts of God" as defined in Public Contract Code section 7105.

6.10.7. Contractor shall take, and require Subcontractors to take, all necessary precautions for safety of workers on the Project and shall comply with all applicable federal, state, local, and other safety laws, standards, orders, rules, regulations, and building codes to prevent accidents or injury to persons on, about, or adjacent to premises where work is being performed and to provide a safe and healthful place of employment. Contractor shall furnish, erect, and properly maintain at all times, all necessary safety devices, safeguards, construction canopies, signs, nets, barriers, lights, and watchmen for protection of workers and the public and shall post danger signs warning against hazards created by such features in the course of construction.

6.10.8. Hazards Control – Contractor shall store volatile wastes in covered metal containers and remove them from the Site daily. Contractor shall prevent accumulation of wastes that create hazardous conditions. Contractor shall provide adequate ventilation during use of volatile or noxious substances.

6.10.9. Contractor shall designate a responsible member of its organization on the Project, whose duty shall be to post information regarding protection and obligations of workers and other notices required under occupational safety and health laws, to comply with reporting and other occupational safety requirements, and to protect the life, safety, and health of workers. Name and position of person so designated shall be reported to Owner by Contractor.

6.10.10. Contractor shall correct any violations of safety laws, rules, orders, standards, or regulations. Upon the issuance of a citation or notice of violation by the Division of Occupational Safety and Health, Contractor shall correct such violation promptly.

6.10.11. In an emergency affecting safety of life or of work or of adjoining property, Contractor, without special instruction or authorization, shall act, at its discretion, to prevent such threatened loss or injury. Any compensation claimed by Contractor on account of emergency work shall be determined by agreement.

6.10.12. All salvage materials will become the property of the Contractor and shall be removed from the Site unless otherwise called for in the Contract Documents. However, the Owner reserves the right to designate certain items of value that shall be turned over to the Owner unless otherwise directed by Owner.

6.10.13. All connections to public utilities and/or existing on-site services shall be made and maintained in such a manner as to not interfere with the continuing use of same by the Owner during the entire progress of the Work.

6.10.14. Contractor shall provide such heat, covering, and enclosures as are necessary to protect all Work, materials, equipment, appliances, and tools against damage by weather conditions, such as extreme heat, cold, rain, snow, dry winds, flooding, or dampness.

6.10.15. The Contractor shall protect and preserve the Work from all damage or accident, providing any temporary roofs, window and door coverings, boxings, or other construction as required by the Architect. The Contractor shall be responsible for existing structures, walks, roads, trees, landscaping, and/or improvements in working areas; and shall provide adequate protection therefor. If temporary removal is necessary of any of the above items, or damage occurs due to the Work, the Contractor shall replace same at his expense with same kind, quality, and size of Work or item damaged. This shall include any adjoining property of the Owner and others.

6.10.16. Contractor shall take adequate precautions to protect existing roads, sidewalks, curbs, pavements, utilities, adjoining property, and structures (including, without limitation, protection from settlement or loss of lateral support), and to avoid damage thereto, and repair any damage thereto caused by construction operations.

6.10.17. Contractor shall confine apparatus, the storage of materials, and the operations of workers to limits indicated by law, ordinances, permits, or directions of Architect, and shall not interfere with the Work or unreasonably encumber Premises or overload any structure with materials. Contractor shall enforce all instructions of Owner and Architect regarding signs, advertising, fires, and smoking, and require that all workers comply with all regulations while on Project Site.

6.10.18. Contractor, Contractor's employees, Subcontractors, Subcontractors' employees, or any person associated with the Work shall conduct themselves in a manner appropriate for a public safety building site. No verbal or physical contact with neighbors, students, and faculty, profanity, or inappropriate attire or behavior will be permitted. Owner may require Contractor to permanently remove non-complying persons from Project Site.

6.10.19. Contractor shall take care to prevent disturbing or covering any survey markers, monuments, or other devices marking property boundaries or corners. If such markers are disturbed, Contractor shall have a civil engineer, registered as a professional engineer in California; replace them at no cost to Owner.

6.10.20. In the event that the Contractor enters into any agreement with owners of any adjacent property to enter upon the adjacent property for the purpose of performing the Work, Contractor shall fully indemnify, defend, and hold harmless each person, entity, firm, or agency that owns or has any interest in adjacent property. The form and content of the agreement of indemnification shall be approved by the Owner prior to the commencement of any Work on or about the adjacent property. The Contractor shall also indemnify the Owner as provided in the indemnification provision herein. These provisions shall be in addition to any other requirements of the owners of the adjacent property.

6.11. Working Evenings, Weekends and Holidays

Contractor may be required to work evenings and/or weekends and holidays at no additional cost to the Owner. Contractor shall give the Owner forty-eight (48) hours notice prior to performing any evening and/or weekend work. Contractor shall perform all evening and/or weekend work only upon Owner's approval and in compliance with all applicable rules, regulations, laws, and local ordinances including, without limitation, all noise and light limitations. Contractor shall reimburse the Owner for any Inspector charges necessitated by the Contractor's evening and/or weekend and holidays work.

6.12. Cleaning Up

6.12.1. The Contractor shall provide all services, labor, materials, and equipment necessary for protecting the Work, furnishings, equipment, and building structure from damage until its completion and final acceptance by Owner. Dust barriers shall be provided to isolate dust and dirt from construction operations. At completion of the Work and portions thereof, Contractor shall clean to the original state any areas beyond the Work area that become dust laden as a result of the Work. The Contractor must erect the necessary warning signs and barricades to ensure the safety of all school and park occupants. The Contractor at all times must maintain good housekeeping practices to reduce the risk of fire damage and must make a fire extinguisher, fire blanket, and/or fire watch, as applicable, available at each location where cutting, braising, soldering, and/or welding is being performed or where there is an increased risk of fire.

6.12.2. Contractor at all times shall keep Premises free from debris such as waste, rubbish, and excess materials and equipment caused by the Work. Contractor shall not leave debris under, in, or about the Premises, but shall promptly remove same from the Premises on a daily basis. If Contractor fails to clean up, Owner may do so and the cost thereof shall be charged to Contractor. If Contract is for work on an existing facility, Contractor shall also perform specific clean-up on or about the Premises upon request by the Owner as it deemed. Contractor shall comply with all related provisions of the Specifications.

6.12.3. If the Construction Manager, Architect, or Owner observes the accumulation of trash and debris, the Owner will give the Contractor a 24-hour written notice to mitigate the condition.

6.12.4. Should the Contractor fail to perform the required clean-up, or should the clean-up be deemed unsatisfactory by the Owner, the Owner will then perform the clean-up. All cost associated with the clean-up work (including all travel, payroll burden, and costs for supervision) will be deducted from the Contract Price, or Owner may withhold those amounts from payment(s) to Contractor.

7. SUBCONTRACTORS

7.1. Contractor shall provide the Owner with information for all Subcontracts as indicated in the Contractor's Submittals and Schedules Section herein.

7.2. No contractual relationship exists between the Owner and any Subcontractor, supplier, or sub-subcontractor by reason of this Contract.

7.3. Contractor agrees to bind every Subcontractor by terms of Contract as far as those terms are applicable to Subcontractor's work including, without limitation, all provisions and requirements of the Owner's Labor Compliance Program ("LCP"), if an LCP is in force on this Project. If Contractor shall subcontract any part of this Contract, Contractor shall be as fully responsible to Owner for acts and omissions of any Subcontractor and of persons either directly or indirectly employed by any Subcontractor, as it is for acts and omissions of persons directly employed by Contractor. The divisions or sections of the Specifications are not intended to control the Contractor in dividing the Work among Subcontractors or limit the work performed by any trade.

7.4. Owner's consent to, or approval of, or failure to object to, any Subcontractor under this Contract shall not in any way relieve Contractor of any obligations under this Contract and no such consent shall be deemed to waive any provisions of this Contract.

7.5. Contractor is directed to familiarize itself with sections 4100 through 4114 of the Public Contract Code of the State of California, as regards subletting and subcontracting, and to comply with all applicable requirements therein. In addition, Contractor is directed to familiarize itself with sections 1720 through 1861 of the Labor Code of the State of California, as regards the payment of prevailing wages and related issues, and to comply with all applicable requirements therein all including, without limitation, section 1775 and the Contractor's and Subcontractors' obligations and liability for violations of prevailing wage law and other applicable laws. In addition, Contractor is directed to familiarize itself with all requirements of Federal Davis Bacon Act wages and related issues, including reporting, to comply with all FTA grant funding requirements on this project.

7.6. No Contractor whose Bid is accepted shall, without consent of the awarding authority and in full compliance with section 4100, et seq, of the Public Contract Code, including, without limitation, sections 4107, 4107.5, and 4109 of the Public Contract Code, either:

7.6.1. Substitute any person as a Subcontractor in place of the Subcontractor designated in the original Bid; or

7.6.2. Permit any Subcontract to be assigned or transferred, or allow any portion of the Work to be performed by anyone other than the original Subcontractor listed in the Bid; or

7.6.3. Sublet or subcontract any portion of the Work in excess of one-half of one percent (1/2 of 1%) of the Contractor's total bid as to which his original bid did not designate a Subcontractor.

7.7. The Contractor shall be responsible for the coordination of the trades, Subcontractors, sub-subcontractors, and material or equipment suppliers working on the Project.

7.8. Contractor is solely responsible for settling any differences between the Contractor and its Subcontractor(s) or between Subcontractors.

7.9. Contractor must include in all of its subcontracts the assignment provisions as indicated in the Termination section of these General Conditions.

8. OTHER CONTRACTS/CONTRACTORS

8.1. Owner reserves the right to let other contracts in connection with the Project. Contractor shall afford other contractors reasonable opportunity for introduction and storage of their materials and execution of their work and shall properly coordinate and connect Contractor's Work with the work of other contractors.

8.2. In addition to Contractor's obligation to protect its own Work, Contractor shall protect the work of any other contractor that Contractor encounters while working on the Project.

8.3. If any part of Contractor's Work depends for proper execution or results upon work of any other contractor, the Contractor shall inspect and promptly report to the Owner in writing before proceeding with its Work any defects in any other contractor's work that render Contractor's Work unsuitable for proper execution and results. Contractor shall be held accountable for damages to Owner for any other contractor's work that Contractor failed to inspect or should have inspected. Contractor's failure to inspect and report shall constitute Contractor's acceptance of all other contractors' work as fit and proper for reception of Contractor's Work, except as to defects that may develop in other contractor's work after execution of Contractor's Work.

8.4. To ensure proper execution of its subsequent work, Contractor shall measure and inspect work already in place and shall at once report to the Owner in writing any discrepancy between that executed work and the Contract Documents.

8.5. Contractor shall ascertain to its own satisfaction the scope of the Project and nature of any other contracts that have been or may be awarded by Owner in prosecution of the Project to the end that Contractor may perform this Contract in light of the other contracts, if any.

8.6. Nothing herein contained shall be interpreted as granting to Contractor exclusive occupancy of the Site, the Premises, adjacent City Right of Way, or of the Project. Contractor shall not cause any unnecessary hindrance or delay to the use of the Premises and/or to any other contractor working on the Project. If simultaneous execution of any contract or Owner operation is likely to cause interference with performance of Contractor's Contract, Contractor shall coordinate with those contractor(s), person(s), and/or entity(s) and shall notify the Owner of the resolution.

8.7. Contractor shall not connect to, rely on, or drain into any continuation of underground systems in adjacent project under construction until such time as that system is tested, cleaned and accepted by

the Owner and / or City. Contractor is made aware of the adjacent Off-site project which will be constructed concurrently with this On-site project.

9. DRAWINGS AND SPECIFICATIONS

9.1. A complete list of all Drawings that form a part of the Contract is to be found as an index on the Drawings themselves; plus any drawings modified or identified by addenda.

9.2. Materials or Work described in words that so applied have a well known technical or trade meaning shall be deemed to refer to recognized standards, unless noted otherwise.

9.3. Trade Name or Trade Term. It is not the intention of this Contract to go into detailed descriptions of any materials and/or methods commonly known to the trade under “trade name” or “trade term.” The mere mention or notation of “trade name” or “trade term” shall be considered a sufficient notice to Contractor that it will be required to complete the work so named, complete, finished, and operable, with all its appurtenances, according to the best practices of the trade.

9.4. The naming of any material and/or equipment shall mean furnishing and installing of same, including all incidentals and accessory items thereto and/or labor therefore, as per best practices of the trade(s) involved, unless specifically noted otherwise.

9.5. Contract Documents are complementary, and what is called for by one shall be binding as if called for by all. As such, Drawings and Specifications are intended to be fully cooperative and to agree. However, if Contractor observes that Drawings and Specifications are in conflict, Contractor shall promptly notify Owner and Architect in writing, and any necessary changes shall be made as provided in the Contract Documents. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. It shall be the responsibility of the Contractor to notify his sub-bidders at the time of request for bids of all paragraphs of the General Conditions, Special Conditions and any parts of other sections of Specifications or Plans that he, the Contractor, intends to include as a part of the subcontract.

9.6. Drawings and Specifications are intended to comply with all laws, ordinances, rules, and regulations of constituted authorities having jurisdiction, and where referred to in the Contract Documents, the laws, ordinances, rules, and regulations shall be considered as a part of the Contract within the limits specified. Contractor shall bear all expense of correcting work done contrary to said laws, ordinances, rules, and regulations.

9.7. Ownership of Drawings

All copies of Plans, Drawings, Designs, Specifications, and copies of other incidental architectural and engineering work, or copies of other Contract Documents furnished by Owner, are the property of Owner. They are not to be used by Contractor in other work and, with the exception of signed sets of Contract Documents, are to be returned to Owner on request at completion of Work, or may be used by Owner as it may require without any additional costs to Owner. Neither the Contractor nor any Subcontractor, or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications, and other documents prepared by the Architect. Owner hereby grants the Contractor, Subcontractors, sub-subcontractors, and material or equipment

suppliers a limited license to use applicable portions of the Drawings prepared for the Project in the execution of their Work under the Contract Documents.

9.8. Detail Drawings and Instructions

9.8.1. In case of ambiguity, conflict, or lack of information, Owner will furnish clarifications with reasonable promptness. In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities

A. The Agreement.
B. Addenda, with those of later date having precedence over those of earlier date.
C. The Special Conditions
D. The General Conditions of the Contract for Construction
E. Division 1 of the Specifications
F. Drawings and Divisions 2-45 of the Specifications.

In the case of conflicts or discrepancies between Drawings and Divisions 2-45 of the Specifications or within either Document not clarified by Addendum, the better quality or greater quantity of Work shall be provided in accordance with the Architect's interpretation. In general, full size details shall take precedence over scale drawings as to shape and details of construction; specifications shall govern as to materials.

9.8.2. Should any clarification, in the opinion of Contractor, cause an increase in the Contract Price, Contractor may request a change in the Contract Price and/or Contract. Any request for a change shall be according to the applicable procedures indicated herein.

9.8.3. Any necessary material, item, piece of equipment or operation not called for, but reasonably implied as necessary for proper completion of the Work, shall be furnished and installed consistent with adjacent or related materials, items or pieces of equipment in accordance with good practice with no added cost.

10. CONTRACTOR'S SUBMITTALS AND SCHEDULES

Contractor's submittals shall comply with the provisions and requirements of the Specifications including, without limitation, Submittals.

10.1. Schedule of Work, Schedule of Submittals, and Schedule of Values

10.1.1. Within **TEN (10)** days after the date of the Notice to Proceed (unless otherwise specified in the Specifications), the Contractor shall prepare and submit to the Owner for review, in a form supported by sufficient data to substantiate its accuracy as the Owner may require:

10.1.1.1. Preliminary Schedule. A preliminary schedule of construction indicating the starting and completion dates of the various stages of the Work, including any information and following any form as may be specified in the Specifications. Once accepted by Owner, this shall become the Construction Schedule until the formal Baseline is provided, see section 00 31 13 - Construction Durations, Phasing and Milestones and 01 32 00 - Construction Progress Documentation for additional requirements. This schedule shall include and identify all tasks that are on the Project's critical path with a specific determination of the start and completion of each critical path task as well as all contract milestones and each milestone's completion date(s) as may be required by the Owner.

10.1.1.2. Preliminary Schedule of Values. A preliminary schedule of values for all of the Work, which must include quantities and prices of items aggregating the Contract Price and

must subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. This preliminary schedule of values shall include, at a minimum, the following information and the following structure:

10.1.1.2.1. Divided into at least the following categories:

10.1.1.2.1.1. Overhead and profit;
10.1.1.2.1.2. Supervision;
10.1.1.2.1.3. General conditions;
10.1.1.2.1.4. Layout;
10.1.1.2.1.5. Mobilization;
10.1.1.2.1.6. Required Pre-testing;
10.1.1.2.1.7. Submittals;
10.1.1.2.1.8. Bonds and insurance;
10.1.1.2.1.9. Close-out documentation;
10.1.1.2.1.10. Contract Allowances
10.1.1.2.1.11. Division 2 Work
10.1.1.2.1.12. Division 3 Work
10.1.1.2.1.13. Division 4 Work
10.1.1.2.1.14. Division 5 Work
10.1.1.2.1.15. Division 6 Work
10.1.1.2.1.16. Division 7 Work
10.1.1.2.1.17. Division 8 Work
10.1.1.2.1.18. Division 9 Work
10.1.1.2.1.19. Division 10 Work
10.1.1.2.1.20. Division 11 Work
10.1.1.2.1.21. Division 12 Work
10.1.1.2.1.22. Division 14 Work
10.1.1.2.1.23. Division 21 Work
10.1.1.2.1.24. Division 22 Work
10.1.1.2.1.25. Division 23 Work
10.1.1.2.1.26. Division 26 Work
10.1.1.2.1.27. Division 27 Work
10.1.1.2.1.28. Division 28 Work
10.1.1.2.1.29. Division 31 Work
10.1.1.2.1.30. Division 32 Work
10.1.1.2.1.31. Division 33 Work
10.1.1.2.1.32. Division 41 Work
10.1.1.2.1.33. Division 45 Work
10.1.1.2.1.34. Testing & Commissioning
10.1.1.2.1.35. Punch list and acceptance.

10.1.1.2.2. Divided by each of the following areas:

10.1.1.2.2.1. Site work;
10.1.1.2.2.2. By each building;
10.1.1.2.2.3. By each floor.

10.1.1.2.3. The preliminary schedule of values shall not provide for values any greater than the following percentages of the Contract value:

10.1.1.2.3.1. Mobilization and layout combined to equal not more than 1%;
10.1.1.2.3.2. Submittals, samples and shop drawings combined to equal not more than 3%,

10.1.1.2.3.3. bonds and insurance combined to equal not more than 2%.

10.1.1.2.4. Closeout documentation shall have a value in the preliminary schedule of value of not less than 5%.

10.1.1.2.5. Notwithstanding any provision of the Contract Documents to the contrary, payment of the Contractor's overhead, supervision and general conditions costs and profit, as reflected in the Cost Breakdown, shall be paid by the Owner in equal installments, based on percentage complete, with the disbursement of Progress Payments and the Final Payment.

10.1.1.2.6. Contractor shall certify that the preliminary schedule of values as submitted to the Owner is accurate and reflects the costs as developed in preparing Contractor's bid. The preliminary schedule of values shall be subject to the Owner's review and approval of the form and content thereof. In the event that the Owner objects to any portion of the preliminary schedule of values, the Owner shall notify the Contractor, in writing of the Owner's objection(s) to the preliminary schedule of values. Within five (5) days of the date of the Owner's written objection(s), Contractor shall submit a revised preliminary schedule of values to the Owner for review and approval. The foregoing procedure for the preparation, review and approval of the preliminary schedule of values shall continue until the Owner has approved the entirety of the preliminary schedule of values.

10.1.1.2.7. Once the preliminary schedule of values is approved by the Owner, this shall become the Schedule of Values. The Schedule of Values shall not be thereafter modified or amended by the Contractor without the prior consent and approval of the Owner, which may be granted or withheld in the sole discretion of the Owner.

10.1.1.3. **Preliminary Schedule of Submittals.** A preliminary schedule of submittals, including Shop Drawings, Product Data, Samples and Mock-ups submittals. Once approved by Owner, this shall become the Submittal Schedule. All submittals shall be forwarded to the Owner by the date indicated on the approved Submittal Schedule, unless an earlier date is necessary to maintain the Construction Schedule, in which case those submittals shall be forwarded to the Owner so as not to delay the Construction Schedule.

10.1.1.4. **Safety Plan.** Contractor's Safety Plan specifically adapted for the Project. Contractor's Safety Plan shall comply with the following requirements:

10.1.1.4.1. All applicable requirements of California Division of Industrial Safety ("CalOSHA") and/or by the United States Occupational Safety and Health Administration ("OSHA").

10.1.1.4.2. All provisions regarding Project safety, including all applicable provisions in these General Conditions.

10.1.1.4.3. Contractor's Safety Plan shall be in English and in the language(s) of the Contractor's and its Subcontractors' employees.

10.1.1.5. **Complete Subcontractor List.** The name, address, telephone number, facsimile number, California State Contractors License number, classification, and monetary value of all Subcontracts for parties furnishing labor, material, or equipment for completion of the Project.

10.1.2. Contractor must provide all construction schedules both in hard copy and electronically, in a format required per Section 01 32 16 - Construction Progress Documentation.

10.1.3. The Owner will review the construction schedules submitted and the Contractor shall make changes and corrections in the schedules as requested by the Owner and resubmit the schedules until accepted by the Owner.

10.1.4. The Owner shall have the right at any time to revise the schedule of values if, in the Owner's sole opinion, the schedule of values does not accurately reflect the value of the Work performed.

10.1.5. All submittals and schedules must be accepted by the Owner before Contractor can rely on them as a basis for payment.

10.2. Monthly Progress Schedule(s)

Upon request by the Owner, Contractor shall provide Monthly Progress Schedule(s) to the Owner. A Monthly Progress Schedule shall update the approved Construction Schedule, showing all work completed and to be completed. The process for Owner acceptance of the Monthly Progress Schedule shall be the same as the process for approval of the Construction Schedule. Contractor shall submit Monthly Progress Schedule(s) with payment applications, no later than the 25th of each month, reflecting status thru the end of the month.

10.3. Material Safety Data Sheets (MSDS)

Contractor is required to ensure Material Safety Data Sheets are available in a readily accessible place at the Work Site for any material requiring a Material Safety Data Sheet per the Federal "Hazard Communication" standard, or employees right to know law. The Contractor is also required to ensure proper labeling on substance brought onto the job site and that any person working with the material or within the general area of the material is informed of the hazards of the substance and follows proper handling and protection procedures. Two additional copies of the Material Safety Data Sheets shall also be submitted directly to the Owner Representative.

11. SITE ACCESS, CONDITIONS, AND REQUIREMENTS

11.1. Site Investigation

Before bidding on this Work, Contractor shall make a careful investigation of the Site and thoroughly familiarize itself with the requirements of the Contract. By the act of submitting a bid for the Work included in this Contract, Contractor shall be deemed to have made a complete study and investigation, and to be familiar with and accepted the existing conditions of the Site.

11.2. Soils Investigation Report

11.2.1. While a soils investigation report obtained from test holes at Site exists, that report shall be available to the Contractor but shall not be a part of this Contract. Any information obtained from that report or any information given on Drawings as to subsurface soil conditions or to elevations of existing grades or elevations of underlying rock is approximate only, is not guaranteed, does not form a part of this Contract, and Contractor may not rely solely thereon. By submitting its bid, Contractor acknowledges that it has made visual examination of Site and has made whatever tests Contractor deems appropriate to determine underground condition of soil.

11.3. Access to Work

Owner and its representatives shall at all times have access to Work wherever it is in preparation or progress, including storage and fabrication. Contractor shall provide safe and proper facilities for such access so that Owner's representatives may perform their functions.

11.4. Layout and Field Engineering

11.4.1. All field engineering required for layout of this Work and establishing lines and grades for earthwork, site utilities and building layout operations shall be furnished by Contractor at its expense. This Work shall be done by a qualified, California-registered civil engineer approved in writing by Owner and Architect. Required “Record” drawings of as-built improvements shall be prepared by the approved civil engineer.

11.4.2. The Contractor shall be responsible for having ascertained pertinent local conditions such as location, accessibility, and general character of the Site and for having satisfied itself as to the conditions under which the Work is to be performed. Owner shall not be liable for any claim for allowances because of Contractor’s error or negligence in acquainting itself with the conditions at the Site.

11.4.3. Contractor shall protect and preserve established benchmarks and monuments and shall make no changes in locations without the prior written approval of Owner. Contractor shall replace any benchmarks or monuments that are lost or destroyed subsequent to proper notification of Owner and with Owner's approval.

11.5. Utilities

Not Used

11.6. Sanitary Facilities

Not Used

11.7. Surveys

Contractor shall provide surveys done by a California licensed civil surveyor to determine locations of construction, grading, and site work as required to perform the Work.

11.8. Regional Notification Center

The Contractor, except in an emergency, shall contact the appropriate regional notification center at least Seven (7) days prior to commencing any excavation if the excavation will be conducted in an area or in a private easement that is known, or reasonably should be known, to contain subsurface installations other than the underground facilities owned or operated by the Owner, and obtain an inquiry identification number from that notification center. No excavation shall be commenced and/or carried out by the Contractor unless an inquiry identification number has been assigned to the Contractor or any Subcontractor and the Contractor has given the Owner the identification number. Any damages arising from Contractor's failure to make appropriate notification shall be at the sole risk and expense of the Contractor. Any delays caused by failure to make appropriate notification shall be at the sole risk of the Contractor and shall not be considered for an extension of the Contract time.

11.9. Existing Utility Lines

11.9.1. Pursuant to Government Code section 4215, Owner assumes the responsibility for removal, relocation, and protection of main or trunk utility lines and facilities located on the construction Site at the time of commencement of construction under this Contract with respect to any such utility facilities that are not identified in the Plans and Specifications. Contractor shall not be assessed for liquidated damages for delay in completion of the Project caused by failure of Owner or by the owner of a utility to provide for removal or relocation of such utility facilities.

11.9.2. Locations of existing utilities provided by Owner shall not be considered exact, but approximate within reasonable margin and shall not relieve Contractor of responsibilities to exercise reasonable care or costs of repair due to Contractor's failure to do so. Owner shall compensate Contractor for the costs of locating, repairing damage not due to the failure of Contractor to exercise reasonable care, and removing or relocating such utility facilities not indicated in the Plans and Specifications with reasonable accuracy, and for equipment necessarily idle during such work.

11.9.3. No provision herein shall be construed to preclude assessment against Contractor for any other delays in completion of the Work. Nothing in this Article shall be deemed to require Owner to indicate the presence of existing service laterals, appurtenances, or other utility lines, within the exception of main or trunk utility lines. Whenever the presence of these utilities on the Site of the construction Project can be inferred from the presence of other visible facilities, such as buildings, meter junction boxes, on or adjacent to the Site of the construction.

11.9.4. If Contractor, while performing Work under this Contract, discovers utility facilities not identified by Owner in Contract Plans and Specifications, Contractor shall immediately notify the Owner and the utility in writing. The cost of repair for damage to above-mentioned visible facilities without prior written notification to the Owner shall be borne by the Contractor.

11.10. Notification

Contractor understands, acknowledges and agrees that the purpose for prompt notification to the Owner pursuant to these provisions is to allow the Owner to investigate the condition(s) so that the Owner shall have the opportunity to decide how the Owner desires to proceed as a result of the condition(s). Accordingly, failure of Contractor to promptly notify the Owner in writing, pursuant to these provisions, shall constitute Contractor's waiver of any claim for damages or delay incurred as a result of the condition(s).

11.11. Not Used

11.12. No Signs

Neither the Contractor nor any other person or entity shall display any signs not required by law or by the Contract Documents at the Site, fences, trailers, offices, or elsewhere on the Site, without specific prior written approval of the Owner.

12. TRENCHES

12.1. Trenches Greater Than Five Feet

Pursuant to Labor Code section 6705, if the Contract Price exceeds $25,000 and involves the excavation of any trench or trenches five (5) feet or more in depth, the Contractor shall, in advance of excavation, promptly submit to the Owner and/or a registered civil or structural

engineer employed by the Owner or Architect, a detailed plan showing the design of shoring for protection from the hazard of caving ground during the excavation of such trench or trenches.

12.2. Excavation Safety

If such plan varies from the Shoring System Standards established by the Construction Safety Orders, the plan shall be prepared by a registered civil or structural engineer, but in no case shall such plan be less effective than that required by the Construction Safety Orders. No excavation of such trench or trenches shall be commenced until said plan has been accepted by the Owner or by the person to whom authority to accept has been delegated by the Owner

12.3. No Tort Liability of Owner

Pursuant to Labor Code section 6705, nothing in this Article shall impose tort liability upon the Owner or any of its employees.

12.4. No Excavation Without Permits

The Contractor shall not commence any excavation Work until it has secured all necessary permits including the required CAL OSHA Building/Structures, Scaffold/Falsework, Demolition, Trenches/Excavation Permit. Any permits shall be prominently displayed on the Site prior to the commencement of any excavation.

12.5. Discovery of Hazardous Waste and/or Unusual Conditions

12.5.1. Pursuant to Public Contract Code section 7104, if the Work involves digging trenches or other excavations that extend deeper than four feet below the Surface, the Contractor shall promptly, and before the following conditions are disturbed, notify the Owner, in writing, of any:

12.5.1.1. Material that the Contractor believes may be material that is hazardous waste, as defined in section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.

12.5.1.2. Subsurface or latent physical conditions at the Site differing from those indicated.

12.5.1.3. Unknown physical conditions at the Site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.

12.5.2. The Owner shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the Work, shall issue a Change Order under the procedures described herein.

12.5.3. In the event that a dispute arises between Owner and the Contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the Work, the Contractor shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all work to be performed under the Contract. The Contractor shall retain any and all rights provided either by Contract or by law that pertain to the resolution of disputes and protests.

13. INSURANCE AND BONDS

13.1. Insurance

Unless different provisions and/or limits are indicated in the section 00 73 16 – Insurance and / or other sections, all insurance required of Contractor and/or its Subcontractor(s) shall be in amounts and including the provisions as set forth herein.

13.1.1. Commercial General Liability and Automobile Liability Insurance

13.1.1.1. Contractor shall procure and maintain, during the life of this Contract, Commercial General Liability Insurance and Automobile Liability Insurance that shall protect Contractor, Owner, State, Construction Manager(s), Project Inspector(s), and Architect(s) from all claims for bodily injury, property damage, personal injury, death, advertising injury, and medical payments arising from operations under this Contract. Contractor shall ensure that Products Liability and Completed Operations coverage and Fire Damage Liability is included within the above policies and at the required limits, or Contractor shall procure and maintain these coverage separately.

13.1.1.2. **Subcontractor:** Contractor shall require its Subcontractors, if any, to procure and maintain similar Commercial General Liability Insurance and Automobile Liability Insurance with minimum limits equal to the amount required of the Contractor.

13.1.2. Excess Liability Insurance

13.1.2.1. Contractor shall procure and maintain, during the life of this Contract, Excess Liability Insurance that shall protect Contractor, Owner, State, Construction Manager(s), Project Manager(s), Architect(s) and Project Inspectors and in amounts and including the provisions as set forth in the Supplementary Conditions and/or Special Conditions.

13.1.2.2. **Subcontractor:** Contractor shall require its Subcontractor(s), if any, to procure and maintain similar Excess Liability Insurance with minimum limits equal to the amount required of the Contractor.

13.1.3. Workers' Compensation and Employers' Liability Insurance

13.1.3.1. In accordance with provisions of section 3700 of the California Labor Code, the Contractor and every Subcontractor shall be required to secure the payment of compensation to its employees.

13.1.3.2. Contractor shall procure and maintain, during the life of this Contract, Workers' Compensation Insurance and Employers' Liability Insurance for all of its employees engaged in work under this Contract, on/or at the Site of the Project. This coverage shall cover, at a minimum, medical and surgical treatment, disability benefits, rehabilitation therapy, and survivors' death benefits. Contractor shall require its Subcontractor(s), if any, to procure and maintain Workers' Compensation Insurance and Employers' Liability Insurance for all employees of Subcontractor(s). Any class of employee or employees not covered by a Subcontractor's insurance shall be covered by Contractor's insurance. If any class of employee or employees engaged in Work under this Contract, on or at the Site of the Project, are not protected under the Workers' Compensation Statute, Contractor shall provide, or shall cause a Subcontractor to provide, adequate insurance coverage for the protection of any employee(s) not otherwise protected before any of those employee(s) commence work.

13.1.4. Builder's Risk Insurance: Builder's Risk "All Risk" Insurance

The Contractor, during the progress of the work and until Final Acceptance of the Work upon completion of the entire Contract, shall maintain Builder's Risk "All-Risk" Completed Value Insurance Coverage on all insurable Work included under the Contract Documents which coverage is to provide extended coverage and insurance against vandalism and malicious mischief, theft, perils of fire, sprinkler leakage, civil authority, sonic boom, collapse and flood upon the entire Work which is the subject of the Contract Documents, and including completed Work and Work in progress to the full insurable value thereof. This insurance shall include coverage for all materials and equipment not yet installed whether on site or in a "bonded" warehouse. Additional requirements and limits may be required at Section 00 73 16 - Insurance.

13.1.4 **Proof of Carriage of Insurance and Other Requirements: Endorsements and Certificates**

13.1.4.1 Contractor shall not commence Work nor shall it allow any Subcontractor to commence Work under this Contract, until Contractor and its Subcontractor(s) have procured all required insurance and Contractor has delivered in duplicate to the Owner complete endorsements (or entire insurance policies) and certificates indicating the required coverage have been obtained, and the Owner has accepted these documents.

13.1.4.2 Endorsements, certificates and insurance policies shall include the following:

13.1.4.2.1 A clause stating:

"This policy shall not be amended or modified and the coverage amounts shall not be reduced until notice has been mailed to Owner, Architect, and Construction Manager stating date of amendment or modification. Date of amendment or modification may not be less than thirty (30) days after date of mailing notice."

13.1.4.2.2 Language stating in particular those insured, extent of insurance, location and operation to which insurance applies, expiration date, to whom cancellation and reduction notice will be sent, and length of notice period.

13.1.4.3 All endorsements, certificates and insurance policies shall state that Owner, the State of California, Construction Manager(s), Project Manager(s), Inspector(s) and Architect(s) are named additional insureds under all policies except Workers' Compensation Insurance and Employers' Liability Insurance. Contractor's and Subcontractors' insurance policy(s) shall be primary to any insurance or self-insurance maintained by Owner, the State of California, Construction Manager(s), Project Manager(s), Project Inspector(s), Architect(s) and their agents, representatives and employees.

13.1.4.4 All policies shall be written on an occurrence form.

13.1.4.5 All of Contractor's insurance shall be with insurance companies with an A.M. Best rating of no less than **A-1**

13.1.5 **General Contractor's Pollution Legal Liability**

Provide coverage requirements and endorsements as called for herein and per section 00 73 16 (Insurance) with the required endorsements, which provides coverage for all events during construction an after, which may result from contractor's work.

13.1.6 **Insurance Policy** Limits

Unless different limits are indicated in the Special Conditions, the limits of insurance shall not be less than the following amounts:

Commercial General Liability	Each Occurrence	$5,000,000
	General Aggregate	$10,000,000
	Product Liability and Completed Operations	$10,000,000
Automobile Liability – Any Auto	Combined Single Limit	$2,000,000
Excess Liability		$10,000,000
Workers Compensation		Statutory limits pursuant to State law
Employers' Liability		$1,000,000
Builders Risk ("All Risk")		100% of completed value of work.
Pollution liability	Each pollution Condition and Aggregate Limit	$10,000,000

13.2 Contract Security - Bonds

13.2.4 Contractor shall furnish two surety bonds issued by a California admitted surety insurer as follows:

13.2.4.1 **Performance Bond**: A bond in an amount at least equal to one hundred percent (100%) of Contract Price as security for faithful performance of this Contract.

13.2.4.2 **Payment Bond**: A bond in an amount at least equal to one hundred percent (100%) of the Contract Price as security for payment of persons performing labor and/or furnishing materials in connection with this Contract.

13.2.5 Cost of bonds shall be included in the Bid and Contract Price.

13.2.6 All bonds related to this Project shall be in the forms set forth in these Contract Documents and shall comply with all requirements of the Contract Documents, including, without limitation, the bond forms.

14 WARRANTY/GUARANTEE/INDEMNITY

14.1 Warranty/Guarantee

14.1.4 The Contractor shall obtain and preserve for the benefit of the Owner, manufacturer's warranties on materials, fixtures, and equipment incorporated into the Work.

14.1.5 In addition to guarantees required elsewhere, Contractor shall, and hereby does guarantee and warrant all Work furnished on the job against all defects for a period of **ONE (1)** year after the later of the following dates:

14.1.5.1 The date of completion as defined in Public Contract Code section 7107, subdivision (c),

14.1.5.2 The commissioning date for the Project, if any.

At the Owner's sole option, Contractor shall repair or replace any and all of that Work, together with any other Work that may be displaced in so doing, that may prove defective in workmanship and/or materials within a **ONE (1)** year period from date of completion as defined above without expense whatsoever to Owner. In the event of failure of Contractor and/or Surety to commence and pursue with diligence said replacements or repairs within ten (10) days after being notified in writing, Contractor and Surety hereby acknowledge and agree that Owner is authorized to proceed to have defects repaired and made good at expense of Contractor and/or Surety who hereby agree to pay costs and charges therefore immediately on demand.

14.1.6 If, in the opinion of Owner, defective work creates a dangerous condition or requires immediate correction or attention to prevent further loss to Owner or to prevent interruption of operations of Owner, Owner will attempt to give the notice required above. If Contractor or Surety cannot be contacted or neither complies with Owner's request for correction within a reasonable time as determined by Owner, Owner may, notwithstanding the above provision, proceed to make any and all corrections and/or provide attentions the Owner believes are necessary. The costs of correction or attention shall be charged against Contractor and Surety of the guarantees provided in this Article or elsewhere in this Contract.

14.1.7 The above provisions do not in any way limit the guarantees on any items for which a longer guarantee is specified or on any items for which a manufacturer gives a guarantee for a longer period. Contractor shall furnish to Owner all appropriate guarantee or warranty certificates as indicated in the Specifications or upon request by Owner.

14.1.8 Nothing herein shall limit any other rights or remedies available to Owner.

14.2 Indemnity

14.2.4 The Contractor shall indemnify, defend with legal counsel reasonably acceptable to the Owner, keep and hold harmless the Owner and its consultants, the Architect and its consultants, the Construction Manager and its consultants, separate contractors, and their respective board members, officers, representatives, contractors, agents, and employees, in both individual and official capacities ("Indemnitees"), against all suits, claims, damages, losses, and expenses, including but not limited to attorney's fees, caused by, arising out of, resulting from, or incidental to, the performance of the Work under this Contract by the Contractor or its Subcontractors to the full extent allowed by the laws of the State of California, and not to any extent that would render these provisions void or unenforceable, including, without limitation, any such suit, claim, damage, loss, or expense attributable to, without limitation, bodily injury, sickness, disease, death, alleged patent violation or copyright infringement, or to injury to or destruction of tangible property (including damage to the Work itself) including the loss of

use resulting therefrom, except to the extent caused wholly by the sole negligence or willful misconduct of the Indemnitees. This agreement and obligation of the Contractor shall not be construed to negate, abridge, or otherwise reduce any right or obligation of indemnity that would otherwise exist as to any party or person described herein. This indemnification, defense, and hold harmless obligation includes any failure or alleged failure by Contractor to comply with any provision of law or the Contract Documents, including, without limitation, any stop notice actions, or liens by the California Department of Labor Standards Enforcement.

14.2.5 The Contractor shall give prompt notice to the Owner in the event of any injury (including death), loss, or damage included herein. Without limitation of the provisions herein, if the Contractor's agreement to indemnify, defend, and hold harmless the Indemnitees as provided herein against liability for damage arising out of bodily injury to persons or damage to property caused by or resulting from the negligence of any of the Indemnitees shall to any extent be or be determined to be void or unenforceable, it is the intention of the parties that these circumstances shall not otherwise affect the validity or enforceability of the Contractor's agreement to indemnify, defend, and hold harmless the rest of the Indemnitees, as provided herein, and in the case of any such suits, claims, damages, losses, or expenses caused in part by the default, negligence, or act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, and in part by any of the Indemnitees, the Contractor shall be and remain fully liable on its agreements and obligations herein to the full extent permitted by law.

14.2.6 In any and all claims against any of the Indemnitees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the Contractor's indemnification obligation herein shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Contractor or any Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

15 TIME

15.1 Notice to Proceed

15.1.4 Owner may issue a Notice to Proceed within four (4) months from the date of the Notice of Award. Once Contractor has received the Notice to Proceed, Contractor shall complete the Work within the period of time indicated in the Contract Documents.

15.1.5 In the event that the Owner desires to postpone issuing the Notice to Proceed beyond this 4-month period, it is expressly understood that with reasonable notice to the Contractor, the Owner may postpone issuing the Notice to Proceed. It is further expressly understood by Contractor that Contractor shall not be entitled to any claim of additional compensation as a result of the postponement of the issuance of the Notice to Proceed.

15.1.6 If the Contractor believes that a postponement of issuance of the Notice to Proceed beyond two months (2) will cause a hardship to Contractor, Contractor may terminate the Contract. Contractor's termination due to a postponement shall be by written notice to Owner within ten (10) days after receipt by Contractor of Owner's notice of postponement. It is further understood by Contractor that in the event that Contractor terminates the Contract as a result of postponement by the Owner, the Owner shall only be obligated to pay Contractor for the Work that Contractor had performed at the time of notification of postponement. Should Contractor terminate the Contract as a result of a

notice of postponement, Owner shall have the authority to award the Contract to the next lowest responsive responsible bidder.

15.2 **Computation of Time / Adverse Weather**

15.2.4 The Contractor will only be allowed a time extension for Adverse Weather conditions if requested by Contractor and only if all of the following conditions are met:

15.2.4.1 The weather conditions constitute Adverse Weather, as defined herein;

15.2.4.2 Contractor can verify that the Adverse Weather caused delays in excess of five hours of the indicated labor required to complete the scheduled tasks of Work on the day affected by the Adverse Weather;

15.2.4.3 The Contractor's crew is dismissed as a result of the Adverse Weather; and

15.2.4.4 The number of days of delay for the month exceeds those indicated in the Special Conditions.

15.2.5 A day-for-day extension will only be allowed for those days in excess of those indicated in the Special Conditions.

15.2.6 The Contractor shall work seven (7) days per week, if necessary, irrespective of inclement weather, to maintain access and the Construction Schedule, and to protect the Work under construction from the effects of Adverse Weather, all at no further cost to the Owner.

15.2.7 The Contract Time has been determined with consideration given to the average climate weather conditions prevailing in the County in which the Project is located.

15.3 Hours of Work

15.3.4 Sufficient Forces

Contractor and Subcontractors shall continuously furnish sufficient forces to ensure the prosecution of the Work in accordance with the Construction Schedule.

15.3.5 Performance During Working Hours

Work shall be performed during regular working hours as permitted by the appropriate governmental agency except that in the event of an emergency, or when required to complete the Work in accordance with job progress, Work may be performed outside of regular working hours with the advance written consent of the Owner and approval of any required governmental agencies.

15.4 **Progress and Completion**

15.4.4 Time is of the Essence

Time limits stated in the Contract Documents are of the essence to the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

15.4.5 No Commencement Without Insurance

The Contractor shall not commence operations on the Project site or elsewhere prior to the effective date of insurance and bonds. The date of commencement of the Work shall

not be changed by the effective date of such insurance. If Contractor commences Work without insurance and bonds, all Work is performed at Contractor's peril and shall not be compensable until and unless Contractor secures bonds and insurance pursuant to the terms of the Contract Documents and subject to Owner claim for damages.

15.5 **Not Used**

15.6 **Expeditious Completion**

The Contractor shall proceed expeditiously with adequate forces and shall achieve Completion within the Contract Time, time is of the essence.

16 EXTENSIONS OF TIME – LIQUIDATED DAMAGES

16.1 **Liquidated Damages**

Contractor and Owner hereby agree that the exact amount of damages for failure to complete the Work within the time specified is extremely difficult or impossible to determine. If the Work is not completed within the time specified in the Contract Documents, it is understood that the Owner will suffer damage. It being impractical and unfeasible to determine the amount of actual damage, it is agreed the Contractor shall pay to Owner as fixed and liquidated damages, and not as a penalty, the amount set forth in the section 00 31 13 (Construction Duration, Phasing and Milestones) for each calendar day of delay in completion.Contractor and its Surety shall be liable for the amount thereof pursuant to Government Code section 53069.85.

16.2 **Excusable Delay**

16.2.4 Contractor shall not be charged for liquidated damages because of any delays in completion of Work which are not the fault or negligence of Contractor or its Subcontractors, including acts of God as defined in Public Contract Code section 7105, acts of enemy, epidemics, and quarantine restrictions. Contractor shall, within five (5) calendar days of beginning of any delay, notify Owner in writing of causes of delay including documentation and facts explaining the delay and efforts taken by Contractor to mitigate time impacts. Owner shall review the facts and extent of any delay and shall grant extension(s) of time for completing Work when, in its judgment, the findings of fact justify an extension. Extension(s) of time shall apply only to that portion of Work affected by delay, and shall not apply to other portions of Work not so affected. An extension of time may only be granted if Contractor has timely submitted the Construction Schedule as required herein. Extensions of time will only be considered when accompanied by a Time Impact Analysis proving out critical path delay to the Final Completion date of the project.

16.2.5 Contractor shall notify the Owner pursuant to the claims provisions in these General Conditions of any anticipated delay and its cause. Following submission of a claim, the Owner may determine whether the delay is to be considered avoidable or unavoidable, how long it continues, and to what extent the prosecution and completion of the Work might be delayed thereby.

16.2.6 In the event the Contractor requests an extension of Contract Time for unavoidable delay, such request shall be submitted in accordance with the provisions in the Contract Documents governing changes in Work. When requesting time, requests must be submitted with full justification and documentation. If the Contractor fails to submit justification, it waives its right to a time extension at a later date. Such justification must be based on the official Construction Schedule as updated at the time of occurrence of the delay or execution of Work related to any changes to the Scope of Work. Any claim for delay must include the following information as support, without limitation:

16.2.6.1 The duration of the activity relating to the changes in the Work and the resources (manpower, equipment, material, etc.) required to perform the activities within the stated duration.

16.2.6.2 Specific logical ties to the Contract Schedule for the proposed changes and/or delay showing the activity/activities in the Construction Schedule that are affected by the change and/or delay. (A portion of any delay of seven (7) days or more must be provided.)

16.2.6.3 A revised schedule must be submitted.

16.3 **No Additional Compensation for Delays Within Contractor's Control**

16.3.4 Contractor is aware that governmental agencies, including, without limitation, the City of Chico, gas companies, electrical utility companies, water companies, and other agencies may have to approve Contractor-prepared drawings or approve a proposed installation. Accordingly, Contractor shall include in its bid, time for actual review of its drawings and for actual delays and damages that may be caused by such agencies. Thus, Contractor is not entitled to make a claim for damages or delays arising from the review of Contractor's drawings or installations by any public utility on site.

16.3.5 Contractor shall only be entitled to compensation for delay when all of the following conditions are met:

16.3.5.1 The Owner is responsible for the delay;

16.3.5.2 The delay is unreasonable under the circumstances involved;

16.3.5.3 The delay was not within the contemplation of Owner and Contractor; and

16.3.5.4 Contractor complies with the claims procedure of the Contract Documents.

16.4 **Float or Slack in the Schedule**

Float or slack is the amount of time between the early start date and the late start date, or the early finish date and the late finish date, of any of the activities in the schedule. Float or slack is not for the exclusive use of or benefit of either the Owner or the Contractor, but its use shall be determined solely by the Owner.

17 CHANGES IN THE WORK

17.1 No Changes Without Authorization

17.1.4 There shall be no change whatsoever in the Drawings, Specifications, or in the Work without an executed Change Order or a written Construction Change Directive authorized by the Owner as herein provided. Owner shall not be liable for the cost of any extra work or any substitutions, changes, additions, omissions, or deviations from the Drawings and Specifications unless the Owner's governing board has authorized the same and the cost thereof has been approved in writing by Change Order or Construction Change Directive. No extension of time for performance of the Work shall be allowed hereunder unless claim for such extension is made at the time changes in the Work are ordered, and such time duly adjusted in writing in the Change Order or Construction Change Directive. The provisions of the Contract Documents shall apply to all such changes, additions, and omissions with the same effect as if originally embodied in the Drawings and Specifications.

17.1.5 Contractor shall perform immediately all work that has been authorized by a fully executed Change Order or Construction Change Directive. Contractor shall be fully responsible for any and all delays and/or expenses caused by Contractor's failure to expeditiously perform this Work.

17.1.6 Should any Change Order result in an increase in the Contract Price, the cost of that Change Order shall be agreed to, in writing, in advance by Contractor and Owner and be subject to the monetary limitations set forth in Public Contract Code section 20118.4. In the event that Contractor proceeds with any change in Work without a Change Order executed by the Owner or Construction Change Directive, Contractor waives any claim of additional compensation or time for that additional work.

17.1.7 Contractor understands, acknowledges, and agrees that the reason for Owner authorization is so that Owner may have an opportunity to analyze the Work and decide whether the Owner shall proceed with the Change Order or alter the Project so that a change in Work becomes unnecessary.

17.2 Architect Authority

The Architect will have authority to order minor changes in the Work not involving any adjustment in the Contract Price, or an extension of the Contract Time, or a change that is inconsistent with the intent of the Contract Documents. These changes shall be effected by written Change Order, Construction Change Directive, or by Architect’s response(s) to RFI(s).

17.3 Change Orders

17.3.4 A Change Order is a written instrument prepared and issued by the Owner and/or the Construction Manager and signed by the Owner (as authorized by the Owner's Board or it’s authorized designee(s)), the Contractor, and approved by the Owner’s Board (if necessary), stating their agreement regarding all of the following:

17.3.4.1 A description of a change in the Work;

17.3.4.2 The amount of the adjustment in the Contract Price, if any; and

17.3.4.3 The extent of the adjustment in the Contract Time, if any.

17.4 Construction Change Directives

17.4.4 A Construction Change Directive is a written order prepared and issued by the Owner, the Construction Manager, and/or the Architect and signed by the Owner, directing a change in the Work. The Owner may as provided by law, by Construction Change Directive and without invalidating the Contract, order changes in the Work consisting of additions, deletions, or other revisions. Any dispute as to the sum or time impact of the Construction Change Directive or timing of payment shall be resolved pursuant to the Payment and Claims and Disputes provisions herein.

17.4.5 The Owner may issue a Construction Change Directive in the absence of agreement on the terms, cost or time proposed for a Change Order.

17.5 Force Account Directives

17.5.4 When work, for which a definite price has not been agreed upon in advance, is to be paid for on a force account basis, all direct costs necessarily incurred and paid by the Contractor for labor, material, and equipment used in the performance of that Work, shall be subject to the approval of the Owner and compensation will be determined as set forth herein.

17.5.5 The Owner will issue a Force Account Directive to proceed with the Work on a force account basis, and a not-to-exceed budget will be established by the Owner.

17.5.6 All requirements regarding direct cost for labor, labor burden, material, equipment, and markups on direct costs for overhead and profit described in this section shall apply to Force Account Directives. However, the Owner will only pay for actual costs verified in the field by the Owner or its authorized representative(s) on a daily basis.

17.5.7 The Contractor shall be responsible for all cost related to the administration of Force Account Directive. The markup for overheard and profit for Contractor modifications shall be full compensation to the Contractor to administer Force Account Directive.

17.5.8 The Contractor shall notify the Owner or its authorized representative(s) at least twenty-four (24) hours prior to proceeding with any of the force account work. Furthermore, the Contractor shall notify the Owner when it has consumed eighty percent (80%) of the budget, and shall not exceed the budget unless specifically authorized in writing by the Owner. The Contractor will not be compensated for force account work in the event that the Contractor fails to timely notify the Owner regarding the commencement of force account work, or exceeding the force account budget.

17.5.9 The Contractor shall diligently proceed with the work, and on a daily basis, submit a daily force account report on a form supplied by or acceptable to the Owner no later than 5:00 p.m. each day work is performed. The report shall contain a detailed itemization of the daily labor, material, and equipment used on the force account work only. The names of the individuals performing the force account work shall be included on the daily force account reports. The type and model of equipment shall be identified and listed. The Owner will review the information contained in the reports, and sign the reports no later than the next work day, and return a copy of the report to the Contractor for their records. The Owner will not sign, nor will the Contractor receive compensation for work the Owner cannot verify. The Contractor will provide a weekly force account summary indicating the status of each Force Account Directive in terms of percent complete of the not-to-exceed budget and the estimated percent complete of the work

17.5.10 In the event the Contractor and the Owner reach a written agreement on a set cost for the work while the work is proceeding based on a Force Account Directive, the Contractor's signed daily force account reports shall be discontinued and all previously signed reports shall be invalid.

17.6 Price Request

17.6.4 Definition of Price Request

A Price Request ("PR") is a written request prepared by the Architect requesting the Contractor to submit to the Owner and the Architect an estimate of the effect of a proposed change in the Work on the Contract Price and the Contract Time.

17.6.5 Scope of Price Request

A Price Request shall contain adequate information, including any necessary Drawings and Specifications, to enable Contractor to provide the cost breakdowns required herein. The Contractor shall not be entitled to any additional compensation for preparing a response to a Price Request, whether ultimately accepted or not.

17.7 Proposed Change Order

17.7.4 Definition of Proposed Change Order

A Proposed Change Order ("PCO") is a written request prepared by the Contractor requesting that the Owner and the Architect issue a Change Order based upon a proposed change to the Work.

17.7.5 Changes in Contract Price

A PCO shall include breakdowns pursuant to the revisions herein to validate any change in Contract Price.

17.7.6 Changes in Time

A PCO shall also include any changes in time required to complete the Project. Any additional time requested shall not be the number of days to make the proposed change, but must be based upon the impact to the Construction Schedule as defined in the Contract Documents. If Contractor fails to request a time extension in a PCO, then the Contractor is thereafter precluded from requesting time and/or claiming a delay.

17.7.7 Unknown and/or Unforeseen Conditions

If Contractor submits a PCO requesting an increase in Contract Price and/or Contract Time that is based at least partially on Contractor's assertion that Contractor has encountered unknown and/or unforeseen condition(s) on the Project, then Contractor shall base the PCO on provable information that, beyond a reasonable doubt and to the Owner's satisfaction, demonstrates that the unknown and/or unforeseen condition(s) were actually unknown and/or unforeseen and that the condition(s) were reasonably unknown and/or unforeseen. If not, the Owner shall deny the PCO and the Contractor shall complete the Project without any increase in Contract Price and/or Contract Time based on that PCO.

17.8 Format for Proposed Change

17.8.4 The following format shall be used as applicable by the Owner and the Contractor (e.g. Change Orders, PCO's) to communicate proposed additions and deductions to the Contract, supported by attached documentation.

	SUBCONTRACTOR PERFORMED WORK	**ADD**	**DEDUCT**
(a)	**Material** (attach itemized quantity and unit cost plus sales tax)		
(b)	**Add Labor** (attach itemized hours and rates, fully encumbered)		
(c)	**Add Equipment** (attach suppliers' invoice)		
(d)	**Subtotal**		
(e)	**Add Subcontractor's overhead and profit,** not to exceed fifteen percent (15%) of item (d)		
(f)	**Subtotal**		
(g)	**Add Contractor's overhead and profit**, not to exceed five percent (5%) of Item (f)		
(h)	**Subtotal**		
(i)	**Add Bond and Insurance,** not to exceed two percent (2%) of Item (h)		
(j)	**TOTAL**		
(k)	**Time**	_____	**Days**

	CONTRACTOR PERFORMED WORK	**ADD**	**DEDUCT**
(a)	**Material** (attach itemized quantity and unit cost plus sales tax)		
(b)	**Add Labor** (attach itemized hours and rates, fully encumbered)		
(c)	**Add Equipment** (attach suppliers' invoice)		
(d)	**Subtotal**		
(e)	**Add Contractor's overhead and profit,** not to exceed fifteen percent (15%) of **item (d).**		
(f)	**Subtotal**		
(g)	**Add Bond and Insurance,** not to exceed two percent (2%) of Item (f)		
(h)	**TOTAL**		
(i)	**Time**	_____	**Days**

17.9 Change Order Certification

17.9.4 All Change Orders and PCOs must include the following certification by the Contractor:

17.9.4.1 The undersigned Contractor approves the foregoing as to the changes, if any, and the Contract Price specified for each item and as to the extension of time allowed, if any, for completion of the entire Work as stated herein, and agrees to furnish all labor, materials, and service, and perform all work necessary to complete any additional work specified for the consideration stated herein. Submission of sums which have no basis in fact or which Contractor knows are false are at the sole risk of Contractor and may be a violation of the False Claims Act set forth under Government Code section 12650 et seq. It is understood that the changes herein to the Contract shall only be effective when approved by the governing board of the Owner.

17.9.4.2 It is expressly understood that the value of the extra Work or changes expressly includes any and all of the Contractor's costs and expenses, both direct and indirect, resulting from additional time required on the Project or resulting from delay to the Project. Any costs, expenses, damages, or time extensions not included are deemed waived.

17.10 Determination of Change Order Cost

17.10.4 The amount of the increase or decrease in the Contract Price from a Change Order, if any, shall be determined in one or more of the following methods as applicable to a specific situation and at the Owner's discretion:

17.10.4.1 By Owner acceptance of a lump sum PCO with complete supporting backup and breakdown of all cost elements. Upon the Owner's written request, the Contractor shall furnish a detailed estimate of increase or decrease in costs, together with cost breakdowns and other support data within the time specified in such request. The Contractor shall be responsible for any additional costs caused by the Contractor's failure to provide the estimate within the time specified.

17.10.4.2 By the Owner, on the basis of the Owner's estimate of increase or decrease in costs;

17.10.4.3 By the Owner, whether or not negotiations are intitiated as provided herein, by actual and necessary costs, as determined by the Owner, on the basis of actual cost records. Beginning with the first day and at the end of each day, the Contractor shall furnish to the Owner detailed hourly records for labor, construction equipment, and services; and itemized records of materials and equipment used that day in performance of the changes. Such records shall be on a form acceptable to the Owner. Such records shall be signed by the Contractor and, when agreed to by the Owner, will become the basis for compensation for the changed work. Such agreement shall not preclude subsequent adjustment based upon later audit by the Owner;

17.10.4.4 By unit prices contained in Contract Documents, or subsequently agreed upon;

17.10.4.5 By a manner agreed upon by the Owner and the Contractor.

17.10.5 Allowable Costs: The only costs which will be allowed due to changes in the Work shall be computed in the following manner:

17.10.5.1 Labor: Compensation for labor shall include the applicable payroll cost for labor, including first level supervision providing physical construction labor directly engaged in performance of the changes. Others, who may be involved in the preparation of the change order, including, but not limited to supervisors, superintendent, engineers, or estimators, shall be considered as overhead costs under clause 17.10.5.4. Payroll

cost for labor shall be the General Prevailing Wage Rates applicable for this project and in the locality for performance of the changes. In addition to the published rates, only social security, worker compensation, state and federal taxes shall be included in the total payroll cost. Other costs shall be considered as mark-ups under clause 17.10.5.4. Use of classification which would increase labor costs will not be permitted.

17.10.5.2 Materials and Equipment: Compensation for materials and equipment shall include the necessary costs for materials and equipment directly required for performance of the changes. Cost of materials and equipment may include costs of transportation and delivery. If discounts by suppliers are available to the Contractor, they shall be credited to the Owner. If materials and equipment are obtained from a supply or source owned by, or in part, by the Contractor, payment therefore will not exceed current wholesale prices for such materials and equipment. If, in the opinion of the Owner, the cost of materials and equipment is excessive, or if the Contractor fails to furnish satisfactory evidence of costs from supplier, the cost of materials and equipment shall be the lowest current wholesale price at which similar materials and equipment are available in quantities required. The Owner reserves the right to furnish materials and equipment required for performance of the changes, and the Contractor shall have no claim for costs or mark-ups on such materials and equipment.

17.10.5.3 Construction Equipment;

17.10.5.3.1 Compensation for construction equipment shall include the necessary costs for use of equipment directly required for performance of the changes. Any use for less than 30 minutes shall be considered one-half hour. No costs will be allowed for time while construction equipment is inoperative, idle or on stand-by, for any reason, unless such times have been approved in advance by the Owner. Rental time for construction equipment moved by its own power shall include the time required to move equipment to the Work Site from the nearest available source for rental of such equipment, and time required to return such equipment to the source. If construction equipment is not moved by its own power, loading and transportation costs will be paid in lieu of such rental time. Neither moving time nor loading and transportation costs will be allowed if the equipment is used for any work other than the change. No allowance will be made for individual pieces of construction equipment and tools having a replacement value of $500 or less. No construction equipment costs will be recognized in excess of rental rates established by Cal-Trans Rental Rates in effect at the time of performance of the change.

17.10.5.3.2 Unless otherwise approved by the Owner, the allowable rate for use of construction equipment shall constitute full compensation to the Contractor for cost of fuel, power, oil, lubrication, supplies, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, labor except for construction equipment operators and any and all costs to the Contractor incidental to the use of such construction equipment.

17.10.4 Mark-ups for Added Work:

17.10.4.1 General: The following allowance for mark-ups for performance of the changes shall constitute full compensation for additional field and home office overhead, profit, insurance, taxes, and bonds, and other costs not covered under Clause 17.10.5.1 through 17.10.5.3.

17.10.4.2 **Contractor:** When work is added, the Contractor may request mark-up in addition to authorized allowable costs, a reasonable sum as compensation for the items identified in 17.10.5.3.1 above, subject to proof of entitlement based on actual job costs, actual job experience, the Contractor's bidding data, and industry custom and practice. Under no circumstance can this sum exceed the following percentages;

17.10.4.2.1 Contractor Labor ……..…15%, includes bond cost.

17.10.4.2.2 Contractor Materials and Equipment ..... 15%, includes bond cost.

17.10.4.2.3 Subcontractor Work …… 5% of Subcontractor's costs, includes bond cost.

17.10.4.3 **Subcontractors:** When work is added, the Subcontractor may claim mark-up in addition to authorized allowable costs, a reasonable sum as compensation for the items identified in Clause 17.10.5.4.1 above, subject to proof of entitlement based on actual job costs, actual job experience, the Subcontractor's bidding data, and industry custom and practice. Under no circumstance can this sum exceed the following percentages;

17.10.4.3.1 Subcontractor Labor …… 15%

17.10.4.3.2 Subcontractor Materials and Equipment …….. 15%

17.10.4.3.3 The aggregate mark-ups for all subcontract tiers shall not exceed 20% for labor, materials and equipment.

17.10.5 For Deleted Work: When the Owner is entitled to a credit for deleted work, the credit shall include direct labor, materials, and supervision plus overhead of the Contractor and Subcontractor, as applicable for the deleted work. Deleted overhead shall be computed as no less than 5% of the direct labor, materials and supervision, and should reflect the actual savings to the Contractor resulting from the deletion based upon actual job prices for the work at issue, actual job experience, the Contractor's bidding data for the project and industry custom and practice. For example, if a $10,000 item of work is deleted, the credit to the Owner would no less than $10,500.

17.10.6 For Combination of Added and Deleted Work: For Change Orders that involve both added and deleted work, the Contract Sum will be adjusted based on the following computation: Cost before mark-ups of added and deleted work shall each be separately estimated. If a difference between costs results in an increase to the Contract Sum, a mark-up for added work shall be applied to the difference. If a difference in costs results in a decrease, then the 5% credit to the Owner for deleted overhead set forth above shall be applied to the difference.

17.10.7 General Limitations: Costs to the Contractor for changes which exceed market values prevailing at the time of the change will not be allowed unless the Contractor establishes that all reasonable means for performance of the changes at prevailing maket values have been investigated and the excess cost could not be avoided. Notwithstanding actual charges to the Contractor on work performed or furnished by others, no mark-ups will be allowed in excess of those specified in clause 17.10.5.4 above

17.10.8 Cost Disallowance: Costs which will not be allowed or paid in Change Orders or Claim settlements under this agreement include, but are not limited to; Interest cost of any tupe other than those mandated by statute; Claim preparation or filing costs; Legal expenses; the costs of preparing or reviewing proposed Change Orders or Change Order proposals concerning Change Orders which are not issued by the Owner, Lost revenues; Lost profits; Lost income or earnings; Rescheduling costs; Costs of idled equipment when such equipment is not yet at the site or has not yet been employed on the work; Lost earnings or interest on unpaid retainage; Claims consulting costs; The costs of corporate officers or staff visiting the site or participating in meetings with the Owner; Any compensation due to the fluctuation of foreign currency conversions or exchange rates; or loss of other business.

17.11 Deductive Change Orders

All deductive Change Order(s) must be prepared pursuant to the provisions herein. If Contractor offers a proposed amount for a deductive Change Order(s), Contractor shall include a minimum of ten percent (10%) total profit and overhead to be deducted with the amount of the work of the Change Order(s). If Subcontractor work is involved, Subcontractors shall also include a minimum of Ten percent (10%) profit and overhead to be deducted with the amount of its deducted work. Any deviation from this provision shall not be allowed.

17.12 Discounts, Rebates, and Refunds

For purposes of determining the cost, if any, of any change, addition, or omission to the Work hereunder, all trade discounts, rebates, refunds, and all returns from the sale of surplus materials and equipment shall accrue and be credited to the Contractor, and the Contractor shall make provisions so that such discounts, rebates, refunds, and returns may be secured, and the amount thereof shall be allowed as a reduction of the Contractor's cost in determining the actual cost of construction for purposes of any change, addition, or omission in the Work as provided herein.

17.13 Accounting Records

With respect to portions of the Work performed by Change Orders and Construction Change Directives, the Contractor shall keep and maintain cost-accounting records satisfactory to the Owner, which shall be available to the Owner on the same terms as any other books and records the Contractor is required to maintain under the Contract Documents.

17.14 Notice Required

If the Contractor desires to request an increase in the Contract Price, or any extension in the Contract Time for completion, it shall notify the Owner pursuant to the provisions herein. No request shall be considered unless made in accordance with this subparagraph. Contractor shall proceed to execute the Work even though the adjustment may not have been agreed upon. Any change in the Contract Price or extension of the Contract Time resulting from such claim shall be authorized by a Change Order.

17.15 Applicability to Subcontractors

Any requirements under this Article shall be equally applicable to Change Orders or Construction Change Directives issued to Subcontractors by the Contractor to the extent as required by the Contract Documents.

17.16 Alteration to Change Order Language

Contractor shall not alter Change Orders or reserve time in Change Orders. Contractor shall execute finalized Change Orders and proceed under the provisions herein with proper notice.

17.17 Failure of Contractor to Execute Change Order

Contractor shall be in default of the Contract if Contractor fails to execute a Change Order when the Contractor agrees with the addition and/or deletion of the Work in that Change Order.

18 REQUEST FOR INFORMATION

18.10 Any Request for Information (RFI) shall reference all applicable Contract Document(s), including Specification section(s), detail(s), page number(s), drawing number(s), and sheet number(s), etc. The Contractor shall make suggestions and interpretations of the issue raised by each Request for Information. A Request for Information cannot modify the Contract Price, Contract Time, or the Contract Documents.

18.11 The Contractor shall be responsible for any costs incurred for professional services that Owner may deduct from any amounts owing to the Contractor, if a Request for Information requests an interpretation or decision of a matter where the information sought is equally available to the party making the request. Owner, at its sole discretion, shall deduct from and/or invoice Contractor for all the professional services arising herein.

18.12 Contractor shall use the Request for Information form included with the Contract Documents, and be responsible for entering all information into the Web Based Project Information Management system directly, as called for at section 01 31 00 – Project Management and Coordination.

19 PAYMENTS

19.10 Contract Price

The Contract Price is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

19.11 Applications for Progress Payments

19.11.4 Procedure for Applications for Progress Payments

19.11.4.1 Draft Application for Progress Payment

19.11.4.1.1 Not before the twenty-fifth (25th) day of each calendar month during the progress of the Work, Contractor shall submit to the Owner and the Architect three (3) copies of an itemized draft Application for Payment for operations completed in accordance with the Schedule of Values for the current month. This draft application shall include the following or each portion thereof as the Owner and/or the Architect requires:

19.11.4.1.1.1 The amount paid to-date to the Contractor, to all its Subcontractors, and all others furnishing labor, material, or equipment for its Contract;

19.11.4.1.1.2 The amount being requested under the Application for Payment by the Contractor on its own behalf and separately stating the amount requested on behalf of each of the Subcontractors and all others furnishing labor, material, and equipment under the Contract. Provide written backup from subcontractor's and vendors supporting that entity's request each month;

19.11.4.1.1.3 The balance that will be due to each of these entities after the currently requested payment is made;

19.11.4.1.1.4 An Itemized breakdown of work done for the purpose of requesting partial payment;

19.11.4.1.1.5 The additions to and subtractions from the Contract Price and Contract Time;

19.11.4.1.1.6 A total of the retentions held;

19.11.4.1.1.7 Material invoices, evidence of equipment purchases, rentals, and other support and details of cost as the Owner may require from time to time;

19.11.4.1.1.8 The percentage of completion of the Contractor's Work by line item;

19.11.4.1.1.9 Schedule of Values updated from the preceding Application for Payment;

19.11.4.1.1.10 Notwithstanding the fact that this document submitted by Contractor is a draft, the Contractor shall be subject to the False Claims Act set forth under Government Code section 12650 et seq., for information provided with any draft Application for Progress Payment.

19.11.4.2 Certified Application for Progress Payment

19.11.4.2.1 Within five (5) days of the Owner's approval of a draft Application for Progress Payment, Contractor shall submit to the Owner and the Architect three (3) copies of an itemized Certified Application for Payment for operations completed in accordance with the Schedule of Values for the month that is part of the Certified Application for Payment. This Certified Application for Payment shall be notarized, if required, and shall include the following or each portion thereof as the Owner and/or the Architect requires:

19.11.4.2.1.1 A final and complete statement of all the information required in the draft Application for Progress Payment;

19.11.4.2.1.2 An updated and acceptable construction schedule in conformance with the provisions herein;

19.11.4.2.1.3 A duly completed and executed conditional waiver and release upon progress payment compliant with Civil Code section 3262 from the Contractor and each subcontractor of any tier and supplier to be paid from the current progress payment;

19.11.4.2.1.4 A duly completed and executed unconditional waiver and release upon progress payment compliant with Civil Code section 3262 from the Contractor and each subcontractor of any tier and supplier that was paid from the previous progress payment;

19.11.4.2.1.5 If the Owner has an LCP in force on this Project and if not previously submitted as required herein, all remaining certified payroll record ("CPR(s)") for each journeyman, apprentice, worker, or other employee employed by the Contractor and/or each Subcontractor in connection with the Work for the period of the Application for Payment. As indicated herein, if the Owner has an LCP in force on this Project, the Owner shall not make any payment to Contractor until:

19.11.4.2.1.5.1 Contractor and/or its Subcontractor(s) provide CPRs acceptable to the Owner, and

19.11.4.2.1.5.2 The Owner is given sufficient time to review and/or audit the CPRs to determine their acceptability. Any delay in Contractor and/or its Subcontractor(s) providing CPRs to the Owner in a timely manner will directly delay the Owner's review and/or audit of the CPRs and Contractor's payment.

19.11.4.2.1.6 A certification that the Record Drawings and annotated Specifications are current, including a review by the Owner;

19.11.4.2.1.7 A certification by the Contractor of the following:

"*The Contractor warrants title to all Work performed as of the date of this payment application. The Contractor further warrants that all Work performed as of the date of this payment application is free and clear of liens, claims, security interests, or encumbrances in favor of the Contractor, Subcontractors, material and equipment suppliers, workers, or other persons or entities making a claim by reason of having provided labor, materials, and equipment relating to the Work, except those of which the Owner has been informed*."

19.11.4.2.1.8 The Contractor shall be subject to the False Claims Act set forth under Government Code section 12650 et seq., for information provided with any Application for Progress Payment.

19.11.5 Prerequisites for Progress Payments

19.11.5.1 First Payment Request: The following items, if applicable, must be completed before the Owner will accept and/or process the Contractor's first payment request:

19.11.5.1.1 Installation of the Project sign;

19.11.5.1.2 Installation of field office;

19.11.5.1.3 Installation of temporary facilities and fencing;

19.11.5.1.4 Schedule of Values;

19.11.5.1.5 Contractor's Construction Schedule;

19.11.5.1.6 Schedule of unit prices, if applicable;

19.11.5.1.7 Submittal Schedule;

19.11.5.1.8 Receipt by Architect of all submittals due as of the date of the payment application;

19.11.5.1.9 Copies of necessary permits;

19.11.5.1.10 Copies of authorizations and licenses from governing authorities;

19.11.5.1.11 Initial progress report;

19.11.5.1.12 Surveyor qualifications;

19.11.5.1.13 Written acceptance of Owner's survey of rough grading, if applicable;

19.11.5.1.14 List of all Subcontractors, with names, license numbers, telephone numbers, and Scope of Work;

19.11.5.1.15 All bonds and insurance endorsements; and

19.11.5.1.16 Resumes of Contractor's project manager, and if applicable, job site secretary, record documents recorder, and job site superintendent.

19.11.5.2 Not Used

19.11.5.3 No Waiver of Criteria. Any payments made to Contractor where criteria set forth herein have not been met shall not constitute a waiver of said criteria by Owner. Instead, such payment shall be construed as a good faith effort by Owner to resolve differences so Contractor may pay its Subcontractors and suppliers. Contractor agrees that failure to submit such items may constitute a breach of contract by Contractor and may subject Contractor to termination.

19.12 **Progress Payments**

19.12.4 Owner's Approval of draft Application for Payment

19.12.4.1 Upon receipt of a draft Application for Payment, the Owner shall act in accordance with both of the following:

19.12.4.1.1 Each draft Application for Payment shall be reviewed by the Owner as soon as practicable after receipt for the purpose of determining that the draft Application for Payment is a proper draft Application for Payment.

19.12.4.1.2 Any draft Application for Payment determined not to be a proper draft Application for Payment suitable for payment shall be returned to the Contractor as soon as practicable, but not later than seven (7) days, after receipt. A draft Application for Payment returned pursuant to this paragraph shall be accompanied by a document setting forth in writing the reasons why the draft Application for Payment is not proper. The number of days available to the Owner to make a payment without incurring interest pursuant to this section shall be reduced by the number of days by which the Owner exceeds this seven-day return requirement.

19.12.4.1.3 A draft Application for Payment shall be considered properly executed if funds are available for payment of the draft Application for Payment, and payment is not delayed due to an audit inquiry by the financial officer of the Owner.

19.12.4.2 The Owner's review of the Contractor's draft Application for Payment will be based on the Owner's and the Construction Managers observations at the Site and the data comprising the draft Application for Payment that the Work has progressed to the point indicated and that, to the best of the Owner's and the Architect's knowledge, information, and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to:

19.12.4.2.1 Observation of the Work for general conformance with the Contract Documents,

19.12.4.2.2 Results of subsequent tests and inspections,

19.12.4.2.3 Minor deviations from the Contract Documents correctable prior to completion, and

19.12.4.2.4 Specific qualifications expressed by the Architect.

19.12.5 Owner's approval of the certified Application for Payment shall be based on Contractor complying with all requirements for a fully complete and valid certified Application for Payment.

19.12.6 Payments to Contractor

19.12.6.1 Within thirty (30) days after approval of the certified Application for Payment, Contractor shall be paid a sum equal to ninety five percent (95%) of the value of the Work performed (as verified by Architect and Inspector and certified by Contractor) up to the last day of the previous month, less the aggregate of previous payments and amount to be withheld. The value of the Work completed shall be Contractor's best estimate. No inaccuracy or error in said estimate shall operate to release the Contractor, or any Surety upon any bond, from damages arising from such Work, or from the Owner's right to enforce each and every provision of this Contract, and the Owner shall have the right subsequently to correct any error made in any estimate for payment.

19.12.6.2 The Contractor shall not be entitled to have any payment requests processed, or be entitled to have any payment made for Work performed, so long as any lawful or proper direction given by the Owner concerning the Work, or any portion thereof, remains incomplete.

19.12.6.3 If the Owner fails to make any progress payment within thirty (30) days after receipt of an undisputed and properly submitted Application for Payment from the Contractor, the Owner shall pay interest to the Contractor equivalent to the legal rate set forth in subdivision (a) of Section 685.010 of the Code of Civil Procedure.

19.12.7 No Waiver

No payment by Owner hereunder shall be interpreted so as to imply that Owner has inspected, approved, or accepted any part of the Work. Notwithstanding any payment, the Owner may enforce each and every provision of this Contract. The Owner may correct or require correction of any error subsequent to any payment.

19.12.8 Warranty of Title

19.12.9 If a lien or a claim based on a stop notice of any nature should at any time be filed against the Work or any Owner property, by any entity that has supplied material or services at the request of the Contractor, Contractor and Contractor's Surety shall promptly, on demand by Owner and at Contractor's and Surety's own expense, take any and all action necessary to cause any such lien or a claim based on a stop notice to be released or discharged immediately therefrom.

19.12.10 If the Contractor fails to furnish to the Owner within ten (10) calendar days after demand by the Owner, satisfactory evidence that a lien or a claim based on a stop notice has been so released, discharged, or secured, the Owner may discharge such indebtedness and deduct the amount required therefor, together with any and all losses, costs, damages, and attorney's fees and expense incurred or suffered by Owner from any sum payable to Contractor under the Contract.

19.13 **Decisions to Withhold Payment**

19.13.4 Reasons to Withhold Payment

The Owner may withhold payment in whole, or in part, to the extent reasonably necessary to protect the Owner if, in the Owner's opinion, the representations to the Owner required herein cannot be made. The Owner may withhold payment, in whole, or in part, to such extent as may be necessary to protect the Owner from loss because of, but not limited to:

19.13.4.1 Defective Work not remedied within **FORTY-EIGHT (48)** hours of written notice to Contractor;

19.13.4.2 Stop Notices or other liens served upon the Owner as a result of the Contract;

19.13.4.3 Liquidated damages assessed against the Contractor;

19.13.4.4 The cost of completion of the Contract if there exists reasonable doubt that the Work can be completed for the unpaid balance of the Contract Price or by the completion date;

19.13.4.5 Damage to the Owner or other contractor(s);

19.13.4.6 Unsatisfactory prosecution of the Work by the Contractor;

19.13.4.7 Failure to store and properly secure materials;

19.13.4.8 Failure of the Contractor to submit, on a timely basis, proper, sufficient, and acceptable documentation required by the Contract Documents, including, without limitation, a Construction Schedule, Schedule of Submittals, Schedule of Values, Monthly Progress Schedules, Shop Drawings, Product Data and samples, Proposed product lists, executed Change Orders, and/or verified reports;

19.13.4.9 Failure of the Contractor to maintain Record Drawings;

19.13.4.10 Erroneous estimates by the Contractor of the value of the Work performed, or other false statements in an Application for Payment;

19.13.4.11 Unauthorized deviations from the Contract Documents;

19.13.4.12 Failure of the Contractor to prosecute the Work in a timely manner in compliance with the Construction Schedule, established progress schedules, and/or completion dates;

19.13.4.13 If the Owner has an LCP in force on this Project, the failure to provide certified payroll records acceptable to the Owner for each journeyman, apprentice, worker, or other employee employed by the Contractor and/or each Subcontractor in connection with the Work for the period of the Application for Payment;

19.13.4.14 Failure to properly pay prevailing wages as defined in Labor Code section 1720 et seq., failure to comply with any other Labor Code requirements, and/or failure to comply with the Owner's LCP, if one is in force on this Project;

19.13.4.15 Failure to properly maintain or clean up the Site;

19.13.4.16 Payments to indemnify, defend, or hold harmless the Owner;

19.13.4.17 Any payments due to the Owner, including but not limited to payments for failed tests, utilities changes, or permits;

19.13.4.18 Failure to pay Subcontractor(s) or supplier(s) as required by law and by the Contract Documents;

19.13.4.19 Contractor is otherwise in breach, default, or in substantial violation of any provision of this Contract.

19.13.5 Reallocation of Withheld Amounts

19.13.5.1 Owner may, in its discretion, apply any withheld amount to pay outstanding claims or obligations as defined herein. In so doing, Owner shall make such payments on behalf of Contractor. If any payment is so made by Owner, then that amount shall be considered a payment made under Contract by Owner to Contractor and Owner shall not be liable to Contractor for any payment made in good faith. These payments may be made without prior judicial determination of claim or obligation. Owner will render Contractor an accounting of funds disbursed on behalf of Contractor.

19.13.5.2 If Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents or fails to perform any provision thereof, Owner may, after **FORTY-EIGHT (48)** hours written notice to the Contractor and, without prejudice to any other remedy, make good such deficiencies. The Owner shall adjust the total Contract Price by reducing the amount thereof by the cost of making good such deficiencies if Owner deems it inexpedient to correct Work that is damaged, defective, or not done in accordance with Contract provisions, an equitable reduction in the Contract Price (of at least one hundred twenty-five percent (125%) of the estimated reasonable value of the nonconforming Work) shall be made therefore.

19.13.6 Payment After Cure

When Contractor removes the grounds for declining approval, payment shall be made for amounts withheld because of them. No interest shall be paid on any retainage or amounts withheld due to the failure of the Contractor to perform in accordance with the terms and conditions of the Contract Documents.

19.14 **Subcontractor Payments**

19.14.4 Payments to Subcontractors

No later than ten (10) days after receipt, or pursuant to Business and Professions Code section 7108.5 and Public Contract Code section 7107, the Contractor shall pay to each Subcontractor, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to its Sub-subcontractors in a similar manner.

19.14.5 No Obligation of Owner for Subcontractor Payment

The Owner shall have no obligation to pay, or to see to the payment of, money to a Subcontractor except as may otherwise be required by law.

19.14.6 Joint Checks

Owner shall have the right in its sole discretion, if necessary for the protection of the Owner, to issue joint checks made payable to the Contractor and Subcontractors and material or equipment suppliers. The joint check payees shall be responsible for the allocation and disbursement of funds included as part of any such joint payment. In no event shall any joint check payment be construed to create any contract between the Owner and a Subcontractor of any tier, any obligation from the Owner to such Subcontractor, or rights in such Subcontractor against the Owner.

20 COMPLETION OF THE WORK

20.10 Completion

20.10.4 Owner will accept completion of Contract and have the Notice of Completion recorded when the entire Work shall have been completed to the satisfaction of Owner.

20.10.5 The Work may only be accepted as complete by action of the director and/or governing board of the Owner.

20.10.6 Owner, at its sole option, may accept completion of Contract and have the Notice of Completion recorded when the entire Work shall have been completed to the satisfaction of Owner, except for minor corrective items, as distinguished from incomplete items. If Contractor fails to complete all minor corrective items within thirty (30) days after the date of the Owner's acceptance of completion, Owner shall withhold from the final payment one hundred fifty percent (150%) of an estimate of the amount sufficient to complete the corrective items, as determined by Owner, until the item(s) are completed.

20.10.7 At the end of the thirty-five (35) day period, if there are any items remaining to be corrected, Owner may elect to proceed as provided herein related to adjustments to Contract Price, and/or Owner's right to perform the Work of the Contractor.

20.11 Close-Out Procedures

20.11.4 Punch List

The Contractor shall notify the Architect when Contractor considers the Work complete. Upon notification, Architect will prepare a list of minor items to be completed or corrected ("Punch List"). The Contractor and/or its Subcontractors shall proceed promptly to complete and correct items on the Punch List. Failure to include an item on Punch List does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

20.11.5 Close-Out Requirements

20.11.5.1 Utility Connections

Buildings shall be connected to water, gas, sewer, and electric services, complete and ready for use. Service connections shall be made and existing services reconnected.

20.11.5.2 Record Drawings

20.11.5.2.1 Contractor shall provide exact "as-built" Record Drawings of the Work upon completion of the Project as indicated in the Specifications.

20.11.5.2.2 Contractor is liable and responsible for any and all inaccuracies in as-built Record Drawings, even if inaccuracies become evident at a future date.

20.11.5.2.3 Upon completion of the Work and as a condition precedent to approval of final payment, Contractor shall obtain the Inspector's approval of the corrected prints and employ a competent draftsman to transfer the "as-built" information to the most current version of AutoCad that is, at that time, currently utilized for plan check submission by either the Owner, the Architect, and/or the Construction Manager, and print a complete set of prints. When completed, Contractor shall

deliver corrected prints and diskette/CD/other data storage device with AutoCad and/or Revit file to the Owner.

20.11.5.2.4 Contractor shall provide all updates to the Architect's Revit Model to reflect the final as-built location of all MEP, structural, and underground elements resulting from the MEP Coordinated Shop Drawing process and all final field fit locations of improvements. Revit Model shall be modified and provided to Owner in the same version as started by the Architect. All MEP elements in the model shall be labeled with sizes, service, and references to the equipment schedule items.

20.11.5.3 Maintenance Manuals: Contractor shall prepare all operation and maintenance manuals and date as indicated in the Specifications.

20.11.5.4 Reference Division 1 and Technical Specifications for additional closeout requirements.

20.12 Final Inspection

20.12.4 Contractor shall comply with Punch List procedures as provided herein, and maintain the presence of a Project Superintendent and Project Manager until the Punch List is complete to ensure proper and timely completion of the Punch List. Under no circumstances shall Contractor demobilize its forces prior to completion of the Punch List. Upon receipt of Contractor's written notice that all of the Punch List items have been fully completed and the Work is ready for final inspection and acceptance, Architect and Construction Manager will inspect the Work and shall submit to Contractor and Owner a final inspection report noting the Work, if any, required in order to complete in accordance with the Contract Documents. Absent unusual circumstances, this report shall consist of the Punch List items not yet satisfactorily completed.

20.12.5 Upon Contractor's completion of all items on the Punch List and any other uncompleted portions of the Work, the Contractor shall notify the Owner and Architect, who shall again inspect such Work. If the Architect finds the Work complete and acceptable under the Contract Documents, the Architect will notify Contractor, who shall then jointly submit to the Architect and the Owner its final Application for Payment.

20.12.6 Final Inspection Requirements

20.12.6.1 Before calling for final inspection, Contractor shall determine that the following have been performed:

20.12.6.1.1 The Work has been completed.

20.12.6.1.2 All life safety items are completed and in working order.

20.12.6.1.3 Mechanical and electrical Work are complete and tested, fixtures are in place, connected, and ready for tryout.

20.12.6.1.4 Electrical circuits scheduled in panels and disconnect switches labeled.

20.12.6.1.5 Painting and special finishes complete.

20.12.6.1.6 Doors complete with hardware, cleaned of protective film, relieved of sticking or binding, and in working order.

20.12.6.1.7 Tops and bottoms of doors sealed.

20.12.6.1.8 Floors waxed and polished as specified.

20.12.6.1.9 Broken glass replaced and glass cleaned.

20.12.6.1.10 Grounds cleared of Contractor's equipment, raked clean of debris, and trash removed from Site.

20.12.6.1.11 Work cleaned, free of stains, scratches, and other foreign matter, of damaged and broken material replaced.

20.12.6.1.12 Finished and decorative work shall have marks, dirt, and superfluous labels removed.

20.12.6.1.13 Final cleanup, as provided herein.

20.13 **Costs of Multiple Inspections**

More than two (2) requests of the Owner to make a final inspection shall be considered an additional service of Owner, Architect, Construction Manager, and/or Project Inspector, and all subsequent costs will be invoiced to Contractor and funds withheld from remaining payments.

20.14 **Partial Occupancy or Use Prior to Completion**

20.14.4 Owner's Rights

The Owner may occupy or use any completed or partially completed portion of the Work at any stage. The Owner and the Contractor shall agree in writing to the responsibilities assigned to each of them for payments, security, maintenance, heat, utilities, damage to the Work, insurance, the period for correction of the Work, and the commencement of warranties required by the Contract Documents. Any dispute as to responsibilities shall be resolved pursuant to the Claims and Disputes provisions herein, with the added provision that during the dispute process, the Owner shall have the right to occupy or use any portion of the Work that it desires to.

20.14.5 Inspection Prior to Occupancy or Use

Immediately prior to partial occupancy or use, the Owner, the Contractor, and the Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

20.14.6 No Waiver

Unless otherwise agreed upon, partial or entire occupancy or use of a portion or portions of the Work shall not constitute beneficial occupancy or acceptance of the Work not complying with the requirements of the Contract Documents.

21 FINAL PAYMENT AND RETENTION

21.10 Final Payment

Upon receipt and approval of a valid and final Application for Payment, the Architect will issue a final Certificate of Payment. The Owner shall thereupon jointly inspect the Work and either accept the Work as complete or notify the Architect and the Contractor in writing of reasons why the Work is not complete. Upon acceptance of the Work of the Contractor as fully complete (that, absent unusual circumstances, will occur when the Punch List items have been satisfactorily completed), the Owner shall record a Notice of Completion with the County Recorder, and the Contractor shall, upon receipt of final payment from the Owner, pay the amount due Subcontractors.

21.11 **Prerequisites for Final Payment** The following conditions must be fulfilled prior to Final Payment:

21.11.4 A full and final waiver or release of all Stop Notices in connection with the Work shall be submitted by Contractor, including a release of Stop Notice in recordable form, together with (to the extent permitted by law) a copy of the full and final release of all Stop Notice rights.

21.11.5 A duly completed and executed conditional waiver and release upon final payment compliant with Civil Code section 3262 from the Contractor and each subcontractor of any tier and supplier to be paid from the current progress payment;

21.11.6 A duly completed and executed unconditional waiver and release upon progress payment compliant with Civil Code section 3262 from the Contractor and each subcontractor of any tier and supplier that was paid from the previous progress payment; and

21.11.7 The Contractor shall have made all corrections to the Work that are required to remedy any defects therein, to obtain compliance with the Contract Documents or any requirements of applicable codes and ordinances, or to fulfill any of the orders or directions of Owner required under the Contract Documents.

21.11.8 Each Subcontractor shall have delivered to the Contractor all written guarantees, warranties, applications, and bonds required by the Contract Documents for its portion of the Work.

21.11.9 Contractor must have completed all requirements set forth under “Close Out Procedures,” Including, without limitation, an approved set of complete “as-built” Record Drawings.

21.11.10 Architect shall have issued its written approval that final payment can be made.

21.11.11 The Contractor shall have delivered to the Owner all manuals and materials required by the Contract Documents.

21.11.12 The Contractor shall have completed final clean up as provided herein.

21.12 **Retention**

21.12.4 The retention, less any amounts disputed by the Owner or that the Owner has the right to withhold pursuant to provisions herein, shall be paid:

21.12.4.1 After approval of the Owner of Final Certificate of Payment,

21.12.4.2 After the satisfaction of the conditions set forth herein, and

21.12.4.3 After thirty-five (35) days after the recording of the Notice of Completion by Owner.

21.12.5 No interest shall be paid on any retention, or on any amounts withheld due to a failure of the Contractor to perform, in accordance with the terms and conditions of the Contract Documents, except as provided to the contrary in any Escrow Agreement between the Owner and the Contractor pursuant to Public Contract Code section 22300.

21.13 **Substitution of Securities** The Owner NOT will permit the substitution of securities in accordance with the provisions of Public Contract Code section 22300.

22 UNCOVERING OF WORK

If a portion of the Work is covered without Inspector or Architect approval or not in compliance with the Contract Documents, it must, if required in writing by the Owner, the Project Inspector, or the Architect, be uncovered for the Project Inspector's or the Architect's observation and be replaced at the Contractor's expense without change in the Contract Price or Contract Time.

23 NONCONFORMING WORK AND CORRECTION OF WORK

23.10 Nonconforming Work

23.10.4 Contractor shall promptly remove from Premises all Work identified by Owner as failing to conform to the Contract Documents whether incorporated or not. Contractor shall promptly replace and re-execute its own Work to comply with the Contract Documents without additional expense to the Owner and shall bear the expense of making good all work of other contractors destroyed or damaged by any removal or replacement pursuant hereto and/or any delays to the Owner or other Contractors caused thereby.

23.10.5 If Contractor does not remove Work that Owner has identified as failing to conform to the Contract Documents within a reasonable time, not to exceed **FORTY-EIGHT (48)** hours, Owner may remove it and may store any material at Contractor's expense. If Contractor does not pay expense(s) of that removal within ten (10) days' time thereafter, Owner may, upon ten (10) days' written notice, sell any material at auction or at private sale and shall deduct all costs and expenses incurred by the Owner and/or Owner may withhold those amounts from payment(s) to Contractor.

23.11 Correction of Work

23.11.4 Correction of Rejected Work

Pursuant to the notice provisions herein, the Contractor shall promptly correct the Work rejected by the Owner, the Architect, or the Project Inspector as failing to conform to the requirements of the Contract Documents, whether observed before or after Completion and whether or not fabricated, installed, or completed. The Contractor shall bear costs of correcting the rejected Work, including additional testing, inspections, and compensation for the Inspector's or the Architect's services and expenses made necessary thereby.

23.11.5 One-Year Warranty Corrections

If, within one (1) year after the date of Completion of the Work or a designated portion thereof, or after the date for commencement of warranties established hereunder, or by the terms of an applicable special warranty required by the Contract Documents, any of the Work

is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so. This period of one (1) year shall be extended with respect to portions of the Work first performed after Completion by the period of time between Completion and the actual performance of the Work. This obligation hereunder shall survive acceptance of the Work under the Contract and termination of the Contract. The Owner shall give such notice promptly after discovery of the condition.

23.11.6 Owner's Rights if Contractor Fails to Correct

If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it after **FORTY-EIGHT (48)** hours written notice, pursuant to the applicable provisions in these General Conditions regarding the Owner's right to perform work.

24 TERMINATION AND SUSPENSION

24.10 Owner's Right to Terminate Contractor for Cause

24.10.4 Grounds for Termination The Owner, in its sole discretion, may terminate the Contract and/or terminate the Contractor's right to perform the work of the Contract based upon the following:

24.10.4.1 Contractor refuses or fails to execute the Work or any separable part thereof with sufficient diligence as will ensure its completion within the time specified or any extension thereof, or

24.10.4.2 Contractor fails to complete said Work within the time specified or any extension thereof, or

24.10.4.3 Contractor persistently fails or refused to perform Work or provide material of sufficient quality as to be in compliance with Contract Documents; or

24.10.4.4 Contractor files a petition for relief as a debtor, or a petition is filed against the Contractor without its consent, and the petition not dismissed within sixty (60) days; or

24.10.4.5 Contractor makes a general assignment for the benefit of its creditors, or a receiver is appointed on account of its insolvency; or

24.10.4.6 Contractor persistently or repeatedly refuses fails, except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials to complete the Work in the time specified; or

24.10.4.7 Contractor fails to make prompt payment to Subcontractors, or for material, or for labor; or

24.10.4.8 Contractor persistently disregards laws, or ordinances, or instructions of Owner; or

24.10.4.9 Contractor fails to supply labor, including that of Subcontractors, that can work in harmony with all other elements of labor employed or to be employed on the Work; or

24.10.4.10 Contractor or its Subcontractor(s) is/are otherwise in breach, default, or in substantial violation of any provision of this Contract.

24.10.5 Notification of Termination

24.10.5.1 Upon the occurrence at Owner's sole determination of any of the above conditions, Owner may, without prejudice to any other right or remedy, serve written notice upon Contractor and its Surety of Owner's termination of this Contract and/or the Contractor's right to perform the work of the Contract. This notice will contain the reasons for termination. Unless, within three (3) days after the service of the notice, any and all condition(s) shall cease, and any and all violation(s) shall cease, or arrangement satisfactory to Owner for the correction of the condition(s) and/or violation(s) be made, this Contract shall cease and terminate. Upon Determination, Contractor shall not be entitled to receive any further payment until the entire Work is finished.

24.10.5.2 Upon Termination, Owner may immediately serve written notice of tender upon Surety whereby Surety shall have the right to take over and perform this Contract only if Surety:

24.10.5.2.1 Within three (3) days after service upon it of the notice of tender, gives Owner written notice of Surety's intention to take over and perform this Contract; and

24.10.5.2.2 Commences performance of this Contract within (three (3) days from date of serving of its notice to Owner.

24.10.5.3 If Surety fails to notify Owner or begin performance as indicated herein, Owner may take over the Work and execute the Work to completion by any method it may deem advisable at the expense of Contractor and/or its Surety. Contractor and/or its Surety shall be liable to Owner for any excess cost or other damages the Owner incurs thereby. Time is of the essence in this Contract. If the Owner takes over the Work as herein provided, Owner may, without liability for so doing, take possession of and utilize in completing the Work such materials, appliances, plan, and other property belonging to Contractor as may be on the Site of the Work, in bonded storage, or previously paid for.

24.10.6 Effect of Termination

24.10.6.1 Contractor shall, only if ordered to do so by the Owner, immediately remove from the Site all or any materials and personal property belonging to Contractor that have not been incorporated in the construction of the Work, or which are not in place in the Work. The Owner retains the right, but not the obligation, to keep and use any materials and personal property belonging to Contractor that have not been incorporated in the construction of the Work, or which are not in place in the Work. The Contractor and its Surety shall be liable upon the performance bond for all damages caused the Owner by reason of the Contractor's failure to complete the Contract.

24.10.6.2 In the event that the Owner shall perform any portion of, or the whole of the Work, pursuant to the provisions of the General Conditions, the Owner shall not be liable nor account to the Contractor in any way for the time within which, or the manner in which, the Work is performed by the Owner or for any changes the Owner may make in the Work or for the money expended by the Owner in satisfying claims and/or suits and/or other obligations in connection with the Work.

24.10.6.3 In the event that the Contract is terminated for any reason, no allowances or compensation will be granted for the loss of any anticipated profit by the Contractor.

24.10.6.4 If the expense to the Owner to finish the Work exceeds the unpaid Contract Price, Contractor and Surety shall pay difference to Owner within twenty-one (21) days of Owner's request.

24.10.6.5 The Owner shall have the right (but shall have no obligation) to assume and/or assign to a general contractor or construction manager or other third party who is qualified and has sufficient resources to complete the Work, the rights of the Contractor under its subcontracts with any or all Subcontractors. In the event of an assumption or assignment by the Owner, no Subcontractor shall have any claim against the Owner or third party for Work performed by Subcontractor or other matters arising prior to termination of the Contract.

The Owner or any third party, as the case may be, shall be liable only for obligations to the Subcontractor arising after assumption or assignment. Should the Owner so elect, the Contractor shall execute and deliver all documents and take all steps, including the legal assignment of its contractual rights, as the Owner may require, for the purpose of fully vesting in the Owner the rights and benefits of it Subcontractor under Subcontracts or other obligations or commitments. All payments due the Contractor hereunder shall be subject to a right of offset by the Owner for expenses and damages suffered by the Owner as a result of any default, acts, or omissions of the Contractor. Contractor must include this assignment provision in all of its contracts with its Subcontractors.

24.10.6.6 The foregoing provisions are in addition to and not in limitation of any other rights or remedies available to Owner.

24.10.7 Emergency Termination of Public Contracts Act of 1949

24.10.7.1 This Contract is subject to termination as provided by sections 4410 and 4411 of the Government Code of the State of California, being a portion of the Emergency Termination of Public Contracts Act of 1949.

24.10.7.1.1 Section 4410 of the Government Code states:

In the event a national emergency occurs, and public work, being performed by contract, is stopped, directly or indirectly, because of the freezing or diversion of materials, equipment or labor, as the result of an order or a proclamation of the President of the United States, or of an order of any federal authority, and the circumstances or conditions are such that it is impracticable within a reasonable time to proceed with a substantial portion of the work, then the public agency and the contractor may, by written agreement, terminate said contract.

24.10.7.1.2 Section 4411 of the Government Code states:

Such an agreement shall include the terms and conditions of the termination of the contract and provision for the payment of compensation or money, if any, which either party shall pay to the other or any other person, under the facts and circumstances in the case.

24.10.7.2 Compensation to the Contractor shall be determined at the sole discretion of Owner on the basis of the reasonable value of the Work done, including preparatory work. As an exception to the foregoing and at the Owner's discretion, in the case of any fully completed separate item or portion of the Work for which there is a separate previously submitted unit price or item on the accepted schedule of values, that price shall control. The Owner, at its sole discretion, may adopt the Contract Price as the reasonable value of the work done or any portion thereof.

24.11 **Termination of Contractor for Convenience**

24.11.4 Owner in its sole discretion may terminate the Contract upon three (3) days written notice to the Contractor. Under a termination for convenience, the Owner retains the right to all the options available to the Owner if there is a termination for cause. In case of a termination for convenience, the Contractor shall have no claims against the Owner except:

24.11.4.1 The actual cost for labor, materials, and services performed that is unpaid and can be documented through timesheets, invoices, receipts, or otherwise, and

24.11.4.2 Five percent (5%) of the total cost of work performed as of the date of termination or five percent (5%) of the value of the Work yet to be performed, whichever is less. This five percent (5%) amount shall be full compensation for all Contractors' and its Subcontractor(s)' mobilization and/or demobilization costs and any anticipated loss profits resulting from termination of the Contractor for convenience.

25 CLAIMS AND DISPUTES

25.10 Performance During Claim Process

The Contractor shall continue to perform its Work under the Contract and shall not cause a delay of the Work during any dispute, claims definition, negotiation, mediation, or arbitration proceeding, except by written agreement by the Owner.

25.11 Definition of Claim

25.11.4 For purposes of this section, a claim means a separate demand by the Contractor for:

25.11.4.1 A time extension,

25.11.4.2 Payment of money or damages arising from Work done by or on behalf of the Contractor pursuant to the Contract and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to, or

25.11.4.3 Payment of money that the Owner disputes is owing.

25.12 Claim Presentations

25.12.4 If Contractor intends to claim an increase in the Contract Price or Contract Time for any reason including, without limitation, the acts of Owner or its agents, Contractor shall, within ten (10) days after the event giving rise to the claim, give notice of the claim in writing and submit to the Owner a written statement of the damage sustained or time requested. On or before twenty (20) days after Contractor's written notice of claim, Contractor shall file with the Owner an itemized statement of the details and amounts of its claim for any increase in the Contract Price of Contract Time. Contractor must timely submit the Notice of Claim and the substantiating documentation for any claim. Otherwise, Contractor shall have waived and relinquished its claim against the Owner and Contractor's claims for compensation or an extension of time shall be forfeited and invalidated, and Contractor shall not be entitled to consideration for payment or time on account of the instant matter.

25.12.5 The attention of the Contractor is drawn to Government Code section 12650, et seq. regarding penalties for false claims.

25.12.6 Contractor shall file with the Owner any written claim, including the documents necessary to substantiate it, on or before the day of final payment on the Contract.

25.12.7 The Contractor shall bind all its Subcontractors, material persons, and suppliers to the provisions of this section on mediation and arbitration and will hold the Owner harmless against disputes and claims by Subcontractors, material persons, or suppliers.

25.13 **Claim Resolution**

25.13.4 In the event of a dispute between the parties as to performance of the Work, the interpretation of this Contract, or payment or nonpayment for Work performed or not performed, the parties shall attempt to resolve the dispute by those procedures set forth in Public Contract Code section 20104, if applicable. Pending resolution of the dispute, if the dispute is not resolved, Contractor agrees it will neither rescind the Contract nor stop the progress of the Work, but will allow determination by the court of the State of California in the county in which the Owner is located, to wit, the County of Butte, after the Project has been completed, and not before.

25.13.5 Public Works Claims of $375,000 or Less

25.13.5.1 For all public works claims of three hundred seventy-five thousand dollars ($375,000) or less which arise between a Contractor and a local agency, the procedure set forth in Public Contract Code section 20104 et seq. shall apply:

25.13.5.1.1 For claims of less than fifty thousand dollars ($50,000), the Owner shall respond in writing within forty-five (45) days of receipt of the claim or may request in writing within thirty (30) days of receipt of the claim any additional documentation supporting the claim or relating to defenses or claims the Owner may have against the claimant.

25.13.5.1.1.1 If additional information is required, it shall be requested and provided by mutual agreement of the parties.

25.13.5.1.1.2 The Owner's written response to the documented claim shall be submitted to the claimant within fifteen (15) days after receipt of the further documentation or within a period of time no greater than that taken by the claimant to produce the additional information, whichever is greater.

25.13.5.1.2 For claims of over fifty thousand dollars ($50,000) and less than or equal to three hundred Seventy-five thousand dollars ($375,000), the Owner shall respond in writing to all written claims within sixty (60) days of receipt of the claim, or may request, in writing, within thirty (30) days of receipt of the claim any additional documentation supporting the claim or relating to defenses or claims the Owner may have against the claimant.

25.13.5.1.2.1 If additional information is required, it shall be requested and provided upon mutual agreement of the Owner and the claimant.

25.13.5.1.2.2 The Owner's written response to the claim, as further documented, shall be submitted to the claimant within thirty (30) days after receipt of the further documentation, or within a period of time no greater than that taken by the claimant to produce the additional information or requested documentation, whichever is greater.

25.13.5.2 If the claimant disputes the Owner's written response, or the Owner fails to respond within the time prescribed, the claimant may so notify the Owner, in writing, either within fifteen (15) days of receipt of the Owner's response or within fifteen (15) days of the Owner's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the Owner shall schedule a meet and confer conference within thirty (30) days for settlement of the dispute.

25.13.5.3 Following the meeting and conference, if the claim or any portion of it remains in dispute, the claimant may file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions the running of the time within which a claim must be filed shall be tolled from the time the claimant submits its written claim until the time the claim is denied, including any period of time utilized by the meet and confer process.

25.13.5.4 For any civil action filed to resolve claims filed pursuant to this section, within sixty (60) days, but no earlier than thirty (30) days, following the filing of responsive pleadings, the court shall submit the matter to nonbinding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide for the selection within fifteen (15) days by both parties of a disinterested third person as mediator, shall be commenced within thirty (30) days of the submittal, and shall be concluded within fifteen (15) days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of both parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.

25.13.5.5 If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of the Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1141.11 of that code. The Civil Discovery Act of 1986, (Article 3 (commencing with Section 2016) of Chapter 3 of Title 3 of part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

25.13.5.6 The Owner shall not fail to pay money as to any portion of a claim which is undisputed except as otherwise provided in the Contract Documents. In any suit filed pursuant to this section, the Owner shall pay interest at the legal rate on any arbitration award or judgment. Interest shall begin to accrue on the date the suit is filed in a court of law.

25.13.6 Public Works Claims Over $375,000

25.13.6.1 For all claims of over three hundred seventy-five thousand dollars ($375,000) which arise between a Contractor and the Owner, the following procedure shall apply:

25.13.6.1.1 The parties agree to first endeavor to settle the dispute in an amicable manner by mediation under the Construction Industry Mediation Rules of the American Arbitration Association before having recourse to arbitration or a judicial forum. The claim or dispute shall be identified in writing to the Owner within thirty (30) days of discovery and shall be mediated within one hundred and twenty (120) days of discovery.

25.13.6.2 The parties further agree that all Contractors, Subcontractors, Sub-subcontractors, suppliers, and material persons whose portion of the Work amounts to five thousand dollars ($5,000) or more, and their insurers and their sureties, shall agree to mediation as the first method of dispute resolution on all claims in excess of three hundred seventy-five thousand dollars ($375,000).

26 LABOR, WAGE & HOUR, APPRENTICE, AND RELATED PROVISIONS

26.10 Labor Compliance Program

If the Project is at least partially funded with State bond, State Grant and or Federal Grant funding, then, pursuant to Labor Code section 1771.7, the Owner and/or its designee is operating a labor compliance program ("LCP") on this Project as indicated in the Labor Compliance Program Information and Forms. Contractor specifically acknowledges and understands that it shall perform the Work of this Agreement while complying with all the applicable provisions of the Owner's LCP, including, without limitation, the requirement that the Contractor and all of its Subcontractors shall timely submit complete and accurate certified payroll records every two (2) weeks, and in no case later than with each application for payment, or the Owner cannot issue payment. The following provisions indicated herein are specifically understood to be part of the Owner's LCP. If there is no LCP on this Project, the Contractor and its subcontractor(s) are still required to comply with all applicable provisions of the Labor Code and the obligation to provide certified payroll records to the Owner as indicated herein.

26.11 Wage Rates, Travel, and Subsistence

26.11.4 Pursuant to the provisions of article 2 (commencing at section 1770), chapter 1, part 7, division 2, of the Labor Code of California, the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work in the locality in which this public work is to be performed for each craft, classification, or type of worker needed to execute this Contract are on file at the Owner's principal office and copies will be made available to any interested party on request. Contractor shall obtain and post a copy of these wage rates at the job site.

26.11.5 Holiday and overtime work, when permitted by law, shall be paid for at a rate of at least one and one-half times the above specified rate of per diem wages, unless otherwise specified. The holidays upon which those rates shall be paid need not be specified by the Owner, but shall be all holidays recognized in the applicable collective bargaining agreement. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code.

26.11.6 Contractor shall pay and shall cause to be paid each worker engaged in Work on the Project not less than the general prevailing rate of per diem wages determined by the Director of the Department of Industrial Relations ("DIR") ("Director") and / or Federal Davis Bacon Act current wage rates, regardless of any contractual relationship which may be alleged to exist between Contractor or any Subcontractor and such workers.

26.11.7 If during the period this bid is required to remain open, the Director determines that there has been a change in any prevailing rate of per diem wages in the locality in which the Work under the Contract is to be performed, such change shall not alter the wage rates in the Notice to Bidders or the Contract subsequently awarded.

26.11.8 Pursuant to Labor Code section 1775, Contractor shall, as a penalty to Owner, forfeit the statutory amount (believed by the Owner to be currently fifty dollars ($50)) for each calendar day, or portion thereof, for each worker paid less than the prevailing rates, determined by the Owner and/or the Director, for the work or craft in which that worker is employed for any public work done under Contract by Contractor or by any Subcontractor under it. The difference between such prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which each

worker was paid less than the prevailing wage rate shall be paid to each worker by Contractor.

26.11.9 Any worker employed to perform Work on the Project, which Work is not covered by any classification listed in the general prevailing wage rate of per diem wages determined by the Director, shall be paid not less than the minimum rate of wages specified therein for the classification which most nearly corresponds to Work to be performed by him, and such minimum wage rate shall be retroactive to time of initial employment of such person in such classification.

26.11.10 Pursuant to Labor Code section 1773.1, per diem wages are deemed to include employer payments for health and welfare, pension, vacation, travel time, subsistence pay, and apprenticeship or other training programs authorized by section 3093, and similar purposes.

26.11.11 Contractor shall post at appropriate conspicuous points on the Site of Project, a schedule showing all determined minimum wage rates and all authorized deductions, if any, from unpaid wages actually earned. In addition, Contractor shall post a sign-in log for all workers and visitors to the Site, a list of all subcontractors of any tier on the Site, and the required Equal Employment Opportunity poster(s).

26.12 **Hours of Work**

26.12.4 As provided in article 3 (commencing at section 1810), chapter 1, part 7, division 2, of the Labor Code, eight (8) hours of labor shall constitute a legal days work. The time of service of any worker employed at any time by Contractor or by any Subcontractor on any subcontract under this Contract upon the Work or upon any part of the Work contemplated by this Contract shall be limited and restricted by Contractor to eight (8) hours per day, and forty (40) hours during any one week, except as hereinafter provided. Notwithstanding the provisions hereinabove set forth, Work performed by employees of Contractor in excess of eight (8) hours per day and forty (40) hours during any one week, shall be permitted upon this public work upon compensation for all hours worked in excess of eight (8) hours per day at not less than one and one-half times the basic rate of pay.

26.12.5 Contractor shall keep and shall cause each Subcontractor to keep an accurate record showing the name of and actual hours worked each calendar day and each calendar week by each worker employed by Contractor in connection with the Work or any part of the Work contemplated by this Contract. The record shall be kept open at all reasonable hours to the inspection of Owner and to the Division of Labor Standards Enforcement of the DIR.

26.12.6 Pursuant to Labor Code section 1813, Contractor shall as a penalty to the Owner forfeit the statutory amount (believed by the Owner to be currently twenty-five dollars ($25)) for each worker employed in the execution of this Contract by Contractor or by any Subcontractor for each calendar day during which such worker is required or permitted to work more than eight (8) hours in any one calendar day and forty (40) hours in any one calendar week in violation of the provisions of article 3 (commencing at section 1810), chapter 1, part 7, division 2, of the Labor Code.

26.12.7 Any Work necessary to be performed after regular working hours, or on Sundays or other holidays shall be performed without additional expense to the Owner.

26.13 **Payroll Records**

26.13.4 If the Owner has an LCP in force on this Project then, pursuant to the provisions of section 1776 of the Labor Code, notice is hereby given that Contractor shall prepare and provide to the Owner and shall cause each Subcontractor performing any portion of the Work under this Contract to prepare and provide to the Owner an accurate and certified payroll record ("CPR(s)"), showing the name, address, social security number, work classification, straight time, and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by the Contractor and/or each Subcontractor in connection with the Work.

26.13.4.1 The CPRs enumerated hereunder shall be certified and shall be provided to the Owner on a weekly basis. The CPRs from the Contractor and each Subcontractor for each week shall be provided on or before Wednesday of the week following the week covered by the CPRs. Owner shall not make any payment to Contractor until:

26.13.4.1.1 Contractor and/or its Subcontractor(s) provide CPRs acceptable to the Owner, and

26.13.4.1.2 The Owner is given sufficient time to review and/or audit the CPRs to determine their acceptability. Any delay in Contractor and/or its Subcontractor(s) providing CPRs to the Owner in a timely manner will directly delay the Owner's review and/or audit of the CPRs and Contractor's payment.

26.13.5 Whether or not the Owner has an LCP in force on this Project, all CPRs shall be available for inspection at all reasonable hours at the principal office of Contractor on the following basis:

26.13.5.1 A certified copy of an employee's CPR shall be made available for inspection or furnished to the employee or his/her authorized representative on request.

26.13.5.2 CPRs shall be made available for inspection or furnished upon request to a representative of Owner, Division of Labor Standards Enforcement, Division of Apprenticeship Standards, and/or the Department of Industrial Relations.

26.13.5.3 CPRs shall be made available upon request by the public for inspection or copies thereof made; provided, however, that a request by the public shall be made through the Owner, Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement. If the requested CPRs have not been provided pursuant to the provisions herein, the requesting party shall, prior to being provided the records reimburse the costs of preparation by Contractor, Subcontractors, and the entity through which the request was made. The public shall not be given access to the records at the principal office of Contractor.

26.13.6 The form of certification for the CPRs shall be as follows:

I, _____ (Name-Print), the undersigned, am the _____ (Position in business) with the authority to act for and on behalf of _____ (Name of business and/or Contractor), certify under penalty of perjury that the records or copies thereof submitted and consisting of _____ (Description, number of pages) are the originals or true, full, and correct copies of the originals which depict the payroll record(s) of actual disbursements by way of cash, check, or whatever form to the individual or individual named, and (b) we have complied with the

requirements of sections 1771, 1811, and 1815 for any work performed by our employees on the Project.

Date: _____ Signature: _____
(Section 16401 of the California Code of Regulations)

26.13.7 Each Contractor shall file a certified copy of the CPRs with the entity that requested the records within ten (10) days after receipt of a written request.

26.13.8 Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by Owner, Division of Apprenticeship Standards, or Division of Labor Standards Enforcement shall be marked or obliterated in such a manner as to prevent disclosure of an individual's name, address, and social security number. The name and address of Contractor awarded Contract or performing Contract shall not be marked or obliterated.

26.13.9 Contractor shall inform Owner of the location of the records enumerated hereunder, including the street address, city, and county, and shall, within five (5) working days, provide a notice of change of location and address.

26.13.10 In the event of noncompliance with the requirements of this section, Contractor shall have ten (10) days in which to comply subsequent to receipt of written notice specifying in what respects Contractor must comply with this section. Should noncompliance still be evident after the ten (10) day period, Contractor shall, as a penalty to Owner, forfeit twenty-five dollars ($25) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of Division of Apprenticeship Standards or Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due.

26.13.11 It shall be the responsibility of Contractor to ensure compliance with the provisions of Labor Code section 1776.

26.14 **Apprentices**

26.14.4 Contractor acknowledges and agrees that, if this Contract involves a dollar amount greater than or a number of working days greater than that specified in Labor Code section 1777.5, then this Contract is governed by the provisions of Labor Code Section 1777.5. It shall be the responsibility of Contractor to ensure compliance with this Article and with Labor Code section 1777.5 for all apprenticeship occupations.

26.14.5 Apprentices of any crafts or trades may be employed and, when required by Labor Code section 1777.5, shall be employed provided they are properly registered in full compliance with the provisions of the Labor Code.

26.14.6 Every such apprentice shall be paid the standard wage paid to apprentices under the regulations of the craft or trade at which he/she is employed, and shall be employed only at the work of the craft or trade to which she/he is registered.

26.14.7 Only apprentices, as defined in section 3077 of the Labor Code, who are in training under apprenticeship standards and written apprentice agreements under chapter 4 (commencing at section 3070), division 3, of the Labor Code, are eligible to be employed. The employment and training of each apprentice shall be in accordance with the provisions of the apprenticeship standards and apprentice agreements under which he/she is training.

26.14.8 Pursuant to Labor Code section 1777.5, if that section applies to this Contract as indicated above, Contractor and any Subcontractors employing workers in any apprenticeable craft or trade in performing any Work under this Contract shall apply to the applicable joint apprenticeship committee for a certificate approving the Contractor or Subcontractor under the applicable apprenticeship standards and fixing the ratio of apprentices to journeymen employed in performing the Work.

26.14.9 Pursuant to Labor Code section 1777.5, if that section applies to this Contract as indicated above, Contractor and any Subcontractor may be required to make contributions to the apprenticeship program.

26.14.10 If Contractor or Subcontractor willfully fails to comply with Labor Code section 1777.5, then, upon a determination of noncompliance by the Administrator of Apprenticeship, it shall:

26.14.10.1 Be denied the right to bid on any subsequent project for one (1) year from the date of such determination;

26.14.10.2 Forfeit as a penalty to Owner the full amount as stated in Labor Code section 1777.7. Interpretation and enforcement of these provisions shall be in accordance with the rules and procedures of the California Apprenticeship Council and under the authority of the Chief of the Division of Apprenticeship Standards.

26.14.11 Contractor and all Subcontractors shall comply with Labor Code section 1777.6, which section forbids certain discriminatory practices in the employment of apprentices.

26.14.12 Contractor shall become fully acquainted with the law regarding apprentices prior to commencement of the Work. Special attention is directed to sections 1777.5, 1777.6, and 1777.7 of the Labor Code, and title 8, California Code of Regulations, section 200 et seq. Questions may be directed to the State Division of Apprenticeship Standards, 455 Golden Gate Avenue, San Francisco, California 94102.

26.15 **Non-Discrimination**

26.15.4 Contractor herein agrees not to discriminate in its recruiting, hiring, promotion, demotion, or termination practices on the basis of race, religious creed, national origin, ancestry, sex, age, or physical handicap in the performance of this Contract and to comply with the provisions of the California Fair Employment and Housing Act as set forth in part 2.8 of division 3 of the California Government Code, commencing at section 12900; the Federal Civil Rights Act of 1964, as set forth in Public Law 88-352, and all amendments thereto; Executive Order 11246, and all administrative rules and regulations found to be applicable to Contractor and Subcontractor.

26.15.5 Special requirements for Federally Assisted Construction Contracts: During the performance of this Contract, Contractor agrees to incorporate in all subcontracts the provisions set forth in Chapter 60-1.4(b) of Title 41 published in Volume 33 No. 104 of the Federal Register dated May 28, 1968.

26.16 **Labor First Aid**

Contractor shall maintain emergency first aid treatment for Contractor's workers on the Project which complies with the Federal Occupational Safety and Health Act of 1970 (29 U.S.C. § 651 et

seq.) and the California Occupational Safety and Health Act of 1973 (8 Cal. Code of Regs., §1 et seq.).

27 MISCELLANEOUS

27.10 Assignment of Antitrust Actions

27.10.4 Section 7103.5(b) of the Public Contract Code states:

> In entering into a public works contract or subcontract to supply goods, services, or materials pursuant to a public works contract, the Contractor or subcontractor offers and agrees to assign to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commending with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, made and become effective at the time the awarding body tenders final payment to the Contractor, without further acknowledgment by the parties.

27.10.5 Section 4552 of the Government Code states:

> In submitting a bid to a public purchasing body, the bidder offers and agrees that if the bid is accepted, it will assign to the purchasing body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the bidder for sale to the purchasing body pursuant to the bid. Such assignment shall be made and become effective at the time the purchasing body tenders final payment to the bidder.

27.10.6 Section 4553 of the Government Code states:

> If an awarding body or public purchasing body receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under this chapter, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the public body any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the public body as part of the bid price, less the expenses incurred in obtaining that portion of the recovery.

27.10.7 Section 4554 of the Government Code states:

> Upon demand in writing by the assignor, the assignee shall, within one year from such demand, reassign the cause of action assigned under this part if the assignor has been or may have been injured by the violation of law for which the cause of action arose and (a) the assignee has not been injured thereby, or (b) the assignee declines to file a court action for the cause of action.

27.10.8 Under this Article, “public purchasing body” is Owner and “bidder” is Contractor.

27.11 Excise Taxes

If, under Federal Excise Tax Law, any transaction hereunder constitutes a sale on which a Federal Excise Tax is imposed and the sale is exempt from such Federal Excise Tax because it is a sale to a State or Local Government for its exclusive use, Owner, upon request, will execute

documents necessary to show (1) that Owner is a political subdivision of the State for the purposes of such exemption, and (2) that the sale is for the exclusive use of Owner. No Federal Excise Tax for such materials shall be included in any Contract Price.

27.12 **Taxes**

Contract Price is to include any and all applicable sales taxes or other taxes that may be due in accordance with section 7051 of the Revenue and Taxation Code; Regulation 1521 of the State Board of Equalization or any other tax code that may be applicable.

27.13 **Shipments**

All shipments must be F.O.B. destination to Site or sites, as indicated in the Contract Documents. There must be no charge for containers, packing, unpacking, drayage, or insurance. The total Contract Price shall be all inclusive (including sales tax) and no additional costs of any type will be considered.

-END OF DOCUMENT-

00 73 00 - SPECIAL CONDITIONS

1. Mitigation Measures and Environmental Stewardship

Contractor shall comply with all mitigation measures, adopted by the Butte County Association of Governments (BCAG) with respect to this Project pursuant to the California Environmental Quality Act, (Public Resources Code section 21000 et.seq.).The contractor is responsible for all requirements in the permitting documents and environmental impact report mitigation requirements, made a part of this agreement in attached **Appendix A**. Contractor is to extend extra efforts when working in areas of special concerns identified in these documents.

The summary below is intended to assist in bidding but may not be inclusive of all of the requirements of the contract documents.

Species Protection:
This Project is within or near habitat for regulated species shown below:

- BCAG Butte Regional Transit Operations Center project, Negative Declaration Mitigation, Monitoring Measures, and Reporting Program, included at **Appendix A.**

  The contractor is responsible for all requirements in the Mitigation Measures requirements made a part of this agreement at **Appendix A**. Contractor is to extend extra efforts when working in areas of special concerns identified in this document.

  Biological Resources of heightened concern;
  - MM Biological 5 - Western Burrowing Owls (Transit Facility Site).
  - MM Biological 6 - Swainson's hawks (Transit Facility Site).
  - MM Biological 7 - Migratory birds and raptors (Transit Facility Site).

  Cultural Resources of heightened concern;
  - MM Cultural 1 – Contractor is hereby informed that if any cultural materials are encountered, all work within 100 feet of the discovered site shall cease….

  Hydrology and Water Quality Resources of heightened concern;
  - MM Water Quality 1 - To minimize erosion entering Comanche Creek during construction, the BMPs listed shall be required and are incorporated into the agreement for the project and will be implemented by the contractor to protect water quality…..

General Protection Measures:

1. Contractor will be familiar with and will comply with all environmental permits.
2. Contractor shall keep a binder with all permits onsite for reference at all times.
3. Contractor to notify BCAG 10 working days prior to the start of construction to schedule the BCAG provided biologist to conduct pre-construction migratory bird surveys and notify permitting agencies.
4. Contractor to maintain a clean work site with all trash (especially food wrappers) contained in trash receptacle to prevent attracting wildlife to the site.

Protection Measures for Nesting Migratory Birds, Red Bats, & Burrowing Owls:

1. BCAG provided biologist is required conduct a survey for all birds protected by the MBTA, red bats, & burrowing owls and map all nests located within 500 feet of construction areas.

2. BCAG provided biologist will develop buffer zones around active nests in coordination with CDFG. Construction activity shall be prohibited within the buffer zones until the young have fledged or the nest fails. Nests shall be monitored at least twice per week and a report submitted to CDFG monthly.

Protection Measures for Swainson's Hawk:

1. BCAG provided biologist is required conduct a survey for Swainson's Hawk nests located within ½ mile radius of construction areas.
2. If a nest is found and work must occur a BCAG provided biologist will monitor the nest site. If it is abandoned and if the nestlings are still alive, the BCAG shall fund the recovery and hacking (controlled release of captive reared young) of the nestling(s).

Protection Measures for Water Quality and Aquatic Life:

1. Contractor to maintain water quality BMP's as required in project permits. No siltation is allowed to pass the sediment barrier.
   a. Minimize turbidity/siltation with appropriate sediment barriers.
   b. No plastic monofilament or cross joint in netting that are bound/stitched (such as straw wattles/fiber rolls, and some erosion control blankets) are allowed.
   c. Upon completion of work stabilize site with appropriate erosion control vegetation and then remove barriers.
   d. Implement SWPPP BMP's.
2. Contractor is to conduct water sampling per the Central Valley Regional Water Quality Control Board 401 permit, "Additional Technically Conditioned Certification.
3. Restore site as required in Plans and Specifications.

Cultural Resource Protection:

1. If any cultural materials (e.g. bones, pottery fragments or other potential cultural resources) are encountered or unearthed during construction, all work within 100 feet of the discovered site shall cease. Further, the Contractor shall immediately notify BCAG and the Butte County Coroner pursuant to Section 7050.5 of California's Health and Safety Code, and contact the Planning Services Department at 879-6800 as soon as possible. BCAG shall then retain an archeologist from the City's list of qualified archaeologists to evaluate the significance of the site. If the archaeologist determines that the materials represent a potentially significant resource, the project proponent, archaeologist, City Planning Director, and local tribal coordinator shall begin a consultation process to determine a plan of action either for 1) total data recovery, as a mitigation,
2 tribal cultural resource monitoring, 3) displacement protocol, or 4) total avoidance of the resource.

Full compensation for furnishing all labor, tools, equipment, material and incidentals and for doing all the work involved with conforming to the requirements of this section shall be considered as included in the contract prices paid for the various items of work and no additional compensation will be allowed therefor.

2. Water Pollution Control

The Contractor shall be required to submit an updated Storm Water Pollution Prevention Plan (SWPPP) which complies with the conditions of the Water Quality Order 99-08-DWQ, National Pollutant Discharge Elimination System (NPDES), General Permit for Storm Water Discharges Associated with Construction Activity (General Permit). The SWPPP shall be prepared with guidance from the City of Chico Best Practices Manual, the City of Chico Best Practices Technical Manual, and Caltrans Storm Water Quality Handbooks. This plan shall be approved by the QSD prior to beginning any work. The Contractor shall be responsible for implementing, maintaining, and monitoring such water pollution control measures as called for in the SWPPP, and as directed by the Owner.

Contractor to:

a. Prepare updates to Storm Water Pollution Prevention Plan (SWPPP) already prepared by QSD and uploaded to SMARTS website. SWPPP preparation includes obtaining SWPPP acceptance and amending the SWPPP.
b. Install BMP's per approved SWPPP as required throughout construction as detailed in the SWPPP. Maintain, repair, clean, or replace BMP's as needed throughout project to ensure no site discharges occur.
c. Prepare and implement a SWPPP monitoring program in compliance with the latest California NDPES Storm Water Pollution Prevention rules. All monitoring shall be documented and reported as required to State of California SMARTS website.
d. Prepare Rain Event Action Plans (REAPs) if specified for the project risk level, REAP preparation includes preparing and submitting REAP forms and monitoring weather forecasts.
e. Complete all required Storm Water Sampling and Analysis. Storm Water Sampling and Analysis may include reporting of storm water quality per qualifying rain event. If specified for the risk level, the work includes preparation, collection, analysis, and reporting of storm water samples for turbidity, pH, and other constituents.
f. Prepare and submit all required Storm Water Annual Reports. Storm Water Annual Report preparation includes certifications, monitoring and inspection results, and obtaining Storm Water Annual Report acceptance.
g. Contractor is to assume maintenance and cleaning of all BMP's placed adjacent to the site upon completion of all offsite work. Contractor is to assume responsibility of the SWPPP responsibilities from the Off-site Contractor.
h. Contractor is to work with the Owner at the time they develop the Industrial SWPPP for the site, to ensure the two separate SWPPP's uploaded to the SMARTs website do not include overlapping areas of responsibility prior to the completion of the Phase 1 construction milestone.

Copies of the General Permit, the manuals, and the handbook referred to above are available on the Internet at
http://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml

The Contractor shall be responsible for inspecting the work site a minimum of once at the beginning and once at the end of the work day to insure that pollution control measures as specified in the SWPPP are in place and functioning properly. Inspections will also be required on non-work days when rainfall is forecasted. Monitoring shall be required for all rainfall events whether on work or non-work days. Unless specified otherwise in the approved SWPPP, Contractor-performed monitoring duties shall end when the project Notice of Completion is filed with the County Recorder and the Notice of Termination acceptance by the RWQCB, which includes all annual reports and support documentation. All inspections and monitoring shall be documented in a log that will be maintained on site with the approved SWPPP.

Note special seed restriction for erosion control & hydro seeding regarding variety is required due to adjacent organic farming. Attention is directed to Section 3, Relations with Adjacent Property Owners.

Should the Contractor be found not to be in compliance with the approved SWPPP and the requirements in these Special Provisions, he shall be fined $2,000 for the first occurrence and $3,000 for each occurrence thereafter. The fine shall not relieve the Contractor's obligation to indemnify BCAG from third-party lawsuits as a result of the Contractor's actions.

If the Contractor has been found not to be in conformance with the approved SWPPP and fails to provide the required maintenance of the pollution control devices within the same day that he is notified of the deficiency, BCAG reserves the right to complete the work necessary to bring the devices into conformance with the SWPPP. In addition to the fine stated above, BCAG shall charge the Contractor for the actual cost of such maintenance, which shall be deducted from the Contractor's next progress payment.

MEASUREMENT AND PAYMENT
The contract lump sum price paid for water pollution control shall include full compensation for furnishing all labor, tools, materials, equipment, and incidentals for doing all the work involved in preparing any revisions or updates to the SWPPP and supplying, installing, monitoring, and maintaining the measures implemented as part of the SWPPP as required by the Standard Specifications and these Special Provisions, and as directed by the Engineer.

The Owner will recognize the following percentages in the Schedule of Values for preparing storm water pollution prevention plan and implementation as follows:

1. A total of 90 percent of the item total over the life of the contract.
2. A total of 100 percent of the item total upon accepted Notice of Termination from RWQCB SMARTs website.

Compensation for providing air pollution control and dust control and noise control shall be included in the prices paid for other items of work in the contract, and no additional payment shall be made.

3. Tire Derived Aggregate (TDA) at Bioswales Grantee Requirements

This project has received a Grant from CalRecycle to compensate for Tire Derived Aggregate (TDA) used at the bioswales throughout the project site, see Sheets C1.3 & C5.5. The Grant includes conditions that must be met by Grantee which are made a requirement of the Contractor also. These requirements are primarily cost reporting in nature involved to complete the TDA installation, see **Appendix B** for the requirements Contractor is obligated to meet and/or provide.

The Contractor certifies they have reviewed and agree to meet all their obligations to comply with the CalRecycle Grantee & Contractor obligations identified at the Grant documents included and made a part of this agreement;

- The complete work to install Tire Derived Aggregate/TDA derived from only California generated waste tires at bio-swales shall be completed no later than January 1, 2016, to comply with the Grant terms and allow for payment by CalRecycle on a reimbursement basis prior to grant deadlines. This must include As-built drawings for the TDA installation, which have been verified by a site survey and certified by a Registered Civil Engineer, and a laboratory analysis and gradation report of the TDA material delivered to the jobsite.

- Contractor certifies all contractors involved with the TDA scope of work are NOT on the CalRecycle Unreliable List by completing the State of California, Reliable Contractor Declaration, CalRecycle form 168, prior to the start of any TDA work. This form must be uploaded along with other reporting requirements to the CalRecycle's Grant Management System (GMS). If the Contractor/Subcontractor/Manufacturer involved with the TDA work is placed on the CalRecycle's Unreliable List at any time during this project, the Contractor is obligated to and agrees to replace that party immediately to ensure the Owner's Grant Funding is not lost, see Grant Exhibit A – Terms and Conditions. Should contractor's actions/inactions result in loss of Grant funding to the Owner, Contractor shall be liable for lost funding in an equal amount to be credited via the next change order processed on the project.

- Contractor and/or TDA supplier/manufacturer must complete the State of California, Tire Derived Aggregate (TDA) Certification, CalRecycle form 740-TDA, prior to providing any material to the site.

- The Contractor and/or TDA supplier/manufacturer shall comply with all audit and record keeping requirements of CalRecycle, Department of Finance, the Bureau of State Audits, to ensure the Grant requirements are complied with. Contractor shall provide separate Personnel Time Logs / timesheets to the Owner for audit purposes only, using the Personnel Expenditure Itemized summary, CalRecycle form 165, http://www.calrecycle.ca.gov/grants/forms/General/CalRecycle165.pdf .

- All correspondence, schedule of values, project documentation, etc. relative to the TDA work and CalRecycle Grant shall reference the Grant Number; TDA3-13-0009.

- Contractor to provide the executed Reliable Contractor Declaration, CalRecycle form 168, as a priority, and no later than 30 days after the NTP date for the project.

4. Relations with Adjacent Property Owners

Sierra Nevada Brewery

This project is located adjacent to lands owned by Sierra Nevada Brewery (SNB). A memorandum of understanding (MOU) has been entered into by BCAG and Sierra Nevada Brewery. The Contractor shall be fully informed of the requirements of this agreement as well as rules, regulations, and conditions that may govern the Contractor's operations in these areas and shall conduct the work accordingly. The contractor shall not impact the active operations of SNB. Sierra Nevada receives 8 to 10 train-cars per week at the adjacent property, and the contents are then trucked to the brewery through the intersection at the corner of Huss and Aztec Drives on public roadways.

Notify SNB at least 48 hours in advance of any work which may affect SNB property. Deliveries to the project site should be scheduled so the SNB operations are not negatively impacted. Contractor is obligated to cooperate and schedule work so SNB operations are not impacted to the extent required by the MOU. Owner's obligations are made a part of this agreement and Contractor will cooperate in all respects BCAG is obligated.

Dust Control: Contractor shall take all measures deemed required to maintain a Zero Dust Policy for all equipment, operations and deliveries near the SNB property. This applies to scrapers, loaders, semi-truck and trailers, pick-ups, excavators, etc. The creation of dust on this property will have a negative effect on the success of the farming operations and ultimately the crop yields. Contractor shall maintain a water truck on-site during any period to ensure dust conditions can be dealt with immediately. Contractor shall tarp all truckloads of soil export while driving adjacent to the SNB Farm property, to ensure the dust contamination is minimized. Vehicle speeds shall be reduced to a maximum of 15 mph.

Contractor is required to provide SNB with weekly look ahead schedules when work may affect trucking operations on city streets adjacent to project site. The SNB point of contact is:

David Tamble, Transload Operations Manager, tamble@sierranevada.com or
Lau Ackerman, Agricultural Supervisor, lau@sierranevada.com
1075 East 20th Street
Chico, CA 95928
(530) 510-5085

Sierra Nevada Brewery (SNB) operates organic farming adjacent to this project. Special considerations shall be taken to avoid disturbing the farming operations:

1. Laydown, material, and equipment storage areas shall be kept off SNB lands.
2. SNB shall have continuous access to their property for trucking and agricultural uses. Contractor shall maintain a minimum of 12' clear lane at all times, including in city streets and public right of way. Contractor is to provide flagmen as needed to ensure the continuous operation of the SNB deliveries thru the site, and ensure all contractor equipment and deliveries yield the right of way to the SNB grain transfer.

Contractor is responsible for the costs to repair or other property damage caused by the construction operations. Note special restrictions for erosion control hydroseed mix is required due to adjacent organic farming. Erosion control seed mix shall include only the following pre-approved varieties. Substitutions must be approved by SNB landscape supervisor.

Botanical Name	**Common Name**
Melica californica	California melicgrass
Leymus Triticoides	Creeping Wildrye

Hegan Lane Business Partners

This project is located adjacent to lands owned by Hegan Lane Business Partners (HLBP). A Permit to Enter and Construct (PTEC) has been entered into by BCAG and Hegan Lane Business Partners, see **Appendix C**. The Contractor shall be fully informed of the requirements of this agreement as well as rules, regulations, and conditions that may govern the Contractor's operations in these areas and shall conduct the work accordingly. The contractor shall not impact the active operations of HLBP, and shall name HLBP as additional insureds in all policy's required for the project. Any spoils stockpiles on HLBP adjacent property shall be placed per the requirements of the stockpile layout and sections given at this **Appendix C**.

5. Work by Other Contractors

The Butte Regional Transit Operations Center project will be advertised and divided into multiple discreet projects, each with its own contractor. The Contractor bidding on this project shall be aware of and work cooperatively with other contractor's working adjacent to or on the same site as this contractor. The Contractor agrees to communicate and coordinate their work and the work of other contractor's as though the work is its own. The multiple prime contracts are required due to funding and time constraints, and Contractor is made aware of this and agrees to work in this delivery method with no further claims for cost or time impacts to the Owner as a result of this delivery method. Owner reserves the right to procure other contractors or vendors as needed to complete the project within the time or fiscal constraints required, and contractor agrees to work with such furniture, data, and security or maintenance contractors in the same manner as called for here.

- BRTOC Off-site Plans for Aztec Drive Extension & Comanche Creek Storm Drainage Outfall
- BRTOC On-site plans
- BRTOC Remodel of Existing Building

6. Plans and Bid Documents

See Section 00 11 16 – Invitation to Bid for instruction on obtaining plans and specifications for bidding.

Plans bid documents may be examined at the Butte County Association of Governments Office, located at 2580 Sierra Sunrise Terrace Chico, California, or various Builders Exchanges in the area. Copies of all bid documents are to be requested and obtained through ARC Document Solutions. Technical Questions should be directed to the BCAG offices in Chico, CA, contact Andy Newsum PE, Deputy Director, email anewsum@bcag.org , Fax 530-879-2444.

Interested parties may download copies of bid documents related attachments and all future communication and correspondence regarding this bid process from the County's website at http://www.bcag.org/RFPs/index.html **(**follow the prompts for RFP's/Bid Notices). The Butte County Association of Governments will not be a distribution point for plans.

The Butte County Association of Governments affirms that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises (DBE) will be afforded full opportunity to submit bids in response to this invitation.

7. Water Main work Owned & Inspected by California Water Service

The work performed in connection with Domestic Water, Irrigation Water Services & Fire Water Systems shall conform to the plans and specifications of the local water service provider, California Water Service Company (Cal Water). Cal Water is preparing plans and specifications specifically for this project and will be providing inspection of the installation. These plans will be issued via addendum or after bid day upon receipt when Cal Water completes their design. The design is not expected to differ materially from that design by GHD included in the bid documents now. The contractor is to complete the installation following all Cal Water requirements and direction.

The Cal Water Service Company (Cal Water) Subdivider and Contractor Requirements for Subdivider Installation Agreement and Rule No. 15 – Main Extensions requirements are made a part of this agreement by inclusion here, see **Appendix D**. The Cal Water requirements for the installing contractor of all water services to be Owned and Maintained by Cal Water at completion of the project shall be complied with. See the sample agreement included as for a list of current Approved Installing Contractors the contractor is obligated to use for the installations designed by and ultimately owned by Cal Water.

COST BREAK DOWN. The Contractor shall furnish the Owner a cost break down for the work of Domestic, Irrigation and Fire Water System including hydrants shown on the civil plans. A cost break down table shall be submitted to the Owner for approval within 15 working days after the contract has been approved or the Cal Water design, whichever comes later.

Cost break downs shall be completed and furnished in the format shown in the samples of the cost break downs included in this section. Line item descriptions of work shown in the samples are the minimum to be submitted. Additional line item descriptions of work may be designated by the Contractor. If the Contractor elects to designate additional line item descriptions of work, the quantity, value and amount for those line items shall be completed in the same manner as for the unit descriptions shown in the samples. The line items and quantities given in the samples are to show the manner of preparing the cost break downs to be furnished by the Contractor. The Contractor shall determine the quantities required to complete the work shown on the plans. The quantities and their values shall be included in the cost break downs submitted to the Owner for approval. The Contractor shall be responsible for the accuracy of the quantities and values used in the cost break downs submitted for approval. Overhead and profit shall be included in each individual line item of work listed in a cost break down table.

No adjustment in compensation will be made in the contract lump sum prices paid for water system due to differences between the quantities shown in the cost break downs furnished by the Contractor and the quantities required to complete the work as shown on the plans and as specified in these special provisions.

Individual line item values in the approved cost break down tables will be used to determine partial payments during the progress of the work. The Cost Break-down is also required to be provided to Cal Water Service prior to the start of Water Main Installation work.

Sample Cost Break-Down

UNIT DESCRIPTION	UNIT	APPROXIMATE QUANTITY	VALUE	AMOUNT
12” DUCTILE IRON WATER LINE				
8” C-900 WATER LINE				
6” C-900 WATER LINE				
FIRE HYDRANT ASSEMBLY				
12” VALVE				
8” VALVE				
6” VALVE				
BLOW OFF ASSEMBLY				

TOTAL; _____

8. Clean Water & Air Requirements

The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq. The Contractor agrees to report each violation to the Owner and understands and agrees that the Owner will, in turn, report each violation as required to assure notification to FTA and the appropriate EPA Regional Office. The Contractor also agrees to include these requirements in each subcontract agreement.

This project lies within the boundaries of the Central Valley Regional Water Quality Control Board (RWQCB). The Central Valley RWQCB has issued a permit which governs storm water and non-storm water discharges resulting from construction activities in the project area. The RWQCB permit is entitled "National Pollutant Discharge Elimination System (NPDES) Construction General Permit 2009-0009-DWQ". Copies of the RWQCB permit may be obtained at the BCAG Offices, 2580 Sierra Sunrise Terrace, Suite 100, Chico, CA 95928.

The NPDES permits that regulate this project, as referenced above, are collectively referred to in the agreement as the "permits". This project shall conform to the permits and modifications thereto. The Contractor shall maintain copies of the permits at the project site and shall make them available during construction.

The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. §§ 7401 et seq. The Contractor agrees to report each violation to the Owner and understands and agrees that the Owner will, in turn, report each violation as required to assure notification to FTA and the appropriate EPA Regional Office. The Contractor also agrees to include these requirements in each subcontract.

Contract execution constitutes submittal of the following certification by the Contractor:

"I am aware of the emissions reduction regulations being mandated by the California Air Resources Board. I will comply with such regulations before commencing the performance of the work and maintain compliance throughout the duration of this contract."

The Contractor shall be familiar with and comply with all monitoring, reporting, notifications, and control requirements of agencies having jurisdiction over air quality.

The Contractor shall prevent the formation of an airborne dust nuisance by watering work areas as required until the project is completed and accepted. The amount of water used shall not be excessive to cause soil carry-over or wash-off outside the boundaries of the working area. If soil wash-off occurs, the Contractor shall immediately notify the Engineer and identify the area where wash-off occurred. The Contractor shall provide polyethylene sheeting to place underneath and over any stockpiled soil. The stockpile shall be covered daily after completion of work. The sheeting shall be adequately weighted or secured to keep the sheeting in place during non-work periods.

9. Indemnification

In addition to the requirements for Indemnification given at Section 00 72 13 - General Conditions, Section 14.2, the contractor shall include the following specifically by name as Additional Insureds on their insurance certification;

- Butte County Association of Governments
- Kitchell
- TLCD Architecture
- City of Chico

- Sierra Nevada Brewery (SNB)
- Hegan Lane Business Partners
- California Water Service Company

Including their officers, directors, employees, agents, and design professionals.

10. Encroachment Permit

Prior to start of work within the City of Chico's right-of-way, the contractor will be required to obtain an Encroachment Permit from the City of Chico. Contactor shall pay all associated encroachment fee costs. The City of Chico's procedures to obtain an encroachment permit included below.

PROCEDURE TO OBTAIN AN OFFSITE ENCROACHMENT PERMIT

Step 1: Contractors wishing to obtain an encroachment permit, must have the following:

A. Pre-approved Excavation Bond form (provided by the City of Chico) in the amount of $10,000 *OR* an Excavation Bond form provided by an insurance company which has been approved by the City Attorney.
B. Certificate of GENERAL LIABILITY, in the amount of $1,000,000, which has been approved by the City of Chico Risk Manager (530) 879-7900.
C. State contractor's pocket license which shows the following information:
a) License number; b) Classification(s); and c) Expiration date
D. Letter from corporation/company/sole proprietorship authorizing specific employees/agents to sign Encroachment Permits on behalf of said entity.
E. City of Chico Business License - Contact the Finance Dept. @ (530) 879-7300.
F. Correct and current name of owner/lessee/agent/business, with mailing address(es).

Step 2: Provide this sheet, which is part of the Application process, at the time the Encroachment Permit is requested.

Plan Approval Date:	6/9/14 MS	Proj. Acct: 72173
Subdivision Name:	BCAG Transit Center	
Parcel Map No. (Name):		
APN(s):	Portions 039-060-125 and 126	
Address(es):	Huss Lane	

Step 3: Encroachment Permits are obtained at the Building Permit counter, on the 2nd floor of City Hall.

Step 4: Please allow 1 - 2 days for processing.

Step 5: The City will contact you when the encroachment permit is ready to be signed and picked up.

11. Weather Days

Delays due to Adverse Weather conditions will only be permitted in compliance with the provisions in the General Conditions and only if the number of days of Adverse Weather exceeds the following parameters:

January	**6**	July	**0**
February	**6**	August	**0**
March	**4**	September	**0**
April	**4**	October	**2**
May	**1**	November	**4**
June	**0**	December	**6**

Total; … 33 CD's/Year

The construction schedule shall include critical path activities as the last activities prior to the Final completion milestone that reflects anticipated rain delay for each month during the performance of the Contract. No other activity shall be concurrent with the weather allowance days. The duration shall reflect the average climatic range and usual industrial conditions prevailing in the locality of the Site. Weather data shall be based on information provided by the National Weather Service and as indicated in the table provided here. Comply with all other requirements for weather as provided at section 01 32 00 – Construction Progress Documentation. Contractor shall release the weather days each month as that's month's Schedule Update is statused to provide a true and accurate representation of weather impact which is current thru the end of that month's data date.

Permits, Certificates, Licenses, Fees, Approval

a. **Payment for Permits, Certificates, Licenses, and Fees**. As required in the General Conditions, the Contractor shall secure and pay for all permits, licenses and certificates necessary for the prosecution of the Work with the exception of the following:

(1) **City of Chico Building & Encroachment Permits**

With respect to the above listed items, Contractor shall be responsible for securing such items; however, Owner will be responsible for payment of these charges or fees without contractor any mark-ups. Contractor shall notify the Owner of the amount due with respect to such items and to whom the amount is payable. Contractor shall provide the Owner with an invoice and receipt with respect to such charges or fees.

b. **Storm Water Permits**

(1) Contractor acknowledges Owner is now or will soon be obligated to develop and implement the following storm water requirements, without limitation:

(A) A Municipal Separate Storm Sewer System (MS4). An MS4 is a system of conveyances used to collect and/or convey storm water, including, without limitation, catch basins, curbs, gutters, ditches, man-made channels, and storm drains.

(B) A Storm Water Pollution Prevention Plan (SWPPP) at:

(i) Industrial sites where the Owner engages in maintenance (e.g., fueling, cleaning, repairing) of transportation activities.

(ii) Construction sites where:

(a) One (1) or more acres of soil will be disturbed, or

(b) The project is part of a larger common plan of development that disturbs more than one (1) or more acres of soil.

(2) Contractor shall comply with Owner storm water requirements that are approved by the Water Resources Control Board and applicable to the Project, at no additional cost to the Owner, see **Appendix E** and SWPPP/BMP requirements in the bid documents.

13. APPENDICIES:

APPENDIX A
BCAG Negative Declaration Mitigation Monitoring Measures

APPENDIX B
Tire Derived Aggregate (TDA) grant requirements for contractor to comply with
1) Grant Agreement cover sheet.
2) Grant Terms and Conditions, Exhibit A 10 pages dated 9/12/13.
3) Grant Procedures and Requirements, Exhibit B 11 pages FY 2013 / 2014.
4) Forms Guide, 1 page.

5) Reliable Contractor Declaration, CalRecycle form 168, 2 pages Revised 7/2013.
6) Tire Derived Aggregate (TDA) Certification, CalRecycle form 740-TDA, 2 pages dated 8/13.

APPENDIX C

1) Hegan Lane Business Partners Permit to Enter and Construct (PTEC), June 3 2014.
2) Excess spoils stockpile requirements on adjacent HLBP property.

APPENDIX D

1) California Water Service , Subdivider and Contractor Requirements for subdivider installation agreements, Form 1518 dated 11/14/02.
2) California Water Service, Approved Installing Contractors as of 8/30/12.
3) Developers cost Estimate form
4) CWS Rule 15 – Main Extensions, Form 1283 Rev. 8/08.

APPENDIX E

1) Central Valley Regional Water Quality Control Board 401 Permit (WDID#_____).

APPENDIX F

1) Bidders Question Form.

APPENDIX G

APPENDIX H

1) Federal Davis-Bacon Act Wage determination, effective as of 7/4/14.

END OF DOCUMENT

00 73 16 – INSURANCE

The Butte County Association of Governments (BCAG) and all officers and employees thereof connected with the work including, shall not be answerable or accountable for any loss or damage that may happen to the work or any part thereof; for any loss or damage to any of the materials or other things used or employed in performing the work; for injury to or death of any person, either workers or the public; or for damage to property from any cause which might have been prevented by the Contractor, or his/her workers, or anyone employed by him/her, except as otherwise provided by law.

The Contractor shall be responsible for any liability imposed by law and for injuries to or death of any person except as otherwise provided by law including, but not limited to, workers and the public, or damage to property resulting from defects or obstructions, or from any cause whatsoever during the progress of the work, or at any time before its completion and final acceptance.

The Contractor shall indemnify and save harmless the BCAG and all officers, employees and consultants thereof connected with the work including, from all claims, suits, or actions of every name, kind, and description brought forth, or on account of, injuries to or death of any person including, but not limited to, workers and the public, or damage to property resulting from the performance of a contract, except as otherwise provided by law. The duty of the Contractor to indemnify and save harmless includes the duties to defend as set forth in the Section 2778 of the Civil Code.

With respect to third party claims against the Contractor, the Contractor waives any and all rights to any type of express or implied indemnity against BCAG, its officers, or employees.

It is the intent of the parties that the Contractor will indemnify and hold harmless BCAG, its officers, and employees from any and all claims, suits, or actions as set forth above regardless of the existence or degree of fault or negligence on the part of BCAG, the Contractor, the subcontractor, or employee of any of these, other than the active negligence of BCAG, its officers, and employees, to the full extent permitted by law.

Contractor shall procure and maintain for the duration of the contract insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by the Contractor, his agents, representatives, employees, or subcontractors. The cost of such insurance shall be included in the Contractor's bid.

Contractor's insurance shall be as follows:

1. Minimum Scope of Insurance: Coverage shall be at least as broad as the following:

    A. Insurance Services Office Commercial General Liability coverage, "Occurrence" Form CG 0001 1185, or Insurance Services Office Form GL 0002 (Ed. 1/73) covering Comprehensive General Liability and Insurance Services Office Form GL 0404 covering Broad Form Comprehensive General Liability.

    B. Insurance Services Office Business Auto Coverage Form CA 0001 0187 covering Automobile Liability, Code 1 "any auto," and Endorsement CA 0029 1288, Changes in Business Auto and Truckers Coverage Forms - Insured Contract.

    C. Workers' Compensation insurance as required by the Labor Code of the State of California and Employers Liability insurance.

2. Minimum Limits of Insurance: Contractor shall maintain limits no less than:

    A. **General Liability**: $5,000,000 combined single limit per occurrence for bodily injury,

personal injury, and property damage. If Commercial General Liability Insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location, or the general aggregate limit shall be twice the required occurrence limit.

B. **Automobile Liability**: $5,000,000 combined single limit per accident for bodily injury and property damage.

C. **Workers' Compensation and Employers Liability**: Workers' Compensation limits as required by the Labor Code of the State of California and Employers Liability limits of $1,000,000 per accident.

D. **Builders Risk "All-Risk" Course of Construction Insurance**; for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, damage to adjacent buildings, partial or total collapse of structure(s), debris removal, demolition occasioned by enforcement of Laws, water damage, and damage caused by frost and freezing, in the amount of 110% (One hundred and ten percent) of the completed value of the Work to be performed under this Contract. Each loss shall be borne by Contractor.

E. **General Contractors Pollution Legal Liability;** for physical loss or damage to the work or Owner operations resulting from contractors work. Policy shall include following coverage;

1) Contracting Services Pollution Liability
2) Pollution Legal Liability arising from an owned location
3) Non-Owned disposal site
4) In-bound and Out-bound contingent Transportation

Policy statement shall include contact for a claim or emergency response with a delivery service address, phone, fax and e-mail contact. Policy endorsements shall include; Project occurrence Contracting Services Pollution Liability including completed operations, Terrorism coverage endorsement, choice of law and Jurisdiction and Venue conditions, Primary insurance, coverage of all contractors and subcontractors at all tiers

3. Deductibles and Self-Insured Retentions: Any deductibles or self-insured retentions must be declared to and approved by BCAG. At the option of the Owner, either the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the Owner, its officers, officials, employees, additional insureds and volunteers, or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claim administration, and defense expenses.

4. Other Insurance Provisions: The policies are to contain, or be endorsed to contain, the following provisions:

A. **General Liability and Automobile Liability Coverages**:

1) The BCAG, its officers, officials, employees, additional insureds and volunteers are to be covered as insured as respects: Liability arising out of activities performed by or on behalf of the Contractor, including the insured's general supervision of the Contractor; products and completed operations of the Contractor; premises owned, occupied, or used by the Contractor; or automobiles owned, leased, hired, or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to the Owner, its officers, officials, employees, additional insureds or volunteers.

2) The Contractor's insurance coverage shall be primary insurance as respects the Owner, its officers, officials, employees, additional insureds and volunteers. Any insurance or self-insurance maintained by the BCAG, its officers, officials, employees, or volunteers shall be in excess of the Contractor's insurance and shall not contribute with it.

3) Any failure to comply with reporting provisions of the policies shall not affect coverage provided to the Owner, its officers, officials, employees, additional insureds or volunteers.

4) The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

B. **Workers' Compensation and Employers Liability Coverage**: The insurer shall agree to waive all rights of subrogation against the City, its officers, officials, employees, and volunteers for losses arising from work performed by the Contractor for the Owner.

C. **All Coverages**: Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty (30) days prior written notice by certified mail, return receipt requested, has been given to the Owner.

5. Acceptability of Insurers: Insurance is to be placed with insurers with a Best's rating of no less than A:VII.

6. Verification of Coverage: Contractor shall furnish the Owner with certificates of insurance and with original endorsements effecting coverage required by this clause. The certificates and endorsements for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf.

   If the Contractor elects not to use the forms provided by the Owner for any other reason, the Contractor shall be responsible for paying the BCAG Attorney's fees to verify coverage and the Contractor shall allow a minimum of five (5) working days for the BCAG Attorney to verify coverage.

   All certificates and endorsements are to be received and approved by the Owner before work commences. The Owner reserves the right to require complete, certified copies of all required insurance policies at any time.

7. Subcontractors: Contractor shall include all subcontractors as insured under its policies or shall furnish separate certificates and endorsements for each subcontractor. All coverages for subcontractors shall be subject to all of the requirements stated herein.

The Contractor shall be responsible for any liability imposed by law and for injuries to or death of any person including, but not limited to, workers and the public, or damage to property, and shall indemnify and save harmless any county, city, or district, its officers, and employees connected with the work within the limits of which county, city, or district the work is being performed hereunder, all in the same manner and to the same extent as provided above for the protection of the BCAG and all officers and employees thereof connected with the work, except that no retention of money due the Contractor under and by virtue of the contract will be made by the BCAG pending disposition of suits or claims for damages brought against the said county, city, or district, except as otherwise required by law.

Nothing in the contract is intended to create the public or any member thereof a third party beneficiary hereunder, nor is any term and condition or other provision of the contract intended to establish a

standard of care owed to the public or any member thereof.

A. Required minimum amounts of insurance may be increased should conditions of Work, in opinion of the BCAG, warrant such increase. Contractor shall increase required insurance amounts upon direction by the BCAG.

B. Required Endorsements: The policies required under this Section 00 73 16 shall be endorsed as follows:

1. Name the Butte County Association of Governments and their employees, representatives, consultants, agents, Kitchell, and Architect/Engineer as additional insured, but only with respect to liability arising out of the activities of the Named Insured. See Special Conditions section 00 73 00 for a complete list of Additional Insureds required for this project.

2. Each such policy shall apply separately to each insured against which claim is made or suit is brought, except with respect to the limit of the insurance company's liability required of this Section 00 73 16.

3. Insurance shall be primary and no other insurance or self-insured retention carried or held by the BCAG shall be called upon to contribute to a loss covered by insurance for the named insured.

4. Insurance shall contain a provision requiring the insurance carriers to waive their rights of subrogation against the BCAG and all additional insured, as well as other insurance carriers for the Work.

5. Insurance certificates shall be addressed to: Butte County Association of Governments, C/O **Andy Newsum**, 2580 Sierra Sunrise Terrace, Suite 100, Chico California 94928

C. Certificates of insurance and endorsements shall have clearly typed thereon the BCAG Bid Number and title of Contract Documents. Written notice of cancellation, non-renewal, or reduction in coverage of any policy shall be mailed to the BCAG (Attention: Project Manager) at the address listed in Document 00 52 13 (Agreement), 60 Days in advance of the effective date of the cancellation, non-renewal, or reduction in coverage. Contractor shall maintain insurance in full force and effect during entire period of performance of Contract Documents. Contractor shall keep insurance in force during warranty and guarantee periods, except that Contractor may discontinue All-Risk Course of Construction Insurance after Final Payment. At time of making application for extension of time, and during all periods exceeding the Contract Time resulting from any cause, Contractor shall submit evidence that insurance policies will be in effect during requested additional period of time. Upon the BCAG's request, Contractor shall submit to the BCAG, within 7 Days, copies of the actual insurance policies or renewals or replacements.

D. Contractor shall pay all insurance premiums, including any charges for required waivers of subrogation or the endorsement of additional insured. If Contractor fails to maintain insurance, the BCAG may take out comparable insurance, and deduct and retain amount of premium from any sums due Contractor under Contract Documents.

E. If injury occurs to any employee of Contractor, Subcontractor or sub-subcontractor for which the employee, or the employee's dependents in the event of employee's death, is entitled to compensation from the BCAG under provisions of the Workers' Compensation Insurance and Safety Act, as amended, or for which compensation is claimed from the BCAG, the BCAG may retain out of sums due Contractor under Contract Documents, amount sufficient to cover such compensation, as

fixed by the Act, as amended, until such compensation is paid, or until it is determined that no compensation is due. If the BCAG is compelled to pay compensation, then BCAG may, in its discretion, either deduct and retain from the Contract Sum the amount so paid, or require Contractor to reimburse the BCAG.

F. Nothing in this Section 007316 shall be construed as limiting in any way the extent to which Contractor or any Subcontractor may be held responsible for payment of damages resulting from their operations.

G. All Subcontractors shall maintain the same insurance required to be maintained by Contractor with respect to their portions of the Work, and Contractor shall cause the Subcontractors to furnish proof thereof to the BCAG within ten Days of the BCAG's request.

H. The following provisions apply to any licensed professional engaged by Contractor to perform portions of the Work ("Professional").

1. Each Professional shall maintain the following insurance at its sole cost and expense:
   a. Provided such insurance is customarily required by the BCAG when professionals engaged in the profession practiced by Professional directly contract with the BCAG, Professional Liability Insurance, insuring against professional errors and omissions arising from Professional's work on the Project, with a limit of not less than $1,000,000 for each claim. If Professional cannot provide an occurrence policy, Professional shall provide insurance covering claims made as a result of performance of Work on this Project and shall maintain such insurance in effect for not less than two years following Final Completion of the Project.
   b. All insurance required by paragraphs A.1, A.2 and A.4 of this Section 007316. Professional shall satisfy all other provisions of paragraphs A, B, C, D, E and F of this Section 007316 relating to that insurance, including without limitation providing required insurance certificates (containing the required endorsements) before commencing its Work on the Project.

END OF DOCUMENT

Appendix A - BCAG Negative Declaration Mitigation Monitoring Measures, see Section 00 73 00 – Special Conditions, item 1.

Mitigation Measures

Biological Resources

Mitigation

MM Biological 1 – Valley Elderberry Longhorn Beetle (Storm Drain Outfall). Though the elderberry shrubs are located less than 50 feet from proposed storm drain outfall construction activities, the shrubs are located on the opposite bank of Comanche Creek from where the construction will be. Thus, the root system of the elderberry shrubs will not be impacted and the crown of the shrubs are located outside of the construction zone and will not be impacted. No pesticides or herbicides should be used within the vicinity of any elderberry bushes and dust control measures will be necessary during construction to prevent harm to Valley elderberry longhorn beetles. To further ensure that no impacts to these elderberry shrubs occur, dust abatement measures (as identified in by the Butte County Air Quality Management District's Rule 205 for Fugitive Dust Emissions and MM Water Quality 1), will be implemented during the construction activities within 100 feet of the elderberry shrubs and workers will not be allowed to access the north bank of Comanche Creek.

MM Biological 2 – Giant Garter Snake (Storm Drain Outfall). The following avoidance and minimization measures will be implemented within the storm drain outfall project area per the 1997 Programmatic Formal Consultation for U.S. Army Corps of Engineers 404 Permitted Projects with Relatively Small Effects on the GGS within Butte, Colusa, Glenn, Fresno, Merced, Sacramento, San Joaquin, Solano, Stanislaus, Sutter and Yolo Counties, California (GGS Programmatic).

a) Construction activities within 200 feet of Comanche Creek must be conducted during the active season for GGS (between May 1 and October 1) to minimize any direct impacts to the species.

b) Dewatered habitat must remain dry for at least 15 consecutive days after April 15 and prior to excavation or filling of the dewatered habitat.

c) Construction personnel will participate in a USFWS worker environmental awareness training program. During the training, workers will be informed of the potential for this species to be present and the associated habitat for GGS and that it is unlawful to take harm or harass GGS.

d) The site will be inspected by a USFWS approved biologist within 24 hours prior to the commencement of the construction activities. If GGS are found within the project area, the USFWS will be notified immediately and the qualified biologist has the authority to stop all construction work on the site until the appropriate corrective measures have been conducted and it is determined that the snake will not be harmed.

e) The clearing of wetland vegetation will be confined to the minimal area necessary to excavate the toe of bank for the outfall and riprap placement. Excavation equipment will be located and operated from the top of the bank.

f) Movement of heavy equipment to and from the site will be restricted to established roadways to minimize habitat disturbance and no staging or storing of equipment will occur within 200 feet of Comanche Creek.

g) Adjacent GGS habitat will be designated as Environmentally Sensitive Areas and will be flagged or fenced off using orange barrier fencing to avoid inadvertent impacts from the construction personnel.

h) After completion of the construction activities, any temporary water diversion structures and debris will be removed and the disturbed bank will be restored to pre-construction height and slope and revegetated with an appropriate native seed mix.

MM Biological 3 – Giant Garter Snake (Storm Drain Outfall). Actual mitigation is dependent on the level and amount of impact the project causes to potential GGS habitats and determined per GGS Programmatic. Due to the temporary nature of the impacts, compensation will be completed at Level 1 for the temporary direct impacts to 0.02 acre of GGS upland habitat.

Compensation for Level 1 temporary impacts per the GGS Programmatic requires restoration of affected snake habitat to pre-project conditions within the same season or, at most, the same calendar year. It also includes one calendar year of monitoring of the restored habitat and Project site with photo documentation and letter report documenting pre and post construction conditions due one year from the date restoration occurred (USFWS 2005).

MM Biological 4 – Red Bats (Storm Drain Outfall). As the western red bat typically roosts in trees, to avoid and minimize any potential impacts to the bat, no trees will be removed within the storm drain outfall area. Furthermore, a pre-construction bat survey will be conducted in combination with the pre-construction migratory bird and raptor survey (see **MM Biological 7**) to determine if any bat roosts occur within the project area.

MM Biological 5 – Western Burrowing Owls (Transit Facility Site). Vegetation removal or ground disturbance in areas where nests of western burrowing owls potentially occur must be conducted between September 1 and February 28 (during the non-breeding season). If vegetation removal or ground disturbance occurs during the breeding season (i.e., March 1 to August 31) then a qualified biologist will conduct pre-construction surveys for western burrowing owls nests. If a potential nest is observed on the site, the area must either be monitored to determine if the nest is active or that area will be avoided. If an active nest is observed, a no-disturbance buffer will be established and no ground disturbance in that area will be allowed until the young have fledged.

MM Biological 6 – Swainson's hawks (Transit Facility Site and Storm Drain Outfall). Though no active nests have been recorded in close proximity to the project area, old nests could be re-used by Swainson's hawks in the future or new nests could be constructed in close proximity to the project site. Therefore, to ensure no indirect impacts to active nests occur due to any future construction activities, a pre-construction survey for raptor nests per the *Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley* (CDFG 2000b) will be conducted if construction occurs during the breeding season (March-August). The area to be surveyed should include a ½ mile radius area including and surrounding the project area and a qualified biologist should conduct the surveys. If active nests are found, mitigation measures consistent with the *Staff Report Regarding Mitigation for Impacts to Swainson's Hawk (Buteo swainsoni) in the Central Valley of California* (Staff Report, CDFG 1994) should be incorporated in the following manner:

- No intensive new disturbances (e.g., heavy equipment operation associated with construction, use of cranes or draglines, new rock crushing activities) or other project-related activities that may cause nest abandonment or forced fledging, should be initiated within ¼ mile (buffer zone) of an active nest between March 1 and September 15.

- If construction or other project-related activities that may cause nest abandonment or forced fledging are necessary within the buffer zone, monitoring of the nest site (funded by the project proponent) by a qualified biologist (to determine if the nest is abandoned) will be required. If it is abandoned and if the nestlings are still alive, the project proponent shall fund the recovery and hacking (controlled release of captive reared young) of the nestling(s).

MM Biological 7 – Migratory birds and raptors (Transit Facility Site and Storm Drain Outfall). Vegetation removal or ground disturbance in areas where nests of birds protected by the MBTA (16 USC §703) and the CFGC (§3503) potentially occur must be conducted between September 1 and February 28 (i.e. the non-breeding season). If vegetation removal or ground disturbance occurs during the breeding season (i.e. March 1 to August 31) then a qualified biologist shall:

- Conduct a survey for all birds protected by the MBTA and map all nests located within 500 feet of construction areas;

- Develop buffer zones around active nests in coordination with CDFG. Construction activity shall be prohibited within the buffer zones until the young have fledged or the nest fails. Nests shall be monitored at least twice per week and a report submitted to CDFG monthly.

Cultural Resources

Mitigation

MM Cultural 1 – A note shall be placed on all grading and construction plans which informs the construction contractor that if any cultural materials (e.g. bones, pottery fragments or other potential cultural resources) are encountered or unearthed during construction, all work within 100 feet of the discovered site shall cease. Further, the developer shall immediately notify the Butte County Coroner pursuant to Section 7050.5 of California's Health and Safety Code, and contact the Planning Services Department at 879-6800 as soon as possible. The developer shall then retain an archeologist from the City's list of qualified archaeologists to evaluate the significance of the site. If the archaeologist determines that the materials represent a potentially significant resource, the project proponent, archaeologist, City Planning Director, and local tribal coordinator shall begin a consultation process to determine a plan of action either for 1) total data recovery, as a mitigation, 2) tribal cultural resource monitoring, 3) displacement protocol, or 4) total avoidance of the resource.

Hydrology and Water Quality

Mitigation

MM Water Quality 1 – To minimize potential erosion and siltation entering Comanche Creek during construction activities associated with the storm drain infrastructure and outfall replacement, the following BMPs shall be required and incorporated into the all Contract

Appendix A - BCAG Negative Declaration Mitigation Monitoring Measures, see Section 00 73 00 – Special Conditions, item 1.

Documents and Construction Plans for the project and implemented by the contractor to protect water quality:

a) Construction crews shall be instructed in preventing and minimizing pollution on the job.

b) Interim erosion control measures may be needed and shall be installed during construction to assure adequate erosion control facilities are in place at all times.

c) All slopes greater than 10% and less than 50% that are free of vegetation shall have earthguard applied, mulch spread and tacked down or plastic sheeting prior to a 30% chance of rain.

d) Ensure all SWPPP measures are in place prior to a 30% chance of rain.

e) Dust control measures in the form of water application to all exposed soil surfaces to prevent the transport of soil from exposed surfaces on construction sites in the form of airborne particulates watering of exposed soil surfaces shall occur at least twice daily, preferably in the late morning and after work is done for the day. All clearing, grading, earth moving or excavation activities shall cease when winds exceed 20 mph.

f) If the construction site is to remain inactive longer than 3 months the site shall be stabilized by applying "earth guard" or seeded and watered until grass cover is grown or other approved method.

g) Inspect sediment control devices after each storm and remove sediment.

h) During long periods of rain and high intensity rainfall SWPPP measures may become clogged. Extreme care should be taken to clean SWPPP measures to reduce fugitive discharge and potential flooding.

i) Be prepared for rain and have the necessary materials onsite before the rainy season.

j) Inspect all BMP's before and after each storm event. Maintain BMP's on regular basis and replace as necessary, through the entire course of construction.

k) For additional storm water pollution prevention measures see approved SWPPP drawing and verbiage.

STATE OF CALIFORNIA –CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

DEPARTMENT OF RESOURCES RECYCLING AND RECOVERY (CalRecycle)

GRANT AGREEMENT COVER SHEET

CalRecycle 110 (Revised 8/13)

	GRANT NUMBER TDA3-13-0009
NAME OF GRANT PROGRAM 2013/14 Tire-Derived Aggregate Grant Program	
GRANTEE NAME Butte County Association of Governments	
TAXPAYER'S FEDERAL EMPLOYER IDENTIFICATION NUMBER 68-0293768	TOTAL GRANT AMOUNT NOT TO EXCEED $85,750.00
TERM OF GRANT AGREEMENT FROM: April 01, 2014	TO: April 01, 2016

The Department of Resources Recycling and Recovery (CalRecycle) and Butte County Association of Governments (the "Grantee"), in mutual consideration of the promises made herein, agree to comply with the provisions of this Agreement, which consists of this Grant Agreement Cover Sheet and the following Exhibits, which are incorporated by this reference and made a part of this Agreement as if attached hereto:

Exhibit A – Terms and Conditions
Exhibit B – Procedures and Requirements
Exhibit C – Application with revisions, if any, and any amendments

This Agreement is of no force or effect until signed by both parties. Grantee shall not commence performance until it receives written approval from CalRecycle.

IN WITNESS WHEREOF, this Agreement has been executed by the parties hereto.

CALRECYCLE		GRANTEE'S NAME (PRINT OR TYPE) Butte County Association of Governments	
SIGNATURE OF CALRECYCLE'S AUTHORIZED SIGNATORY		SIGNATURE OF GRANTEE (AS AUTHORIZED IN RESOLUTION, LETTER OF COMMITMENT, OR LETTER OF DESIGNATION)	
TITLE Deputy Director, CalRecycle	DATE 3/20/14	TITLE EXECUTIVE DIRECTOR	DATE 3/12/2014
		GRANTEE'S ADDRESS (INCLUDE STREET, CITY, STATE AND ZIP CODE) 2580 Sierra Sunrise Terrace, Suite 100 Chico, CA 95928	

CERTIFICATE OF FUNDING

AMOUNT ENCUMBERED BY THIS AGREEMENT	PROGRAM/CATEGORY (CODE AND TITLE)	FUND TITLE
$85,750.00	2013/14 Tire-Derived Aggregate Grant Program	CBCRF Clearing Account
PRIOR AMOUNT ENCUMBERED FOR THIS AGREEMENT	(OPTIONAL USE)	

TOTAL AMOUNT ENCUMBERED TO DATE	ITEM	CHAPTER	STATUTE	FISCAL YEAR
$85,750.00	3970-001-0133	20	2013	2013/14
	OBJECT OF EXPENDITURE (CODE AND TITLE) 7820-G3600-418.03			

I hereby certify upon my own personal knowledge that budgeted funds are available for the period and purpose of the expenditure stated above.	T.B.A. NO.	B.R. NO.
SIGNATURE OFCALRECYCLE BUDGET OFFICE:	DATE 3/5/14	

GENERAL CHECKLIST OF BUSINESS PERMITS, LICENSES AND FILINGS

CalRecycle 669 (Rev. 05/13)

GRANT APPLICANT/GRANTEE NAME		
BUTTE COUNTY ASSOCIATION OF GOVERNMENTS		
GRANT NAME AND CYCLE	GRANT NUMBER, IF APPLICABLE	DATE SUBMITTED/UPDATED
Tire-Derived Aggregate Grant Program (TDA3: 2013/14)	15346	1/22/2014

Mark (✓ or X) appropriate box on <u>each</u> line below. All lines must be completed.

Note: This list is not all-inclusive. Grant Applicant/Grantee must list other critical permits/licenses/filings not identified below.

Grant Applicant/Grantee currently holds this valid permit/license/filing	Grant Applicant/Grantee will modify and/or obtain this permit/license/filing	This permit/license/filing is not applicable for this grant project or business	LOCAL PERMITS, LICENSES & FILINGS	REGULATOR OR ISSUER
☐	☐	☒	Authority to Construct/Permit to Operate	Air Quality Management District
☐	☒	☐	Building Construction Permit	City or County
☐	☐	☒	Business License	City or County
☐	☐	☒	Fictitious Business Name Filing	County
☐	☒	☐	Fire Department Permit	City or County
☐	☒	☐	Land Use Permit/Zoning Clearance/Conditional Use Permit	City or County
☐	☐	☒	Permit By Rule (PBR) for Permanent HHW Facilities or Temporary Collection Events	City, County or Cal/EPA-DTSC
☐	☒	☐	Planning Department Permit	City or County
☐	☒	☐	Waste Hauler Permit	City or County
			STATE PERMITS, LICENSES & FILINGS	
☐	☒	☐	Antifreeze, Battery, Oil & Paint (ABOP) Notification	CUPA or Cal/EPA-DTSC
☐	☒	☐	Corporate, Company or Partnership Filings	Ca. Secretary of State
☐	☒	☐	Hazardous Waste Haulers Permit	Cal/EPA – DTSC
☐	☒	☐	Industrial Activities Storm Water General Permit	Cal/EPA – SWRCB
☒	☐	☐	Non-Profit Organization 501 (C) (3)	Ca. Secretary of State
☐	☒	☐	Prop. 65 Safe Drinking Water & Toxic Enforcement Act	Cal/EPA – OEHHA
☐	☒	☐	Solid Waste Facilities Permit	Cal/EPA – CalRecycle
☐	☒	☐	State EPA Identification Number	Cal/EPA – DTSC
☐	☒	☐	Waste and Used Tire Hauler Registration	Cal/EPA – CalRecycle
☐	☒	☐	Waste Discharge Requirements	Cal/EPA – SWRCB
☐	☒	☐	Waste Tire Facilities Permit	Cal/EPA – CalRecycle
			FEDERAL PERMITS, LICENSES & FILINGS	
☐	☒	☐	US EPA – Identification Number	US EPA
☐	☒	☐	US EPA – NPDES and/or NSR Permits	US EPA
			OTHER PERMITS, LICENSES & FILINGS	
☐	☐	☐		
☐	☐	☐		
☐	☐	☐		

Submit copies of the permits/licenses/filings with this form ONLY if required by the Grant Program. Please retain all permits/licenses/filings in grant file for audit purposes.

GENERAL CHECKLIST OF BUSINESS PERMITS, LICENSES AND FILINGS

CalRecycle 669 (Rev. 05/13)

Comments/Notes:

Mark (✓ or X) appropriate box below.

☐	**PRIVATE ENTITY CERTIFICATION**: I declare under penalty of perjury under the laws of the State of California that the proposed grantee: 1) is in good standing and qualified to do business in the State; and 2) has or will comply with all applicable state, federal, and local laws, ordinances, regulations, license and permit requirements necessary for the proper performance of this grant; and 3) where compliance has not been met, I have attached a letter describing what has been done to achieve full compliance.
☒	**PUBLIC ENTITY CERTIFICATION:** I declare under penalty of perjury under the laws of the State of California that the proposed grantee: 1) has or will comply with all applicable state, federal, and local laws, ordinances, regulations, license and permit requirements necessary for the proper performance of this grant; and 2) where compliance has not been met, have attached a letter describing what has been done to achieve full compliance.

Executed at: Chico, CA (City and State) on 1-21-14 (Date)

X	
Signature Authority / Authorized Designee *(as authorized in Resolution, Letter of Commitment, or Letter of Designation)*	*Date*
Print Name	*Print Title*

Note: Falsification under penalty of perjury may result in criminal and civil penalties. In addition, pursuant to the terms of the grant agreement, any misrepresentations in the above certification shall constitute a breach of contract that could result in non-payment of grant funds to the grantee; relinquishment by the grantee of funds previously paid; termination of the grant; and/or placing the grantee on CalRecycle's Unreliable Contractors List.

EXHIBIT A
TERMS AND CONDITIONS

Tire-Derived Aggregate (TDA) Grant Program
Fiscal Year 2013/14

The following terms used in this Grant Agreement (Agreement) have the meanings given to them below, unless the context clearly indicates otherwise:

- "CalRecycle" means the Department of Resources Recycling and Recovery.
- "Director" means the Director of CalRecycle or his or her designee.
- "Grant Agreement" and "Agreement" means all documents comprising the agreement between CalRecycle and the Grantee for this Grant.
- "Grant Manager" means CalRecycle staff person responsible for monitoring the grant.
- "Grantee" means the recipient of funds pursuant to this Agreement.
- "Program" means the Tire-Derived Aggregate (TDA) Grant Program.
- "State" means the State of California, including, but not limited to, CalRecycle and/or its designated officer.

ACKNOWLEDGEMENTS: The Grantee shall acknowledge CalRecycle's support each time projects funded, in whole or in part, by this Agreement are publicized in any medium, including, but not limited to, news media, brochures, or other types of promotional materials. The acknowledgement of CalRecycle's support must incorporate the CalRecycle logo. Initials or abbreviations for CalRecycle shall not be used. The Grant Manager may approve deviation from the prescribed language on a case-by-case basis where such deviation is consistent with CalRecycle's Communication Strategy and Outreach Plan. If, subsequent to this Agreement, CalRecycle adopts updated or new logos or language (language), the Grant Manager may require the Grantee to include this language in newly printed or generated materials.

AIR OR WATER POLLUTION VIOLATION: The Grantee shall not be:

(a) In violation of any order or resolution not subject to review promulgated by the State Air Resources Board or an air pollution control district;
(b) Out of compliance with any final cease and desist order issued pursuant to Water Code section 13301 for violation of waste discharge requirements or discharge prohibitions; or
(c) Finally determined to be in violation of provisions of federal law relating to air or water pollution.

AMENDMENT: No amendment or variation of the terms of this Agreement shall be valid unless made in writing, signed by the parties, and approved as required. No oral understanding or agreement not incorporated into this Agreement is binding on any of the parties. This Agreement may be amended, modified or augmented by mutual consent of the parties, subject to the requirements and restrictions of this paragraph.

AMERICANS WITH DISABILITIES ACT: The Grantee assures the State that it complies with the Americans with Disabilities Act of 1990 (ADA)(42 U.S.C.§ 12101 et seq.), which prohibits discrimination on the basis of disability, as well as all applicable regulations and guidelines issued pursuant to the ADA.

ASSIGNMENT, SUCCESSORS, AND ASSIGNS:

(a) This Agreement may not be assigned by the Grantee, either in whole or in part, without CalRecycle's prior written consent.
(b) The provisions of this Agreement shall be binding upon and inure to the benefit of CalRecycle, the Grantee, and their respective successors and assigns.

AUDIT/RECORDS ACCESS: The Grantee agrees that CalRecycle, the Department of Finance, the Bureau of State Audits, or their designated representative(s) shall have the right to review and to copy any records and supporting documentation pertaining to the performance of this Agreement. The Grantee agrees to maintain such records for possible audit for a minimum of three (3) years after final payment date or grant term end date, whichever is later, unless a longer period of records retention is stipulated, or until completion of any action and resolution of all issues which may arise as a result of any litigation, dispute, or audit, whichever is later. The Grantee agrees to allow the designated representative(s) access to such records during normal business hours and to allow interviews of any employees who might reasonably have information related to such records. Further, the Grantee agrees to include a similar right of the State to audit records and interview staff in any contract or subcontract related to performance of this Agreement.

[It may be helpful to share the Terms and Conditions and Procedures and Requirements with your finance department, contractors and subcontractors. Examples of audit documentation include, but are not limited to: expenditure ledger, payroll register entries and time sheets, personnel expenditure summary form, travel expense log, paid warrants, contracts, change orders, invoices, and/or cancelled checks.]

AUTHORIZED REPRESENTATIVE: The Grantee shall continuously maintain a representative vested with signature authority authorized to work with CalRecycle on all grant-related issues. The Grantee shall, at all times, keep the Grant Manager informed as to the identity and contact information of the authorized representative.

AVAILABILITY OF FUNDS: CalRecycle's obligations under this Agreement are contingent upon and subject to the availability of funds appropriated for this grant.

BANKRUPTCY/DECLARATION OF FISCAL EMERGENCY NOTIFICATION: If the Grantee files for protection under Chapter 9 of the U.S. Bankruptcy Code (11 U.S.C. §901 et seq.) or declares a fiscal emergency at any time during the Grant Term, the Grantee shall notify CalRecycle within 15 days of such filing or declaration, pursuant to the procedures set forth in the section entitled "Communications" herein.

CHILD SUPPORT COMPLIANCE ACT: For any agreement in excess of $100,000, the Grantee acknowledges that:

(a) The Grantee recognizes the importance of child and family support obligations and shall fully comply with all applicable state and federal laws relating to child and family support enforcement, including, but not limited to, disclosure of information and compliance with earnings assignment orders, as provided in Family Code section 5200 et seq.; and
(b) The Grantee, to the best of its knowledge, is fully complying with the earnings assignment orders of all employees, and is providing the names of all new employees to the New Hire Registry maintained by the California Employment Development Department.

COMMUNICATIONS: All communications from the Grantee to CalRecycle shall be directed to the Grant Manager. All notices, including reports and payment requests, required by this Agreement shall be given in writing by email, letter, or fax to the Grant Manager as identified in the Procedures and Requirements (Exhibit B). If an original document is required, prepaid mail or personal delivery to the Grant Manager is required following the email or fax.

COMPLIANCE: The Grantee shall comply fully with all applicable federal, state, and local laws, ordinances, regulations, and permits. The Grantee shall provide evidence, upon request, that all local, state, and/or federal permits, licenses, registrations, and approvals have been secured for the purposes for which grant funds are to be expended. The Grantee shall maintain compliance with such requirements throughout the Grant Term. The Grantee shall ensure that the requirements of the California Environmental Quality Act are met for any approvals or other requirements necessary to carry out the terms of this Agreement. The Grantee shall ensure that all of Grantee's contractors and subcontractors

have all local, state, and/or federal permits, licenses, registrations, certifications, and approvals required to perform the work for which they are hired. Any deviation from the requirements of this section shall result in non-payment of grant funds.

CONFLICT OF INTEREST: The Grantee needs to be aware of the following provisions regarding current or former state employees. If the Grantee has any questions on the status of any person rendering services or involved with this Agreement, CalRecycle must be contacted immediately for clarification.

Current State Employees (Pub. Contract Code, § 10410):

(a) No officer or employee shall engage in any employment, activity, or enterprise from which the officer or employee receives compensation or has a financial interest and which is sponsored or funded by any state agency, unless the employment, activity, or enterprise is required as a condition of regular state employment.
(b) No officer or employee shall contract on his or her own behalf as an independent contractor with any state agency to provide goods or services.

Former State Employees (Pub. Contract Code, § 10411):

(a) For the two-year period from the date he or she left state employment, no former state officer or employee may enter into a contract in which he or she engaged in any of the negotiations, transactions, planning, arrangements or any part of the decision-making process relevant to the contract while employed in any capacity by any state agency.
(b) For the twelve-month period from the date he or she left state employment, no former state officer or employee may enter into a contract with any state agency if he or she was employed by that state agency in a policy-making position in the same general subject area as the proposed contract within the twelve month period prior to his or her leaving state service.

If the Grantee violates any provisions of above paragraphs, such action by the Grantee shall render this Agreement void. (Pub. Contract Code, § 10420).

CONTRACTORS/SUBCONTRACTORS: The Grantee will be entitled to make use of its own staff and such contractors and subcontractors as are mutually acceptable to the Grantee and CalRecycle. Any change in contractors or subcontractors must be mutually acceptable to the parties. Immediately upon termination of any such contract or subcontract, the Grantee shall notify the Grant Manager. Nothing contained in this Agreement or otherwise, shall create any contractual relation between CalRecycle and any contractors or subcontractors of Grantee, and no agreement with contractors or subcontractors shall relieve the Grantee of its responsibilities and obligations hereunder. The Grantee agrees to be as fully responsible to CalRecycle for the acts and omissions of its contractors and subcontractors and of persons either directly or indirectly employed by any of them as it is for the acts and omissions of persons directly employed by the Grantee. The Grantee's obligation to pay its contractors and subcontractors is an independent obligation from CalRecycle's obligation to make payments to the Grantee. As a result, CalRecycle shall have no obligation to pay or to enforce the payment of any moneys to any contractor or subcontractor.

COPYRIGHTS: Grantee retains title to any copyrights or copyrightable material produced pursuant to this Agreement. Grantee hereby grants to CalRecycle a royalty-free, nonexclusive, transferable, world-wide license to reproduce, translate, and distribute copies of any and all copyrightable materials produced pursuant this Agreement, for nonprofit, non-commercial purposes, and to have or permit others to do so on CalRecycle's behalf. Grantee is responsible for obtaining any necessary licenses, permissions, releases or authorizations to use text, images, or other materials owned, copyrighted, or trademarked by third parties and for extending such licenses, permissions, releases, or authorizations to CalRecycle pursuant to this section.

CORPORATION QUALIFIED TO DO BUSINESS IN CALIFORNIA: When work under this Agreement is to be performed in California by a corporation, the corporation shall be in good standing and currently qualified to do business in the State. "Doing business" is defined in Revenue and Taxation Code section 23101 as actively engaging in any transaction for the purpose of financial or pecuniary gain or profit.

DISCLAIMER OF WARRANTY: CalRecycle makes no warranties, express or implied, including without limitation, the implied warranties of merchantability and fitness for a particular purpose, regarding the materials, equipment, services or products purchased, used, obtained and/or produced with funds awarded under this Agreement, whether such materials, equipment, services or products are purchased, used, obtained and/or produced alone or in combination with other materials, equipment, services or products. No CalRecycle employees or agents have any right or authority to make any other representation, warranty or promise with respect to any materials, equipment, services or products, purchased, used, obtained, or produced with grant funds. In no event shall CalRecycle be liable for special, incidental or consequential damages arising from the use, sale or distribution of any materials, equipment, services or products purchased or produced with grant funds awarded under this Agreement.

DISCRETIONARY TERMINATION: The Director shall have the right to terminate this Agreement at his or her sole discretion at any time upon thirty (30) days written notice to the Grantee. Within forty-five (45) days of receipt of written notice, Grantee is required to:

(a) Submit a final written report describing all work performed by the Grantee;
(b) Submit an accounting of all grant funds expended up to and including the date of termination; and,
(c) Reimburse CalRecycle for any unspent funds.

DISPUTES: Unless otherwise instructed by the Grant Manager, the Grantee shall continue with its responsibilities under this Agreement during any dispute.

DRUG-FREE WORKPLACE CERTIFICATION: The person signing this Agreement on behalf of the Grantee certifies under penalty of perjury under the laws of California, that the Grantee will comply with the requirements of the Drug-Free Workplace Act of 1990 (Gov. Code, § 8350 et seq.) and will provide a drug-free workplace by taking the following actions:

(a) Publish a statement notifying employees that unlawful manufacture, distribution, dispensation, possession or use of a controlled substance is prohibited and specifying actions that will be taken against employees for violations.
(b) Establish a drug-free awareness program to inform employees about all of the following:
    (1) The dangers of drug abuse in the workplace;
    (2) The Grantee's policy of maintaining a drug-free workplace;
    (3) Any available counseling, rehabilitation, and employee assistance programs; and
    (4) Penalties that may be imposed upon employees for drug abuse violations.
(c) Require that each employee who works on the grant:
    (1) Receive a copy of the drug-free policy statement of the Grantee; and
    (2) Agrees to abide by the terms of such statement as a condition of employment on the grant.

EFFECTIVENESS OF AGREEMENT: This Agreement is of no force or effect until signed by both parties.

ENTIRE AGREEMENT: This Agreement supersedes all prior agreements, oral or written, made with respect to the subject hereof and, together with all attachments hereto, contains the entire agreement of the parties.

ENVIRONMENTAL JUSTICE: In the performance of this Agreement, the Grantee shall conduct its programs, policies, and activities that substantially affect human health or the environment in a manner

that ensures the fair treatment of people of all races, cultures, and income levels, including minority populations and low-income populations of the State.

EXPATRIATE CORPORATIONS: The person signing this Agreement on behalf of the Grantee certifies under penalty of perjury under the laws of California, that the Grantee is not an expatriate corporation or subsidiary of an expatriate corporation within the meaning of Public Contract Code sections 10286 and 10286.1, and is eligible to contract with the State of California.

FAILURE TO PERFORM AS REQUIRED BY THIS AGREEMENT: CalRecycle will benefit from the Grantee's full compliance with the terms of this Agreement only by the Grantee's:

(a) Investigation and/or application of technologies, processes, and devices which support reduction, reuse, and/or recycling of wastes; or
(b) Cleanup of the environment; or
(c) Enforcement of solid waste statutes and regulations, as applicable.

Therefore, the Grantee shall be in compliance with this Agreement only if the work it performs results in:

(a) Application of information, a process, usable data or a product which can be used to aid in reduction, reuse, and/or recycling of waste; or
(b) The cleanup of the environment; or
(c) The enforcement of solid waste statutes and regulations, as applicable.

If the Grant Manager determines that the Grantee has not complied with the Grant Agreement, the Grantee may forfeit the right to reimbursement of any grant funds not already paid by CalRecycle, including, but not limited to, the ten percent (10%) withhold.

FORCE MAJEURE: Neither CalRecycle nor the Grantee, its contractors, vendors, or subcontractors, if any, shall be responsible hereunder for any delay, default, or nonperformance of this Agreement, to the extent that such delay, default, or nonperformance is caused by an act of God, weather, accident, labor strike, fire, explosion, riot, war, rebellion, sabotage, flood, or other contingencies unforeseen by CalRecycle or the Grantee, its contractors, vendors, or subcontractors, and beyond the reasonable control of such party.

FORFEIT OF GRANT FUNDS/REPAYMENT OF FUNDS IMPROPERLY EXPENDED: If grant funds are not expended, or have not been expended, in accordance with this Agreement, or if real or personal property acquired with grant funds is not being used, or has not been used, for grant purposes in accordance with this Agreement, the Director, at his or her sole discretion, may take appropriate action under this Agreement, at law or in equity, including requiring the Grantee to forfeit the unexpended portion of the grant funds, including, but not limited to, the ten percent (10%) withhold, and/or to repay to CalRecycle any funds improperly expended.

GENERALLY ACCEPTED ACCOUNTING PRINCIPLES: The Grantee is required to use Generally Accepted Accounting Principles in documenting all grant expenditures.

GRANT MANAGER'S AUTHORITY: The Grant Manager does not have the authority to approve any deviation from or revision to the Terms and Conditions (Exhibit A) or the Procedures and Requirements (Exhibit B), unless such authority is expressly stated in the Procedures and Requirements (Exhibit B).

GRANTEE ACCOUNTABILITY: The Grantee is ultimately responsible and accountable for the manner in which the grant funds are utilized and accounted for and the way the grant is administered, even if the Grantee has contracted with another organization, public or private, to administer or operate its grant program. In the event an audit should determine that grant funds are owed to CalRecycle, the Grantee is responsible for repayment of the funds to CalRecycle.

GRANTEE'S INDEMNIFICATION AND DEFENSE OF THE STATE: The Grantee agrees to indemnify, defend and save harmless the State and CalRecycle, and their officers, agents and employees from any and all claims and losses accruing or resulting to any and all contractors, subcontractors, suppliers, laborers, and any other person, firm or corporation furnishing or supplying work services, materials, or supplies in connection with the performance of this Agreement, and from any and all claims and losses accruing or resulting to any person, firm or corporation who may be injured or damaged by the Grantee as a result of the performance of this Agreement.

GRANTEE'S NAME CHANGE: A written amendment is required to change the Grantee's name as listed on this Agreement. Upon receipt of legal documentation of the name change, CalRecycle will process the amendment. Payment of Payment Requests presented with a new name cannot be paid prior to approval of the amendment.

IN CASE OF EMERGENCY: In the event of an emergency, or where there is an imminent threat to public health and safety or the environment, the Grantee may choose, at its own risk, to incur grant-eligible expenses not previously included in the approved Budget, subject to subsequent approval by the Grant Manager of both the Budget change and the need to implement the Budget change on an emergency basis. The Grantee shall notify the Grant Manager of the emergency and the Budget change at the earliest possible opportunity. CalRecycle reserves the right to accept or reject the Grantee's determination that the circumstances constituted an emergency or a threat to public health and safety or the environment. If the Grant Manager determines that the circumstances did not constitute an emergency or a threat to public health or safety, the Budget change will be disallowed.

NATIONAL LABOR RELATIONS BOARD CERTIFICATION: The person signing this Agreement on behalf of the Grantee certifies under penalty of perjury that no more than one final unappealable finding of contempt of court by a federal court has been issued against the Grantee within the immediately preceding two-year period because of the Grantee's failure to comply with an order of a federal court which orders the Grantee to comply with an order of the National Labor Relations Board. This section is not applicable if the Grantee is a public entity.

NO AGENCY RELATIONSHIP CREATED/ INDEPENDENT CAPACITY: The Grantee and the agents and employees of Grantee, in the performance of this Agreement, shall act in an independent capacity and not as officers or employees or agents of CalRecycle.

NO WAIVER OF RIGHTS: CalRecycle shall not be deemed to have waived any rights under this Agreement unless such waiver is given in writing and signed by CalRecycle. No delay or omission on the part of CalRecycle in exercising any rights shall operate as a waiver of such right or any other right. A waiver by CalRecycle of a provision of this Agreement shall not prejudice or constitute a waiver of CalRecycle's right otherwise to demand strict compliance with that provision or any other provision of this Agreement. No prior waiver by CalRecycle, nor any course of dealing between CalRecycle and Grantee, shall constitute a waiver of any of CalRecycle's rights or of any of Grantee's obligations as to any future transactions. Whenever the consent of CalRecycle is required under this Agreement, the granting of such consent by CalRecycle in any instance shall not constitute continuing consent to subsequent instances where such consent is required and in all cases such consent may be granted or withheld in the sole discretion of CalRecycle.

NON-DISCRIMINATION CLAUSE:

(a) During the performance of this Agreement, Grantee and its contractors shall not unlawfully discriminate, harass, or allow harassment against any employee or applicant for employment on the bases enumerated in Government Code section 12900 et seq.

(b) The person signing this Agreement on behalf of the Grantee certifies under penalty of perjury under the laws of California that the Grantee has, unless exempted, complied with the nondiscrimination

program requirements (Gov. Code, § 12990, subd. (a-f) and California Code of Regulations, Title 2, section 8103). (Not applicable to public entities.)

ORDER OF PRECEDENCE: The performance of this grant shall be conducted in accordance with the Terms and Conditions, Procedures and Requirements, Project Summary/Statement of Use, Work Plan/Implementation Schedule, and Budget of this Agreement, or other combination of Exhibits specified on the Grant Agreement Coversheet attached hereto (collectively referred to as "Terms"). Grantee's CalRecycle-approved Application (Grantee's Application) is hereby incorporated herein by this reference. In the event of conflict or inconsistency between the articles, exhibits, attachments, specifications or provisions that constitute this Agreement, the following order of precedence shall apply:

(a) Grant Agreement Coversheet and any Amendments thereto
(b) Terms and Conditions
(c) Procedures and Requirements
(d) Project Summary/Statement of Use
(e) Budget
(f) Work Plan/Implementation Schedule
(g) Grantee's Application
(h) All other attachments hereto, including any that are incorporated by reference.

OWNERSHIP OF DRAWINGS, PLANS, AND SPECIFICATIONS: The State shall have separate and independent ownership of all drawings, design plans, specifications, notebooks, tracings, photographs, negatives, reports, findings, recommendations, data, software, and memoranda of every description or any part thereof, paid for in whole or in any part with grant funds. Copies thereof shall be delivered to CalRecycle upon request. Grantee agrees, and shall require that its contractors, subcontractors, and vendors agree, that the State shall have the full right to use said copies in any manner when and where it may determine without any claim to additional compensation.

PAYMENT:

(a) The approved Budget, if applicable, is attached hereto and incorporated herein by this reference and states the maximum amount of allowable costs for each of the tasks identified in the Work Plan, if applicable, which is attached hereto and incorporated herein by this reference. CalRecycle shall reimburse the Grantee for only the work and tasks specified in the Work Plan or the Grant Application at only those costs specified in the Budget and incurred in the term of the Agreement.
(b) The Grantee shall carry out the work described in the Work Plan or in the Grant Application in accordance with the approved Budget, and shall obtain the Grant Manager's written approval of any changes or modifications to the Work Plan, approved project as described in the Grant Application or the approved Budget prior to performing the changed work or incurring the changed cost. If the Grantee fails to obtain such prior written approval, the Director, at his or her sole discretion, may refuse to provide funds to pay for such work or costs.
(c) The Grantee shall request reimbursement in accordance with the procedures described in the Procedures and Requirements.
(d) Ten percent (10%) will be withheld from each Payment Request and paid at the end of the grant term, when all reports and conditions stipulated in this Agreement have been satisfactorily completed. Failure by the Grantee to satisfactorily complete all reports and conditions stipulated in this Agreement may result in forfeiture of any such funds withheld pursuant to CalRecycle's ten percent (10%) retention policy.
(e) Lodgings, Meals and Incidentals: Grantee's Per Diem eligible costs are limited to the amounts authorized in the California State Administrative Manual (contact the Grant Manager for more information).
(f) Payment will be made only to the Grantee.
(g) Reimbursable expenses shall not be incurred unless and until the Grantee receives a Notice to Proceed as described in the Procedures and Requirements (Exhibit B).

PERSONAL JURISDICTION: The Grantee consents to personal jurisdiction in the State of California for all proceedings concerning the validity and operation of this Agreement and the performance of the obligations imposed upon the parties. Native American Tribal Grantees expressly waive tribal sovereign immunity as a defense to any and all proceedings concerning the validity and operation of this Agreement and the performance of the obligations imposed upon the parties.

PERSONNEL COSTS: If there are eligible costs pursuant to Exhibit B, Procedures and Requirements, any personnel expenditures to be reimbursed with grant funds must be computed based on actual time spent on grant-related activities and on the actual salary or equivalent hourly wage the employee is paid for his or her regular job duties, including a proportionate share of any benefits to which the employee is entitled, unless otherwise specified in the Procedures and Requirements (Exhibit B).

REAL AND PERSONAL PROPERTY ACQUIRED WITH GRANT FUNDS:

(a) All real and personal property, including equipment and supplies, acquired with grant funds shall be used by the Grantee only for the purposes for which CalRecycle approved their acquisition for so long as such property is needed for such purposes, regardless of whether the Grantee continues to receive grant funds from CalRecycle for such purposes. In no event shall the length of time during which such property, including equipment and supplies, acquired with grant funds, is used for the purpose for which CalRecycle approved its acquisition be less than five (5) years after the end of the grant term, during which time the property, including equipment and supplies, must remain in the State of California.

(b) Subject to the obligations and conditions set forth in this section, title to all real and personal property acquired with grant funds, including all equipment and supplies, shall vest upon acquisition in the Grantee. The Grantee may be required to execute all documents required to provide CalRecycle with a security interest in any real or personal property, including equipment and supplies, and it shall be a condition of receiving this grant that CalRecycle shall be in first priority position with respect to the security interest on any such property acquired with the grant funds, unless pre-approved in writing by the Grant Manager that CalRecycle will accept a lower priority position with respect to the security interest on the property. Grantee shall inform any lender(s) from whom it is acquiring additional funding to complete the property purchase of this grant condition.

(c) The Grantee may not transfer Title to any real or personal property, including equipment and supplies, acquired with grant funds to any other entity without the express authorization of CalRecycle.

(d) CalRecycle will not reimburse the Grantee for the acquisition of equipment that was previously purchased with CalRecycle grant funds, unless the acquisition of such equipment with grant funds is pre-approved in writing by the Grant Manager. In the event of a question concerning the eligibility of equipment for grant funding, the burden will be on the Grantee to establish the pedigree of the equipment.

RECYCLED-CONTENT PAPER: All documents submitted by the Grantee must be printed double-sided on recycled-content paper containing one hundred percent (100%) post-consumer (PC) fiber. Specific pages containing full color photographs or other ink-intensive graphics may be printed on photographic paper.

REDUCTION OF WASTE: In the performance of this Agreement, Grantee shall take all reasonable steps to ensure that materials purchased or utilized in the course of the project are not wasted. Steps should include, but not be limited to: the use of used, reusable, or recyclable products; discretion in the amount of materials used; alternatives to disposal of materials consumed; and the practice of other waste reduction measures where feasible and appropriate.

REDUCTION OF WASTE TIRES: Unless otherwise provided for in this Agreement, in the performance of this Agreement, for all purchases made with grant funds, including, but not limited to equipment and tire-derived feedstock, the Grantee shall purchase and/or process only California waste

tires and California waste tire-derived products. As a condition of final payment under this Agreement, the Grantee must provide documentation substantiating the source of the tire materials used during the performance of this Agreement to the Grant Manager.

REMEDIES: Unless otherwise expressly provided herein, the rights and remedies hereunder are in addition to, and not in limitation of, other rights and remedies under this Agreement, at law or in equity, and exercise of one right or remedy shall not be deemed a waiver of any other right or remedy.

SEVERABILITY: If any provisions of this Agreement are found to be unlawful or unenforceable, such provisions will be voided and severed from this Agreement without affecting any other provision of this Agreement. To the full extent, however, that the provisions of such applicable law may be waived, they are hereby waived to the end that this Agreement be deemed to be a valid and binding agreement enforceable in accordance with its terms.

SITE ACCESS: The Grantee shall allow the State to access sites at which grant funds are expended and related work being performed at any time during the performance of the work and for ninety (90) days after completion of the work, or until all issues related to the grant project have been resolved.

STOP WORK NOTICE: Immediately upon receipt of a written notice from the Grant Manager to stop work, the Grantee shall cease all work under this Agreement.

TERMINATION FOR CAUSE: CalRecycle may terminate this Agreement and be relieved of any payments should the Grantee fail to perform the requirements of this Agreement at the time and in the manner herein provided. In the event of such termination, CalRecycle may proceed with the work in any manner deemed proper by CalRecycle. All costs to CalRecycle shall be deducted from any sum due the Grantee under this Agreement. Termination pursuant to this section may result in forfeiture by the Grantee of any funds retained pursuant to CalRecycle's ten percent (10%) retention policy.

TIME IS OF THE ESSENCE: Time is of the essence to this Agreement.

TOLLING OF STATUTE OF LIMITATIONS: The statute of limitations for bringing any action, administrative or civil, to enforce the terms of this Agreement or to recover any amounts determined to be owing to CalRecycle as the result of any audit of the grant covered by this Agreement shall be tolled during the period of any audit resolution, including any appeals by the Grantee to the Director.

UNION ORGANIZING: By signing this Agreement, the Grantee hereby acknowledges the applicability of Government Code sections 16645, 16645.2, 16645.8, 16646, 16647, and 16648 to this Agreement and hereby certifies that:

(a) No grant funds disbursed by this grant will be used to assist, promote, or deter union organizing by employees performing work under this Agreement.
(b) If the Grantee makes expenditures to assist, promote, or deter union organizing, the Grantee will maintain records sufficient to show that no state funds were used for those expenditures, and that Grantee shall provide those records to the Attorney General upon request.

UNRELIABLE LIST: Prior to authorizing any contractor or subcontractor to commence work under this Grant, the Grantee shall submit to CalRecycle a Reliable Contractor Declaration (CalRecycle 168) from the contractor or subcontractor, signed under penalty of perjury, disclosing whether of any of the events listed in Section 17050 of Title 14, California Code of Regulations, Natural Resources, Division 7, has occurred with respect to the contractor or subcontractor within the preceding three (3) years. See www.calrecycle.ca.gov/Laws/Regulations/Title14/ch1.htm#ch1a5. If a contractor is placed on CalRecycle's Unreliable List after award of this Grant, the Grantee may be required to terminate that contract.

VENUE/CHOICE OF LAW:

(a) All proceedings concerning the validity and operation of this Agreement and the performance of the obligations imposed upon the parties hereunder shall be held in Sacramento County, California. The parties hereby waive any right to any other venue. The place where the Agreement is entered into and place where the obligation is incurred is Sacramento County, California.

(b) The laws of the State of California shall govern all proceedings concerning the validity and operation of this Agreement and the performance of the obligations imposed upon the parties hereunder.

WAIVER OF CLAIMS AND RECOURSE AGAINST THE STATE: The Grantee agrees to waive all claims and recourse against the State, its officials, officers, agents, employees, and servants, including, but not limited to, the right to contribution for loss or damage to persons or property arising out of, resulting from, or in any way connected with or incident to this Agreement. This waiver extends to any loss incurred attributable to any activity undertaken or omitted pursuant to this Agreement or any product, structure, or condition created pursuant to, or as a result of, this Agreement.

WORK PRODUCTS: Grantee shall provide CalRecycle with copies of all final products identified in the Work Plan. Grantee shall also provide CalRecycle with copies of all public education and advertising material produced pursuant to this Agreement.

WORKERS' COMPENSATION/LABOR CODE: The Grantee is aware of Labor Code section 3700, which requires every employer to be insured against liability for Workers' Compensation or to undertake self-insurance in accordance with the Labor Code, and the Grantee agrees to comply with such provisions before commencing the performance of the work of this Agreement.

EXHIBIT B
PROCEDURES AND REQUIREMENTS
Tire-Derived Aggregate (TDA) Grant Program
Fiscal Year 2013/14

INTRODUCTION
The Procedures and Requirements of the Department of Resources Recycling and Recovery's (CalRecycle) Tire-Derived Aggregate (TDA) Grant Program Grant Agreement (Agreement) describes among other things, project and reporting requirements, report due dates, report contents, grant payment conditions, eligible and ineligible project costs, project completion and close-out procedures, records and audit requirements

Important Notice: Do not start the grant project or incur costs until you receive a Notice to Proceed (NTP) from your CalRecycle Grant Manager (Grant Manager). The NTP will be sent after both the grantee and CalRecycle have signed the Agreement.

MILESTONES

April 2014	**Grant Term begins** on the date indicated on the NTP
April 1, 2015	**Progress Report due** (covering activities from NTP date to April 1, 2015)
April 1, 2016	**Grant Term Ends. Final Report and final Payment Request due. All costs must be incurred by April 1, 2016.**

No extensions will be granted for submittal of the Final Report and final Payment Request. Failure to submit the Final Report and final Payment Request with appropriate documentation by April 1, 2016, may result in the rejection of the Payment Request and/or forfeiture by the grantee of claims for costs incurred that might otherwise have been eligible for grant funding.

QUESTIONS
All communication regarding this grant should be directed to the assigned Grant Manager. To find the email address and telephone number of your Grant Manager, refer to your grant in Grant Management System Web (GMSWeb). Contact information is located in the upper left-hand side. The grantee may also contact the Financial Resources Management (FiRM) Branch at (916) 341-5062 or grants@calrecycle.ca.gov.

For instructions regarding GMSWeb, including log-in directions, see the section below titled "Grant Management System Web".

PRIOR TO COMMENCING WORK
Prior to commencing work under this grant, the grantee's Primary Contact and authorized grant Signature Authority should review the Terms and Conditions (Exhibit A) and these Procedures and Requirements (Exhibit B) to identify key grant administration requirements. Evaluation of a grantee's compliance with these requirements is a focus of grant audits.

RELIABLE CONTRACTOR DECLARATION

This requirement is applicable to grantees that use a contractor on the project. Prior to authorizing a contractor(s) to commence work under this grant, the grantee shall submit to the Grant Manager a declaration from the contractor(s), signed under penalty of perjury, stating that within the preceding three (3) years, none of the events listed in Section 17050 of Title 14, California Code of Regulations, Division 7, has occurred with respect to the contractor(s) and the subcontractor(s). See http://www.calrecycle.ca.gov/Laws/Regulations/Title14/ch1.htm#ch1a5. If any of the listed events has occurred with respect to a contractor or subcontractor, please follow the instructions on the Reliable Contractor Declaration Form referenced below. If a contractor or subcontractor is placed on the CalRecycle Unreliable List after award of this grant, the grantee may be required to terminate the contract.

The grantee must provide the Reliable Contractor Declaration Form (CalRecycle 168) for all contractors and subcontractors that will supply rubberized asphalt materials for the project. To obtain the CalRecycle 168 form, see the General Grant Forms section of the CalRecycle forms web page: http://www.calrecycle.ca.gov/Grants/Forms.

A scanned copy of the signed Reliable Contractor Declaration Form must be uploaded in GMSWeb. To upload the Form:

1. Go to the **Reports** tab.
2. Click on **Reliable Contractor Declaration** link.
3. Click on the **Add Document** button.
4. Type a title, i.e., Reliable Contractor Declaration, then click the **Browse** button to search, select the document, and then **Save**.
5. Click the **Back** button to return to the previous page and then click on the **Submit** button.

For further instructions regarding GMSWeb, including log-in directions, see the section below titled "Grant Management System Web".

If a contractor or subcontractor is placed on the CalRecycle Unreliable List (http://www.calrecycle.ca.gov/Grants/Unreliability/List.htm) after award of this grant, the grantee may be required to terminate that contract.

PERMITTING

The grantee is responsible for ensuring that the entire project, not just the portion reimbursed by this grant, is in compliance with all federal, state, and local laws and permitting requirements. The grantee is also responsible for ensuring that project contractors and subcontractors have all necessary permits and licenses to perform the work for which they are hired, including, but not limited to, permitting by the appropriate Air Pollution Control District, Air Quality Management District, or other local air quality agency when required. Failure to comply with permitting requirements may result in denial of payment under this grant.

PROJECT REQUIREMENTS

All projects are subject to the following requirements:

- Only California-generated waste tires must be used in the TDA portion of the project(s).
- The project(s) must be located in California.
- A combined minimum of 500 tons of TDA must be used in the project(s).

- The project(s) represent a new category of activity at the project(s) facility/location. Projects that are currently underway or that have been completed at the same facility/location within three years of application are not eligible. However, projects in a different category or different use within a category at the same facility/location may be eligible.
- Plans and specifications must be reviewed by CalRecycle staff and/or its contractor(s) prior to commencement of work. The project design plans must be at a minimum 50 percent design at the time of application submission and 100 percent design prior to the start of the project. The design plans must include: project costs (preliminary costs submitted with the application), the location of TDA placement, the type and quantity of TDA (initial estimate submitted with the application), and any analysis necessary to validate the design.
- Each project must incorporate technical assistance/training that will be provided by CalRecycle contractors and/or staff.
- If grantee's ownership of the property on which the project(s) is located does not provide complete and clear access to the project site(s), then prior to incurring any grant-eligible costs, grantee must obtain any and all access rights (e.g., easements) necessary to complete the project(s) within the grant term and shall ensure that such access extends to CalRecycle staff and/or its designated contractors for the purpose of observing the project, providing technical assistance and/or training during the grant term. Such access must be from the legal owner or his/her authorized representative.
- Reimbursement will not exceed the amount stated on the Grant Agreement Cover Sheet (CalRecycle 110).
- Construction of the TDA portion of any project must commence on or after the date indicated in CalRecycle's written NTP and be completed by April 1, 2016.

Additionally, each of the following project requirements is specific to the individual types of projects as indicated:

- **Landfill projects** must not use more than 0.75 cubic yards (0.5 tons) of TDA per lineal foot of landfill gas collection or leachate injection line.
- For purposes of this Agreement, a "**Very Large Project**" is defined as using more than 400,000 passenger tire equivalents or 4,000 tons of TDA material. Landfill applications are not eligible for consideration as a Very Large Project.

PROJECT ACKNOWLEDGEMENT REQUIREMENTS

By April 1, 2016, the grantee must list on their website, for a minimum period of one year, an acknowledgement of CalRecycle's funding and the waste tire diversion amounts for the project(s). See the "Acknowledgements" provision in the Terms and Conditions – Exhibit A, for acknowledgement requirement information. The acknowledgement must include the following:

1. Funded by grant from CalRecycle
2. CalRecycle Logo[1]
3. Number of California waste tires[2] diverted from the waste stream by this project

[1] CalRecycle Logos are available in the Image Gallery web site at: http://www.calrecycle.ca.gov/Gallery/Logos/; or contact your Grant Manager.

[2] To determine the number of tires diverted, refer to the Tire-Derived Aggregate (TDA) Certification Form (CalRecycle 740-TDA) for the calculation formula. This is typically calculated after construction.

When the web site acknowledgement posting is problematic due to grantee-specific issues, the grantee may substitute alternative forms of acknowledgement requirements upon written pre-approval from the Grant Manager.

Alternatives to the web site posting acknowledgement requirement must include one or more of the following:

- Utility bill inserts
- Newspaper ads/stories
- Local radio
- Television public service announcement (PSA)
- Project signage placed in a prominent location at the project site(s). A high resolution file for production purposes can be found on the tire resources web site at: http://www.calrecycle.ca.gov/Tires/Grants/Resources/#Signage

WORK PLAN AND CHANGES/MODIFICATIONS

Proposed changes or modifications to the approved project(s) must be requested in writing to the Grant Manager. The request must include the reason for change and a revised Project Summary and Calculation. **The Grant Manager must approve the proposed changes in writing prior to the grantee performing any changes or incurring any related costs.**

GRANT MANAGEMENT SYSTEM Web (GMSWeb)

GMSWeb is CalRecycle's web-based grant application and grant management system. Access to GMSWeb is secure; grantees must log in using a WebPass. WebPass accounts are tied to a specific email address. If an email address changes, or if it becomes inactive, the grantee must create a new WebPass account to continue accessing GMSWeb. Establish or manage a CalRecycle WebPass at; https://secure.calrecycle.ca.gov/WebPass/.

Accessing the grant

Grantees must log into GMSWeb using their web pass at; https://secure.calrecycle.ca.gov/Grants. After log-in, locate the grant in the **Associated Grant Applications** table and select the **Grant Management** link. The **Grant Management** module includes the following sections:

- **Summary tab** – contains a budget summary that shows approved budget, paid and remaining amounts (this section is available to the grantee in read-only mode) and resource links and documents.
- **Payment Request tab** – requests reimbursement.
- **Reports tab** – uploads required reports and forms.
- **Documents tab** – uploads other grant documents that are not considered supporting documents to a payment request or a report. This section also provides access to documents that were uploaded within other sections of GMSWeb.

Follow the instructions in GMSWeb to work in the system. Use the information in the following sections to determine what reports, transactions, and supporting documents are required.

Contact Updates

- Access to the grant is limited to those listed in the **Contacts** tab in the **Application Module**. Existing contacts may update contact information for all contact types except Signature Authority.
- Email the assigned Grant Manager of any changes to Signature Authority information.

REPORTING REQUIREMENTS

A Progress Report and a Final Report are required by this Agreement; however, the Grant Manager may request a Progress Report at any time during the grant term.

All reports must be uploaded in GMSWeb. *For further instructions regarding GMSWeb, including login directions, see the section above titled, Grant Management System Web.*

To upload a report:

1. Go to the **Reports** tab.
2. Click on the appropriate event name.
3. Click on the **Add Document** button.
4. Type a title, i.e., Progress Report, then click the **Browse** button to search, select the document, and then **Save**.
    - You may upload multiple documents to complete reporting requirements.
    - The maximum allowable file size for each document is 50MB.
5. Click the **Back** button to return to the previous page.
6. Click the **Submit** button when the report upload is complete.

The reports must be current, include all required sections and documents, and must be approved by the Grant Manager before any Payment Request can be processed. Failure to comply with the specified reporting requirements may be considered a breach of this Agreement and may result in the termination of this Agreement, rejection of the Payment Request, and/or forfeiture by the grantee of claims for costs incurred that might otherwise have been eligible for grant funding.

Any problems or delays must be reported immediately to the Grant Manager.

PROGRESS REPORT REQUIREMENTS

The grantee may submit the Progress Report to the Grant Manager any time prior to but no later than **April 1, 2015** (for the period covering the NTP Date to April 1, 2015). The Progress Report must address the work completed during the Reporting Period and be accompanied by all required supporting documentation, including pre-construction photographs.

The Progress Report must be submitted even if the work has not yet begun on the project. **If you are submitting a Grant Payment Request at the same time as your Progress Report, you must follow the guidelines under the Final Report Requirements.**

The Progress Report must be prepared in the format specified below and uploaded into the GMSWeb system, see *Reporting Requirements* section for instructions.

REPORT COMPONENT

Cover Page

- Name of the grantee
- Grant number
- Amount of grant award
- Dates of report coverage
- Report preparation date
- Disclaimer statement, as follows:

  "The statements and conclusions of this report are those of the grantee and not necessarily those of the Department of Resources Recycling and Recovery, its employees, or the State of California. The State makes no warranty, express or implied, and assumes no liability for the information contained in the succeeding text."

Project Summary and Status

Provide a brief description of the progress of the TDA grant project(s) including:

- Completed design plans
- Hired contractor(s)
- Approved, completed, and in-process project(s)
- The timeline for completion of remaining project(s)
- Results Achieved
- Problems encountered or anticipated
- Provide a brief description of any changes to the project and/or schedule including:
  - ✓ Changes in grantee contact information
  - ✓ Changes or modifications to the original project

FINAL REPORT REQUIREMENTS

The Final Report and final Grant Payment Request may be submitted at any time after the project is completed, but must be submitted no later than **April 1, 2016**. The reporting period covers from the NTP to April 1, 2016, or completion of Project, whichever is sooner. **Failure to submit the Final Report and final Grant Payment Request with appropriate documentation by April 1, 2016, may result in rejection of the final Grant Payment Request and/or forfeiture by the grantee of any claims for reimbursement of otherwise eligible costs.**

The Final Report must be prepared in the format specified below and must be uploaded into the GMSWeb system, see *Reporting Requirements* section for instructions; you may need to upload multiple documents to complete all the requirements listed below. If requested, the grantee shall make an oral presentation to CalRecycle.

REPORT COMPONENT

Cover Page

- Name of the grantee
- Grant number
- Amount of grant award
- Dates of report coverage
- Report preparation date
- Disclaimer statement, as follows:

  "The statements and conclusions of this report are those of the Grantee and not necessarily those of the Department of Resources Recycling and Recovery, its employees, or the State of

California. The State makes no warranty, express or implied, and assumes no liability for the information contained in the succeeding text."

Table of Contents
Identify report contents and corresponding page numbers.

Project Summary and Status
Provide a concise Executive Summary of the project(s). Within the narrative of the report, include the following information:

- Project(s) location
- Amount (tons) of TDA used in the project
- General information (type of project, duration to construct, etc.)
- Cost of TDA material ($/ton)
- As-built drawing(s), certified by a Registered Civil Engineer, of the completed project, including any deviation from the CalRecycle initially approved design. Uploaded files cannot exceed 50 megabytes. If necessary, split documents/files and designate them with the document/file name and the extension "a," "b," etc.
- Final project site survey using a pre-established benchmark outside of the project boundaries
- TDA material quality assurance logs
- Laboratory analysis of all soil materials placed on site
- Specification sheet for the Geosynthetic fabric wrap used to enclose the TDA cell
- Lessons learned and any problems encountered

Waste Tires Diverted
Include the total number of California waste tires diverted from the waste stream as a result of the project's completion. You must provide verification that the only tire rubber purchased and used in the project was from California by signing and uploading the completed Tire-Derived Aggregate (TDA) Certification Forms (CalRecycle 740-TDA) via GMSWeb. The form is available at http://www.calrecycle.ca.gov/Grants/Forms, in the Tire Recycling, Cleanup, and Enforcement Grants section.

Photographs/Project Acknowledgement

- Provide two digital photographs each of the preconstruction and completed project(s).
- Include a copy of your internet web page (or alternative) project acknowledgement, including web address. See Project Acknowledgement Requirements section for more alternatives.

Contractor Summary
List of all contractors and subcontractors that supplied, transported, and/or installed TDA materials or that provided engineering/design or testing services for the project. For each contractor and subcontractor include the following information:

- Name of Firm
- Contact person
- Address
- Concise statement of work completed
- Time period in which the work was completed
- Amount paid

- A copy of the Reliable Contractor Declaration (CalRecycle 168) required by Exhibit A – Terms and Conditions (Unreliable List) and filed for each contractor and subcontractor at the beginning of the project

GRANT PAYMENT INFORMATION

1. Payment to the grantee for eligible grant expenses is made on a reimbursement basis only and for only those materials and services specified in the approved Grant Application.
2. Reimbursement may be requested only twice during the grant term. In conjunction with (or after) submission of the Progress Report and in conjunction with the Final Report.
3. The grantee must submit the required Progress Report/Final Report, and the Grant Manager must approve the report prior to, or concurrent with, submission of the Grant Payment Request.
4. The grantee must submit a completed Grant Payment Request and provide supporting documentation as described in the "Grant Payment Request and Documentation" section for completed project(s) only.
5. Grant payments will only be made to the grantee. It is the grantee's responsibility to pay all contractors and subcontractors for purchased goods and services.
6. Ten percent of each approved Grant Payment Request will be withheld and retained until all conditions stipulated in the Agreement, including submission and Grant Manager approval of the Progress and/or Final Report, have been satisfied. Reimbursement of the ten percent retention must be requested in the final Grant Payment Request.
7. CalRecycle will make payments to the grantee as promptly as fiscal procedures permit. The grantee can typically expect payment approximately 45 days from the date a Grant Payment Request is approved by the Grant Manager.
8. The grantee must provide a Reliable Contractor Declaration (CalRecycle 168) (see http://www.calrecycle.ca.gov/Grants/Forms) signed under penalty of perjury by the grantee's contractor(s) and subcontractor(s) in accordance with the "Unreliable List" provision of the Terms and Conditions. The declaration must be received and approved by the Grant Manager prior to commencement of work. See "Unreliable List" provision in Exhibit A – Terms and Conditions for more information.

ELIGIBLE PROJECT COSTS

Eligible costs include expenditures incurred during the Grant Term (beginning after receipt of the NTP through April 1, 2016) directly related to the purchase and transportation of the TDA material, and the installation, testing, and engineering/design work for the project.

One or more projects may be combined into a single grant. Testing costs are subject to a maximum of $5,000 per project category. Engineering/design costs are subject to a maximum of 13 percent of the combined total cost of material, installation, and testing, not to exceed $40,265. For a single Very Large Project (see "Project Requirements" for definition), engineering/design and testing costs are subject to a maximum of 13 percent of the combined total cost of material and installation, not to exceed $86,283, the maximum allowed for a $750,000 grant.

Installation cost may be incurred by the grantee and/or the contractor. Eligible costs include trenching/preparation, placement and covering of the TDA material. Requirements for documentation supporting Installation cost can be found in the "Cost and payment documentation" subsection under the Grant Payment Request and Documentation section.

INELIGIBLE PROJECT COSTS

Ineligible costs include, but are not limited to:

- Costs incurred prior to the Notice to Proceed date or after April 1, 2016.
- Costs incurred for projects that start construction of the TDA portion of the project prior to the Notice to Proceed date, or end construction of the TDA portion of the project after April 1, 2016.
- Projects using TDA material that is not made from only California-generated waste tires.
- Projects using less than the minimum required total amount of TDA material as specified in Project Requirements.
- Projects that are currently underway or that have been completed at the same facility/location within three years of application.
- Use of shredded waste tires as alternative daily cover or alternative intermediate cover in landfill applications.
- Other project-related costs, including, but not limited to, planning, permitting, environmental studies, and site preparation.
- Personnel costs, including fringe benefits.
- Overhead and/or indirect costs.
- Any other costs deemed unreasonable or unrelated to the purpose of the grant by the Grant Manager.

GRANT PAYMENT REQUEST AND DOCUMENTATION

Payment requests must be submitted in GMSWeb. *For further instructions regarding GMSWeb, including login directions, see the section above titled Grant Management System Web.* To submit a Grant Payment Request:

1. Go to the **Payment Request** tab.
2. Click on the **Create a Payment Request** button.
   a. Choose **Reimburse** for the Transaction Type and enter the amount spent in each budget subcategory.
   b. When the transaction is complete, click the **Save** button.
   c. After the transaction is saved, the **Upload Supporting Documentation** button will appear in the lower right corner.
3. Click on the **Upload Supporting Documentation** button.
   a. Type a title, e.g., Payment Request #1, Invoice #1, Cancelled Check, then click the **Browse** button to search and upload the document, and then **Save**.
   b. Select **Back** to upload additional documents and continue this process until all required supporting documents as listed below are uploaded.
   c. The maximum allowable file size for each document is 50MB.
4. Click the **Submit** Transaction button, located on the transaction page, to complete your payment request (including uploading all required supporting documents as listed below).

   Supporting Documentation

   a. A scanned copy of the signed **Grant Payment Request form** (CalRecycle 87).
   The grantee is also <u>required</u> to mail the **original** Grant Payment Request form with an original signature of the signatory or his/her designee*, as authorized by grantee's Resolution or Letter of Commitment to:

Via standard mail:	Via courier/personal delivery:
CalRecycle TDA Grant Program FiRM Branch, 9th Floor P.O. Box 4025 Sacramento, CA 95812-4025	CalRecycle TDA Grant Program FiRM Branch, 9th Floor 1001 I Street Sacramento, CA 95814

* A designee may sign on behalf of the grantee if a) authorized by the Resolution or Letter of Commitment, and b) a Letter of Designation has been provided to the Grant Manager.

b. **Cost and payment documentation**, such as invoices; receipts, weigh tickets or approved progress payment authorizations containing:
   - ✓ Vendor name, phone number or address, purchase amount and date
   - ✓ Description of goods or services
   - ✓ Proof of payment (e.g., copies of cancelled checks, bank statements, invoice marked as paid with corresponding receipts or cancelled checks)
   - ✓ Amount of TDA material produced for the project
   - ✓ Documents supporting Installation Cost containing:
     - For grantees:
       - A Personnel Expenditure Itemization Summary (CalRecycle 165) (PES) form must be submitted for grantee staff directly involved in TDA installation. PES forms are available at Grant Forms web page (http://www.calrecycle.ca.gov/Grants/Forms), in the General Grant Forms section.
       - A letter or an e-mail correspondence, indicating the total linear footage and the percentage representing installation cost.
       - Grantee must retain payroll journal/registers and personnel time logs/timesheets for audit purposes, but do not need to submit them with a Payment Request.
     - For contractors:
       - A Construction Progress Payment (or equivalent), indicating unit (linear foot/yard, etc.) price and total number of units of installation activity work performed.
         - If the above cannot be provided, grantee can submit a PES (CalRecycle 165) form as an alternative. PES forms are available at Grant Forms web page (http://www.calrecycle.ca.gov/Grants/Forms), in the General Grant Forms section.
       - A letter or an e-mail correspondence, indicating the percentage representing installation cost.
       - Contractor must retain payroll journal/registers and personnel time logs/timesheets for audit purposes, but do not need to submit them with a Payment Request.

   Note: *All supporting documentation must be maintained by the grantee in its files, in accordance with the "Audit/Records Access" section of Exhibit A – Terms and Conditions.*

c. A completed and final calculation page that provides information showing how the requested payment amount is calculated. For format, refer to the calculation tool provided in Exhibit C – Grantee's Approved Application, and the Project Summary & Calculation, which is incorporated therein; or the calculation samples from Tables 1 through 6 in the Application Guidelines and Instructions.

d. **For private, for-profit grantees only**, an updated General Checklist of Business Permits, Licenses and Filings form (CalRecycle 669), available at Grant Forms web page (http://www.calrecycle.ca.gov/Grants/Forms), in the General Grant Forms section.

RECORDS AND AUDIT REQUIREMENTS

This grant is subject to a desk or field audit. See the "Audit/Records Access" provision in Exhibit A – Terms and Conditions for more information.

ANNUAL SURVEY

Post-grant term annual surveys are encouraged by this Agreement to help assess your long-term satisfaction with the TDA projects funded by this Agreement. The grantee must complete and submit an annual survey for the TDA Grant Program every year for five years after the grant is closed based upon the schedule below.

Survey Due Date	Survey Period
June 30, 2017	Completion of Project – June 30, 2017
June 30, 2018	July 1, 2017 – June 30, 2018
June 30, 2019	July 1, 2018 – June 30, 2019
June 30, 2020	July 1, 2019 – June 30, 2020
June 30, 2021	July 1, 2020 – June 30, 2021

Grantees will be notified via email once the annual online survey is available. The annual online survey may be accessed online at: http://www.calrecycle.ca.gov/Tires/Grants/TDA/default.htm.
Note: A link to the survey is only active during the survey period.

Attachment

FORMS GUIDE

Form Name	When it's used?	Completed by…
Reliable Contractor Declaration form (CalRecycle 168)	Prior to authorizing contractor to commence work	Grantee & Contractor
Grant Payment Request form (CalRecycle 87)	When requesting reimbursement	Grantee
Tire-Derived Aggregate (TDA) Certification form (CalRecycle 740-TDA)	When requesting reimbursement	Product Supplier, Manufacturer, Contractor, or Grantee

IMPORTANT! These forms are provided for your reference as you review your grant agreement documents. This may not be an all inclusive list. These forms may be updated during your grant term. Please refer to the following website for the latest version, http://www.calrecycle.ca.gov/Grants/Forms/.

STATE OF CALIFORNIA DEPARTMENT OF RESOURCES RECYCLING AND RECOVERY (CalRecycle)

RELIABLE CONTRACTOR DECLARATION

CalRecycle 168 (Revised 7/13)

This form must be completed and submitted to the Department of Resources Recycling and Recovery (CalRecycle) prior to authorizing a contractor(s) to commence work. Failure to provide this documentation in a timely manner may result in nonpayment of funds to the contractor(s).

This form is intended to help the CalRecycle's Grantees comply with the Unreliable List requirement of their Terms and Conditions.

The Unreliable List provision requires the following:
Prior to authorizing a contractor(s) to commence work under the Grant, the Grantee shall submit to CalRecycle a declaration signed under penalty of perjury by the contractor(s) stating that within the preceding three (3) years, none of the events listed in Section 17050 of Title 14, California Code of Regulations, Natural Resources, Division 7, has occurred with respect to the contractor(s). Please see the reverse of this page, or refer to www.calregs.com

If any of the events listed in Section 17050 have occurred, disclosure is required but will not necessarily result in CalRecycle refusing to approve the contractor. A signed statement explaining the facts and circumstances of the events must be attached to and submitted with this form.

Contractor: Complete the form and send original to the Grantee.
Grantee: Scan the form and upload it to the grant in CalRecycle's Grant Management System (GMS). *For further instruction about logging into GMS and uploading this form, reference the Procedures and Requirements.* Retain the original form in your grant file.

GRANTEE INFORMATION	
GRANTEE NAME: BUTTE COUNTY ASSOCIATION	**GRANT NUMBER:** Tire-Derived Aggregate Grant Progr
PRIMARY CONTACT NAME: 15346	
CONTRACTOR INFORMATION	
CONTRACTOR NAME: 1/22/2014	
AUTHORIZED CONTRACTOR REPRESENTATIVE NAME:	
MAILING ADDRESS:	
As the authorized representative of the above identified contractor, I declare under penalty of perjury under the laws of the State of California that within the preceding three (3) years, none of the events listed in Section 17050 of Title 14, California Code of Regulations, Natural Resources, Division 7, has occurred with respect to the above identified contractor. ***Alternatively**, as the authorized representative of the above identified contractor, I declare under penalty of perjury under the laws of the State of California that within the preceding three (3) years, if any of the events listed in Section 17050 of Title 14, California Code of Regulations, Natural Resources, Division 7, has occurred with respect to the above identified contractor, I have disclosed all such occurrences in an attached signed statement that explains the facts and circumstances of the listed events.*	
Signature	***Date***

STATE OF CALIFORNIA DEPARTMENT OF RESOURCES RECYCLING AND RECOVERY (CalRecycle)

RELIABLE CONTRACTOR DECLARATION

CalRecycle 168 (Revised 7/13)

Title 14 CCR, Division 7, Chapter 1
Article 5. Unreliable Contractors, Subcontractors, Borrowers and Grantees
Section 17050. Grounds for Placement on Unreliable List

The following are grounds for a finding that a contractor, any subcontractor that provides services for a CalRecycle agreement, grantee or borrower is unreliable and should be placed on the CalRecycle Unreliable Contractor, Subcontractor, Grantee or Borrower List ("Unreliable List"). The presence of one of these grounds shall not automatically result in placement on the Unreliable List. A finding must be made by the Executive Director in accordance with section 17054, and there must be a final decision on any appeal that may be filed in accordance with section 17055 et seq.

(a) Disallowance of any and/or all claim(s) to CalRecycle due to fraudulent claims or reporting; or
(b) The filing of a civil action by the Attorney General for a violation of the False Claims Act, Government Code section 12650 et. seq; or
(c) Default on a CalRecycle loan, as evidenced by written notice from CalRecycle staff provided to the borrower of the default; or
(d) Foreclosure upon real property loan collateral or repossession of personal property loan collateral by CalRecycle; or
(e) Filing voluntary or involuntary bankruptcy, where there is a finding based on substantial evidence, that the bankruptcy interfered with the CalRecycle contract, subcontract, grant or loan; or
(f) Breach of the terms and conditions of a previous CalRecycle contract, any subcontract for a CalRecycle agreement, grant, or loan, resulting in termination of the CalRecycle contract, subcontract, grant or loan by the CalRecycle or prime contractor; or
(g) Placement on the CalRecycle's chronic violator inventory established pursuant to Public Resources Code section 44104 for any owner or operator of a solid waste facility; or
(h) The person, or any partner, member, officer, director, responsible managing officer, or responsible managing employee of an entity has been convicted by a court of competent jurisdiction of any charge of fraud, bribery, collusion, conspiracy, or any act in violation of any state or federal antitrust law in connection with the bidding upon, award of, or performance under any CalRecycle contract, subcontract, grant or loan; or
(i) The person or entity is on the list of unreliable persons or entities, or similar list, of any other federal or California state agency; or
(j) The person or entity has violated an Order issued in accordance with section 18304; or,
(k) The person or entity has directed or transported to, has or accepted waste tires at, a site where the operator is required to have but does not have a waste tire facility permit; or,
(l) The person or entity has transported waste tires without a waste tire hauler registration; or,
(m) The person or entity has had a solid waste facility or waste tire permit or a waste tire hauler registration denied, suspended or revoked; or,
(n) The person or entity has abandoned a site or taken a similar action which resulted in corrective action or the expenditure of funds by CalRecycle to remediate, clean, or abate a nuisance at the site; or
(o) The following are additional grounds for a finding that, a person or entity described below should be placed on the Unreliable List:
    (1) The person or entity owned 20% or more of an entity on the Unreliable List at the time of the activity that resulted in its placement on the Unreliable List;
    (2) The person held the position of officer director, manager, partner, trustee, or any other management position with significant control (Principal Manager) in an entity on the Unreliable List at the time of the activity that resulted in its placement on the Unreliable List;
    (3) The entity includes a Principal Manager who:
        1. Was a Principal Manager in an entity on the Unreliable List at the time of the activity that resulted in its placement on the Unreliable List; or,
        2. Owned 20% or more of an entity on the Unreliable List at the time of the activity that resulted in its placement on the Unreliable List;
    (4) The entity has a person who owns 20% or more of the entity, if that person:
        1. Was a Principal Manager in an entity on the Unreliable List at the time of the activity that resulted in its placement on the Unreliable List; or,
        2. Owned 20% or more of an entity on the Unreliable List at the time of the activity that resulted in its placement on the Unreliable List.
    (5) The entity has another entity which owns 20% or more of the entity, if that other entity:
        1. Is on the Unreliable List; or,
        2. Owned 20% or more of an entity on the Unreliable List at the time of the activity that resulted in its placement on the Unreliable List.
    (6) Subsection (o) is not intended to apply to a person or entity that purchases or otherwise obtains an entity on the Unreliable List subsequent to its placement on the Unreliable List.

STATE OF CALIFORNIA
DEPARTMENT OF RESOURCES RECYCLING AND RECOVERY (CALRECYCLE)
CALRECYCLE 740- TDA (8/13)

Grantee Name:	BUTTE COUNTY ASSOCIATION O
Grant Number:	

Tire Derived Aggregate (TDA) Certification

This TDA Certification form must be completed by each TDA manufacturer or contractor who provides TDA product for the above referenced grant. By signing this form, the signatory certifies, under penalty of perjury, that (s)he is authorized to sign this document on behalf of the TDA manufacturer or contractor named below and that the information is true and accurate.

Grantee: Request completion of this form by each TDA manufacturer or contractor who provides TDA product for your grant project. Review the form for accuracy and completeness and include it with the Payment Request form submitted for reimbursement for the TDA product described below. Retain a copy of this document and all supporting documentation showing that the tire material used for your grant project is from only California-generated waste tires.

TDA manufacturer or contractor: See instructions on the next page, complete and submit this form and supporting documentation to Grantee.

TDA MANUFACTURER OR CONTRACTOR NAME: 15346	EMAIL:	
CONTACT NAME: 1/22/2014	PHONE:	FAX:
ADDRESS:	WEBSITE:	

SUPPORTING DOCUMENTATION REQUIREMENT
☐ **CERTIFICATE OF ORIGIN OR ACCEPTABLE SUPPORTING DOCUMENTATION ATTACHED (SEE FOOTNOTES ON NEXT PAGE)**

Product Description	Manufacturer Name	Quantity (lbs.)	/ (divided)	Passenger Tire Equivalent (PTE)	=	Number of PTE's Diverted
TDA Material (Type A, Type B, other)	*EXAMPLE*	25,000	/	20 lbs/tire	=	1,250
			/		=	
			/		=	
					TOTAL:	

The Product Provider agrees to be bound by the Audit/Records Access requirements of the above-referenced Grant. See next page for additional detail.

I certify under penalty of perjury that I am an authorized signatory for the above named TDA manufacturer or contractor and that the material provided to the above-named grantee is manufactured from only California-generated waste tires. I understand that if it cannot be verified that the source of the material is from only California-generated waste tires, or if an audit discloses the use of non-California waste tires, that the CalRecycle may deny reimbursement of this cost and/or require the grantee to return some or all grant funds previously paid under this grant, and that the grantee may seek reimbursement from the above-named TDA manufacturer or contractor for the TDA material costs and related damages.

Signature of Authorized Signatory for TDA manufacturer or contractor	*Print Name*	*Title*	*Date*

INSTRUCTIONS:

Grantee to provide:

1. Grantee Name: Complete full legal name as it appears on the TDA Grant Agreement Cover Sheet.

2. Grant Number: Enter assigned grant number.

TDA manufacturer, or contractor to provide:

1. Contact information: Provide your business' contact information in this section.

2. Supporting documentation requirement: Provide the grantee with copies of supporting documentation that validates only California-generated waste tires were used for this grant project and that the waste tires were processed in California. Acceptable forms of supporting documentation include: Certificate of Origin (if completed by a California Processor) or a Bill of Lading and Manifest documentation for non-California processors.

3. Number of tires diverted: Provide the total number of tires diverted in Passenger Tire Equivalents for this project. Include both the number of pounds of TDA material and the calculated number of Passenger Tire Equivalent (PTEs): Use **20** pounds of rubber per PTE.

4. Signature: This form must be signed by an authorized signatory of the TDA manufacturer or contractor. Provide the completed form, with supporting documentation, to the grantee.

AUDIT/RECORDS ACCESS:

The Product Provider agrees that CalRecycle, the Department of Finance, the Bureau of State Audits, or their designated representative(s) shall have the right to review and to copy any records and supporting documentation pertaining to this Certification or the products certified herein. The Product Provider agrees to maintain such records for possible audit for a minimum of three (3) years after final payment date or grant term end date, whichever is later, unless a longer period of records retention is stipulated, or until completion of any action and resolution of all issues which may arise as a result of any litigation, dispute, or audit, whichever is later. The Product Provider agrees to allow the designated representative(s) access to such records during normal business hours and to allow interviews of any employees who might reasonably have information related to such records. Further, the Product Provider agrees to include a similar right of the State to audit records and interview staff in any contract or subcontract related to this Certification or the products certified herein.

PERMIT TO ENTER & CONSTRUCT

Date: 5-30-14
Project: Butte Regional Transit Operations Center
APN: 039-060-125 (portion)

Hegan Lane Partners (OWNER) hereby grants permission to the Butte County Association of Governments (BCAG) and its officers, employees, agents and contractors to enter our property for the purpose of constructing a public roadway extension, stockpiling excavations and accommodating the construction of a storm drain and associated outfall (PROJECT) shown on the attached Exhibit "A" and located at the north end of the Huss Lane and Aztec Drive intersection in Chico, CA.

This permission is granted in consideration of the benefits accruing to OWNER and/or in the interest of the public health, safety, and welfare.

BCAG will give OWNER 5 days notice prior to commencement of the PROJECT. Once the work on the property has commenced, all work will be completed within 120 Working Days unless delayed by reason of inclement weather.

This permit to enter will commence on June 1, 2014 and terminate upon the earlier of the following: (i) completion of the work; (ii) June 1, 2015 or (iii) completion of Mid Valley Title Escrow Number 00401-3846963. After termination, BCAG will have no further rights arising out of this Agreement with respect to the contemplated construction on the Property, excepting therefrom the rights associated with the real state acquisition being contemplated between BCAG and OWNER as defined by Mid Valley Title Escrow Number 00401-3846963.

BCAG will coordinate all of its proposed activities with OWNER to ensure that its work on the property is conducted at times and in a manner that will not unreasonably interfere with the use of the property.

BCAG agrees that at the conclusion of the PROJECT, it will remove all construction equipment, tools and building materials associated with the PROJECT, and any trash and other debris deposited during the work on the property, and will repair, replace or compensate for any existing improvement that may have been unexpectedly or accidentally damaged during the course of work.

All work will be performed at BCAG's sole cost and expense (excepting OWNER's commitment of $333,500 for their share of the storm drain cost) including the cost and expense of obtaining any necessary governmental permits, licenses or other authorizations that may be required.

All work done under this agreement shall conform to all applicable building, fire and sanitary laws, ordinances, and regulations relating to such work, and shall be done in a good and workmanlike manner.

BCAG will protect, indemnify, and hold harmless the OWNER and its officers, employees and agents from and against all liability, loss, cost or expense, including reasonable attorneys' fees and court costs arising out of a negligent act, error or omission, willful misconduct, or violation of law of or by BCAG or its officers, employees, agents and contractors. However, BCAG shall have no obligation to indemnify the OWNER for any loss, liability, or damage caused by the negligence of OWNER, or any of OWNER's employees, agents, or authorized users, including, but not limited to, tenants, invitees or permittees.

BCAG will defend, hold harmless, and indemnify OWNER from any and all third party encumbrances and/or liens against the property arising out of the PROJECT, including any claim or liability in any way connected with the failure of BCAG to pay any of its contractors or subcontractors, or the failure of any contractor or subcontractor of BCAG to pay any person(s) referred to in Section 3181 of the California Civil Code.

Please list any special conditions we should observe while on your property:

OWNER will allow for the deposition of approximately 1500 CY of excavation up to 6 inches in depth contained within a 300' x 300' footprint as shown in the attached Exhibit "A".

OWNER:

By: _____

Print Name: STEVEN SEIDENGLANZ

Title: MANAGING PARTNER

Date: 6-3-2014

Owner Contact and Telephone Number

STEVEN SEIDENGLANZ	530.518-8842	
Name	Telephone #1	Telephone #2

BCAG
Approved BY:

By: _____ Date: 6/3/14

Title: Executive Director

PROPERTY LINE
10'
35'
3:1 slope
3:1 slope
3'
Typical Berm Cross Section
Proposed Extension of Aztec Roadway
BCAG Butte Regional Transit Operations Facility
300'x35' berm
500'x35' berm
Proposed Spoils Location #1 spoils from Storm Drain Trenching between rail spur & railroad. (approximately 1,500 CY)
Proposed Spoils Location #2 spoils from BCAG transit center construction. (up to 3,000 CY)
Aztec Dr
Otterson Dr
Huss Ln
Hegan Ln

FORM I 1518
REV. 11/14/02

CALIFORNIA WATER SERVICE COMPANY
SUBDIVIDER AND CONTRACTOR REQUIREMENTS
FOR SUBDIVIDER INSTALLATION AGREEMENTS

1. All facilities to be installed under a subdivider installation agreement must be installed by a contractor approved by California Water Service Company (Company) and no part of the work may be sublet without the approval of the Company.

2. Contractor must provide Company a photocopy of a valid license issued by the State of California for the construction of water supply mains and related facilities. Acceptable classifications will consist of either an "A" license (General Engineering Contractor) or a "C-34" license (Pipeline Contractors).

3. Contractor must carry the following insurance: bodily injury and property damage liability insurance with limits of not less than One Million Dollars ($1,000,000.00) per occurrence, Two Million Dollars ($2,000,000.00) annual aggregate, insuring Company against any and all liability for the death of or injury to any person and for the loss or damage to any property, respectively, which may arise by reason of acts done or omitted to be done in the course of installation of the Facilities or which may result from such installation, and further insuring Company against all costs and expenses incurred by Company in resisting any claim which may be made against Company for any such injury or damage to any person or property. Each such policy (i) shall be issued by an insurance company approved by Company, which is qualified to do and doing business in the State of California, (ii) shall name Company as an additional insured, (iii) shall specify that it acts as primary insurance and that other insurance or self-insurance maintained by Company shall be excess only and not contributing with insurance provided by Contractor, (iv) shall provide that the policy shall not be cancelled or altered without thirty (30) days' prior written notice to Company, and (v) shall otherwise be in form satisfactory to Company. Each such policy or a certificate thereof shall be delivered to Company prior to start of any construction in connection with installation of the facilities.

4. An endorsement or a certificate thereof to the workers' compensation insurance policy of Contractor providing that the underwriter thereof waives all right of subrogation against Company by reason of any claim-arising out of or connected with installation of the Facilities shall be delivered to Company prior to start of construction. Said endorsement shall provide that it shall not be cancelled or altered without thirty (30) days' prior written notice to Company.

ΔΔΔΔΔΔΔΔΔΔΔΔΔ

PLEASE ANSWER THE FOLLOWING QUESTIONS:

1. Name and address of contracting firm _____

_____

2. California State Contractor's license number & classification_____

3. Length of time contractor has been constructing water distribution facilities.

Date: From _____ To_____

Phone #_____

CALIFORNIA WATER SERVICE COMPANY'S
APPROVED INSTALLING CONTRACTORS
AS OF 8/30/2012

ANDERSON BROS CORPORATION
5584 LITTLE GRAND CANYON DR
PARADISE, CA 95969
(530) 894-5432 LICENSE #384540

COMMUNITY CONSTRUCTION AKA CHICO WEST
PO BOX 6414
CHICO, CA 95927
(530) 895-0586 LICENSE #658031

COX & COX CONSTRUCTION, INC.
PO BOX 992588
REDDING, CA 96099
(530) 243-6016 LICENSE #424045

GUILLON INC CONSTRUCTION
2550 LAKEWEST DRIVE, SUITE 50
CHICO, CA 95928
(530) 897-6458 LICENSE #651842

LASSEN EXCAVATING
11985 MERIDIAN RD
CHICO, CA 95973
(530) 342-0081 LICENSE #709956

NORCAL EXCAVATING, INC.
60 INDEPENDENCE CIR., SUITE 101
CHICO, CA 95973
(530) 343-5953 LICENSE #843448

OMNI PIPELINES, INC.
PO BOX 9
RED BLUFF, CA 96080
(530) 527-1167 LICENSE #405642

R & R HORN
PO BOX 6697
CHICO, CA 95927
(530) 342-8655 LICENSE #780633

GEORGE SANTOS
PO BOX 146
CHICO, CA 95927
(530) 894-2274 LICENSE #353466

M J SHELTON GENERAL ENGINEERING
13 JORDAN'S PLACE, SUITE 100
CHICO, CA 95973
(530) 895-8620 LICENSE #873037

VISINONI BROS
5515 CLARK RD
PARADISE, CA 95969
(530) 624-6517 LICENSE #615638

WALBERG EQUIPMENT
PO BOX 317
CORNING, CA 96021
(530) 824-0773 LICENSE #763762

WEBB HOMES
121 YELLOWSTONE DR
CHICO, CA 95973
(530) 891-3351 LICENSE #743264

WEST VALLEY CONSTRUCTION
11276 MIDWAY
CHICO, CA 95928
(530) 895-0216

DEVELOPER'S COST STATEMENT

CWS Project #_____

Project Name: _____

Location: _____

Developer: _____

Below is the total cost for installing the water system (Cal Water Facilities Only) according to California Water Service specifications: Inside Fold

Installation cost $_____**

Fees Paid to CWS $_____

TOTAL COST $_____

**DO NOT include the cost of customer private pipe or backflow devices.

... ...

Indicate below CWS facilities installed and installation cost for each

Total pipe _____ ft. _____ inch $_____
_____ ft. _____ inch $_____
_____ ft. _____ inch $_____

Total domestic services # _____ _____ inch $_____

Total irrigation services # _____ _____ inch $_____

Total private fire services # _____ _____ inch $_____

Total fire hydrants # _____ $_____

Other _____ $_____

Signed _____ Date _____

Developer'sCostStatement.misc

Rule No. 15
MAIN EXTENSIONS

A. General Provisions and Definitions

1. Applicability

a. All extensions of distribution mains, from the utility's basic production and transmission system or existing distribution system, to serve new customers, except for those specifically excluded below, shall be made under the provisions of this rule unless specific authority is first obtained from the Commission to deviate therefrom. A main extension contract shall be executed by the utility and the applicant or applicants for the main extension before the utility commences construction work on said extensions or, if constructed by applicant or applicants, before the facilities comprising the main extension are transferred to the utility.

b. Extensions primarily for fire hydrant, private fire protection, resale, temporary, standby, or supplemental service shall not be made under this rule.

c. The utility may, but will not be required to, make extensions under this rule in easements or rights-of-way where final grades have not been established, or where street grades have not been brought to those established by public authority. If extensions are made when grades have not been established and there is a reasonable probability that the existing grade will be changed, the utility shall require that the applicant or applicants for the main extension deposit, at the time of execution of the main extension agreement, the estimated net cost of relocating, raising or lowering facilities upon establishment of final grades. Adjustment of any difference between the amount so deposited and the actual cost of relocating, raising or lowering facilities shall be made within ten days after the utility has ascertained such actual cost. The net deposit representing actual cost is not subject to refund. The entire deposit related to the proposed relocation, raising or lowering shall be refunded when such displacements are determined by proper authority to not be required.

2. Limitation of Expansion

a. Whenever the outstanding advance contract balances reach 40 percent of total capital (defined for the purpose of this rule, as proprietary capital, or capital stock and surplus, plus debt and advances for construction) the utility shall so notify the Commission within thirty days.

b. Whenever the outstanding advance contract balances plus the advance on a proposed new extension would exceed 50 percent of total capital, as defined in Section A.2.a. plus the advance on the proposed new extension, the utility shall not make the proposed new extension of distribution mains without authorization of the Commission. Such authorization may be granted by a letter from the Executive Director of the Commission.

c. Whenever the outstanding advance contract balances reach the above level, the utility shall so notify the Commission within thirty days.

3. Definitions

a. A "bona-fide customer," for the purposes of this rule, shall be a customer (excluding any customer formerly served at the same location) who has given satisfactory evidence that service will be reasonably permanent to the property which has been improved with a building of a permanent nature, and to which service has commenced. The provision of service to a real estate developer or builder, during the construction or development period, shall not establish him as a bona-fide customer.

b. A "real estate developer" or "builder," for the purposes of this rule, shall include any individual, association of individuals, partnership, or corporation that divides a parcel of land into two or more portions, or that engages in the construction and resale of individual structures on a continuing basis.

c. The "adjusted construction cost," for the purposes of this rule, shall be reasonable and shall not exceed the costs recorded in conformity with generally accepted water utility accounting practices, and as specifically defined in the Uniform System of Accounts for Water Utilities prescribed by the Commission for the installing facilities of adequate capacity for the service requested. If the utility, at its option, should install facilities with a larger capacity or resulting in a greater footage of extension than required for the service

requested, the "adjusted construction cost," for the purpose of this rule, shall be determined by the application of an adjustment factor to actual construction cost of facilities installed. This factor shall be the ratio of estimated cost of required facilities to estimated cost of actual facilities installed.

4. Ownership, Design, and Construction of Facilities

a. Any facilities installed hereunder shall be the sole property of the utility. In those instances which title to certain portions of the installation, such as fire hydrants, will be held by a political subdivision, such facilities shall not be included as a part of the main extension under this rule, and will neither be owned by the utility nor subject to refund under the provisions of Section C.2. of this rule.

b. The size, type, quality of materials, and their location shall be specified by the utility; and the actual construction shall be done by the utility or by a constructing agency acceptable to it.

c. Where the property of an applicant is located adjacent to a right-of-way, exceeding 70 feet in width, for a street, highway, or other public purpose, regardless of the width of the traveled way or pavement; or on a freeway, waterway, or railroad right-of-way, the utility may elect to install a main extension on the same side thereof as the property of the applicant, and the estimated and adjusted construction costs in such case shall be based upon such an extension.

d. When an extension must comply with an ordinance, regulation, or specification of a public authority, the estimated and adjusted construction costs of said extension shall be based upon the facilities required to comply therewith.

e. If the following provisions for water conservation are included in local building codes and/or ordinances, the main extension contract shall contain these provisions.

(1) All interior plumbing in new buildings shall meet the following requirements:

(a) Toilets shall not use more than 3½ gallons per flush, except that toilets and urinals with flush valves may be installed.

(b) Shower heads shall contain flow controls which restrict flow to a maximum of approximately 3 gallons per minute.

(c) Kitchen and lavatory faucets shall have flow controls which restrict flow to a maximum of approximately 2 gallons per minute.

(2) All new parks, median strips, landscaped public areas and landscaped areas surrounding condominiums, townhouses, apartments and industrial parks shall have a well-balanced automatic irrigation system designed by a landscape architect or other competent person, and shall be operated by electric time controller stations set for early morning irrigation.

5. Estimates, Plans, and Specifications

a. Upon request by a potential applicant for a main extension of 100 feet or less, the utility shall prepare, without charge, a preliminary sketch and rough estimates of the cost of installation to be advanced by said applicant.

b. Any applicant for a main extension requesting the utility to prepare detailed plans, specifications, and cost estimates shall be required to deposit with the utility an amount equal to the estimated cost of preparation of such material. The utility shall, upon request, make available within 45 days after receipt of the deposit referred to above, such plans, specifications, and cost estimates of the proposed main extension. If the extension is to include oversizing of facilities to be done at the utility's expense, appropriate details shall be set forth in the plans, specifications, and cost estimates.

c. In the event a main extension contract with the utility is executed within 180 days after the utility furnishes the detailed plans and specifications, the deposit shall become a part of the advance, and shall be refunded in accordance with the terms of the main extension contract. If such contract is not so executed, the deposit to cover the cost of preparing plans, specifications, and cost estimates shall be forfeited by the applicant for the main extension and the amount of the forfeited deposit shall be credited to the account or accounts to which the expense of preparing said material was charged.

d. When detailed plans, specifications and cost estimates are requested, the applicant for a main extension shall furnish a map to a suitable scale showing the street and lot layouts and, when requested by the utility, contours or other indication of the relative elevation of the various parts of the area to be developed. If changes are made subsequent to the presentation of this map by the applicant, and these changes require additional expense in revising plans, specifications and cost estimates, this additional expense shall be

borne by the applicant, not subject to refund, and the additional expense thus recovered shall be credited to the account or accounts to which the additional expense was charged.

6. Timing and Adjustment of Advances

a. Unless the applicant for the main extension elects to arrange for the installation of the extension himself, as permitted by Section C.1.c., the full amount of the required advance or an acceptable surety bond must be provided to the utility at the time of execution of the main extension agreement.

b. If the applicant for a main extension posts a surety bond in lieu of cash, such surety bond must be replaced with cash not less than ten calendar days before construction is to commence; provided, however, that if special facilities are required primarily for the service requested, the applicant for the extension may be required to deposit sufficient cash to cover the cost of such special facilities before they are ordered by the utility.

c. An applicant for a main extension who advances funds shall be provided with a statement of actual construction cost and adjusted construction cost showing in reasonable detail the costs incurred for material, labor, any other direct and indirect costs, overheads, and total costs; or unit costs; or contract costs, whichever are appropriate.

d. Said statement shall be submitted within sixty days after the actual construction costs of the installation have been ascertained by the utility. In the event that the actual construction costs for the entire installations shall not have been determined within 120 days after the completion of construction work, a preliminary determination of actual and adjusted construction costs shall be submitted, based upon the best available information at that time.

e. Any differences between the adjusted construction costs and the amount advanced shall be shown as a revision of the amount of advance and shall be payable within thirty days of date of submissions of statement.

7. Assignment of Main Extension Contracts

Any contract entered into under Sections B and C of this rule, or under similar provisions of former rules, may be assigned, after settlement of adjusted construction costs, after written notice to the utility by the holder of said contract as shown by the utility's records. Such assignment shall apply only to those refunds which become due more than thirty days after the date of receipt by the utility of the notice of assignment. The utility shall not be required to make any one refund payment under such contract to more than a single assignee.

8. Interpretations and Deviations

In case of disagreement or dispute regarding the application of any provision of this rule, or in circumstances where the application of this rule appears unreasonable to either party, the utility, applicant or applicants may refer the matter to the Commission for determination.

B. Extensions to Serve Individuals

1. Payment

Extensions of water mains to serve new individual customers shall be paid for and contributed to the utility by the individual customer requesting the main extension. Calculation of payment shall be on the basis of a main not in excess of 6" in diameter,, except where a larger main is required by the special needs of the new customer. The utility shall be responsible for installing and paying for service pipes, meter boxes and meter to serve the new individual customer; provided, however, a Class C or Class D utility, or a Class A or Class B utility district or subsidiary serving 2,000 or fewer connections, may accept from individual customers amounts in contribution as a connection fee calculated pursuant to the Commission's Connection Fee Data Form contained in the utility's tariffs.

2. Refunds

If subsequent applicants for water service are connected directly in the main extension contributed by the original individual customer, such subsequent applicants shall pay to the utility an amount equal to the cost of 100 feet of the original extension. Such amounts shall be immediately refunded by the utility to the

initial customer who originally paid for and contributed the main extension to the utility. Total payments to the initial customer by subsequent applicants for water service who are connected directly to the extension shall not exceed the original cost of the extension. No refunds shall be made after a period of ten years from completion of the main extension.

C. Extensions to Serve Subdivisions, Tracts, Housing Projects; Industrial Developments, Commercial Buildings, or Shopping Centers

1. Advances

a. Unless the procedure outlined in Section C.1.c., is followed, an applicant for a main extension to serve a new subdivision, tract, housing project, industrial development, or organized commercial district shall be required to advance to the utility, before construction is commenced, the estimated reasonable cost of the extension to be actually installed, from the nearest utility facility at least equal in size or capacity to the main required to serve both the new customers and a reasonable estimate of the potential customers who might be served directly from the main extension. The costs of the extension shall include necessary service stubs or service pipes, fittings, gates and housing therefor, and meter boxes, but shall not include meters. To this shall be added the cost of fire hydrants when requested by the applicant for the main extension or required by public authority, whenever such hydrants are to become the property of the utility.

b. If special facilities consisting of items not covered by section C.1.a. are required for the service requested and, when such facilities to be installed will supply both the main extension and other parts of the utility's system, at least 50 percent of the design capacity (in gallons, gpm, or other appropriate units) is required to supply the main extension, the cost of such special facilities may be included in the advance, subject to refund, as hereinafter provided, along with refunds of the advance of the cost of the extension facilities described in Section C.1.a. above except as specified in Section C.1.e. below.

c. In lieu of providing the advances in accordance with Sections C.1.a. and C.1.b., the applicant for a main extension shall be permitted, if qualified in the judgment of the utility, to construct and install the facilities himself, or arrange for their installation pursuant to competitive bidding procedures initiated by him and limited to qualified bidders. The cost, including the cost of inspection and supervision by the utility, shall be paid directly by applicant. The applicant shall provide the utility with a statement of actual construction cost in reasonable detail. The amount to be treated as an advance subject to refund shall be the lesser of (1) the actual cost or (2) the price quoted in the utility's detailed cost estimate. The installation shall be in accordance with the plans and specifications submitted by the utility pursuant to Section A.5.b.

d. If, in the opinion of the utility, it appears that a proposed main extension will not, within a reasonable period, develop sufficient revenue to make the extension self-supporting, or if for some other reason it appears to the utility that a main extension contract would place an excessive burden on customers, the utility may require a non refundable contribution of plant facilities from developers in lieu of a main extension contract.

If an applicant for a main extension contract who is asked to contribute the facilities believes such a request to be unreasonable, such applicant may refer the matter to the Commission for determination, as provided for in Section A.8. of this rule.

e. A special facilities fee for water supply will be included in the advance in lieu of any domestic water supply requirement covered under Section C.1.b. in some areas. The districts and fees applicable are shown below.

District	Facilities Fee	Fee for multi-family
Bakersfield *	$2,500	$1,250
Bakersfield – Califarming **	$1,050	$525
Chico	$1,000	$500
Dixon	$1,500	$750
King City	$1,500	$750
Marysville	$450	$225
Salinas	$1,200	$600
Selma	$1,500	$750
Visalia	$1,100	$550
Willows	$1,500	$750

This fee is per equivalent 1-inch service and is applicable to all subdivisions requiring a main extension except those extensions serving four or fewer residential lots or equivalent single-family dwelling units. The following factors are used to determine equivalents for larger service connections:

Service Size	Factor	Service Size	Factor
1-inch	1.0	6-inch	20.0
2-inch	3.2	8-inch	32.0
4-inch	10.0	10-inch	46.0

* For Bakersfield beginning on July 1, 2009 the facilities fee increases to $2,500 and multi-family fee increases to $1,250.
** Califarming's reduced fees apply to the first 2,500 services built in NE Bakersfield.

2. Refunds

a. The amount advanced under Section C.1.a., C.1.b. and C.1.c. shall be subject to refund by the utility, in cash, without interest, to the party or parties entitled thereto as set forth in the following two paragraphs. The total amount so refunded shall not exceed the total of the amount advanced and for a period not to exceed 40 years after the date of the contract.

b. Payment of refunds shall be made not later than June 30 of each year, beginning the year following execution of contract, or not later than 6 months after the contract anniversary date if on an anniversary date basis.

c. Whenever costs of main extensions and/or special facilities have been advanced pursuant to Section C.1.a., C.1.b. or C.1.c., the utility shall annually refund to the contract holders an amount equal to 2½ percent of the advances until the principal amounts of the contracts have been fully repaid.

Whenever costs of special facilities have been advanced pursuant to Section C.1.a., C.1.b. or C.1.c., the amount so advanced shall be divided by the number of lots (or living units, whichever is greater) which the special facilities are designed to serve, to obtain an average advance per lot (or living unit) for special facilities. When another builder applies for a main extension to serve any lots for which the special facilities are to be used, the new applicant shall, in addition to the costs of his proposed main extension, also advance an amount for special facilities. This amount shall be the average advance per lot for special facilities for each lot to be used less 2½ percent of the average advance for each year in which refunds have been due and payable on the original contract, prorated to June 30 on a monthly basis.

The amount advanced to the utility by the new applicant shall be immediately refunded to the holder of the original contract, which included the cost of the special facilities and the original contract advance will be reduced accordingly. The utility will thenceforth refund 2½ percent annually on each of the contract amounts, as determined above, to the holders of the contracts.

Advances and refunds based on additional builder participation will be determined in a similar manner.

In no case shall the refund on any contract exceed the amount advanced.

d. With respect to a contract entered into before the effective date of this tariff sheet if, at any time during the 20-year refund period, 80 percent of the bona fide customers for which the extension or special facilities were designed are being served therefrom, the utility may, with the approval of the contract holder, modify the contract so that the utility shall become obligated to pay, in cash, any balance which may remain unrefunded at the end of said 20-year period. Such balance shall be refunded in five equal annual installments, payable beginning 21 years after the date of the contract.

3. Termination of Main Extension Contracts

a. Any contract whose refunds are based on a percentage of the amount advanced may be purchased by the utility and terminated provided that the terms are mutually agreed to by the parties or their assignees and Section C.3.c. and Section C.3.d. are complied with. The maximum price that may be paid by the utility to terminate a contract shall be calculated by multiplying the remaining unrefunded contract balance times the appropriate termination factor set out below. No contract that has been in effect for less than 10 years shall be terminated without prior Commission approval.

TERMINATION FACTORS

Years Remaining	Factor	Years Remaining	Factor	Years Remaining	Factor	Years Remaining	Factor
1	.8929	11	.5398	21	.3601	31	.2608
2	.8450	12	.5162	22	.3475	32	.2535
3	.8006	13	.4941	23	.3356	33	.2465
4	.7593	14	.4734	24	.3243	34	.2399
5	.7210	15	.4541	25	.3137	35	.2336
6	.6852	16	.4359	26	.3037	36	.2276
7	.6520	17	.4188	27	.2942	37	.2218
8	.6210	18	.4028	28	.2851	38	.2136
9	.5920	19	.3877	29	.2766	39	.2111
10	.5650	20	.3729	30	.2685	40	.2061

b. Any contract with refunds based upon percentage of revenues and entered into under Section C. of the former rule, may be purchased by the utility and terminated, provided the payment is not in excess of the estimated revenue refund multiplied by the termination factor in the following table, the terms are otherwise mutually agreed to by the parties or their assignees and Section C.3.c. and Section C.3.d. hereof are complied with. The estimated revenue refund is the amount that would otherwise be refunded , at the current level of refunds, over the remainder of the twenty-year contract period, or shorter period that would be required to extinguish the total refund obligation. It shall be determined by multiplying 22 percent of the average annual revenue per service for the immediately preceding calendar year by the number of bona fide customers at the proposed termination date, times the number of years or fractions thereof to the end of the twenty-year contract period or shorter that would be required to refund the remaining contract balance.

TERMINATION FACTORS

Years Remaining	Factor	Years Remaining	Factor	Years Remaining	Factor
1	.8929	7	.6520	13	.4941
2	.8450	8	.6210	14	.4734
3	.8006	9	.5920	15	.4541
4	.7593	10	.5650	16	.4359
5	.7210	11	.5398	17	.4188
6	.6852	12	.5162	18	.4028
				19	.3877

c. The utility shall furnish promptly to the Commission the following information in writing and shall obtain prior authorization by a formal application under Sections 816-830 of the Public Utilities Code if payment is to be made other than in cash:

(1) A copy of the main extension contract, together with data adequately describing the development for which the advance was made and the total adjusted construction cost of the extension.

(2) The balance unpaid on the contract and the calculation of the maximum termination price, as above defined, as of the date of termination and the terms under which the obligation was terminated.

(3) The name of the holder of the contract when terminated.

d. Discounts obtained by the utility from contracts terminated under the provisions of this section shall be accounted for by credits to Acc. 265 , Contributions in Aid of Construction.

D. Extensions Designed to Include Fire Protection

1. The cost of distribution mains designed to meet the fire flow requirements set forth in Section VIII.1(a) of General Order No. 103 is to be advanced by the applicant. The utility shall refund this advance as provided in Sections B.2. and C.2. of this rule.

2. Should distribution mains be designed to meet fire flow requirements in excess of those set forth in Section VIII.1(a) of General Order No. 103, the increase in cost of the distribution mains necessary to meet such higher fire flow requirements shall be paid to the utility as a contribution in aid of construction.

3. The cost of facilities other than hydrants and distribution mains required to provide supply, pressure, or storage primarily for fire protection purposes, or portions of such facilities allocated in proportion to the capacity designed for fire protection purposes, shall be paid to the utility as a contribution in aid of construction.

E. Income Tax Component of Contributions and Advances Provision

1. Contributions in Aid of Construction and Advances for Construction shall include, but are not limited to, cash, services, facilities, labor, property and income taxes thereon provided by a person or agency to the utility. The value of all contributions and advances shall be based on the utility's estimates. Contributions and advances shall consist of two components for the purpose of recording transactions as follows:
   a. Income Tax Component (ITC), and
   b. The balance of the contribution or advance.

2. The ITC shall be calculated by multiplying the balance of the contribution by the tax factor of:

Prior to January 1, 1992	25.4%
After December 31, 1991	
a. For Contribution	32.7%
b. For Advance	33.1%

3. The tax factor is established by using Method 5 as set forth in Decision No. D. 87-09-026 in I. 86-11-019.

4. The formula to compute Method 5 includes the following factors:

	Prior to 1-1-92	After 12-31-91
a. Corporate tax rate of:	34.00%	34.00%
b. Franchise tax rate of:		9.30%
c. A discount rate of:	11.69%	11.25%
d. A pretax rate of return of:	15.24%	15.42%

5. The ITC tax factor has been derived from the corporate rate and it will remain in effect until the utility's net taxable income changes to the extent the gross-up rate would increase or decrease by five percentage points or more. When and if that occurs, the utility will file an advice letter showing the new rates and cancel out this sheet.

6. If a utility collects a gross-up calculated by using an incremental tax rate that is more than its actual incremental rate, the difference between what was collected and what should have been collected will be refunded to the contributor.

Bidders Questions Form

Requests for Clarification or interpretation of the BRTOC Bid Documents must be in writing and forwarded via e-mail to all of the following;

Andy Nuwsum/BCAG;
Email: ANewsum@bcag.org

Kevin Teel/TLCD
kevin.teel@tlcd.com

Kirk Sheeley/Kitchell;
ksheeley@kitchell.com

The form below must be completed and returned to the above as an attachment to your e-mail. Any entries made to the file will need to be saved (in any directory on your computer) then attached to your e-mail.

Date	
Project title	**Butte Regional Transit Operations Center**
Firm Name	
Requested by (individuals name)	
Telephone No.	
Fax No.	
Email Address	

Please use a separate row for each comment or question. The row will automatically expand in height as necessary.

RFP Section No.	RFP Page No.	Brief Description of Request or Question

Note that any revisions or clarifications will be made by written addenda issued by BCAG, and posted to the BCAG website at; http://www.bcag.org/RFPs/index.html
See Section 00 21 13 – Instructions to Bidders for deadline for al bid questions.

Room Ready Checklist for Implementation of IT Infrastructures

Main Distribution Frame (MDF) / Intermediate Distribution Frame (IDF)

- All network distribution racks shall be of AOC or ANSI/EIA 310-D standard and installed with seismic bracing, properly grounded and bonded per AOC or ANSI/EIA 610 standard (proper grounding is extremely important due to the electronic nature of the equipment)
- Installation completed and of sufficient quantity of overhead ladder cabling racks, sleeves, cable trays, or other cable management type systems
- Installation completed of all patch panels, terminal strips and other connecting hardware on network racks per architectural low voltage design
- Installation of all cabling associated with the data network infrastructure is to be certified complete.
- Installation completed of required blocks and telco panels for extended circuit services
- Sufficient lighting and adequate room shall be provided - work space around the racks shall be available to access, to add, or remove network equipment, wire, and cable without the need to remove any obstructions
- Sufficient electrical power of required voltage, as well as type and quantity of power receptacles
- HVAC providing temperature range of 64-75 degrees Fahrenheit, with a humidity range from 30 to 55% relative
- Secured room – (pre-approved personnel with use of access log preferred)
- Dust/dirt free environment. Finished ceilings, walls and floor (completion of work which typically result in excessive dust, debris or harmful vapors). Highly recommend use of a HEPA vacuum instead of sweeping with a broom.

Failure to meet the above requirements may subject the equipment to abnormal physical or electrical duress beyond what was intended and may result with voiding of the manufacturer’s warranty.

General Decision Number: CA140009 07/04/2014 CA9

Superseded General Decision Number: CA20130009

State: California

Construction Types: Building, Heavy (Heavy and Dredging) and Highway

Counties: Alpine, Amador, Butte, Colusa, El Dorado, Glenn, Lassen, Marin, Modoc, Napa, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Siskiyou, Solano, Sonoma, Sutter, Tehama, Trinity, Yolo and Yuba Counties in California.

BUILDING CONSTRUCTION PROJECTS (excluding Amador County only); DREDGING CONSTRUCTION PROJECTS (does not include hopper dredge work); HEAVY CONSTRUCTION PROJECTS (does not include water well drilling); AND HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/03/2014
1	01/10/2014
2	01/24/2014
3	03/07/2014
4	04/11/2014
5	05/23/2014
6	05/30/2014
7	06/06/2014
8	06/13/2014
9	06/20/2014
10	07/04/2014

ASBE0016-001 01/01/2014

AREA 1: ALAMEDA, CONTRA COSTA, LAKE, MARIN, MENDOCINO, MONTEREY, NAPA, SAN BENITO, SAN FRANCISCO, SAN MATEO, SANTA CLARA, SANTA CRUZ, SOLANO, & SONOMA COUNTIES

AREA 2: ALPINE, AMADOR, BUTTE, CALAVERAS, COLUSA, DEL NORTE, EL DORADO, FRESNO, GLENN, HUMBOLDT, KINGS, LASSEN, MADERA, MARIPOSA, MERCED, MODOC, MONO, NEVADA, PLACER, PLUMAS, SACRAMENTO, SAN JOAQUIN, SHASTA, SIERRA, SISKIYOU, STANISLAU, SUTTER, TEHEMA, TRINITY, TULARE, TUOLUMNE, YOLO, & YUBA COUNTIES

	Rates	Fringes
Asbestos Workers/Insulator (Includes the application of all insulating materials, Protective Coverings, Coatings, and Finishes to all types of mechanical systems)		
Area 1	$ 57.15	18.72
Area 2	$ 44.05	18.62

ASBE0016-007 01/01/2013

	Rates	Fringes
Asbestos Removal worker/hazardous material handler (Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems, whether they contain asbestos or not)	$ 31.13	6.95

BOIL0549-002 01/01/2013

	Rates	Fringes
BOILERMAKER		
(1) Marin & Solano Counties	$ 42.06	33.43
(2) Remaining Counties	$ 38.37	31.32

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* BRCA0003-001 08/01/2013

	Rates	Fringes
MARBLE FINISHER	$ 28.05	14.01

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* BRCA0003-004 05/01/2013

AREA 1: ALPINE, AMADOR, BUTTE, COLUSA, EL DORADO, GLENN, LASSEN, MODOC, NEVADA, PLACER, PLUMAS, SACRAMENTO, SHASTA, SIERRA, SUTTER, TEHAMA, YOLO AND YUBA COUNTIES

AREA 2: MARIN, NAPA, SISKIYOU, SOLANO, SONOMA AND TRINITY COUNTIES

	Rates	Fringes
BRICKLAYER		
AREA 1	$ 36.48	19.59
AREA 2	$ 39.96	23.79

SPECIALTY PAY:
(A) Underground work such as tunnel work, sewer work, manholes, catch basins, sewer pipes and telephone conduit shall be paid $1.25 per hour above the regular rate. Work in direct contact with raw sewage shall receive $1.25 per hour in addition to the above.
(B) Operating a saw or grinder shall receive $1.25 per hour above the regular rate.
(C) Gunite nozzle person shall receive $1.25 per hour above the regular rate.

BRCA0003-008 07/01/2013

	Rates	Fringes

TERRAZZO FINISHER	$ 33.15	13.93
TERRAZZO WORKER/SETTER	$ 39.95	24.39

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* BRCA0003-010 04/01/2014

	Rates	Fringes
TILE FINISHER		
Area 1	$ 22.58	10.04
Area 2	$ 22.58	12.50
Area 3	$ 22.76	12.37
Area 4	$ 22.26	11.85
Tile Layer		
Area 1	$ 38.13	11.98
Area 2	$ 36.43	13.74
Area 3	$ 40.59	13.79
Area 4	$ 37.46	13.74

AREA 1: Butte, Colusa, El Dorado, Glenn, Lassen, Modoc, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Sutter, Tehema, Yolo, Yuba
AREA 2: Alpine, Amador
AREA 3: Marin, Napa, Solano, Siskiyou
AREA 4: Sonoma

BRCA0003-014 08/01/2013

	Rates	Fringes
MARBLE MASON	$ 39.30	22.48

CARP0034-001 07/01/2013

	Rates	Fringes
Diver		
Assistant Tender, ROV		
Tender/Technician	$ 38.60	29.78
Diver standby	$ 43.38	29.78
Diver Tender	$ 42.38	29.78
Diver wet	$ 85.91	29.78
Manifold Operator (mixed gas)	$ 47.38	29.78
Manifold Operator (Standby)	$ 42.38	29.78

DEPTH PAY (Surface Diving):
050 to 100 ft $2.00 per foot
101 to 150 ft $3.00 per foot
151 to 220 ft $4.00 per foot

SATURATION DIVING:
The standby rate shall apply until saturation starts. The saturation diving rate applies when divers are under pressure continuously until work task and decompression are complete. The diver rate shall be paid for all saturation hours.

DIVING IN ENCLOSURES:

Where it is necessary for Divers to enter pipes or tunnels, or other enclosures where there is no vertical ascent, the following premium shall be paid: Distance traveled from entrance 26 feet to 300 feet: $1.00 per foot. When it is necessary for a diver to enter any pipe, tunnel or other enclosure less than 48" in height, the premium will be $1.00 per foot.

WORK IN COMBINATION OF CLASSIFICATIONS:
Employees working in any combination of classifications within the diving crew (except dive supervisor) in a shift are paid in the classification with the highest rate for that shift.

CARP0034-003 07/01/2013

	Rates	Fringes
Piledriver	$ 38.60	29.78

CARP0035-001 08/01/2013

AREA 1: MARIN, NAPA, SOLANO & SONOMA

AREA 3: SACRAMENTO, WESTERN EL DORADO (Territory west of an including highway 49 and the territory inside the city limits of Placerville), WESTERN PLACER (Territory west of and including highway 49), & YOLO

AREA 4: ALPINE, BUTTE, COLUSA, EASTERN EL DORADO, GLENN, LASSEN, MODOC, NEVADA, EASTERN PLACER, PLUMAS, SHASTA, SIERRA, SISKIYOU, SUTTER, TEHAMA, TRINITY, & YUBA

	Rates	Fringes
Drywall Installers/Lathers:		
Area 1	$ 39.35	27.02
Area 3	$ 33.97	27.02
Area 4	$ 32.62	27.02
Drywall Stocker/Scrapper		
Area 1	$ 19.68	15.65
Area 3	$ 16.99	15.65
Area 4	$ 16.31	15.65

CARP0035-009 07/01/2013

Marin County

	Rates	Fringes
CARPENTER		
Bridge Builder/Highway Carpenter	$ 39.35	26.58
Hardwood Floorlayer, Shingler, Power Saw Operator, Steel Scaffold & Steel Shoring Erector, Saw Filer	$ 39.50	26.58

Journeyman Carpenter	$ 39.35	26.58
Millwright	$ 39.45	28.17

CARP0035-010 07/01/2013

AREA 1: Marin, Napa, Solano & Sonoma Counties

AREA 2: Alpine, San Benito and Santa Cruz

AREA 3: Alpine, Butte, Colusa, El Dorado, Glenn, Lassen, Modoc, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Siskiyou, Sutter, Tehama, Trinity, Yolo & Yuba counties

	Rates	Fringes
Modular Furniture Installer		
Area 1		
Installer I	$ 22.96	17.52
Installer II	$ 19.53	17.52
Lead Installer	$ 26.41	18.02
Master Installer	$ 30.63	18.02
Area 2		
Installer I	$ 20.31	17.52
Installer II	$ 17.36	17.52
Lead Installer	$ 23.28	18.02
Master Installer	$ 26.91	18.02
Area 3		
Installer I	$ 19.36	17.52
Installer II	$ 16.59	17.52
Lead Installer	$ 22.16	18.02
Master Installer	$ 25.58	18.02

CARP0046-001 07/01/2013

El Dorado (West), Placer (West), Sacramento and Yolo Counties

	Rates	Fringes
Carpenters		
Bridge Builder/Highway Carpenter	$ 39.35	26.58
Hardwood Floorlayer, Shingler, Power Saw Operator, Steel Scaffold & Steel Shoring Erector, Saw Filer	$ 33.62	26.58
Journeyman Carpenter	$ 33.47	26.58
Millwright	$ 35.97	28.17

Footnote: Placer County (West) includes territory West of and including Highway 49 and El Dorado County (West) includes territory West of and including Highway 49 and territory inside the city limits of Placerville.

CARP0046-002 07/01/2013

Alpine, Colusa, El Dorado (East), Nevada, Placer (East), Sierra, Sutter and Yuba Counties

	Rates	Fringes
Carpenters		
Bridge Builder/Highway Carpenter	$ 39.35	26.58
Hardwood Floorlayer, Shingler, Power Saw Operator, Steel Scaffold & Steel Shoring Erector, Saw Filer	$ 32.27	26.58
Journeyman Carpenter	$ 32.12	26.58
Millwright	$ 34.62	28.17

CARP0152-003 07/01/2013

Amador County

	Rates	Fringes
Carpenters		
Bridge Builder/Highway Carpenter	$ 39.35	26.58
Hardwood Floorlayer, Shingler, Power Saw Operator, Steel Scaffold & Steel Shoring Erector, Saw Filer	$ 32.27	26.58
Journeyman Carpenter	$ 32.12	26.58
Millwright	$ 34.62	28.17

CARP0180-001 07/01/2013

Solano County

	Rates	Fringes
Carpenters		
Bridge Builder/Highway Carpenter	$ 39.35	26.58
Hardwood Floorlayer, Shingler, Power Saw Operator, Steel Scaffold & Steel Shoring Erector, Saw Filer	$ 39.50	26.58
Journeyman Carpenter	$ 39.35	26.58
Millwright	$ 39.45	28.17

CARP0751-001 07/01/2013

Napa and Sonoma Counties

	Rates	Fringes
Carpenters		
Bridge Builder/Highway Carpenter	$ 39.35	26.58
Hardwood Floorlayer, Shingler, Power Saw		

Operator, Steel Scaffold & Steel Shoring Erector, Saw Filer	$ 39.50	26.58
Journeyman Carpenter	$ 39.35	26.58
Millwright	$ 39.45	28.17

CARP1599-001 07/01/2013

Butte, Glenn, Lassen, Modoc, Plumas, Shasta, Siskiyou, Tehama and Trinity Counties

	Rates	Fringes
Carpenters		
Bridge Builder/Highway Carpenter	$ 39.35	26.58
Hardwood Floorlayer, Shingler, Power Saw Operator, Steel Scaffold & Steel Shoring Erector, Saw Filer	$ 32.27	26.58
Journeyman Carpenter	$ 32.12	26.58
Millwright	$ 34.62	28.17

ELEC0180-001 06/01/2014

NAPA AND SOLANO COUNTIES

	Rates	Fringes
CABLE SPLICER	$ 50.97	3%+20.13
ELECTRICIAN	$ 45.31	3%+20.13

ELEC0180-003 12/01/2013

NAPA AND SOLANO COUNTIES

	Rates	Fringes
Sound & Communications		
Installer	$ 31.32	3%+15.30
Technician	$ 35.66	3%+15.30

SCOPE OF WORK INCLUDES-
SOUND & VOICE TRANSMISSION (Music, Intercom, Nurse Call, Telephone); FIRE ALARM SYSTEMS [excluding fire alarm work when installed in raceways (including wire and cable pulling) and when performed on new or major remodel building projects or jobs],
TELEVISION & VIDEO SYSTEMS, SECURITY SYSTEMS, COMMUNICATIONS SYSTEMS that transmit or receive information and/or control systems that are intrinsic to the above.

EXCLUDES-
Excludes all other data systems or multiple systems which include control function or power supply; excludes installation of raceway systems, line voltage work, industrial work, life-safety systems (all buildings having floors located more than 75' above the lowest floor level

having building access); excludes energy management systems.

ELEC0340-002 12/01/2013

ALPINE, AMADOR, BUTTE, COLUSA, EL DORADO, GLENN, LASSEN, NEVADA, PLACER, PLUMAS, SACRAMENTO, TRINITY, YOLO, YUBA COUNTIES

	Rates	Fringes
Communications System		
Sound & Communications Installer	$ 24.68	3%+12.85
Sound & Communications Technician	$ 28.38	3%+12.85

SCOPE OF WORK

Includes the installation testing, service and maintenance, of the following systems which utilize the transmission and/or transference of voice, sound, vision and digital for commercial, education, security and entertainment purposes for the following TV monitoring and surveillance, background-foreground music, intercom and telephone interconnect, inventory control systems, microwave transmission, multi-media, multiplex, nurse call system, radio page, school intercom and sound, burglar alarms, and low voltage master clock systems.

A. SOUND AND VOICE TRANSMISSION/TRANSFERENCE SYSTEMS
Background foreground music Intercom and telephone interconnect systems, Telephone systems, Nurse call systems, Radio page systems, School intercom and sound systems, Burglar alarm systems, Low voltage master clock systems, Multi-media/multiplex systems, Sound and musical entertainment systems, RF systems, Antennas and Wave Guide.

B. FIRE ALARM SYSTEMS
Installation, wire pulling and testing

C. TELEVISION AND VIDEO SYSTEMS Television monitoring and surveillance systems, Video security systems, Video entertainment systems, Video educational systems, Microwave transmission systems, CATV and CCTV

D. SECURITY SYSTEMS Perimeter security systems Vibration sensor systems Card access systems Access control systems Sonar/infrared monitoring equipment

E. COMMUNICATIONS SYSTEMS THAT TRANSMIT OR RECEIVE INFORMATION AND/OR CONTROL SYSTEMS THAT ARE INTRINSIC TO THE ABOVE LISTED SYSTEMS SCADA (Supervisory Control and Data Acquisition) PCM (Pulse Code Modulation) Inventory Control Systems Digital Data Systems Broadband and Baseband and Carriers Point of Sale Systems VSAT Data Systems Data Communication Systems RF and Remote Control Systems Fiber Optic Data Systems WORK EXCLUDED Raceway systems are not covered

(excluding Ladder-Rack for the purpose of the above listed systems). Chases and/or nipples (not to exceed 10 feet) may be installed on open wiring systems. Energy management systems. SCADA (Supervisory Control and Data Acquisition) when not intrinsic to the above listed systems (in the scope). Fire alarm systems when installed in raceways (including wire and cable pulling) shall be performed at the electrician wage rate, when either of the following two (2) conditions apply:
1. The project involves new or major remodel building trades construction.
2. The conductors for the fire alarm system are installed in conduit.

ELEC0340-003 12/01/2013

ALPINE (West of Sierra Mt. Watershed), AMADOR, BUTTE, COLUSA, EL DORADO (West of Sierra Mt. Watershed), GLENN, LASSEN, NEVADA (West of Sierra Mt. Watershed), PLACER, PLUMAS, SACRAMENTO, SHASTA, SIERRA (West of Sierra Mt. Watershed), SUTTER, TEHAMA, TRINITY, YOLO & YUBA COUNTIES

	Rates	Fringes
ELECTRICIAN		
Remaining area	$ 39.06	18.54
Sierra Army Depot, Herlong	$ 48.83	18.54
Tunnel work	$ 41.01	18.54

CABLE SPLICER: Receives 110% of the Electrician basic hourly rate.

ELEC0401-005 07/01/2013

ALPINE (east of the main watershed divide), EL DORADO (east of the main watershed divide), NEVADA (east of the main watershed), PLACER (east of the main watershed divide) and SIERRA (east of the main watershed divide) COUNTIES:

	Rates	Fringes
ELECTRICIAN	$ 37.00	14.62

ELEC0551-004 06/01/2014

MARIN AND SONOMA COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 47.20	16.76

ELEC0551-005 12/01/2013

MARIN & SONOMA COUNTIES

	Rates	Fringes

Sound & Communications

	Rates	Fringes
Installer	$ 31.32	16.23
Technician	$ 35.66	16.36

SCOPE OF WORK INCLUDES-
SOUND & VOICE TRANSMISSION (Music, Intercom, Nurse Call, Telephone); FIRE ALARM SYSTEMS [excluding fire alarm work when installed in raceways (including wire and cable pulling) and when performed on new or major remodel building projects or jobs], TELEVISION & VIDEO SYSTEMS, SECURITY SYSTEMS, COMMUNICATIONS SYSTEMS that transmit or receive information and/or control systems that are intrinsic to the above.

EXCLUDES-
Excludes all other data systems or multiple systems which include control function or power supply; excludes installation of raceway systems, line voltage work, industrial work, life-safety systems (all buildings having floors located more than 75' above the lowest floor level having building access); excludes energy management systems.

ELEC0659-006 01/01/2013

DEL NORTE, MODOC and SISKIYOU COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 30.27	14.81

ELEC0659-008 02/01/2013

DEL NORTE, MODOC & SISKIYOU COUNTIES

	Rates	Fringes
Line Construction		
(1) Cable Splicer	$ 51.09	4%+13.30
(2) Lineman, Pole Sprayer, Heavy Line Equipment Man	$ 45.62	4%+13.30
(3) Tree Trimmer	$ 32.07	4%+9.80
(4) Line Equipment Man	$ 45.62	4%+9.80
(5) Powdermen, Jackhammermen	$ 34.22	4%+9.80
(6) Groundman	$ 31.31	4%+9.80

ELEC1245-004 06/01/2013

ALL COUNTIES EXCEPT DEL NORTE, MODOC & SISKIYOU

	Rates	Fringes
LINE CONSTRUCTION		
(1) Lineman; Cable splicer	$ 50.30	15
(2) Equipment specialist (operates crawler tractors, commercial motor		

vehicles, backhoes,
trenchers, cranes (50 tons
and below), overhead &
underground distribution
line equipment).....$ 40.17 14.56
(3) Groundman.....$ 30.73 13.48
(4) Powderman.....$ 44.91 13.48

HOLIDAYS: New Year's Day, M.L. King Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day and day after Thanksgiving, Christmas Day

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ELEV0008-001 01/01/2014

	Rates	Fringes
ELEVATOR MECHANIC	$ 59.19	26.785

FOOTNOTE:
PAID VACATION: Employer contributes 8% of regular hourly rate as vacation pay credit for employees with more than 5 years of service, and 6% for 6 months to 5 years of service.
PAID HOLIDAYS: New Years Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Friday after Thanksgiving, and Christmas Day.

ENGI0003-008 07/01/2013

	Rates	Fringes
Dredging: (DREDGING: CLAMSHELL & DIPPER DREDGING; HYDRAULIC SUCTION DREDGING:)		
AREA 1:		
(1) Leverman	$ 40.53	27.81
(2) Dredge Dozer; Heavy duty repairman	$ 35.57	27.81
(3) Booster Pump Operator; Deck Engineer; Deck mate; Dredge Tender; Winch Operator	$ 34.45	27.81
(4) Bargeman; Deckhand; Fireman; Leveehand; Oiler	$ 31.15	27.81
AREA 2:		
(1) Leverman	$ 42.53	27.81
(2) Dredge Dozer; Heavy duty repairman	$ 37.57	27.81
(3) Booster Pump Operator; Deck Engineer; Deck mate; Dredge Tender; Winch Operator	$ 36.45	27.81
(4) Bargeman; Deckhand; Fireman; Leveehand; Oiler	$ 33.15	27.81

AREA DESCRIPTIONS

AREA 1: ALAMEDA,BUTTE, CONTRA COSTA, KINGS, MARIN, MERCED, NAPA, SACRAMENTO, SAN BENITO, SAN FRANCISCO, SAN JOAQUIN, SAN MATEO, SANTA CLARA, SANTA CRUZ, SOLANO, STANISLAUS, SUTTER, YOLO, AND YUBA COUNTIES

AREA 2: MODOC COUNTY

THE REMAINGING COUNTIES ARE SPLIT BETWEEN AREA 1 AND AREA 2 AS NOTED BELOW:

ALPINE COUNTY:
Area 1: Northernmost part
Area 2: Remainder

CALAVERAS COUNTY:
Area 1: Remainder
Area 2: Eastern part

COLUSA COUNTY:
Area 1: Eastern part
Area 2: Remainder

ELDORADO COUNTY:
Area 1: North Central part
Area 2: Remainder

FRESNO COUNTY:
Area 1: Remainder
Area 2: Eastern part

GLENN COUNTY:
Area 1: Eastern part
Area 2: Remainder

LASSEN COUNTY:
Area 1: Western part along the Southern portion of border with Shasta County
Area 2: Remainder

MADERA COUNTY:
Area 1: Except Eastern part
Area 2: Eastern part

MARIPOSA COUNTY
Area 1: Except Eastern part
Area 2: Eastern part

MONTERREY COUNTY
Area 1: Except Southwestern part
Area 2: Southwestern part

NEVADA COUNTY:
Area 1: All but the Northern portion along the border of Sierra County
Area 2: Remainder

PLACER COUNTY:
Area 1: Al but the Central portion
Area 2: Remainder

PLUMAS COUNTY:
Area 1: Western portion
Area 2: Remainder

SHASTA COUNTY:
Area 1: All but the Northeastern corner
Area 2: Remainder

SIERRA COUNTY:
Area 1: Western part
Area 2: Remainder

SISKIYOU COUNTY:
Area 1: Central part
Area 2: Remainder

SONOMA COUNTY:
Area 1: All but the Northwestern corner
Area 2: Remainder

TEHAMA COUNTY:
Area 1: All but the Western border with Mendocino & Trinity Counties
Area 2: Remainder

TRINITY COUNTY:
Area 1: East Central part and the Northeastern border with Shasta County
Area 2: Remainder

TUOLUMNE COUNTY:
Area 1: Except Eastern part
Area 2: Eastern part

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* ENGI0003-018 06/30/2014

"AREA 1" WAGE RATES ARE LISTED BELOW

"AREA 2" RECEIVES AN ADDITIONAL $2.00 PER HOUR ABOVE AREA 1 RATES.

SEE AREA DEFINITIONS BELOW

	Rates	Fringes
OPERATOR: Power Equipment (AREA 1:)		
GROUP 1	$ 39.85	27.44
GROUP 2	$ 38.32	27.44
GROUP 3	$ 36.84	27.44
GROUP 4	$ 35.46	27.44
GROUP 5	$ 34.19	27.44
GROUP 6	$ 32.87	27.44
GROUP 7	$ 31.73	27.44
GROUP 8	$ 30.59	27.44
GROUP 8-A	$ 28.38	27.44
OPERATOR: Power Equipment (Cranes and Attachments -		

AREA 1:)
GROUP 1
Cranes.....$ 40.73 27.44
Oiler.....$ 33.76 27.44
Truck crane oiler.....$ 37.33 27.44
GROUP 2
Cranes.....$ 38.97 27.44
Oiler.....$ 33.50 27.44
Truck crane oiler.....$ 37.04 27.44
GROUP 3
Cranes.....$ 37.23 27.44
Hydraulic.....$ 32.87 27.44
Oiler.....$ 33.26 27.44
Truck Crane Oiler.....$ 36.77 27.44
GROUP 4
Cranes.....$ 34.19 27.44
OPERATOR: Power Equipment
(Piledriving - AREA 1:)
GROUP 1
Lifting devices.....$ 41.07 27.44
Oiler.....$ 31.81 27.44
Truck crane oiler.....$ 34.09 27.44
GROUP 2
Lifting devices.....$ 39.25 27.44
Oiler.....$ 31.54 27.44
Truck Crane Oiler.....$ 33.84 27.44
GROUP 3
Lifting devices.....$ 37.57 27.44
Oiler.....$ 31.32 27.44
Truck Crane Oiler.....$ 33.55 27.44
GROUP 4
Lifting devices.....$ 35.80 27.44
GROUP 5
Lifting devices.....$ 34.50 27.44
GROUP 6
Lifting devices.....$ 33.16 27.44
OPERATOR: Power Equipment
(Steel Erection - AREA 1:)
GROUP 1
Cranes.....$ 41.70 27.44
Oiler.....$ 32.15 27.44
Truck Crane Oiler.....$ 34.38 27.44
GROUP 2
Cranes.....$ 39.93 27.44
Oiler.....$ 31.88 27.44
Truck Crane Oiler.....$ 34.16 27.44
GROUP 3
Cranes.....$ 38.45 27.44
Hydraulic.....$ 32.67 27.44
Oiler.....$ 31.66 27.44
Truck Crane Oiler.....$ 33.89 27.44
GROUP 4
Cranes.....$ 36.43 27.44
GROUP 5
Cranes.....$ 35.13 27.44
OPERATOR: Power Equipment
(Tunnel and Underground Work
- AREA 1:)
SHAFTS, STOPES, RAISES:
GROUP 1.....$ 35.95 27.44

GROUP 1-A	$ 38.32	27.44
GROUP 2	$ 34.59	27.44
GROUP 3	$ 33.36	27.44
GROUP 4	$ 32.22	27.44
GROUP 5	$ 31.08	27.44
UNDERGROUND:		
GROUP 1	$ 35.85	27.44
GROUP 1-A	$ 38.32	27.44
GROUP 2	$ 34.59	27.44
GROUP 3	$ 33.26	27.44
GROUP 4	$ 32.12	27.44
GROUP 5	$ 30.98	27.44

FOOTNOTE: Work suspended by ropes or cables, or work on a Yo-Yo Cat: $.60 per hour additional.

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Operator of helicopter (when used in erection work); Hydraulic excavator, 7 cu. yds. and over; Power shovels, over 7 cu. yds.

GROUP 2: Highline cableway; Hydraulic excavator, 3-1/2 cu. yds. up to 7 cu. yds.; Licensed construction work boat operator, on site; Power blade operator (finish); Power shovels, over 1 cu. yd. up to and including 7 cu. yds. m.r.c.

GROUP 3: Asphalt milling machine; Cable backhoe; Combination backhoe and loader over 3/4 cu. yds.; Continuous flight tie back machine assistant to engineer or mechanic; Crane mounted continuous flight tie back machine, tonnage to apply; Crane mounted drill attachment, tonnage to apply; Dozer, slope brd; Gradall; Hydraulic excavator, up to 3 1/2 cu. yds.; Loader 4 cu. yds. and over; Long reach excavator; Multiple engine scraper (when used as push pull); Power shovels, up to and including 1 cu. yd.; Pre-stress wire wrapping machine; Side boom cat, 572 or larger; Track loader 4 cu. yds. and over; Wheel excavator (up to and including 750 cu. yds. per hour)

GROUP 4: Asphalt plant engineer/box person; Chicago boom; Combination backhoe and loader up to and including 3/4 cu. yd.; Concrete batch plant (wet or dry); Dozer and/or push cat; Pull- type elevating loader; Gradesetter, grade checker (GPS, mechanical or otherwise); Grooving and grinding machine; Heading shield operator; Heavy-duty drilling equipment, Hughes, LDH, Watson 3000 or similar; Heavy-duty repairperson and/or welder; Lime spreader; Loader under 4 cu. yds.; Lubrication and service engineer (mobile and grease rack); Mechanical finishers or spreader machine (asphalt, Barber-Greene and similar); Miller Formless M-9000 slope paver or similar; Portable crushing and screening plants; Power blade support; Roller operator, asphalt; Rubber-tired scraper, self-loading (paddle-wheels, etc.); Rubber- tired earthmoving equipment (scrapers); Slip form paver (concrete); Small tractor with drag; Soil stabilizer (P & H or equal); Spider plow and spider puller; Tubex pile rig; Unlicensed constuction work boat operator,

on site; Timber skidder; Track loader up to 4 yds.; Tractor-drawn scraper; Tractor, compressor drill combination; Welder; Woods-Mixer (and other similar Pugmill equipment)

GROUP 5: Cast-in-place pipe laying machine; Combination slusher and motor operator; Concrete conveyor or concrete pump, truck or equipment mounted; Concrete conveyor, building site; Concrete pump or pumpcrete gun; Drilling equipment, Watson 2000, Texoma 700 or similar; Drilling and boring machinery, horizontal (not to apply to waterliners, wagon drills or jackhammers); Concrete mixer/all; Person and/or material hoist; Mechanical finishers (concrete) (Clary, Johnson, Bidwell Bridge Deck or similar types); Mechanical burm, curb and/or curb and gutter machine, concrete or asphalt); Mine or shaft hoist; Portable crusher; Power jumbo operator (setting slip-forms, etc., in tunnels); Screed (automatic or manual); Self-propelled compactor with dozer; Tractor with boom D6 or smaller; Trenching machine, maximum digging capacity over 5 ft. depth; Vermeer T-600B rock cutter or similar

GROUP 6: Armor-Coater (or similar); Ballast jack tamper; Boom- type backfilling machine; Assistant plant engineer; Bridge and/or gantry crane; Chemical grouting machine, truck-mounted; Chip spreading machine operator; Concrete saw (self-propelled unit on streets, highways, airports and canals); Deck engineer; Drilling equipment Texoma 600, Hughes 200 Series or similar up to and including 30 ft. m.r.c.; Drill doctor; Helicopter radio operator; Hydro-hammer or similar; Line master; Skidsteer loader, Bobcat larger than 743 series or similar (with attachments); Locomotive; Lull hi-lift or similar; Oiler, truck mounted equipment; Pavement breaker, truck-mounted, with compressor combination; Paving fabric installation and/or laying machine; Pipe bending machine (pipelines only); Pipe wrapping machine (tractor propelled and supported); Screed (except asphaltic concrete paving); Self- propelled pipeline wrapping machine; Tractor; Self-loading chipper; Concrete barrier moving machine

GROUP 7: Ballast regulator; Boom truck or dual-purpose A-frame truck, non-rotating - under 15 tons; Cary lift or similar; Combination slurry mixer and/or cleaner; Drilling equipment, 20 ft. and under m.r.c.; Firetender (hot plant); Grouting machine operator; Highline cableway signalperson; Stationary belt loader (Kolman or similar); Lift slab machine (Vagtborg and similar types); Maginnes internal full slab vibrator; Material hoist (1 drum); Mechanical trench shield; Pavement breaker with or without compressor combination); Pipe cleaning machine (tractor propelled and supported); Post driver; Roller (except asphalt); Chip Seal; Self-propelled automatically applied concrete curing mahcine (on streets, highways, airports and canals); Self-propelled compactor (without dozer); Signalperson; Slip-form pumps (lifting device for concrete forms); Tie spacer; Tower mobile; Trenching machine, maximum digging capacity up to and including 5 ft. depth; Truck- type loader

GROUP 8: Bit sharpener; Boiler tender; Box operator;

Brakeperson; Combination mixer and compressor (shotcrete/gunite); Compressor operator; Deckhand; Fire tender; Forklift (under 20 ft.); Generator; Gunite/shotcrete equipment operator; Hydraulic monitor; Ken seal machine (or similar); Mixermobile; Oiler; Pump operator; Refrigeration plant; Reservoir-debris tug (self-propelled floating); Ross Carrier (construction site); Rotomist operator; Self-propelled tape machine; Shuttlecar; Self-propelled power sweeper operator (includes vacuum sweeper); Slusher operator; Surface heater; Switchperson; Tar pot firetender; Tugger hoist, single drum; Vacuum cooling plant; Welding machine (powered other than by electricity)

GROUP 8-A: Elevator operator; Skidsteer loader-Bobcat 743 series or smaller, and similar (without attachments); Mini excavator under 25 H.P. (backhoe-trencher); Tub grinder wood chipper

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ALL CRANES AND ATTACHMENTS

GROUP 1: Clamshell and dragline over 7 cu. yds.; Crane, over 100 tons; Derrick, over 100 tons; Derrick barge pedestal-mounted, over 100 tons; Self-propelled boom-type lifting device, over 100 tons

GROUP 2: Clamshell and dragline over 1 cu. yd. up to and including 7 cu. yds.; Crane, over 45 tons up to and including 100 tons; Derrick barge, 100 tons and under; Self-propelled boom-type lifting device, over 45 tons; Tower crane

GROUP 3: Clamshell and dragline up to and including 1 cu. yd.; Cranes 45 tons and under; Self-propelled boom-type lifting device 45 tons and under;

GROUP 4: Boom Truck or dual purpose A-frame truck, non-rotating over 15 tons; Truck-mounted rotating telescopic boom type lifting device, Manitex or similar (boom truck) over 15 tons; Truck-mounted rotating telescopic boom type lifting device, Manitex or similar (boom truck) - under 15 tons;

PILEDRIVERS

GROUP 1: Derrick barge pedestal mounted over 100 tons; Clamshell over 7 cu. yds.; Self-propelled boom-type lifting device over 100 tons; Truck crane or crawler, land or barge mounted over 100 tons

GROUP 2: Derrick barge pedestal mounted 45 tons to and including 100 tons; Clamshell up to and including 7 cu. yds.; Self-propelled boom-type lifting device over 45 tons; Truck crane or crawler, land or barge mounted, over 45 tons up to and including 100 tons; Fundex F-12 hydraulic pile rig

GROUP 3: Derrick barge pedestal mounted under 45 tons; Self-propelled boom-type lifting device 45 tons and under; Skid/scow piledriver, any tonnage; Truck crane or crawler, land or barge mounted 45 tons and under

GROUP 4: Assistant operator in lieu of assistant to engineer; Forklift, 10 tons and over; Heavy-duty repairperson/welder

GROUP 5: Deck engineer

GROUP 6: Deckhand; Fire tender

STEEL ERECTORS

GROUP 1: Crane over 100 tons; Derrick over 100 tons; Self-propelled boom-type lifting device over 100 tons

GROUP 2: Crane over 45 tons to 100 tons; Derrick under 100 tons; Self-propelled boom-type lifting device over 45 tons to 100 tons; Tower crane

GROUP 3: Crane, 45 tons and under; Self-propelled boom-type lifting device, 45 tons and under

GROUP 4: Chicago boom; Forklift, 10 tons and over; Heavy-duty repair person/welder

GROUP 5: Boom cat

TUNNEL AND UNDERGROUND WORK

GROUP 1-A: Tunnel bore machine operator, 20' diameter or more

GROUP 1: Heading shield operator; Heavy-duty repairperson; Mucking machine (rubber tired, rail or track type); Raised bore operator (tunnels); Tunnel mole bore operator

GROUP 2: Combination slusher and motor operator; Concrete pump or pumpcrete gun; Power jumbo operator

GROUP 3: Drill doctor; Mine or shaft hoist

GROUP 4: Combination slurry mixer cleaner; Grouting Machine operator; Motorman

GROUP 5: Bit Sharpener; Brakeman; Combination mixer and compressor (gunite); Compressor operator; Oiler; Pump operator; Slusher operator

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AREA DESCRIPTIONS:

POWER EQUIPMENT OPERATORS, CRANES AND ATTACHMENTS,TUNNEL AND UNDERGROUND [These areas do not apply to Piledrivers and

Steel Erectors]

AREA 1: ALAMEDA, BUTTE, CONTRA COSTA, KINGS, MARIN, MERCED, NAPA, SACRAMENTO, SAN BENITO, SAN FRANCISCO, SAN JOAQUIN, SAN MATEO, SANTA CLARA, SANTA CRUZ, SOLANO, STANISLAUS, SUTTER, YOLO, AND YUBA COUNTIES

AREA 2 - MODOC COUNTY

THE REMAINING COUNTIES ARE SPLIT BETWEEN AREA 1 AND AREA 2 AS NOTED BELOW:

ALPINE COUNTY:
Area 1: Northernmost part
Area 2: Remainder

CALAVERAS COUNTY:
Area 1: Except Eastern part
Area 2: Eastern part

COLUSA COUNTY:
Area 1: Eastern part
Area 2: Remainder

DEL NORTE COUNTY:
Area 1: Extreme Southwestern corner
Area 2: Remainder

ELDORADO COUNTY:
Area 1: North Central part
Area 2: Remainder

FRESNO COUNTY
Area 1: Except Eastern part
Area 2: Eastern part

GLENN COUNTY:
Area 1: Eastern part
Area 2: Remainder

HUMBOLDT COUNTY:
Area 1: Except Eastern and Southwestern parts
Area 2: Remainder

LAKE COUNTY:
Area 1: Southern part
Area 2: Remainder

LASSEN COUNTY:
Area 1: Western part along the Southern portion of border with Shasta County
Area 2: Remainder

MADERA COUNTY
Area 1: Remainder
Area 2: Eastern part

MARIPOSA COUNTY
Area 1: Remainder
Area 2: Eastern part

MENDOCINO COUNTY:
Area 1: Central and Southeastern parts
Area 2: Remainder

MONTEREY COUNTY
Area 1: Remainder
Area 2: Southwestern part

NEVADA COUNTY:
  Area 1: All but the Northern portion along the border of
  Sierra County
Area 2: Remainder

PLACER COUNTY:
Area 1: All but the Central portion
Area 2: Remainder

PLUMAS COUNTY:
Area 1: Western portion
Area 2: Remainder

SHASTA COUNTY:
Area 1: All but the Northeastern corner
Area 2: Remainder

SIERRA COUNTY:
Area 1: Western part
Area 2: Remainder

SISKIYOU COUNTY:
Area 1: Central part
Area 2: Remainder

SONOMA COUNTY:
Area 1: All but the Northwestern corner
Area 2: Reaminder

TEHAMA COUNTY:
  Area 1: All but the Western border with mendocino & Trinity
  Counties
Area 2: Remainder

TRINITY COUNTY:
  Area 1: East Central part and the Northeaster border with
  Shasta County
Area 2: Remainder

TULARE COUNTY;
Area 1: Remainder
Area 2: Eastern part

TUOLUMNE COUNTY:
Area 1: Remainder
Area 2: Eastern Part

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SEE AREA DESCRIPTIONS BELOW

	Rates	Fringes
OPERATOR: Power Equipment (LANDSCAPE WORK ONLY)		
GROUP 1		
AREA 1	$ 29.64	25.71
AREA 2	$ 31.64	25.71
GROUP 2		
AREA 1	$ 26.04	25.71
AREA 2	$ 28.04	25.71
GROUP 3		
AREA 1	$ 21.43	25.71
AREA 2	$ 23.43	25.71

GROUP DESCRIPTIONS:

GROUP 1: Landscape Finish Grade Operator: All finish grade work regardless of equipment used, and all equipment with a rating more than 65 HP.

GROUP 2: Landscape Operator up to 65 HP: All equipment with a manufacturer's rating of 65 HP or less except equipment covered by Group 1 or Group 3. The following equipment shall be included except when used for finish work as long as manufacturer's rating is 65 HP or less: A-Frame and Winch Truck, Backhoe, Forklift, Hydragraphic Seeder Machine, Roller, Rubber-Tired and Track Earthmoving Equipment, Skiploader, Straw Blowers, and Trencher 31 HP up to 65 HP.

GROUP 3: Landscae Utility Operator: Small Rubber-Tired Tractor, Trencher Under 31 HP.

AREA DESCRIPTIONS:

AREA 1: ALAMEDA, BUTTE, CONTRA COSTA, KINGS, MARIN, MERCED, NAPA, SACRAMENTO, SAN BENITO, SAN FRANCISCO, SAN JOAQUIN, SAN MATEO, SANTA CLARA, SANTA CRUZ, SOLANO, STANISLAUS, SUTTER, YOLO, AND YUBA COUNTIES

AREA 2 - MODOC COUNTY

THE REMAINING COUNTIES ARE SPLIT BETWEEN AREA 1 AND AREA 2 AS NOTED BELOW:

ALPINE COUNTY:
Area 1: Northernmost part
Area 2: Remainder

CALAVERAS COUNTY:
Area 1: Except Eastern part
Area 2: Eastern part

COLUSA COUNTY:
Area 1: Eastern part
Area 2: Remainder

DEL NORTE COUNTY:
Area 1: Extreme Southwestern corner

Area 2: Remainder

ELDORADO COUNTY:
Area 1: North Central part
Area 2: Remainder

FRESNO COUNTY
Area 1: Except Eastern part
Area 2: Eastern part

GLENN COUNTY:
Area 1: Eastern part
Area 2: Remainder

HUMBOLDT COUNTY:
Area 1: Except Eastern and Southwestern parts
Area 2: Remainder

LAKE COUNTY:
Area 1: Southern part
Area 2: Remainder

LASSEN COUNTY:
  Area 1: Western part along the Southern portion of border
  with Shasta County
Area 2: Remainder

MADERA COUNTY
Area 1: Remainder
Area 2: Eastern part

MARIPOSA COUNTY
Area 1: Remainder
Area 2: Eastern part

MENDOCINO COUNTY:
Area 1: Central and Southeastern parts
Area 2: Remainder

MONTEREY COUNTY
Area 1: Remainder
Area 2: Southwestern part

NEVADA COUNTY:
  Area 1: All but the Northern portion along the border of
  Sierra County
Area 2: Remainder

PLACER COUNTY:
Area 1: All but the Central portion
Area 2: Remainder

PLUMAS COUNTY:
Area 1: Western portion
Area 2: Remainder

SHASTA COUNTY:
Area 1: All but the Northeastern corner
Area 2: Remainder

SIERRA COUNTY:
Area 1: Western part
Area 2: Remainder

SISKIYOU COUNTY:
Area 1: Central part
Area 2: Remainder

SONOMA COUNTY:
Area 1: All but the Northwestern corner
Area 2: Reaminder

TEHAMA COUNTY:
Area 1: All but the Western border with mendocino & Trinity Counties
Area 2: Remainder

TRINITY COUNTY:
Area 1: East Central part and the Northeaster border with Shasta County
Area 2: Remainder

TULARE COUNTY;
Area 1: Remainder
Area 2: Eastern part

TUOLUMNE COUNTY:
Area 1: Remainder
Area 2: Eastern Part

IRON0377-002 07/01/2013

	Rates	Fringes
Ironworkers:		
Fence Erector	$ 26.58	17.74
Ornamental, Reinforcing and Structural	$ 33.00	26.30

PREMIUM PAY:

$6.00 additional per hour at the following locations:

China Lake Naval Test Station, Chocolate Mountains Naval Reserve-Niland,
Edwards AFB, Fort Irwin Military Station, Fort Irwin Training Center-Goldstone, San Clemente Island, San Nicholas Island, Susanville Federal Prison, 29 Palms - Marine Corps, U.S. Marine Base - Barstow, U.S. Naval Air Facility - Sealey, Vandenberg AFB

$4.00 additional per hour at the following locations:

Army Defense Language Institute - Monterey, Fallon Air Base, Naval Post Graduate School - Monterey, Yermo Marine Corps Logistics Center

$2.00 additional per hour at the following locations:

Port Hueneme, Port Mugu, U.S. Coast Guard Station - Two Rock

LABO0067-002 12/01/2013

AREA "A" - ALAMEDA, CONTRA COSTA, MARIN, SAN FRANCISCO, SAN MATEO AND SANTA CLARA COUNTIES

AREA "B" - ALPINE, AMADOR, BUTTE, CALAVERAS, COLUSA, DEL NORTE, EL DORADO, FRESNO, GLENN, HUMBOLDT, KINGS, LAKE, LASSEN, MADERA, MARIPOSA, MENDOCINO, MERCED, MODOC, MONTEREY, NAPA, NEVADA, PLACER, PLUMAS, SACRAMENTO, SAN BENITO, SAN JOAQUIN, SANTA CRUZ, SHASTA, SIERRA, SISKIYOU, SOLANO, SONOMA, STANISLAUS, SUTTER, TEHAMA, TRINITY, TULARE, TUOLUMNE, YOLO AND YUBA COUNTIES

	Rates	Fringes
Asbestos Removal Laborer		
Areas A & B	$ 19.66	9.02
LABORER (Lead Removal)		
Area A	$ 27.89	19.20
Area B	$ 26.89	19.20

ASBESTOS REMOVAL-SCOPE OF WORK: Site mobilization; initial site clean-up; site preparation; removal of asbestos-containing materials from walls and ceilings; or from pipes, boilers and mechanical systems only if they are being scrapped; encapsulation, enclosure and disposal of asbestos-containing materials by hand or with equipment or machinery; scaffolding; fabrication of temporary wooden barriers; and assembly of decontamination stations.

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* LABO0067-006 06/30/2014

AREA "A" - ALAMEDA, CONTRA COSTA, MARIN, SAN FRANCISCO, SAN MATEO AND SANTA CLARA COUNTIES

AREA "B" - ALPINE, AMADOR, BUTTE, CALAVERAS, COLUSA, EL DORADO, FRESNO, GLENN, KINGS, LASSEN, MADERA, MARIPOSA, MERCED, MODOC, MONTEREY, NAPA, NEVADA, PLACER, PLUMAS, SACRAMENTO, SAN BENITO, SAN JOAQUIN, SANTA CRUZ, SHASTA, SIERRA, SISKIYOU, SOLANO, SONOMA, STANISLAUS, SUTTER, TEHAMA, TRINITY, TULARE, TUOLUMNE, YOLO AND YUBA COUNTIES

	Rates	Fringes
Laborers: (CONSTRUCTION CRAFT LABORERS - AREA A:)		
Construction Specialist Group	$ 29.09	19.57
GROUP 1	$ 28.39	19.57
GROUP 1-a	$ 28.61	19.57
GROUP 1-c	$ 28.44	19.57
GROUP 1-e	$ 28.94	19.57
GROUP 1-f	$ 28.97	19.57
GROUP 1-g (Contra Costa		

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     County).....................$ 28.59            19.57
     GROUP 2.....................$ 28.24            19.57
     GROUP 3.....................$ 28.14            19.57
     GROUP 4.....................$ 21.83            19.57
  See groups 1-b and 1-d under laborer classifications.
Laborers: (CONSTRUCTION CRAFT
LABORERS - AREA B:)
     Construction Specialist
     Group.......................$ 28.09            19.57
     GROUP 1.....................$ 27.39            19.57
     GROUP 1-a...................$ 27.61            19.57
     GROUP 1-c...................$ 27.44            19.57
     GROUP 1-e...................$ 27.94            19.57
     GROUP 1-f...................$ 27.97            19.57
     GROUP 2.....................$ 27.24            19.57
     GROUP 3.....................$ 27.14            19.57
     GROUP 4.....................$ 20.83            19.57
  See groups 1-b and 1-d under laborer classifications.
Laborers: (GUNITE - AREA A:)
     GROUP 1.....................$ 29.35            19.57
     GROUP 2.....................$ 28.85            19.57
     GROUP 3.....................$ 28.26            19.57
     GROUP 4.....................$ 28.14            19.57
Laborers: (GUNITE - AREA B:)
     GROUP 1.....................$ 28.35            19.57
     GROUP 2.....................$ 27.85            19.57
     GROUP 3.....................$ 27.26            19.57
     GROUP 4.....................$ 27.14            19.57
Laborers: (WRECKING - AREA A:)
     GROUP 1.....................$ 28.39            19.57
     GROUP 2.....................$ 28.24            19.57
Laborers: (WRECKING - AREA B:)
     GROUP 1.....................$ 27.39            19.57
     GROUP 2.....................$ 27.24            19.57
Landscape Laborer (GARDENERS,
HORTICULTURAL & LANDSCAPE
LABORERS - AREA A:)
     (1) New Construction........$ 28.14            19.57
     (2) Establishment Warranty
     Period......................$ 21.83            19.57
Landscape Laborer (GARDENERS,
HORTICULURAL & LANDSCAPE
LABORERS - AREA B:)
     (1) New Construction........$ 27.14            19.57
     (2) Establishment Warranty
     Period......................$ 20.83            19.57

FOOTNOTES:
  Laborers working off or with or from bos'n chairs, swinging
  scaffolds, belts shall receive $0.25 per hour above the
  applicable wage rate.  This shall not apply to workers
  entitled to receive the wage rate set forth in Group 1-a
  below.

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LABORER CLASSIFICATIONS

  CONSTRUCTION SPECIALIST GROUP: Asphalt ironer and raker;
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Chainsaw; Laser beam in connection with laborers' work; Cast-in- place manhole form setter; Pressure pipelayer; Davis trencher - 300 or similar type (and all small trenchers); Blaster; Diamond driller; Multiple unit drill; Hydraulic drill

GROUP 1: Asphalt spreader boxes (all types); Barko, Wacker and similar type tampers; Buggymobile; Caulker, bander, pipewrapper, conduit layer, plastic pipelayer; Certified hazardous waste worker including Leade Abatement; Compactors of all types; Concrete and magnesite mixer, 1/2 yd. and under; Concrete pan work; Concrete sander; Concrete saw; Cribber and/or shoring; Cut granite curb setter; Dri-pak-it machine; Faller, logloader and bucker; Form raiser, slip forms; Green cutter; Headerboard, Hubsetter, aligner, by any method; High pressure blow pipe (1-1/2" or over, 100 lbs. pressure/over); Hydro seeder and similar type; Jackhammer operator; Jacking of pipe over 12 inches; Jackson and similar type compactor; Kettle tender, pot and worker applying asphalt, lay-kold, creosote, lime, caustic and similar type materials (applying means applying, dipping or handling of such materials); Lagging, sheeting, whaling, bracing, trenchjacking, lagging hammer; Magnesite, epoxyresin, fiberglass, mastic worker (wet or dry); No joint pipe and stripping of same, including repair of voids; Pavement breaker and spader, including tool grinder; Perma curb; Pipelayer (including grade checking in connection with pipelaying); Precast-manhole setter; Pressure pipe tester; Post hole digger, air, gas and electric; Power broom sweeper; Power tampers of all types (except as shown in Group 2); Ram set gun and stud gun; Riprap stonepaver and rock-slinger, including placing of sacked concrete and/or sand (wet or dry) and gabions and similar type; Rotary scarifier or multiple head concrete chipping scarifier; Roto and Ditch Witch; Rototiller; Sandblaster, pot, gun, nozzle operators; Signalling and rigging; Tank cleaner; Tree climber; Turbo blaster; Vibrascreed, bull float in connection with laborers' work; Vibrator; Hazardous waste worker (lead removal); Asbestos and mold removal worker

GROUP 1-a: Joy drill model TWM-2A; Gardner-Denver model DH143 and similar type drills; Track driller; Jack leg driller; Wagon driller; Mechanical drillers, all types regardless of type or method of power; Mechanical pipe layers, all types regardless of type or method of power; Blaster and powder; All work of loading, placing and blasting of all powder and explosives of whatever type regardless of method used for such loading and placing; High scalers (including drilling of same); Tree topper; Bit grinder

GROUP 1-b: Sewer cleaners shall receive $4.00 per day above Group 1 wage rates. "Sewer cleaner" means any worker who handles or comes in contact with raw sewage in small diameter sewers. Those who work inside recently active, large diameter sewers, and all recently active sewer manholes shal receive $5.00 per day above Group 1 wage rates.

GROUP 1-c: Burning and welding in connection with laborers'

work; Synthetic thermoplastics and similar type welding

GROUP 1-d: Maintenance and repair track and road beds. All employees performing work covered herein shall receive $ .25 per hour above their regular rate for all work performed on underground structures not specifically covered herein. This paragraph shall not be construed to apply to work below ground level in open cut. It shall apply to cut and cover work of subway construction after the temporary cover has been placed.

GROUP 1-e: Work on and/or in bell hole footings and shafts thereof, and work on and in deep footings. (A deep footing is a hole 15 feet or more in depth.) In the event the depth of the footing is unknown at the commencement of excavation, and the final depth exceeds 15 feet, the deep footing wage rate would apply to all employees for each and every day worked on or in the excavation of the footing from the date of inception.

GROUP 1-f: Wire winding machine in connection with guniting or shot crete

GROUP 1-g, CONTRA COSTA COUNTY: Pipelayer (including grade checking in connection with pipelaying); Caulker; Bander; Pipewrapper; Conduit layer; Plastic pipe layer; Pressure pipe tester; No joint pipe and stripping of same, including repair of voids; Precast manhole setters, cast in place manhole form setters

GROUP 2: Asphalt shoveler; Cement dumper and handling dry cement or gypsum; Choke-setter and rigger (clearing work); Concrete bucket dumper and chute; Concrete chipping and grinding; Concrete laborer (wet or dry); Driller tender, chuck tender, nipper; Guinea chaser (stake), grout crew; High pressure nozzle, adductor; Hydraulic monitor (over 100 lbs. pressure); Loading and unloading, carrying and hauling of all rods and materials for use in reinforcing concrete construction; Pittsburgh chipper and similar type brush shredders; Sloper; Single foot, hand-held, pneumatic tamper; All pneumatic, air, gas and electric tools not listed in Groups 1 through 1-f; Jacking of pipe - under 12 inches

GROUP 3: Construction laborers, including bridge and general laborer; Dump, load spotter; Flag person; Fire watcher; Fence erector; Guardrail erector; Gardener, horticultural and landscape laborer; Jetting; Limber, brush loader and piler; Pavement marker (button setter); Maintenance, repair track and road beds; Streetcar and railroad construction track laborer; Temporary air and water lines, Victaulic or similar; Tool room attendant (jobsite only)

GROUP 4: Final clean-up work of debris, grounds and building including but not limited to: street cleaner; cleaning and washing windows; brick cleaner (jobsite only); material cleaner (jobsite only). The classification "material cleaner" is to be utilized under the following conditions:
A: at demolition site for the salvage of the material.
B: at the conclusion of a job where the material is to be

salvaged and stocked to be reused on another job.
C: for the cleaning of salvage material at the jobsite or temporary jobsite yard.

The material cleaner classification should not be used in the performance of "form stripping, cleaning and oiling and moving to the next point of erection".

GUNITE LABORER CLASSIFICATIONS

GROUP 1: Structural Nozzleman

GROUP 2: Nozzleman, Gunman, Potman, Groundman

GROUP 3: Reboundman

GROUP 4: Gunite laborer

WRECKING WORK LABORER CLASSIFICATIONS

GROUP 1: Skilled wrecker (removing and salvaging of sash, windows and materials)

GROUP 2: Semi-skilled wrecker (salvaging of other building materials)

LABO0185-002 07/01/2013

ALPINE, AMADOR, BUTTE, COLUSA, EL DORADO, GLENN, LASSEN, MODOC, NEVADA, PLACER, PLUMAS, SACRAMENTO, SHASTA, SIERRA, SISKIYOU, SUTTER, TEHAMA, TRINITY, YOLO AND YUBA COUNTIES

	Rates	Fringes
LABORER		
Mason Tender-Brick	$ 31.52	16.53

LABO0185-005 07/01/2013

ALPINE, AMADOR, BUTTE, COLUSA, EL DORADO, GLENN, LASSEN, MODOC, NEVADA, PLACER, PLUMAS, SACRAMENTO, SHASTA, SIERRA, SISKIYOU, SUTTER, TEHAMA, TRINITY, YOLO AND YUBA COUNTIES

	Rates	Fringes
Tunnel and Shaft Laborers:		
GROUP 1	$ 34.10	16.53
GROUP 2	$ 33.87	16.53
GROUP 3	$ 33.62	16.53
GROUP 4	$ 33.17	16.53
GROUP 5	$ 32.63	16.53
Shotcrete Specialist	$ 36.12	16.53

TUNNEL AND SHAFT CLASSIFICATIONS

GROUP 1: Diamond driller; Groundmen; Gunite and shotcrete nozzlemen

GROUP 2: Rodmen; Shaft work & raise (below actual or excavated ground level)

GROUP 3: Bit grinder; Blaster, driller, powdermen, heading; Cherry pickermen - where car is lifted; Concrete finisher in tunnel; Concrete screedman; Grout pumpman and potman; Gunite & shotcrete gunman & potman; Headermen; High pressure nozzleman; Miner - tunnel, including top and bottom man on shaft and raise work; Nipper; Nozzleman on slick line; Sandblaster - potman, Robotic Shotcrete Placer, Segment Erector, Tunnel Muck Hauler, Steel Form raiser and setter; Timberman, retimberman (wood or steel or substitute materials therefore); Tugger (for tunnel laborer work); Cable tender; Chuck tender; Powderman - primer house

GROUP 4: Vibrator operator, pavement breaker; Bull gang - muckers, trackmen; Concrete crew - includes rodding and spreading, Dumpmen (any method)

GROUP 5: Grout crew; Reboundman; Swamper/ Brakeman

LABO0261-002 07/01/2013

MARIN COUNTY

	Rates	Fringes
LABORER (TRAFFIC CONTROL/LANE CLOSURE)		
Escort Driver, Flag Person	$ 27.64	18.74
Traffic Control Person I	$ 27.94	18.74
Traffic Control Person II	$ 25.44	18.74

TRAFFIC CONTROL PERSON I: Layout of traffic control, crash cushions, construction area and roadside signage.

TRAFFIC CONTROL PERSON II: Installation and removal of temporary/permanent signs, markers, delineators and crash cushions.

LABO0261-004 07/01/2013

MARIN COUNTY

	Rates	Fringes
Tunnel and Shaft Laborers:		
GROUP 1	$ 34.10	16.53
GROUP 2	$ 33.87	16.53
GROUP 3	$ 33.62	16.53
GROUP 4	$ 33.17	16.53
GROUP 5	$ 32.63	16.53
Shotcrete Specialist	$ 36.12	16.53

TUNNEL AND SHAFT CLASSIFICATIONS

GROUP 1: Diamond driller; Groundmen; Gunite and shotcrete nozzlemen

GROUP 2: Rodmen; Shaft work & raise (below actual or excavated ground level)

GROUP 3: Bit grinder; Blaster, driller, powdermen, heading; Cherry pickermen - where car is lifted; Concrete finisher in tunnel; Concrete screedman; Grout pumpman and potman; Gunite & shotcrete gunman & potman; Headermen; High pressure nozzleman; Miner - tunnel, including top and bottom man on shaft and raise work; Nipper; Nozzleman on slick line; Sandblaster - potman, Robotic Shotcrete Placer, Segment Erector, Tunnel Muck Hauler, Steel Form raiser and setter; Timberman, retimberman (wood or steel or substitute materials therefore); Tugger (for tunnel laborer work); Cable tender; Chuck tender; Powderman - primer house

GROUP 4: Vibrator operator, pavement breaker; Bull gang - muckers, trackmen; Concrete crew - includes rodding and spreading, Dumpmen (any method)

GROUP 5: Grout crew; Reboundman; Swamper/ Brakeman

LABO0261-007 07/01/2013

MARIN COUNTY

	Rates	Fringes
LABORER		
Mason Tender-Brick	$ 32.77	16.53

LABO0324-004 07/01/2013

NAPA, SOLANO, AND SONOMA, COUNTIES

	Rates	Fringes
LABORER (TRAFFIC CONTROL/LANE CLOSURE)		
Escort Driver, Flag Person	$ 26.64	18.74
Traffic Control Person I	$ 26.94	18.74
Traffic Control Person II	$ 24.44	18.74

TRAFFIC CONTROL PERSON I: Layout of traffic control, crash cushions, construction area and roadside signage.

TRAFFIC CONTROL PERSON II: Installation and removal of temporary/permanent signs, markers, delineators and crash cushions.

LABO0324-008 07/01/2013

NAPA, SOLANO, AND SONOMA COUNTIES

	Rates	Fringes
Tunnel and Shaft Laborers:		
GROUP 1	$ 34.10	16.53
GROUP 2	$ 33.87	16.53
GROUP 3	$ 33.62	16.53
GROUP 4	$ 33.17	16.53
GROUP 5	$ 32.63	16.53
Shotcrete Specialist	$ 36.12	16.53

TUNNEL AND SHAFT CLASSIFICATIONS

GROUP 1: Diamond driller; Groundmen; Gunite and shotcrete nozzlemen

GROUP 2: Rodmen; Shaft work & raise (below actual or excavated ground level)

GROUP 3: Bit grinder; Blaster, driller, powdermen, heading; Cherry pickermen - where car is lifted; Concrete finisher in tunnel; Concrete screedman; Grout pumpman and potman; Gunite & shotcrete gunman & potman; Headermen; High pressure nozzleman; Miner - tunnel, including top and bottom man on shaft and raise work; Nipper; Nozzleman on slick line; Sandblaster - potman, Robotic Shotcrete Placer, Segment Erector, Tunnel Muck Hauler, Steel Form raiser and setter; Timberman, retimberman (wood or steel or substitute materials therefore); Tugger (for tunnel laborer work); Cable tender; Chuck tender; Powderman - primer house

GROUP 4: Vibrator operator, pavement breaker; Bull gang - muckers, trackmen; Concrete crew - includes rodding and spreading, Dumpmen (any method)

GROUP 5: Grout crew; Reboundman; Swamper/ Brakeman

LABO0324-010 07/01/2013

NAPA, SOLANO AND SONOMA COUNTIES

	Rates	Fringes
LABORER (Brick)		
Mason Tender-Brick	$ 31.95	16.53

LABO1414-005 08/07/2013

	Rates	Fringes
Plasterer tender	$ 30.00	16.36

Work on a swing stage scaffold: $1.00 per hour additional.

PAIN0016-004 01/01/2013

MARIN, NAPA, SOLANO & SONOMA COUNTIES

	Rates	Fringes

Painters:.....$ 33.86 20.26

PREMIUMS:
EXOTIC MATERIALS - $0.75 additional per hour.
SPRAY WORK: - $0.50 additional per hour.
INDUSTRIAL PAINTING - $0.25 additional per hour
[Work on industrial buildings used for the manufacture and processing of goods for sale or service; steel construction (bridges), stacks, towers, tanks, and similar structures]

HIGH WORK:
over 50 feet - $2.00 per hour additional
100 to 180 feet - $4.00 per hour additional
Over 180 feet - $6.00 per houir additional

PAIN0016-005 01/01/2013

ALPINE, BUTTE, COLUSA, EL DORADO (west of the Sierra Nevada Mountains), GLENN, LASSEN (west of Hwy. 395, excluding Honey Lake); MARIN, MODOC, NAPA, NEVADA (west of the Sierra Nevada Mountains), PLACER (west of the Sierra Nevada Mountains), PLUMAS, SACRAMENTO, SHASTA, SIERRA (west of the Sierra Nevada Mountains), SISKIYOU, SOLANO, SONOMA, SUTTER, TEHAMA, TRINITY, YOLO AND YUBA COUNTIES

	Rates	Fringes
DRYWALL FINISHER/TAPER.....	$ 36.24	18.67

PAIN0016-007 01/01/2013

ALPINE, AMADOR, BUTTE, COLUSA. EL DORADO (west of the Sierra Nevada Mountains), GLENN, LASSEN (west of Highway 395, excluding Honey Lake), MODOC, NEVADA (west of the Sierra Nevada Mountains), PLACER (west of the Sierra Nevada Mountains), PLUMAS, SACRAMENTO, SHASTA, SIERRA (west of the Sierra Nevada Mountains), SISKIYOU, SUTTER, TEHAMA, TRINITY, YOLO & YUBA COUNTIES

	Rates	Fringes
Painters:.....	$ 29.06	15.98

SPRAY/SANDBLAST: $0.50 additional per hour.
EXOTIC MATERIALS: $1.00 additional per hour.
HIGH TIME: Over 50 ft above ground or water level $2.00 additional per hour. 100 to 180 ft above ground or water level $4.00 additional per hour. Over 180 ft above ground or water level $6.00 additional per hour.

PAIN0016-008 01/01/2013

MARIN, NAPA, SOLANO AND SONOMA COUNTIES

	Rates	Fringes

SOFT FLOOR LAYER.....$ 44.87 17.98

PAIN0169-004 01/01/2013

MARIN , NAPA & SONOMA COUNTIES; SOLANO COUNTY (west of a line defined as follows: Hwy. 80 corridor beginning at the City of Fairfield, including Travis Air Force Base and Suisun City; going north of Manakas Corner Rd., continue north on Suisun Valley Rd. to the Napa County line; Hwy. 80 corridor south on Grizzly Island Rd. to the Grizzly Island Management area)

	Rates	Fringes
GLAZIER	$ 41.88	21.59

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* PAIN0567-001 07/01/2013

EL DORADO COUNTY (east of the Sierra Nevada Mountains); LASSEN COUNTY (east of Highway 395, beginning at Stacey and including Honey Lake); NEVADA COUNTY (east of the Sierra Nevada Mountains); PLACER COUNTY (east of the Sierra Nevada Mountains); AND SIERRA COUNTY (east of the Sierra Nevada Mountains)

	Rates	Fringes
Painters:		
Brush and Roller	$ 23.30	10.19
Spray Painter & Paperhanger	$ 24.15	10.19

PREMIUMS:
Special Coatings (Brush), and Sandblasting = $0.50/hr
Special Coatings (Spray), and Steeplejack = $1.00/hr
Special Coating Spray Steel = $1.25/hr
Swing Stage = $2.00/hr

*A special coating is a coating that requires the mixing of 2 or more products.

PAIN0567-007 07/01/2013

EL DORADO COUNTY (east of the Sierra Nevada Mountains); LASSEN COUNTY (east of Highway 395, beginning at Stacey and including Honey Lake); NEVADA COUNTY (east of the Sierra Nevada Mountains); PLACER COUNTY (east of the Sierra Nevada Mountains) AND SIERRA COUNTY (east of the Sierra Nevada Mountains)

	Rates	Fringes
SOFT FLOOR LAYER	$ 25.40	11.49

PAIN0567-010 07/01/2013

EL DORADO COUNTY (east of the Sierra Nevada Mountains); LASSEN COUNTY (east of Highway 395, beginning at Stacey and including

Honey Lake); NEVADA COUNTY (east of the Sierra Nevada Mountains); PLACER COUNTY (east of the Sierra Nevada Mountains); AND SIERRA COUNTY (east of the Sierra Nevada Mountains)

	Rates	Fringes
Drywall		
(1) Taper	$ 27.07	11.14
(2) Steeplejack - Taper, over 40 ft with open space below	$ 28.57	11.14

PAIN0767-004 01/01/2013

ALPINE, AMADOR, BUTTE, COLUSA, EL DORADO, GLENN, LASSEN, MODOC, NEVADA, PLACER, PLUMAS, SACRAMENTO, SHASTA, SIERRA, SISKIYOU, SOLANO (Remainder), SUTTER, TEHAMA, TRINITY, YOLO, YUBA

	Rates	Fringes
GLAZIER	$ 32.24	19.88

PAID HOLIDAYS: New Year's Day, Martin Luther King, Jr. Day, President's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, and Christmas Day.

Employee rquired to wear a body harness shall receive $1.50 per hour above the basic hourly rate at any elevation.

PAIN1176-001 07/01/2013

HIGHWAY IMPR0VEMENT

	Rates	Fringes
Parking Lot Striping/Highway Marking:		
GROUP 1	$ 28.27	11.65
GROUP 2	$ 28.60	11.65
GROUP 3	$ 26.96	11.65

CLASSIFICATIONS

GROUP 1: Striper: Layout and application of painted traffic stripes and marking; hot thermo plastic; tape, traffic stripes and markings

GROUP 2: Gamecourt & Playground Installer

GROUP 3: Protective Coating, Pavement Sealing

PAIN1237-001 01/01/2013

ALPINE; COLUSA; EL DORADO (west of the Sierra Nevada Mountains); GLENN; LASSEN (west of Highway 395, beginning at

Stacey and including Honey Lake); MODOC; NEVADA (west of the Sierra Nevada Mountains); PLACER (west of the Sierra Nevada Mountains); PLUMAS; SACRAMENTO; SHASTA; SIERRA (west of the Sierra Nevada Mountains); SISKIYOU; SUTTER; TEHAMA; TRINITY; YOLO AND YUBA COUNTIES

	Rates	Fringes
SOFT FLOOR LAYER	$ 28.25	16.73

PLAS0300-003 07/01/2009

	Rates	Fringes
PLASTERER		
AREA 295: Alpine, Amador, Butte, Colusa, El Dorado, Glenn, Lassen, Modoc, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Siskiyou, Solano, Sutter, Tehema, Trinity, Yolo & Yuba Counties	$ 32.82	15.10
AREA 355: Marin, Napa & Sonoma Counties	$ 32.82	15.30

* PLAS0300-005 06/30/2014

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 30.00	23.66

PLUM0038-002 07/01/2013

MARIN AND SONOMA COUNTIES

	Rates	Fringes
PLUMBER (Plumber, Steamfitter, Refrigeration Fitter)		
(1) Work on wooden frame structures 5 stories or less excluding hgih-rise buildings and commercial work such as hospitals, prisons, hotels, schools, casinos, wastewater treatment plants, and resarch facilities as well as refrigeration pipefitting, service and repair work - MARKET RECOVERY RATE	$ 62.00	42.39
(2) All other work - NEW CONSTRUCTION RATE	$ 62.00	42.39

PLUM0038-006 07/01/2013

MARIN & SONOMA COUNTIES

	Rates	Fringes
Landscape/Irrigation Fitter (Underground/Utility Fitter)	$ 52.70	31.45

PLUM0228-001 01/01/2014

BUTTE, COLUSA, GLENN, LASSEN, MODOC, PLUMAS, SHASTA, SIERRA, SISKIYOU, SUTTER, TEHAMA, TRINITY & YUBA COUNTIES

	Rates	Fringes
PLUMBER	$ 34.50	25.24

PLUM0343-001 07/01/2013

NAPA AND SOLANO COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER		
Light Commercial	$ 30.60	19.40
All Other Work	$ 47.50	28.20

DEFINITION OF LIGHT COMMERICIAL:
Work shall include strip shopping centers, office buildings, schools and other commercial structures which the total plumbing bid does not exceed Two Hundred and Fifty Thousand ($250,000) and the total heating and cooling does not exceed Two Hundred Fifty Thousand ($250,000); or Any projects bid in phases shall not qualify unless the total project is less than Two Hundred Fifty Thousand ($250,000) for the plumbing bid; and Two Hundred Fifty Thousand ($250,000) for the heating and cooling bid. Excluded are hospitals, jails, institutions and industrial projects, regardless size of the project

FOOTNOTES: While fitting galvanized material: $.75 per hour additional. Work from trusses, temporary staging, unguarded structures 35' from the ground or water: $.75 per hour additional. Work from swinging scaffolds, boatswains chairs or similar devices: $.75 per hour additional.

PLUM0350-001 01/01/2011

EL DORADO COUNTY (Lake Tahoe area only); NEVADA COUNTY (Lake Tahoe area only); AND PLACER COUNTY (Lake Tahoe area only)

	Rates	Fringes
PLUMBER/PIPEFITTER	$ 34.60	10.50

PLUM0355-001 07/01/2013

ALPINE, AMADOR, BUTTE, COLUSA, EL DORADO, GLENN, LASSEN, MODOC,

NAPA, NEVADA, PLACER, PLUMAS, SACRAMENTO, SHASTA, SIERRA, SISKIYOU, SOLANO, SUTTER, TEHAMA, TRINITY, YOLO, AND YUBA COUNTIES

	Rates	Fringes
Underground Utility Worker /Landscape Fitter	$ 28.55	8.30

PLUM0442-003 01/01/2014

AMADOR (South of San Joaquin River) and ALPINE COUNTIES

	Rates	Fringes
PLUMBER	$ 35.00	24.99

PLUM0447-001 07/01/2013

AMADOR (north of San Joaquin River), EL DORADO (excluding Lake Tahoe area), NEVADA (excluding Lake Tahoe area); PLACER (excluding Lake Tahoe area), SACRAMENTO AND YOLO COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER		
Journeyman	$ 41.77	22.35
Light Commercial Work	$ 32.23	17.22

ROOF0081-006 08/01/2011

MARIN, NAPA, SOLANO AND SONOMA COUNTIES

	Rates	Fringes
Roofer	$ 33.16	10.90

ROOF0081-007 08/01/2012

ALPINE, BUTTE, COLUSA, EL DORADO, GLENN,LASSEN, MODOC, NEVADA, PLACER, PLUMAS, SACRAMENTO, SHASTA, SIERRA, SISKIYOU, SUTTER, TEHAMA, TRINITY, YOLO, AND YUBA COUNTIES

	Rates	Fringes
Roofer	$ 32.33	11.97

SFCA0483-003 01/01/2014

MARIN, NAPA, SOLANO AND SONOMA COUNTIES

	Rates	Fringes
SPRINKLER FITTER (Fire Sprinklers)	$ 52.42	25.62

SFCA0669-003 07/01/2013

ALPINE, BUTTE, COLUSA, EL DORADO, GLENN, LASSEN, MODOC, NEVADA, PLACER, PLUMAS, SACRAMENTO, SHASTA, SIERRA, SISKIYOU, SUTTER, TEHAMA, TRINITY, YOLO AND YUBA COUNTIES

	Rates	Fringes
SPRINKLER FITTER	$ 34.19	19.37

SHEE0104-006 07/01/2013

MARIN, NAPA, SOLANO SONOMA & TRINITY COUNTIES

	Rates	Fringes
Sheet Metal Worker		
Mechanical Contracts		
$200,000 or less	$ 51.30	35.96
All other work	$ 52.80	34.46

SHEE0104-009 07/01/2013

AMADOR, COLUSA, EL DORADO, NEVADA, PLACER, SACRAMENTO, SUTTER, YOLO AND YUBA COUNTIES

	Rates	Fringes
SHEET METAL WORKER	$ 38.43	29.31

SHEE0104-010 07/01/2013

AlPINE COUNTY

	Rates	Fringes
SHEET METAL WORKER	$ 35.87	26.88

SHEE0104-011 07/01/2013

BUTTE, COLUSA, EL DORADO, GLENN, LASSEN, MODOC, NEVADA, PLACER, PLUMAS, SACRAMENTO, SHASTA, SIERRA, SISKIYOU, SUTTER, TEHAMA, YOLO AND YUBA COUNTIES

	Rates	Fringes
Sheet Metal Worker (Metal decking and siding only)	$ 38.43	29.31

SHEE0104-014 07/01/2013

MARIN, NAPA, SOLANO, SONOMA AND TRINITY COUNTIES

	Rates	Fringes
SHEET METAL WORKER (Metal Decking and Siding only)	$ 52.80	34.46

SHEE0104-019 07/01/2013

BUTTE, GLENN, LASSEN, MODOC, PLUMAS, SHASTA, SIERRA, SISKIYOU AND TEHAMA COUNTIES

	Rates	Fringes
SHEET METAL WORKER		
Mechanical Jobs $200,000 & under	$ 29.54	27.16
Mechanical Jobs over $200,000	$ 38.43	29.31

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* TEAM0094-001 07/01/2014

	Rates	Fringes
Truck drivers:		
GROUP 1	$ 27.96	24.28
GROUP 2	$ 28.26	24.28
GROUP 3	$ 28.56	24.28
GROUP 4	$ 28.91	24.28
GROUP 5	$ 29.26	24.28

FOOTNOTES:

Articulated dump truck; Bulk cement spreader (with or without auger); Dumpcrete truck; Skid truck (debris box); Dry pre-batch concrete mix trucks; Dumpster or similar type; Slurry truck: Use dump truck yardage rate.

Heater planer; Asphalt burner; Scarifier burner; Industrial lift truck (mechanical tailgate); Utility and clean-up truck: Use appropriate rate for the power unit or the equipment utilized.

TRUCK DRIVER CLASSIFICATIONS

GROUP 1: Dump trucks, under 6 yds.; Single unit flat rack (2-axle unit); Nipper truck (when flat rack truck is used appropriate flat rack shall apply); Concrete pump truck (when flat rack truck is used appropriate flat rack shall apply); Concrete pump machine; Fork lift and lift jitneys; Fuel and/or grease truck driver or fuel person; Snow buggy; Steam cleaning; Bus or personhaul driver; Escort or pilot car driver; Pickup truck; Teamster oiler/greaser and/or serviceperson; Hook tender (including loading and unloading); Team driver; Tool room attendant (refineries)

GROUP 2: Dump trucks, 6 yds. and under 8 yds.; Transit mixers, through 10 yds.; Water trucks, under 7,000 gals.; Jetting trucks, under 7,000 gals.; Single-unit flat rack (3-axle unit); Highbed heavy duty transport; Scissor truck; Rubber-tired muck car (not self-loaded); Rubber-tired truck jumbo; Winch truck and "A" frame drivers; Combination winch truck with hoist; Road oil truck or bootperson; Buggymobile; Ross, Hyster and similar straddle carriers; Small rubber-tired tractor

GROUP 3: Dump trucks, 8 yds. and including 24 yds.; Transit

mixers, over 10 yds.; Water trucks, 7,000 gals. and over; Jetting trucks, 7,000 gals. and over; Vacuum trucks under 7500 gals. Trucks towing tilt bed or flat bed pull trailers; Lowbed heavy duty transport; Heavy duty transport tiller person; Self- propelled street sweeper with self-contained refuse bin; Boom truck - hydro-lift or Swedish type extension or retracting crane; P.B. or similar type self-loading truck; Tire repairperson; Combination bootperson and road oiler; Dry distribution truck (A bootperson when employed on such equipment, shall receive the rate specified for the classification of road oil trucks or bootperson); Ammonia nitrate distributor, driver and mixer; Snow Go and/or plow

GROUP 4: Dump trucks, over 25 yds. and under 65 yds.; Water pulls - DW 10's, 20's, 21's and other similar equipment when pulling Aqua/pak or water tank trailers; Helicopter pilots (when transporting men and materials); Lowbedk Heavy Duty Transport up to including 7 axles; DW10's, 20's, 21's and other similar Cat type, Terra Cobra, LeTourneau Pulls, Tournorocker, Euclid and similar type equipment when pulling fuel and/or grease tank trailers or other miscellaneous trailers; Vacuum Trucks 7500 gals and over and truck repairman

GROUP 5: Dump trucks, 65 yds. and over; Holland hauler; Low bed Heavy Duty Transport over 7 axles

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is union or non-union.

Union Identifiers

An identifier enclosed in dotted lines beginning with characters other than "SU" denotes that the union classification and rate have found to be prevailing for that classification. Example: PLUM0198-005 07/01/2011. The first four letters , PLUM, indicate the international union and the

four-digit number, 0198, that follows indicates the local union number or district council number where applicable , i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2011, following these characters is the effective date of the most current negotiated rate/collective bargaining agreement which would be July 1, 2011 in the above example.

Union prevailing wage rates will be updated to reflect any changes in the collective bargaining agreements governing the rates.

0000/9999: weighted union wage rates will be published annually each January.

Non-Union Identifiers

Classifications listed under an "SU" identifier were derived from survey data by computing average rates and are not union rates; however, the data used in computing these rates may include both union and non-union data. Example: SULA2004-007 5/13/2010. SU indicates the rates are not union majority rates, LA indicates the State of Louisiana; 2004 is the year of the survey; and 007 is an internal number used in producing the wage determination. A 1993 or later date, 5/13/2010, indicates the classifications and rates under that identifier were issued as a General Wage Determination on that date.

Survey wage rates will remain in effect and will not change until a new survey is conducted.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

==========

END OF GENERAL DECISION

SECTION 01 1000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work by Owner.
5. Work under separate contracts.
6. Access to site.
7. Coordination with occupants.
8. Work restrictions.
9. Specification and drawing conventions.
10. Miscellaneous provisions

B. Related Section:
1. Section 01 5000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Butte Regional Transit Operations Center
1. Project Location: 326 Huss Drive, Chico, Ca.

B. Owner: Butte County Association of Governments
2580 Sierra Sunrise Terrace, Suite 100
Chico, Ca. 95928
1. Owner's Representative: Andy Newsum
a. Phone: 530.879.2468
b. Facsimilie: 530.879.2444

C. Construction Manager: Kitchell
2750 Gateway Oaks Drive, Suite 300
Sacramento, Ca. 95833
1. Contact: Kirk Sheeley
a. Phone: 916.648.9700
b. Facsimilie: 916.648.6534

D. Architect:
   1. TLCD Architecture.
      a. Address: 111 Santa Rosa Avenue, Suite 300, Santa Rosa, California 95404.
      b. Phone: (707) 525-5600.
      c. Facsimile: (707) 525-5616.
      d. Contact: Don Tomasi

E. Web-Based Project Information Management System: A web-based project information management system administered by the Architect will be used for purposes of managing communication and documents during the construction stage.
   1. See Division 01 Section "Project Management and Coordination" for Contractor's requirements for utilizing the project information management system.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of the Project is defined by the Contract Documents and consists of the following:
   1. Addition of an Administration / Operations Building, a Maintenance Building, Fueling Facility, Bus Wash Facility and site improvements.

B. Type of Contract
   1. Project will be constructed under a prime contract.

1.5 PHASED CONSTRUCTION

A. Phase 1: all work related to the project outside the boundary set on civil drawings.

B. Phase 2: all work required to finalize project within the boundary set on civil drawings.

1.6 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner and Owners vendors.

A. Preceding Work: Owner will perform the following construction operations at Project site. Those operations are scheduled to be: 1. Off-Site Improvement at Aztec Drive and 48” SD to outfall ongoing concurrently. This will be a multi-prime site. Contractor is obligated to schedule work in a cooperative manner with other prime contractors for betterment of overall project.

1.7 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other

contracts. Coordinate the Work of this Contract with work performed under separate contracts.

1.8 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is described in contract documents.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.9 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy site and adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
   1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
   2. Notify the Owner not less than 72 hours in advance of activities that will affect Owner's operations.

B. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
   1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
      2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
      3. Maintain access to existing building and associated parking.

C. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment, prior to Substantial Completion of the Work. Contractor to schedule their work to allow owner full access to the project for their OFOI work throughout the project duration. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.10 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.
1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to comply with City of Chico limits on work days and hours, and as otherwise indicated.
1. Weekend Hours: Coordinate with Owner and obtain authorization in writing.
2. Early Morning Hours: Restricted to hours allowed by local authorities having jurisdiction for restrictions on noisy work.
3. Hours for Utility Shutdowns: Comply with Owner’s restrictions.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
1. Notify Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Nonsmoking Site: Smoking is not permitted on the project site.

F. Controlled Substances: Use of controlled substances on the Project site is not permitted.

1.11 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 2300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. **Alternate No. 1 (Standby Engine Generators)**

1. **Base Bid:** Infrastructure stubbed to generator location (no generators, concrete pad or decorative fence and gates)
2. **Alternate:** Provide standby engine generators, concrete pad and decorative fence and gates. Include all Butte County Air Quality District construction and operation permits. S.E.D. and S.A.D. for scope of work.

B. Alternate No. 2 (Planting Plan – Hydroseed to Plantings)

1. **Base Bid:** Hydroseed per planting plan
2. **Alternate:** Provide plantings per planting plan alternate layout (including all additional irrigation as required). S.L.D. for scope of work.

END OF SECTION

SECTION 01 2500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Sections:
1. Section 01 6000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers and for requirements for submitting “or equal” substitutions consistent with California Public Contract Code Section 3400.
2. Divisions 02 through 45 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Use facsimile of form provided in the Project Manual.
a. Substitutions for Cause or Convenience: Use “Substitution Request Form (After the Bid Date).”

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
   a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
   b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
   c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
   d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
   e. Samples, where applicable or requested.
   f. Certificates and qualification data, where applicable or requested.
   g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
   h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
   i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
   j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
   k. Cost information, including a proposal of change, if any, in the Contract Sum.
   l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
   m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
   a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
   b. Decision by Architect is final. Resubmittal of substitution requests will not be allowed.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
   1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
      a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
      b. Substitution request is fully documented and properly submitted.
      c. Requested substitution will not adversely affect Contractor's construction schedule.
      d. Requested substitution has received necessary approvals of authorities having jurisdiction.
      e. Requested substitution is compatible with other portions of the Work.
      f. Requested substitution has been coordinated with other portions of the Work.
      g. Requested substitution provides specified warranty.
      h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 30 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
   1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
      a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may

include compensation to Architect for redesign and evaluation services, increased testing and inspection costs, increased cost of other construction by Owner, and similar considerations.

b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Requested substitution provides sustainable design characteristics that specified product provided.
e. Substitution request is fully documented and properly submitted.
f. Requested substitution will not adversely affect Contractor's construction schedule.
g. Requested substitution has received necessary approvals of authorities having jurisdiction. Requested substitutions that affect structural, access, or fire/ life safety requirements of the project will require approval by the AHJ. Such substitutions shall be submitted to AHJ as a Change Order.
h. Requested substitution is compatible with other portions of the Work.
i. Requested substitution has been coordinated with other portions of the Work.
j. Requested substitution provides specified warranty.
k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION

Attachments: Substitution Request Form (After the Bid Date)

SUBSTITUTION REQUEST No. ____

(After the Bid Date)

Project: _____ From: _____

_____ Date: _____

To: _____ Arch Project No.: _____

Re: _____ Contract For: _____

Specification Title: Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution:

Manufacturer: _____ Trade Name: _____

Address: _____ Model No.: _____

Phone: _____

Installer: _____

Address: _____

Phone: _____

History: □New Product □2-5 yrs old □5-10 yrs old □> 10 yrs old

Differences between proposed substitution and specified product:

_____

_____

□Point-by-point comparative data attached – **REQUIRED BY ARCHITECT**

Reason for not providing specified item:

Similar Installation:

Project: _____ Owner: _____

Address: _____ Contact/Phone: _____

Date Installed: _____ Architect: _____

Contact/Phone: _____

Proposed substitution affects other parts of Work: □No □Yes; explain

Savings to Owner if substitution is accepted: ($).

Changes to Contract Time if substitution is accepted: □No □Yes [Add] [Deduct] days.

Supporting Data Attached:

□Drawings □Product Data □Samples □Tests □Reports □Other

Page 1 of 2

SUBSTITUTION REQUEST NO. ____ (Continued)

The Undersigned certifies that:

1. Proposed substitution has been fully investigated and determined to be equal or superior in all respects to the specified product.
2. Same warranty will be furnished for proposed substitution as for specified product.
3. Same maintenance service and source of replacement parts, if applicable, is available.
4. Proposed substitution will have no effect on other trades and will not affect or delay progress schedule.
5. Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
6. Proposed substitution does not affect dimensions, utility size or connections, structural supports and anchorage, seismic bracing, or functional clearances.
7. Payment will be made for changes to building design, including Architectural design, calculations,
   drawings, obtaining agency approvals, testing and inspection costs, and construction costs caused by the substitution.
8. Coordination, installation and changes to the Work as necessary for acceptance will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Phone: _____

Attachments (list):

_____

_____

ARCHITECT'S REVIEW AND ACTION

☐ Substitution accepted – Make submittals in accordance with Specification Section 01 3300.

☐ Substitution accepted as noted – Make submittals in accordance with Specification Section 01 3300.

☐ Substitution rejected – Use specified materials.

☐ Substitution Request received too late – Use specified materials.

Signed by: _____ Date: _____

Additional Comments By:

☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ Architect ☐ Other

SECTION 01 2600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections:
   1. Section 01 6000 "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on Field Order form included in the Project Manual.
   1. Notify Architect immediately and request direction if Contractor deems Field Order Work requires modification to the Contract Sum or Contract Time

B. Make Minor Changes in the Work required by Special Inspector not involving adjustment to the Contract Sum or the Contract Time.
   1. Notify Architect immediately and request direction if Contractor deems Field Order Work requires modification to the Contract Sum or Contract Time.

1.4 COST REQUESTS

A. Owner-Initiated Cost Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Cost Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
   2. Within time specified in Proposal Request or 20 days, when not otherwise specified**,** after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
e. Quotation Form: Use CSI Form 13.6B "Proposal Worksheet Summary" and 13.6C "Proposal Worksheet Detail" or Contractor’s forms containing equivalent information and acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect in the form of a Proposed Change Order.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 01 2500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposed Change Order Form: Use form acceptable to Architect.

1.5 ADMINISTRATIVE CHANGE ORDERS

A. Unit Price Adjustment: Refer to Section 01 2200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit price work.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Cost Request, Construction Change Directive or Proposed Change Order Architect will issue a Change Order for signatures of Owner and Contractor on form included in Project Manual.
1. Owner reserves the right to compile individual Cost Request, Construction Change Directive or Proposed Change Orders into cumulative Change Orders.

B. On Owner's approval of a Construction Change Directive, Cost Request or Proposed Change Order the Architect will prepare and issue a Change Order for signatures of Owner and Contractor.
   1. Owner reserves the right to compile individual Change Orders into cumulative Change Orders at intervals determined by the Owner.
   2. Distribute Change Orders to Contractor's forces and execute changes in a timely manner to incorporate changes into the Work and prevent delays.
   3. Include approved Change Orders on the following month's Schedule of Values and Application for Payment.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on form included in Project Manual. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
   2.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

ATTACHED FORMS
TLCD Architecture Field Order Form
TLCD Architecture Cost Request Form
TLCD Architecture Change Order Form
TLCD Architecture Construction Change Directive Form

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FIELD ORDER

TLCD ARCHITECTURE

FIELD ORDER NO. **FIELD CHANGE DIRECTIVE**

DATE **TO**

COPIES TO

FROM

PROJECT **PROJECT NO**

YOU ARE HEREBY DIRECTED TO EXECUTE THIS FIELD ORDER WHICH INTERPRETS THE CONTRACT DOCUMENTS, OR ORDERS MINOR CHANGES IN THE WORK WITHOUT CHANGING THE CONTRACT SUM OR CONTRACT TIME. IF YOU CONSIDER THAT A CHANGE IN CONTRACT SUM OR CONTRACT TIME IS REQUIRED, PLEASE SUBMIT YOUR ITEMIZED PROPOSAL ON A CHANGE ORDER REQUEST FORM TO THE ARCHITECT IMMEDIATELY. IF YOUR PROPOSAL IS FOUND TO BE SATISFACTORY AND IN PROPER ORDER, THIS FIELD ORDER WILL, IN THAT EVENT, BE SUPERSEDED.

SUBJECT

DIRECTIVE

ATTACHMENTS

111 SANTA ROSA AVENUE, #300
SANTA ROSA, CA 95404
TEL 707.525.5600
FAX 707.525.5616

WWW.TLCD.COM

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COST REQUEST

TLCD ARCHITECTURE

COST REQUEST NO.

DATE **REVISED DATE:**

TO

COPIES TO

FROM

PROJECT **PROJECT NO**

PLEASE SUBMIT AN ITEMIZED QUOTATION FOR CHANGES IN THE CONTRACT SUM AND / OR TIME INCIDENTAL TO PROPOSED MODIFICATIONS TO THE CONTRACT DOCUMENTS DESCRIBED HEREIN. THIS IS NOT A CHANGE ORDER NOR A DIRECTION TO PROCEED WITH THE WORK DESCRIBED HEREIN.

DESCRIPTION

REQUESTED BY **REFERENCE**

ATTACHMENTS

111 SANTA ROSA AVENUE, #300
SANTA ROSA, CA 95404
TEL 707.525.5600
FAX 707.525.5616

WWW.TLCD.COM

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TLCDARCHITECTURE

CHANGE ORDER

CHANGE ORDER NO.:	**ONE**
DATE:	2/1/2013
PROJECT:	MAJOR PROJECT
PROJECT NO:	13000.00
OWNER:	Owner
CONTRACTOR:	Builder

CONTRACT DATE:	1/1/2013	
CONTRACT COMPLETION DATE:	1/2/2014	
PREVIOUS CONTRACT COMPLETION DATE:	1/1/2014	
ORIGINAL CONTRACT SUM:		$ 1,000.00
TOTAL CHANGE BY PREVIOUS CHANGE ORDERS:		
CONTRACT SUM PRIOR TO THIS CHANGE ORDER:		$ 1,000.00
CONTRACT SUM WILL BE INCREASED BY THIS CHANGE ORDER:		$ 1.00
CONTRACT TIME WILL BE INCREASED BY THIS CHANGE ORDER:		1
THE NEW CONTRACT SUM INCLUDING THIS CHANGE ORDER WILL BE:		$ 1,001.00
THE NEW CONTRACT COMPLETION DATE WILL BE:		1/2/2014

YOU ARE DIRECTED TO MAKE THE FOLLOWING CHANGES TO THIS CONTRACT:

ITEM	DESCRIPTION	COST
1.1		$ 1.00
	Reason:	
	Requested by:	
1.2		
	Reason:	
	Requested by:	
1.3		
	Reason:	
	Requested by:	
1.4		
	Reason:	
	Requested by:	

TOTAL CHANGE ORDER	ONE	$	1.00

TLCDARCHITECTURE

CHANGE ORDER

CHANGE ORDER NO.: **ONE**
DATE: 2/1/2013

PROJECT: MAJOR PROJECT
PROJECT NO.: 13000.00
CONTRACT DATE: 1/1/2013
OWNER: Owner

SIGNATURE SHEET

ARCHITECT DATE

OWNER DATE

CHANGE ORDER CERTIFICATION

The undersigned Contractor approves the foregoing as to the changes in work, if any, and as to the Contract price specified for each item and as to the extension of time allowed, if any, for completion of the Project as stated herein, and agrees to furnish all labor, materials, and service and to perform all work necessary to complete any additional work specified for the consideration stated herein. Submission of claims which have no basis in fact or which Contractor knows are false are made at the sole risk of the Contractor and may be a violation of the False Claims Act, as set forth in Government Code §§12650 *et seq.* It is understood that the changes to the Contract Documents set forth herein shall only be effective upon approval by the Governing Board of the District.

It is expressly understood that the value of the extra work or changes expressly includes any and all of the Contractor's costs and expenses, both direct and indirect, resulting from additional time required on the Project or resulting from delay to the Project. Any costs, expenses, damages, or time extensions not included herein are deemed waived.

CONTRACTOR DATE

CONSTRUCTION CHANGE DIRECTIVE

TLCD ARCHITECTURE

CHANGE DIRECTIVE NO **DATE**

TO

COPIES TO

FROM

PROJECT **PROJECT NO**

IN ORDER TO EXPEDITE THE WORK AND AVOID OR MINIMIZE DELAYS IN THE WORK, THE CONTRACT DOCUMENTS ARE HEREBY AMENDED AS DESCRIBED BELOW. PLEASE PROCEED WITH THIS WORK PROMPTLY. THIS IS NOT A CHANGE ORDER BUT A DIRECTION TO PROCEED WITH THE WORK AS AGREED HEREIN. A FORMAL CHANGE ORDER WILL FOLLOW.

DESCRIPTION

AMOUNT

RFI FO CR PCO CHANGE ORDER ASSIGNED

CCD REFERENCES

ATTACHMENTS

ISSUED BY _____
ARCHITECT DATE

AUTHORIZED BY _____
OWNER (OR OWNER'S AUTHORIZED AGENT) DATE

CONFIRMED BY _____
CONTRACTOR DATE

FINAL DISTRIBUTION ☐ Architect ☐ Owner ☐ Contractor] Project Manager

PRINTED Wednesday, September 26, 2012 3:47:38 PM

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SECTION 01 2900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections:
   1. Section 01 2600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Section 01 3200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
   1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with continuation sheets.
      b. Submittal schedule.
      c. Items required to be indicated as separate activities in Contractor's construction schedule.
   2. Submit the schedule of values to Architect at earliest possible date but no later than fifteen days before the date scheduled for submittal of initial Applications for Payment.
   3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.

4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values correlated with each element.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the schedule of values:
      a. Project name and location.
      b. Name of Architect.
      c. Architect's project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Arrange schedule of values consistent with format of AIA Document G703 .
   3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.
      a. Include separate line items for the following:
         1) General Contractor:
            a) Profit.
            b) Bond and insurance.
            c) On site management and supervision.
            d) Initial site mobilization at the start of Work.
            e) Temporary facilities for the duration of the Work.
            f) Shop Drawing and Submittal preparation and review.
            g) Site demobilization at the end of Work.
            h) Punch list activities.
            i) Final Project cleaning.
            j) Operation and maintenance manuals.
            k) Demonstration and training.
            l) Project Record Documents.
         2) Under required principal subcontracts:
            a) Punch list activities.
            b) Operation and maintenance manuals.
            c) Project Record Documents.
            d) Demonstration and training.
   4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
   5. Payment for materials or equipment purchased or fabricated and stored but not yet installed will be allowed only for specialty or long-lead time items and only when approved by the Owner in advance. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
      a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance.
   6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

7. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
9. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
10. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
    1. Initial Application for Payment and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
    1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
    2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
    3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
    4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Payment for materials or equipment purchased or fabricated and stored but not yet installed will be allowed only for specialty or long-lead time items and only when approved by the Owner in advance. Include in Application for Payment amounts

applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:
   a. Materials previously stored and included in previous Applications for Payment.
   b. Work completed for this Application utilizing previously stored materials.
   c. Additional materials stored with this Application.
   d. Total materials remaining stored, including materials with this Application.

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien and similar attachments.
   1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Project Record Document Review: Submit statement indicating that project record documents are current with the status of the Work. Obtain Inspector of Record’s signature indicating they have reviewed the documents and concur with the status indicated.

H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
   1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
   2. When an application shows completion of an item, submit conditional final or full waivers.
   3. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
   4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. List of subcontractors.
   2. Schedule of values.
   3. Contractor's construction schedule (preliminary if not final).
   4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
   5. Products list (preliminary if not final).
   6. Schedule of unit prices.
   7. Submittal schedule (preliminary if not final).
   8. List of Contractor's staff assignments.
   9. List of Contractor's principal consultants.

10. Copies of building permits.
11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
12. Initial progress report.
13. Report of preconstruction conference.
14. Certificates of insurance and insurance policies.
15. Performance and payment bonds.
16. Data needed to acquire Owner's insurance.

J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
2. Division of the State Architect Final Verified Report Form DSA-6.
3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Updated final statement, accounting for final changes to the Contract Sum.
5. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
6. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
7. AIA Document G707, "Consent of Surety to Final Payment."
8. Evidence that claims have been settled.
9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date when Owner took possession of and assumed responsibility for corresponding elements of the Work.
10. Final liquidated damages settlement statement.
11. Completion of punchlist items.
12. Transmittal of required Project construction records to Owner.
13. Removal of temporary facilities and services.
14. Removal of surplus materials, rubbish and similar elements.
15. Other requirements indicated in Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 3100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination drawings.
   3. Requests for Information (RFIs).
   4. Web-Based Project Information Management System (PIM)
   5. Project meetings.

B. Related Requirements:
   1. Section 01 3200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
   2. Section 01 7300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   3. Section 01 7700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. PIM: Web-Based Project Information Management System.

B. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
   1. Name, address, and telephone number of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
   1. Post copies of list in project meeting room, in temporary field office, to Project Web-Based Project Information Management System, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
   1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's construction schedule.
   2. Preparation of the schedule of values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Preinstallation conferences.
   7. Project closeout activities.
   8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
    c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    f. Indicate required installation sequences.
    g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:

a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
c. Fire-rated enclosures around ductwork.

7. Electrical Work: Show the following:
   a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
   b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
   c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
   d. Location of pull boxes and junction boxes, dimensioned from column center lines.
8. Fire-Protection System: Show the following:
   a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Division 01 Section "Submittal Procedures."

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings (Revit 2014).
2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format (drawing.rvt)
3. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
   a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
   b. Digital Data Software Program: Drawings are available in Autocad 2007 or Revit 2014.
   c. Contractor shall execute a data licensing agreement in the form of AIA Document C106 and pay a fee of $1000.

1.7 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
   1. Project name.
   2. Project number.
   3. Date.
   4. Name of Contractor.
   5. Name of Architect.
   6. RFI number, numbered sequentially.
   7. RFI subject.
   8. Specification Section number and title and related paragraphs, as appropriate.
   9. Drawing number and detail references, as appropriate.
   10. Field dimensions and conditions, as appropriate.
   11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
   12. Contractor's signature.
   13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
      a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as AIA Document G716, acceptable to Architect.
   1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow ten working days for Architect's response for each RFI. RFIs posted to PIM system after 1:00 p.m. will be considered as received the following working day.
   1. The following Contractor-generated RFIs will be returned without action:
      a. Requests for approval of submittals.
      b. Requests for approval of substitutions.
      c. Requests for approval of Contractor's means and methods.
      d. Requests for coordination information already indicated in the Contract Documents.
      e. Requests for adjustments in the Contract Time or the Contract Sum.
      f. Requests for interpretation of Architect's actions on submittals.
      g. Incomplete RFIs or inaccurately prepared RFIs.
   2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
   3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
      a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. RFI Log: RFI log will be maintained by project’s web-based project information management system. Print a tabular log of RFIs organized by the RFI number for review at project meetings.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
   1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
   2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 WEB-BASED PROJECT INFORMATION MANAGEMENT SYSTEM

A. Unless otherwise approved, use Architect's Web-Based Project Information Management System for purposes of managing project communication and documentation until Final Completion.
   1. Software: Architrek by Architrek, LLC.
   2. Functions include the following:
      a. Meeting minutes.
      b. Contract modifications forms and logs.
      c. RFI forms and logs.
      d. Calendar management.
      e. Submittals forms and logs.
      f. Payment application forms.
      g. Drawing and specification revision hosting, viewing, and updating.
      h. Archiving functions.

1.9 PROJECT MEETINGS

A. General: Owner will schedule and conduct meetings and conferences at Project site unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved.

B. Preconstruction Conference: Owner will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
   1. Conduct the conference to review responsibilities and personnel assignments.
   2. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing and long-lead items.

d. Designation of key personnel and their duties.
e. Lines of communications.
f. Procedures for processing field decisions and Change Orders.
g. Procedures for RFIs.
h. Procedures for testing and inspecting.
    1) Owner's Testing Agency procedures and responsibilities.
    2) Inspector of Record's responsibilities.
i. Procedures for processing Applications for Payment.
j. Distribution of the Contract Documents.
k. Submittal procedures.
l. .Preparation of record documents.
m. Use of the premises and existing building.
n. Work restrictions.
o. Working hours.
p. Owner's occupancy requirements.
q. Responsibility for temporary facilities and controls.
r. Procedures for moisture and mold control.
s. Procedures for disruptions and shutdowns.
t. Construction waste management and recycling.
u. Parking availability.
v. Office, work, and storage areas.
w. Equipment deliveries and priorities.
x. First aid.
y. Security.
z. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Project Information Management System Training: Architect will schedule and conduct a Project Information Management System Training session before the start of construction.

D. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    a. Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Review of mockups.
    i. Possible conflicts.

j. Compatibility requirements.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

E. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
a. Preparation of record documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Submittal of written warranties.
d. Requirements for preparing operations and maintenance data.
e. Requirements for delivery of material samples, attic stock, and spare parts.
f. Requirements for demonstration and training.
g. Preparation of Contractor's punch list.
h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
i. Submittal procedures.
j. Coordination of separate contracts.
k. Owner's partial occupancy requirements.
l. Installation of Owner's furniture, fixtures, and equipment.

m. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

F. Progress Meetings: Owner will conduct progress meetings at biweekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      1) Review schedule for next period.
   b. Review present and future needs of each entity present, including the following:
      1) Interface requirements.
      2) Sequence of operations.
      3) Resolution of BIM component conflicts.
      4) Status of submittals.
      5) Deliveries.
      6) Off-site fabrication.
      7) Access.
      8) Site utilization.
      9) Temporary facilities and controls.
      10) Progress cleaning.
      11) Quality and work standards.
      12) Status of correction of deficient items.
      13) Field observations.
      14) Status of RFIs.
      15) Status of proposal requests.
      16) Pending changes.
      17) Status of Change Orders.
      18) Pending claims and disputes.
      19) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

G. Progress Payment Meetings: Owner will conduct a progress payment meeting each month prior to submittal of Application for Payment. Progress payment meeting shall coincide with last Progress Meeting of the month whenever possible.
   1. Attendees: Representatives of Owner, Architect, Construction Manager and Contractor's Project Manager.
   2. Prepare draft of the current month's proposed billing (pencil copy pay application) for review with the Architect, and Inspector of Record at the progress payment meeting.
   3. Following review of the proposed payment application, revise as required, prepare Application for Payment and submit per the requirements of Division 01 Section "Payment Procedures."

H. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
   1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
      a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
      c. Review present and future needs of each contractor present, including the following:
         1) Interface requirements.
         2) Sequence of operations.
         3) Resolution of BIM component conflicts.
         4) Status of submittals.
         5) Deliveries.
         6) Off-site fabrication.
         7) Access.
         8) Site utilization.
         9) Temporary facilities and controls.
         10) Work hours.
         11) Hazards and risks.
         12) Progress cleaning.
         13) Quality and work standards.
         14) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 3200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Start-up construction schedule.
   2. Contractor's construction schedule.
   3. Construction schedule updating reports.
   4. Daily construction reports.
   5. Site condition reports.
   6. Special reports.

B. Related Sections:
   1. Section 01 3300 "Submittal Procedures" for submitting schedules and reports.
   2. Section 01 4000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of the Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.
1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
1. PDF electronic file.
2. Two paper copies.
3. Schedule back-up file as a .stx or .prx file type.

B. Start-up construction schedule.
1. Approval of cost-loaded start-up construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Start-up Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

F. Construction Schedule Updating Reports: Submit with Applications for Payment

G. Daily Construction Reports: Submit at daily intervals.

H. Field Condition Reports: Submit at time of discovery of differing conditions.

I. Special Reports: Submit at time of unusual event.

J. Qualification Data: For scheduling consultant.

K. Provide 4 week look ahead reports at each project meeting.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 3100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including work stages, area separations, and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review time required for review of submittals and resubmittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for completion and startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
10. Review submittal requirements and procedures.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
   1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
      a. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.<Insert list of major items or pieces of equipment>.
   2. Submittal Review Time: Include review and resubmittal times indicated in Section 01 3300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
   3. Startup and Testing Time: Include not less than 15 days for startup and testing.
   4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
   5. Punch List and Final Completion: Include not more than 30 days for punch list and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Phasing: Arrange list of activities on schedule by phase.
   2. Work under More Than One Contract: Include a separate activity for each contract.
   3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
   4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
   5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
   6. Work Restrictions: Show the effect of the following items on the schedule:
      a. Coordination with existing construction.
      b. Limitations of continued occupancies.
      c. Uninterruptible services.
      d. Partial occupancy before Substantial Completion.
      e. Use of premises restrictions.
      f. Provisions for future construction.

g. Seasonal variations.
h. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
   a. Subcontract awards.
   b. Submittals.
   c. Purchases.
   d. Mockups.
   e. Fabrication.
   f. Sample testing.
   g. Deliveries.
   h. Installation.
   i. Tests and inspections.
   j. Adjusting.
   k. Curing.
   l. Startup and placement into final use and operation.
8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
   a. Structural completion.
   b. Permanent space enclosure.
   c. Completion of mechanical installation.
   d. Completion of electrical installation.
   e. Final Completion

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed and final completion.

E. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.
   1. Refer to Section 01 2900 "Payment Procedures" for cost reporting and payment procedures.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
   1. Unresolved issues.
   2. Unanswered Requests for Information.
   3. Rejected or unreturned submittals.
   4. Notations on returned submittals.
   5. Pending modifications affecting the Work and Contract Time.

G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 START-UP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit start-up horizontal bar-chart-type construction schedule within 15 days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's construction schedule within 30 days of date established for the Notice to Proceed. Base schedule on the start-up construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
   1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

C. Submit schedule to Owner’s Representative for evaluation. Respond and revise until schedule is approved.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
   1. List of subcontractors at Project site.
   2. List of separate contractors at Project site.
   3. Approximate count of personnel at Project site, by subcontractor / vendor.
   4. Equipment at Project site.
   5. Material deliveries.
   6. High and low temperatures and general weather conditions, including presence of rain or snow.
   7. Accidents.
   8. Meetings and significant decisions.
   9. Unusual events (refer to special reports).
   10. Stoppages, delays, shortages, and losses.
   11. Meter readings and similar recordings.
   12. Emergency procedures.
   13. Orders and requests of authorities having jurisdiction.

14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.
4. Include or modify schedule to address Owner’s representative comments. Provide narrative to explain changes in the schedule from previous update.

B. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have

completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

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SECTION 01 3300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, Deferred-Approval Submittals and other submittals.

B. Related Sections:
1. Section 01 2900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 01 3200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Section 01 7839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
4. Section 01 7823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
5. Section 01 7900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals.

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as informational submittals.

C. Deferred Approval Submittal: Written information, graphic information, calculations, test data and other required documentation prepared by the Contractor and submitted to Architect, for submission by the Architect to the Authority Having Jurisdiction for approval.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.
   1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
   2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
   3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
      a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
   4. Format: Arrange the following information in a tabular format:
      a. Scheduled date for first submittal.
      b. Specification Section number and title.
      c. Submittal category: Action, informational.
      d. Name of subcontractor.
      e. Description of the Work covered.
      f. Scheduled date for Architect's final release or approval.
      g. Scheduled dates for purchasing.
      h. Scheduled dates for installation.
      i. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Digital copies of Architect’s Revit Drawings (AutoCad when applicable) of the Contract Drawings may be made available by Architect, solely at Architect’s discretion, for Contractor's use in preparing submittals. Digital data prepared by the Architect’s Consultants are not included in this offer. Contact the Architect’s Consultants directly for information on availability, cost and conditions for digital data prepared by Consultants
   1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
      a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
      b. Digital Drawing Software Program: The Contract Drawings are available in Revit 2014 and Autocad 2007.

c. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement and pay licensing fees.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
   a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 14 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21days for initial review of each submittal.
5. Deferred Approval Submittals: Allow 60 days for review by Authority Having Jurisdiction and receipt of comments by Architect.
   a. Resubmittal Review: Allow 60 days for review of each resubmittal.

D. Paper Submittals: Place a permanent label or title block on each paper copy submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:
   a. Project name.
   b. Date.
   c. Name of Architect.
   d. Name of Construction Manager.
   e. Name of Contractor.
   f. Name of subcontractor.
   g. Name of supplier.
   h. Name of manufacturer.
   i. Submittal number or other unique identifier, including revision identifier.

1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

j. Number and title of appropriate Specification Section.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Other necessary identification.

4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.
   a. Transmittal Form for Paper Submittals: Use AIA Document G810, CSI Form 12.1A, or Contractor's software-generated form with substantially the same content, acceptable to Architect.

E. Digital Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Digital Submittals: Use digital form acceptable to Architect**,** containing the following information:
   a. Project name.
   b. Date.
   c. Name and address of Architect.
   d. Name of Contractor.
   e. Name of firm or entity that prepared submittal.
   f. Names of subcontractor, manufacturer, and supplier.
   g. Category and type of submittal.
   h. Submittal purpose and description.
   i. Specification Section number and title.
   j. Specification paragraph number or drawing designation and generic name for each of multiple items.
   k. Drawing number and detail references, as appropriate.
   l. Location(s) where product is to be installed, as appropriate.
   m. Related physical samples submitted directly.
   n. Indication of full or partial submittal.

o. Transmittal number.
p. Submittal and transmittal distribution record.
q. Other necessary identification.
r. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
   a. Project name.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
   d. Product name**.**

F. Options: Identify options requiring selection by the Architect.

G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
   1. Note date and content of previous submittal.
   2. Note date and content of revision in label or title block and clearly indicate extent of revision.
   3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

K. Material Safety Data Sheets (MSDSs): Submit information directly to Owner Representative; do not submit to Architect.
   1. Architect will not review submittals that include MSDSs and will return them for resubmittal without MSDSs

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections. If submittal type (Action or Informational) is not indicated, comply with action submittal procedures.
   1. Post digital submittals as PDF electronic files directly to Project Web site specifically established for Project.

a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Action Submittals: Submit four paper copies of each submittal, unless otherwise indicated. Architect will return one copy.
3. Informational Submittals: At Contractor's Option, Contractor may submit either:
   a. PDF Digital file.
   b. Two paper copies of each submittal, unless otherwise indicated. Architect will not return copies.
4. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 7700 "Closeout Procedures."
5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
   a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
   b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
6. Test and Inspection Reports Submittals: Comply with requirements specified in Section 01 4000 "Quality Requirements."

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's catalog cuts.
   b. Manufacturer's product specifications.
   c. Standard color charts.
   d. Statement of compliance with specified referenced standards.
   e. Testing by recognized testing agency.
   f. Application of testing agency labels and seals.
   g. Notation of coordination requirements.
   h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:
   a. Three paper copies of Product Data, unless otherwise indicated. Architect will return one copy.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data**,** unless submittal based upon Architect's digital data drawing files is otherwise permitted.
   1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
      a. Identification of products.
      b. Schedules.
      c. Compliance with specified standards.
      d. Notation of coordination requirements.
      e. Notation of dimensions established by field measurement.
      f. Relationship and attachment to adjoining construction clearly indicated.
      g. Seal and signature of professional engineer if specified.
   2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
   3. Submit Shop Drawings in the following format:
      a. Two opaque (bond) copies of each submittal. Architect will return one copy.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
   1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
   2. Identification: Attach label on unexposed side of Samples that includes the following:
      a. Generic description of Sample.
      b. Product name and name of manufacturer.
      c. Sample source.
      d. Number and title of applicable Specification Section.
   3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
      a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
      b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
   4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

      a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
   5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in

manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit four sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a Project record sample.
    1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
    2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule in the following format:
    a. PDF electronic file.

F. Contractor's Construction Schedule: Comply with requirements specified in Section 01 3200"Construction Progress Documentation."

G. Application for Payment: Comply with requirements specified in Section 01 2900 "Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Section 01 2900 "Payment Procedures."

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Submit subcontract list in the following format:
    a. PDF electronic file.

J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

K. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

L. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

M. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

Q. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

R. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

S. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

T. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

U. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

V. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

W. Maintenance Data: Comply with requirements specified in Section 01 7823 "Operation and Maintenance Data."

X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit four paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
   1. Where professional design services are required, use design professional with a valid California license.
   2. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Section 01 7700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal

has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
1. “No Exceptions Taken” indicates final unrestricted release: the Work covered by the submittal may proceed provided it complies with the Contract Documents. Final acceptance will depend on that compliance.
2. “Make Corrections Noted” indicates final, but restricted release: the Work covered by the submittal may proceed provided it complies both with the Architect’s notations and corrections on the submittal and with the Contract Documents. Final acceptance will depend on that compliance.
3. “Rejected” indicates do not proceed with the Work covered by the submittal. Prepare a new submittal for a product that complies with the Contract Documents.
4. “Revise and Resubmit” indicates do not proceed with the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity for the product submitted. Revise or prepare a new submittal according to Architect’s notations and corrections.
5. “Submit Specified Item” indicates do not proceed with the Work covered by the submittal. Prepare additional information requested, or required by the Contract Documents, that indicates compliance with requirements..

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

F. Submittals not required by the Contract Documents may be returned by the Architect without action..

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SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control :
   1. Inspection of materials, products, fabrication and installation.
   2. Testing of materials, products, fabrication and installation by Owner’s Testing Agency.
   3. Mock ups.
   4. Contractor’s quality assurance and control services.
   5. Other quality assurance and control services, as applicable

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements or applicable building code requirements.
      a. Testing shall comply with requirements of:
         1) California Building Code, Title 24, Part 7, Chapter 4, Section 4-335.
         2) Requirements indicated in specification Sections Division 02 through 45.
         3) Other requirements of authorities having jurisdiction.
   3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections:
   1. Section 01 3200 "Construction Progress Documentation" for developing a schedule of required tests and inspections.
   2. Divisions 02 through 33 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
   1. Laboratory Mockups: Full-size, physical assemblies constructed at testing facility to verify performance characteristics.
   2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on the project site, consisting of multiple products, assemblies and subassemblies.
   3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

D. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
   1. Owner’s Testing Agency: Testing agency hired by the Owner.
   2. Costs for testing and inspections not indicated to be performed by Owner’s testing agency and inspector are solely at the expense of the Contractor.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

A. Shop Drawings: For mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
1. Indicate manufacturer and model number of individual components.
2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems.
1. Seismic-force resisting system, designated seismic system, or component listed in the designated seismic system quality assurance plan prepared by the Architect.
2. Main wind-force resisting system or a wind-resisting component listed in the wind-force-resisting system quality assurance plan prepared by the Architect.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in

the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: Include in quality-control plan a comprehensive schedule of Work requiring testing or inspection, including the following:
1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
2. Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of technical representative making report.
   2. Statement on condition of substrates and their acceptability for installation of product.
   3. Statement that products at Project site comply with requirements.
   4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   6. Statement whether conditions, products, and installation will affect warranty.
   7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of factory-authorized service representative making report.
   2. Statement that equipment complies with requirements.
   3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   4. Statement whether conditions, products, and installation will affect warranty.
   5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.9 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
   1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
   2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
   1. Contractor responsibilities include the following:
      a. Provide test specimens representative of proposed products and construction.
      b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
      c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
      d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
      e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
      f. When testing is complete, remove test specimens, assemblies, mockups; do not reuse products on Project.
   2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
   3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
   4. Demonstrate the proposed range of aesthetic effects and workmanship.
   5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
      a. Allow seven days for initial review and each re-review of each mockup.
   6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   7. Demolish and remove mockups when directed, unless otherwise indicated.

L. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections in Divisions 02 through 49.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services. Owner will pay for these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

2. Costs for travel, per diems premium time/ overtime and other expenses associated with tests, inspections and special inspections performed outside of the State of California will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
3. Premium time/ overtime costs associated with tests and inspections required to be performed outside of normal work hours for the convenience of the Contractor or because of Contractor's scheduling requirements will be charged to Contractor and the Contract Sum will be adjusted by Change Order.
4. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 3300 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of the Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Contractor will engage a qualified testing agency special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in Statement of Special Inspections attached to this Section, and as follows:

B. Contractor to request inspections in writing on inspection form provided by the Owner’s representative.

C. Contractor will initiate and obtain all required inspections form City of Chico to obtain occupancy permit.

D. Special Tests and Inspections: Conducted by a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and in Statement of Special Inspections, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 7300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

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SECTION 01 4200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect

as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The) www.aluminum.org	(703) 358-2960
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists www.aatcc.org	(919) 549-8141
ABAA	Air Barrier Association of America www.airbarrier.org	(866) 956-5888
ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155

ACI	American Concrete Institute www.concrete.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Landcare Network)	
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020

AOSA	Association of Official Seed Analysts, Inc. www.aosaseed.com	(405) 780-7372
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)	
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9500
ATIS	Alliance for Telecommunications Industry Solutions www.atis.org	(202) 628-6380
AWCI	Association of the Wall and Ceiling Industry www.awci.org	(703) 534-8300
AWCMA	American Window Covering Manufacturers Association (Now WCMA)	

AWI	Architectural Woodwork Institute www.awinet.org	(571) 323-3636
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association) www.awpa.com	(205) 733-4077
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BICSI	BICSI, Inc. www.bicsi.org	(800) 242-7405 (813) 979-1991
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) www.bifma.com	(616) 285-3963
BISSC	Baking Industry Sanitation Standards Committee www.bissc.org	(866) 342-4772
BWF	Badminton World Federation (Formerly: IBF - International Badminton Federation) www.internationalbadminton.org	6-03-9283 7155
CCC	Carpet Cushion Council www.carpetcushion.org	(610) 527-3880
CDA	Copper Development Association www.copper.org	(800) 232-3282 (212) 251-7200
CEA	Canadian Electricity Association www.canelect.ca	(613) 230-9263
CEA	Consumer Electronics Association www.ce.org	(866) 858-1555 (703) 907-7600
CFFA	Chemical Fabrics & Film Association, Inc. www.chemicalfabricsandfilm.com	(216) 241-7333

CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523 (510) 485-7175
CPA	Composite Panel Association www.pbmdf.com	(301) 670-0604
CPPA	Corrugated Polyethylene Pipe Association www.cppa-info.org	(800) 510-2772 (202) 462-9607
CRI	Carpet and Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSA	Canadian Standards Association	(800) 463-6727 (416) 747-4000
CSA	CSA International (Formerly: IAS - International Approval Services) www.csa-international.org	(866) 797-4272 (416) 747-4000
CSI	Cast Stone Institute www.caststone.org	(717) 272-3744
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CSSB	Cedar Shake & Shingle Bureau www.cedarbureau.org	(604) 820-7700
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087

DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945
EJCDC	Engineers Joint Contract Documents Committee www.ejdc.org	(703) 295-5000
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
ESD	ESD Association (Electrostatic Discharge Association) www.esda.org	(315) 339-6937
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA) www.intertek.com	(800) 967-5352
FIBA	Federation Internationale de Basketball (The International Basketball Federation) www.fiba.com	41 22 545 00 00
FIVB	Federation Internationale de Volleyball (The International Volleyball Federation) www.fivb.ch	41 21 345 35 35
FM Approvals	FM Approvals LLC www.fmglobal.com	(781) 762-4300
FM Global	FM Global (Formerly: FMG - FM Global) www.fmglobal.com	(401) 275-3000
FMRC	Factory Mutual Research (Now FM Global)	
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc. www.floridaroof.com	(407) 671-3772
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
FSC	Forest Stewardship Council www.fsc.org	49 228 367 66 0

GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
GRI	(Part of GSI)	
GS	Green Seal www.greenseal.org	(202) 872-6400
GSI	Geosynthetic Institute www.geosynthetic-institute.org	(610) 522-8440
HI	Hydraulic Institute www.pumps.org	(973) 267-9700
HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IAS	International Approval Services (Now CSA International)	
IBF	International Badminton Federation (Now BWF)	
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000

IEST	Institute of Environmental Sciences and Technology www.iest.org	(847) 255-1561
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance www.igmaonline.org	(613) 233-1510
ILI	Indiana Limestone Institute of America, Inc. www.iliai.com	(812) 275-4426
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
	Available from ANSI www.ansi.org	(202) 293-8020
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(877) 464-7732 (702) 567-8150
ITS	Intertek Testing Service NA (Now ETL SEMCO)	
ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LMA	Laminating Materials Association (Now part of CPA)	
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MFMA	Maple Flooring Manufacturers Association, Inc. www.maplefloor.org	(888) 480-9138
MFMA	Metal Framing Manufacturers Association, Inc. www.metalframingmfg.org	(312) 644-6610
MH	Material Handling (Now MHIA)	
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190

MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937 (604) 298-7578
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(630) 942-6591
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(800) 797-6623 (281) 228-6200
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NAGWS	National Association for Girls and Women in Sport www.aahperd.org/nagws/	(800) 213-7193, ext. 453
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCAA	National Collegiate Athletic Association (The) www.ncaa.org	(317) 917-6222
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 775-2300
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901

NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(888) 300-6382 (269) 488-6382
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association www.glass.org	(866) 342-5642 (703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association) www.nofma.com	(901) 526-5016
NOMMA	National Ornamental & Miscellaneous Metals Association www.nomma.org	(888) 516-8585
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. (The) www.ntma.com	(800) 323-9736 (540) 751-0930

NTRMA	National Tile Roofing Manufacturers Association (Now TRI)	
NWWDA	National Wood Window and Door Association (Now WDMA)	
OPL	Omega Point Laboratories, Inc. (Now ITS)	
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting & Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
PGI	PVC Geomembrane Institute http://pgi-tp.ce.uiuc.edu	(217) 333-3929
PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America) www.landcarenetwork.org	(800) 395-2522 (703) 736-9666
PTI	Post-Tensioning Institute www.post-tensioning.org	(602) 870-7540
RCSC	Research Council on Structural Connections www.boltcouncil.org	
RFCI	Resilient Floor Covering Institute www.rfci.com	(301) 340-8580
RIS	Redwood Inspection Service www.redwoodinspection.com	(888) 225-7339 (415) 382-0662
SAE	SAE International www.sae.org	(877) 606-7323 (724) 776-4841
SDI	Steel Deck Institute www.sdi.org	(847) 458-4647
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	(877) 294-5424 (516) 294-5424

SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)	
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIA	Security Industry Association www.siaonline.org	(866) 817-8888 (703) 683-2075
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)	
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMA	Screen Manufacturers Association www.smacentral.org	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SMPTE	Society of Motion Picture and Television Engineers www.smpte.org	(914) 761-1100
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org	(800) 523-6154
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SPRI	Single Ply Roofing Industry www.spri.org	(781) 647-7026
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
STI	Steel Tank Institute www.steeltank.com	(847) 438-8265
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333

SWRI	Sealant, Waterproofing, & Restoration Institute www.swrionline.org	(816) 472-7974
TCA	Tile Council of America, Inc. (Now TCNA)	
TCNA	Tile Council of North America, Inc. www.tileusa.com	(864) 646-8453
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
TPI	Truss Plate Institute, Inc. www.tpinst.org	(703) 683-1010
TPI	Turfgrass Producers International www.turfgrasssod.org	(800) 405-8873 (847) 649-5555
TRI	Tile Roofing Institute www.tileroofing.org	(312) 670-4177
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
USAV	USA Volleyball www.usavolleyball.org	(888) 786-5539 (719) 228-6800
USGBC	U.S. Green Building Council www.usgbc.org	(800) 795-1747
USITT	United States Institute for Theatre Technology, Inc. www.usitt.org	(800) 938-7488 (315) 463-6463
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association www.wcmanet.org	(212) 297-2122

WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association) www.windowcoverings.org	(800) 506-4636 (212) 297-2109
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California) www.wicnet.org	(916) 372-9943
WIC	Woodwork Institute of California (Now WI)	
WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WSRCA	Western States Roofing Contractors Association www.wsrca.com	(800) 725-0333 (650) 570-5441
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CAC	California Building Standards Administrative Code, California Code of Regulations, Title 24, Part 1	CAC
CBC	California Building Code, California Code of Regulations, Title 24, Part 2, Volumes 1, 2 and 3.	CBC
CEC	California Electrical Code, California Code of Regulations, Title 24, Part 3, Volumes 1, 2 and 3.	CEC
CFC	California Fire Code, California Code of Regulations, Title 24, Part 9	CFC
CMC	California Mechanical Code, California Code of Regulations, Title 24, Part 4	CMC
CPC	California Plumbing Code, California Code of Regulations, Title 24, Part 5	CPC

CRS	California Referenced Standards Code, California Code of Regulations, Title 24, Part 12	CRS
EC	California Energy Code, California Code of Regulations, Title 24 Part 6	EC
ESC	California Elevator Safety Construction Code, California Code of Regulations, Title 24, Part 7	ESC
FMR	California Public Safety Code, State Fire Marshal Regulations, California Code of Regulations, Title 19	FMR
DIN	Deutsches Institut fur Normung e.V. www.din.de	49 30 2601-0
IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICC	International Code Council www.iccsafe.org	(888) 422-7233
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers www.usace.army.mil	(202) 761-0011
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
DOD	Department of Defense http://.dodssp.daps.dla.mil	(215) 697-6257
DOE	Department of Energy www.energy.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167

FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
PBS	Public Buildings Service (See GSA)	
PHS	Office of Public Health and Science www.osophs.dhhs.gov/ophs	(202) 690-7694
RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department www.state.gov	(202) 647-4000
TRB	Transportation Research Board http://gulliver.trb.org	(202) 334-2934
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USP	U.S. Pharmacopeia www.usp.org	(800) 227-8772

USPS	Postal Service www.usps.com	(202) 268-2000

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office www.gpoaccess.gov/cfr/index.html	(866) 512-1800 (202) 512-1800
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
DSCC	Defense Supply Center Columbus (See FS)	
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
	Available from Defense Standardization Program www.dps.dla.mil	
	Available from General Services Administration www.gsa.gov	(202) 619-8925
	Available from National Institute of Building Sciences www.wbdg.org/ccb	(202) 289-7800
FTMS	Federal Test Method Standard (See FS)	
MIL	(See MILSPEC)	

MIL-STD (See MILSPEC)

MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CBHF	State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation www.dca.ca.gov/bhfti	(800) 952-5210 (916) 574-2041
CCR	California Code of Regulations www.calregs.com	(916) 323-6815
CPUC	California Public Utilities Commission www.cpuc.ca.gov	(415) 703-2782
DSA	Division of the State Architect, California Division of General Services DSA Sacramento Regional Office DSA San Francisco Bay Area Regional Office	(916) 445-8100 (916) 445-8730 (510) 622-3101
OSHPD	Office of Statewide Health Planning and Development, California Health and Human Services Agency	(916) 653-0730
SSS	Structural Safety Section, Division of the State Architect, California Division of General Services	
TFS	Texas Forest Service Forest Resource Development http://txforestservice.tamu.edu	(979) 458-6650

G. Other Abbreviations:

IOR Inspector of Record:
For Projects where DSA is the Authority Having Jurisdiction: Inspector certified through the DSA Project Inspector certification program and approved for the project
For Projects where OSHPD is the Authority Having Jurisdiction: Inspector certified through the OSHPD Hospital Inspector certification program and approved for the project

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:
1. Section 01 1000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, Owner's representative, Owner's Construction Manager, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Water and Sewer service from Owner's existing water system is not available for use. Install construction water meter and pay Owner for water used by all entities for construction operations. Provide connections and extensions of services as required for construction operations.

C. Electric Power, Telephone and Data Service: Contractor's responsibility. Contractor will be required to make all service connections and will be responsible for all expenses related to installation and removal.

1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
   1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
   2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
   3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
   1. Locations of dust-control partitions at each phase of work.
   2. HVAC system isolation schematic drawing.
   3. Location of proposed air-filtration system discharge.
   4. Waste handling procedures.
   5. Other dust-control measures.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete or galvanized-steel bases for supporting posts.

B. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

C. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
   1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
   1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
   2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
   3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 7700 "Closeout Procedures."

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.

3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
2. Install lighting for Project identification sign.

I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
1. Provide additional telephone lines for the following:
a. Provide a dedicated telephone line for each facsimile machine.
2. At each telephone, post a list of important telephone numbers.
a. Police and fire departments.
b. Ambulance service.
c. Contractor's home office.
d. Contractor's emergency after-hours telephone number.
e. Architect's office.
f. Engineers' offices.
g. Owner's office.
h. Principal subcontractors' field and home offices.
3. Provide superintendent with cellular telephone for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Final Completion inspection. Remove before Final Completion. Personnel remaining after Final Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

D. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
   a. Provide temporary, directional signs for construction personnel and visitors.
3. Maintain and touchup signs so they are legible at all times.

E. Waste Disposal Facilities: Comply with requirements specified in Section 01 7419 "Construction Waste Management and Disposal."

F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 7300 "Execution."

G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
1. Comply with work restrictions specified in Section 01 1000 "Summary."

C. Temporary Erosion and Sedimentation Control: Comply with requirements of WQCB SWPPP..

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at

Final Completion. Perform control operations lawfully, using environmentally safe materials.

G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
   1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
   2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner and Construction Manager.

H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

L. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
   1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
   2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
      a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
   3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
   4. Insulate partitions to control noise transmission to occupied areas.
   5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
   6. Protect air-handling equipment.
   7. Provide walk-off mats at each entrance through temporary partition.

M. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
   1. Protect porous materials from water damage.
   2. Protect stored and installed material from flowing or standing water.
   3. Keep porous and organic materials from coming into prolonged contact with concrete.
   4. Remove standing water from decks.
   5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
   1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
   2. Keep interior spaces reasonably clean and protected from water damage.
   3. Periodically collect and remove waste containing cellulose or other organic matter.
   4. Discard or replace water-damaged material.
   5. Do not install material that is wet.
   6. Discard, replace, or clean stored or installed material that begins to grow mold.
   7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
   1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
   2. Use permanent HVAC system to control humidity.
   3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
      a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.

b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
c. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.

D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Final Completion.

E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Final Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Final Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 7700 "Closeout Procedures."

END OF SECTION 01 5000

SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Sections:
   1. Section 01 2500 "Substitution Procedures" for requests for substitutions.
   2. Section 01 4200 "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product not identified by manufacturer's product name, make or model number or other designation that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
   4. “Or approved equal” Product: Comparable Product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
   2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 14 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
      a. Form of Approval: As specified in Division 1 Section "Submittal Procedures."
      b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. “Or approved equal” request: Same requirements as for comparable product request.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 3300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:
   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
   3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:
   1. Store products to allow for inspection and measurement of quantity or counting of units.

2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
   3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 7700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Approved Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:
1. Product: Where Specifications explicitly state “no substitutions” or “substitutions not permitted” and name a single product and manufacturer, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
3. Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
4. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 2500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not

satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

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SECTION 01 7300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Field engineering and surveying.
   3. Installation of the Work.
   4. Cutting and patching.
   5. Coordination of Owner-installed products.
   6. Progress cleaning.
   7. Starting and adjusting.
   8. Protection of installed construction.
   9. Correction of the Work.

B. Related Sections:
   1. Section 01 1000 "Summary" for limits on use of Project site.
   2. Section 01 3300 "Submittal Procedures" for submitting surveys.
   3. Section 01 7700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
   4. Section 02 4119 "Selective Structure Demolition" for demolition and removal of selected portions of the building.
   5. Section 07 8413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
   1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
   2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
   3. Products: List products to be used for patching and firms or entities that will perform patching work.
   4. Dates: Indicate when cutting and patching will be performed.
   5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate how long services and systems will be disrupted.

B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
   1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
   2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
      a. Primary operational systems and equipment.
      b. Fire separation assemblies.
      c. Air or smoke barriers.
      d. Fire-suppression systems.
      e. Mechanical systems piping and ducts.
      f. Control systems.
      g. Communication systems.
      h. Electrical wiring systems.
      i. Operating systems of special construction.
   3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
      a. Water, moisture, or vapor barriers.
      b. Membranes and flashings.
      c. Exterior curtain-wall construction.

d. Sprayed fire-resistive material.
e. Equipment supports.
f. Piping, ductwork, vessels, and equipment.
g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems**,** and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present

where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Section 01 3100 "Project Management and Coordination."

D. Surface and Substrate Preparation: Comply with manufacturer's recommendations for preparation of substrates to receive subsequent work.

3.3 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control

points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Final Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Section 01 1000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and

with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
   a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
   a. Utilize containers intended for holding waste materials of type to be stored.
4. Coordinate progress cleaning for joint-use areas where more than one installer has worked.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Final Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 7419 "Construction Waste Management."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Final Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 01 4000 "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Final Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

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SECTION 01 7419 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
   1. Special requirements for waste management during demolition, renovation and construction operations.
      a. Protect the environment, both on-site and off-site, during demolition, renovation, and construction operations.
      b. Prevent environmental pollution and damage.
      c. Maximize source reduction, reuse and recycling of solid waste.
   2. Monitoring requirements.

B. Related Sections include but are not limited to, the following:
   1. Section 01 3300 “Submittal Procedures” for submittal procedures.
   2. Section 01 3100 “Project Management and Coordination” for project meeting requirements.
   3. Section 01 7839 “Project Record Documents” for record documentation submittal requirements.
   4. Section 01 8113.13 “Sustainable Design Requirements – LEED” for construction waste documentation.

1.3 DEFINITIONS

A. Definitions pertaining to sustainable development: As defined in ASTM E2114.

B. Environmental pollution and damage: The presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances; or degrade the utility of the environment for aesthetic, cultural, or historical purposes.

C. Solid Waste: Garbage, debris, sludge, or other discharged material (except hazardous waste) including solid, liquid, semisolid, or contained gaseous materials resulting from domestic, industrial, commercial, mining, or agricultural operations. Material not regulated as solid waste are: nuclear source or byproduct materials regulated under the Federal Atomic Energy Act of 1954 as amended; suspended or dissolved materials in domestic sewage effluent or irrigation return flows, or other regulated point source discharges; regulated air emissions; and fluids or wastes associated with natural gas or crude oil exploration or production.

D. Debris: Non-hazardous solid material generated during the construction, demolition, or renovation of a structure and which exceeds 60 mm (2.5 inch) particle size that is: a manufactured object; plant or animal matter; or natural geologic material (e.g. cobbles and boulders). A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if the mixture is comprised primarily of debris by volume, based on visual inspection.

E. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

F. Hazardous Waste: Hazardous waste as defined in 40 CFR 261 or as defined by applicable State and local regulations.

G. Hazardous Materials: Any material that is regulated as a hazardous material in accordance with 49 CFR 173, requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200, or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in accordance with 40 CFR 261. Throughout this specification, hazardous material includes hazardous chemicals.

1.4 QUALITY ASSURANCE

A. Maximize use of source reduction and recycling procedures outlined in ASTM D5834.

B. Diversion Goals: A minimum 50 percent by weight of total project solid waste to be diverted from landfill.

1.5 PRECONSTRUCTION MEETING

A. After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with Owner and Architect to discuss the proposed Waste Management Plan and to develop mutual understanding relative to details of environmental protection.

1.6 ACTION SUBMITTALS

A. Solid Waste Management Plan: Not less than 10 days before the Pre-construction meeting, prepare and submit a Solid Waste Management Plan including, but not limited to, the following:
   1. List of the recycling facilities, reuse facilities, municipal solid waste landfills and other disposal area(s) to be used. Include:
      a. Name, location, and phone number.
      b. Copy of permit or license for each facility.
   2. Identify materials that cannot be recycled or reused. Provide explanation or justification.
   3. Revise and resubmit Plan as required by Owner.
      a. Approval of Contractor’s Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations.

1.7 INFORMATIONAL SUBMITTALS

A. Progress Documentation: Document solid waste disposal and diversion. Include the quantity by weight of waste generated; waste diverted through sale, reuse, or recycling; and waste disposed by landfill or incineration. Identify landfills, recycling centers, waste processors, and other organizations that process or receive the solid waste.
   1. Document on form in Appendix A of this Section, or similar form as approved by Owner.
   2. With each Application for Payment, submit updated Documentation for solid waste disposal and diversion.
   3. With each Application for Payment, submit manifests, weight tickets, receipts, and invoices specifically identifying the Project and waste material.
      a. Submit copies to Owner's designated representative.

B. Record Submittals: With Record Submittals as specified in Section 01 7839, submit the following:
   1. Summary of solid waste disposal and diversion. Submit on form in Appendix A of this Section, or similar form as approved by Owner.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION

3.1 SOLID WASTE MANAGEMENT

A. Develop and implement a waste management program in accordance with ASTM E1609 and as specified herein.

B. Collection: Implement a recycling/reuse program that includes separate collection of waste materials of the following types as appropriate to the project waste and to the available recycling and reuse programs in the project area:
   1. Land clearing debris.
      a. Asphalt.
      b. Concrete.
   2. Metal.
      a. Ferrous.
      b. Non-ferrous.
   3. Wood, nails and staples allowed.
   4. Debris.
   5. Glass, colored glass allowed.
   6. Paper.
      a. Bond.
      b. Newsprint.
      c. Cardboard and paper packaging materials.
   7. Plastic.
      a. Type 1: Polyethylene Terephthalate (PET, PETE).
      b. Type 2: High Density Polyethylene (HDPE).

c. Type 3: Vinyl (Polyvinyl Chloride or PVC).
d. Type 4: Low Density Polyethylene (LDPE).
e. Type 5: Polypropylene (PP).
f. Type 6: Polystyrene (PS).
g. Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

8. Gypsum.
9. Paint and paint cans.
10. Carpet.
11. Insulation.
12. Others as appropriate.

C. Recycling/Reuse: Maximize recycling and reuse of materials.
1. Recycling/Reuse off project site: The following is a partial list for Contractor's information only.
a. Habitat for Humanity, a non-profit housing organization that rehabilitates and builds housing for low-income families. Sites requiring donated materials vary. Contact the national hotline (800) HABITAT.
b. California Materials Exchange (CAL-MAX) Program sponsored by the California Integrated Waste Management Board; (916) 255-2369.

D. Handling:
1. Clean materials that are contaminated prior to placing in collection containers. Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.
2. Arrange for collection by or delivery to the appropriate recycling or reuse facility.
3. Hazardous Waste and Hazardous Materials: Handle in accordance with applicable regulations.

E. Composting: In accordance with State Extension Service recommendations and as follows:
1. Moisture content: Maintain between 35 percent and 60 percent.
2. Carbon to nitrogen (C/N) ratio: Maintain at approximately 30 to 1 by weight.
3. Do not compost meat or dairy products on site.
4. Where the proposed Waste Management Plan incorporates composting of plastics, assess the potential effect of each type of plastic to be included on the composting process in accordance with ASTM D5509 or ASTM D5512.

END OF SECTION

Appendix A

SUMMARY OF SOLID WASTE DISPOSAL AND DIVERSION

Project Name: ___ Project Number: _____

Contractor Name: _____ License Number: _____

Contractor Address: _____

Solid Waste Material	**Date Material Disposed/ Diverted**	**Amount Disposed/ Diverted** (ton or cu. yd)	**Municipal Solid Waste Facility** (name, address, & phone number)	**Recycling/Reuse Facility** (name, address, & phone number)	**Comments** (if disposed, state why not diverted)
Land Clearing Debris					
Asphalt					
Concrete					
Metal					
Wood					
Debris					
Glass					
Clay brick					
Paper/ Cardboard					
Plastic					

Gypsum					
Paint					
Carpet					
Other:					

Signature: _____ Date: _____

SECTION 01 7700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Inspection procedures.
   2. Warranties.
   3. Final cleaning.

B. Related Sections include, but are not limited to, the following:
   1. General Conditions Article “Project Completion” for additional administrative and procedural requirements.
   2. Section 01 2900 "Payment Procedures" for requirements for Applications for Payment for Final Completion.
   3. Section 01 7300 "Execution" for progress cleaning of Project site.
   4. Section 01 7839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
   5. Section 01 7823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
   6. Section 01 7900 "Demonstration and Training" for requirements for instructing Owner's personnel.
   7. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 FINAL COMPLETION

A. Pre-Final Inspection: In preparation for Final Completion, Contractor may, at their option, request a pre-final inspection.
   1. Contractor shall prepare and submit to Architect prior to the inspection a list of items to be completed and corrected (punch list) prior to Final Completion.
   2. Included in this inspection will be the Contractor, and Subcontractor representatives for Fire Protection, Plumbing, HVAC and Electrical (as applicable).
   3. If the inspection discloses additional items, the Architect shall add these items to the Contractor’s list. Failure to include items on this list does not relieve the Contractor from fulfilling all requirements of the Contract.
   4. The Architect will promptly deliver the amended list of items to be completed and corrected (punch list) to the Contractor.

B. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
   1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
   2. Submit certified copy of Architect's inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
   4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

C. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
      a. Make request for reinspection only upon completion of all punch list items. Architect will make one reinspection only. Additional reinspection by Architect due to unfulfilled requirements shall be at the Contractor’s expense.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Initial Submittal: Submit within 35 days of the Notice to Proceed, a draft of the Contractor’s proposed punch list form. Architect will review and comment whether form is acceptable.
   1. Make changes requested by Architect and resubmit until an acceptable punch list form is obtained.
   2. If Contractor’s alternate form is not accepted by the Architect, use CSI Form 14.1A.

B. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
   1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, when applicable.
   2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
   3. Include the following information at the top of each page:
      a. Project name.
      b. Date.
      c. Name of Architect.
      d. Name of Contractor.
      e. Page number.

1.5 REIMBURSEMENT OF ARCHITECT'S ADDITIONAL REINSPECTION COSTS

A. Payment for Architect's time for additional reinspections due to unfulfilled requirements at time of initial reinspection shall be the sole responsibility of the Contractor. Architect's costs include, but are not limited to, reinspection time, travel, mileage, evaluations, documentation of reinspection, reproductions and distribution of reinspection results.
   1. Architect will record time and costs for additional reinspections and deliver the billing to the Contractor. Billing rates shall be based upon the Architect's standard rates at the time additional reinspections are provided.
   2. Contractor shall reimburse Architect within 15 days of receipt of Architect's billing.
   3. If Contractor does not reimburse Architect within the allotted time, Owner may deduct the Architect's costs from the Contract Amount and pay the Architect directly.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Final Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
   1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
   2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
   3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
   1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
      a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
      b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
      c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
      d. Remove tools, construction equipment, machinery, and surplus material from Project site.
      e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
      f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
      g. Sweep concrete floors broom clean in unoccupied spaces.
      h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
      i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
      j. Remove labels that are not permanent.
      k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
         1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
      l. Wipe surfaces of mechanical and electrical equipment, elevator equipment (when applicable), and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
      m. Replace parts subject to unusual operating conditions.
      n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
p. Clean ducts, blowers, and coils if units were operated without filters during construction.
q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
r. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

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SECTION 01 7823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation, emergency and maintenance manuals index.
   2. Operation and maintenance documentation directory.
   3. Emergency manuals.
   4. Operation manuals for systems, subsystems, and equipment.
   5. Maintenance manuals for the care and maintenance of products, materials, and finishes systems and equipment.

B. Related Sections include, but are not limited to, the following:
   1. Section 01 3300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
   2. Section 01 7700 "Closeout Procedures" for submitting operation and maintenance manuals.
   3. Section 01 7839 "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
   4. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Initial Submittal: Submit 2 draft copies of operation, emergency and maintenance manuals index at least 45 days before requesting inspection for Final Completion. Architect will return one copy of draft and mark whether general scope and content of index is acceptable.

B. Final Submittal: Submit one copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
   1. Correct or modify each manual to comply with Architect's comments.
      a. Number and Format of copies:
         1) Submit 2 sets in hard copy format.
         2) Submit one digital copy in PDF format on CD-R media.

1.5 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION, EMERGENCY AND MAINTENANCE MANUALS INDEX

A. Include a section in the index for each operation, emergency and maintenance manual required in the individual specification Sections.

B. Organization: Use the Project Manual table of contents as a guide to establish the index.

2.2 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:
   1. List of documents.
   2. List of systems.
   3. List of equipment.
   4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.3 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page.
   2. Table of contents.
   3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
   1. Subject matter included in manual.
   2. Name and address of Project.
   3. Name and address of Owner.
   4. Date of submittal.
   5. Name, address, and telephone number of Contractor.
   6. Name and address of Architect.
   7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
   1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
   1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
      a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
      b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
   2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
   3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
   4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
   5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
      a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.4 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.5 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.

10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:
1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.6 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:
1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
   1. Inspection procedures.
   2. Types of cleaning agents to be used and methods of cleaning.
   3. List of cleaning agents and methods of cleaning detrimental to product.
   4. Schedule for routine cleaning and maintenance.
   5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

2.7 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
   1. Standard printed maintenance instructions and bulletins.
   2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
   3. Identification and nomenclature of parts and components.
   4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
   1. Test and inspection instructions.
   2. Troubleshooting guide.
   3. Precautions against improper maintenance.
   4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   5. Aligning, adjusting, and checking instructions.
   6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
   1. Do not use original Project Record Documents as part of operation and maintenance manuals.
   2. Comply with requirements of newly prepared Record Drawings in Section 01 7839 "Project Record Documents."

G. Comply with Section 01 7700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 01 7839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.
   4. Miscellaneous record submittals.

B. Related Requirements:
   1. Section 01 7300 "Execution" for final property survey.
   2. Section 01 7700 "Closeout Procedures" for general closeout procedures.
   3. Section 01 7823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit copies of record Drawings as follows:
      a. Initial Submittal:
         1) Submit one paper-copy set(s) of marked-up record prints.
         2) Submit PDF electronic files of scanned record prints and one of file prints.
         3) Submit Revit 2014 model as record document.
         4) Submit Navisworks 2014 model with as-built corrections
         5) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
         6)
      b. Final Submittal:
         1) Submit one paper-copy set(s) of marked-up record prints.
         2) Submit record digital data files, PDF’s of record digital data files, and two set(s) of record digital data file plots.
         3) Submit Revit 2014 model as record document
         4) SubmitNavisworks 2014 model with as-built corrections for facility maintenance contractor.
         5) Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one paper copy and annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy and annotated PDF electronic files and directories of each submittal.
   1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy and annotated PDF electronic files and directories of each submittal.

E. Reports: Submit written report monthly with payment application indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
   1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an acceptable drawing technique.
      c. Record data as soon as possible after obtaining it.
      d. Record and check the markup before enclosing concealed installations.
      e. Cross-reference record prints to corresponding archive photographic documentation.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings.
      b. Revisions to details shown on Drawings.
      c. Depths of foundations below first floor.
      d. Locations and depths of underground utilities.
      e. Revisions to routing of piping and conduits.
      f. Revisions to electrical circuitry.
      g. Actual equipment locations.
      h. Duct size and routing.
      i. Locations of concealed internal utilities.
      j. Changes made by Change Order or Construction Change Directive.
      k. Changes made following Architect's written orders.

l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Final Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.
4. Architect may make available, solely at Architect’s discretion, for the Contractor’s use digital data files of the Contract Drawings for use in recording information.
a. See Division 01 Section "Submittal Procedures" for requirements related to licensing and use of Architect's digital data files.

C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.

e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
   4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
   5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
   3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Product Data.
   1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file or scanned PDF electronic file(s) of marked-up miscellaneous record submittals.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION

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SECTION 01 7900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment.
   2. Training in operation and maintenance of systems, subsystems, and equipment.

B. Related Sections:
   1. Divisions 02 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

B. Qualification Data: For instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. At completion of training, submit complete training manual(s) for Owner's use.

1.5 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

B. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
   1. Inspect and discuss locations and other facilities required for instruction.
   2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
   3. Review required content of instruction.
   4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
   1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
      a. System, subsystem, and equipment descriptions.
      b. Performance and design criteria if Contractor is delegated design responsibility.

c. Operating standards.
d. Regulatory requirements.
e. Equipment function.
f. Operating characteristics.
g. Limiting conditions.
h. Performance curves.

2. Documentation: Review the following items in detail:
   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project record documents.
   e. Identification systems.
   f. Warranties and bonds.
   g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.
   l. Required sequences for electric or electronic systems.
   m. Special operating instructions and procedures.
5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.
7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.

f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 1 Section "Operations and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
   2. Owner will furnish an instructor to describe Owner's operational philosophy.
   3. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
   1. Schedule training with Owner with at least seven days' advance notice.

C. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, written, or demonstration performance-based test.

D. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION

SECTION 01 8113.13 - SUSTAINABLE DESIGN REQUIREMENTS - LEED FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to obtain LEED-Certified certification based on USGBC's "LEED 2009 for New Construction & Major Renovations."
   1. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
   2. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
   3. A copy of the LEED Project checklist is attached at the end of this Section for information only.
   4. Specific requirements for LEED are included in greater detail in other Sections.

1.3 DEFINITIONS

A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

B. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

C. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Respond to questions and requests from Architect and the USGBC regarding LEED credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until the USGBC has made its determination on the project's LEED certification application. Document responses as informational submittals.

1.5 ACTION SUBMITTALS

A. General: Submit additional LEED submittals required by other Specification Sections.

B. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.

C. LEED Documentation Submittals:
1. Credit SS 7.1: Product data and certification letter from product manufacturers indicating solar reflective index (SRI), and receipts for materials used.
2. Credit MR 2: Comply with Section 01 7419 "Construction Waste Management and Disposal."
3. Credit MR 4: Product data and certification letter from product manufacturers indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating material cost for each product having recycled content.
4. Credit MR 5: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Credit MR 7: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
6. Credit IEQ 3.1:
    a. Construction indoor-air-quality management plan.
    b. Product data for temporary filtration media.
    c. Product data for filtration media used during occupancy.
    d. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality

management measures, such as protection of ducts and on-site stored or installed absorptive materials.

7. Credit IEQ 3.2:
   a. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
   b. Product data for filtration media used during flush-out and during occupancy.
   c. Report from testing and inspecting agency indicating results of indoor-air-quality testing and documentation showing compliance with indoor-air-quality testing procedures and requirements.
8. Credit IEQ 4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used.
9. Credit IEQ 4.2: Product data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used.
10. Credit IEQ 4.4: Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.
11. Credit ID 1.1: Product data for tire derived aggregate. Receipts for products used.
12. Credit ID 1.2: Product data for lighting products containing mercury indicating mercury content in picograms per lumen-hour. Product data for lighting products not containing mercury indicating no mercury content.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For LEED coordinator.

B. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:
   1. Furniture.
   2. Plumbing.
   3. Mechanical.
   4. Electrical.
   5. Specialty items such as elevators and equipment.
   6. Wood-based construction materials.

C. LEED Action Plans: Provide preliminary submittals within 30 days of date established for commencement of the Work indicating how the following requirements will be met:
   1. Prerequisite SS 1: Construction Activity Pollution Prevention plan complying with Phase 1 and Phase 2 of the National Pollutant Discharge Elimination System (NPDES) or local regulations.
   1. Credit MR 2: Waste management plan complying with Section 017419 "Construction Waste Management and Disposal."
   2. Credit MR 4: List of proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
   3. Credit MR 5: List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.

4. Credit MR 7: List of proposed certified wood products. Indicate each product containing certified wood, including its source and cost of certified wood products.
5. Credit IEQ 3.1: Construction indoor-air-quality management plan during construction.
6. Credit IEQ 3.2: Construction indoor-air-quality management plan before occupancy.
7.

D. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:
1. Credit MR 2: Waste reduction progress reports complying with Section 017419 "Construction Waste Management and Disposal."
2. Credit MR 4: Recycled content.
3. Credit MR 5: Regional materials.
4. Credit MR 7: Certified wood products.

1.7 QUALITY ASSURANCE

A. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated.

2.2 RECYCLED CONTENT OF MATERIALS

A. Credit MR 4: Building materials shall have recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content for Project constitutes a minimum of 20 percent of cost of materials used for Project.
1. Cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
2. Do not include furniture, plumbing, mechanical and electrical components, and specialty items such as elevators and equipment in the calculation.

2.3 REGIONAL MATERIALS

A. Credit MR 5: Not less than 20 percent of building materials (by cost) shall be regional materials.

2.4 CERTIFIED WOOD

A. Credit MR 7: Not less than 50 percent (by cost) of wood-based materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
   1. Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:
      a. Rough carpentry.
      b. Miscellaneous carpentry.
      c. Structural glued-laminated timber.
      d. Finish carpentry.
      e. Architectural woodwork.
      f. Wood paneling.
      g. Wood cabinets.

2.5 LOW-EMITTING MATERIALS

A. Credit IEQ 4.1: For field applications that are inside the weatherproofing system, adhesives and sealants shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Wood Glues: 30 g/L.
   2. Metal-to-Metal Adhesives: 30 g/L.
   3. Adhesives for Porous Materials (Except Wood): 50 g/L.
   4. Subfloor Adhesives: 50 g/L.
   5. Plastic Foam Adhesives: 50 g/L.
   6. Carpet Adhesives: 50 g/L.
   7. Carpet Pad Adhesives: 50 g/L.
   8. VCT and Asphalt Tile Adhesives: 50 g/L.
   9. Cove Base Adhesives: 50 g/L.
   10. Gypsum Board and Panel Adhesives: 50 g/L.
   11. Rubber Floor Adhesives: 60 g/L.
   12. Ceramic Tile Adhesives: 65 g/L.
   13. Multipurpose Construction Adhesives: 70 g/L.
   14. Fiberglass Adhesives: 80 g/L.
   15. Contact Adhesive: 80 g/L.
   16. Structural Glazing Adhesives: 100 g/L.
   17. Wood Flooring Adhesive: 100 g/L.
   18. Structural Wood Member Adhesive: 140 g/L.
   19. Single-Ply Roof Membrane Adhesive: 250 g/L.

20. Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine-covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
21. Top and Trim Adhesive: 250 g/L.
22. Plastic Cement Welding Compounds: 250 g/L.
23. ABS Welding Compounds: 325 g/L.
24. CPVC Welding Compounds: 490 g/L.
25. PVC Welding Compounds: 510 g/L.
26. Adhesive Primer for Plastic: 550 g/L.
27. Sheet-Applied Rubber Lining Adhesive: 850 g/L.
28. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent by weight.
29. Aerosol Adhesive, General-Purpose Web Spray: 55 percent by weight.
30. Special-Purpose Aerosol Adhesive (All Types): 70 percent by weight.
31. Other Adhesives: 250 g/L.
32. Architectural Sealants: 250 g/L.
33. Nonmembrane Roof Sealants: 300 g/L.
34. Single-Ply Roof Membrane Sealants: 450 g/L.
35. Other Sealants: 420 g/L.
36. Sealant Primers for Nonporous Substrates: 250 g/L.
37. Sealant Primers for Porous Substrates: 775 g/L.
38. Modified Bituminous Sealant Primers: 500 g/L.
39. Other Sealant Primers: 750 g/L.

B. Credit IEQ 4.2: For field applications that are inside the weatherproofing system, paints and coatings shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Flat Paints and Coatings: VOC not more than 50 g/L.
2. Nonflat Paints and Coatings: VOC not more than 150 g/L.
3. Dry-Fog Coatings: VOC not more than 400 g/L.
4. Primers, Sealers, and Undercoaters: VOC not more than 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.
7. Pretreatment Wash Primers: VOC not more than 420 g/L.
8. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
9. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
10. Floor Coatings: VOC not more than 100 g/L.
11. Shellacs, Clear: VOC not more than 730 g/L.
12. Shellacs, Pigmented: VOC not more than 550 g/L.
13. Stains: VOC not more than 250 g/L.

C. Credit IEQ 4.4: Composite wood, agrifiber products, and adhesives shall not contain urea-formaldehyde resin.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. Credit MR 2: Comply with Section 01 7419 "Construction Waste Management and Disposal."

3.2 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Credit IEQ 3.1: Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."
   1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 015000 "Temporary Facilities and Controls," install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
   2. Replace all air filters immediately prior to occupancy.

B. Credit IEQ 3.2:
   1. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14000 cu. ft. (4 300 000 L) of outdoor air per sq. ft. (sq. m) of floor area while maintaining an internal temperature of at least 60 deg F (16 deg C) and a relative humidity no higher than 60 percent.
   2. If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3500 cu. ft. (1 070 000 L) of outdoor air per sq. ft. (sq. m) of floor area to the space. Once a space is occupied, it shall be ventilated at a minimum rate of 0.30 cfm per sq. ft. (1.52 L/s per sq. m) of outside air or the design minimum outside air rate determined in Prerequisite IEQ 1, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14000 cu. ft./sq. ft. (4 300 000 L/sq. m) of outside air has been delivered to the space.

END OF SECTION

LEED 2009 for New Construction and Major Renovations

Project Checklist

Campus Credits Claimed

BCAG Regional Transit Maintenance Facility - ADMIN/OPS BUILDING

6/9/2014

Sustainable Sites — Possible Points: 26

	Y	?	N			
	7	2		**Sustainable Sites**	Possible Points:	**26**
A,C	Y			Prereq 1	Construction Activity Pollution Prevention	
-			N	Credit 1	Site Selection	1
-			N	Credit 2	Development Density and Community Connectivity	5
-			N	Credit 3	Brownfield Redevelopment	1
A			N	Credit 4.1	Alternative Transportation—Public Transportation Access	6
A	1			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
A	3			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
C			N	Credit 4.4	Alternative Transportation—Parking Capacity	2
-			N	Credit 5.1	Site Development—Protect or Restore Habitat	1
-			N	Credit 5.2	Site Development—Maximize Open Space	1
C	1			Credit 6.1	Stormwater Design—Quantity Control	1
C	1			Credit 6.2	Stormwater Design—Quality Control	1
C		1		Credit 7.1	Heat Island Effect—Non-roof	1
A	1			Credit 7.2	Heat Island Effect—Roof	1
E		1		Credit 8	Light Pollution Reduction	1

Water Efficiency — Possible Points: 10

	6			**Water Efficiency**	Possible Points:	**10**
M	Y			Prereq 1	Water Use Reduction—20% Reduction	
LS	2			Credit 1	Water Efficient Landscaping	2 to 4
-			N	Credit 2	Innovative Wastewater Technologies	2
M	4			Credit 3	Water Use Reduction	2 to 4

Energy and Atmosphere — Possible Points: 35

	20	2		**Energy and Atmosphere**	Possible Points:	**35**
M	Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
M,E	Y			Prereq 2	Minimum Energy Performance	
M	Y			Prereq 3	Fundamental Refrigerant Management	
M,E	19			Credit 1	Optimize Energy Performance	1 to 19
E			N	Credit 2	On-Site Renewable Energy	1 to 7
-			N	Credit 3	Enhanced Commissioning	2
M		2		Credit 4	Enhanced Refrigerant Management	2
M,E	1			Credit 5	Measurement and Verification	3
-			N	Credit 6	Green Power	2

Materials and Resources — Possible Points: 14

	5			**Materials and Resources**	Possible Points:	**14**
A	Y			Prereq 1	Storage and Collection of Recyclables	
-			N	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
-			N	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
A,C	2			Credit 2	Construction Waste Management	1 to 2
-			N	Credit 3	Materials Reuse	1 to 2

Materials and Resources, Continued

	Y	?	N			
A	1			Credit 4	Recycled Content	1 to 2
A	1			Credit 5	Regional Materials	1 to 2
			N	Credit 6	Rapidly Renewable Materials	1
A	1			Credit 7	Certified Wood	1

Indoor Environmental Quality — Possible Points: 15

	12	2		**Indoor Environmental Quality**	Possible Points:	**15**
M	Y			Prereq 1	Minimum Indoor Air Quality Performance	
A	Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
M		1		Credit 1	Outdoor Air Delivery Monitoring	1
M	1			Credit 2	Increased Ventilation	1
A,M	1			Credit 3.1	Construction IAQ Management Plan—During Construction	1
A,M	1			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
A	1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
A	1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
A	1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
A	1			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
A,M		1		Credit 5	Indoor Chemical and Pollutant Source Control	1
E	1			Credit 6.1	Controllability of Systems—Lighting	1
M	1			Credit 6.2	Controllability of Systems—Thermal Comfort	1
M	1			Credit 7.1	Thermal Comfort—Design	1
M			N	Credit 7.2	Thermal Comfort—Verification	1
A	1			Credit 8.1	Daylight and Views—Daylight	1
A	1			Credit 8.2	Daylight and Views—Views	1

Innovation and Design Process — Possible Points: 6

	2	2		**Innovation and Design Process**	Possible Points:	**6**
C		1		Credit 1.1	Innovation in Design: TDL - TIRE DERIVED AGGREGATE	1
E	1			Credit 1.2	Innovation in Design: LOW MERCURY LIGHTING	1
A		1		Credit 1.3	Innovation in Design: Public Education	1
			N	Credit 1.4	Innovation in Design: Specific Title	1
			N	Credit 1.5	Innovation in Design: Specific Title	1
M	1			Credit 2	LEED Accredited Professional	1

Regional Priority Credits — Possible Points: 4

	2			**Regional Priority Credits**	Possible Points:	**4**
A			N	Credit 1.1	Regional Priority:Public Transportation	1
LS	1			Credit 1.2	Regional Priority: Water Efficient Landscaping	1
E			N	Credit 1.3	Regional Priority: On site renewable energy	1
M	1			Credit 1.4	Regional Priority: Water use reductuion	1

54	8		**Total**	Possible Points:	**110**

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

LEED 2009 for New Construction and Major Renovations

Project Checklist

Campus Credits Claimed

BCAG Regional Transit Maintenance Facility - MAINT BUILDING

6/9/2014

	Y	?	N			
	7			**Sustainable Sites**	Possible Points:	**26**
A,C	Y			Prereq 1	Construction Activity Pollution Prevention	
-			N	Credit 1	Site Selection	1
-			N	Credit 2	Development Density and Community Connectivity	5
-			N	Credit 3	Brownfield Redevelopment	1
A			N	Credit 4.1	Alternative Transportation—Public Transportation Access	6
A	1			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
A	3			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
C			N	Credit 4.4	Alternative Transportation—Parking Capacity	2
-			N	Credit 5.1	Site Development—Protect or Restore Habitat	1
-			N	Credit 5.2	Site Development—Maximize Open Space	1
C	1			Credit 6.1	Stormwater Design—Quantity Control	1
C	1			Credit 6.2	Stormwater Design—Quality Control	1
C			N	Credit 7.1	Heat Island Effect—Non-roof	1
A	1			Credit 7.2	Heat Island Effect—Roof	1
E			N	Credit 8	Light Pollution Reduction	1
	6			**Water Efficiency**	Possible Points:	**10**
M	Y			Prereq 1	Water Use Reduction—20% Reduction	
LS	2			Credit 1	Water Efficient Landscaping	2 to 4
-			N	Credit 2	Innovative Wastewater Technologies	2
M	4			Credit 3	Water Use Reduction	2 to 4
	22			**Energy and Atmosphere**	Possible Points:	**35**
M	Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
M,E	Y			Prereq 2	Minimum Energy Performance	
M	Y			Prereq 3	Fundamental Refrigerant Management	
M,E	19			Credit 1	Optimize Energy Performance	1 to 19
E			N	Credit 2	On-Site Renewable Energy	1 to 7
-			N	Credit 3	Enhanced Commissioning	2
M	2			Credit 4	Enhanced Refrigerant Management	2
M,E	1			Credit 5	Measurement and Verification	3
-			N	Credit 6	Green Power	2
	5			**Materials and Resources**	Possible Points:	**14**
A	Y			Prereq 1	Storage and Collection of Recyclables	
-			N	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
-			N	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
A,C	2			Credit 2	Construction Waste Management	1 to 2
-			N	Credit 3	Materials Reuse	1 to 2

	Y	?	N			
				Materials and Resources, Continued		
A	1			Credit 4	Recycled Content	1 to 2
A	1			Credit 5	Regional Materials	1 to 2
			N	Credit 6	Rapidly Renewable Materials	1
A	1			Credit 7	Certified Wood	1
	10	**1**		**Indoor Environmental Quality**	Possible Points:	**15**
M	Y			Prereq 1	Minimum Indoor Air Quality Performance	
A	Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
M		1		Credit 1	Outdoor Air Delivery Monitoring	1
M	1			Credit 2	Increased Ventilation	1
A,M	1			Credit 3.1	Construction IAQ Management Plan—During Construction	1
A,M	1			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
A	1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
A	1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
A	1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
A	1			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
A,M			N	Credit 5	Indoor Chemical and Pollutant Source Control	1
E	1			Credit 6.1	Controllability of Systems—Lighting	1
M	1			Credit 6.2	Controllability of Systems—Thermal Comfort	1
M	1			Credit 7.1	Thermal Comfort—Design	1
M			N	Credit 7.2	Thermal Comfort—Verification	1
A			N	Credit 8.1	Daylight and Views—Daylight	1
A			N	Credit 8.2	Daylight and Views—Views	1
	2	**2**		**Innovation and Design Process**	Possible Points:	**6**
C		1		Credit 1.1	Innovation in Design: TDL - TIRE DERIVED AGGREGATE	1
E	1			Credit 1.2	Innovation in Design: LOW MERCURY LIGHTING	1
A		1		Credit 1.3	Innovation in Design: Public Education	1
			N	Credit 1.4	Innovation in Design: Specific Title	1
			N	Credit 1.5	Innovation in Design: Specific Title	1
M	1			Credit 2	LEED Accredited Professional	1
	3			**Regional Priority Credits**	Possible Points:	**4**
A	1			Credit 1.1	Regional Priority:Public Transportation	1
LS	1			Credit 1.2	Regional Priority: Water Efficient Landscaping	1
E			N	Credit 1.3	Regional Priority: On site renewable energy	1
M	1			Credit 1.4	Regional Priority: Water use reductuion	1
	55	3		**Total**	Possible Points:	**110**

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

LEED 2009 for New Construction and Major Renovations

Project Checklist

Building Credits

BCAG Regional Transit Maintenance Facility - Master Site

4/22/2014

Sustainable Sites — Possible Points: 26

	Y	?	N			
A,C			N	Prereq 1	Construction Activity Pollution Prevention	
-			N	Credit 1	Site Selection	1
-			N	Credit 2	Development Density and Community Connectivity	5
-			N	Credit 3	Brownfield Redevelopment	1
A	6			Credit 4.1	Alternative Transportation—Public Transportation Access	6
A	1			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
A	3			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
C			N	Credit 4.4	Alternative Transportation—Parking Capacity	2
-			N	Credit 5.1	Site Development—Protect or Restore Habitat	1
-			N	Credit 5.2	Site Development—Maximize Open Space	1
C	1			Credit 6.1	Stormwater Design—Quantity Control	1
C	1			Credit 6.2	Stormwater Design—Quality Control	1
C		N		Credit 7.1	Heat Island Effect—Non-roof	1
A			N	Credit 7.2	Heat Island Effect—Roof	1
E			N	Credit 8	Light Pollution Reduction	1

Water Efficiency — Possible Points: 10

M				Prereq 1	Water Use Reduction—20% Reduction	
LS	2			Credit 1	Water Efficient Landscaping	2 to 4
-			N	Credit 2	Innovative Wastewater Technologies	2
M			N	Credit 3	Water Use Reduction	2 to 4

Energy and Atmosphere — Possible Points: 35

M				Prereq 1	Fundamental Commissioning of Building Energy Systems	
M,E				Prereq 2	Minimum Energy Performance	
M	Y			Prereq 3	Fundamental Refrigerant Management	
M,E			N	Credit 1	Optimize Energy Performance	1 to 19
E			N	Credit 2	On-Site Renewable Energy	1 to 7
-			N	Credit 3	Enhanced Commissioning	2
M		2		Credit 4	Enhanced Refrigerant Management	2
M,E			N	Credit 5	Measurement and Verification	3
-			N	Credit 6	Green Power	2

Materials and Resources — Possible Points: 14

A	Y			Prereq 1	Storage and Collection of Recyclables	
-			N	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
-			N	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
A,C	2			Credit 2	Construction Waste Management	1 to 2
-			N	Credit 3	Materials Reuse	1 to 2

Materials and Resources, Continued

	Y	?	N			
A			N	Credit 4	Recycled Content	1 to 2
A			N	Credit 5	Regional Materials	1 to 2
			N	Credit 6	Rapidly Renewable Materials	1
A			N	Credit 7	Certified Wood	1

Indoor Environmental Quality — Possible Points: 15

M				Prereq 1	Minimum Indoor Air Quality Performance	
A	Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
M			N	Credit 1	Outdoor Air Delivery Monitoring	1
M			N	Credit 2	Increased Ventilation	1
A,M			N	Credit 3.1	Construction IAQ Management Plan—During Construction	1
A,M			N	Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
A	1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
A	1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
A	1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
A	1			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
A,M			N	Credit 5	Indoor Chemical and Pollutant Source Control	1
E			N	Credit 6.1	Controllability of Systems—Lighting	1
M			N	Credit 6.2	Controllability of Systems—Thermal Comfort	1
M			N	Credit 7.1	Thermal Comfort—Design	1
M			N	Credit 7.2	Thermal Comfort—Verification	1
A			N	Credit 8.1	Daylight and Views—Daylight	1
A			N	Credit 8.2	Daylight and Views—Views	1

Innovation and Design Process — Possible Points: 6

C		1		Credit 1.1	Innovation in Design: TDL - TIRE DERIVED AGGREGATE	1
E		1		Credit 1.2	Innovation in Design: LOW MERCURY LIGHTING	1
A		1		Credit 1.3	Innovation in Design: Public Education	1
			N	Credit 1.4	Innovation in Design: Specific Title	1
			N	Credit 1.5	Innovation in Design: Specific Title	1
M			N	Credit 2	LEED Accredited Professional	1

Regional Priority Credits — Possible Points: 4

A	1			Credit 1.1	Regional Priority:Public Transportation	1
LS	1			Credit 1.2	Regional Priority: Water Efficient Landscaping	1
E			N	Credit 1.3	Regional Priority: On site renewable energy	1
M			N	Credit 1.4	Regional Priority: Water use reductuion	1

Total — Possible Points: 110

22	5		

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

SECTION 01 9113 – LEED GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. OPR and BoD documentation are included by reference for information only.

1.2 SUMMARY

A. Section includes general requirements that apply to implementation of LEED commissioning without regard to specific systems, assemblies, or components. Additional commissioning may be required per the construction documents.

B. Related Sections:

1. Section 23 0800 "Commissioning of HVAC" for commissioning process activities for HVAC&R systems, assemblies, equipment, and components.

2. Section 26 0923 "Lighting Control Devices" for commissioning process activities for lighting systems.

1.3 DEFINITIONS

A. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

B. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

C. CxA: Commissioning Authority.

D. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

E. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.4 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:

1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

1.5 OWNER'S RESPONSIBILITIES

A. Provide the OPR documentation to the CxA and Contractor for information and use.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

C. Provide the BoD documentation, prepared by Architect and approved by Owner, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
3. Attend commissioning team meetings.
4. Integrate and coordinate commissioning process activities with construction schedule.
5. Review and accept construction checklists provided by the CxA.

6. Complete construction checklists as Work is completed and provide to the Commissioning Authority with electronic copies on a weekly basis.
7. Review and accept commissioning process test procedures provided by the Commissioning Authority.
8. Complete commissioning process test procedures.

1.7 CxA'S RESPONSIBILITIES

A. Organize and lead the commissioning team.

B. Provide commissioning plan.

C. Convene commissioning team meetings.

D. Provide Project-specific construction checklists and commissioning process test procedures.

E. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log.

F. Prepare and maintain the Issues Log.

G. Prepare and maintain completed construction checklist log.

H. Witness systems, assemblies, equipment, and component startup.

I. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 02 01 00 - SITE CONDITIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. General: All information obtained by the Engineer regarding site conditions, subsurface information, groundwater elevations, existing construction of site facilities, and existing underground utilities and similar data are shown on the Drawings, or are available for review in the Geotechnical Investigation Report (Soils Report). The following Soils Report has been prepared for the project:

1. “Geotechnical Engineering Investigation Report for the Butte Regional Transit Operations Center, 326 Huss Drive, Chico, California” by Holdrege & Kull, dated May 17, 2012.
2. "Design Memorandum: Recommendations for Subgrade Soil Stabilization Using Lime Treatment," Date: August 27, 2013, Author: Holdrege & Kull
3. "Supplemental Recommendations to the Geotechnical Engineering Investigation Report dated May 17, 2012," by Holdrege & Kull, dated July 1, 2014.

B. Investigations conducted by a geotechnical Engineer of subsurface conditions were made for the purpose of study and design, and neither the Owner's Representative nor the Owner assume any responsibility whatever with respect to the sufficiency or accuracy of borings, or of the Log of Test Borings, or of other investigations that have been made, or of the interpretations made thereof, and there is no warranty or guarantee, either expressed or implied, that the conditions indicated by such investigations are representative of those existing throughout such area, or any part thereof, or that unlooked for developments may not occur.

C. This Geotechnical Investigation is not part of the Contract Documents but the technical data contained therein upon which Bidder is entitled to rely are incorporated therein by reference. Such technical data is boring method, location and logs; and laboratory test methods and results.

D. Any logs of test borings or topographic maps showing a record of the data obtained by the Owner's Representative's investigations of surface and subsurface conditions that are made available or bound herewith shall be considered a part of the Contract Documents. Said logs represent the opinion of the Owner's Representative as to the character of the materials encountered by them in their investigations.

E. Information derived from inspection of logs of test borings, of topographic maps, or from plans showing locations of utilities and structures will not in any way relieve the Contractor from any risk, or from properly examining the site and making such additional investigations as he may elect, or from properly fulfilling all the terms of the Contract Documents.

F. Related Work described elsewhere:

1. Section 02 01 10, EXISTING UTILITIES AND UNDERGROUND STRUCTURES
2. Section 02 32 00, GEOTECHNICAL INVESTIGATION DATA
3. Section 31 00 00, EARTHWORK

1.2 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor shall satisfy himself as to the nature and location of the Work, the general and local conditions, particularly those bearing upon availability of transportation, disposal, handling and storage of materials, availability of labor, water, sanitary sewer, electric power, communications, roads, and uncertainties of weather, river stages, or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment facilities needed preliminary to and during the prosecution of the Work and all other matters which can in any way affect the Work or the cost thereof under this Contract.

B. The Contractor shall further satisfy himself as to the character, quality, and quantity of surface and subsurface materials to be encountered by inspecting the site as well as, any exploratory work performed by the Owner's Representative, and information presented by the plans and specifications made as part of this Contract. Any failure by the Contractor to acquaint himself with all available information will not relieve him from responsibility for properly estimating the difficulty or cost of successfully performing the Work.

C. The Contractor shall anticipate underground obstructions such as utility lines, foundations, groundwater, stumps, varying soil conditions, and debris. No extra payment will be allowed for the removal, replacement, repair, or possible increased cost caused by underground obstructions indicated in the Contract Documents. Any such lines or obstructions indicated on the Drawings show only the approximate location and must be verified in the field by the Contractor.

D. The Contractor shall note that portions of the existing road surfaces are not in structural sections and that heavy truck and equipment operations may cause road surface damage in excess of normal usage. If damage does occur due to construction activity, the Engineer shall be notified immediately before proceeding with the Work, or causing more damage to occur. Damage caused to the existing asphalt road surface by Contractor's operations shall be repaired per Section 32 12 16, HOT MIX ASPHALT PAVING.

1.3 ADDITIONAL INFORMATION

A. Prior to bidding, bidders may make their own subsurface investigations subject to time schedules and arrangements approved in advance by the Owner. Before any subsurface test holes are excavated, obtain clearance from Owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 02 01 00

SECTION 02 01 10 - EXISTING UTILITIES AND UNDERGROUND STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Contractor is responsible for locating and protecting existing utilities, facilities and underground structures. Responsibilities shall include but are not limited to those defined in this section.

B. Refer to Drawings for the approximate locations of utilities and underground structures.

1.2 GENERAL

A. The Contractor shall protect all existing utilities and improvements not designated for removal, and shall restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than they were prior to such damage or temporary relocation, all in accordance with requirements of the Contract Documents.

B. The approximate locations of known existing utilities are shown in the Drawings. The Contractor shall verify the location of existing utilities at least 2 days but no more than 14 days prior to the beginning excavation by notifying Underground Services Alert (USA) at (800) 227-2600. The Contractor shall notify the Engineer of any utilities not shown in the Drawings or substantially different from the Drawings. The Contractor shall make exploratory excavations of all utilities including those not shown in the Drawings that may interfere with the Work. All such exploratory excavations shall be performed as soon as practicable after award of the Contract and, in any event, a sufficient time in advance of construction to avoid possible delays to the Contractor's Work.

C. The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and grade of the utility.

1.3 CALIFORNIA ADMINISTRATIVE CODE

A. Section 1540(a)1 of Construction Safety Orders (Title 8) California Administrative Code, Section 1540 states:

B. (1) "Prior to opening and excavation, effort shall be made to determine whether underground installations; i.e., sewer, water, fuel, electric lines, etc., will be encountered and, if so, where such underground installations are located. When the excavation approaches the approximate location of such an installation, the exact location shall be determined by careful probing or hand digging; and, when it is uncovered, adequate protection shall be provided for the existing installation. All known owners of underground facilities in the area concerned shall be advised of proposed Work at least 48 hours prior to the start of actual excavation."

C. The Owner and Engineer have determined the location of public utilities and underground structures as well as existing mapping permits. However, in accordance with California's Administrative Code, Section 1540, the Contractor shall make the effort to determine the exact location of underground installations.

1.4 PUBLIC UTILITIES AND AGENCIES AFFECTED

A. Electrical, Pacific Gas & Electric Company - Call: (707) 468-3954. It should be noted that where a structure is known to receive service and does not have overhead service, then underground service shall be assumed to exist. For underground utility location call Underground Service Alert (USA) at (800) 227-2600.

B. Gas, Pacific Gas & Electric Company has jurisdiction over gas lines and electrical power. Call: (707) 468-3954

C. Telephone Service, AT&T - Call: (530) 487-1056. It should be noted that where service to a structure is known to receive service and does not have overhead service, then underground service shall be assumed to exist. For assistance with location of underground telephone facilities, call U.S.A. at (800) 227-2600.

D. Water Service, California Water Service Company has jurisdiction over water utilities. Call: (530) 893-6300.

E. Drainage, City of Chico has jurisdiction over drainage facilities in the area. Call: (530) 879-6959.

F. Sewer Service, City of Chico has jurisdiction over sanitary sewer facilitiess in the area. Call: (530) 879-6959.

1.5 PROTECTION OF STREET OR ROADWAY MARKERS

A. The Contractor shall not destroy, remove, or otherwise disturb any existing survey markers, street monuments, or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or the permanent markers points that will be disturbed by the construction operations have been properly referenced. All survey markers or points disturbed by the Contractor shall be accurately replaced after all street or roadway resurfacing has been completed.

1.6 RESTORATION OF PAVEMENT

A. General. All paved areas, including asphalt concrete berms cut or damaged during construction, shall be replaced with similar materials and of a thickness equal to the existing plus 1 inch or 6 inches, whichever is greater, except where specific resurfacing requirements have been called for in the Contract Documents. Restoration of paved areas shall be in accordance with the requirements of Section 32 12 16, “Hot Mix Asphalt Paving.” All pavements that are subject to partial removal shall be neatly saw cut in straight lines.

B. Temporary Resurfacing. The Contractor shall place temporary surfacing promptly after backfilling and shall maintain such surfacing until final restoration of improvements.

C. Permanent Resurfacing. Damaged edges of pavement along excavations and elsewhere shall be trimmed back by saw cutting in straight line to provide a clean, sound, vertical joint before permanent replacement of an excavated or damaged portion of pavement. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent

undisturbed pavement and other facilities (i.e., valve lids, manhole covers, etc). The Contractor shall replace damaged pavement striping in kind.

D. Restoration of Sidewalks. Wherever sidewalks have been removed for purposes of construction, the Contractor shall place suitable temporary sidewalks promptly after backfilling and shall maintain them in satisfactory condition until the final restoration there has been made.

1.7 EXISTING UTILITIES AND IMPROVEMENTS

A. General. The Contractor shall protect all existing underground utilities and other improvements that may be impaired during construction operations. It shall be the Contractor's responsibility to ascertain the actual location of all existing utilities and other improvements that will be encountered in its construction operations, and to see that such utilities or other improvements are adequately protected from damage due to such operations. The Contractor shall take all possible precautions for the protection of unforeseen utility lines to provide for uninterrupted service and to provide such special protection as may be necessary.

B. Utilities to be moved. In case it shall be necessary to move the property of any public utility or franchise holder, such utility company or franchise holder will, upon request of the Contractor, be notified by the Owner to move such property. Time of relocation of the utility by the utility company is not a responsibility of the Owner. When utility lines that are to be removed are encountered within the area of operations, the Contractor shall notify the Engineer a sufficient time in advance for the necessary measures to be taken to prevent interruption of service.

C. Where the proper completion of the Work requires the temporary or permanent removal and/or relocation of an existing utility or other improvement that is indicated, the Contractor shall remove and, without unnecessary delay, temporarily replace or relocate such utility or improvement in a manner satisfactory to the Engineer and the Owner of the facility. In all cases of such temporary removal or relocation, restoration to former location shall be accomplished by the Contractor in a manner that will restore or replace the utility or improvement as nearly as possible to its former location and to equal or better condition as found prior to removal.

D. Owner's Right of Access. The right is reserved to the Owner and to the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the Work of this Contract.

E. Underground Utilities Indicated. Existing utility lines that are indicated or the locations of which are made known to the Contractor prior to excavation and that are to be retained, and all utility lines that are constructed during excavation operations shall be protected from damage during excavation and backfilling, and if damaged, shall be immediately repaired or replaced by the Contractor to the satisfaction of the Engineer.

F. Underground Utilities not Indicated. In the event that the Contractor damages any existing utility lines that are not indicated or the locations of which are not made known to the Contractor prior to excavation, a written report there-of shall be made by the Contractor to the Owner.

G. All costs of locating, repairing damage not due to failure of the Contractor to exercise reasonable care, and removing or relocating such utility facilities not shown in the Contract documents with

reasonable accuracy, and for equipment on the project which was actually working on that portion of the Work which was interrupted or idled during such Work will be paid for as extra Work.

H. Approval of Repairs. All repairs to a damaged utility or improvement are subject to inspection and approval by an authorized representative of the utility or improvement Owner before being concealed by backfill or other Work. Contractor to schedule with Owner for all inspections.

I. Maintain In Service. All power and telephone or the communication cable ducts, gas and water mains, irrigation lines, sanitary sewer lines, storm drain lines, poles, and overhead power and communication wires and cables encountered along the line of Work shall remain continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the Engineer are made with the Owner of said pipelines, duct, main, irrigation lines, sanitary sewer, storm drain, pole, or wire or cable. The Contractor shall be responsible for and shall repair all damage due to its operations, and the provisions of this section shall not be abated even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling.

1.8 TREES WITHIN STREET RIGHTS-OF-WAYS AND PROJECT LIMITS

A. General. The Contractor shall exercise all necessary precautions so as not to damage or destroy any trees or shrubs to remain, including those lying within street rights-of-way and project limits, and shall not trim or remove any trees unless such trees have been approved for trimming or removal by the Owner. All existing trees and shrubs to remain that are damaged during construction shall be trimmed or replaced by the Contractor or a certified tree company under permit from the Owner. Tree trimming and replacement shall be accomplished in accordance with the following paragraphs.

B. Trimming. Symmetry of the tree shall be preserved; no stubs or splits or torn branches left; clean cuts shall be made close to the trunk or large branch. Spikes shall not be used for climbing live trees. All limbs over 1-1/2 inches in diameter shall be coated with an asphaltic emulsion material.

C. Replacement. The Contractor shall immediately notify the Owner if any tree is damaged by the Contractor’s operations. If, in the opinion of the Owner, the damage is such that replacement is necessary, the Contractor shall replace the tree at its own expense. The tree shall be of a like size and variety as the tree damaged, or, if of a smaller size, the Contractor shall pay to the Owner of said tree a compensatory payment acceptable to the tree Owner, subject to the approval of the jurisdictional agency or Owner. The size of the trees shall be not less than 1-inch diameter nor less than 6 feet in height.

1.9 NOTIFICATION BY THE CONTRACTOR

A. Prior to any excavation in the vicinity of any existing underground facilities, including all water, sanitary sewer, storm drain, gas, or other pipelines; all buried electric power, communications, or television cables; all traffic signal and street lighting facilities; and all roadway; the Contractor shall notify the respective authorities representing the owners or agencies responsible for such facilities not less than three (3) days nor more than seven (7) days prior to excavation so that a representative of said owners of agencies can be present during such Work if they so desire. The Contractor shall also notify USA at (800) 227-2600 at least 2 days, but no more than 14 days, prior to such excavation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CONTRACTOR RESPONSIBILITY

A. The Contractor shall anticipate water, sanitary sewer, electrical, gas, communication, drainage and telephone services. It may be expected that there will be variation in location from that as shown on the Drawings to the actual location. Contractor responsible for verifying actual location in the field after pre-marking by the various utilities affected.

B. No extra payment will be allowed for the removal, replacement, repair, or possible increased cost caused by inadvertent or planned interception and breaking of underground obstructions which may exist.

C. It should be understood that the various utilities are indicated on the Drawings to show only the approximate location and must be verified in the field by the Contractor. The various utility agencies will cooperate with the Contractor to endeavor to familiarize him with all known underground utilities obstructions, but this will not relieve the Contractor from full responsibility in anticipating and locating their actual location.

D. The Contractor, in conjunction with the affected utility company(s), shall pothole and establish the horizontal and vertical location of all utilities shown on the Drawings and marked in the field. This may be done on an area-by-area basis, but shall be accomplished at least five working days in advance of the date of construction within such area. Any discrepancies (horizontal and/or vertical) between the location of a utility found by the potholing operation than that shown on the Drawings shall be brought to the Engineer’s attention immediately. Potholing shall be required at the connection to existing facilities prior to the shop drawing submittals.

3.2 PRIOR INVESTIGATION

A. Prior to bidding, each bidder shall make his own subsurface investigations, talk to the various utilities affected to secure, for his own information, the knowledge of each utility with the precise location of their facilities so that he may take into account in his bid the difference in location from that believed to exist to that which may actually prove to be the precise location.

END OF SECTION 02 01 10

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SECTION 02 32 00 - GEOTECHNICAL INVESTIGATION DATA

PART 1 - GENERAL

1.1 INVESTIGATION

A. Soil and subsurface investigations were conducted for this project, and the results and recommendations are contained in the following report:
   1. Title: Geotechnical Engineering Investigation Report for the Butte Regional Transit Operations Center, 326 Huss Drive, Chico, California.
      Date: May 17, 2012.
      Author: Holdrege & Kull
   2. Title: Design Memorandum: Recommendations for Subgrade Soil Stabilization Using Lime Treatment
      Date: August 27, 2013
      Author: Holdrege & Kull

B. A copy of this information may be reviewed only at the office of the Owner or Engineer. A copy of the soils boring logs is included at the end of this section.

C. Reproductions of information will NOT be available or made at the office of the Engineer.

D. This report of explorations and tests of subsurface conditions at the site has been utilized by the Engineer in preparation of the Contract Documents. Bidder may rely upon the accuracy of the "technical" data contained in such reports but not upon nontechnical data, interpretations or opinions contained therein or for the completeness thereof for the purposes of bidding or construction.

E. This Geotechnical Investigation is not part of the Contract Documents but the technical data contained therein upon which Bidder is entitled to rely are incorporated therein by reference. Such technical data is boring method, location and logs; and laboratory test methods and results.

F. Before submitting a Bid, each Bidder will, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests and studies and obtain any additional information and data, which pertain to the physical conditions, surface or subsurface, at or contiguous to the site or otherwise which may affect cost, progress, performance or furnishing of the Work and which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 02 32 00

HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS

EXPLORATORY BORING LOG

8 SEVILLE COURT, SUITE 100, CHICO, CA 95928
(530) 894-2487 FAX 894-2437

Boring No. B12-1

Project Name: BCAG BRTOC | **Project No.:** 70395-01 | **Task:** 1 | **Start:** 03/07/12 | **Sheet:** 1 of 2

Location: HUSS DRIVE, CHICO, CA | **Ground Elev. (Ft. MSL):** | **Finish:** 03/07/12

Logged By: CUMMINGS, SHANE | **Drilling Cmpny:** PC EXPLORATION | **Drill Rig Type:** CME 75

Driller: NATE | **Drilling Method:** HOLLOW STEM AUGER | **Hammer Type:** 140 LB AUTO HAMMER

Boring Diam (In.): 7.25 | **Total Depth (Ft.):** 19 | **Backfill or Well Casing:** NATIVE CUTTINGS

Ground Water Information

Date	03/07/12			
Time	14:45			
Depth (ft)	NONE			

Time (H:M)	Pocket Penetrometer (TSF)	Uncorrected Blow Counts (Blows / 6-inch)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log	Soil and/or Rock Descriptions
14:05			HSA			1				(CL) SANDY CLAY, FLD. EST: 65% LOW PLASTICITY FINES , 35% VERY FINE TO FINE SAND, DARK BROWN (7.5YR 3/4), STIFF, DAMP
						2				
						3				
						4				
						5				
		7	2.5SS			6				
		9			2/2					
14:10	>4.75	10		0.8	L-1	7				
			HSA							(SM) SILTY SAND, FIELD ESTIMATE: 60% VERY FINE TO FINE SAND , 40% LOW PLASTIC FINES; BROWN (7.5YR, 5/4), MEDIUM DENSE, DRY TO DAMP, SLIGHTLY CEMENTED
						8				
						9				
						10				
14:15		6	2.5SS			11				
		17			1/1					
	>4.75	28		1.2	L-2	12				(GM) SITLY GRAVEL, FLD. EST: 40% FINE TO COURSE GRAVEL, 30% FINE TO MEDIUM SAND, 30% LOW PLASTICITY FINES; BROWN (7.5YR 5/4), DENSE, DRY
			HSA							
						13				
						14				SLOW DRILLING
						15				60% GRAVEL, 20% SAND, 20% LOW PLASTICITY FINES
14:30		27	SPT			16				COBBLES
		30								
	>4.75	19		0.5	--	17				
			HSA							
						18				
						19				
14:45										REFUSAL @ 19 FEET
						20				

NOTES:

HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS

EXPLORATORY BORING LOG

8 SEVILLE COURT, SUITE 100, CHICO, CA 95928
(530) 894-2487 FAX 894-2437

Boring No. B12-2

Project Name: BCAG BRTOC | **Project No.:** 70395-01 | **Task:** 1 | **Start:** 03/07/12 | **Sheet:** 1 of 1

Location: HUSS DRIVE, CHICO, CA | **Ground Elev. (Ft. MSL):** | **Finish:** 03/07/12

Logged By: CUMMINGS, SHANE | **Drilling Cmpny:** PC EXPLORATION | **Drill Rig Type:** CME 75

Driller: NATE | **Drilling Method:** HOLLOW STEM AUGER | **Hammer Type:** 140 LB AUTO HAMMER

Boring Diam (In.): 7.25 | **Total Depth (Ft.):** 16 | **Backfill or Well Casing:** NATIVE CUTTINGS

Ground Water Information

Date	03/07/12			
Time	15:30			
Depth (ft)	NONE			

Time (H:M)	Pocket Penetrometer (TSF)	Uncorrected Blow Counts (Blows / 6-inch)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log
15:00			HSA			1			
						2			
15:05		6	2.5SS			3			
		12			1/2	4			
	2.5	11		1.2	L-1				
			HSA			5			
15:10		9	2.5SS			6			
		10			1/1				
	2.5	12		0.9	L-2	7			
			HSA			8			
						9			
						10			
15:20		6	2.5SS			11			
		16			2/2				
	4.5	15		1.1	L-3	12			
			HSA			13			
						14			
						15			
15:30			SPT			16			
		13							
	>4.75	25		1.0	--	17			
						18			
						19			
						20			

Soil and/or Rock Descriptions

(USCS Symbol; Partical Size (%); Color; Density/Consistency; Moisture; Gradation; Dilatancy; Plasticity; Structure; Cementation; Organics, Fill Material; Other)

(CL) SANDY CLAY, FLD. EST: 65% LOW PLASTICITY FINES , 35% VERY FINE TO FINE SAND, DARK BROWN (7.5YR 3/4), STIFF, DAMP

(SM) SILTY SAND, FIELD ESTIMATE: 60% VERY FINE TO FINE SAND , 40% LOW PLASTIC FINES; BROWN (7.5YR, 5/4), MEDIUM DENSE, DRY TO DAMP, SLIGHTLY CEMENTED

(GM) SITLY GRAVEL, FLD. EST: 40% FINE TO COURSE GRAVEL, 30% FINE TO MEDIUM SAND, 30% LOW PLASTICITY FINES; BROWN (7.5YR 5/4), DENSE, DRY
VERY HARD DRILLING, COBBLES
REFUSAL @ 16 FEET

NOTES:

HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS

EXPLORATORY BORING LOG

8 SEVILLE COURT, SUITE 100, CHICO, CA 95928
(530) 894-2487 FAX 894-2437

Boring No. B12-3

Project Name: BCAG BRTOC | **Project No.:** 70395-01 | **Task:** 1 | **Start:** 03/08/12 | **Sheet:** 1 of 1

Location: HUSS DRIVE, CHICO, CA | **Ground Elev. (Ft. MSL):** | **Finish:** 03/08/12

Logged By: CUMMINGS, SHANE | **Drilling Cmpny:** PC EXPLORATION | **Drill Rig Type:** CME 75

Driller: NATE | **Drilling Method:** HOLLOW STEM AUGER | **Hammer Type:** 140 LB AUTO HAMMER

Boring Diam (In.): 7.25 | **Total Depth (Ft.):** 19.5 | **Backfill or Well Casing:** NATIVE CUTTINGS

Ground Water Information

Date	03/08/12			
Time	09:50			
Depth (ft)	NONE			

Time (H:M)	Pocket Penetrometer (TSF)	Uncorrected Blow Counts (Blows / 6-Inch)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log
09:20			HSA			1			
						2			
09:25		5	SPT			3			
		2							
	1.5	3		1.5	--	4			
			HSA			5			
09:30		2	SPT						
		5				6			
	2.0	4		1.5	--				
			HSA			7			
						8			
						9			
						10			
09:35		5	SPT						
		8				11			
	2.0	10		1.5	--				
			HSA			12			
						13			
						14			
						15			
09:40		4	SPT						
		7				16			
	3.75	11		1.5	--				
			HSA			17			
						18			
						19			
09:50						20			

Soil and/or Rock Descriptions

(USCS Symbol; Partical Size (%); Color; Density/Consistency; Moisture; Gradation; Dilatancy; Plasticity; Structure; Cementation; Organics, Fill Material; Other)

(CL) SANDY CLAY, FLD. EST: 65% LOW PLASTICITY FINES , 35% VERY FINE TO FINE SAND, DARK BROWN (7.5YR 3/4), STIFF, DAMP

BULK SAMPLE ID: 030712A, COLLECTED FROM 0 TO 5 FEET

(SM) SILTY SAND, FIELD ESTIMATE: 60% VERY FINE TO FINE SAND , 40% LOW PLASTIC FINES; BROWN (7.5YR, 5/4), MEDIUM DENSE, DRY TO DAMP, SLIGHTLY CEMENTED

(GM) SITLY GRAVEL, FLD. EST: 40% FINE TO COURSE GRAVEL, 30% FINE TO MEDIUM SAND, 30% LOW PLASTICITY FINES; BROWN (7.5YR 5/4), DENSE, DRY

REFUSAL @ 19.5 FEET

NOTES:

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EXPLORATORY BORING LOG

8 SEVILLE COURT, SUITE 100, CHICO, CA 95928
(530) 894-2487 FAX 894-2437

Boring No. B12-4

Project Name: BCAG BRTOC | **Project No.:** 70395-01 | **Task:** 1 | **Start:** 03/08/12 | **Sheet:** 1 of 1

Location: HUSS DRIVE, CHICO, CA | **Ground Elev. (Ft. MSL):** | **Finish:** 03/08/12

Logged By: CUMMINGS, SHANE | **Drilling Cmpny:** PC EXPLORATION | **Drill Rig Type:** CME 75

Driller: NATE | **Drilling Method:** HOLLOW STEM AUGER | **Hammer Type:** 140 LB AUTO HAMMER

Boring Diam (In.): 7.25 | **Total Depth (Ft.):** 18 | **Backfill or Well Casing:** NATIVE CUTTINGS

Ground Water Information

Date	03/08/12			
Time	10:35			
Depth (ft)	NONE			

Time (H:M)	Pocket Penetrometer (TSF)	Uncorrected Blow Counts (Blows / 6-Inch)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log	Soil and/or Rock Descriptions
10:00			HSA			1				(CL) SANDY CLAY, FLD. EST: 65% LOW PLASTICITY FINES , 35% VERY FINE TO FINE SAND, DARK BROWN (7.5YR 3/4), STIFF, DAMP
						2				
10:05		4	SPT			3				
		3								
	0.5	4		0.8	--	4				
			HSA			5				
10:10		3	SPT							
		4				6				
	2.0	10		1.2	--					
			HSA			7				
						8				
						9				
						10				
10:20		4	SPT							
		6				11				
	2.0	8		1.5	--					(SM) SILTY SAND, FIELD ESTIMATE: 60% VERY FINE TO FINE SAND , 40% LOW PLASTIC FINES; BROWN (7.5YR, 5/4), MEDIUM DENSE, DRY TO DAMP, SLIGHTLY CEMENTED
			HSA			12				
						13				
						14				
						15				
10:25		2	SPT							
		8				16				
	2.5	10		1.5	--					
			HSA			17				
10:35						18				(GM) SITLY GRAVEL, FLD. EST: 40% FINE TO COURSE GRAVEL, 30% FINE TO MEDIUM SAND, 30% LOW PLASTICITY FINES; BROWN (7.5YR 5/4), DENSE, DRY REFUSAL @ 18 FEET
						19				
						20				

NOTES:

HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS

EXPLORATORY BORING LOG

8 SEVILLE COURT, SUITE 100, CHICO, CA 95928
(530) 894-2487 FAX 894-2437

Boring No. B12-5

Project Name: BCAG BRTOC | **Project No.:** 70395-01 | **Task:** | **Start:** 03/08/12 | **Sheet:** 1 of 1

Location: HUSS DRIVE, CHICO, CA | **Ground Elev. (Ft. MSL):** | **Finish:** 03/08/12

Logged By: CUMMINGS, SHANE | **Drilling Cmpny:** PC EXPLORATION | **Drill Rig Type:** CME 75

Driller: NATE | **Drilling Method:** HOLLOW STEM AUGER | **Hammer Type:** 140 LB AUTO HAMMER

Boring Diam (In.): 7.25 | **Total Depth (Ft.):** 18 | **Backfill or Well Casing:** NATIVE CUTTINGS

Ground Water Information

Date	03/08/12			
Time	11:20			
Depth (ft)	NONE			

Time (H:M)	Pocket Penetrometer (TSF)	Uncorrected Blow Counts (Blows / 6-inch)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log	Soil and/or Rock Descriptions
10:45			HSA			1				(CL) SANDY CLAY, FLD. EST: 65% LOW PLASTICITY FINES , 35% VERY FINE TO FINE SAND, DARK BROWN (7.5YR 3/4), STIFF, DAMP
						2				
10:50		3	SPT			3				
		3								
	2.5	3		1.5	--	4				
			HSA			5				
10:55		3	SPT							
		6				6				
	2.25	4		0.7	--	7				
			HSA							
						8				
						9				
						10				
11:05		4	SPT							
		4				11				
	2.5	5		1.5	--	12				(SM) SILTY SAND, FIELD ESTIMATE: 60% VERY FINE TO FINE SAND , 40% LOW PLASTIC FINES; BROWN (7.5YR, 5/4), MEDIUM DENSE, DRY TO DAMP, SLIGHTLY CEMENTED
			HSA			13				
						14				
						15				(GM) SITLY GRAVEL, FLD. EST: 40% FINE TO COURSE GRAVEL, 30% FINE TO MEDIUM SAND, 30% LOW PLASTICITY FINES; BROWN (7.5YR 5/4), DENSE, DRY
11:10		35	SPT							
	--	50/4		--	--	16				REFUSAL @ 16.5 FEET
11:20			HSA			17				
						18				
						19				
						20				

NOTES:

HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS

EXPLORATORY BORING LOG

8 SEVILLE COURT, SUITE 100, CHICO, CA 95928
(530) 894-2487 FAX 894-2437

Boring No. B12-6

Project Name: BCAG BRTOC | **Project No.:** 70395-01 | **Task:** | **Start:** 03/08/12 | **Sheet:** 1 of 1

Location: HUSS DRIVE, CHICO, CA | **Ground Elev. (Ft. MSL):** | **Finish:** 03/08/12

Logged By: CUMMINGS, SHANE | **Drilling Cmpny:** PC EXPLORATION | **Drill Rig Type:** CME 75

Driller: NATE | **Drilling Method:** HOLLOW STEM AUGER | **Hammer Type:** 140 LB AUTO HAMMER

Boring Diam (In.): 7.25 | **Total Depth (Ft.):** 17.5 | **Backfill or Well Casing:** NATIVE CUTTINGS

Ground Water Information

Date	03/08/12			
Time	12:05			
Depth (ft)	NONE			

Time (H:M)	Pocket Penetrometer (TSF)	Uncorrected Blow Counts (Blows / 6-inch)	Drilling Method and/or Sampler Type	Sample Recovery (Ft./Ft.)	Sample No.	Depth B.G.S. (Ft.)	Sample Interval And Symbol	Well Construction Detail	Graphic Log	Soil and/or Rock Descriptions
11:30			HSA			1				(CL) SANDY CLAY, FLD. EST: 65% LOW PLASTICITY FINES , 35% VERY FINE TO FINE SAND, DARK BROWN (7.5YR 3/4), STIFF, DAMP
						2				
11:35		5	SPT			3				
		2								
	1.5	4		1.5	--	4				
			HSA			5				
11:40		4	SPT							
		6				6				
	1.5	5		1.5	--					
			HSA			7				
						8				
						9				
						10				(SM) SILTY SAND, FIELD ESTIMATE: 60% VERY FINE TO FINE SAND , 40% LOW PLASTIC FINES; BROWN (7.5YR, 5/4), MEDIUM DENSE, DRY TO DAMP, SLIGHTLY CEMENTED
11:45		4	SPT							
		5				11				
	--	3		--	--					
			HSA			12				
						13				
						14				
						15				
12:00		3	SPT							
		4				16				
	--	8		--	--					
			HSA			17				
12:05						18				(GM) SITLY GRAVEL, FLD. EST: 40% FINE TO COURSE GRAVEL, 30% FINE TO MEDIUM SAND, 30% LOW PLASTICITY FINES; BROWN (7.5YR 5/4), DENSE, DRY REFUSAL @ 17.5 FEET
						19				
						20				

NOTES:

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SECTION 02 41 10 - DEMOLITION, SALVAGE AND ABANDONMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Contractor shall furnish all tools, equipment, materials, and supplies and shall perform all labor as required for the demolition, abandonment, or removal of pavements and structures and utility abandonments, as indicated on the Drawings and as specified herein.

B. The Work of this Section shall include, but shall not be limited to the following items:
   1. Demolition of asphalt pavement, concrete structures, concrete pavement, curb, gutter, sidewalk, underground piping, and other features as required to install utilities, structures, concrete pavement and asphalt pavement.
   2. Abandonment or removal of existing pipe and other utilities as indicated on the Drawings and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 31 00, PROJECT MANAGEMENT AND COORDINATION

B. Section 02 01 00, SITE CONDITIONS

C. Section 02 01 10, EXISTING UTILITIES AND UNDERGROUND STRUCTURES

D. Section 02 32 00, GEOTECHNICAL INVESTIGATION DATA

E. Section 31 00 00, EARTHWORK

F. Section 31 11 00, SITE CLEARING AND GRUBBING

1.3 DEMOLITION/ABANDONMENT COORDINATION

A. The Contractor shall maintain the existing BCAG Transit Maintenance Facility and all associated utilities in service and operational until the new Maintenance Building and Operations Building are fully operational, occupied and in use by BCAG and their contractors.

B. The Contractor shall anticipate and coordinate construction demolition and improvement phasing as shown on the Drawings and described in the Construction Documents.

C. The Contractor shall carefully coordinate the extent of the Work in areas where existing utilities shall be reconnected to new facilities and where existing facilities shall remain operational.

D. While Work is being performed, the Contractor shall provide adequate access for normal transit operations, including routine operation and maintenance. The Contractor shall erect and maintain fences, warning signs, barricades, and other devices as required for the protection of the Contractor's and Owner’s employees and the public around pipelines, structures and excavations. The Contractor

shall remove all such protection when the demolition/abandonment operations are completed, or as Work progresses, or when directed by the Engineer.

E. The Contractor shall coordinate all Work with the Engineer.

F. The Contractor shall be responsible for scheduling and coordinating any required shut down and/or relocations as necessary for performance of the work.

1.4 SUBMITTALS

A. Demolition and Abandonment Plan: The Contractor shall prepare and submit a Utility and Building Demolition and Abandonment Plan to the Engineer for review at least 14 days prior to start of demolition. The procedures shall provide for safe conduct of the Work, careful deactivation of utilities serving existing buildings, removal and disposition of materials and equipment, protection of property which are to remain undisturbed, coordination with existing facilities to remain in service, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operation.

1.5 REPAIR OF DAMAGE

A. Any damage to existing street improvements, utility poles, building elements to remain, other existing utilities and facilities to remain, and private property, as caused by the Contractor's operations shall be repaired at the Contractor's expense to the satisfaction of the Engineer.

B. Damaged items shall be repaired or replaced with new materials as required to restore damaged items or surfaces to a condition equal to and matching that existing prior to damage or start of Work of this Contract.

1.6 PROTECTION OF EXISTING FACILITIES

A. Before beginning any cutting, trenching, demolition or abandonment Work, the Contractor shall carefully inspect the existing facilities to determine the extent of the Work. The Contractor shall take all necessary precautions to prevent damage to existing facilities which are to remain in place and in operation. The Contractor shall be responsible for any damages to existing facilities, which are caused by the operations of the Contractor. Damages to such facilities shall be repaired or replaced to existing condition at no additional cost to the Owner and to the satisfaction of the Engineer. The Contractor shall carefully coordinate the Work of this Section with all other Work and shall provide shoring, bracing, and supports, as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition Work performed under any part of this Contract. The Contractor shall remove all temporary protection when the Work is complete or when so authorized by the Engineer.

B. The Contractor shall carefully consider all bearing loads and capacities for placement of equipment and material.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 DEMOLITION AND ABANDONMENT OF FACILITIES

A. Demolition shall be accomplished in accordance with applicable codes and regulations. Blasting shall not be permitted.

B. Disposal of all materials shall be performed in compliance with all applicable local, state and federal codes, regulations, and requirements. Structures to be abandoned shall be cleaned prior to abandonment.

C. Demolition activities shall be phased as shown on the Drawings to allow for the continued and uninterrupted operation of the existing BCAG Transit Maintenance Facility and all associated utilities until the new Maintenance Building and Operations Building are fully operational, occupied and in use by BCAG and their contractors.

D. The Drawings used in this Contract to indicate demolition, abandonment and salvage are based on Record Drawings and the best available information on the existing facilities. The structures and utilities may differ slightly. Prior to the submittal of bids, the Contractor shall conduct a comprehensive survey of the facilities to verify the scope of Work, the extent of utilities, and the physical sequencing constraints.

E. The Contract Drawings define the minimum portion of the structures to be removed. Unless otherwise shown on the Drawings, the Contractor may make rough cuts or breaks that exceed the limits of demolition shown.

F. All debris, materials, piping, and miscellaneous waste products from the demolition process shall be removed safely from the project site as soon as possible. They shall be disposed of in accordance with applicable federal, state, and local regulations. The Contractor is responsible for determining and complying with these regulations and shall bear all costs associated with disposal of these items.

G. All equipment, materials, and piping within the limits of the demolition shall become the property of the Contractor, unless noted otherwise on the Drawings, and shall be removed from the site.

H. No toxic or hazardous materials are anticipated for demolition or removal. If these or questionable substances are found during the demolition process, report the condition immediately to the Engineer in writing.

3.2 UTILITIES

A. The known utilities on site are potable water, gas, communications, electricity, storm drains and sanitary sewer, as described in Section 02 01 10, EXISTING UTILITIES AND UNDERGROUND STRUCTURES.

B. The Contractor shall be responsible for coordinating all utility service shut-downs with the Owner or Owner’s Representative before demolition is started.

C. Where utility lines are exposed by demolition excavation, they shall be removed.

D. Sewer lines and other piping to be plugged and abandoned shall be done so in accordance with City of Chico Standards.

E. All utilities designated to remain in service shall remain in service for the duration of the work.

3.3 PAVING DEMOLITION

A. Asphalt concrete and armor coats shall be saw cut with a suitable tool before excavation. For all roads and paved areas, saw cutting shall be required. Breaking of asphalt, concrete, or armor coats with jack hammers or excavation equipment will not be permitted.

B. All edges of asphalt concrete or armor coats shall be cut four (4) inches vertically, with a neat, square edge.

C. In all cases, existing asphalt paving or armor coating shall be saw cut out after construction and just prior to final paving to a point twelve (12) inches or more wider than each side of the trench line. Saw cuts shall be parallel or perpendicular to centerline of the trench. Any strip of existing pavement with a width of four (4) feet or less shall be removed and replaced with new pavement.

D. The Contractor shall dispose of all Portland cement concrete and asphalt concrete generated from removal or demolition activities on the project at a recycler for these materials. The Contractor shall provide receipts verifying delivery and approximate quantity (TONS) of the material delivered to the material recycler. Recycled paving may be reused after inspection and written approval by the Geotechnical Engineer.

3.4 TREE REMOVAL

A. Tree Removal:
   1. It is understood that the Contractor has examined the site and has full knowledge of the conditions and difficulties to be met. No variations or allowances from the contract sum will be made because of such lack of knowledge.
   2. Trees designated for removal are shown on the Drawings and will be clearly marked. Trees will be removed in a manner consistent with the tree removal plan, the health and safety of the tree, the general public, and private property.

B. Public Safety: During removal, the Contractor shall be responsible for public safety, including:
   1. The placement of barricades, warning cones, or roping off an area in which work is taking place.
   2. Traffic and pedestrian control when necessary.
   3. Maintenance of a clear right-of-way at the end of the working day on sidewalks, streets, and driveways. If objects are left in the right-of-way overnight, they must be coned off.
   4. Any brush chipper left unattended shall have the hopper closed, the ignition locked and key removed.
   5. Ropes shall be pulled out of the tree or secured high enough to be out of reach at the end of the working day.
   6. Saws and other tools, when not in use, shall be secured.

7. Each crew will have easily accessible a fire extinguisher, first aid kit and a list of local emergency telephone numbers with them.

3.5 PROTECTED AREAS

A. The existing structures not designated for removal, along with its associated utilities and landscaping, shall remain in place, in service and accessible to employees. The Contractor shall exercise caution when working near these structures. Any damage to this building, surrounding landscaping, or paved areas shall be repaired or replaced to original pre-contract conditions at the Contractor's sole expense. The Contractor is responsible for providing any temporary access as required for this facility.

B. All other areas of the site not within the limits of demolition and grading shown on the Drawings shall be left undisturbed. Any damage to these areas during the demolition or construction process shall be repaired or replaced to original pre-contract conditions at the Contractor's sole expense. Disturbed areas, not within the demolition and grading limits shown on the Drawings, shall be reseeded.

3.6 BACKFILLING

A. The Contractor shall backfill all demolition areas to final grade with appropriate fill material as shown on the Drawings and described in these Specifications.

B. Backfill material shall meet the applicable requirements of SECTION 31 00 00, EARTHWORK. In all areas not immediately backfilled to ground level, the Contractor shall erect safety barriers around the excavation.

END OF SECTION 02 41 10

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SECTION 03 10 00 – CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes, but is not necessarily limited to, the furnishing and installing of formwork for all cast-in-place concrete as indicated on the Drawings and specified herein.

B. Related Sections include the following:
1. Section 03 20 00, Concrete Reinforcing
2. Section 03 30 00, Cast-in-Place Concrete

1.3 QUALITY ASSURANCE

A. Reference Standards:
1. American Concrete Institute (ACI):
   a. ACI 347, Guide to Formwork for Concrete.
   b. ACI SP-4, Formwork for Concrete.
   c. ACI 117, Standard Specifications for Tolerances for Concrete Construction and Materials.
2. California Building Code (CBC), 2013 Edition.

B. The design and engineering of all formwork, falsework, and shoring, as well as its construction and protection, is the Contractor's responsibility.

1.4 SUBMITTALS

A. Formwork Shop Drawings: Submit shop drawings showing fabrication and assembly details for complete and accurate placement signed by a qualified professional engineer. Include proposed schedule and sequence of removing formwork and shoring.

B. Material Certificates: Provide manufacturer’s certification for form materials and form release agents.

PART 2 - PRODUCTS

2.1 FORMWORK MATERIALS

A. Provide formwork materials that will provide continuous, true, and smooth concrete surfaces.

B. Forms-facing materials: Exterior grade plywood panels complying with PS 1 and as follows:

1. B-B (Concrete Form), Class 1 or better, mill oiled and edge sealed.
2. Structural I, B-B or better, mill oiled and edge sealed.
3. High Density Overlay, Class 1 or better.
4. Medium Density Overlay, Class 1 or better, mill oiled and edge sealed.

C. Void Forms: Biodegradable paper surface, structurally sufficient to support weight of concrete and other construction loads.

D. Chamfer Strips: Wood, metal, rubber or PVC strips, ¾" x ¾" minimum, or as noted on the Drawings.

E. Form Ties: Adjustable type, arranged to leave no metal within one inch of surface and without lugs, cones or other devices that will leave holes larger than one inch diameter in exposed concrete surfaces.

F. Form Coating: Clear, non-staining type which will not discolor or adversely affect the surface of the concrete, will not react adversely with any ingredients of the concrete and will not impair subsequent concrete treatments or finishes.

PART 3 - EXECUTION

3.1 GENERAL

A. Design, furnish, erect, support, brace and maintain formwork, bulkheads and shoring according to ACI 301 to support safely all vertical and lateral symmetrical and unsymmetrical loads that might be applied until such loads can be carried by the concrete work.

B. All concrete exposed to view except as otherwise indicated and specified, shall have smooth finish of uniform texture, free from visible irregularities and free from coating, oils, or other matter that will prevent bonding of waterproofing or painting materials. Concrete work out of alignment, level, or plumb will be rejected and shall be removed and replaced at no additional cost to Owner.

C. Provisions for Other Trades: Provide openings for mechanical and electrical work and work or other trades. Place items to be incorporated in concrete and support formwork. Be responsible for location, elevation and size of all openings and sleeves required in the concrete work, and obtain setting and size requirements for all sleeves from the trade requiring the same.

3.2 FORMWORK

A. Build and erect forms to conform to the required shapes, lines, grades and dimensions indicated on the Drawings, within the tolerances of ACI 117.

B. Forms shall be substantial, and tight to prevent leakage of mortar, and shall be properly braced and tied together to maintain specified tolerances for support of the plastic concrete or of the construction loads.

C. Joints in forming material shall be butted tightly and bear on solid construction. All bevels, grooves, recesses, etc., shall be carefully formed to neat straight lines.

D. Chamfer corners of exposed concrete as indicated in the Drawings.

E. Forms shall be so constructed that they can be removed readily without hammering, wedging or prying against the concrete.

F. Apply specified form release agent to all forms, as recommended by manufacturer, before reinforcing steel is placed.

3.3 CONSTRUCTION, ERECTION, REMOVAL, AND SHORING

A. General Requirements: Formwork shall be observed continuously while concrete is being placed, to ensure that there are no changes of elevation, plumbness, or camber. If, during construction, any weakness develops and the falsework shows settlement or distortion, the work shall be stopped, the affected construction removed if permanently damaged, and the falsework strengthened as necessary to eliminate further settlement or distortion.

B. Form Removal: Remove forms, shoring and bracing carefully to avoid damage to fresh concrete, but not before concrete is capable of self-support and support of construction loads. Do not pry against concrete. Use wooden wedges only. Do not pull tie rods until concrete is hard enough to permit withdrawal without damage to concrete. When forms are removed during specified curing period, cure the concrete as specified in Section 03300, Cast-in-Place Concrete. Leave forms in place for the following periods:
   1. Vertical surfaces: 2 days minimum, or until concrete is hard enough to not be damaged by form removal operations.
   2. Slabs and Beams: 7 days minimum, or until 70% of the design strength is reached.

C. Reuse:
   1. Plywood: Before reuse of plywood forms, thoroughly clean, sand and recoat with form coating. Do not reuse damaged plywood that has torn grain, patches and worn edges.
   2. Other Wood Forms: Prepare for reuse by thorough cleaning and recoat with form coating. Repair damaged forms and replace loose or damaged boards.

END OF SECTION 03 10 00

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SECTION 03 20 00 – CONCRETE REINFORCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes, but is not necessarily limited to, the furnishing and installing of steel reinforcement for all concrete work as indicated on the Drawings and specified herein.

B. Related Sections include the following:
   1. Section 03 10 00, Concrete Forming & Accessories
   2. Section 03 30 00, Cast-in-Place Concrete

1.3 QUALITY ASSURANCE

A. Reference Standards:
   1. American Concrete Institute (ACI):
      a. ACI 318, Building Code Requirements for Reinforced Concrete.
      b. ACI 315, Details and Detailing of Concrete Reinforcement.
      c. ACI 117, Standard Specifications for Tolerances for Concrete Construction and Materials.
   2. Concrete Reinforcing Steel Institue (CRSI):
      a. Recommended Practice for Placing Reinforcing Bars
      b. Recommended Practice for Placing Bar Supports, Specifications, and Nomenclature.
      c. Manual of Standard Practice.
   3. California Building Code (CBC), 2013 Edition.

B. Requirements of Regulatory Agencies: Special Inspection during placement of reinforcement is required in accordance with Chapter 17 of CBC, and shall be paid for by the Owner.

C. Welding Qualifications: Welders and procedures shall be qualified in accordance with AWS D1.4, Structural Welding Code – Reinforcing Steel.

1.4 SUBMITTALS

A. LEED Submittals: For products having recycled content, provide documentation indicating percentages of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

B. Steel Reinforcing Shop Drawings: Submit shop drawings showing fabrication, bending and placing details for complete and accurate location of reinforcement.

1. Details of reinforcement shall be in accordance with ACI 318 and ACI 315.
2. Reinforcing steel shall not be fabricated or placed before Shop Drawings have been reviewed and returned to Contractor.

C. Welding certificates.

D. Material Certificates: Submit certified mill test reports and manufacturer's certification for each heat of steel used for reinforcing bars and mechanical splice devices.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver reinforcing bars in bundles with mill tags bearing heat numbers intact.

B. Pile reinforcement at site to prevent excessive rusting or fouling that will interfere with bond.

C. Store so as to maintain identification after bundles are broken.

PART 2 - PRODUCTS

2.1 GENERAL

A. Recycled Content: Provide products with an average recycled content of steel so post-consumer plus one-half pre-consumer recycled content is at least 25%.

2.2 STEEL REINFORCEMENT

A. Reinforcing bars: ASTM A615, Grade 60, deformed.

B. Low Alloy Steel Reinforcing Bars: ASTM A706, deformed.

C. Welded Wire Fabric: ASTM A185.

D. Tie Wire: ASTM A82.

2.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, bar supports, and other accessories as required in accordance with CRSI Manual of Standard Practice.
1. Legs of accessories to be of type that will rest on forms without embedding into forms.
2. Galvanize metal items that are exposed to moisture or use approved other non-corrodible, non-staining supports.
3. Use plastic or plastic-coated accessories for supporting accessories at exposed concrete surfaces.

2.4 FABRICATION

A. Comply with details on Drawings and fabricate reinforcing in accordance with CRSI Manual of Standard Practice.

B. Reinforcing steel shall be cut and bent cold to exact lengths and shapes required.

C. Contractor is responsible for providing reinforcement that will comply with Contract Documents within tolerances specified.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with CRSI Manual of Standard Practice.

B. Reinforcement shall be free of paint, oil, dirt, scale or loose rust or coating that might reduce bond with concrete.

C. Prior to placing concrete, reinforcement shall be inspected and, if necessary, cleaned, relocated, and tied at no additional cost to Owner.

D. Provisions for Other Trades: Coordinate location of anchors, inserts, conduits, sleeves, and other items which are required to be cast in concrete and notify Architect when such embedded items interfere with placing of reinforcing steel before concrete is placed.

E. Securely tie rebar and support reinforcement to prevent displacement by construction traffic and during casting of concrete and to maintain minimum concrete cover. Displacement of reinforcement shall be immediately corrected.

F. Maintain reinforcement at proper distance from form face.

G. Tie wires shall be bent away from form.

H. Tack welding of reinforcement bars is prohibited.

I. Lap welded wire fabric at least one mesh width plus end extension of wires, but not less than six inches and lace wire fabric together at laps.

J. Reinforcement shall not be bent after being embedded in hardened concrete.

END OF SECTION 03 20 00

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SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes, but is not necessarily limited to, the furnishing and placing of cast-in-place concrete as indicated on the Drawings and specified herein.

B. Related Sections include the following:
1. Section 03 10 00, Concrete Forming & Accessories
2. Section 03 20 00, Concrete Reinforcing

1.3 QUALITY ASSURANCE

A. Coordination: The Contractor shall be responsible for installation of all accessories embedded in concrete etc. necessary for execution of the work of other trades. For holes larger than 6" diameter, contact engineer for review.
1. Patching or cutting made necessary by failure or delay in complying with this requirement shall be at Contractor's expense.

B. The Testing Agency shall not be affiliated with concrete supplier.

C. The special requirements for HVFAC include having mix designs proportioned by a qualified concrete technologist; specific testing requirements; and specific curing procedures. HVFAC technology may require additional procedures that differ from those used in non HVFAC. Contractor shall conduct Field Trials before actual concrete construction commences to educate workers as to the characteristics (handling, pumpability, finishing, etc.) of working with HVFAC.

D. Requirements of Regulatory Agencies:
1. Perform work in accordance with codes and standards specified herein.
2. "Special Inspection" of concrete is required per Chapter 17 of California Building Code (CBC) 2013 Edition, and shall be paid for by the Owner. Inspector shall also inspect installation of sill bolts, hold-down bolts and structural embed items.
3. Contractor shall be responsible for quality of concrete in place and shall bear burden of proof that concrete as placed meets minimum requirements.

E. Reference Standards:
1. American Concrete Institute (ACI): (latest edition).
   a. ACI 301, "Specification for Structural Concrete for Buildings."
   b. ACI 304, "Recommended Practice for Measuring, Mixing, and Placing Concrete."
   c. ACI 305, "Recommended Practice for Hot-Weather Concreting."
   d. ACI 307, "Recommended Practice for Cold-Weather Concreting."
   e. ACI 318, "Building Code Requirements for Reinforced Concrete."

f. ACI 221, “Standard Practice for Selecting Proportions for Normal, Lightweight and Mass Concrete.”
g. ACI 233R, “Ground Granulated Blast Furnace Slag as a Cementitious Constituent in Concrete.”

2. American Society for Testing and Materials.
3. California Code (CBC) 2013 Edition.

1.4 SUBMITTALS

A. Shop Drawings: Show construction joint and control joint locations for Architect's review.

B. Test Reports: Submit "Special Inspection" reports of concrete compression, yields, air content, and slump test by Testing Laboratory to Owner, Architect, Contractor, and organization being tested or inspected.

C. Certificates:
1. Certified copies of mix designs for each concrete class specified, including compressive strength.
2. Certification that materials meet requirements specified.
3. Certification from vendor that samples originate from and are representative of each lot proposed for use.
4. Testing Agency's certificate of compliance.

D. Concrete Compressive Strength Cylinders for HVFAC and SCC:
1. Comply with ACI 301
2. Take sets for every 100 cubic yards of concrete for each mix design used each day. A total of six (6) lab cured cylinders per set shall be tested as follows:
a. 2 at 7 days
b. 2 at 28 days
c. 2 at 56 days
3. Cylinders shall be site cured in molds for 7 days at 60 degrees F or above. Subsequent to that they can be transported for Lab curing.

E. Contractor shall submit concrete mix designs and trial batch data including shrinkage test data, for the Architect’s review and the Testing Agency’s approval at least ten (10) working days before placing concrete. Architect’s review is for general conformity with the requirements of the specifications but is not an approval of the mix proportions or components.

F. Certificate of Conformance: Submit current certificate issued by the National Ready Mix Association for the ready-mix plant supplying concrete.

G. Name and qualification of qualified concrete technologist to be used for HVFAC and SCC mix design.

1.5 DELIVERY, STORAGE AND HANDLING

A. Insure storage facilities are weather tight and dry.

B. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.

C. Store coarse and fine aggregate in separate, covered bins to prevent mixing and to preserve moisture content of aggregate at batching plant.

D. Store bulk cement in covered bins.

E. Use sacked cement in chronological order of delivery. Store each shipment so that it may be readily distinguishable from other shipments.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General Requirements:
   1. Cement and aggregates shall be from constant sources and shall have proven history of successful use with one another.
   2. Calcium chloride admixtures are not permitted.
   3. No frozen aggregates will be permitted.
   4. For shrinkage requirements, see General Notes Drawing.

B. Cements: ASTM C150, Type II.

C. Fly Ash: ASTM C618, Class F.

D. Ground Granulated Blast Furnace Slag (GGBFS): ASTM C989, Grade 120.

E. Normal Weight Aggregates: ASTM C33.
   1. Coarse aggregate: Fine grain, sound crushed stone, natural gravel or granite with cleanness value not less than 75 when tested as per Test Method Calif. 227.
   2. Fine Aggregate: Natural sand with sand equivalent of not less than 75 when tested as per Test Method Calif. 217-E.

F. Water: ASTM C94 and potable, free from impurities detrimental to concrete.

G. Water-Reducing Admixtures: ASTM C494, Type A or Type D.

H. Other admixtures: Only with prior written approval by Architect and Testing Agency.

I. Non-shrink Grout: Premixed nonmetallic, non-staining grout requiring only addition of water at site.

J. Curing Materials:
   1. Curing Compounds: Clear, waterborne, membrane-forming compound complying with ASTM C309, Type 1, certified by the manufacturer to not impair bonding of floor covering.

2. Absorptive Cover: Burlap cloth weighing approximately 9 oz. per sq. yd. and complying with AASHTO M182, Class 2.
3. Moisture-retaining cover: One of the following complying with ASTM C171:
   a. Polyethylene film
   b. Polyethylene coated burlap

2.2 CONCRETE MIXES

A. General:
1. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of trial batch data or field test reports, in accordance with ACI 301. Design of all concrete mixes shall be provided by an independent testing laboratory or concrete technologist hired and paid for by the contractor. HVFAC and SCC mixes shall be proportioned by a concrete technologist with documented experience in the design of such concrete.
2. Mix designs shall be subject to review by Architect and by Testing Agency.
3. Shrinkage in concrete shall not exceed 0.055% per ASTM C-157 (28 days drying after 7 days moist curing).
4. Use water-reducing admixture in concrete as required for placement and workability.
5. Introduction of calcium chloride admixtures will not be permitted.
6. Unspecified admixtures will not be permitted unless specifically approved by Architect and by Testing Agency.

B. Concrete Classes:

Concrete Class and Location	Coarse Aggregate	Slump (± 1 in.)	Min. 28-day strength	Cementitious Materials		Max. water to binder ratio (C+S)
				Cement /cu. yd. (C)	SCM(i) /cu. cd (S).	
A. Foundation	1 in. max	5 in.	3000 psi	50%	50%	0.40
B. Suspended Slabs, Walls and Columns	1 in. max	4 in	3000 psi	75%	25%	0.40
C. Fill on Met-al Deck	1 in. max	4 in.	4000 psi	75%	25%	0.40

(i) SCM: Supplementary Cementitious Material – Fly Ash, Ground Granulated Blast Furnace Slag or a combination of both with fly ash not to exceed 25%.

(ii) For improved workability of HVFAC, it is suggested that the coarse aggregates be apportioned in the following approximate amounts:

1” max. 80-85%
3/8” max. 15-20%

2.3 CONCRETE MIXING

A. Ready Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94 and provide batch ticket information.

B. Batching Plant Conditions: Ensure equipment and plant will provide accurate weighing, minimize segregation, and will efficiently handle materials to satisfaction of Architect and Testing Agency.

C. Thoroughly clean concrete equipment before use to avoid contamination.

D. Mix cement, fine and coarse aggregates, admixtures, and water to exact proportions of mix designs.

E. Measure fine and coarse grain aggregates separately according to approved method which provides accurate control and checking.

F. Maintain proportions, values, or factors of approved mixes throughout work.

PART 3 - EXECUTION

3.1 QUALITY CONTROL BY TESTING AGENCY

A. Inspections:
1. Construction of formwork is complete.
2. Placement of required reinforcement, inserts, and embedded items is complete.
3. Form ties at construction joints are tight.
4. Areas to receive concrete are free of debris and excess water.
5. Conveying equipment is clean and properly operating.
6. The required design mix is provided.
7. Concrete placement is performed in conformance with this Section.
8. Curing is performed in conformance with this Section.
9. Verification of concrete strength before form removal.

B. Concrete Tests: Comply with ACI 301 and the following:
1. Take sets for every 100 cubic yards of concrete or fraction for each mix design used each day. Cylinders shall be site cured in molds for 7 days at 60 degrees F or above. Subsequent to that they can be transported for Lab curing.
2. A total of six lab cured cylinders per set shall be tested as follows:
3. 2 at 7 days
4. 2 at 28 days
5. 2 at 56 days (for Class A only)
6. Strength of concrete mix will be acceptable if the average of three consecutive strength tests exceeds the specified compressive strength and none of the values is less than 500 psi below the specified strength.

3.2 PREPARATION

A. Ensure availability of sufficient labor, equipment, and materials to place concrete correctly in accordance with schedule.

B. Verify that formwork, reinforcement, and embeds are in place and inspected before placing concrete.

C. Protect finished surfaces adjacent to areas to receive concrete.

D. Provisions for Other Trades: Coordinate location of anchors, inserts, conduits, sleeves, and other items which are required to be cast in concrete and make the necessary provisions for the placement of such embedded items.

E. Construction Joints:
1. Verify location and conformance with typical details; provide only where designated or as approved by Architect.
2. Continue reinforcement across construction joint unless otherwise noted.
3. Form keyed joints as indicated on the Drawings
4. Roughen construction-joint contact surfaces by sand-blasting to remove surface laitance and expose sound mortar and clean using compressed air.

F. Notify Architect and Special Inspector at least 48 hours before placing concrete.

3.3 PLACING

A. Do not add water to concrete during delivery, at the site, or during placement unless specifically approved by the Architect and Testing Agency.

B. Do not place concrete where sun, wind, heat, or facilities prevent proper finishing and curing.

C. Convey concrete as rapidly and directly as practicable to preserve quality and to prevent separation from rehandling and flowing. Place concrete as continuous operation to permit proper and thorough integration and to complete scheduled placement.
1. Deposit concrete in horizontal layers as necessary, avoiding free falls in excess of 6 ft.
2. Consolidate concrete in accordance with ACI 301 to ensure proper encasement of reinforcement, around embedded items and into corners.
3. Take precautions to avoid displacement of reinforcement and formwork.
4. Place concrete within 1 hour of adding water, unless otherwise specified.
5. Retempering of concrete which is partially set will not be permitted.

D. Consolidating:
1. Use mechanical vibrators for thorough consolidation of concrete.
2. Provide vibrators at each point of deposit during simultaneous placing to ensure timely consolidation; ensure availability of spare vibrators in case of failures.
3. Do not, place vibrators against reinforcement, attach to forms, or use to spread concrete.
4. For exposed concrete, vibrate with rubber-type heads and, in addition, spade along forms with flat strap or plate.

E. Walls and Other Formed Elements:
   1. Placing procedures of concrete in forms that permit escape of mortar, or flow of concrete itself, will not be permitted.
   2. Level top surface upon stopping work.
   3. Space points of deposit to eliminate need for lateral flow.
   4. Take special care to fill each part of forms by depositing concrete directly as near final position as possible.
   5. Force concrete under and around reinforcement and embedded items without displacement.
   6. After concrete has taken its initial set, exercise care to avoid jarring forms or placing strain on ends of projecting reinforcement.
   7. Provide intermittent key indentations at all walls and a key indentation at each column.
   8. Keep forms and reinforcement clean above placement line by removing clinging concrete with wire brush before placing next lift.

F. Interruption in placement lasting longer than 45 minutes shall be cause for discontinuing placement for remainder of day.
   1. In this event, cut concrete back and provide construction joints as directed.
   2. Clean forms and reinforcement as necessary to receive concrete at a later time.

G. Hot-Weather Concreting: Conform to ACI 305 mean daily temperature rises above 90° F.

H. Cold-Weather Concreting: Conform to ACI 306 when mean daily temperature falls below 40° F.

3.4 FINISHING

A. Concrete non-metallic hardener: Shake applied, VOC compliant
   1. Basis of Design: W.R. Meadows, “GENFLOR” or approved equal
   2. Locations: Per FINISH SCHEDULE
   3. Color: As selected by architect from manufacturer’s full range

3.5 CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
   1. Formed surfaces: Cure all formed surfaces including undersides of beams, supported slabs and similar surfaces by moist curing with forms in places. If forms are removed before end of curing period, continue curing for the remainder of the curing period.
   2. Unformed surfaces: Begin curing all unformed surfaces immediately after finishing.
   3. Start initial curing after placing of concrete and when free moisture has disappeared from concrete surface.
   4. Begin final curing procedures immediately following initial curing and before concrete has dried.
   5. Continue final curing for at least 7-days and in accordance with ACI 301.
   6. Avoid rapid drying at end of final curing period.

B. HVFAC and SCC:
   1. Typically HVFAC and SCC exhibit little or no bleeding.

2. Under ordinary conditions HVFAC and SCC may require 1 to 2 hours longer to set than ordinary concrete. Immediately after final set, it is essential to subject HVFAC and SCC to continuous moist curing for at least 7 days.
3. Continue curing for an additional 21-days.

C. Curing Method: Cure concrete in accordance with ACI 308.1 by one or combinations of the following methods:
1. Moisture Curing: Keep surface of concrete continuously wet by one of the following:
   a. Covering with water.
   b. Continuous water-fog spray.
   c. Covering concrete surfaces with specified absorptive cover, thoroughly saturating cover with water, and keeping absorptive cover continuously wet. Place absorptive cover with 12-inch lap over adjacent covers.
2. Moisture-Cover Curing:
   a. Cover concrete surfaces with moisture-retaining cover for the duration of curing, placed in the widest possible width, with sides and ends lapped at least 12-inch and sealed by waterproofing tape or adhesive.
   b. Repair holes or tears during curing period using cover material and waterproof tape.
3. Liquid Membrane Curing:
   a. Apply membrane-forming curing compound uniformly to damp concrete surfaces as soon as possible after final finishing operations are complete. Follow manufacturer's recommendations.
   b. Recoat areas which are subjected to heavy rainfall within 3-hours after initial application.
   c. Maintain continuity of coating and repair damage during curing period.
   d. Do not use membrane curing compounds on surfaces to receive floor coverings bonded to the concrete, liquid floor treatments, or other coating or finishing material applied directly to concrete, unless specifically approved by the Architect.

D. Temperature of Concrete during Curing:
1. When atmospheric temperature is 40°F. and below, cure in accordance with ACI 306.1, maintaining concrete temperature between 50°F. & 70°F. throughout curing period.
2. When necessary, arrange for heating, covering, insulation or housing required to maintain specified temperature and moisture conditions during the curing period.
3. When atmospheric temperature is 80°F. and above, cure in accordance with ACI 301.
4. When necessary, arrange for installation of wind breaks or shading, and for fog spraying, wet sprinkling, or moisture-retaining covering.
5. Maintain concrete temperature as uniformly as possible, and protect from rapid atmospheric temperature changes. Avoid temperature changes in concrete which exceed 5°F. in one hour, and 50°F. in 24-hour periods.

3.6 PROTECTION

A. Protect concrete from injurious action of elements and defacement of any nature during construction operations.

B. Protect exposed corners of concrete from traffic or use which will damage them in any way.

C. Protect finished concrete surfaces from damage by subsequent construction operations.

D. Make provisions to keep exposed concrete free from laitance caused by spillage or leaking forms or other contaminants.

3.7 MISCELLANEOUS CONCRETE ITEMS

A. Grouting Column Base Plates:
   1. The grouting of steel base plates, specified under Section 05120 Structural Steel, shall be performed as specified herein as part of this section.
   2. All grout used for the grouting of base plates shall be applied in strict accordance with manufacturer's directions.
   3. All grouting of bases shall be carefully done to make sure that all voids between the base plates and the concrete are completely filled with non-shrink grout.

B. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on the Drawings.

C. Modular Seals at Concrete Penetrations:
   1. Basis of Design: Link-Seal, Model C with S-316 hardware, or approved equal
   2. Locations: Per MEP and Equipment Drawings

END OF SECTION 03 30 00

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SECTION 03 3510 – POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Stained and polished concrete.

B. Related Sections include the following:
   1. Division 03 Section “Cast-In-Place Concrete.” For concrete densifier and chemical hardener.

1.3 REFERENCES

A. American Concrete Institute (ACI):
   1. ACI 302.1R Guide for Concrete Floor and Slab Construction.

B. ASTM International:
   1. ASTM C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
   2. ASTM C171 Standard Specification for Sheet Materials for Curing Concrete.
   3. ASTM C779 Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.

C. National Floor Safety Institute (NFSI):
   1. NFSI Test Method 101-A Standard for Evaluating High-Traction Flooring Materials, Coatings, and Finishes.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Installation procedures, including proposed schedule for installation related to other trades.

C. Shop Drawings:
   1. Layout, including dimensions and floor-grinding schedule.
   2. Floor and joint pattern layout.
   3. Areas to receive colored surface treatment.

D. Samples for Selection: Samples from Manufacturers full range

1.5 INFORMATIONAL SUBMITTALS

A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

B. Manufacturer Certificates: Signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is capable of providing field service representation during construction and approving application method.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of polished concrete surfacing required for the Project.
1. Engage in installer who is certified in writing by concrete polishing system manufacturer as qualified to install systems indicated, including hardeners/densifiers and dye stains.

C. Source Limitations: Obtain materials from a single source from a single manufacturer.

D. Mock-ups:
1. Mock-Up Size: 100 sq. ft. sample panel at location as directed under conditions similar to those which will exist during actual placement.
2. Mock-up will be used to judge workmanship, concrete substrate preparation (and protection during construction), operation of equipment, material application, color selection, finish gloss level, grade finish and control joints. Edge conditions, including material finishes to be included.
3. Mock-Up to be produced by individual workers who will perform the work for the project.
4. Allow 24 hours for inspection of mock-up before proceeding with work.
5. When accepted, mock-up to remain through completion of Work for use as a quality standard for finished work.

E. Preinstallation Meetings: Conduct a preinstallation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Review the following:
1. Environmental requirements.
2. Scheduling and phasing of work.
3. Coordinating with other work and personnel.
4. Protection of adjacent surfaces.
5. Surface preparation.
6. Repair of defects and defective work prior to installation.
7. Cleaning.
8. Installation of polished floor finishes.
9. Application of liquid hardener, densifier.
10. Protection of finished surfaces after installation.
11. Protection of concrete surfaces prior to installation.

1.7 DELIVERY, STORAGE & HANDLING

A. Delivery:
1. Deliver materials in manufacturer's original packaging with identification labels and seals intact.

B. Storage and Protection:
1. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
2. Protect concrete slab.
a. Protect from petroleum stains during construction.
b. Diaper hydraulic power equipment.
c. Restrict vehicular parking.
d. Restrict use of pipe cutting machinery.
e. Restrict placement of reinforcing steel on slab.
f. Restrict use of acids or acidic detergents on slab.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting performance.

PART 2 - PRODUCTS

2.1 POLISHED CONCRETE FINISH

A. Polished concrete includes grinding, installation of sealer (hardener, densifier) polishing, and dye stain.
1. ASTM D2047 Coefficient of Friction: 0.60 minimum.

B. Design Requirements:
1. Hardened Concrete Properties:
a. Minimum Concrete Compressive Strength: 3500 psi.
b. Normal Weight Concrete: No lightweight aggregate.
c. Non-air entrained.
2. Placement Properties:
a. Natural concrete slump of 4 1/2 inches to 5 inches. Admixtures may be used.
b. Flatness Requirements:
1) Overall FF 40.
2) Local FF 20.
3. Hard-Steel Troweled (3 passes) Concrete: No burn marks. Finish to ACI 302.1R, Class 5 floor.
4. Curing Options:
a. Membrane forming curing compounds (ASTM C309, Type 1, Class B, all resin, dissipating cure).
1) Acrylic curing and sealing compounds not allowed.
b. Sheet membrane (ASTM C171); polyethylene film not allowed.
c. Damp Curing: Seven day cure.

2.2 MANUFACTURERS

1. Basis-of-Design Product: Subject to compliance with requirements, provide Advanced Floor Products or comparable product by one of the following:
   a. Approved equal.

B. Hardener, Sealer, Densifier: Proprietary, water based, odorless liquid, VOC compliant, environmentally safe chemical hardening solution leaving no surface film.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Advanced Floor Products “Retro Plate 99” or comparable product by one of the following:
   a. Approved equal.
2. Performance Criteria:
   a. Abrasion Resistance: ASTM C779
   b. Impact Resistance: ASTM C805
   c. Ultraviolet Light and Water Spray: ASTM G23-81

C. Concrete Dye Stain: Solvent based color liquid dye concentrate. (**CO1**)

1. Basis-of-Design Product: Subject to compliance with requirements, provide L.M. Scofield Company “Formula One Liquid Dye Concentrate” or comparable product by one of the following:
   a. Approved equal.
2. Color: 1435 Inca Gold.

D. Joint Filler: Manufacturer’s approved self-leveling joint sealant.

E. Cleaning Solution: Manufacturer’s approved liquid concrete cleaner, environmentally safe.

F. Finish Gloss Level:

1. Medium gloss: 800 grit.

G. Grade Level: Grade 2 – Salt and Pepper Finish

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions with Applicator present for compliance with requirements.

B. Begin polishing process only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ensure surfaces are clean and free of dirt and other foreign matter harmful to performance of concrete finishing materials.

B. Double scrub floor with automatic scrubber capable of a minimum of 80 to 120 pounds of head pressure equipped with black stripping pads. Scrub floor once without squeegee or vacuum. On second pass, remove water solution.

C. Power rinse surface to remove all traces of soap residue.

D. Inspect the concrete surface.

3.3 INSTALLATION

A. Floor Surface Polishing and Treatment:
   1. Provide polished concrete floor treatment in entirety of slab indicated by drawings. Provide consistent finish in all contiguous areas.
   2. Apply floor finish prior to installation of fixtures and accessories.
   3. Diamond polish concrete floor surfaces with power disc machine recommended by floor finish manufacturer. Sequence with coarse to fine grit using dry method.
      a. Comply with manufacturer's recommended polishing grits for each sequence to achieve desired finish level. Level of sheen shall match that of approved mock-up.
      b. Expose aggregate in concrete surface only as determined by approved mock-up.
      c. All concrete surfaces shall be as uniform in appearance as possible.
   4. Stained and Polished Concrete:
      a. Locate demarcation line between stained surfaces and other finishes.
      b. Polish concrete to final finish level.
      c. Apply concrete floor stain in accordance with manufacturer's instructions to polished concrete surface.
         1) Control depth of color by adjusting volume of stain applied to floor.
         2) Apply two applications of concrete floor stain. Allow to dry completely after each application.
      d. Remove residue in accordance with manufacturer's instructions.
      e. Allow floor to completely dry.
   5. Apply hardener densifier per manufacturer's requirements.
      a. Follow manufacturer's recommendations for drying time between successive coats.
   6. Remove defects and repolish defective areas.
   7. Finish edges of floor finish adjoining other materials in a clean and sharp manner.

B. Polish to higher gloss those areas not meeting specified gloss levels per mock-up.

C. Fill joints flush to surface.

3.4 FINAL CLEANING

A. Mechanically scrub treated floors for seven days with soft to medium pads with approved cleaning solution.

3.5 PROTECTION

A. Protect installed product from damage until Substantial Completion.

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SECTION 04 81 60 – CONCRETE UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes, but is not necessarily limited to, the furnishing and installing concrete block masonry including reinforcing, grouting and cleaning.

B. Related Sections include the following:
1. Section 03 20 00, Concrete Reinforcing
2. Section 07 92 00, Joint Sealants
3. Section 09 90 -0, Paints and Coatings

1.3 QUALITY ASSURANCE

A. Reference Standrads:
1. California Building Code, 2013 Edition.
2. ASTM C90 - Standard Specification for Load-bearing Concrete Masonry Units
3. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar
4. ASTM C150 - Standard Specification for Portland Cement
5. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes
6. ASTM C404 - Standard Specification for Aggregates for Masonry Grout
7. ASTM C476 - Standard Specification for Grout for Masonry

1.4 SUBMITTALS

A. Submit Manufacturer’s Product Data.

B. Submit shop drawings for reinforcing steel for structural concrete masonry. Comply with requirements of Section 03200 - Concrete Reinforcement.

C. Provide masonry prism test reports in accordance with CBC verifying that concrete block assembly meet the specified f’m prior to constructing work of this Section.

1.5 DELIVERY, HANDLING AND STORAGE

A. Do not bring cementitious or other material to the site if it has become lumpy, caked, hardened or air slaked from absorption of moisture.

B. Handle blocks in manner to prevent chipping and breakage. Protect reinforcing steel from kinking and bending and from contamination with dirt, mud, oil and other foreign matter detrimental to bond.

C. Store materials where protected from weather, contact with soil, traffic and construction operations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete Block: ASTM C 90, Type 1, Grade N, two cell, open end and bond beam units where indicated or required, made with lightweight expanded clay or shale aggregates.
   1. Size: 16 in. X 8 in. X 8 in. nominal, unless noted otherwise on Structural Drawings.
   2. Unit Weight: 85 to 105 pcf.
   3. Max. Linear Shrinkage: 0.065 percent.
   4. Min. Compressive Strength (For Concrete Masonry Assembly): 1500 psi @ 28 days.
   5. Color and Textures: Basis of design: Basalite #390, shotblast, or approved equal.

B. Reinforcing Steel: ASTM A615 Grade 60. Conform to requirements of Section 03 20 00 - Concrete Reinforcement. Provide positioning devices or other approved means for maintaining vertical and horizontal reinforcing in the locations indicated in the Contract Documents. Devices shall occur at top and bottom of vertical steel and at intermediate points not to exceed 200 bar diameters or 10 feet.

C. Portland Cement: ASTM C 150, Type I or II.

D. Hydrated Lime: ASTM C 207, Type S.

E. Aggregates:
   1. Setting Mortar Sand: ASTM C 144, with not less than three percent passing No. 100 sieve. Use same source throughout project.
   2. Grout Aggregate: ASTM C 404, size 1 for sand and size 8 for coarse aggregates (pea gravel).

F. Water: Clean and potable, free of impurities detrimental to mortar or grout.

2.2 SETTING MORTAR

A. Type: S or M as per Table 2103.7 of the CBC.

B. Proportioning: (Parts by volume)

Portland Cement	1
Sand	2-3/4 - 3-3/4
Hydrated Lime or Lime Putty	1/4 max.

C. Minimum Strength (psi at 28 days): 2500 psi.

D. Mixing: Measure materials accurately and machine mix in batch type mixer in which quantity of water can be accurately controlled. Use mixers of full sack (cement) capacity, split sack batches not

permitted. Mix for a least 3 minutes after all materials are in drum. Empty mixer completely before loading each succeeding batch. Work mortar at frequent enough intervals to prevent separation of ingredients. Retemper only as necessary to replace water lost through evaporation. Do not use mortar after final set has begun.

2.3 GROUT

A. Type: Coarse as per ASTM C 476.

B. Proportioning (Parts By Volume):

Portland Cement	1
Sand	3 (max.)
Aggregate	2 (max.)

C. Minimum Strength (psi at 28 days): 3000 psi.

D. Batching and Mixing: ASTM C 94 (transit mixed). Water shall be added as required to provide a pourable consistency without segregation (approximately 9 inch - 11 inch slump).

E. Color: To match masonry units or per Architect.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean and roughen concrete at bonding surface, sandblasting where required. Bend dowels into proper alignment, straight and unkinked.

3.2 CONSTRUCTION

A. Construct concrete block masonry in accord with Reference Standards except where otherwise qualified or modified herein. Where standards conflict, assume the more stringent condition.

B. Bond Pattern and Joint Treatment: Common running bond with nominal 3/8 inch wide joints, unless otherwise noted in architectural drawings; compacted and tooled concave where exposed and struck flush where concealed.

C. Masonry units shall not be wet prior to laying.

D. Set masonry units plumb, true to line, with level courses accurately spaced. Keep bond pattern plumb and in alignment full height of wall, corners and reveals plumb and true. Cut facing units with a power driven carborundum saw. No chipped faces, corners, or edges permitted.

E. Lay block with head and bed joints solidly filled with mortar for a distance in from the face of the unit equal to the thickness of the face shell.

F. Provide cleanouts at bottom of grouted cells except that cleanouts are not required in walls four feet high and less where "low-lift" grouting is employed. Where cleanouts are required to occur on exposed masonry surface, remove entire face shell.

G. Build in anchors, inserts, bolts, flashings, frames, etc., furnished by others, as the work progresses.

H. Where metal door frames are to be grouted, plumb and brace frames prior to laying adjacent masonry units. Fully grout frames at same time as block grout is placed. Refer to Section 08112 – Standard Steel Doors and Frames.

I. Lay blocks to preserve unobstructed vertical continuity of cells. Dowels shall be set to align with cores containing reinforcing steel.

J. Use open end units and bond beam units at horizontal reinforcing.

K. Remove overhanging mortar or obstructions from inside of cells to be grouted using high pressure jet stream or approved mechanical means.

3.3 GROUTING

A. All cells in concrete blocks shall be filled solid with grout unless noted otherwise in the Structural Drawings.

B. Grouting may be done by "high lift"; "low lift" method (Contractor option).

C. Grout spaces shall not be wet at the time grout is placed.

D. Spaces to be filled with grout shall be free from debris, mortar, etc., before filling.

E. Grout shall not be placed by high lift process until mortar in joints has set for 24 hours.

F. High-lift grout shall be poured in maximum lifts of 4 feet. At cessation of each lift, the grout in this lift shall be vibrated with a 3/4 inch flexible cable vibrator for the full height of the lift. Vibrator shall be placed in cells not to exceed 16 inch centers (in plan). When top of wall is reached, alternately "top" and vibrate to complete the pour to top of wall. Succeeding lifts of grout shall be placed following an appropriate lapse of time for grout settlement and absorption of excess moisture.

G. Place high-lift grout using adequate grout pumps.

H. For such time as may be required immediately following grouting, keep walls flushed down with a pressure stream of clear water to completely remove laitance from exposed faces.

3.4 CLEANING

A. Clean work as it progresses keeping exposed finished portions of the work free of soil and mortar stains. Do not use acid cleaners.

3.5 QUALITY CONTROL, TESTS AND INSPECTIONS

A. Testing agency will perform Special Inspections required by Chapter 17 of the Code, including those tests and inspections specified herein and such other tests and inspections as the Owner may require to establish acceptability of the work. Testing and inspection services will be paid for separately by the Owner. Refer to Division 1 quality control provisions.

B. Compressive Strength of Masonry: Conform to Code Section 2105.

C. Additional Tests: Where above tests indicate failure to meet contract requirements, the Testing Agency will perform core tests as per ASTM C1314 as directed by the Owner and at Contractor's expense. Make repairs required by taking test cores. Where test cores indicate inadequate strengths, remove and replace deficient masonry as required at Contractor's expense.

D. Selection and preparation of samples will be supervised by Testing Agency.

E. Contractor shall furnish materials required for analysis of masonry work.

END OF SECTION 04 81 60

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SECTION 05 12 00 – STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes, but is not necessarily limited to, the furnishing and erection of all structural steel items complete, as shown and/or specified including:
   1. Furnishing of anchor bolts for structural steel columns and responsibility for their correct locations; provide templates.
   2. Brackets and miscellaneous iron connections shop-connected to structural members.
   3. Installing and removing temporary guys, shores, scaffolding and bracing required for steel erection.

B. Related Sections include the following:
   1. Section 03 30 00, Cast-in-Place Concrete (for grouting of base and setting plates).
   2. Section 05 50 00, Metal Fabrications.
   3. Section 09 90 00, Painting and Coating.

1.3 QUALITY ASSURANCE

A. Reference Standards
   1. AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings, of the American Institute of Steel Construction, latest edition.
   2. AISC Code of Standard Practice for Steel Buildings and Bridges, latest edition.
   3. AWS Code for Welding in Building Construction, D1.1 of the American Welding Society.
   4. Specifications for Structural Joints using ASTM A325 or A490 Bolts by the Research Council of Riveted and Bolted Structural Joints.
   5. Safety regulations prescribed by O.S.H.A.
   6. California Building Code, 2013 Edition.
   7. ANSI B18.22.1 – Plain Washers
   8. ASTM A 36/A 36M - Carbon Structural Steel.
   9. ASTM A 53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   10. ASTM A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality.
   11. ASTM A 307 - Carbon Steel Bolts and Studs, 60 ksi Tensile Strength.
   12. ASTM A 325 - Structural Bolts, Steel, Heat-Treated, 120/105 ksi Minimum Tensile Strength.
   13. ASTM A354 - Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
   14. ASTM A490 - Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
   15. ASTM A 500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
   16. ASTM A 501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
   17. ASTM A572/A572M - High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

18. ASTM A578/A578M - Straight-Beam Ultrasonic Examination of Plain and Clad Steel Plates for Special Applications.
19. ASTM A992/A992M - Steel for Structural Shapes For Use in Building Framing.
20. ASTM E329-02 Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
21. ASTM F436 - Hardened Steel Washers.
22. ASTM F959 - Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
23. FS TT-P-645 - Primer, Paint, Zinc-Molybdate, Alkyd Type.

B. Welding procedures, welders, welding operations and tackers shall be qualified in accord with the AWS Code.

1.4 SUBMITTALS

A. Shop Drawings: Indicate shop and erection details including cuts, copes, connections, holes, threaded fasteners and welds.

B. Proof of Compliance: Unless otherwise noted, submit the following in four (4) copies for review by Owner-hired testing agency and A/E.

C. Certified reports of tensile properties and bend tests for steel shapes, bar, and plates.

D. Certificates of conformance for structural steel tubing.

E. Affidavit (in duplicate) that structural steel having a yield strength greater than 36 ksi conforms to requirements of Drawings and Specifications.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver anchor bolts and other anchorage devices which are to be embedded in the work of other trades to the project site in sufficient time to permit their timely installation. Provide proper setting drawings, templates and directions for installation of these items.

B. Structural steel members which are stored at the site or a staging area shall be above ground on platforms, skids, or other supports. Store fasteners and welding electrodes in a weather tight and dry place until ready for use. Store packaged materials in their original containers.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Wide-Flange Shapes: ASTM A992.

B. Angles and Plates: ASTM 572, Grade 50.

C. Other Structural Steel Shapes: ASTM A572, Grade 50, unless otherwise noted.

D. Hollow Structural Sections (HSS): ASTM A500 (cold formed), Grade B.

E. Structural Pipe: ASTM A53, Grade B or ASTM A501.

F. Standard Threaded Fasteners:

G. Threaded Rods: ASTM A572, Grade50.

H. Plain Washers: ANSI B18.22.1, Type A.

I. Beveled Washers: ASTM F436.

J. High Strength Bolts, Nuts and Washers: ASTM A325, Type 1, and ASTM A354 BD. See structural connection details for location of bearing-type and friction-type bolts.

K. Direct Tension Indicators (Load Indicator Washers): ASTM F959, Type 325.

L. Anchor Bolts: ASTM F1554, GRADE 36.

M. Welded Studs (Shear Connectors welded directly to Steel Frames): Low carbon, cold drawn, headed type steel shear connectors for stud welded installation, Fy = 50 ksi, Ft = 60 ksi, conforming to ASTM A108.

N. Welding Electrodes: E7OXX low hydrogen.

O. Structural Steel Primer Paint: Zinc chromate alkyd primer (TT-P-645), except as otherwise recommended by the manufacturer of the coating for exposed steel.

2.2 FABRICATION

A. Fabricate structural steel within tolerances specified under Codes and Standards referenced in Article entitled “Reference Standards.”

B. Fabricate and assemble structural steel in the shop to the greatest extent possible. Do shearing carefully and accurately using machine equipment where possible.

C. Connections shall be welded or bolted as indicated. Shop connections not otherwise shown shall be welded. Eccentric connections are not permitted unless shown in detail on shop drawings.

D. Surfaces required to be milled or planned are indicated on the drawings.

E. Provide bearing plates for members bearing on footings, piers, and walls.

F. Drift pins may be used for assembling parts provided metal is not distorted or holes enlarged. Holes requiring enlargement to admit bolts shall be reamed. Misaligned holes will subject members to rejection.

G. Welding:
   1. Perform welding in accord with appropriate Section of Reference Standards.
   2. In addition to specific requirements of Drawings, details of welded joints shall comply with requirements for joints which are accepted without qualification tests under the AWS Code.

H. High Strength Bolted Construction: See Part 3 - Execution.

I. Shop Cleaning: Thoroughly clean loose mill scale, rust, dirt, grease and other foreign matter from structural steel shapes.

J. Shop Painting: Shop paint structural steel work except structural steel which is designated to receive spray fireproofing. Coordinate the use of primer paint on the steel with Architectural Drawings and fire ratings.
   1. Surface Preparation: After inspection and before shipping, clean steel work to be painted. Remove loose rust, loose mill scale, and spatter slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) SP-2, SP-3, or SP-7.
   2. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide uniform dry film thickness on 1.5 mils. Use painting methods which will result in full coverage of joints, corners, edges, and exposed surfaces.

PART 3 - EXECUTION

3.1 CONDITION OF SURFACES

A. Before starting work, verify locations and elevations of bearings and anchor bolts. Immediately report inaccuracies. Work under this Section shall include responsibility for accurate bearing of steel and correct location of anchorage.

3.2 ERECTION

A. Erect items of structural steel in accord with applicable provisions of Article entitled “Reference Standards”.

B. Erection Tolerances: Structural Steel work erection tolerances shall be in accord with "AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings" and "AISC Code of Standard Practice for Steel Buildings and Bridges".

C. Field connections shall be welded or bolted as indicated.

D. Bolting:
   1. As erection progresses, bolt up work to take care of dead loads, construction live loads, lateral forces and erection stresses.
   2. Unless otherwise noted, erection bolts used in welded construction may be either tightened securely and left in place or removed and the holes filled with plug welds.

E. High Strength Bolting:

1. Make high strength bolted connections in accord with Reference Standard for "friction-type" connections with threads excluded from shear plane for bearing-type connections.
2. Contact surface with "slip critical (friction) type" connections shall be free of oil, paint, lacquer, or other coatings.
3. Tighten nuts using Direct Tension Indicators. Minimum bolt tension as per Reference Standard for each bolt type and size used. Use beveled washers to compensate for parallelism when outer face of bolted parts has a slope greater than 1:20 with respect to a plane normal to the bolt axis.
4. When bolts have been completely tightened, mark with identifying symbol.

F. Temporary Bracing: Introduce wherever necessary to provide for loads to which structure is subjected including erection equipment and its operation. Leave in place until no longer required for safety. Make proper provisions for construction loads, piles of materials, equipment, etc., carried by structural frame during erection.

3.3 QUALITY CONTROL, TESTS AND INSPECTIONS

A. Owner-Hired Testing Agency: Testing and inspection shall be as required by Drawings as well as these Specifications. Testing and inspection of structural steel will be paid for separately by Owner as specified in Division 1 Specification Sections, except as follows:
1. It is assumed that steel will be fabricated within the State of California. Transportation costs and per diem living costs for inspection at fabricator's plants outside of California will be back-charged to the Contractor.
2. It is assumed that fabrication will take place in one shop location only. Additional inspection costs resulting from fabrication at more than one shop location will be back-charged to the Contractor.
3. Mill tests and costs of retests of plain materials shall be at expense of Contractor.

B. Tests for structural steel will be made and reports furnished by Owner-hired testing agency in accord with the following requirements:
1. Test of Mill Order: Where steel, ordered from mill, cut to lengths, is identified by heat or melt numbers and is accompanied by mill analysis test reports, material may be used without further local tests, provided an affidavit is given that materials conform with requirements. In case of controversy, tension and bend tests of materials, either locally or at the mill, as required for local stock is mandatory, in which case, such testing will be back-charged to the Contractor.
2. Test of Unidentified Steel: In the event that structural steel cannot be identified by heat or melt numbers and is accompanied by mill analysis and test reports, such stock may be used, provided one (1) tension and (1) bend test is made for each 50 tons or fractional part, of stock as may be used in the work. Complete four-sided surface inspection may be required for materials. Each piece of high-strength local stock steel will be tested and stamped. Costs of such testing will be back-charged to the Contractor.
    a. Contractor shall take test Specimens under direction of Owner-hired testing agency and shall be machined by the Contractor, at Contractor’s expense, to dimensions as required by related applicable Standard ASTM Specification.
3. Tests of Welding and Bolting: Owner-hired testing agency will inspect shop and field welding and inspect high tensile bolting. Owner-hired testing agency will comply with regulations of the California Building Code and will certify in writing, upon completion of

work, that welding and high tensile bolting has been performed in accord with Drawings and Specifications and applicable Article entitled “Reference Standards”.

4. Inspection of high Tensile bolts: Owner-hired testing agency will check bolt tightness on 100 percent of bolts.
5. Continuous Inspection of Welds: Owner-hired testing agency will inspect welded connections of column-to-column, column-to-girder, or girder-to-girder by ultrasonic or other approved non-destructive tests.
6. Ultrasonic testing will be performed by a specially trained, qualified technician, who will operate equipment, examine welds and maintain a record of welds examined, defects found and disposition of each defect. Defective welds shall be repaired and costs of retesting defective welds shall be borne by the Contractor.
    a. Welds requiring ultrasonic testing will be tested at the rate of 100 percent.
    b. When ultrasonic indication arising from the weld root can be interpreted as either a weld defect or backing strip, backing strip shall be removed at expense of Contractor, and if no root defect is visible, weld will be re-tested. If no defect is indicated on this retest and no significant amount of base and weld metal have been removed, joint needs no further repair or welding. If a defect is indicated, it shall be repaired at no expense to Owner.
    c. Questionable root indications that prove not to be defective will not count against welder to increase test rates.
    d. Ultrasonic instrumentation will be calibrated by a qualified technician to evaluate quality of welds in accord with AWS D1.1, Appendix C.
7. Other methods of inspection, for example, X-ray, gamma ray, magnetic particle, or dye penetrant, may be used on welds if deemed necessary by Owner-hired testing agency with cooperation of Contractor.
8. Ultrasonic Material Inspection:
    a. All column material within 1 foot (6 inches either side) of a direct buttweld for girder flange connections will be ultrasonically tested for laminations in accord with ASTM A578-Level II.
    b. Material in designated location will be tested for laminations by ultrasonic means prior to fabrication, with written reports submitted to A/E.
9. Detection of Laminations: Rejectable defect discovered by ultrasonic means are defined as follows: Using suitable calibrated ultrasonic equipment, any recordable discontinuity causing complete loss of back-reflection and which cannot be encompassed within a 3-inch diameter circle is unacceptable (Level II Standard of Acceptance). Should such flaws be detected, they may be repaired by welding, subject to A/E's review.
10. All full penetration groove welds, all partial penetration groove welds and all electroslag welds will be subjected to ultrasonic testing.

END OF SECTION 05 12 00

SECTION 05 21 00 – STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes, but is not necessarily limited to, the design, furnishing and installation of steel joist framing and accessories.

B. Related Sections include the following:
1. Section 05 12 00, Structural Steel
2. Section 05 54 00, Cold-Formed Metal Framing

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this section shall comply with the following:
1. AISC - American Institute for Steel Construction:
2. Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
3. ASTM Standards:
4. A36 - Carbon Structural Steel.
5. SJI - Steel Joist Institute:
6. Standard Specifications, Load Tables & Weight Tables for Steel Joists & Joist Girders.
7. UL Fire Resistance Directory.

1.4 STEEL JOIST DESIGN REQUIREMENTS

A. Joist Manufacturer: Responsible for the structural design of steel joists and joist girders.

B. Design:
1. In accordance with SJI and AISC references listed in 1.3.
2. For the design loads listed in the SJI references for the particular joist framing size as indicated on the Drawings.
3. For Joist Framing Occurring at Column Lines:
   a. Design for the end moments due to wind in combination with live and dead loads, if so indicated on the Drawings.
   b. Refer to notes on Drawings.
4. For extended ends or top chord extensions: Design for live and dead loads.
5. Rollover design capacity for diaphragm conditions for “K” Series and “LH” Series joists shall be as indicated on the Drawings at joist seat.
6. Performed under the responsibility of a registered professional engineer.

C. UL Designs: Supply and install joist framing in conformance with UL designs as indicated on the Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials used in the manufacture of steel joist framing: In accordance with SJI and AISC references listed in Article 1.3.

2.2 FABRICATION

A. Welding:
1. Production welding techniques which develop joints and connections having at least same factor of safety as material used.
2. Verify factor of safety by load tests.

B. Horizontal and Diagonal Bridging:
1. In Accordance With:
   a. Steel Joist Institute Specifications.
   b. UL designs, as applicable.
2. As indicated on the Drawings.

C. Extended Ends and Top Chord Extensions: As indicated on the Drawings.

D. Shop Painting:
1. Remove mill scale, rust, grease, dirt, debris and residue from cleaning.
2. Dip or spray with a minimum of a 2-3 mil coating dry film thickness rust inhibitive paint in accordance with Steel Joist Institute Specifications.
3. Coating shall be lead and chromate free and comply with federal and state regulation limiting V.O.C. content.

PART 3 - EXECUTION

3.1 ERECTION

A. Protection:
   a. Exercise care at all times to avoid damage as a result of careless handling.
   b. Exercise care to avoid excessive concentrated loads.
   c. Provide means for adequate distribution of loads so that the capacity of joist framing is not exceeded.

B. Bridging: As soon as joist framing are erected, completely install bridging and permanently fasten framing into place before applying loads.

C. Setting:
1. Set joist framing accurately in place to the spacing indicated on the Drawings.

2. Provide proper length of bearing at each end.
3. Framing shall have full contact between bearing surfaces.
4. Fasten framing to supporting members by field welding unless otherwise indicated on the Drawings or specified herein.

D. Joist Framing at Column Lines:
1. Fasten top chord of framing occurring at column lines to supporting beams or columns by bolting, and extend bottom chords of joist framing to stabilizer plate supporting member. Do not weld or bolt unless specifically indicated.
2. Where top chord bolts are installed in slotted holes, weld top chords to supporting structure after erection.

E. Touch Up Paint:
1. Immediately after erection, touch up areas where the shop coat has broken down or been damaged.
2. Use paint of the same type as used for shop painting.

3.2 CLEANING

A. Prior to acceptance of the work of this section, thoroughly clean the joist framing and all affected areas in accordance with Division 01 requirements.

END OF SECTION 05 21 00

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SECTION 05 31 00 – STEEL DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes, but is not necessarily limited to, the furnishing and installing of steel deck work, including headed type welded studs (shear connectors) whether welded through the decking or directly to the structure, and accessories. This Section also includes miscellaneous metal supports required for the proper installation of steel decking and which are not shown on the Drawings or specified elsewhere.

B. Related Sections include the following:
1. Section 03 20 00, Concrete Reinforcing
2. Section 03 30 00, Cast-in-Place Concrete
3. Section 05 12 00, Structural Steel
4. Section 05 50 00, Metal Fabrications
5. Section 09 96 00, High-Performance Coatings

1.3 QUALITY ASSURANCE

A. Reference Standards:
1. "Specifications for the Design of Light Gage Cold Formed Steel Structural Members" of the American Iron and Steel Institute (AISI).
2. AWS D1.1 Structural Welding Code – Steel.
3. AWS D1.3 Structural Welding Code – Sheet Steel.
4. California Building Code, 2007 Edition.
5. ASTM A36/A36M - Carbon Structural Steel.
6. ASTM A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality.
7. ASTM A466/A466M - Weldless Chain.
8. ASTM A653/A653M - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
9. ASTM A1008/A1008M - Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

1.4 SUBMITTALS

A. Shop and Erection Drawings: Indicate layout and erection details including welds, mechanical fasteners, studs, clips, reinforcement, flashings, and closures and accessories which are to be applied or installed under this section.
1. Review of drawings will cover only the general scheme and character of details but not the checking of dimensions; nor will such review relieve the Contractor from responsibility for executing the Work in accordance with the Drawings.

B. Submit certified mill analysis and test report for each heat for review by the SFIA-hired testing agency.

C. LEED Submittals: See Division 1 Section "LEED Requirements" for LEED NC 2.2 Documentation Submittals. Provide LEED Criteria Worksheet for each product to be incorporated into the Work. Provide LEED Product Information Forms as required by the LEED Criteria Worksheet. In addition, provide documentation of sustainable attributes of products, including but not limited to documentation for the following credits:
   1. LEED NC 2.2 Credit MR 4.1 and 4.2, Recycled Content: Product Data indicating percentage by weight of post-consumer and post-industrial recycled content for products having recycled content. Include a statement indicating costs for each product having recycled content.
   2. LEED NC 2.2 Credit MR 5.1 and 5.2, Local/Regional Materials: Product data indicating location of material manufacturer and point of extraction for regionally extracted, processed and manufactured materials.
   3. If only a fraction of the material is extracted and manufactured locally, indicate percentage by weight.
   4. Include printed statement of costs for each regionally extracted, processed and manufactured material.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Decking:
   1. Base Metal: Steel decking shall be formed from sheet steel conforming to ASTM A1008 or A 466 and having a minimum yield strength of 33,000 psi.
   2. Coating: Sheets shall have received, before being formed, a hot-dipped, zinc protective coating meeting or exceeding the requirements of ASTM A653 for G60 Coating Designation with not less than 0.60 oz. of zinc per sq. ft. of sheet (Triple Spot Test). For sheets exposed to weather, galvanizing shall meet G90 designation.
   3. Physical Properties: Drawings indicate sectional profiles, depths, and minimum gages required.
   4. Manufacturer: Verco Manufacturers Inc., the ASC Company, or equal.
   5. Steel deck manufacturer shall supply decking free of lubricants or oils which would significantly impair the adhesion of sprayed fireproofing.

B. Miscellaneous Metal Items (as required): ASTM A36, shop primed if not encased in concrete or sprayed with fireproofing. Where exposed to weather, apply coating in accordance with Section 09 96 00.

C. Accessories:
   1. Flashings, Closures, and Screeds: Galvanized sheet steel as specified for decking, 16 gauge.
   2. Venting Devices: Deck units having concrete fill and which are to receive waterproof membranes or weatherproof coatings (roofing, elastomeric coatings, etc.) shall have provisions incorporated into deck fabrication or installation for venting moisture. Individual

separating clips, or built-in venting slots formed as an integral part of deck profile, per deck manufacturer's recommendations.

D. Welding Electrodes and Equipment: As recommended by deck manufacturer and approved for use in accordance with Article "References, Codes, and Standards".

E. Welded Studs: Low carbon cold drawn, headed steel shear connectors for stud welded installation and having a min. yield strength of 50,000 psi and a min. tensile strength of 60,000 psi (ASTM A108, Type-B). Studs shall not be painted or galvanized.

2.2 FABRICATION

A. Composite Construction: Decking designed for composite construction shall be formed with shear lugs to provide mechanical key to transfer horizontal shear and to prevent vertical separation with either interlocking side laps or lapping type sidelaps.

PART 3 - EXECUTION

3.1 INSPECTION OF STRUCTURE

A. Verify that supports for decking are properly aligned and sufficiently level to permit proper bearing and report any discrepancies. Proceeding with final installation implies acceptance of conditions.

3.2 ERECTION

A. Erect decking as per governing codes, drawing requirements and manufacturer's specifications and recommendations.

B. Ship deck units to job site in standard widths and cut to proper lengths such that end joints occur over supporting members. Perform field cuts as required.

C. Place deck units on supporting framework and adjust to final position with proper bearing before permanently fastening. Provide a minimum bearing of 2-1/2 inches over supporting beams.

D. Place units in straight alignment for entire length of flute run with close alignment between flute ends.

E. Provide flashings and closure where required to prevent concrete leakage. Fasten in place by welding.

F. Make welds in accord with provisions of AWS Code. Use only welders certified for welding in light gauge metal.

G. Opening reinforcement shall be as detailed on the Drawings. Cutting of holes other than those detailed on the Drawings shall be done only as specifically approved by the Design Build General Contractor. Show holes on shop drawings and coordinate required openings. Holes not shown on Structural Drawings shall be cut and reinforced in accord with details on Drawings. In general, reinforcing is not necessary for holes 6 inches or less in diameter.

H. Touch up abrasions and damaged areas in galvanized coating and painted coatings on metal deck and miscellaneous metal items.

I. Remove welding ferrules and flux from welded studs using a wire brush.

3.3 HANGER LOADS

A. The load on any wire hanger shall not exceed 50 pounds. The total load from all hangers or a single hanger with adequate spreader plate on a deck unit shall not exceed 100 pounds. Do not place such loads within the middle half of deck spans.

3.4 CLEAN-UP

A. After erection, remove metal cuttings and construction debris from flutes for entire length. Remove grease, oil, and other foreign material. Leave deck and cells in proper condition for obtaining bond with concrete fill and spray fireproofing.

3.5 QUALITY CONTROL, TESTS AND INSPECTIONS

A. Testing agency will review mill test reports, welding procedures, qualification of welders and deck and stud welding during erection. Cost associated with retests, qualification of welders and tests of unidentified material will be at Contractor's expense.

B. Qualification of welders for stud shear connectors shall conform to AWS D1.1. Such qualification procedures shall be performed prior to actual use on project.

C. Testing and inspection of steel studs welded through the steel deck to structural steel below will be in accordance with Section 7, Stud Welding, AWS D1.1 including application qualification requirements. Five percent (5%) of the studs will be bend tested in accordance with Paragraph 7.6.6.1. Each bend-tested stud shall have an additional stud of the same size welded adjacent to it whether the tested stud fails or not. All additional studs shall be paid for by the Contractor.

D. If material is not identified by certified mill analysis and test reports, one set of tension and bend tests will be made by the testing agency for each 5 tons or fraction thereof for each size or gage. Costs of such testing shall be paid by the Contractor.

END OF SECTION 05 31 00

SECTION 05 40 00 – COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes, but is not necessarily limited to, the furnishing and installing of cold-formed metal framing for:
   1. Interior wall framing.
   2. Exterior wall framing.
   3. Joist framing.

B. Related Sections include the following:
   1. Section 06 16 00, Sheathing
   2. Section 09 25 00, Gypsum Board

1.3 QUALITY ASSURANCE

A. Reference Standards:
   1. American Iron and Steel Institute (AISI) Specifications and Standards: North American Specification for the Design of Cold-Formed Steel Structural Members and Standard for Cold-Formed Steel Framing - General Provisions.
   2. American Welding Society (AWS) D1.1, Structural Welding Code – Steel.
   3. American Welding Society (AWS) D1.3, Structural Welding Code – Sheet Steel.
   4. California Building Code (CBC), 2013 Edition.

B. Installer Qualifications: An experienced installer who has successfully completed work of similar scope and size as indicated for this Project.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

D. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

1.4 SUBMITTALS

A. Product Data: Submit manufacturer’s product data for each type of cold-formed metal framing product and accessory indicated. Include specifications, installation instructions, and data substantiating that the materials comply with the specified requirements.

B. LEED Submittals: See Division 1 Section "LEED Requirements" for LEED NC 2.2 Documentation Submittals. Provide LEED Criteria Worksheet for each product to be incorporated into the Work. Provide LEED Product Information Forms as required by the LEED Criteria Worksheet. In addition, provide documentation of sustainable attributes of products, including but not limited to documentation for the following credits:
   1. LEED NC 2.2 Credit MR 4.1 and 4.2, Recycled Content: Product Data indicating percentage by weight of post-consumer and post-industrial recycled content for products having recycled content. Include a statement indicating costs for each product having recycled content.
   2. LEED NC 2.2 Credit MR 5.1 and 5.2, Local/Regional Materials: Product data indicating location of material manufacturer and point of extraction for regionally extracted, processed and manufactured materials.
   3. If only a fraction of the material is extracted and manufactured locally, indicate percentage by weight.
   4. Include printed statement of costs for each regionally extracted, processed and manufactured material.

C. Welding certificates: Submit welding procedure specifications and welder performance qualifications in accordance with AWS D1.1 and D1.3.

D. Mill Certificates: Submit mill certificates or data from a qualified independent testing agency indicating steel sheet complies with specified requirements, including base metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and coating thickness.

E. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
   1. Expansion anchors.
   2. Power-actuated anchors.
   3. Mechanical fasteners.
   4. Vertical deflection clips.
   5. Horizontal drift deflection clips
   6. Miscellaneous structural clips and accessories.

F. Research/Evaluation Reports: For cold-formed metal framing.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
   1. CEMCO Steel Framing
   2. A current member of the Steel Studs Manufacturers Association
   3. Or equal

2.2 MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products required to achieve LEED MR Credit 4.

B. Steel Sheet: ASTM A 653, structural steel, zinc coated, of grade and coating as follows:
   1. Grade 33, for all 43 mil and lighter
   2. Grade 50, for all 54 mil and heavier
   3. Coating, G90 minimum

2.3 EXTERIOR LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of sizes indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 54 mil.
   2. Flange Width: 1-5/8 inches, minimum.

B. Steel Track: Manufacturer's standard U-shaped steel track, of sizes indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: Matching steel studs.
   2. Flange Width: 1-1/2 inches.

2.4 JOIST FRAMING

A. Steel Joists: Manufacturer's standard C-shaped steel sections, of sizes indicated, unpunched or punched with enlarged service holes with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 54 mil.
   2. Flange Width: 1-5/8 inches, minimum.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet of same grade and coating used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.
   3. Web stiffeners.
   4. Anchor clips.
   5. End clips.
   6. Foundation clips.
   7. Gusset plates.

8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc-coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials with approved ICC report per 2010 CBC requirements.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

F. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

G. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035 or ASTM A 780.

2.8 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

B. Fabricate framing assemblies using jigs or templates.

C. Cut framing members by sawing or shearing; do not torch cut.

D. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

E. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

F. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

G. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

H. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

I. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

J. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

K. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

E. Cut framing members by sawing or shearing; do not torch cut.

F. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

G. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

H. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

I. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

J. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

K. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

L. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

M. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

N. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

O. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

C. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.

D. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

E. Space joists not more than 2 inches from abutting walls, and as indicated on the Drawings.

F. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.

G. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.

H. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:

I. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
   1. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

J. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 05 5000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Steel framing and supports for overhead doors.
2. Steel framing and supports for countertops.
3. Steel tube reinforcement for low partitions.
4. Steel framing and supports for mechanical and electrical equipment.
5. Steel framing and supports for applications where framing and supports are not specified in other Sections.
6. Metal ladders.
7. Metal bollards.
8. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section include the following:
1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:
1. Section 03 3000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Section 04 8160 "Concrete Unit Masonry Assemblies" for installing loose lintels, anchor bolts, and other items built into unit masonry.
3. Section 05 1200 "Structural Steel Framing."
4. Section 07 7200 “Roof Accessoris” for roof hatches.
5. Section 10 2600 “Wall and Door Protection” for corner guards.
6. Section 12 9300 "Site Furnishings" for bicycle racks.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:
1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Paint products.
3. Grout.

B. LEED Submittals:
1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
1. Steel framing and supports for overhead doors.
2. Steel framing and supports for countertops.
3. Steel tube reinforcement for low partitions.
4. Steel framing and supports for mechanical and electrical equipment.
5. Steel framing and supports for applications where framing and supports are not specified in other Sections.
6. Metal bollards.

D. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design ladders.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.

E. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

F. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

G. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

H. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
   1. Size of Channels: 1-5/8 by 1-5/8 inches unless otherwise indicated.
   2. Material: Cold-rolled steel, ASTM A 1008/A 1008M, commercial steel, Type B; 0.0677-inch minimum thickness; hot-dip galvanized after fabrication.

I. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

J. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.

K. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

L. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

M. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
   1. Provide stainless-steel fasteners for fastening aluminum.
   2. Provide stainless-steel fasteners for fastening stainless steel.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.

E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

G. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or

ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

B. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete: Comply with requirements in Section 03 3000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Fabricate units from slotted channel framing where indicated.
   2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 COUNTERTOP SUPPORTS

A. Flush mounted counter brackets: Bracket for 30 inch wide work surface; Model No. EH-1824FM as manufactured by Rangine Corporation.
   1. Construction: Fabricated from horizontal aluminum T section and vertical aluminum L section. Vertical leg designed to attach to side of supporting stud and be concealed by gypsum board or other wall finish.
   2. Load capacity per bracket: 300 pounds.
   3. Faceplates: Provide 4 by 4 inches aluminum faceplates with adhesive backing and notched to fit around vertical flange of flush mounted counter support bracket and conceal penetration through gypsum board providing neat, finished appearance.
      a. Location: All open countertops, unless specified elsewhere.

B. Flush mounted vanity bracket: Flush mounted bracket fabricated from miter cut and welded aluminum sections; Rakks EVH-Vanity Bracket as manufactured by Rangine Corporation.
   1. Configuration: C shaped with vertical rear leg for attachment to wall, horizontal member for supporting vanity top, and vertical front leg with sloped return for attachment of front baffle**.**
      a. Location: All open countertops with sinks

2.8 METAL LADDERS

A. General:
   1. Comply with ANSI A14.3.

B. Aluminum Ladders:
   1. Manufacturers: Subject to compliance with requirements, provide products by the following: O'Keeffe's Inc., '501 Heavy Duty Tubular Rail Fixed Ladder" or:
      a. Approved Equal.

   2. Space siderails 18 3/8 inches (457 mm) apart unless otherwise indicated.
   3. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches (64 mm) deep, 3/4 inch (19 mm) wide, and 1/8 inch (3.2 mm) thick.
   4. Rungs: Extruded-aluminum tubes, not less than 3/4 inch (19 mm) deep and not less than 1/8 inch (3.2 mm) thick, with ribbed tread surfaces.
   5. Fit rungs in centerline of siderails; fasten by welding or with stainless-steel fasteners or brackets and aluminum rivets.
   6. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted aluminum brackets.
   7. Floor Anchorage: Manuf. Standard.

2.9 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
   1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize and prime exterior miscellaneous steel trim.

D. Prime exterior miscellaneous steel trim with zinc-rich primer.

2.10 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe.
   1. Cap bollards with 1/4-inch- thick steel plate.
   2. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.
   3. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.

B. Fabricate sleeves for bollard anchorage from steel pipe or tubing with 1/4-inch- thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.

C. Fabricate internal sleeves for removable bollards from Schedule 40 steel pipe or 1/4-inch wall-thickness steel tubing with an OD approximately 1/16 inch less than ID of bollards. Match drill sleeve and bollard for 3/4-inch steel machine bolt.

D. Prime bollards with zinc-rich primer.

E. Size and Locations: 8” typ., 4” at interior locations per drawings.

2.11 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

C. Prime plates with primer specified in Section 099600 "High-Performance Coatings."

2.12 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.13 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.14 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
   1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
   1. Shop prime with universal shop primer unless indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.15 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
   1. Cast Aluminum: Heavy coat of bituminous paint.
   2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for overhead doors securely to, and rigidly brace from, building structure.

3.3 INSTALLING METAL BOLLARDS

A. Fill bollards solidly with concrete and allow concrete to cure seven days before installing. Provide rounded concrete cap flush to pipe.
   1. Do not fill removable bollards with concrete.

B. Anchor bollards in concrete per drawings.

C. Anchor internal sleeves for removable bollards per drawings.

D. Place removable bollards over internal sleeves and secure with 3/4-inch machine bolts and nuts. After tightening nuts, drill holes in bolts for inserting padlocks. Owner furnishes padlocks.

3.4 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 9100 "Painting."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION

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SECTION 05 5116 - METAL FLOOR PLATE STAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes industrial-type stairs with steel floor plate treads and railings attached to metal floor plate stairs.

B. Related Requirements:
   1. Section 05 5213 “Pipe and Tube Railings” for steel pipe and tube railings

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For metal floor plate stairs and the following:
   1. Metal floor plate treads.
   2. Paint products.
   3. Grout.

B. LEED Submittals:
   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

D. Delegated-Design Submittal: For stairs, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design stairs.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Uniform Load: 100 lbf/sq. ft..
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360 or ¼ inch, whichever is less.

C. Seismic Performance of Stairs: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and the California Building Code.
1. Component Importance Factor: 1.5.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallically bonded to steel.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Harsco Industrial IKG, a division of Harsco Corporation; Mebac; Mebac.
      b. SlipNOT Metal Safety Flooring, a division of W. S. Molnar Company; SlipNOT.
      c. Approved equal.

2.3 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
   1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts.

D. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
   1. Join components by welding unless otherwise indicated.
   2. Use connections that maintain structural value of joined pieces.
   3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.

B. Form exposed work with accurate angles and surfaces and straight edges.

C. Weld connections to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Weld exposed corners and seams continuously unless otherwise indicated.
   5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 4 welds: good quality, uniform undressed weld with minimal splatter.

2.6 STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," industrial class, unless more stringent requirements are indicated.

B. Stair Framing:
   1. Fabricate stringers of steel plates or channels
      a. Provide closures for exposed ends of channel stringers.
   2. Construct platforms of steel plate or channel headers and miscellaneous framing members as needed to comply with performance requirements.
   3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers.

C. Metal Floor Plate Stairs: Form treads and platforms to configurations shown from abrasive-surface floor plate of thickness needed to comply with performance requirements, but not less than 1/4 inch.
   1. Form treads with integral nosing and back edge stiffener. Form risers of same material as treads.
   2. Form treads with integral nosing and back edge stiffener. Form risers from steel sheet not less than 0.097 inch thick, welded to tread nosings and stiffeners and to platforms.
   3. Form treads with integral nosing and back edge stiffener and with open risers.
   4. Weld steel supporting brackets to stringers and weld treads to brackets.
   5. Fabricate platforms with integral nosings matching treads and weld to platform framing.
   6. Form risers to be fully enclosed and integrated with treads.

2.7 STAIR RAILINGS

A. Comply with applicable requirements in Section 05 5213 "Pipe and Tube Railings."
   1. Rails may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings.
   2. Connect posts to stair framing by direct welding unless otherwise indicated.

2.8 FINISHES

A. Finish metal stairs after assembly.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

D. Finish and Color: Match Pipe and Tube Railings

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

3.2 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.

B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
   1. Use nonmetallic, nonshrink grout unless otherwise indicated.
   2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 9100 "Painting."

END OF SECTION

SECTION 05 5213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Steel pipe and tube railings.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Manufacturer's product lines of mechanically connected railings.
   2. Railing brackets.
   3. Grout, anchoring cement, and paint products.

B. LEED Submittals:
   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

D. Samples: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.
3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
   a. Show method of connecting and finishing members at intersections.

E. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

E. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

F. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Handrails and Top Rails of Guards:
      a. Uniform load of 50 lbf/ ft. applied in any direction.
      b. Concentrated load of 200 lbf applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.
   2. Infill of Guards:
      a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
      b. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
   1. Temperature Change: 120 deg F, ambient; 180 deg F.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
   1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STEEL AND IRON

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Tubing: ASTM A 500 (cold formed) or ASTM A 513.

C. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

D. Plates, Shapes, and Bars: ASTM A 36/A 36M.

E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.4 FASTENERS

A. General: Provide the following:
   1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
   2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
   3. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:
   1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
   2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
   3. Provide square or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
   1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

E. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

H. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
   1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with either welded or nonwelded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove flux immediately.
   4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
   1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

J. Form Changes in Direction as Follows:
   1. As detailed.
   2. By flush bends or by inserting prefabricated flush-elbow fittings.

K. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

L. Close exposed ends of railing members with prefabricated end fittings.

M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
   1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

P. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

Q. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.7 STEEL AND IRON FINISHES

A. Galvanized Railings:
   1. Hot-dip galvanize exterior indicated steel railings, including hardware, after fabrication.
   2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
   3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
   4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
   5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.

E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   1. Exterior Railings: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Railings Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   3. Railings Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   4. Other Railings: SSPC-SP 3, "Power Tool Cleaning."

F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
   1. Shop prime uncoated railings with universal shop primer unless indicated.
   2. Do not apply primer to galvanized surfaces.

G. Shop-Painted Finish: Comply with Section 099113 "Exterior Painting."
   1. Color: As selected by Architect from manufacturer's full range.
   2. Locations: Typical, u.o.n.

H. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.
   1. Color: As selected by Architect from manufacturer's full range.
   2. Locations: Maintenance Building

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
   1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
   3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
   1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

C. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

D. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.

C. Attach railings to wall with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

D. Secure wall brackets and railing end flanges to building construction as follows:
1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed partitions, use hanger or lag bolts set intowood backing between studs. Coordinate with stud installation to locate backing members.
4. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
5. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.6 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting." Section 099600 "High-Performance Coatings." Section 099113 "Exterior Painting,"Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

SECTION 05 7500 - DECORATIVE FORMED METAL (SUNSHADES)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Exterior Sunshade System: Modular, shop fabricated, metal sunshades to mount on exterior walls.

1.3 COORDINATION

A. Coordinate installation of anchorages for decorative formed metal items. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.

B. Coordinate installation of decorative formed metal with adjacent construction to ensure that wall assemblies, flashings, trim, and joint sealants, are protected against damage from the effects of weather, age, corrosion, and other causes of deterioration.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including finishing materials.

B. LEED Submittals:

   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
   2. Laboratory Test Reports for Credit IEQ 4.2: For paints and coatings, documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Shop Drawings: Show fabrication and installation details for decorative formed metal.

1. Include plans, elevations, component details, and attachment details.
2. Indicate materials and profiles of each decorative formed metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.

D. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.

E. Samples for Verification: 10 by 10 inches (254 by 254 mm) minimum size sample of sun shade panel illustrating design, fabrication workmanship, and selected color coating.

F. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For decorative formed metal elements that house items specified in other Sections. Show dimensions of housed items, including locations of housing penetrations and attachments, and necessary clearances.

B. Qualification Data: For professional engineer.

C. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing decorative formed metal similar to that indicated for this Project and with a record of successful in-service performance as well as sufficient production capacity to produce required units.

B. Organic-Coating Applicator Qualifications: A firm experienced in successfully applying organic coatings of type indicated to metals of types indicated and that employs competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.

C. Anodic Finisher Qualifications: A firm experienced in successfully applying anodic finishes of type indicated and that employs competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.

D. Powder-Coating Applicator Qualifications: A firm experienced in successfully applying powder coatings of type indicated to metals of types indicated and that employs competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.

E. Installer Qualifications: Fabricator of products, or approved by manufacturer in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver decorative formed metal products wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.

B. Store products on elevated platforms in a dry location.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, beams, and other construction contiguous with decorative formed metal by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Provide in accordance with Section 01 7700 “Closeout Procedures”.
   1. 20 year warranty for factory finish against cracking, peeling and blistering under normal use.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design decorative formed metal, including attachment to building construction.

B. Structural Performance: Decorative formed metal items, including anchors and connections, shall withstand the effects of gravity loads and the following loads and stresses without exceeding the allowable design working stress of materials involved and without exhibiting permanent deformation in any components:

   1. Wind Loads on Exterior Items: 30 lbf/sq. ft. (1436 Pa).

C. Seismic Performance: Exterior decorative formed metal items, including anchors and connections, shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

   1. Component Importance Factor: 1.0.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METAL

A. Galvanized-Steel Sheet: ASTM A526, either commercial steel or forming steel.

B. Steel Tubing: ASTM A500, Grade B.

C. Steel Bar Stock: ASTM A36.

2.3 SUNSHADE SYSTEM

A. Sunshade System (including support):
1. Manufacturers: Subject to compliance with requirements, provide products by the following: Ametco Manufacturing Corporation or:
   a. Approved Equal.
2. Type: Galvanized steel sunshades consisting of modular framed panels with perforated sheet infill and outriggers for mounting to exterior wall surfaces.
3. Sunshade panel: Modular panel with perimeter frame.
4. Panel Size: Per drawings.
5. Panel Type: Perforated, flat.
6. Thickness: 1/8”
7. Perforation Pattern: Staggered, round.
8. Open Area: 33%
9. Diameter: 3/16”
10. Spacing: 5/16”

B. Support System: Provide outriggers or other means for support of sun shade panel fabricated from same material as panel. System shall be designed to resist applicable dead, live, wind, and seismic loads.
1. Type: Straight projecting outriggers
2. Construction: Welded fabrication consisting of attachment plate, double support angles, and tapered plate extension as detailed and dimensioned on Drawings and approved shop drawings.
3. Size: As required to provide sufficient structural support of panels.

C. Fasteners: Stainless steel bolts, studs, and other types of size and spacing as recommended by manufacturer for specific condition and detailed on approved shop drawings.

2.4 FACTORY FINISH

A. Sun shade panels, outriggers, and other components shall receive electrostatically applied colored polyester powder coating heat cured to chemically bond finish to metal substrate.

1. Minimum hardness measured in accordance with ASTM D3363: 2H.

2. Direct impact resistance tested in accordance with ASTM D2794: Withstand 160 inch-pounds.

3. Salt spray resistance tested in accordance with ASTM B117: No undercutting, rusting, or blistering after 500 hours in 5 percent salt spray at 95 degrees F and 95 percent relative humidity and after 1000 hours less than [3/16 inch] [5 mm] undercutting.

4. Weatherability tested in accordance with ASTM D822: No film failure and 88 percent gloss retention after 1 year exposure in South Florida with test panels tilted at 45 degrees.

B. Color: Match exterior siding adjacent to sunshade system.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble decorative formed metal items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Coordinate dimensions and attachment methods of decorative formed metal items with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.

C. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch- (12-mm-) wide hem on the concealed side, or ease edges to a radius of approximately 1/32 inch (1 mm) and support with concealed stiffeners.

D. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use.

1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.

E. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce decorative formed metal items as needed to attach and support other construction.

F. Provide support framing, mounting and attachment clips, splice sleeves, fasteners, and accessories needed to install decorative formed metal items.

G. Where welding or brazing is indicated, weld or braze joints and seams continuously. Grind, fill, and dress to produce smooth, flush, exposed surfaces in which joints are not visible after finishing is completed.

1. Use welding and brazing procedures that will blend with and not cause discoloration of metal being joined.

2.6 GENERAL FINISH REQUIREMENTS

A. Complete mechanical finishes of flat sheet metal surfaces before fabrication where possible. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match sheet finish.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative formed metal.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate and place decorative formed metal items level and plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install decorative formed metal.

1. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where needed to protect metal surfaces and to make a weathertight connection.

C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.

D. Install concealed gaskets, joint fillers, insulation, sealants, and flashings, as the Work progresses, to make exterior decorative formed metal items weatherproof.

E. Install concealed gaskets, joint fillers, sealants, and insulation, as the Work progresses, to make interior decorative formed metal items soundproof or lightproof as applicable to type of fabrication indicated.

F. Corrosion Protection: Apply bituminous paint or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.

G. Install decorative-formed-metal-clad doors and frames to comply with requirements specified in Section 081113 "Hollow Metal Doors and Frames."

3.3 ADJUSTING AND CLEANING

A. Unless otherwise indicated, clean metals by washing thoroughly with water and soap, rinsing with clean water, and drying with soft cloths.

B. Clean copper alloys according to metal finisher's written instructions in a manner that leaves an undamaged and uniform finish matching approved Sample.

C. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

D. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

E. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

3.4 PROTECTION

A. Protect finishes of decorative formed metal items from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION

SECTION 06 1053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Wood blocking**,**and nailers.
   2. Plywood backing panels.

B. Related Requirements:
   1. Section 06 1600 "Sheathing."

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   1. NHLA: National Hardwood Lumber Association.
   2. NLGA: National Lumber Grades Authority.
   3. WCLIB: West Coast Lumber Inspection Bureau.
   4. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
   3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. LEED Submittals:
1. Certificates for Credit MR 6: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
2. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:
1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.
6. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Certified Wood: Lumber and plywood shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-

writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all miscellaneous carpentry unless otherwise indicated. items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawl spaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Metal Framing: Length as recommended by screw manufacturer for material being fastened:
   1. Non-structural metal framing: ASTM C1002
   2. Cold-formed metal framing: ASTM C954.

F. Lag Bolts: ASME B18.2.1.

G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
   1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
   2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.5 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Cleveland Steel Specialty Co.
   2. KC Metals Products, Inc.
   3. Phoenix Metal Products, Inc.
   4. Simpson Strong-Tie Co., Inc.
   5. USP Structural Connectors.
   6. Approved equal.

B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
   1. Use for interior locations unless otherwise indicated.

C. Hot-Dip Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
   1. Use for wood-preservative-treated lumber and where indicated.

D. Stainless-Steel Sheet: ASTM A 666, Type 316.
   1. Use for exterior locations and where indicated.

2.6 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
   1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

E. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

F. Do not splice structural members between supports unless otherwise indicated.

G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
   1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

2. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
3. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
4. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
5. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

H. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

J. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 1600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Wall sheathing.
2. Composite nail base insulated roof sheathing.
3. Roof sheathing

B. Related Requirements:
1. Section 06 1053 "Miscellaneous Rough Carpentry" for plywood backing panels.
2. Section 07 2500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. LEED Submittals:
1. Certificates for Credit MR 6: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.

2. Product Data for Credit IEQ 4.4: For composite wood products, documentation indicating that product contains no urea formaldehyde.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For following products, from ICC-ES:
1. Foam-plastic sheathing.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or GA-600, "Fire Resistance Design Manual" as indicated.

2.2 WALL SHEATHING

A. Plywood Wall Sheathing: Exterior, Structural I sheathing.
1. Span Rating: Not less than 32/16.
2. Nominal Thickness: Not less than. 15/32 inch.

2.3 COMPOSITE NAIL BASE INSULATED ROOF SHEATHING

A. Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing: Rigid, cellular, polyisocyanurate thermal insulation with oriented strand board laminated to one face complying with ASTM C 1289, Type V.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Atlas Roofing Corporation.
   b. Cornell Corporation.
   c. Dow Chemical Company (The).
   d. Johns Manville; Berkshire Hathaway Inc.
   e. Rmax, Inc.
   f. Approved equal.
2. Polyisocyanurate-Foam Thickness: 5.5 inches.
3. Oriented-Strand-Board Nominal Thickness: 7/16 inch (11.1 mm).
4. Seams: Stagger seams of laminated board with lower foam layer as applicable.

2.4 ROOF SHEATHING

A. Plywood Roof Sheathing: Exterior, Structural I Sheathing
   1. Span Rating: Not less than 32/16.
   2. Nominal Thickness: Not less than 1 1/8”
   3. Locations: All metal roof deck locations w/o composite nail base insulated roof sheathing.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
   1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
   2. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
   3. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

F. Screws for Fastening Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours

according to ASTM B 117. Provide washers or plates if recommended by sheathing manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.
   2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:
   1. Wall and Roof Sheathing:
      a. Screw to cold formed metal framing.
      b. Space panels 1/8 inch apart at edges and ends.

END OF SECTION

SECTION 06 2013 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Exterior trim.
   2. Rain Screen Wood Siding System (including interior wood finish)

B. Related Sections include the following:
   1. Section 06 1053 "Miscellaneous Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
   2. Section 07 2500 “Weather Barriers” for weather barriers behind exterior finish carpentry.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

B. Samples for Verification:
   1. For each species and cut of lumber and panel products, with 1/2 of exposed surface finished; 50 sq. in. for lumber and 8 by 10 inches for panels.

C. LEED Submittal:
   1. Certificates for Credit MR 7: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
      a. Include statement indicating costs for each certified wood product.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation within and around stacks and under temporary coverings.

1.5 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber
   1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
   2. For exposed lumber, mark grade stamp on end or back of each piece.

2.2 STANDING AND RUNNING TRIM

A. Lumber Trim for Clear Finish:
   1. Species and Grade: Santa Maria.
   2. Finger Jointing: Not allowed.
   3. Face Surface: Smooth.

2.3 RAIN SCREEN WOOD SIDING SYSTEM (**WD1**)

A. Manufacturers: Subject to compliance with requirements, provide “Mataverde Climate Shield Rain Screen Wood Siding System”, or approved equal.

B. Species: Santa Maria, 100% FSC

C. Rainscreen clips: 2” Aluminum Manufacturer standard, vertical siding, starter rail.
   1. Locations: Wall locations

D. Concealed Fastener direct attachment to plywood w/ adhesive:
   1. Locations: Reception counters, per drawings.

E. Pattern: Vertical shiplap siding with eased edges (horizontal at reception locations)
   1. Nominal size: 1 by 6 inches.
   2. Face Surface: Smooth.

F. Formed End Caps: Match siding species. End cap size per drawings. Fully adhered to siding material.

G. Finish: Manufacturer's clear finish.

H. Venting Strips: Manufacturer's standard

I. Outside Corners: Mitered and fastened, per Manufacturer's standard.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into cold-formed metal framing.
   1. For fastening siding: Basis of Design: Swan Secure "Woodpeckers."
      a. Size: #7.
      b. Material: 316 Stainless Steel, with powdercoated-head.
   2. For applications not otherwise indicated, provide stainless-steel fasteners.

B. Wood Glue: Waterproof resorcinol glue recommended by manufacturer for exterior carpentry use.

C. Flashing: Comply with requirements in Section 07 6200 "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.

D. Sealants: Latex, complying with ASTM C 834, Type P, Grade NF and with applicable requirements in Section 07 9200 "Joint Sealants," recommended by sealant manufacturer and manufacturer of substrates for intended application.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. Bostik Findley; Chem-Calk 600.
      b. Pecora Corporation; AC-20+.
      c. Schnee-Morehead, Inc.; SM 8200.
      d. Sonneborn, Division of ChemRex Inc.; Sonolac.
      e. Tremco; Tremflex 834.
      f. Approved equal.

2.5 FABRICATION

A. Back out or kerf backs of standing and running trim wider than 5 inches, except members with ends exposed in finished work.

B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Prime wood siding and trim to receive clear finish, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Section 09 9100 “Painting.”

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
   1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
   1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
   2. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
   3. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 TRIM INSTALLATION

A. Install flat grain lumber with bark side exposed to weather.

B. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long except where necessary.
   1. Use scarf joints for end-to-end joints.
   2. Stagger end joints in adjacent and related members.

C. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

D. Unless otherwise indicated, countersink fasteners where face fastening is unavoidable.

3.5 SIDING INSTALLATION

A. Install siding to comply with manufacturer's written instructions.

B. Vertical Wood Siding: Begin application at corner with grooved edge toward the adjacent wall. Install subsequent courses with tongue-and-groove edges tightly fitted together. Fasten through horizontal blocking. Fastener must penetrate 1 ¼ inch minimum into blocking.
   1. Leave 1/8-inch gap at trim and corners unless otherwise recommended by manufacturer, and apply sealant.

C. Flashing: Install metal flashing as indicated on Drawings and as recommended by siding manufacturer.

D. Finish: Apply final finish within two weeks of installation.

3.6 ADJUSTING

A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.7 CLEANING

A. Clean exterior finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.8 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

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SECTION 06 4023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Interior standing and running trim.

B. Related Sections include the following:
   1. Section 05 5000 “Metal Fabrications” for metal supports for countertops.
   2. Section 06 1053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
   3. Section 09 9100 “Painting” for field painting interior architectural woodwork for opaque finish.
   4. Section 06 4116 “Plastic Laminate Faced Architectural Cabinets” for cabinets and accessories.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

B. Surface Definitions: Comply with WI's “Architectural Woodwork Standards” for definitions of “exposed”, “semi-exposed” and “concealed” surfaces for grades indicated and the following additional requirements:
   1. The following surfaces are to be considered “exposed” regardless of grade indicated:
      a. Tops of cabinets without countertops.
      b. Bottoms of wall hung cabinets, unless resting on construction below (concealing bottom).
      c. Interior surfaces and shelves of open cabinets, or cabinets with glass doors.
      d. Closure panels, fillers and trims exposed to view, or adjacent to an “exposed” cabinet surface.

1.4 ACTION SUBMITTALS

A. Product Data: For panel products high-pressure decorative laminate adhesive for bonding plastic laminate solid-surfacing material cabinet hardware and accessories.

A. LEED Submittals:
1. LEED Credit MR 4 Recycled Content:
a. Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
b. Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
c. For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.
2. LEED Credit MR 5, Regional Materials:
a. For products and materials required to comply with requirements for regional materials, submit data indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
3. LEED Credit MR 7,Certified Wood:
a. Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
4. LEED Credit IEQ 4.1, Low-Emitting Materials, Adhesives and Sealants:
a. Manufacturer's technical data sheet showing a printed statement of VOC content for all adhesives and sealants and demonstrating compliance with SCAQMD Rule #1168, effective July 1, 2005 and amended January 1, 2005.
5. LEED Credit EQ 4.2, Low-Emitting Materials, Paints and Coatings:
a. Manufacturer's technical data sheet showing a printed statement of VOC content for all paints and coatings and demonstrating compliance with Green Seal standard GS-11 paints, May 1993; with GS-03, anti-rust and anti-rust coatings, January 7, 1997; with SCAQMD Rule #1113, clear wood finishes, floor coatings, stains, primers, and shellacs, January 1, 2004.
6. LEED Credit EQ 4.4: Low-Emitting Composite Wood and Agrifiber Products:
a. Submit manufacturer's printed statement or product data indicating that composite wood or agrifiber products and laminating adhesives contain no added urea formaldehyde (NAUF).

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.

3. Show locations and sizes of cutouts and holes for plumbing fixtures faucets, soap dispensers and other items installed in architectural woodwork.
4. Apply WI-certified compliance label to first page of Shop Drawings.

C. Samples for Verification:
1. Provide mock-up cabinet showing plastic laminate, thermoset decorative panels and cabinet hardware.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of product, signed by product manufacturer.

B. Woodwork Quality Standard Compliance Certificates: WI-certified compliance certificates.

C. Qualification Data: For fabricator.

1.6 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Provide cabinets capable of withstanding the effects of earthquake motions determined according to the building code in effect for this Project.
1. 2010 California Building Code, California Code of Regulations Title 24, Part 2, Volumes 1 and 2.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products .

C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers.

Project Quality Control: Project is subject to WI's Certified Compliance Program (CCP). Before delivery to the job-site:

1. Licensees of the Woodwork Institute shall issue a Certified Compliance Certificate indicating the Interior Architectural Woodwork products being furnished for this Project, and certifying that these products and their installation will fully meet all the requirements of the grade(s) specified.
2. Non-Licensees of the Woodwork Institute shall provide evidence that they have arranged for inspection by a Woodwork Institute inspector after completion of fabrication and installation. If all conditions are found to be compliant, the inspector will issue a certified Compliance Certificate indicating the Interior Architectural Woodwork products furnished for this project and certifying that these products and their installation fully meet all the requirements of the grade(s) specified.

D. Quality Standard: Unless otherwise indicated, comply with WI's "Architectural Woodwork Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
   1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with such selections and requirements in addition to the quality standard.

E. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Approved mockups may become part of the completed Work if undisturbed at time of Final Completion.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements Section 01 3100 "Project Management and Coordination."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
   2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.10 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 LEED MATERIALS REQUIREMENTS

A. LEED Credit MR4: Provide materials with high levels of recycled content.

B. LEED Credit MR 5: Provide materials extracted, harvested, recovered and manufactured within 500 miles of the project site. Materials shall comply with LEED credit MR 5 to the extent possible.

C. LEED Credit MR 7: Provide minimum 50 percent of wood-based materials and products from wood obtained from forests certified in accordance with FSC Principles and Criteria.

D. All VOC-containing materials applied on-site inside of the weatherproof barrier of the building shall comply with LEED credits EQ4:
   1. LEED Credit EQ4.1: Provide grouts, adhesives and sealants with VOC content and chemical component limits not exceeding the content limits defined by SCAQMD Rule #1168, July 1, 2005, amended January 1, 2005 and Green Seal GS-36, effective October 19, 2000 for aerosol adhesives.

2. LEED Credit EQ 4.2: For field-applied materials, provide paints and coatings that comply with the limits defined by Green Seal Standard GS-11, GS-03 or SCAQMD Rule #1113 as applicable.
3. LEED Credit EQ 4.4: Provide only composite wood (plywood, MDF, etc.), agrifiber products and laminating adhesives that contain no added urea formaldehyde (NAUF). All composite wood installed within the weatherproofing barrier of the project must comply with this requirement. All laminating adhesives regardless of installation or whether shop-applied must comply with this requirement.

2.2 MATERIALS

A. General: Provide materials that comply with requirements of WI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Species and Cut for Transparent Finish: Flat Cut Walnut, to match flush wood doors.

2.3 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

D. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

E. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Wood Glues: 30 g/L.
2. Contact Adhesive: 250 g/L.

2.4 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
   1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
   2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
   3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch.

D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
   2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
   1. Seal edges of openings in countertops with a coat of varnish.

2.5 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

A. Grade: Custom.

B. Wood Species and Cut: Flat Cut Walnut, Transparent Finish. Match Flush wood doors.

C. For trim items wider than available lumber, use veneered construction. Do not glue for width.

D. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

2.6 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

A. Grade: Premium.

B. Material: Medium-Density Fiberboard.

C. Finish: Field paint.

2.7 SHOP FINISHING

A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. Finish Materials: Use finish materials that meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.
   1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.

D. Shop Priming: Shop apply the prime coat including backpriming, if any, for items specified to be field finished. Refer to Section 09 9100 "Painting" for material and application requirements.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
   1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
   2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

G. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 06 4116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:
1. Section 05 5000 “Metal Fabrications” for counter brackets.
2. Section 06 1056 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
3. Section 12 3623.13 “Plastic Laminate Clad Countertops” for countertops and trim.
4. Section 12 3661.16 “Solid Surface Countertops” for countertops and trim.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, and cabinet hardware and accessories.
1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. LEED Submittals:
1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Certificates for Credit MR 7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification and chain-of-custody requirements. Include statement indicating cost for each certified wood product.

3. Product Data for Credit IEQ 4.4: For adhesives and composite wood products, documentation indicating that products contain no urea formaldehyde.

C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural plastic-laminate cabinets.
4. Apply WI Certified Compliance Program label to Shop Drawings.

D. Samples for Initial Selection:
1. Plastic laminates.
2. PVC edge material (manufacturers full range)
3. Thermoset decorative panels.

E. Samples for Verification:
1. Plastic laminates, 8 by 10 inches, for each color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.
2. Thermoset decorative panels, 8 by 10 inches, for each color, pattern, and surface finish, with edge banding on one edge.
3. Corner pieces as follows:
   a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
   b. Miter joints for standing trim.
4. Exposed cabinet hardware and accessories, one unit for each type.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer fabricator.

B. Product Certificates: For each type of product.

C. Woodwork Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.

D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a licensee of WI's Certified Compliance Program.

B. Installer Qualifications: Fabricator of products.

C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockups of typical plastic-laminate cabinets as shown on Drawings.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 08 7100 "Door Hardware" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS (**PL1, PL3**)

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
   1. Provide labels and certificates from WI certification program indicating that woodwork, including installation, complies with requirements of grades specified.
   2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.
   1. Basis of Design: Subject to compliance with requirements, provide Formica “Laminate” or the following:
      a. Approved equal.

C. Grade: Premium.

D. Type of Construction: Frameless.

E. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

F. Laminate Cladding for Exposed Surfaces:
   1. Horizontal Surfaces: Grade HGS.
   2. Postformed Surfaces: Grade HGP.
   3. Vertical Surfaces: Grade VGS.
   4. Edges: Grade HGS.
   5. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.

G. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

H. Cabinets with lighting:
   1. Extend Door to align with valance
   2. Valance to match depth of lighting. Match door finish.
   3. Locations: Per drawings

I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
   1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

K. Locations:
   1. **PL1**: All cabinets, unless specified elsewhere.

2. **PL3**: Cabinets at Rooms 125, 135.

L. Colors:
1. **PL1**: 1097-MC Citadel
2. **PL3**: 918-SP Neutral White

M. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. As selected from manufacturer's complete range of available standard and premium colors.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
2. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
3. Softwood Plywood: DOC PS 1, medium-density overlay.
4. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
5. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087 100 "Door Hardware."

A. Barrel Hinge Basis of Design: Subject to compliance with requirements, provide products by Grass America or approved equal:
1. Institutional Hinges:
a. Comply with ANSI/BHMA A156.9, Grade 1 criteria.
b. Opening Condition: 270 degrees.
1) Overlay style.
2) Common Panel
c. Finish: Nickel.

B. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

C. Catches: Magnetic catches, BHMA A156.9, B03141.

D. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.

E. Drawer Slides Basis of Design: Subject to compliance with requirements, provide products by Accuride International, Inc. or approved equal.
   1. Comply with ANSI/ BHMA A156.9.
   2. Finish: Clear zinc.

F. Box Drawer Slides:
   1. Drawers 16 inches wide or less: Accuride 3832SC all ball bearing, self-closing (additional pull-force to open), handed lever disconnect, full extension slides with a 100 lb/pr load rating.
   2. Drawers 24 inches wide or less: Accuride 7432, full extension all ball bearing rail mount, full extension plus 1 inch over travel slides, hold-in detent, with a 100 lb/pr load rating and progressive movement.

G. File Drawer Slides:
   1. Drawers 24 inches wide or less: Accuride 4034 all ball bearing, rail mount, full extension plus 1 inch over travel slides, hold-in detent with a 150 lb./pr load rating and progressive movement.
   2. Drawers 42 inches wide or less: Accuride 3640 all ball bearing, rail/bracket mount, full extension plus 1 inch over travel slides, hold-in detent with a 200 lb/pr load rating and sequential movement.

H. Pencil Drawer Slides:
   1. Drawers not more than 3 inches high and 24 inches wide: Accuride 3005 all ball bearing, side mount, full extension plus 1 inch over travel slides, detent-in with a 100 lb/ pr load rating.

I. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.
   1. Product: Subject to compliance with requirements, provide "OG series" by Doug Mockett & Company, Inc.

J. Door and Drawer Silencers: BHMA A156.16, L03011.

K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
   1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
   2. Satin Stainless Steel: BHMA 630.

L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.5 FABRICATION

A. Fabricate cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
   2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

D. Install glass to comply with applicable requirements in Section 08 8000 "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
   1. Use filler matching finish of items being installed.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
   1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
   2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips and No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION

SECTION 06 6400 - PLASTIC PANELING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glass-fiber reinforced plastic (FRP) wall paneling and trim accessories.

B. Related Sections:
   1. Section 06 1053 "Miscellaneous Rough Carpentry" for wood furring for installing plastic paneling.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:
   1. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.

C. Samples for Verification: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.4 QUALITY ASSURANCE

A. Testing Agency: Acceptable to authorities having jurisdiction.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

2.2 PLASTIC SHEET PANELING (**FRP1**)

A. General: Gelcoat-finished, glass-fiber reinforced plastic panels complying with ASTM D 5319.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Nudo Products, Inc. “Fiberlite FRP Wall Panel” or comparable product by one of the following:
      a. Approved equal.
   2. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 25 or less.
      b. Smoke-Developed Index: 450 or less.
   3. Nominal Thickness: Not less than 0.09 inch.
   4. Surface Finish: Smooth.
   5. Color: Pearl (750)

2.3 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, and caps as needed to conceal edges.
   1. Color: Match panels.

B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.

C. Adhesive: As recommended by plastic paneling manufacturer.

D. Sealant: Single-component, mildew-resistant, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 07 9200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

B. Clean substrates of substances that could impair bond of adhesive, including oil, grease, dirt, and dust.

C. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

D. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels.
   1. Mark plumb lines on substrate at trim accessory locations for accurate installation.
   2. Locate trim accessories to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install panels in a full spread of adhesive.

C. Install trim accessories with adhesive and nails. Do not fasten through panels.

D. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.

E. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

F. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.

G. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION

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SECTION 07 1326 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Modified bituminous sheet waterproofing.
   2. Modified bituminous sheet waterproofing, fabric reinforced.

B. Related Requirements:

   1. Section 33 4100 “Storm Utility Drainage” for drainage pipe.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
   2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

C. Samples: For each exposed product and for each color and texture specified, including the following products:
   1. 8-by-8-inch square of waterproofing and flashing sheet.
   2. 4-by-4-inch (100-by-100-mm) square of drainage panel.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.
   1. Build for each typical waterproofing installation including topping slab to demonstrate surface preparation, crack and joint treatment, corner treatment, and protection.
      a. Size: 100 sq. ft. in area.
      b. Description: Each type of wall, deck, and plaza installation.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
   1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials from single source from single manufacturer.

2.2 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one side to a 4-mil- thick, polyethylene-film reinforcement, and with release liner on adhesive side.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. American Hydrotech, Inc.; VM75.
      b. Carlisle Coatings & Waterproofing Inc.; CCW MiraDRI 860/861.
      c. CETCO Building Materials Group, a subsidiary of AMCOL International Corp.; Envirosheet.
      d. Grace, W. R., & Co. - Conn.; Bituthene 3000/Low Temperature or Bituthene 4000.
      e. Henry Company; Blueskin WP 100/200.
      f. Meadows, W. R., Inc.; SealTight Mel-Rol.
      g. Polyguard Products, Inc.; Polyguard 650.
      h. Protecto Wrap Company; PW 100/60.
      i. Tamko Building Products, Inc.; TW-60.
      j. Approved equal.
   2. Physical Properties:
      a. Tensile Strength, Membrane: 250 psi minimum; ASTM D 412, Die C, modified.
      b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
      c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
      d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
      e. Puncture Resistance: 40 lbf minimum; ASTM E 154.
      f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
      g. Water Vapor Permeance: 0.05 perms maximum; ASTM E 96/E 96M, Water Method.
      h. Hydrostatic-Head Resistance: 200 feet minimum; ASTM D 5385.
   3. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

B. Modified Bituminous Sheet, Fabric Reinforced: Minimum 60-mil nominal thickness, self-adhering sheet consisting of rubberized-asphalt membrane with embedded fabric reinforcement, and with release liner on adhesive side.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Protecto Wrap Company; Jiffy Seal 140/60.

b. Royston, Div. of Chase Specialty Coatings; Royal-Gard Plus Membrane 104ARHT.
c. Approved equal.

2. Physical Properties:
   a. Pliability: No cracks when bent 180 degrees over a 1-inch mandrel at minus 25 deg F; ASTM D 146.
   b. Puncture Resistance: 40 lbf minimum; ASTM E 154.
   c. Water Vapor Permeance: 0.05 perms maximum; ASTM E 96/E 96M, Water Method.
3. Sheet Strips: Self-adhering, reinforced, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

C. Locations: All below-grade wall, vertical surfaces (including pits, vaults)

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by sheet-waterproofing material manufacturer.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.

E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.

F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.

G. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
1. Thickness: 1/4 inch, nominal.
2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for protection course type.

2.4 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size

not exceeding No. 70 sieve laminated to one side of the core and a polymeric film bonded to the other side; and with a vertical flow rate of 9 to 15 gpm per ft..

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. American Hydrotech, Inc.; Hydrodrain 400 or Hydrodrain 420.
   b. Carlisle Coatings & Waterproofing Inc.; CCW MiraDRAIN 6000 CCW, MiraDRAIN 6000XL CCW, MiraDRAIN 6200 or CCW MiraDRAIN 6200XL.
   c. Grace, W. R., & Co. - Conn.; Hydroduct 220 or Hydroduct 660.
   d. Protecto Wrap Company; Protecto Drain 2000-V.
   e. Approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the waterproofing.
   1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
   2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
   1. Install sheet strips of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.

F. Bridge and cover isolation joints expansion joints and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips of widths according to manufacturer's written instructions.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
   1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:
      a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.
   1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.

D. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

E. Seal edges of sheet-waterproofing terminations with mastic.

F. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.

G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.
   1. Immediately install protection course with butted joints over waterproofing membrane.Molded-sheet drainage panels may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.

3.4 MOLDED-SHEET DRAINAGE-PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives or other methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
1. For vertical applications, install protection course before installing drainage panels.

3.5 FIELD QUALITY CONTROL

A. Engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish daily reports to Architect.

B. Prepare test and inspection reports.

3.6 PROTECTION, REPAIR, AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

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SECTION 07 1900 - WATER REPELLENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes penetrating water-repellent treatments for the following vertical and horizontal surfaces:
   1. Cast-in-place concrete.
   2. Unit Masonry

B. Related Sections:
   1. Section 04 2000 "Unit Masonry" for integral water-repellent admixture for unit masonry assemblies.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Testing: Installed water repellents shall comply with performance requirements indicated, as evidenced by reports of tests performed on manufacturer's standard substrate assemblies by a qualified testing agency.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Include manufacturer's printed statement of VOC content.
   2. Include manufacturer's standard colors.
   3. Include manufacturer's recommended number of coats for each type of substrate and spreading rate for each separate coat.

B. Samples: For each type of water repellent and substrate indicated, 12 by 12 inches in size, with specified water-repellent treatment applied to half of each Sample.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Applicator.

B. Product Certificates: For each type of water repellent, from manufacturer.

C. Preconstruction Testing Reports: For water-repellent-treated substrates.

D. Field quality-control reports.

E. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: An employer of workers trained and approved by manufacturer with not less than 3 years of experience with the system.

B. Mockups: Apply water repellent to each type of substrate required.
   1. Locate each test application as directed by Architect.
   2. Size: 25 sq. ft..
   3. Final approval by Architect of water-repellent application will be from test applications.

C. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:
   1. Concrete surfaces and mortar have cured for not less than 28 days.
   2. Building has been closed in for not less than 30 days before treating wall assemblies.
   3. Ambient temperature is above 40 deg F and below 100 deg F and will remain so for 24 hours.
   4. Substrate is not frozen and substrate-surface temperature is above 40 deg F and below 100 deg F.
   5. Rain or snow is not predicted within 24 hours.
   6. Not less than 24 hours have passed since surfaces were last wet.
   7. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agree(s) to repair or replace materials that fail to maintain water repellency specified in "Performance Requirements" Article within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PENETRATING WATER REPELLENTS

A. Silane/Siloxane-Blend, Penetrating Water Repellent: Clear, silane and siloxane blend with 400 g/L or less of VOCs.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Advanced Chemical Technologies, Inc.; Sil-Act Dri-Treat WB.
      b. BASF Construction Chemicals, LLC; Enviroseal 7.
      c. Degussa Corporation; Protectosil Aqua-Trete EM.
      d. Karnak Corporation; LL10.
      e. Kryton International Inc., Kryton Group of Companies (The); Hydrostop WB.
      f. L&M Construction Chemicals, Inc.; Aquapel.
      g. Pecora Corporation; KlereSeal 910-W.
      h. PROSOCO, Inc.; Siloxane PD.
      i. Rainguard Products Company; Blok-Lok.
      j. Sika Corporation, Inc.; Sikagard 701W.
      k. Symons by Dayton Superior; Siloxane/Silane 10%.
      l. Tamms Industries, Inc., Euclid Chemical Company (The); Chemstop WB Regular.
      m. Tnemec Inc.; Dur A Pell 10.
      n. Approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
   1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in three representative locations by method recommended by manufacturer.
   2. Inspect for previously applied treatments that may inhibit penetration or performance of water repellents.
   3. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
   4. Verify that required repairs are complete, cured, and dry before applying water repellent.

B. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions and as follows:
   1. Cast-in-Place Concrete: Remove oil, curing compounds, laitance, and other substances that inhibit penetration or performance of water repellents according to ASTM E 1857.

B. Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.

C. Coordination with Sealant Joints: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
   1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those required.

3.3 APPLICATION

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

B. Apply a heavy-saturation coating of water repellent, on surfaces indicated for treatment, using 15 psi- pressure spray with a fan-type spray nozzle, roller or brush to the point of saturation. Apply coating in dual passes of uniform, overlapping strokes. Remove excess material; do not allow material to puddle beyond saturation. Comply with manufacturer's written instructions for application procedure unless otherwise indicated.

C. Apply a second saturation coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

3.4 FIELD QUALITY CONTROL

A. Testing of Water-Repellent Material: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when water repellent is being applied:
   1. Owner will engage the services of a qualified testing agency to sample water-repellent material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
   2. Testing agency will perform tests for compliance of water-repellent material with product requirements.

3. Owner may direct Contractor to stop applying water repellents if test results show material being used does not comply with product requirements. Contractor shall remove noncomplying material from Project site, pay for testing, and correct deficiency of surfaces treated with rejected materials, as approved by Architect..

B. Coverage Test: In the presence of Architect, hose down a dry, repellent-treated surface to verify complete and uniform product application. A change in surface color will indicate incomplete application.
1. Notify Architect seven days in advance of the dates and times when surfaces will be tested.
2. Reapply water repellent until coverage test indicates complete coverage.

3.5 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application, as approved by Architect.

B. Comply with manufacturer's written cleaning instructions.

END OF SECTION

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SECTION 07 2100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Foam-plastic board insulation.
2. Glass-fiber blanket insulation.
3. Spray polyurethane foam insulation.

B. Related Sections:
1. Section 06 1600 “Sheathing” for insulated nail-base sheathing.
2. Section 09 2900 "Gypsum Board" for installation in metal-framed assemblies of insulation specified by referencing this Section.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:
1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:
1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Styrofoam Brand “Perimate” or comparable product by one of the following:
a. Approved equal.
2. Thickness: 1.063”
3. Locations: All edge of slab (heated), all pit walls.
4. Water Vapor Permeance: ASTM E96

2.2 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. CertainTeed Corporation.
2. Guardian Building Products, Inc.
3. Johns Manville.
4. Knauf Insulation.
5. Owens Corning.
6. Approved equal.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

C. Reinforced-Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

D. Sound Attenuating Batt Insulation: ASTM E90-1990, ASTM E413.
   1. STC Rating: 49 min.

2.3 SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF Corporation.
      b. BaySystems NorthAmerica, LLC.
      c. Dow Chemical Company (The).
      d. ERSystems, Inc.
      e. Gaco Western Inc.
      f. Henry Company.
      g. NCFI; Division of Barnhardt Mfg. Co.
      h. SWD Urethane Company.
      i. Volatile Free, Inc.
      j. Approved equal.
   2. Minimum density of 1.5 lb/cu. ft., thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce

thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
   1. If not otherwise indicated, extend insulation a minimum of 16 inches below exterior grade line.

3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Glass-Fiber Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
   4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
   5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings and seal each continuous area of insulation to ensure airtight installation. Set units with facing placed toward interior of construction.

C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
   1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.5 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches up either side of partitions.

3.6 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

3.7 INSULATION SCHEDULE

APPLICATION	TYPE	THICKNESS	REMARKS
Perimeter of Radiant Slab/Pit/Interior at CMU per drawings	Extruded-polystyrene	1 inch	R-5
PART 4 - Exterior Wall Cavity	PART 5 - Faced glass-fiber blanket	PART 6 - 6 inches	PART 7 - R-21
		8 inches	R-25. use in locations with no insulated metal wall panel exterior finish.
Above Ceiling	Faced glass-fiber blanket	6 inches	R-21. see ceiling plan / legend for additional information
Miscellaneous Voids	Spray Polyurethane	As required	
Steep-Slope Roofs	Composite nail base insulated sheathing		See 06 1600.

END OF SECTION

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SECTION 07 2119 - FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Closed-cell spray polyurethane foam.

B. Related Requirements:

1. Section 072100 "Thermal Insulation" for foam-plastic board insulation and spray polyurethane for miscellaneous voids.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Evaluation Reports: For spray-applied polyurethane foam-plastic insulation, from ICC-ESR 2669.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of **2.0 lb/cu. ft. 32 kg/cu. m)** and minimum R-value at 1-inch (25.4-mm) thickness of 5.8 deg F x h x sq. ft./Btu at 75 deg F (43 K x sq. m/W at 24 deg C) (ASTM C 518)
1. Basis-of-Design Product: Subject to compliance with requirements, provide CertainTeed Corporation “Certaspray Closed Cell Spray Foam” or comparable product by one of the following:
   a. Approved Equal
2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 450 or less.
3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
4. Thickness: 4” (from bottom of metal deck flute)
5. Locations: Underside of exposed metal deck, per drawings.

2.2 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.

B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Spray insulation to envelop entire area to be insulated and fill voids.

C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.

D. Miscellaneous Voids: Apply according to manufacturer's written instructions.

3.3 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION

SECTION 07 2500 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Self-adhering vapor permeable modified-bituminous sheet.
   2. Flexible flashing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.
   1. Plans and elevations showing locations and extent of weather barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
   2. Include details of interfaces with other materials that form part of weather barrier including, but not limited to, flashings, adjacent waterproofing membranes and sealants. Manufacturer’s typical details do not comply with this requirement.
      a. Minimum drawing scale: 3 inches = 1 foot.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: From weather barrier manufacturer, certifying compatibility of weather barriers and accessory materials with Project materials that connect to or that come in contact with weather barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer and having a minimum of 5 years of installation experience installing the specified products under similar conditions.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.1 VAPOR PERMEABLE SELF-ADHERING SHEET

A. Modified Bituminous Sheet: 40-mil- thick, self-adhering sheet consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick, cross-laminated polyethylene film with release liner on adhesive side and formulated for application with primer that complies with VOC limits of authorities having jurisdiction.
   1. Basis of Design Product: Subject to compliance with requirements, provide W.R. Grace Perm-A-Barrier VPS Wall Membrane or approved equal.
   2. Physical and Performance Properties:
      a. Air Permeance: Maximum 0.0004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
      b. Water Vapor Permeance: Not less than 15 perms; ASTM E 96/E 96M, Water Method.
      c. Water Resistance: AATCC-127 Hydrostatic Head Test 1,2: Not less than 5 hrs.
   3. Locations: Per drawings and all roofs (full surface) less than 3:12 slope.

2.2 MISCELLANEOUS MATERIALS

A. Flexible Membrane Wall Flashing: Basis of Design: Perm-A-Barrier Wall Flashing manufactured by Grace Construction Products; a 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:
   1. Water Vapor Transmission: ASTM E96, Method B: 0.05 perms max.
   2. Water Absorption: ASTM D570: max. 0.1% by weight
   3. Puncture Resistance: ASTM E154: 80 lbs. min.
   4. Tear Resistance
      a. Initiation ASTM D1004: min. 13.0 lbs. M.D.
      b. Propagation ASTM D1938: min. 9.0 lbs. M.D.
   5. Lap Adhesion at 25ºF: ASTM D1876: 5.0 lbs./in. of width
   6. Low Temperature Flexibility ASTM D1970: Unaffected to -45ºF
   7. Tensile Strength: ASTM D412, Die C Modified: min. 5.5 800 psi
   8. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%

B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

C. Nails and Staples: ASTM F 1667.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
   1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by weather barrier to prevent spillage and overspray affecting other construction.

C. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
   1. Install modified bituminous strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.

D. Bridge and cover isolation joints, expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with overlapping modified bituminous strips.

E. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

F. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for weather barrier.

3.3 INSTALLATION

A. General: Install weather barrier sheets and accessory materials according to air-barrier manufacturer's written instructions and according to recommendations in ASTM D 6135.
   1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous air-barrier sheet produced for low-temperature application. Do not install low-temperature sheet if ambient or substrate temperature is higher than 60 deg F.

B. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
   1. Install modified bituminous strips centered over vertical inside corners. Install 3/4-inch fillets of termination mastic on horizontal inside corners.

C. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations with termination mastic and according to ASTM D 6135.

D. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.
   1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

E. Apply and firmly adhere weather barrier sheets horizontally over area to receive weather barrier. Accurately align sheets and maintain uniform 3-inch- minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.
   1. Apply sheets in a shingled manner to shed water without interception by any exposed sheet edges.
   2. Roll sheets firmly with hand roller to enhance adhesion to substrate.

F. Apply continuous modified bituminous sheets over modified bituminous strips bridging substrate cracks, construction, and contraction joints.

G. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination liquid membrane.

H. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous weather barrier.

I. Connect and seal exterior wall air-barrier membrane continuously to roofing-membrane weather barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

J. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply flexible membrane wall flashing so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.
   1. Modified Bituminous Transition Strip: Roll with hand roller to enhance adhesion.

K. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air-barrier membrane with foam sealant.

L. At end of each working day, seal top edge of air-barrier material to substrate with termination liquid membrane.

M. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

N. Repair punctures, voids, and deficient lapped seams in weather barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 6 inches beyond repaired areas in all directions.

O. Do not cover weather barrier until it has been tested and inspected by Owner's testing agency.

P. Correct deficiencies in or remove weather barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Inspections: Weather-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air-barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed.
7. Laps in sheet materials have complied with the minimum requirements and have been shingled in the correct direction (or mastic applied on exposed edges), with no fishmouths.
8. Termination liquid membrane has been applied on cut edges.
9. Weather barrier has been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

C. Tests: As determined by Owner's testing agency from among the following tests:
1. Qualitative Air-Leakage Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, smoke pencil with pressurization or depressurization or ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
2. Quantitative Air-Leakage Testing: Air-barrier assemblies will be tested for air leakage according to ASTM E 783.

3. Adhesion Testing: Air-barrier assemblies will be tested for minimum air-barrier adhesion of 16 lbf/sq. in. according to ASTM D 4541 for each 600 sq. ft. of installed weather barrier or part thereof.

D. Weather barriers will be considered defective if they do not pass tests and inspections.
1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to weather barriers caused by testing; follow manufacturer's written instructions.

3.5 CLEANING AND PROTECTION

A. Protect weather-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
1. Protect weather barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 150 days, remove and replace weather barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
2. Protect weather barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed Work, using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 2616 - BELOW-GRADE VAPOR RETARDER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, documents, and general provisions of the Contract, including, but not necessarily limited to, General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Vapor Retarder for installation under concrete slabs.
   2. Accessories.

B. Related Sections include the following:
   1. Section 03 3000 “Cast-In-Place Concrete.”

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. ASTM E 1745 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
   2. ASTM E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs
   3. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials
   4. ASTM E 1643 Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

B. American Concrete Institute (ACI)
   1. ACI 302.1 Vapor Barrier Component (plastic membrane) is not less than 10 mils thick.
   2. ACI 302.2R Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples:
   1. Membrane
   2. Seam Tape
   3. Accessories

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer’s installation instructions for placement, seaming and pipe boot installation

B. Independent laboratory test results showing compliance with ASTM & ACI Standards

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Classification: ASTM E 1745, Class A.

B. Permeance Rating: 0.01 perms or lower per ASTM E 96.

C. Puncture Resistance: 3000 grams minimum per ASTM E 1709.

2.2 VAPOR RETARDER

A. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
1. Fortifiber Building Systems Group; Moistop Ultra 15.
2. Insulation Solutions, Inc.; Viper VaporCheck 16.
3. Meadows, W. R., Inc.; Perminator 15 mil.
4. Raven Industries Inc.; Vapor Block 15.
5. Reef Industries, Inc.; Griffolyn 15 mil Green.
6. Approved equal.

B. Locations: Under all slab on grade (including pit locations)

2.3 ACCESSORIES

A. Seam Tape: Manufacturer's recommended, pressure sensitive type, self-adhering, and of perm rating not less than vapor retarder.

B. Adhesive: Type recommended by manufacturer of sheet products, compatible with sheet and substrate.

C. Vapor Proofing Mastic: Manufacturer's recommended and of perm rating not less than vapor retarder.

D. Pipe Boots
1. Provide factory-fabricated pipe boots or construct pipe boots from vapor retarder material, pressure sensitive tape and/or mastic per manufacturer's instructions.

PART 3 - EXECUTION

3.1 PREPARATION

A. Level and tamp or roll aggregate, sand or tamped earth base.

3.2 INSTALLATION

A. Install Vapor Retarder:
   1. Installation shall be in accordance with manufacturer's instructions and ASTM E1643.
      a. Unroll Vapor Retarder with the longest dimension parallel with the direction of the pour.
      b. Lap Vapor Retarder over footings and seal to foundation walls.
      c. Overlap joints 6 inches and seal with manufacturer's tape.
      d. Seal all penetrations (including pipes and reinforcing steel) per manufacturer's instructions.
      e. No penetration of the Vapor Retarder is allowed except for reinforcing steel and permanent utilities.
      f. Repair damaged areas by cutting patches of Vapor Retarder, overlapping damaged area 6 inches and taping all four sides with tape.

3.3 PROTECTION AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected vapor retarder membrane.

B. Protect vapor retarder from damage.

END OF SECTION

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SECTION 07 3113 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Asphalt shingles.
   2. Underlayment.

B. Related Sections:
   1. Division 6 Section "Rough Carpentry" for wood framing.
   2. Division 6 Section "Sheathing" for composite nail base insulated roof sheathing.
   3. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings counterflashings and flashings.
   4. Division 7 Section "Weather Barriers" for self-adhering vapor permeable modified-bituminous sheet and flexible flashing.

1.3 DEFINITION

A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of asphalt shingle ridge and hip cap shingles and ridge vent indicated.
   1. Include similar Samples of trim and accessories involving color selection.

C. Samples for Verification: For the following products, of sizes indicated, to verify color selected:
   1. Asphalt Shingle: Full size.
   2. Ridge and Hip Cap Shingles: Full size.
   3. Self-Adhering Underlayment: 12 inches square.

D. Qualification Data: For qualified Installer.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for asphalt shingles.

F. Research/Evaluation Reports: For each type of asphalt shingle required, from the ICC.

G. Maintenance Data: For each type of asphalt shingle to include in maintenance manuals.

H. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain ridge and hip cap shingles ridge vents felt underlayment and self-adhering sheet underlayment from single source from single manufacturer.

C. Fire-Resistance Characteristics: Where indicated, provide asphalt shingles and related roofing materials identical to those of assemblies tested for fire resistance per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
   1. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockups for asphalt shingles including related roofing materials.
      a. Size: 48 inches long by 48 inches wide.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, well-ventilated, weathertight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.
   1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.

B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install asphalt shingles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
   1. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

1.8 WARRANTY

A. Special Warranty: Standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Manufacturing defects.
      b. Structural failures including failure of asphalt shingles to self-seal after a reasonable time.
   2. Material Warranty Period: 40 years from date of Final Completion, prorated, with first seven years nonprorated.
   3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds up to 110 mph for five years from date of Substantial Completion.

B. Special Project Warranty: Roofing Installer's Warranty, or warranty form at end of this Section, signed by roofing Installer, covering the Work of this Section, in which roofing Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Two years from date of Final Completion.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Asphalt Shingles: 100 sq. ft of each type, in unbroken bundles.

PART 2 - PRODUCTS

2.1 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

A. Asphalt Shingles: ASTM D 3018, glass-fiber reinforced, two-ply laminated construction, mineral-granule surfaced, and self-sealing.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Elk Corporation of Texas, California Division “Prestique 40 High Definition Cool Color Series” or comparable product by one of the following:
      a. Atlas Roofing Corporation.
      b. CertainTeed Corporation.

c. Emco Building Products Corp.
d. GAF Materials Corporation.
e. IKO.
f. Malarkey Roofing Products.
g. Owens Corning.
h. PABCO Roofing Products.
i. TAMKO Roofing Products, Inc.

2. Comply with requirements of ASTM D 3462.
3. Product meets criteria for ESR-1475 ICC-ES
4. Color and Blends: Cool Weathered Wood.
5. Solar Reflectance: 0.27
6. Thermal Emittance: 0.92
7. Solar Reflectance Index (SRI): 29

B. Starter Strip (for application at eave and rake edge): Elk Starter Strip.

C. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.2 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226 or ASTM D 4869, Type II, asphalt-saturated organic felts, nonperforated.

2.3 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.

B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- diameter, smooth shank, sharp-pointed, with a minimum 3/8-inch- diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.
1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

C. Felt Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch minimum diameter.

2.4 METAL FLASHING AND TRIM

A. General: Comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."
1. Sheet Metal: Zinc-tin alloy-coated steel.

B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.

1. Apron Flashings: Fabricate with lower flange a minimum of 4 inches over and 4 inches beyond each side of downslope asphalt shingles and 6 inches up the vertical surface.
2. Cricket Flashings: Fabricate with concealed flange extending a minimum of 24 inches beneath upslope asphalt shingles and 6 inches.
3. Drip Edges: Fabricate in lengths not exceeding 10 feet with 2-inch roof-deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.

C. Vent Pipe Flashings: ASTM B 749, Type L51121, at least 1/16 inch thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches from pipe onto roof.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

B. Single-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches over underlying course. Lap ends a minimum of 4 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with felt underlayment nails.
1. Install felt underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt over self-adhering sheet underlayment not less than 3 inches in direction to shed water. Lap ends of felt not less than 6 inches over self-adhering sheet underlayment.
2. Install fasteners at no more than 36 inch o.c.

C. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated below, lapped in direction to shed water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.
   1. Ridges: Extend 36 inches on each side.
   2. Sidewalls: Extend beyond sidewall 18 inches, and return vertically against sidewall not less than 4 inches.
   3. Dormers, Chimneys, Skylights, and Other Roof-Penetrating Elements: Extend beyond penetrating element 18 inches, and return vertically against penetrating element not less than 4 inches.
   4. Roof Slope Transitions: Extend 18 inches on each roof slope.
   5. Roof Slope Requirements: Full roof for slopes less than 3:12.
   6. Roof / Wall intersection: Extend up wall minimum 8” and down roof minimum 18”.

3.3 METAL FLASHING INSTALLATION

A. General: Install metal flashings and other sheet metal to comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."
   1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Apron Flashings: Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.

C. Step Flashings: Install with a headlap of 2 inches and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.

D. Cricket Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.

E. Rake Drip Edges: Install rake drip edge flashings over underlayment and fasten to roof deck.

F. Eave Drip Edges: Install eave drip edge flashings below underlayment and fasten to roof sheathing.

G. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.4 ASPHALT SHINGLE INSTALLATION

A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Install starter strip along lowest roof edge.

1. Extend asphalt shingles 1/2 inch over fasciae at eaves and rakes.
2. Install starter strip along rake edge.

C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

D. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

E. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full-length first course followed by cut second course, repeating alternating pattern in succeeding courses.

F. Fasten asphalt shingle strips with a minimum of six roofing nails located according to manufacturer's written instructions.
1. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.
2. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.

G. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.

H. Ridge Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

3.5 ROOFING INSTALLER'S WARRANTY

A. WHEREAS <**Insert name**> of <**Insert address**>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: <**Insert name of Owner**>.
2. Address: <**Insert address**>.
3. Building Name/Type: <**Insert information**>.
4. Address: <**Insert address**>.
5. Area of Work: <**Insert information**>.
6. Acceptance Date: <**Insert date**>.
7. Warranty Period: <**Insert time**>.
8. Expiration Date: <**Insert date**>.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:
   1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
      a. Lightning;
      b. Peak gust wind speed exceeding 80 mph;
      c. Fire;
      d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
      e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
      f. Vapor condensation on bottom of roofing; and
      g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
   2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
   3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
   4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
   5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
   6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
   7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty

shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this <**Insert day**> day of <**Insert month**>, <**Insert year**>.
   1. Authorized Signature: <**Insert signature**>.
   2. Name: <**Insert name**>.
   3. Title: <**Insert title**>.

END OF SECTION

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SECTION 07 4213.13 - FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Exposed-fastener, lap-seam metal wall panels.

B. Related Sections:

   1. Section 32 3119 “Decorative Metal Fences and Gates” for steel posts and rails.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
   2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
   4. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
   5. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
   6. Review temporary protection requirements for metal panel assembly during and after installation.
   7. Review of procedures for repair of metal panels damaged after installation.
   8. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. LEED Submittals:
   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings:
   1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
   2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied finishes.
   1. Include Samples of trim and accessories involving color selection.

E. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:
   1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including rupturing, cracking, or puncturing.
      b. Deterioration of metals and other materials beyond normal weathering.
   2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

A. General: Provide factory-formed metal panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.

B. Reverse-Rib-Profile, Exposed-Fastener Metal Wall Panels: Formed with recessed, box-shaped ribs, evenly spaced across panel width, and with rib/recess sides angled 60 degrees or more.
1. Basis-of-Design Product: Subject to compliance with requirements, provide ”Centria EcoScreen BR5-36 Perforated Screen Wall Panels” or comparable product by one of the following:
   a. AEP Span; a BlueScope Steel company.
   b. Fabral.
   c. MBCI; A Division of NCI Building Systems, L.P.
   d. McElroy Metal, Inc.
   e. Metal Sales Manufacturing Corporation.
   f. Morin, A Kingspan Group Company.
   g. Approved equal.
2. Aluminum Face Sheet: Smooth surface coil coated, ASTM B209, 3003-H14 alloy
   a. Nominal Thickness 0.040 (1.0 mm) inch.
   b. Exterior Finish: Two-coat fluoropolymer.
   c. Color: Match insulated metal wall panel system adjacent to fences/gates.
3. Rib Spacing: 7.2 inches
4. Panel Coverage: 36 inches
5. Panel Height: 1.5 inches
6. Perforation Pattern: Staggered
7. Open Area: 33%
8. Diameter: 3/16”
9. Spacing: 5/16”

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
   1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
   2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
   3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
   1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
   2. Seams: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
   3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
   4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
   5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
      a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:
   1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
   1. Shim or otherwise plumb substrates receiving metal panels.
   2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
   3. Install screw fasteners in predrilled holes.
   4. Locate and space fastenings in uniform vertical and horizontal alignment.
   5. Install flashing and trim as metal panel work proceeds.
   6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
   7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.

B. Fasteners:
   1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
   1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
   2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.

3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Flash and seal panels with weather closures at perimeter of all openings.

E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

F. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 4213.19 - INSULATED METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Foamed-insulation-core metal wall panels.

B. Related Requirements:
   1. Section 07 4213.53 "Metal Soffit Panels" for metal panels used in horizontal soffit applications.
   2. Section 07 2500 “Weather Barriers” for weather barriers below metal wall panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
   2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
   4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
   5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
   6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
   7. Review temporary protection requirements for metal panel assembly during and after installation.
   8. Review procedures for repair of metal panels damaged after installation.
   9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. LEED Submittals:
   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings:
   1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
   2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
   1. Include similar Samples of trim and accessories involving color selection.

E. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below.
   1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Where directed by Architect, build mockup of typical metal panel assembly 1 bay wide, including corner, soffits, supports, attachments, and accessories.
   2. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration according to AAMA 501.2.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Final Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including rupturing, cracking, or puncturing.
      b. Deterioration of metals and other materials beyond normal weathering.
   2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 72:
   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: As indicated on Drawings.
   3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

C. Air Infiltration: Air leakage of not more than 0.01 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:
   1. Test-Pressure Difference: 6.24 lbf/sq. ft..

D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
   1. Test-Pressure Difference: 6.24 lbf/sq. ft..

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

F. Fire-Test-Response Characteristics: Provide metal wall panels and system components with the following fire-test-response characteristics, as determined by testing identical panels and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
   1. Fire-Resistance Characteristics: Provide materials and construction tested for fire resistance per ASTM E 119.
   2. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which wall panel is a part, complies with

NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies.

3. Radiant Heat Exposure: No ignition when tested according to NFPA 268.
4. Potential Heat: Acceptable level when tested according to NFPA 259.
5. Surface-Burning Characteristics: Provide wall panels with a flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E 84.

2.2 FOAMED-INSULATION-CORE METAL WALL PANELS

A. General: Provide factory-formed and -assembled metal wall panels fabricated from two metal facing sheets and insulation core foamed in place during fabrication, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.

1. Panel Performance:
   a. Flatwise Tensile Strength: 30 psi when tested according to ASTM C 297/C 297M.
   b. Humid Aging: Volume increase not greater than 6.0 percent and no delamination or metal corrosion when tested for seven days at 140 deg F and 100 percent relative humidity according to ASTM D 2126.
   c. Heat Aging: Volume increase not greater than 2.0 percent and no delamination, surface blistering, or permanent bowing when tested for seven days at 200 deg F according to ASTM D 2126.
   d. Cold Aging: Volume decrease not more than 1.0 percent and no delamination, surface blistering, or permanent bowing when tested for seven days at minus 20 deg F according to ASTM D 2126.
   e. Fatigue: No evidence of delamination, core cracking, or permanent bowing when tested to a 20-lbf/sq. ft. positive and negative wind load and with deflection of L/180 for 2 million cycles.
   f. Autoclave: No delamination when exposed to 2-psi pressure at a temperature of 212 deg F for 2-1/2 hours.
2. Insulation Core: Modified isocyanurate or polyurethane foam using a non-CFC blowing agent, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.
   a. Closed-Cell Content: 90 percent when tested according to ASTM D 6226.
   b. Density: 2.0 to 2.6 lb/cu. ft. when tested according to ASTM D 1622.
   c. Compressive Strength: Minimum 20 psi when tested according to ASTM D 1621.
   d. Shear Strength: 26 psi when tested according to ASTM C 273/C 273M.

B. Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels: Formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Metl-Span LLC 7.2 Insul-Rib Insulated Metal Wall Panel or comparable product by one of the following:
   a. Approved equal.
2. Metallic-Coated Steel Sheet: Facings of zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 coating

designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
a. Nominal Thickness: 0.028 inch.
b. Exterior Finish: Two-coat fluoropolymer.
1) Color: As selected by Architect from manufacturer's full range.
c. Interior Finish: Siliconized polyester.
1) Color: 439RZ2996M Weathered Zinc
3. **Exterior Profile: 7.2 inch on-center rib pattern, 1 ½ inches deep**.
4. Panel Coverage: 36 inches nominal.
5. Panel Thickness and Locations:
a. 2.5 inches at Operation and Administration Buildings
b. 3.0 inches at Maintenance Building.

C. Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels: Formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Metl-Span LLC CF Architectural Insulated Metal Wall panel or comparable product by one of the following:
a. CENTRIA Architectural Systems.
b. IPS - Insulated Panel Systems, an NCI company.
c. Kingspan
d. MBCI, a division of NCI Building Systems, L.P.
e. Approved equal.
2. Metallic-Coated Steel Sheet: Facings of zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
a. Nominal Thickness: 0.028 inch.
b. Exterior Finish: Two-coat fluoropolymer.
1) Color: 439RZ1802M Silver Metallic
c. Interior Finish: Siliconized polyester.
1) Color: As selected by Architect from manufacturer's full range.
3. Exterior Profile: Architectural flat with flush side joints.
4. Panel Coverage: 24 or 36 inches nominal as indicated.
5. Panel Thickness and Locations: 2.5 inches at Operations and Administration building and Maintenance building clerestories.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M,Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
   1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
   2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
   3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
   1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
   2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
   3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal

Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:
    1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
    a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:
1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal wall panel manufacturer.
   1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
   2. Prepare joints and apply sealants to comply with requirements in Section 07 9200 "Joint Sealants."

3.4 INSULATED METAL WALL PANEL INSTALLATION

A. Foamed-Insulation-Core Metal Wall Panels: Fasten metal wall panels to supports with concealed clips at each joint at location and spacing and with fasteners recommended by manufacturer. Fully engage tongue and groove of adjacent panels.
   1. Install clips to supports with self-tapping fasteners.

B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
   1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight.
   1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
   2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.5 FIELD QUALITY CONTROL

A. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.

C. Metal wall panels will be considered defective if they do not pass test and inspections.

D. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

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SECTION 07 6200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Formed roof-drainage sheet metal fabrications.
2. Formed low-slope roof sheet metal fabrications.
3. Formed steep-slope roof sheet metal fabrications.
4. Formed wall sheet metal fabrications.
5. Formed equipment support flashing.

B. Related Sections:
1. Section 06 1053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 07 4213.19 "Insulated Metal Wall Panels" for sheet metal flashing and trim integral with metal wall panels.
3. Section 07 7200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. LEED Submittals:
1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
1. Identification of material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Details of termination points and assemblies, including fixed points.
5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
7. Details of special conditions.
8. Details of connections to adjoining work.
9. Detail formed flashing and trim at a scale of not less than 3 inches per 12 inches.

D. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Accessories and Miscellaneous Materials: Full-size Sample.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified fabricator.

B. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

C. Warranty: Sample of special warranty.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

C. Preinstallation Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.
3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.9 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

A. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

B. Recycled Content of Steel-Sheet Flashing and Trim: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; structural quality.
3. Surface: Smooth, flat.
4. Exposed Coil-Coated Finish:
a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions..
5. Color: As selected by Architect from manufacturer's full range.

6. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
   1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
   2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
   3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
      b. Henry Company; Blueskin PE200 HT.
      c. Metal-Fab Manufacturing, LLC; MetShield.
      d. Owens Corning; WeatherLock Metal High Temperature Underlayment.
      e. Protecto Wrap Company; Protecto Jiffy Seal Ice & Water Guard HT.
      f. Approved equal.

B. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
   1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
      a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
      b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
   2. Fasteners for Zinc-Tin Alloy-Coated Stainless-Steel Sheet: Series 300 stainless steel.
   3. Fasteners for Zinc-Coated (Galvanized) and Aluminum-Zinc Alloy-Coated Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.

C. Solder:
   1. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
   1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
   2. Obtain field measurements for accurate fit before shop fabrication.
   3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
   4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

H. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
1. Gutter Profile: Style A according to cited sheet metal standard.
2. Expansion Joints: Butt type with cover plate.
3. Accessories: Wire-ball downspout strainer.
4. Gutters with Girth up to 15 Inches: Fabricate from the following materials:
   a. Galvanized Steel: 0.022 inch thick.
   b. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

B. Downspouts: Fabricate square downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
1. Hanger Style: Per drawings
2. Fabricate from the following materials:
   a. Galvanized Steel: 0.022 inch thick.
   b. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

C. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows. Fabricate from the following materials:
1. Galvanized Steel: 0.028 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof-to-Wall Transition Expansion-Joint Cover: Fabricate from the following materials:
1. Galvanized Steel: 0.034 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.034 inch thick.

B. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
1. Galvanized Steel: 0.028 inch thick.

2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

C. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
1. Galvanized Steel: 0.022 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

D. Flashing Receivers: Fabricate from the following materials:
1. Galvanized Steel: 0.022 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

E. Roof-Penetration Flashing: Fabricate from the following materials:
1. Galvanized Steel: 0.028 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

2.8 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:
1. Galvanized Steel: 0.022 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

B. Valley Flashing: Fabricate from the following materials:
1. Galvanized Steel: 0.028 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

C. Drip Edges: Fabricate from the following materials:
1. Galvanized Steel: 0.022 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

D. Eave, Rake, Ridge, and Hip Flashing: Fabricate from the following materials:
1. Galvanized Steel: 0.022 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

E. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
1. Galvanized Steel: 0.022 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

F. Flashing Receivers: Fabricate from the following materials:
1. Galvanized Steel: 0.022 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

G. Roof-Penetration Flashing: Fabricate from the following materials:
1. Galvanized Steel: 0.028 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

2.9 WALL SHEET METAL FABRICATIONS

A. Opening Flashings in Frame Construction: Fabricate head, sill, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:
   1. Galvanized Steel: 0.022 inch thick.
   2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

B. Below Grade Flashing:
   1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. General: Install underlayment as indicated on Drawings.

B. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
5. Install sealant tape where indicated.
6. Torch cutting of sheet metal flashing and trim is not permitted.
7. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Seal joints as shown and as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 07 9200 "Joint Sealants."

E. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
   1. Fasten gutter spacers to front and back of gutter.
   2. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches (600 mm) apart.
   3. Anchor gutter with gutter brackets spaced not more than 24 inches (600 mm) apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
   4. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet (15.24 m) apart. Install expansion-joint caps.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints.
   1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.
   2. Provide elbows at base of downspout to direct water away from building.
   3. Connect downspouts to underground drainage system.

D. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 inches in direction of water flow.

3.5 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch (75-mm) centers.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head and similar flashings to extend 4 inches beyond wall openings.

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

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SECTION 07 7200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Roof hatches with pre-manufactured curbs
2. Gravity ventilators.
3. Preformed flashing sleeves.
4. Roof top anchors

B. Related Sections:
1. Section 05 5000 "Metal Fabrications" for metal ladders for access to roof hatches.
2. Section 07 6200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
   1. Size and location of roof accessories specified in this Section.
   2. Method of attaching roof accessories to roof or building structure.
   3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
   4. Required clearances.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.
   1. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
   2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 coated.
   1. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

C. Aluminum Extrusions and Tubes: ASTM B 221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used, otherwise mill finished.

D. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.

E. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.

F. Steel Tube: ASTM A 500, round tube.

G. Galvanized-Steel Tube: ASTM A 500, round tube, hot-dip galvanized according to ASTM A 123/A 123M.

H. Steel Pipe: ASTM A 53/A 53M, galvanized.

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Glass-Fiber Board Insulation: ASTM C 726, thickness as indicated.

C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Underlayment:
1. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

F. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.

G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

H. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.3 ROOF HATCH

A. Roof Hatches: Metal roof-hatch units with lids and insulated single [double]-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Bilco Company “Type E” Roof Hatch or comparable product by one of the following:
      a. AES Industries, Inc.
      b. Babcock-Davis.
      c. Bilco Company (The).
      d. Bristolite Skylights.
      e. Custom Solution Roof and Metal Products.
      f. Dur-Red Products.
      g. Hi Pro International, Inc.
      h. J. L. Industries, Inc.
      i. Metallic Products Corp.
      j. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
      k. Naturalite Skylight Systems; Vistawall Group (The).
      l. Nystrom.
      m. O'Keeffe's Inc.
      n. Pate Company (The).
      o. Precision Ladders, LLC.

B. Type and Size: Single-leaf lid, 36 by 36 inches.

C. Curb: Pre-manufactured, pitch-corrected to match roof slope and maintain level door.

D. Hardware:: Stainless-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
   1. Provide two-point latch on lids larger than 84 inches (2130 mm).
   2. Provide remote-control operation.

E. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
   1. Height: 42 inches (1060 mm) above finished roof deck.
   2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches (31 mm) in diameter or galvanized-steel tube, 1-5/8 inches (41 mm) in diameter.
   3. Flat Bar: Galvanized steel, 2 inches (50 mm) high by 3/8 inch (9 mm) thick.
   4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches (533 mm) in diameter.
   5. Chain Passway Barrier: Galvanized proof coil chain with quick link on fixed end.

6. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
7. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
8. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
9. Fabricate joints exposed to weather to be watertight.
10. Fasteners: Manufacturer's standard, finished to match railing system.
11. Finish: Manufacturer's standard.
    a. Color:: As selected by Architect from manufacturer's full range.

F. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.
1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
2. Height: 42 inches (1060 mm) above finished roof deck.
3. Material: Stainless steel or Aluminum.
4. Post: 1-5/8-inch- (41-mm-) diameter pipe.
5. Finish: Manufacturer's standard baked enamel or powder coat.
    a. Color:: As selected by Architect from manufacturer's full range.

2.4 ROOF TOP ANCHORS

A. Basis of Design Product: Subject to compliance with requirements, provide DBI-Sala “Model 2100077” or comparable product by one of the following:
1. Approved Equal

B. Locations: Per Drawings

2.5 GRAVITY VENTILATORS

A. Low-Profile, Cylindrical-Style Gravity Ventilators: Manufacturer's standard, fabricated as indicated, with manufacturer's standard welded or sealed mechanical joints.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Active Ventilation Products, Inc.
    b. Greenheck Fan Corporation.
    c. Loren Cook Company.
    d. Metallic Products Corp.
    e. Thaler Metal USA Inc.
    f. Approved equal.
2. Construction: Integral base flange, vent cylinder, cylinder bird screen, and rain cap.
3. Dimensions: As indicated on Drawings.
4. Configuration: As indicated on Drawings.
5. Bird Screens: Manufacturer's standard mesh with rewireable frame.
6. Insect Screens: Manufacturer's standard mesh with rewireable frame.
7. Vent Cylinder, Base Flange, and Hood Material: Zinc-coated (galvanized) steel sheet, of manufacturer's standard thickness.

8. Finish: As selected by Architect from manufacturer's full range.

2.6 PREFORMED FLASHING SLEEVES

A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, 12 inches high, with removable metal hood and slotted or perforated metal collar.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Custom Solution Roof and Metal Products.
      b. Thaler Metal USA Inc.
      c. Approved equal.
   2. Metal: Aluminum sheet, 0.063 inch thick.
   3. Diameter: As indicated.
   4. Finish: Manufacturer's standard.

B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Custom Solution Roof and Metal Products.
      b. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
      c. Thaler Metal USA Inc.
      d. Approved equal.
   2. Metal: Aluminum sheet, 0.063 inch thick.
   3. Height: 19 inches.
   4. Diameter: As indicated.
   5. Finish: Manufacturer's standard.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.
   1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
   2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
   3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
   4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.
   3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof-Hatch Installation:
   1. Install roof hatch so top surface of hatch curb is level.
   2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
   3. Attach safety railing system to roof-hatch curb.
   4. Attach ladder-assist post according to manufacturer's written instructions.

D. Gravity Ventilator Installation: Verify that gravity ventilators operate properly and have unrestricted airflow. Clean, lubricate, and adjust operating mechanisms.

E. Preformed Flashing-Sleeve Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions.

F. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 09 9100 "Painting."

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Clean off excess sealants.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 9200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Silicone joint sealants.
   2. Urethane joint sealants.
   3. Latex joint sealants.

B. Related Sections:
   1. Section 08 8000 "Glazing" for glazing sealants.
   2. Section 09 2900 "Gypsum Board" for sealing perimeter joints.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
   3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
   5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:
1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

D. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

E. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

F. Field-Adhesion Test Reports: For each sealant application tested.

G. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.
1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Final Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Dow Corning Corporation; 790.
   b. Pecora Corporation; 301 NS.
   c. Tremco Incorporated; Spectrem 800.
   d. Approved equal.

B. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. BASF Building Systems; Omniplus.
   b. Dow Corning Corporation; 786 Mildew Resistant.
   c. GE Advanced Materials - Silicones; Sanitary SCS1700.
   d. Tremco Incorporated; Tremsil 200 Sanitary.
   e. Approved equal.

2.3 URETHANE JOINT SEALANTS

A. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. BASF Building Systems; Sonolastic NP1 .
   b. Bostik, Inc.; Chem-Calk 900.
   c. Pacific Polymers International, Inc.; Elasto-Thane 230 Type II.
   d. Pecora Corporation; Dynatrol I-XL.
   e. Polymeric Systems, Inc.; Flexiprene 1000.
   f. Schnee-Morehead, Inc.; Permathane SM7108.
   g. Sika Corporation, Construction Products Division; Sikaflex - 1a.
   h. Tremco Incorporated; Dymonic.
   i. Approved equal.

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. BASF Building Systems; Sonolac.
   b. Bostik, Inc.; Chem-Calk 600.
   c. Pecora Corporation; AC-20+.
   d. Schnee-Morehead, Inc.; SM 8200.
   e. Tremco Incorporated; Tremflex 834.
   f. Approved equal.

2.5 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
   a. Concrete.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
   a. Metal.
   b. Glass.
   c. Porcelain enamel.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
   4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
   5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
      a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
   1. Extent of Testing: Test completed and cured sealant joints as follows:
      a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
      b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.
   2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
      a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   3. Inspect tested joints and report on the following:
      a. Whether sealants filled joint cavities and are free of voids.
      b. Whether sealant dimensions and configurations comply with specified requirements.
      c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
   4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Final Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces JS-1.
   1. Joint Locations:
      a. Isolation and contraction joints in cast-in-place concrete slabs.
      b. Joints between cast-in-place concrete slabs and building edge.
   2. Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing .
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces JS-2.
   1. Joint Locations:
      a. Joints between metal panels.
      b. Sealed joints in rainscreen system.
      c. Perimeter joints between materials listed above and frames of doors and windows.
      d. Other joints as indicated.
   2. Urethane Joint Sealant: Single component, nonsag, Class 25.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces JS-3.
   1. Joint Locations:
      a. Isolation joints in cast-in-place concrete slabs.
      b. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing .
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces JS-4.
1. Joint Locations:
   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
   c. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
   d. Other joints as indicated.
2. Joint Sealant: Latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces JS-5.
1. Joint Sealant Location:
   a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   b. Other joints as indicated.
2. Joint Sealant: Single component, nonsag, mildew resistant, acid curing.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces JS-6.
1. Joint Location:
   a. Acoustical joints where indicated.
   b. Other joints as indicated.
2. Joint Sealant: Acoustical.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

G. Joint-Sealant Application: Back and sides of all junction boxes (4 gang and smaller) at interior sound-rated partitions. JS-7.
1. Joint Location:
   a. Junction boxes at interior sound-rated partitions.
   b. Other joints as indicated.
2. Joint Sealant: Sheet sealant for junction boxes.

H. Joint-Sealant Application: Multiple pipe or conduit penetrations in sound-rated construction. JS-8.
1. Joint Location:
   a. Multiple pipe or conduit penetrations in sound-rated construction.
2. Joint Sealant: Spray polyurethane foam.

END OF SECTION

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SECTION 08 1113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
4. Division 08 Section "Door Hardware".
5. Division 08 Section "Access Control Hardware".
6. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CECO Door Products.
2. Curries Company.
3. Security Metal Products.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

B. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
4. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
5. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Manufacturers Basis of Design:

1. CECO Door Products Legion Series.
2. Curries Company 707 Series.
3. Security Metal Products.

2.4 ENERGY-EFFICIENT HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design specified, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Energy Efficient Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.

1. Design: Flush panel.
2. Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 “Laminated Core”.

    a. Provide 22 gauge steel stiffeners at 6 inches on-center internally welded at 5" on- center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
    b. Thermal properties to rate at a fully operable minimum U-Factor 0.29 and R-Value 3.4, including insulated door, thermal-break frame and threshold.

        1) Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.36 and R-Value 2.7, including insulated door, kerf type frame, and threshold.

3. Level/Model: Level 2 and Physical Performance Level A (Heavy Duty), Minimum 18 gauge (0.042 inch - 1.1-mm) thick steel, Model 2.
4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Manufacturers Basis of Design:

1. CECO Door Products Trio-E/Trio Series.
2. Curries Company 777 Trio-E/Trio Series.

2.5 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames, with the exception of slip-on drywall types, with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.
3. Frames for Steel Doors: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
4. Frames for openings up to 48 inches in width: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.]
5. Frames for openings 48 inches and wider in width: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.]
6. Frames for Wood Doors: Minimum 16 gauge (0.053-inch-1.3-mm-) thick steel sheet.
7. Frames for Borrowed Lights: Minimum 16 gauge (0.053-inch-1.3-mm-) thick steel sheet.
8. Manufacturers Basis of Design:

    a. CECO Door Products BQ/BU/DQ/DU/BR/DR Series (Drywall Profile).
    b. CECO Door Products SQ/SU/SR Series (Masonry Profile).
    c. Curries Company C/CM/CG Series (Drywall Profile).
    d. Curries Company M/G Series (Masonry Profile).

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.6 ENERGY-EFFICIENT HOLLOW METAL FRAMES

A. Weatherstripped Frames: Subject to the same compliance standards and requirements as standard hollow metal frames, provide where indicated weatherstripped profiles with 1/8" integral kerf formed into the frame soffit able to receive manufacturer's listed gasket material. Available for use in both masonry and drywall construction, with fire rating up to 3 hours complying with NFPA 105, UL 1784, and ASTM E-283 Test criteria.

1. Manufacturers Basis of Design:

    a. CECO Door Products - Weatherstripped SQW/SRW Series.
    b. Curries Company - Weatherstripped WC/WM Series.

2.7 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Sleeve Anchors
   a. Size: 3/8” x 5”
   b. Tension (min.): 1150 psi
   c. Shear (min.): 2400 psi
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator’s shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

E. Glazing: Comply with requirements in Division 08 Section "Glazing" and with the hollow metal door manufacturer's written instructions.

1. Factory Glazing: Factory install glazing in doors as indicated. Doors with factory installed glass to include all of the required glazing material.

2.9 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.10 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld joints continuously through full throat width of frames, including rabbets, soffits, and stops; grind, fill, dress, and make smooth, flush, and invisible.

    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.

7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
9. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.11 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION

SECTION 08 1416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid core doors with wood veneer, hardboard or MDF faces.
2. Factory finishing wood doors.
3. Factory fitting wood doors to frames and factory machining for hardware.
4. Light frames and glazing installed in wood doors.

B. Related Sections:
1. Division Section 08 1113 "Hollow Metal Doors and Frames" for wood doors in steel frames.
2. Division Section 08 8000 "Glazing" for glass view panels in wood doors.
3. Division Section 08 7100 "Door Hardware" for door hardware for flush wood doors and wood frames.
4. Division Section "Access Control Hardware" for electromechanical hardware for flush wood doors and wood frames.

C. Standards and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A208.1 – Wood Particleboard.
2. Intertek Testing Service (ITS Warnock Hersey) - Certification Listings for Fire Doors.
3. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
4. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
5. UL 10C - Positive Pressure Fire Tests of Door Assemblies; UL 1784 - Standard for Air Leakage Tests of Door Assemblies.
6. Window and Door Manufacturers Association - WDMA I.S.1-A Architectural Wood Flush Doors.

1.3 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, trim for openings, and WDMA I.S.1-A or AWS classifications. Include factory finishing specifications.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the wood door supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire protection ratings for fire rated doors.

D. Samples for Initial Selection: For factory finished doors.

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

2. Corner sections of doors, 8 by 10 inches, with door faces and edges representing actual materials to be used.

   a. Provide samples for each species of veneer and solid lumber required.
   b. Finish veneer faced door samples with same materials proposed for factory finished doors.

3. Frames for light openings, 6 inches long, for each material, type, and finish required.

E. Warranty: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, latest edition, "Industry Standard for Architectural Wood Flush Doors'.

C. Fire Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40" above sill) or UL 10C (neutral pressure testing according to UL 10B where specified).

1. Oversize Fire Rated Door Assemblies: For units exceeding sizes of tested assemblies provide manufacturer's construction label, indicating compliance to independent 3rd party certification agency's procedure, except for size.

2. Temperature Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire test exposure.

3. Smoke Control Door Assemblies: Comply with NFPA 105.

    1) Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

4. Blocking: Indicate size and location of blocking in 45, 60 and 90 minute mineral core doors.

D. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for receiving, handling, and installing flush wood doors.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package pre-finished doors individually in plastic bags or cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.

b. Telegraphing of core construction in wood face veneers exceeding 0.01 inch in a 3-inch span.
c. Telegraphing of core construction and delaminating of face in decorative laminate-faced doors.

2. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

3. Warranty Period for Solid Core Interior Doors: Life of installation according to manufacturer's written warranty.

PART 2 - PRODUCTS

2.1 DOOR CONSTRUCTION – GENERAL

A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty; Aesthetic Grade: Premium.

B. Fire Rated Doors: Provide construction and core as needed to provide fire ratings indicated.

1. Category A Edge Construction: Provide fire rated door edge construction with intumescent seals concealed by outer stile (Category A) at 45, 60, and 90 minute rated doors. Comply with specified requirements for exposed edges.

2. Category B Edge Construction: Provide 20 minute fire rated doors as Category B, with smoke and fire seals (supplied by seal manufacturer) applied to frame for 20 minute openings.

3. Pairs: Provide fire retardant stiles that are listed and labeled for applications indicated without formed steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

a. Where required or specified, provide formed steel edges and astragals with intumescent seals. Finish steel edges and astragals with baked enamel.VENEERED DOORS FOR TRANSPARENT FINISH

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Graham: GPD

D. Interior Solid Core Doors:

1. Stain and veneer as selected by Architect.

2. Match between Veneer Leaves: Book match.

3. Assembly of Veneer Leaves on Door Faces:

a. Running Match.

4. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
5. Transom Match: Continuous match.
6. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.
7. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors
8. Construction: Five plies. Stiles and rails are bonded to core, then entire unit sanded before applying face veneers.
9. At doors over 40% of the face cut-out for lights and or louvers, furnish engineered composite lumber core.

2.2 LIGHT FRAMES AND GLAZING

A. Metal Frames for Light Openings in Fire Rated Doors over 20-minute rating: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated.

B. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with the flush wood door manufacturer's written instructions.

2.3 FABRICATION

A. Factory fit doors to suit frame opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with requirements in NFPA 80 for fire rated doors.

B. Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed steel edges for hardware for pairs of fire rated doors.

C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.

D. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Comply with applicable requirements in Division 08 Section "Glazing."
3. Louvers: Factory install louvers in prepared openings.

E. Electrical Raceways: Provide flush wood doors receiving electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through wire transfer hardware or wiring harness specified in hardware sets in Division 08 "Door Hardware". Wire nut connections are not acceptable.

2.4 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Transparent Finish: Provide a clear protective coating over the wood veneer allowing the natural color and grain of the selected wood species to provide the appearance specified. Stain is applied to the wood surface underneath the transparent finish to add color and design flexibility.

1. Grade: Premium.
2. Finish: Meet or exceed WDMA I.S. 1A TR6 Catalyzed Polyurethane finish performance requirements.
3. Staining: As selected by Architect from manufacturer's full range.
4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire rated doors in corresponding fire rated frames according to NFPA 80.

C. Factory Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Re-hang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08 1613 – FRP DOORS AND ALUMINUM FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. (FRP) Fiberglass reinforced polyester doors and aluminum frames

B. Related Sections:

1. Division 08 Section "Glazing" for glass view panels in doors.
2. Division 08 Section “Hollow Metal Doors and Frames” for hollow metal frames.
3. Division 08 Sections "Door Hardware" and "Access Control Hardware" for door hardware.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
2. ASTM B 209 - Aluminum and Aluminum-Alloy Sheet and Plate.
3. ASTM B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
4. ASTM D 256 - Determining the Pendulum Impact Resistance of Notched Specimens of Plastics.
5. ASTM D 543 - Evaluating the Resistance of Plastics to Chemical Reagents.
6. ASTM D 1308 - Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
7. ASTM D 2126 - Response of Rigid Cellular Plastics to Thermal and Humid Aging.
8. ASTM D 6670-01 - Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products.
9. ASTM E 84 - Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, components, hardware reinforcements, profiles, and finishes.

B. Templates: Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors.
3. Locations of reinforcement and preparations for hardware.
4. Details of each different wall opening condition.
5. Details of accessories.
6. Details of preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain doors and frames through one source from a single manufacturer wherever possible.

B. Pre-Installation Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

B. Store materials under cover at Project site in accordance with the manufacturer’s instructions. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for door frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts,

anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.8 WARRANTY

A. Provide manufacturer's written warranty against defects in materials and workmanship upon final completion and acceptance of Work in this section. Warranty period is ten years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CECO Door Products.
2. Curries Company.

B. Substitutions: Material from alternate door and frame fabricators will not be accepted on jobsite without prior written and sample approval in accordance with requirements specified in Division 01.

2.2 MATERIALS

A. Aluminum: 6063-T6 hardened aluminum alloy.

B. Fiberglass Reinforced Plastic Sheet: Thickness of .120” with the finish color for the full thickness of the sheet.

2.3 FIBERGLASS REINFORCED PLASTIC DOORS

A. General: Provide 1-3/4 inch doors of type and design indicated, not less than thickness indicated; fabricated without visible joints or seams on exposed faces unless otherwise indicated.

1. Design: As indicated on the drawings.
2. Core Construction: Five pound density foam-in-place polyurethane core.
3. Stiles and Rails: Extruded aluminum with mitered corners. Provide 3/8” diameter tie rods top and bottom.
4. Faces: Fiberglass reinforced plastic sheets of .120” thickness with a pebble texture.
5. Surface Applied Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6.

2.4 FABRICATION

A. General: Fabricate work to be rigid and free of defects. Accurately form to required sizes and profiles.

B. Fiberglass Reinforced Plastic Doors:

1. Top Caps: Close tops of doors flush with aluminum top caps.

C. Surface Hardware Preparation: Factory prepare work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section, "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors to receive non-template, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of work for hardware.

2.5 FINISHES

A. FRP Door finish shall be:

1. Light Gray.

B. Aluminum finish for stiles and rails, light kits, and door frames shall be:

1. Satin Clear.

2.6 Frame Anchors

1. Masonry Type: Sleeve Anchors
   a. Size: 3/8” x 5”
   b. Tension (min.): 1150 psi
   c. Shear (min.): 2400 psi

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prior to installation, check openings for squareness, alignment, twist, and plumbness.

B. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Fiberglass Reinforced Plastic Doors: Fit doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Doors:

a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
c. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).

C. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with door manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including stainless steel work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from stainless steel work immediately after installation.

C. Remove stains and materials that will have and adverse affect on the doors and frames and restore slight blemishes in accordance with manufacturer’s instructions to match original finish.

END OF SECTION

SECTION 08 3113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Access doors and frames for walls and ceilings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

A. LEED Submittals:
   1. LEED Credit MR 4 Recycled Content:
      a. Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
      b. Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
      c. For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.

B. Shop Drawings:
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Detail fabrication and installation of access doors and frames for each type of substrate.

C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.

D. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Acudor Products, Inc.
2. Babcock-Davis.
3. Elmdor/Stoneman Manufacturing Co.; Div. of Acorn Engineering Co.
4. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
5. Karp Associates, Inc.
6. Milcor Inc.
7. Nystrom, Inc.
8. Williams Bros. Corporation of America (The).
9. Approved equal.

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Flush Access Doors with Exposed Flanges AD1:
1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
2. Locations: Wall and ceiling.
3. Door Size: As required.
4. Uncoated Steel Sheet for Door: Nominal 0.060 inch.
   a. Finish: Factory finish.
5. Stainless-Steel Sheet for Door: Nominal 0.062 inch, 16 gage.
   a. Finish: No. 4.
6. Frame Material: Same material, thickness, and finish as door.
7. Hinges: Manufacturer's standard.
8. Hardware: Lock.

D. Flush Access Doors with Concealed Flanges AD2:
1. Assembly Description: Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
2. Locations: Wall and ceiling.
3. Door Size: As required.

4. Stainless-Steel Sheet for Door: Nominal 0.062 inch, 16 gage.
   a. Finish: No. 4.
5. Frame Material: Same material and thickness as door.
6. Hinges: Manufacturer's standard.
7. Hardware: Lock.

E. Recessed Access Doors AD3:
1. Assembly Description: Fabricate door in the form of a pan recessed 5/8 inch or 1 inch for gypsum board or acoustical tile infill. Provide frame with gypsum board bead for concealed flange and no bead for acoustical tile installation.
2. Locations: Wall and ceiling.
3. Uncoated Steel Sheet for Door: Nominal 0.060 inch.
   a. Finish: Factory finish.
4. Frame Material: Same material and thickness as door.
5. Hinges: Manufacturer's standard.
6. Hardware: Lock.

F. Fire-Rated, Flush Access Doors with Exposed Flanges AD4:
1. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release. Provide manufacturer's standard-width exposed flange, proportional to door size.
2. Locations: Wall and ceiling.
3. Fire-Resistance Rating: Not less than that of adjacent construction.
4. Stainless-Steel Sheet for Door: Nominal 0.038 inch, 20 gage.
   a. Finish: No. 4.
5. Frame Material: Same material, thickness, and finish as door.
6. Hinges: Manufacturer's standard.
7. Hardware: Lock.

G. Fire-Rated, Flush Access Doors with Concealed Flanges AD5:
1. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release. Provide frame with gypsum board beads for concealed flange installation.
2. Locations: Wall and ceiling.
3. Fire-Resistance Rating: Not less than that of adjacent construction.
4. Stainless-Steel Sheet for Door: Nominal 0.038 inch, 20 gage.
   a. Finish: No. 4.
5. Frame Material: Same material, thickness, and finish as door.
6. Hinges: Manufacturer's standard.
7. Hardware: Lock.

H. Exterior Flush Access Doors AD6:
1. Assembly Description: Fabricate door to be weatherproof and fit flush to frame. Provide manufacturer's standard 2-inch- thick fiberglass insulation and extruded door gaskets. Provide manufacturer's standard-width frame for surface mounting, proportional to door size.
2. Locations: Wall.
3. Door Size: As required.
4. Stainless-Steel Sheet for Door: Nominal 0.062 inch, 16 gage.
a. Finish: No. 4.
5. Frame Material: Same material, thickness, and finish as door.
6. Hinges: Manufacturer's standard.
7. Hardware: Lock.

2.3 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines or blend into finish.

E. Frame Anchors: Same type as door face.

F. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.4 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
2. Provide mounting holes in frames for attachment of units to metal or wood framing.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
   1. For cylinder locks, furnish two keys per lock and key all locks alike.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Stainless-Steel Finishes:
   1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
   2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
      a. Run grain of directional finishes with long dimension of each piece.
      b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
      c. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

3.4 ACCESS DOOR AND FRAME APPLICATION SCHEDULE

TYPE	APPLICATION	RATING	REMARKS
AD1	Service or storage areas not generally accessible to the public	Non-rated	Stainless steel in wet areas.
AD2	Toilet rooms, labs and “wet” areas.	Non-rated	
AD3	Public and staff spaces, spaces generally accessible to staff and public	Non-rated	
AD4	Service or storage areas not generally accessible to the public	Rated	
AD5	Public and staff spaces, spaces generally accessible to staff and public	Rated	
AD6	Exterior	Non-rated	

END OF SECTION

SECTION 08 3323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Electrically operated insulated service doors.

B. Related Requirements:
   1. Section 05 5000 "Metal Fabrications" for miscellaneous steel supports.
   2. Section 26 0500 “Common Work Results for Electrical” for additional electrical requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.
   1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
   3. Include description of automatic closing device and testing and resetting instructions.

B. LEED Submittals:
   1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

C. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
   1. Include plans, elevations, sections, and mounting details.
   2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
   4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.

5. Show locations of controls, locking devices, and other accessories.
6. Include diagrams for power, signal, and control wiring.

D. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
1. Include similar Samples of accessories involving color selection.

E. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
1. Curtain slats.
2. Bottom bar with sensor edge.
3. Guides.
4. Brackets.
5. Hood.
6. Locking device(s).
7. Include similar Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Power Certificate: Signed by installer certifying that the electrical service as shown and specified is adequate for operator being provided.

C. Oversize Construction Certification: For door assemblies required to be fire-rated and that exceed size limitations of labeled assemblies.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
   1. Obtain operators and controls from overhead coiling door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
   1. Design Wind Load: As indicated on Drawings.
   2. Testing: According to ASTM E 330.
   3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.

B. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. Component Importance Factor: 1.0.

2.3 DOOR ASSEMBLY <**OCD 1**>

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Overhead Door Corporation, Series 627 or comparable product by one of the following:
      a. Approved equal.

B. Operation Cycles: Door components and operators capable of operating for not less than 50,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
   1. Include tamperproof cycle counter.

C. Curtain R-Value: 10.9 (1.91 W/Msq.)

D. Door Curtain Material: Galvanized steel.

E. Door Curtain Slats: Flat profile slats of manufacturers standard.
   1. Insulated-Slat Interior Facing: Metal.
   2. Gasket Seal. Manufacturer's standard continuous gaskets between slats.

F. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from hot-dip galvanized steel and finished to match door.

G. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.

H. Hood: Match curtain material and finish.

1. Shape: Square
2. Mounting: As shown on Drawings.

I. Locking Devices: Equip door with slide bolt for padlock and chain lock keeper.
1. Locking Device Assembly: Manufacturers standard.

J. Electric Door Operator:
1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
2. Operator Location: Top of hood.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
4. Motor Exposure: Interior.
5. Emergency Manual Operation: Chain type.
6. Obstruction-Detection Device: Automatic pneumatic sensor edge on bottom bar.
   a. Sensor Edge Bulb Color: Black.
7. Control Station(s): Interior mounted.
8. Other Equipment: Audible and visual signals.

K. Curtain Accessories: Equip door with weatherseals.

L. Door Finish:
1. Baked-Enamel or Powder-Coated Finish: Match color of adjacent insulated metal wall panel system.
2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.4 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 zinc coating; nominal sheet Vision-Panel Glazing: Manufacturer's standard clear glazing, fabricated from transparent acrylic sheet or fire-protection rated glass as required for type of door; set in glazing channel secured to curtain slats.
2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84 or UL 723. Enclose insulation completely within slat faces.

3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch.

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.6 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
1. Galvanized Steel: Nominal 0.028-inch- thick, hot-dip galvanized steel sheet with G90 zinc coating, complying with ASTM A 653/A 653M.
2. Stainless Steel: 0.025-inch- thick stainless-steel sheet, Type 304, complying with ASTM A 666.
3. Aluminum: 0.040-inch- thick aluminum sheet complying with ASTM B 209, of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.
4. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.
5. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

2.7 CURTAIN ACCESSORIES

A. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.

1. At door head, use 1/8-inch- thick, replaceable, continuous-sheet baffle secured to inside of hood or field- installed on the header.
2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- (3-mm-) thick seals of flexible vinyl, rubber, or neoprene.

B. Astragal for Interior Doors: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

C. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

D. Pull-Down Strap: Provide pull-down straps for doors more than 84 inches high.

E. Poll Hooks: Provide pole hooks and poles for doors more than 84 inches high.

2.8 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.9 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
   1. Comply with NFPA 70.
   2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door Operator Location(s): Operator location indicated for each door.
   1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
   2. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
   3. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.
   1. Electrical Characteristics:
      a. Phase: Single phase.
      b. Volts: 115 V.
      c. Hertz: 60.
   2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
   3. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
   4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.
   1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
      a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.
   2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
      a. Self-Monitoring Type: Four-wire configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.
   3. Pneumatic Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
   1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
   2. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.

H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for

emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

2.10 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.11 STEEL AND GALVANIZED-STEEL FINISHES

A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.za

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

D. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
   1. Perform installation and startup checks according to manufacturer's written instructions.
   2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
   3. Test door closing when activated by detector or alarm-connected fire-release system. Reset door-closing mechanism after successful test.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
   1. Adjust exterior doors and components to be weather-resistant.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
   1. Perform maintenance, including emergency callback service, during normal working hours.
   2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION

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SECTION 08 3613 - SECTIONAL DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
   1. Electrically operated sectional doors.

B. Related Requirements:
   1. Section 05 5000 "Metal Fabrications" for miscellaneous steel supports.
   2. Section 26 0500 “Common Work Results for Electrical” for additional electrical requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of sectional door and accessory.
   1. Include construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. LEED Submittals:
   1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

C. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
   1. Include plans, elevations, sections, and mounting details.
   2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
   4. Include diagrams for power, signal, and control wiring.

D. Samples for Initial Selection: For units with factory-applied finishes.
   1. Include Samples of accessories involving color selection.

E. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
   1. Flat door sections with sensor edge on bottom section.
   2. Frame for paneled door sections; of each width of stile and rail required.
   3. Panel for raised-panel door sections; not smaller than required to show raised-panel profile.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Power Certificate: Signed by installer certifying that the electrical service as shown and specified is adequate for operator being provided.

C. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sectional doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Failure of components or operators before reaching required number of operation cycles.
      c. Faulty operation of hardware.
      d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
      e. Delamination of exterior or interior facing materials.
   2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain sectional doors from single source from single manufacturer.
   1. Obtain operators and controls from sectional door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Sectional doors shall comply with performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.

B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
   1. Design Wind Load: As indicated on Drawings.
   2. Testing: According to ASTM E 330.
   3. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components.
      a. Deflection of door sections in horizontal position (open) shall not exceed 1/120 of the door width.
      b. Deflection of horizontal track assembly shall not exceed 1/240 of the door height.

C. Seismic Performance: Sectional doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

   1. Component Importance Factor: 1.0.

2.3 DOOR ASSEMBLY

A. Full-Vision Aluminum Sectional Door: Sectional door formed with hinged sections and fabricated according to DASMA 102 unless otherwise indicated.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Overhead Door Corporation Series 511 or comparable product by one of the following:
      a. Amarr Garage Doors.
      b. Arm-R-Lite.
      c. C.H.I. Overhead Doors.
      d. Clopay Building Products.
      e. Fimbel Architectural Door Specialties.
      f. Haas Door.
      g. Harmann LLC.
      h. Martin Door Manufacturing.
      i. Overhead Door Corporation.
      j. Raynor.
      k. Rite-Hite Corporation.
      l. Wayne-Dalton Corp.

m. Windsor Door.
n. Approved equal.

B. Operation Cycles: Door components and operators capable of operating for not less than 50,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

C. Aluminum Sections: Full vision with manufacturer's standard, nonglazed panels across bottom section of door.

D. Track Configuration: High-lift track.
1. Size: 3”
2. Type: Steel Jamb

E. Weatherseals: Fitted to bottom and top of door. Provide combination bottom weatherseal and sensor edge.

F. Roller-Tire Material: Manufacturer's standard.

G. Locking Devices: Equip door with locking device assembly.
1. Locking Device Assembly: Single-jamb side locking bars, operable from inside with thumbturn.

H. Counterbalance Type: Torsion spring.

I. Electric Door Operator:
1. Usage Classification: Medium duty, up to 12 cycles per hour and up to 50 cycles per day.
2. Operator Type: Manufacturer's standard for door requirements unless otherwise indicated.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
4. Motor Exposure: Interior, clean, and dry.
5. Emergency Manual Operation: Chain type.
6. Obstruction-Detection Device: Automatic pneumatic sensor edge on bottom section.
a. Sensor Edge Bulb Color: Black.
7. Control Station: Interior-side mounted unless otherwise indicated.
8. Other Equipment: Audible and visual signals.

J. Door Finish:
1. Aluminum Finish: Baked or Powder Coated: Match color of adjacent insulated metal wall panel system.
2. Finish of Interior Facing Material: Match finish of exterior section face.

2.4 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 ALUMINUM DOOR SECTIONS

A. Sections: Extruded-aluminum stile and rail members with dimensions and profiles as indicated on Drawings; members joined by welding or with concealed, 1/4-inch- minimum diameter, aluminum or nonmagnetic stainless-steel through bolts, full height of door section; and with meeting rails shaped to provide a weather-resistant seal.
   1. Aluminum: ASTM B 221 extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; minimum thickness 0.065 inch for door section 1-3/4 inches deep, and as required to comply with requirements.
   2. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Ensure that reinforcement does not obstruct vision lites.
   3. Provide reinforcement for hardware attachment.

B. Solid Panels: Aluminum sheet, complying with ASTM B 209, alloy and temper standard with manufacturer for type of use and finish indicated, not less than 0.040 inch thick, set in continuous vinyl channel retained with rigid, snap-in, extruded-vinyl moldings or with rubber or neoprene glazing gasket with aluminum stop.

C. Full-Vision Sections: Manufacturer's standard, tubular, aluminum-framed section fully glazed with 1/2” (12-mm), insulated glazing, (low e) set in vinyl, rubber, or neoprene glazing channel and with removable extruded-vinyl or aluminum stops.

2.6 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Manufacturer's standard, galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances indicated on Drawings, Provide complete system including brackets, bracing, and reinforcement to ensure rigid support of ball-bearing roller guides for required door type, size, weight, and loading.
   1. Galvanized Steel: ASTM A 653/A 653M, minimum G60 zinc coating.
   2. Slope tracks at an angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.
   3. Track Reinforcement and Supports: Galvanized-steel members to support track without sag, sway, and vibration during opening and closing of doors. Slot vertical sections of track spaced 2 inches apart for door-drop safety device.
      a. For Vertical Track: Continuous reinforcing angle attached to track and attached to wall with jamb brackets.
      b. For Horizontal Track: Continuous reinforcing angle from curve in track to end of track, attached to track and supported at points by laterally braced attachments to overhead structural members.

B. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.

2.7 HARDWARE

A. General: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.

B. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch- nominal coated thickness at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is impossible. Provide double-end hinges where required, for doors more than 16 feet wide unless otherwise recommended by door manufacturer.

C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch- diameter roller tires for 3-inch- wide track and 2-inch- diameter roller tires for 2-inch- wide track.

D. Push/Pull Handles: Equip each push-up operated or emergency-operated door with galvanized-steel lifting handles on each side of door, finished to match door.

2.8 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded deadbolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
   1. Lock Cylinders: Cylinders specified in Section 08 7100 "Door Hardware" and keyed to building keying system.
   2. Keys: Two for each cylinder.

B. Chain Lock Keeper: Suitable for padlock.

C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.9 COUNTERBALANCE MECHANISM

A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from steel-spring wire complying with ASTM A 229/A 229M, mounted on torsion shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.

B. Cable Drums and Shaft for Doors: Cast-aluminum or gray-iron casting cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft. Provide one additional midpoint bracket for shafts up to 16 feet long and two additional brackets at one-third points to support shafts more than 16 feet long unless closer spacing is recommended by door manufacturer.

C. Cables: Galvanized-steel, multistrand, lifting cables with cable safety factor of at least 5 to 1.

D. Cable Safety Device: Include a spring-loaded steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.

E. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.

F. Bumper: Provide spring bumper at each horizontal track to cushion door at end of opening operation.

2.10 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
1. Comply with NFPA 70.
2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.
1. Trolley: Trolley operator mounted to ceiling above and to rear of door in raised position and directly connected to door with drawbar.
2. Jackshaft, Center Mounted: Jackshaft operator mounted on the inside front wall above door and connected to torsion shaft with an adjustable coupling or drive chain.
3. Jackshaft, Side Mounted: Jackshaft operator mounted on the inside front wall on right or left side of door and connected to torsion shaft with an adjustable coupling or drive chain.

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.
1. Electrical Characteristics:
   a. Phase: Single phase.
   b. Volts: 115 V.
   c. Hertz: 60.
2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
3. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.

4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
5. Use adjustable motor-mounting bases for belt-driven operators.

E. Limit Switches: Equip motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction Detection Device: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.
1. Pneumatic Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure, push-button control labeled "Close."
1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
2. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.

H. Emergency Manual Operation: Equip electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

2.11 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Tracks:
1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches apart.
2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.

C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

D. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

3.3 STARTUP SERVICES

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust doors and seals to provide weather-resistant fit around entire perimeter.

D. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780/A 780M.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION

SECTION 08 4113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Exterior and interior storefront framing.
2. Storefront framing for punched openings (fixed windows).
3. Exterior and interior manual-swing entrance doors and door-frame units.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. LEED Submittals:
1. LEED Credit MR 4 Recycled Content:
a. Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
b. Statement or vendor’s invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
c. For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Data for Credit IEQ 4.1: For glazing sealants used inside the weatherproofing system, documentation including printed statement of VOC content.

C. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
   1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
   2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
      a. Joinery, including concealed welds.
      b. Anchorage.
      c. Expansion provisions.
      d. Glazing.
      e. Flashing and drainage.
   3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
   4. Storefronts higher than 10’-0” shall be designed and stamped by professional engineer.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

F. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
   1. Joinery, including concealed welds.
   2. Anchorage.
   3. Expansion provisions.
   4. Glazing.
   5. Flashing and drainage.

G. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

H. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Preconstruction Laboratory Mockup Testing Submittals:
   1. Testing Program: Developed specifically for Project.
   2. Test Reports: Prepared by a qualified preconstruction testing agency for each mockup test.
   3. Record Drawings: As-built drawings of preconstruction laboratory mockups showing changes made during preconstruction laboratory mockup testing.

B. Qualification Data: For Installer and field testing agency.

C. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
   1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

D. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by a qualified testing agency.

E. Source quality-control reports.

F. Field quality-control reports.

G. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
   1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 MOCKUPS

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockup of typical wall area as shown on Drawings.
   2. Testing shall be performed on mockups according to requirements in "Field Quality Control" Article.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
5. Mockup shall include all waterproof membrane, pan installations and sealant to represent the proposed complete window installation.

1.9 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.
2. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
1. Deterioration includes, but is not limited to, the following:
a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.
   d. Loosening or weakening of fasteners, attachments, and other components.
   e. Failure of operating units.

C. Structural Loads:
1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.
   a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.
3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
   a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.

E. Structural: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
   a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft..
2. Entrance Doors:

a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..

H. Interstory Drift: Accommodate design displacement of adjacent stories indicated.
1. Design Displacement: As indicated on Drawings.
2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement.

I. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement.
2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement.

J. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.69 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than [0.60] as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 45 as determined according to NFRC 500.

K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 ENTRANCES AND STOREFRONTS **(ES1)**

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer Company, Inc. “Trifab 451 VG T” or comparable product by one of the following:
1. Approved equal.

B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing, spandrel panels, venting windows and accessories, from single manufacturer.

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   1. Construction: Thermally broken.
   2. Glazing System: Retained mechanically with gaskets on four sides.
   3. Glazing Plane: As indicated.
   4. Finish: High-performance organic finish.
   5. Fabrication Method: Field-fabricated stick system.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Materials:
   1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
      a. Sheet and Plate: ASTM B 209.
      b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
      c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
      d. Structural Profiles: ASTM B 308/B 308M.
   2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
      a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
      b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
      c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
   1. Door Construction: 2-inch overall thickness, with minimum 0.188-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
   2. Door Design: As indicated.

3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
   a. Provide nonremovable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 7100 "Door Hardware."

2.6 GLAZING

A. Glazing: Comply with Section 08 8000 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

D. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L.

E. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.

2.7 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
   2. Reinforce members as required to receive fastener threads.
   3. Use exposed fasteners with countersunk Phillips screw heads, fabricated from 300 series stainless steel.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fitted joints with ends coped or mitered.
   3. Physical and thermal isolation of glazing from framing members.
   4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   5. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
   6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
   1. At exterior doors, provide compression weather stripping at fixed stops.
   2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
   1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
   2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF or FEVE resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. General:
   1. Comply with manufacturer's written instructions.
   2. Do not install damaged components.
   3. Fit joints to produce hairline joints free of burrs and distortion.
   4. Rigidly secure nonmovement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
   6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:
   1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
   2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 07 9200 "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 08 8000 "Glazing."

G. Install weatherseal sealant according to Section 07 9200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
   1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
   2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
   1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
   2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
   3. Alignment:
      a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
      b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
      c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
   4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
   1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
      a. Perform a minimum of three tests in areas as directed by Architect.
      b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.

C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 MAINTENANCE SERVICE

A. Entrance Door Hardware:
   1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
   2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION

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SECTION 08 5659 - SERVICE WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Aluminum, heavy-duty sliding pass windows.

1.3 ACTON SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for window units.

A. LEED Submittals:
   1. LEED Credit MR 4 Recycled Content:
      a. Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
      b. Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
      c. For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.
   2. Product Data for Credit IEQ 4.1: For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.

B. Shop Drawings: For pass windows. Include plans, elevations, sections, details, and attachments to other work.
   1. Full-size section details of framing members, including internal armoring, reinforcement, and stiffeners.
   2. Hardware for sliding window units.
   3. Glazing details.
   4. Stainless steel shelf

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
   1. Framing: 12-inch long sections of frame members.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Pack pass windows in wood crates for shipment.

B. Store crated pass windows under cover in a dry location.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 LEED MATERIALS REQUIREMENTS

A. LEED Credit MR4: Provide materials with high levels of recycled content.

B. All VOC-containing materials applied on-site inside of the weatherproof barrier of the building shall comply with LEED credits EQ4:
   1. LEED Credit EQ4.1: Provide grouts, adhesives and sealants with VOC content and chemical component limits not exceeding the content limits defined by SCAQMD Rule #1168, July 1, 2005, amended January 1, 2005 and Green Seal GS-36, effective October 19, 2000 for aerosol adhesives.

2.2 SLIDING PASS WINDOWS

A. Sliding Pass Windows: Provide horizontal-sliding, transaction pass windows with screen.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide C.R. Laurence DW 2600A series or comparable product by one of the following:
      a. Creative Industries, Inc.
      b. Easi-Serv Products.
      c. Quikserv Corp.
      d. United States Bullet Proofing, Inc.
      e. Approved equal.

B. Configuration: ‘OXO’, per drawings

C. Framing: Fabricate perimeter framing, mullions, and glazing stops from metal sheet as follows:
   1. Material: Extruded aluminum with Class I, clear anodized finish.
   2. Profile: Manufacturer's standard, with minimum face dimension indicated.
   3. Minimum Face Dimension: As indicated on Drawings.
   4. Framing Depth:
      a. Manufacturer's standard.

D. Glazing: 1/2 inch tempered glass.

E. Sliding Window Hardware: Window glides on top-hung heavy-duty ball bearing slides. Poly-pile weather stripping and self-latching handle. Replacement and servicing of glass shall be from the clerk side of the window by means of an access panel in the top header and does not require the removal of the frame from the opening. Provide manufacturer's standard pull and lock with two keys for each horizontal-sliding glazed panel. Note: 5lb maximum operating pressure.

F. Accessories:
1. Stainless steel counter shelf (w/ open counter area)
2. Keyed lock.
3. Surrounding frames.

2.3 FABRICATION

A. General: Fabricate pass windows to provide a complete system for assembly of components and anchorage of window units.

B. Provide weep holes and internal water passages for exterior pass windows to conduct infiltrating water to the exterior.

C. Framing: Miter or cope corners the full depth of framing; weld and dress smooth.

D. Glazing Stops: Finish glazing stops to match pass window framing.

E. Welding: Weld components to comply with referenced AWS standard. To greatest extent possible, weld before finishing and in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

F. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

G. Factory-cut openings in glazing for speaking apertures.

H. Preglazed Fabrication: Preglaze window units at factory, where required for applications indicated.

I. Weather Stripping: Factory applied.

2.4 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of pass windows.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of pass window connections before pass window installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of pass windows.

D. Inspect built-in and cast-in anchor installations, before installing pass windows, to verify that anchor installations comply with requirements. Prepare inspection reports.
   1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
   2. Perform additional inspections to determine compliance of replaced or additional work. Prepare anchor inspection reports.

E. For glazing materials whose orientation is critical for performance, verify installation orientation.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other pass window anchors whose installation is specified in other Sections.
   1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.

3.3 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing pass windows to in-place construction.

B. Removable Glazing Stops and Trim: Fasten components with security fasteners.

C. Fasteners: Install pass windows using fasteners recommended by manufacturer with head style appropriate for installation requirements, strength, and finish of adjacent materials.

D. Sealants: Comply with requirements in Section 07 9200 "Joint Sealants" for installing sealants, fillers, and gaskets.
   1. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction unless otherwise indicated.
   2. Seal frame perimeter with sealant to provide weathertight construction unless otherwise indicated.

E. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.4 ADJUSTING

A. Adjust horizontal-sliding pass windows to provide a tight fit at contact points for smooth operation and a secure enclosure.

B. Remove and replace defective work, including pass windows that are warped, bowed, or otherwise unacceptable.

3.5 CLEANING AND PROTECTION

A. Clean surfaces promptly after installation of pass windows. Take care to avoid damaging the finish. Remove excess glazing and sealant compounds, dirt, and other substances.
   1. Lubricate sliding window hardware.

B. Clean glass of pre-glazed pass windows promptly after installation. Comply with requirements in Section 08 8000 "Glazing" for cleaning and maintenance.

C. Provide temporary protection to ensure that pass windows are without damage at time of Final Completion.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain pass windows.

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SECTION 08 7100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Sliding doors.
3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware, power supplies, back-ups and surge protection.
3. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Door Hardware Schedule”.
2. Division 08 Section “Hollow Metal Doors and Frames”.
3. Division 08 Section “Flush Wood Doors”.
4. Division 28 Section “Access Control Hardware”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 80 - Fire Doors and Windows.
4. NFPA 101 - Life Safety Code.
5. NFPA 105 - Installation of Smoke Door Assemblies.
6. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
b. Complete (risers, point-to-point) access control system block wiring diagrams.

2. Electrical Coordination: Coordinate with related Division 26 Electrical Sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum 3 years documented experience installing both standard and electrified builders hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor in good standing by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to

consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

1. Scheduling Responsibility: Preparation of door hardware and keying schedules.

D. Source Limitations: Obtain each type and variety of Door Hardware specified in this Section from a single source, qualified supplier unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

E. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:

1. NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:

   a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
   b. Door Closers: Comply with the following maximum opening-force requirements indicated:

      1) Interior Hinged Doors: 5 lbf applied perpendicular to door.

   c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.

3. NFPA 101: Comply with the following for means of egress doors:

   a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.

   b. Thresholds: Not more than 1/2 inch high.

F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:
1. Five years for exit hardware.
2. Twenty five years for manual surface door closers.
3. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Continuing Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance including repair and replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

1. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

a. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

B. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity, unless otherwise indicated:

a. Two Hinges: For doors with heights up to 60 inches.
b. Three Hinges: For doors with heights 61 to 90 inches.
c. Four Hinges: For doors with heights 91 to 120 inches.

d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:

a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:

1) Out-swinging exterior doors.
2) Out-swinging access controlled doors.
3) Out-swinging lockable doors.

5. Acceptable Manufacturers:

a. McKinney Products (MK).

B. Continuous Geared Hinges: ANSI/BHMA A156.26 certified continuous geared hinge with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Provide concealed flush mount (with or without inset), full surface, or half surface, in standard and heavy duty models, as specified in the Hardware Sets. Concealed continuous hinges to be U.L. listed for use on up to and including 90 minute rated door installations and U.L. listed for windstorm components where applicable. Factory cut hinges for door size and provide with removable service power transfer panel where indicated at electrified openings.

1. Acceptable Manufacturers:

a. McKinney Products (MK).
b. Pemko Manufacturing (PE).

2.3 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified automatic, self-latching, and manual flush bolts and surface bolts. Manual flush bolts to be furnished with top rod of sufficient length to allow bolt location approximately six feet from the floor. Furnish dust proof strikes for bottom bolts. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

1. Acceptable Manufacturers:

    a. Rockwood Manufacturing (RO).

B. Coordinators: ANSI/BHMA A156.3 certified door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Coordinators fabricated from steel with nylon-coated strike plates and built-in adjustable safety release.

1. Acceptable Manufacturers:

    a. Rockwood Manufacturing (RO).

C. Door Push Plates and Pulls: ANS/BHMA A156.6 certified door pushes and pulls of type and design specified below or in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

    a. Acceptable Manufacturers:

        1) Rockwood Manufacturing (RO).

2.4 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

C. Cylinders: Original manufacturer cylinders complying with the following:

1. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
5. Keyway: Manufacturer’s Standard.

D. Keying System: Each type of lock and cylinders to be factory keyed. Conduct specified "Keying Conference" to define and document keying system instructions and requirements. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner. Incorporate decisions made in keying conference, and as follows:

1. Master Key System: Cylinders are operated by a change key and a master key.
2. Grand Master Key System: Cylinders are operated by a change key, a master key, and a grand master key.
3. Great-Grand Master Key System: Cylinders are operated by a change key, a master key, a grand master key, and a great-grand master key.
4. Existing System: Master key or grand master key locks to Owner's existing system.
5. Keyed Alike: Key all cylinders to same change key.

E. Key Quantity: Provide the following minimum number of keys:

1. Top Master Key: One (1)
2. Change Keys per Cylinder: Two (2)
3. Master Keys (per Master Key Group): Two (2)
4. Grand Master Keys (per Grand Master Key Group): Two (2)
5. Construction Keys (where required): Ten (10)
6. Construction Control Keys (where required): Two (2)
7. Permanent Control Keys (where required): Two (2)

F. Construction Keying: Provide construction master keyed cylinders or temporary keyed construction cores where specified. Provide construction master keys in quantity as required by project Contractor. Replace construction cores with permanent cores. Furnish permanent cores for installation as directed under specified "Keying Conference".

G. Key Registration List: Provide keying transcript list to Owner's representative in the proper format for importing into key control software.

2.5 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Commercial Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified mortise locksets furnished in the functions as specified in the Hardware Sets. Locksets to be manufactured with a single sized steel case, closed on sides and back, and be field-reversible for handing without disassembly of the lock body. Lockset trim (including knobs, levers, escutcheons, roses) to be the product of a single manufacturer. Furnish with standard 2 3/4" backset, 3/4" one-piece stainless steel latchbolt, and a full 1" throw hardened steel bolt for deadbolt functions.

1. Acceptable Manufacturers:

    a. Sargent Manufacturing (SA) - 7900 Series.
    b. Yale Locks and Hardware (YA) - 8800(Z) Series.

B. Lock Trim Design: As specified in Hardware Sets.

2.6 INTEGRATED WIEGAND OUTPUT ACCESS CONTROL LOCKING DEVICES

A. Integrated Wiegand Output Cylindrical Locks: Wiegand output ANSI A156.2, Grade 1, Cylindrical Lockset with integrated proximity card reader and request-to-exit signaling in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle trim with 1/2" deadlocking stainless steel latch. Lock is U.L listed and labeled for use on up to 3 hour fire rated openings.

1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand compatible access control systems. Inside lever handle (request-to-exit) signaling standard with door position (open/closed status) monitoring (via separately connected DPS).
2. Reader supports either HID 125 kHz proximity (up to 39 bits, including Corporate 1000) or 13.56 MHz (2K-32K) iClass® credentials.
3. 12VDC external power supply required for reader and lock, with optional 24VDC operation available with iClass® reader (125 kHz reader is always 12VDC). Fail safe or fail secure options.
4. Installation requires only one cable run from the lock to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
5. Installation to include manufacturer's access control panel interface board or module where required for Wiegand output protocol.
    a. Acceptable Manufacturers:

        1) Sargent Manufacturing (SA) - Harmony - H1/H2 10 Line.
        2) Yale Locks and Hardware (YA) - Symphony - S5490LN SYM Series.

2.7 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.5.
4. Dustproof Strikes: BHMA A156.16.

2.8 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

    a. Fire Exit Removable Mullions: Provide keyed removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions to be used only with exit devices for which they have been tested.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is not acceptable except in any case where the door light extends behind the device as in a full glass configuration.

5. Flush End Caps: Provide heavy weight impact resistant flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.

6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty trim with cold forged escutcheons, beveled edges, and four threaded studs for thru-bolts.

   a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets. Provided free-wheeling type trim where indicated.
   b. Where function of exit device requires a cylinder, provide an interchangeable core type keyed cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Provide and install interior surface and concealed vertical rod exit devices as Less Bottom Rod (LBR) unless otherwise indicated.

8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.

9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

10. Rail Sizing: Provide exit device rails factory sized for proper door width application.

11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Mounting rails to be formed from smooth stainless steel, brass or bronze architectural materials no less than 0.072" thick, with push rails a minimum of 0.062" thickness. Painted or aluminum metal rails are not acceptable. Exit device latch to be investment cast stainless steel, pullman type, with deadlock feature.

1. Acceptable Manufacturers:

   a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
   b. Sargent Manufacturing (SA) - 80 Series.
   c. Yale Locks and Hardware (YA) - 7000 Series.

2.9 ELECTROMECHANICAL CONVENTIONAL EXIT DEVICES

A. Electrified Conventional Push Rail Devices (Heavy Duty): Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified below.

1. Acceptable Manufacturers:

   a. Sargent Manufacturing (SA) - 80 Series.
   b. Yale Locks and Hardware (YA) - 7000 Series.

B. Electrified Options: As indicated in hardware sets, provide electrified exit device options including: electric latch retraction , electric dogging, outside door trim control, exit alarm, delayed egress, latchbolt monitoring, lock/unlock status monitoring, touchbar monitoring and request-to-exit signaling. Unless otherwise indicated, provide electrified exit devices standard as fail secure.

2.10 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.

2. Standards: Closers to comply with UL-10C and UBC 7-2 for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.

4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

   a. Where closers are indicated to have mechanical dead-stop, provide heavy duty arms and brackets with an integral positive stop.
   b. Where closers are indicated to have mechanical hold open, provide heavy duty units with an additional built-in mechanical holder assembly designed to hold open against normal wind and traffic conditions. Holder to be manually selectable to on-off position.
   c. Where closers are indicated to have a cushion-type stop, provide heavy duty arms and brackets with spring stop mechanism to cushion door when opened to maximum degree.
   d. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics. Provide drop plates or other accessories as required for proper mounting.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt or security type fasteners as specified in the door Hardware Sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Acceptable Manufacturers:

a. Corbin Russwin Hardware (RU) - DC8000 Series.
b. Norton Door Controls (NO) - 7500 Series.
c. Yale Locks and Hardware (YA) - 4400 Series.

C. Door Closers, Surface Mounted (Unitrol): ANSI/BHMA 156.4, Grade 1 certified surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Unitrol arms to have door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.

1. Acceptable Manufacturers:

a. Corbin Russwin Hardware (RU) - Unitrol DC8000 Series.
b. Norton Door Controls (NO) - Unitrol 7500 Series.
c. Yale Locks and Hardware (YA) - Unitrol 4400 Series.

2.11 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Acceptable Manufacturers:

a. Rockwood Manufacturing (RO).

2.12 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.

C. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

D. Acceptable Manufacturers:

1. Pemko Manufacturing (PE).

2.13 ELECTRONIC ACCESSORIES

A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Acceptable Manufacturers:

a. Securitron (SU) - DPS Series.

B. Power Supplies: Provide Nationally Recognized Testing Laboratory Listed 12VDC or 24VDC (field selectable) filtered and regulated power supplies. Include battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Acceptable Manufacturers:

a. Securitron (SU) - BPS Series.

2.14 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.15 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. and provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SCHEDULE

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. AD - Adams Rite
4. RO - Rockwood
5. SA - Sargent
6. HS - HES
7. NO - Norton
8. SU - Securitron

Hardware Schedule

Set: 01

Doors: 127

6 Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK
1 Dust Proof Strike	570	US26D	RO
1 Flush Bolt	2842	US32D	RO
1 Integrated Card Reader Lock	21 WBS H1-82271 LNNJ (Furnished under div. 28.)	US26D	SA
1 Coordinator	1600	US28	RO

2 Mounting Bracket	1601AB/C	US28	RO
2 Door Closer	PR7500	689	NO
2 Door Stop	406	US32D	RO
1 Threshold	272A Full Notch MSES25		PE
1 Rain Guard	346C		PE
1 Gasketing	S773BL (head & Jamb)		PE
2 Sweep	18062CNB		PE
1 Astragal	357SP		PE
1 Electric Power Transfer	EL-EPT		SU
1 ElectroLynx Harness	QC-C1500P		MK
1 ElectroLynx Harness	QC-C300P		MK

Set: 02

Doors: 131, 212A

6 Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK
1 Exit Device	43 55 MD8610	US32D	SA
1 Exit Device with Card Reader	21 43 H1-MD-8674 106 x ETNJ (Furnished under div. 28.)	US32D	SA
2 Door Closer	PR7500	689	NO
2 Door Stop	406	US32D	RO
1 Threshold	272A Full Notch MSES25		PE
1 Rain Guard	346C		PE
1 Gasketing	S773BL (head & Jamb)		PE
2 Sweep	18062CNB		PE
2 Astragal	18041CNB		PE
2 Electric Power Transfer	EL-EPT		SU
2 ElectroLynx Harness	QC-C1500P		MK
2 ElectroLynx Harness	QC-C300P		MK
1 Position Switch	DPS-M-BK		SU

Set: 03

Doors: 105, 106A, 148, 200A, 226A, 226B, 226C, 226D

3 Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK
1 Exit Device with Card Reader	21 43 H1-8876 ETNJ (Furnished under div. 28.)	US32D	SA
1 Door Closer	PR7500	689	NO
1 Door Stop	406	US32D	RO
1 Threshold	272A Full Notch MSES25		PE

1 Rain Guard	346C		PE
1 Gasketing	S773BL (head & Jamb)		PE
1 Sweep	18062CNB		PE
1 Electric Power Transfer	EL-EPT		SU
1 ElectroLynx Harness	QC-C1500P		MK
1 ElectroLynx Harness	QC-C300P		MK

Set: 04

Doors: 125, 135

1 Continuous Hinge	KCFMXX-HD1 PT		PE
1 Exit Device with Card Reader	21 43 H1-8876 ETNJ (Furnished under div. 28.)	US32D	SA
1 Door Closer	UNIJ7500 7786	689	NO
1 Gasketing	S773BL (head & Jamb)		PE
1 Sweep	18062CNB		PE
1 Electric Power Transfer	EL-EPT		SU
2 ElectroLynx Harness	QC-C1500P		MK

Set: 05

Doors: 136A

1 Continuous Hinge	KCFMXX-HD1 PT		PE
1 Integrated Card Reader Lock	21 WBS H1-82271 LNNJ (Furnished under div. 28.)	US26D	SA
1 Door Closer	UNIJ7500 7786	689	NO
1 Threshold	272A Full Notch MSES25		PE
1 Sweep	18062CNB		PE
1 Electric Power Transfer	EL-EPT		SU
2 ElectroLynx Harness	QC-C1500P		MK

Set: 06

Doors: 122A, 123A, 201A, 304B

3 Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK
1 Integrated Card Reader Lock	21 WBS H1-82271 LNNJ (Furnished under div. 28.)	US26D	SA
1 Door Closer	PR7500	689	NO
1 Door Stop	406	US32D	RO
1 Threshold	272A Full Notch MSES25		PE

1 Rain Guard	346C		PE
1 Gasketing	S773BL (head & Jamb)		PE
1 Sweep	18062CNB		PE
1 Electric Power Transfer	EL-EPT		SU
1 ElectroLynx Harness	QC-C1500P		MK
1 ElectroLynx Harness	QC-C300P		MK

Set: 07

Doors: 210, 213, 404

3 Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK
1 Exit Device with Card Reader	21 43 H1-8876 ETNJ (Furnished under div. 28.)	US32D	SA
1 Door Closer	PR7500	689	NO
1 Door Stop	491S	US26D	RO
1 Threshold	272A Full Notch MSES25		PE
1 Rain Guard	346C		PE
1 Gasketing	S773BL (head & Jamb)		PE
1 Sweep	18062CNB		PE
1 Electric Power Transfer	EL-EPT		SU
1 ElectroLynx Harness	QC-C1500P		MK
1 ElectroLynx Harness	QC-C300P		MK

Set: 08

Doors: 200B

1 Continuous Hinge	CFMXXHD1 PT		PE
1 Deadlatch	4900	US26D	AD
1 Lever Operator	4600 (deadlatches) MJ	US32D	AD
1 Access Control Lock	3090C-01 (Furnished under div. 28)	626	AD
1 Cylinder	21 41 101	US26D	SA
1 Door Closer	UNIJ7500 7786	689	NO
1 Electric Power Transfer	EL-EPT		SU
1 ElectroLynx Harness	QC-C1500P		MK

Set: 09

Doors: 303

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Integrated Card Reader Lock	21 WBS H1-82271 LNNJ	US26D	SA

	(Furnished under div. 28.)		
1 Door Closer	R 7500	689	NO
1 Door Stop	491S	US26D	RO
1 Threshold	272A Full Notch MSES25		PE
1 Gasketing	S773BL (head & Jamb)		PE
1 Sweep	18062CNB		PE
1 Electric Power Transfer	EL-EPT		SU
1 ElectroLynx Harness	QC-C1500P		MK
1 ElectroLynx Harness	QC-C300P		MK

Set: 10

Doors: 305B, 403B

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Integrated Card Reader Lock	21 WBS H1-82271 LNNJ (Furnished under div. 28.)	US26D	SA
1 Door Closer	R 7500	689	NO
1 Door Stop	406	US32D	RO
1 Threshold	272A Full Notch MSES25		PE
1 Gasketing	S773BL (head & Jamb)		PE
1 Sweep	18062CNB		PE
1 Electric Power Transfer	EL-EPT		SU
1 ElectroLynx Harness	QC-C1500P		MK
1 ElectroLynx Harness	QC-C300P		MK
1 Knox Box	As compatible with local fire regulations.		

Set: 11

Doors: 405, 406, 407, 408

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Integrated Card Reader Lock	21 WBS H1-82271 LNNJ (Furnished under div. 28.)	US26D	SA
1 Door Closer	R 7500	689	NO
1 Door Stop	406	US32D	RO
1 Threshold	272A Full Notch MSES25		PE
1 Gasketing	S773BL (head & Jamb)		PE
1 Sweep	18062CNB		PE
1 Electric Power Transfer	EL-EPT		SU
1 ElectroLynx Harness	QC-C1500P		MK

1 ElectroLynx Harness	QC-C300P		MK

Set: 12

Doors: 119, 120, 150, 151

6 Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
2 Surface Bolt	580-8	US32D	RO
1 Storeroom Lock	21 WBS 7904 LNNJ	US26D	SA
2 Door Stop	406	US32D	RO
1 Astragal	355CP		PE
2 Silencer	608		RO

Set: 13

Doors: 121

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Dust Proof Strike	570	US26D	RO
1 Flush Bolt	1962	US32D	RO
1 Classroom Lock	21 WBS 7937 LNNJ	US26D	SA
1 Coordinator	1600	US28	RO
2 Door Closer	R 7500	689	NO
2 Kickplate	K1050 10" 4BE CSK	US32D	RO
2 Door Stop	406	US32D	RO
1 Astragal	355CP		PE
2 Silencer	608		RO

Set: 14

Doors: 201B

6 Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
2 Surface Bolt	580-8	US32D	RO
1 Storeroom Lock	21 WBS 7904 LNNJ	US26D	SA
2 Door Stop	406	US32D	RO
1 Astragal	357SP		PE
2 Silencer	608		RO

Set: 15

Doors: 202

6 Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK

2 Dust Proof Strike	570	US26D	RO
2 Flush Bolt	1962	US32D	RO
1 Classroom Lock	21 WBS 7937 LNNJ	US26D	SA
1 Coordinator	1600	US28	RO
2 Mounting Bracket	1601AB/C	US28	RO
2 Door Closer	PR7500	689	NO
2 Door Stop	406	US32D	RO
1 Astragal	357SP		PE
2 Silencer	608		RO

Set: 16

Doors: 217A, 220, 221, 222, 223, 224, 225, 403A

1 Overhead door	All hardware is furnished by the door supplier.		

Set: 17

Doors: 240

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Dust Proof Strike	570	US26D	RO
1 Flush Bolt	2842	US32D	RO
1 Passage Latch	WBS 7915 LNNJ	US26D	SA
1 Coordinator	1600	US28	RO
2 Mounting Bracket	1601AB/C	US28	RO
2 Door Closer	7500	689	NO
2 Door Stop	406	US32D	RO
1 Astragal	357SP		PE
2 Silencer	608		RO

Set: 18

Doors: 101, 102, 103, 107, 113, 114, 115, 124, 132, 136B, 137, 138, 139, 147, 152, 153, 154, 155, 156, 157

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Office Lock	21 WBS 7955 LNNJ	US26D	SA
1 Door Stop	406	US32D	RO
3 Silencer	608		RO

Set: 19

Doors: 106B

1 Exit Device	43 55 MD8610	US32D	SA
3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Classroom Lock	21 WBS 7937 LNNJ	US26D	SA
1 Door Closer	R 7500	689	NO
1 Kickplate	K1050 10" 4BE CSK	US32D	RO
1 Door Stop	406	US32D	RO
3 Silencer	608		RO

Set: 20

Doors: 111, 122B, 123B, 140

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Passage Latch	WBS 7915 LNNJ	US26D	SA
1 Door Stop	406	US32D	RO
3 Silencer	608		RO

Set: 21

Doors: 117, 118

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Push Plate	70C	US32D-MS	RO
1 Pull Plate	106x70C	US32D-MS	RO
1 Door Closer	R 7500	689	NO
1 Kickplate	K1050 10" 4BE CSK	US32D	RO
1 Mop Plate	K1050 4" 4BE CSK	US32D	RO
1 Door Stop	406	US32D	RO
3 Silencer	608		RO

Set: 22

Doors: 127B (SOUND RATED GASKETING),128, 129, 130

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Storeroom Lock	21 WBS 7904 LNNJ	US26D	SA
1 Door Stop	406	US32D	RO

3 Silencer	608		RO

Set: 23

Doors: 126

1 Continuous Hinge	KCFMXX-HD1		PE
1 Lever Operator	4600 (2190) MJ	US32D	AD
1 Mortise Lock	2190 1-Exterior Trim MJ	US32D	AD
1 Cylinder	21 41 101	US26D	SA
1 Door Closer	UNIJ7500 7786	689	NO

Set: 24

Doors: 142, 143, 145

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Passage Latch	WBS 7915 LNNJ	US26D	SA
1 Door Closer	R 7500	689	NO
1 Kickplate	K1050 10" 4BE CSK	US32D	RO
1 Door Stop	406	US32D	RO
3 Silencer	608		RO

Set: 25

Doors: 206, 207

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Classroom Lock	21 WBS 7937 LNNJ	US26D	SA
1 Door Stop	406	US32D	RO
3 Silencer	608		RO

Set: 26

Doors: 208

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Storeroom Lock	21 WBS 7904 LNNJ	US26D	SA
1 Door Closer	R 7500	689	NO
1 Door Stop	406	US32D	RO
3 Silencer	608		RO

Set: 27

Doors: 209, 211

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Push Plate	70C	US32D-MS	RO
1 Pull Plate	106x70C	US32D-MS	RO
1 Door Closer	R 7500	689	NO
1 Kickplate	K1050 10" 4BE CSK	US32D	RO
1 Mop Plate	K1050 4" 4BE CSK	US32D	RO
1 Door Stop	406	US32D	RO
3 Silencer	608		RO

Set: 28

Doors: 212B, 214, 215, 217B

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Storeroom Lock	21 WBS 7904 LNNJ	US26D	SA
1 Door Stop	406	US32D	RO
3 Silencer	608		RO

Set: 29

Doors: 216

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Passage Latch	WBS 7915 LNNJ	US26D	SA
1 Door Stop	406	US32D	RO
3 Silencer	608		RO

Set: 30

Doors: 217C, 218, 219

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Office Lock	21 WBS 7955 LNNJ	US26D	SA
1 Door Stop	406	US32D	RO
3 Silencer	608		RO

Set: 31

Doors: 304A, 305A

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Integrated Card Reader Lock	21 WBS H1-82271 LNNJ (Furnished under div. 28.)	US26D	SA
1 Door Closer	R 7500	689	NO
1 Door Stop	406	US32D	RO
3 Silencer	608		RO
1 Electric Power Transfer	EL-EPT		SU
1 ElectroLynx Harness	QC-C1500P		MK
1 ElectroLynx Harness	QC-C300P		MK

Set: 32

Doors: Gate A, Gate B, Gate C, Gate D

1 Continuous Hinge	CFMXXHD1 PT		PE
1 Gate Lock	GL1-FL		SU
1 Cylinder	21 41	US26D	SA
1 Door Pull	BF167	US32D	RO
1 Door Closer	7500	689	NO
1 Bracket	7798	689	NO
1 Electric Power Transfer	EL-EPT		SU
1 ElectroLynx Harness	QC-C012P		MK
1 ElectroLynx Harness	QC-C1500P		MK
1 Position Switch	DPS-M-BK		SU
1 Electromechanical Bar	WEMB-CL-42		SU
1 Card Reader	RP40		HD
1 Bracket	FMK-SW		SU

Notes: The access control system is furnished by the security contractor.
System Operation:
Egress: Free at all times.
Ingress: By key or access credential.

Set: 33

Doors: Gate E

2 Continuous Hinge	CFMXXHD1 PT		PE
2 Magnetic Lock	M62		SU
1 Cylinder	21 41	US26D	SA
2 Door Closer	7500	689	NO

2 Bracket	7798	689	NO
2 Electric Power Transfer	EL-EPT		SU
2 ElectroLynx Harness	QC-C012P		MK
2 ElectroLynx Harness	QC-C1500P		MK
2 Position Switch	DPS-M-BK		SU
1 Card Reader	RP40		HD
2 Touch Handle	TSH-CL (Pull)		SU
2 Touch Handle	DTSH-CL (Push)		SU
1 Push Button	EEB2		SU
1 Keyswitch	MK		SU

Notes: The access control system is furnished by the security contractor.
System Operation:
Egress: Free at all times.
Ingress: By key or access credential.

END OF SECTION

SECTION 08 8000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Windows.
   2. Doors.
   3. Storefront framing.
   4. Interior borrowed lites.

B. Related Sections:
   1. Section 08 3613 "Sectional Doors" for glazing specified as part of a sectional door assemblies.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.5 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
   1. Insulating glass.

C. Glazing Accessory Samples: For gaskets, sealants and colored spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers, manufacturers of insulating-glass units with sputter-coated, low-e coatings glass, testing agency and sealant testing agency.

B. Product Certificates: For glass and glazing products, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for coated glass insulating glass glazing sealants and glazing gaskets.
   1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Warranties: Sample of special warranties.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

E. Source Limitations for Glass: Obtain coated float glass and insulating glass from single source from single manufacturer for each glass type.

F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

I. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

J. Preinstallation Conference: Conduct conference at Project site.
   1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review temporary protection requirements for glazing during and after installation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.10 WARRANTY

A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
   1. Warranty Period: 10 years from date of Final Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

B. Strength: Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
   1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
   2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
   3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
   4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
   5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
   2. For uncoated glass, comply with requirements for Condition A.

3. For coated vision glass, comply with requirements for Condition C (other coated glass).

2.3 INSULATING GLASS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Oldcastle Glass.
   2. PPG Industries.
   3. Viracron.
   4. Approved equal.

B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
   1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
   2. Spacer: Manufacturer's standard spacer material and construction.
   3. Desiccant: Molecular sieve or silica gel, or blend of both.

C. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Insulating-Glass Types" Article.

2.4 INSULATING GLASS (LIGHT DIFFUSING)

A. Basis of Design: Subject to compliance with requirements, provide Advanced Glazing Systems Ltd., “Solera L R2.2” or:
   1. Approved equal.

B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
   1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
   2. Spacer: Manufacturer's standard spacer material and construction.
   3. Desiccant: Molecular sieve or silica gel, or blend of both.

C. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Insulating-Glass Types" Article.

2.5 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
   1. Neoprene complying with ASTM C 864.
   2. EPDM complying with ASTM C 864.
   3. Silicone complying with ASTM C 1115.
   4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene, EPDM, silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
   1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.6 GLAZING SEALANTS

A. General:
   1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
   3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dow Corning Corporation; 790.
      b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
      c. May National Associates, Inc.; Bondaflex Sil 290.
      d. Pecora Corporation; 890.
      e. Sika Corporation, Construction Products Division; SikaSil-C990.
      f. Tremco Incorporated; Spectrem 1.
      g. Approved equal.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
   1. AAMA 804.3 tape, where indicated.
   2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.9 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

2.10 MONOLITHIC-GLASS TYPES

A. Glass Type **GL-1**: Clear fully tempered float glass.

1. Thickness: 6.0 mm.
2. Provide safety glazing labeling.

2.11 INSULATING-GLASS TYPES

A. Glass Type **GL-2**: Low-e^2, clear insulating glass.
1. Overall Unit Thickness: 1 inch.
2. Thickness of Each Glass Lite: 6.0 mm.
3. Outdoor Lite: Fully tempered float glass.
4. Interspace Content: Air.
5. Indoor Lite: Fully tempered float glass.
6. Low-E Coating: Pyrolytic or sputtered on second and third surface.
7. Visible Light Transmittance: 68 percent minimum.
8. Winter U-Factor: 0.31 maximum.
9. Solar Heat Gain Coefficient: 0.60 maximum.
10. Provide safety glazing labeling.

B. Glass Type **GL-3**: Light Diffusing (Translucent) Insulating Glass Unit
1. Overall Unit Thickness: 1 inch.
2. Thickness of Each Glass Lite: 6.0 mm.
3. Outdoor Lite: Fully tempered float glass.
4. Interspace Content: Manuf. standard.
5. Indoor Lite: Fully tempered float glass.
6. Low-E Coating: Pyrolytic or sputtered on second and third surface.
7. Visible Light Transmittance: 62 percent.
8. Winter U-Factor: 0.47 maximum.
9. Surface 2 and 3: Light Diffusing Veil.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress

gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.8 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Final Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

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SECTION 08 9119 – FIXED LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Fixed, extruded-aluminum louvers.

B. Related Sections:
   1. Section 08 1113 "Hollow Metal Doors and Frames" for louvers in hollow-metal doors.
   2. Section 08 1416 "Flush Wood Doors" for louvers in flush wood doors.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.

C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

D. Storm-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural and seismic performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
   1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

C. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

E. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. LEED Submittals:
1. LEED Credit MR 4 Recycled Content:
a. Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
b. Statement or vendor’s invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
c. For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Data for Credit IEQ 4.1: For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.

C. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
2. Show mullion profiles and locations.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: For each type of metal finish required.

F. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Aluminum Castings: ASTM B 26/B 26M, Alloy 319.

D. Fasteners: Use types and sizes to suit unit installation conditions.
1. Use tamper-resistant screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
3. For color-finished louvers, use fasteners with heads that match color of louvers.

E. Postinstalled Fasteners for Concrete: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
   1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
   2. Horizontal Mullions: Provide horizontal mullions at joints unless continuous vertical assemblies are indicated.

C. Maintain equal louver blade spacing to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
   1. Frame Type: Channel unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches o.c., whichever is less.
   1. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.

G. Provide subsills made of same material as louvers or extended sills for recessed louvers.

H. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Storm-Resistant Louver:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Air Balance Inc.; a Mestek company.
      b. Air Flow Company, Inc.
      c. Airolite Company, LLC (The).
      d. All-Lite Architectural Products.
      e. American Warming and Ventilating, Inc.; a Mestek company.
      f. Arrow United Industries; a division of Mestek, Inc.
      g. Construction Specialties, Inc.

h. Greenheck Fan Corporation.
i. Industrial Louvers, Inc.
j. NCA Manufacturing, Inc.
k. Nystrom Building Products.
l. Reliable Products, Inc.
m. Ruskin Company; Tomkins PLC.
n. United Enertech Corp.
o. Approved equal.

2. Louver Depth: 5 inches
3. Frame and Blade Nominal Thickness: Not less than 0.060 inch for blades and 0.080 inch for frames.
4. Louver Performance Ratings:
   a. Free Area: Not less than 7.0 sq. ft. for 48-inch- wide by 48-inch- high louver.
   b. Air Performance: Not more than 0.10-inch wg static pressure drop at 800-fpm free-area exhaust velocity.
   c. Wind-Driven Rain Performance: Not less than 99 percent effectiveness when subjected to a rainfall rate of 3 inches per hour and a wind speed of 29 mph at a core-area intake velocity of 672 fpm.
5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.
   1. Screen Location for Fixed Louvers: Interior face.
   2. Screening Type: Bird screening .

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
   1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
   2. Finish: Mill finish unless otherwise indicated.
   3. Type: Non-rewirable, U-shaped frames.

D. Louver Screening for Aluminum Louvers:
   1. Bird Screening: Flattened, expanded aluminum, 3/4 by 0.050 inch thick.

2.5 BLANK-OFF PANELS

A. Insulated, Blank-Off Panels: Laminated panels consisting of insulating core surfaced on back and front with metal sheets and attached to back of louver.
   1. Thickness: 1 inch.
   2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch nominal thickness.
   3. Insulating Core: Rigid, glass-fiber-board insulation or extruded-polystyrene foam.

4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard channel frames, with corners mitered and with same finish as panels.
5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
6. Panel Finish: Same type of finish applied to louvers, but black color.
7. Attach blank-off panels with clips or sheet metal screws.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.7 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

F. Protect unpainted galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 9200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.

B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

D. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
   1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

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SECTION 09 2216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section:
   1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
   2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

B. Related Sections include the following:
   1. Section 05 4000 "Cold-Formed Metal Framing" for exterior non-load-bearing wall studs and ceiling joists.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:
   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

1.4 INFORMATION SUBMITTALS

A. Evaluation Reports: For firestop tracks, from ICC-ES

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
   2. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized, unless otherwise indicated.

B. Studs and Runners: ASTM C 645.
   1. Minimum Base-Metal Thickness: 0.033 inch.
   2. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide one of the following:
   1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
   2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
   3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
      a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
         1) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
         2) Superior Metal Trim; Superior Flex Track System (SFT).

D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   2. Products: Subject to compliance with requirements, provide one of the following:
      a. Fire Trak Corp.; Fire Trak.
      b. Metal-Lite, Inc.; The System.

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
   1. Minimum Base-Metal Thickness: 0.033 inch.

F. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges.
   1. Depth: 1-1/2 inches.
   2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.

G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base Metal Thickness: 0.033 inch.
   2. Depth: 7/8 inch.

H. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
   1. Configuration: Asymmetrical or hat shaped.

I. Cold-Rolled Furring Channels: 0.053-inch bare-steel thickness, with minimum 1/2-inch-wide flanges.
   1. Depth: 3/4 inch.
   2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312 inch.
   3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch diameter wire, or double strand of 0.0475-inch- diameter wire.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16-inch diameter.

C. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch- wide flanges.
   1. Depth: As indicated on Drawings.

D. Furring Channels (Furring Members):
   1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
   2. Steel Studs and Runners: ASTM C 645.
      a. Minimum Base-Metal Thickness: 0.033 inch.
      b. Depth: As indicated on Drawings.
   3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
      a. Minimum Base Metal Thickness: 0.033 inch.
   4. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
      a. Configuration: Asymmetrical or hat shaped .

E. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Armstrong World Industries, Inc.; Drywall Grid Systems.
      b. Chicago Metallic Corporation; Drywall Grid System.
      c. USG Corporation; Drywall Suspension System.
      d. Approved equal

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:
   1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
   2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
   1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
   1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
      a. Install two studs at each jamb, unless otherwise indicated.
      b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
      c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
   3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
   4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
      a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
   5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Direct Furring:
   1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
      a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
      a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
   3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   4. Do not attach hangers to steel roof deck.
   5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
   6. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

SECTION 09 2900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Interior gypsum board.

B. Related Requirements:
   1. Section 06 1600 "Sheathing" for gypsum sheathing for exterior walls.
   2. Section 09 2216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
   3. Section 09 3000 "Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:
   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
   2. Product Data for Credit IEQ 4.1: For adhesives used to laminate gypsum board panels to substrates, documentation including printed statement of VOC content.

C. Samples: For the following products:
   1. Trim Accessories: Full-size Sample in 12-inch long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Install mockups for the following:
      a. Each level of gypsum board finish indicated for use in exposed locations.
      b. Each texture finish indicated.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Final Completion.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements, gypsum board manufacturer's written recommendations and the following:
1. Room temperature shall be maintained at not less than 40 degrees F during installation.
2. For joint treatment, texturing and decoration, the room temperature shall be maintained not less than 50 degrees F for 48 hours prior to application and continuously thereafter until completely dry.
3. Temperature shall not exceed 95 degrees F in any given room or area.
4. Adequate ventilation shall be maintained in the working area during the installation and curing period.
5. In the event of conflict among the requirements, comply with the most restrictive.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. CertainTeed Corp.
2. Georgia-Pacific Gypsum LLC.
3. National Gypsum Company.
4. PABCO Gypsum.
5. USG Corporation.
6. Approved equal.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
1. Thickness: 5/8 inch.
2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
1. Thickness: 1/2 inch.
2. Long Edges: Tapered.

D. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M, Level 1.
1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
4. Locations: Per drawings.

E. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

F. Noise Reducing Gypsum Board: ASTM C 840; GA-216
1. Basis of Design: Subject to compliance with requirements, provide Certain Teed Corporation “5/8” SilentFX Type X” or comparable product by one of the following:
a. Approved Equal
2. Core: 5/8 inch, Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
5. Abuse Resistance: ASTM C 1629, Level 1.

6. STC Rating: 57 (OL 11-0646
7. Outlet (Openings) Sealing: Putty Pads (ASTM E 90)
8. Edge Sealing: ¼ inch gap all wall edges, (ASTM C 919) Continuous acoustical sealant.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. L-Bead: L-shaped; exposed long flange receives joint compound.
   d. Expansion (control) joint.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Fry Reglet Corp.
   b. Gordon, Inc.
   c. Pittcon Industries.
   d. Approved equal.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.
4. Shapes: As indicated.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
   a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, drying-type, all-purpose compound high-build or interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

C. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

D. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
      b. Grabber Construction Products; Acoustical Sealant GSC.
      c. Pecora Corporation; AC-20 FTR.
      d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
      e. USG Corporation; SHEETROCK Acoustical Sealant.
      f. Approved equal.
   2. Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Thermal Insulation: As specified in Section 07 2100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Type X: Typical unless otherwise indicated.
   2. Ceiling Type: Ceiling surfaces.
   3. Abuse-Resistant Type: As indicated on Drawings.

4. Moisture- and Mold-Resistant Type: At toilet rooms, kitchen and janitor closets.

B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   b. At high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated and at intersections with dissimilar materials.

D. Aluminum Trim: Install in locations indicated on Drawings.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for FRP.
3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
   a. Primer and its application to surfaces are specified in Section 09 9100 "Painting."

4. Level 5: Administration Building: Gridline A2 wall (at corridors), full height, including canted wall and ceiling.
   a. Primer and its application to surfaces are specified in other Section 09 9100 "Painting."

3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 3000 - TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Ceramic tile.
2. Stone thresholds.
3. Waterproof membrane.
4. Tile backing panels.
5. Metal corner strips (inside and outside corners)

B. Related Sections:
1. Section 07 9200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

E. Wet Locations: Areas subject to periodic water contact. Includes, but not limited to, behind sinks, shower areas.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For adhesives, grout, and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit IEQ 4.3: For adhesives and grouts, documentation including printed statement of VOC content.

C. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

D. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

E. Samples for Verification:
1. Full-size units of each type and composition of tile and for each color and finish required.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 16 inches square, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
3. Full-size units of each type of trim and accessory for each color and finish required.
4. Metal edge strips in 6-inch lengths.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

C. Product Certificates: For each type of product, signed by product manufacturer.

D. Material Test Reports: For each tile-setting and -grouting product.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.7 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain tile of each type from one source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
1. Joint sealants.
2. Cementitious backer units.

D. Preinstallation Conference: Conduct conference at Project site.
1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 LEED MATERIALS REQUIREMENTS

A. Provide products for use inside the weatherproofing system, that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Ceramic tile adhesives (thin set): 65 g/L.
2. Architectural sealant (grout and grout sealer): 250 g/L.

2.3 TILE PRODUCTS (**T1, T2, T3**)

A. Wall tile.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Daltile “Natural Hues” or comparable product by one of the following:
a. Approved equal.
2. Module Size: 6x12 inch
3. Thickness: 5/16 inch.
4. Face: Plain with modified square edges or cushion edges.
5. Tile Color and Pattern: As indicated in the Finish Code List.
6. Grout Color: As indicated in the Finish Code List.
7. Mounting: Factory, back mounted.
8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
a. Wall vertical transition to gypsum board (outside corner) for Thin-Set Mortar Installations:

1) Bullnose edge, match adjacent coursing height.

B. Floor Tile
1. Basis-of-Design Product: Subject to compliance with requirements, provide Daltile "Natural Hues" or comparable product by one of the following:
a. Approved equal.
2. Module Size: 6x6 inch
3. Thickness: 5/16 inch.
4. Face: Plain with modified square edges or cushion edges.
5. Tile Color and Pattern: As indicated in the Finish Code List.
6. Grout Color: As indicated in the Finish Code List.
7. Mounting: Factory, back mounted.

C. Stainless Steel Outside Corner Edge Protection:
1. Basis of Design Product: Subject to compliance with requirements, provide Schluter Systems, "Rondec" edge protection or comparable product by one of the following:
a. Approved Equal
2. Locations: All outside corners at tile construction, full height

D. Stainless Steel Inside Corner Edge Protection:
1. Basis of Design Product: Subject to compliance with requirements, provide Schluter Systems, "ECK-KI/-KHK" edge protection or comparable product by one of the following:
a. Approved Equal
2. Locations:
a. All inside corners at tile construction, full height, includes floor transition.
b. Includes Toilet Room 405 at tile construction and all floor transitions.

2.4 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, in maximum lengths available to minimize end-to-end butt joints.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. C-Cure; C-Cure Board 990.
b. Custom Building Products; Wonderboard.
c. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
d. USG Corporation; DUROCK Cement Board.
e. Approved equal.
2. Thickness: 5/8 inch.
3. Locations: Wet locations in toilet rooms and showers. Full height and minimum 24" beyond edge of wet location.

2.5 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Boiardi Products; a QEP company.
b. Bonsal American; an Oldcastle company.
c. Bostik, Inc.
d. C-Cure.
e. Custom Building Products.
f. Jamo Inc.
g. Laticrete International, Inc.
h. MAPEI Corporation.
i. Mer-Kote Products, Inc.
j. Southern Grouts & Mortars, Inc.
k. Summitville Tiles, Inc.
l. TEC; a subsidiary of H. B. Fuller Company.
m. Approved equal.

2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.6 STONE THRESHOLDS

A. Stone Thresholds
1. Basis-of-Design Product: Subject to compliance with requirements, provide Daltile Double Bevel Threshold 2” or comparable product by one of the following:
a. Approved equal.
2. Module Size: 2” x 36” x 5/8”
3. Locations: Per door schedule
4. Color: Thassos White (M420)

2.7 WATERPROOF MEMEBRANE

A. Waterproof Membrane
1. Basis-of-Design Product: Subject to compliance with requirements, provide Laticrete “9325 Waterproofing membrane and Blue 92 Anti-Fracture Fabric” or comparable product by one of the following:
a. Approved equal.
2. Module Size (Fabric): 38” and 6” wide
3. Locations: Floors, walls (full height) at all shower locations.
4. Installation per manufacturers recommendations.

2.8 GROUT MATERIALS

A. Polymer-Modified Tile Grout: ANSI A118.7.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Boiardi Products; a QEP company.
b. Bonsal American; an Oldcastle company.
c. Bostik, Inc.
d. C-Cure.

e. Custom Building Products.
f. Jamo Inc.
g. Laticrete International, Inc.
h. MAPEI Corporation.
i. Southern Grouts & Mortars, Inc.
j. Summitville Tiles, Inc.
k. TEC; a subsidiary of H. B. Fuller Company.

2.9 MISCELLANEOUS MATERIALS

A. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
   1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
   2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

C. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
   1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other

substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
   1. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

F. Joint Widths: 1/16 inch.

G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

H. Grout Sealer: Apply grout sealer to cementitious grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
   1. Remove grout residue from tile as soon as possible.
   2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
   3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.5 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Wall Installations, (Dry Area walls) Metal Studs or Furring:
   1. Tile Installation W243: Thin-set mortar on gypsum board; TCA W243.
      a. Tile Type: Glazed wall tile.
      b. Thin-Set Mortar: ANSI A118.1T
      c. Grout: Polymer-modified unsanded grout.

B. Interior Wall Installations (Shower walls), Metal Studs or Furring:
   1. Tile Installation B415: Thin-set mortar on cementitious backer units or fiber cement underlayment; TCA B415.
      a. Tile Type: Glazed wall tile.
      b. Mortar: ANSI A118.1E
      c. Grout: Polymer-modified unsanded grout.

C. Interior Installations (Floors, Concrete Subfloor):
   1. Tile Installation F113: Thin-set mortar and cleavage membrane; TCA F113.
      a. Tile Type: Glazed floor tile.
      b. Mortar Bed: ANSI A118.1E
      c. Grout: Polymer-modified unsanded grout.

D. Interior Installations (Floors, Concrete Subfloor, Shower):
   1. Tile Installation F121: Cement Mortar Bed with waterproof membrane; TCA F121.
      a. Tile Type: Glazed floor tile.
      b. Mortar Bed: ANSI A108.1A
      c. Grout: Polymer-modified unsanded grout.

END OF SECTION

SECTION 09 5113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for ceilings:
   1. Acoustical Panel
   2. Gypsum Board

B. Related Requirements:
   1. Section 09 5123 "Acoustical Tile Ceilings" for ceilings consisting of mineral-base acoustical tiles used with concealed suspension systems, stapling, or adhesive bonding.
   2. Section 09 2900 “Gypsum Board” for gypsum board for ceilings.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:
   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
   2. Product Data for Credit EQ 4.1: For sealants, documentation including printed statement of VOC content.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
   1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.

2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.
3. Fasteners and strapping to metal deck at concrete: Set of 2 fasteners/straps of each proposed for hanger and bracing wires.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Size and location of initial access modules for acoustical panels.
4. Items penetrating finished ceiling including the following:
   a. Lighting fixtures.
   b. Air outlets and inlets.
   c. Speakers.
   d. Sprinklers.
   e. Access panels.
5. Perimeter moldings.

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.

D. Evaluation Reports: For each acoustical panel ceiling suspension system, from ICC-ES.

E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
3. Hold-Down Clips: Equal to 2 percent of quantity installed.
4. Impact Clips: Equal to 2 percent of quantity installed.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
   1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
   2. Smoke-Developed Index: 450 or less.

2.2 LEED MATERIALS REQUIREMENTS

A. LEED Credit MR4: Provide materials with high levels of recycled content.

B. Provide products for use inside the weatherproofing system, that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Architectural sealants (acoustical sealant): 250 g/L.

C. All VOC-containing materials applied on-site inside of the weatherproof barrier of the building shall comply with LEED credits EQ4:
   1. LEED Credit EQ4.1: Provide grouts, adhesives and sealants with VOC content and chemical component limits not exceeding the content limits defined by SCAQMD Rule #1168, July 1, 2005, amended January 1, 2005 and Green Seal GS-36, effective October 19, 2000 for aerosol adhesives.

2.3 ACOUSTICAL PANELS, GENERAL

A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.

C. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

D. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
   1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.

E. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
   1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.4 ACOUSTICAL PANELS – (**APC1**)

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc. “Ultima Open Plan” Item Number 1945 or comparable product by one of the following:
   1. Approved equal.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
   1. Type and Form: Type XII, glass-fiber base with membrane-faced overlay; Form 2, cloth.
   2. Pattern: E (lightly textured).

C. Fire Rating: Class A.

D. Color: White.

E. LR: Not less than 0.90.

F. NRC: Not less than 0.95.

G. AC: Not less than 170.

H. Edge/Joint Detail: Beveled Tegular.

I. Thickness: 3/4 inch.

J. Modular Size: 24 by 24 inches.

K. Total Recycled Content: 82 percent.
   1. Post-consumer recycled content: 0 percent.
   2. Pre-consumer recycled content: 82 percent.

2.5 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.
   1. High-Humidity Finish: Comply with ASTM C 635/C 635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
   1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
   2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.

D. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

E. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

F. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

G. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.

H. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.

I. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

2.6 METAL SUSPENSION SYSTEM

A. Basis-of-Design Product: Subject to compliance with requirements, provide products by Armstrong World Industries “Drywall Grid System and Interlude XL HRC 9/16”, Inc. or comparable products by one of the following:
1. CertainTeed Corp.
2. Chicago Metallic Corporation.
3. USG Interiors, Inc.; Subsidiary of USG Corporation.
4. Approved equal.

B. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with prefinished 9/16-inch- wide metal caps on flanges. ASTM C635 heavy duty main beam classification for gypsum board applications and flat installations. ASTM C 645 for rigid furring channels for screw applications of gypsum board.
1. Structural Classification: Heavy-duty system.
2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
3. Face Design: Flat, flush.
4. Cap Material: Steel or aluminum cold-rolled sheet.
5. Cap Finish: Painted white.

2.7 METAL EDGE MOLDINGS AND TRIM

A. Basis-of-Design Product: Subject to compliance with requirements, provide products by Armstrong World Industries or comparable products by one of the following:
1. CertainTeed Corp.

2. Chicago Metallic Corporation.
3. USG Interiors, Inc.; Subsidiary of USG Corporation.
4. Approved equal.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.8 ACOUSTICAL SEALANT

A. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.
3. Acoustical sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
   6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
   7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
   8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
   9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
   1. Testing of anchors in concrete at Metal Deck:

a. Hanger Wires: 1 out of 10 wire/anchor assemblies field tested for 200 lbs. in tension.
b. Bracing Wires: 1 out of 2 wire/anchor assemblies field tested for 440 lbs. in tension.

2. Shot in anchors not permitted for bracing wires

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned acoustical panels as follows:
a. Install panels with pattern running in one direction parallel to long axis of space.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
4. Install hold-down and impact clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
1. Compliance of seismic design.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

C. Acoustical panel ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 6105 - WATER VAPOR CONTROL FOR FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, documents, and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing, testing, and application of systems for the reduction of moisture vapor transmission and alkalinity control for interior concrete slabs requiring the installation of moisture-sensitive floor coverings.

B. Related Sections include the following:
   1. Section 03 3000 “Cast-In-Place Concrete” for curing requirements.
   2. Section 09 6536 “Static-Control Resilient Flooring” for installation requirements.
   3. Section 09 6543 “Linoleum Flooring” for installation requirements.
   4. Section 09 6813 “Tile Carpeting” for installation requirements.

1.3 REFERENCES

A. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials.

B. ASTM D 4541 Standard Test Method for Pull-Off Adhesion Strength of Coatings Using Portable Tester.

C. ASTM D 1308 Standard Test Method for Effect of Household Chemicals on Clear/ Pigmented Organic Finishes

D. ASTM D 1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride Testing of Concrete Sub Floors.

E. ASTM F 710 Concrete Alkalinity (pH) Testing.

F. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

1.4 ACTION SUBMITTALS

A. Product data for each type of product and process specified.

B. LEED Submittal:
   1. Product Data for Credit EQ 4.2: For w systems, documentation including printed statement of VOC content and chemical components.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For water vapor emission control system, signed by product manufacturer.

B. Installer's Certificates: Signed by manufacturer certifying that installer complies with requirements.

C. Manufacturer's Qualifications: Submit list of product use and performance history, for the same formulation and system design, listing reference sources. Similar projects shall have documented minimum initial water vapor transmission rates of 20 lbs per 1000 ft² per 24 hours to 3 lbs per 1000 ft² per 24, and have resulted in maintained water vapor reduction rate of less than 3 lbs per 1000 ft² per 24 hours when tested according to ASTM 1869.98

D. Material Test Reports: For each water vapor emission control system product.

E. Field Quality Control Reports: Test results for water vapor emissions specified in this Section.

F. Warranty: Special warranty specified in this Section.

G. Report by manufacturer's technician documenting that proper application procedures have been followed.

1.6 QUALITY ASSURANCE

A. Installer's Qualifications: Manufacturer-certified or approved installer with no less than five years experience installing the system.

B. Manufacturer's Qualifications
1. Manufacturer shall have ten years experience in manufacturing water vapor reduction systems. The water vapor reduction system must be specifically formulated and marketed for water vapor reduction and alkalinity control without change of system design for a minimum period of five years.

C. Manufacturer's technician(s) to be on site to supervise installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the job site in their original unopened containers, clearly labeled with the manufacturer's name and brand designation.

B. Store products in an approved ventilated dry area; protect from dampness, freezing, and direct sun light. Product should not be stored in areas with temperatures in excess of 90 °F or below 50 °F.

C. Handle product in a manner that will prevent breakage of containers and damage products.

1.8 PROJECT/SITE CONDITIONS

A. Environmental Conditions: Comply with manufacturer's requirements.

B. Protection: Protect water vapor emission control system to prevent damage from active rain or topical water for a minimum period of 24 hours from time of application.

1.9 WARRANTY

1.10

A. Manufacturer's Warranty: Warrant water vapor control system against manufacturing defects and improper installation:
   1. Warranty shall not exclude cracks.
   2. Cover costs of treatment materials, flooring, adhesives, coatings, patching materials and labor to replace system and flooring and to move, store, and reinstall furniture and equipment at no additional cost to Owner.
   3. Warranty period: 15 years from Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary water vapor control materials and accessories from a single source from a single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Systems capable of reducing moisture emission levels from 15 pounds to less than 3.0 pounds per 1000 sq. ft. per 24 hours when tested to ASTM F 1869.

B. System resistant to long term 14 pH (alkalinity) exposure per ASTM D1308.

C. Concrete adhesion strength up to 500 psi per ASTM D 4541.

D. System compatible with adhesives, floor coverings and floor coating materials.

2.3 MATERIALS

A. VOC Content of Water Vapor Control System: Provide water vapor control systems, for use inside the weatherproofing system, that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Primers, sealers, and undercoatings: 70 g/L.

2.4 WATER VAPOR CONTROL SYSTEM

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   1. Advanced Moisture Control "Vapor-Green FC"
   2. Ardex "MC Ultra" Moisture Control System.
   3. Koester American Corporation "VAP I 2000."
   4. Mapei "Planiseal EMB"

5. Approved equal.

B. System Description:
1. Epoxy-based coating.
2. Perm Rating: 0.10 perm rating maximum per ASTM E96.
3. Single coat system.

C. Accessories
1. Primer: Manufacturer's standard.
2. Cementitious Underlayment: 100% Portland cement-based self-leveling compound as recommended by water vapor control system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Conditions: Examine substrates, with Applicator present, where water vapor emission control system is to be applied.
1. Proceed with application only after unsatisfactory conditions have been corrected. Beginning of installation indicates acceptance of existing substrate conditions.
2. Notify Architect in writing of defects that would affect system performance

B. Field Testing of Existing Substrates: Conduct testing prior to installation of vapor control system:
1. Conduct calcium chloride tests per ASTM D1869.
2. Perform relative humidity test using in situ probes, ASTM F 2170.
3. Test a minimum of 1 location for each room at each type of flooring material and as follows:
a. Test a minimum of 3 locations in 1000 sq ft.
b. Test one additional location for each ensuing 1000 sq ft, or portion thereof.

3.2 PREPARATION

A. Protect other work from damage from cleaning, preparation, and application of water vapor emission control system. Provide temporary enclosure to confine spraying operation, and to ensure adequate ambient temperatures and ventilation conditions for application.

B. Slab Preparation: Comply with manufacturer's written instructions:
1. Prepare concrete according to water vapor control system manufacturer's written instructions by grinding or shot blasting apparatus to manufacturer's recommended Concrete Surface Profile.
2. Remove all defective materials and foreign matter such as dust, adhesives, leveling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance.
3. Remove any reinforcing fibers visible after shot blasting.
4. Repair cracks in accordance with Manufacturer's recommendations.
5. Concrete Joints: Clean reveals according to water vapor control system Manufacturer's written instructions.
6. Repair damaged or unsatisfactory concrete according to Manufacturer's written instructions

3.3 APPLICATION

A. General: Apply system components in accordance with manufacturer's requirements to produce a uniform, monolithic barrier.
   1. Apply system at all concrete slabs to receive resilient flooring or tile carpeting.
   2. Spread Rate: Comply with barrier manufacturer's requirements.
   3. Slabs: Roller and squeegee applications methods to saturate slab surfaces.
   4. Cracks and Joints: Treat cracks, control joints, holes and slab imperfections with barrier in compliance with manufacturer's recommendations.
   5. Penetrations: Seal all penetrations to form a moisture and water tight surface.

B. Underlayment Application:
   1. Allow barrier to cure per manufacturer's requirements.
   2. Install self-leveling underlayment compound to barrier surface as recommended by barrier manufacturer.

3.4 FIELD QUALITY CONTROL

A. Post Installation Testing: Owner's Testing Agency to perform testing to confirm compliance with specified requirements as follows:
   1. ASTM F 1869 Calcium Chloride tests at a minimum of 10 locations.
   2. ASTM D 4541 pull-off adhesion at 2 locations to verify concrete adhesion strength. Minimum result: 600 psi or concrete cohesive failure.

B. If post-installation test results exceed specified requirements, take remedial steps at no additional cost to the Owner to bring vapor emissions into compliance with specified requirements.

3.5 PROTECTION

A. Protect barrier during cure periods from any kind of traffic, topical water, and contaminants.

END OF SECTION

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SECTION 09 6513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Resilient base.
   2. Resilient molding accessories.

B. Related Sections:
   1. Section 09 6516.13 “Linoleum Flooring” for linoleum flooring.
   2. Section 09 6536 "Static-Control Resilient Flooring." For static control flooring and base.
   3. Section 09 6813 “Tile Carpeting” for carpeting.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:
   1. LEED Credit MR 5, Regional Materials:
      a. For products and materials required to comply with requirements for regional materials, submit data indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
   2. LEED Credit IEQ 4.1, Low-Emitting Materials, Adhesives and Sealants:
      a. Manufacturer’s technical data sheet showing a printed statement of VOC content for all adhesives and sealants and demonstrating compliance with SCAQMD Rule #1168, effective July 1, 2005 and amended January 1, 2005.
   3. LEED Credit IEQ 4.3, Low-Emitting Materials, Flooring:
      a. Documentation from and independent testing agency indicating compliance with the FloorScore standard.

C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

D. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 LEED MATERIALS REQUIREMENTS

A. Provide products for use inside the weatherproofing system, that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Cove base adhesives: 50 g/L.

B. Resilient Base and Resilient Molding Accessories shall comply with requirements of FloorScore Standard.

2.2 RESILIENT BASE (**B1**)

A. Resilient Base:
   1. Basis of Design: Subject to compliance with requirements, provide Roppe “Pinnacle Rubber Base” or equal products by one of the following:
      a. Approved equal.

B. Resilient Base Standard: ASTM F 1861.
   1. Material Requirement: Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic).
   2. Manufacturing Method: Group I (solid, homogeneous).
   3. Style:
      a. Resilient sheet, linoleum, concrete or other hard flooring surface: Cove (base with toe)
      b. Carpet: Straight (flat or toeless).

C. Minimum Thickness: 0.125 inch.

D. Height: 4” inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Preformed, 4”.

G. Inside Corners: Preformed, 4”.

H. Colors and Patterns: 174 Smoke

2.3 RESILIENT MOLDING ACCESSORY

A. Resilient Molding Accessory:
   1. Basis of Design: Subject to compliance with requirements, provide Roppe “Rubber Accessories” or equal products by one of the following:
      a. Approved equal.

B. Description: Carpet edge for glue-down applications, Nosing for carpet, Nosing for resilient floor covering, Reducer strip for resilient floor covering, Joiner for tile and carpet and Transition strips.

C. Material: Vinyl or Rubber.

D. Profile and Dimensions: As indicated.

E. Colors and Patterns: Match (B1) resilient base.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

D. Floor Polish: Provide protective liquid floor polish products as recommended by resilient stair tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Treads and Accessories: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
   4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
      a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are same temperature as the space where they are to be installed.
1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.
   1. Apply three coat(s).

E. Cover resilient products until Final Completion.

END OF SECTION

SECTION 09 6516.13 - LINOLEUM FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Linoleum sheet flooring.

B. Related Sections:
   1. Section 09 6105 “Water Vapor Control for Flooring” for vapor control components.
   2. Section 09 6513 "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with linoleum floor covering.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:
   a. .
   2. LEED Credit IEQ 4.1, Low-Emitting Materials, Adhesives and Sealants:
      a. Manufacturer’s technical data sheet showing a printed statement of VOC content for all adhesives and sealants and demonstrating compliance with SCAQMD Rule #1168, effective July 1, 2005 and amended January 1, 2005.
   3. LEED Credit IEQ 4.3, Low-Emitting Materials, Flooring:
      a. Documentation from and independent testing agency indicating compliance with the FloorScore standard.

C. Shop Drawings: For each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

D. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch sections of each color and pattern of floor covering required.
   1. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.

E. Heat-Welded Seam Samples: For each floor covering product and welding bead color and pattern combination required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to rigid backing and prepared by Installer for this Project.

F. Product Schedule: For floor covering. Use same designations indicated on Drawings**.**

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor covering to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Sheet Flooring: Furnish not less than 10 linear for every 500 linear feet or fraction thereof, in roll form and in full roll width for each color, pattern, and type of sheet flooring installed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor covering installation.
   1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store floor coverings and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 65 deg F or more than 90 deg F.
   1. Sheet Flooring: Store rolls upright.

1.9 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor coverings during the following time periods:
   1. 72 hours before installation.

2. During installation.
3. 72 hours after installation.

B. Until Final Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 72 hours after floor covering installation.

E. Install floor coverings after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 LEED MATERIALS REQUIREMENTS

A. Provide products for use inside the weatherproofing system, that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. VCT and asphalt adhesives: 50 g/L.

B. Linoleum Flooring shall comply with requirements of FloorScore Standard.

2.2 MANUFACTURERS

A. Basis of Design Products: Subject to compliance with requirements, provide Armstrong World Industries, Inc “Colorette” or equal products by the following:
1. Approved equal.

2.3 LINOLEUM FLOOR COVERING (**RF1**)

A. Sheet Flooring: ASTM F 2034, Type I, linoleum sheet with backing.
1. Roll Size: In manufacturer's standard length by not less than 78 inches wide.

B. Seaming Method: Seam Adhesive. Manufacturers standard

C. Thickness: 0.10 inch.

D. Static Coefficient of Friction: 0.60 minimum. Resilient flooring shall be slip resistant per CBC 2013 11B-302.

E. Colors and Patterns: Half Baked LP 371.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit products and substrate conditions indicated.

C. Seam Adhesive: Water based / resin product of linoleum floor covering manufacturer.

D. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with floor covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
   4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
      a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor coverings until they are same temperature as space where they are to be installed.
1. Move floor coverings and installation materials into spaces where they will be installed at least 72 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.3 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions for installing floor coverings.

B. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

C. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.

D. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on subfloor. Use chalk or other nonpermanent marking device.

E. Install floor coverings on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of floor covering installed on covers and adjoining floor covering. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.

F. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

G. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.

3.4 LINOLEUM SHEET FLOORING INSTALLATION

A. Unroll sheet floorings and allow them to stabilize before cutting and fitting.

B. Lay out sheet floorings as follows:
1. Maintain uniformity of floor covering direction.
2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in floor covering substrates.

3. Match edges of floor coverings for color shading at seams.
4. Avoid cross seams.
5. Eliminate deformations that result from hanging method used during drying process (stove bar marks).

C. Integral-Flash-Cove Base: Cove linoleum floor covering 6 inches up vertical surfaces. Support floor covering at horizontal and vertical junction with cove strip. Butt at top against cap strip.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor coverings.

B. Perform the following operations immediately after completing floor covering installation:
1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive and surface blemishes from floor coverings before applying liquid floor polish.
1. Apply three coat(s).

E. After allowing drying room film (yellow film caused by linseed oil oxidation) to disappear, cover floor coverings until Final Completion.

END OF SECTION

SECTION 09 6536 - STATIC-CONTROL RESILIENT FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Static-dissipative, rubber floor tile with base

B. Related Requirements:
   1. Section 09 6105 “Water Vapor Control for Flooring” for vapor control components.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to static-control resilient flooring including, but not limited to, the following:
      a. Examination and preparation of substrates to receive static-control resilient flooring.
      b. Installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:
   1. Product Data for Credit IEQ 4.1: For adhesives documentation including printed statement of VOC content.
   2. Product Data for Credit IEQ 4.3: For static-control resilient flooring, documentation from an independent testing agency indicating compliance with the FloorScore Standard.

C. Shop Drawings: For each type of static-control resilient flooring. Include floor-covering layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
   1. Show details of special patterns.
   2. Show locations of inscribed maintenance tiles.
   3. Submit grounding diagram showing location of grounding strips and connections.

D. Samples for Initial Selection: For each type of static-control resilient flooring.

E. Samples for Verification: For each type of static-control resilient flooring, of size indicated below:
   1. Floor Tile: Full-size units.

F. Product Schedule: For static-control resilient flooring. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for static-control resilient flooring.

C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of static-control resilient flooring to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for static-control resilient flooring.
   1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store static-control resilient flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer but not less than 50 deg F or more than 90 deg F.
   1. Floor Tile: Store on flat surfaces.

1.10 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, in spaces to receive static-control resilient flooring during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during static-control resilient flooring installation.

D. Close spaces to traffic for 48 hours after static-control resilient flooring installation.

E. Install static-control resilient flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Static-Dissipative Properties: Provide static-control resilient flooring with static-control properties indicated as determined by testing identical products per test method indicated by an independent testing and inspecting agency.
   1. Electrical Resistance: Test per ASTM F 150 with 100-V applied voltage.
      a. Average greater than 1 megohm and less than or equal to 1000 megohms when test specimens are tested surface to ground.
   2. Static Decay: 5000 to zero V in less than 0.25 seconds when tested per FED-STD-101C/4046.1.

B. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 STATIC-DISSIPATIVE RESILIENT FLOOR COVERINGS (**RF2**)

A. Static-Dissipative Rubber Floor Tile: ASTM F 1344; except in manufacturer's standard hardness when tested per ASTM D 2240 using Shore, Type A durometer.
   1. Smooth-Surface Floor Tile: Class I-B (homogenous rubber, through-mottled pattern).
      a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
         1) Nora Rubber Flooring, Freudenberg Building Systems, Inc; “Noraplan Environcare, Art 2462”
         2) Approved equal.
      b. Thickness: Not less than 0.08 inch.
      c. Size: 24 by 24 inches.
      d. Seaming Method: Nora Cold Weld
      e. Static Coefficient of Friction: 0.88 minimum, CBC 2013, 11B-302.
      f. Colors and Patterns: Windflower (2930)
      g. Locations: MDF and IDF rooms
      h. Accessories:
         1) Cove (Sanitary) Base
            a) Color and pattern: Windflower (2930)

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified portland cement or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Static-Control Adhesive: Provided or approved by manufacturer; type that maintains electrical continuity of floor-covering system to ground connection.
   1. Adhesives shall comply with the following limits for VOC content:
      a. Rubber Floor Adhesives: Not more than 60 g/L.

C. Grounding Strips: Provided or approved by manufacturer; type and size that maintains electrical continuity of floor-covering system to ground connection.

D. Maintenance Floor Tiles: Special floor tiles inscribed "Conductive floor. Do not wax."

E. Floor Polish: Provide protective, static-control liquid floor polish products as recommended by floor-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion or static-control characteristics of floor coverings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of static-control resilient flooring and electrical continuity of floor-covering systems.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with floor-covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
   4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
      a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
      b. Perform relative-humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative-humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install static-control resilient flooring until it is same temperature as space where it is to be installed.
   1. Move static-control resilient flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum substrates to be covered by static-control resilient flooring immediately before installation.

3.3 INSTALLATION, GENERAL

A. Install static-control resilient flooring according to manufacturer's written instructions.

B. Embed grounding strips in static-control adhesive. Extend grounding strips beyond perimeter of static-control resilient floor-covering surfaces to ground connections.

C. Scribe, cut, and fit static-control resilient flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

D. Extend static-control resilient flooring into toe spaces, door reveals, closets, and similar openings. Extend static-control resilient flooring to center of door openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on static-control resilient flooring as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

F. Install static-control resilient flooring on covers for telephone and electrical ducts, and similar items in installation areas. Maintain overall continuity of color and pattern with pieces of static-control resilient flooring installed on covers. Tightly adhere static-control resilient flooring edges to substrates that abut covers and to cover perimeters.

G. Adhere static-control resilient flooring to substrates using a full spread of static-control adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

H. Seamless Installation:
   1. Chemically Bonded Seams: Bond seams with chemical-bonding compound to permanently fuse sections into a seamless floor covering. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on floor-covering surfaces.

3.4 FLOOR-TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half floor tile at perimeter.
   1. Lay floor tiles square with room axis unless otherwise indicated.

C. Match floor tiles for color and pattern by selecting floor tiles from cartons in same sequence as manufactured and packaged if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.
   1. Lay static-dissipative floor tiles with grain running in one direction.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified testing agency to test electrical resistance of static-control resilient flooring for compliance with requirements.
   1. Arrange for testing after static-control adhesives have fully cured and static-control resilient flooring has stabilized to ambient conditions and after ground connections are completed.
   2. Arrange for testing of static-control resilient flooring before and after performing floor polish procedures.

B. Static-control resilient flooring will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of static-control resilient flooring.

B. Perform the following operations immediately after completing static-control resilient flooring:
   1. Remove static-control adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect static-control resilient flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
   1. Do not wax static-control resilient flooring.
   2. If recommended in writing by manufacturer, apply protective static-control floor polish formulated to maintain or enhance floor covering's electrical properties; ensure static-control resilient flooring surfaces are free from soil, static-control adhesive, and surface blemishes.
      a. Verify that both floor polish and its application method are approved by manufacturer and that floor polish will not leave an insulating film that reduces static-control resilient flooring's effectiveness for static control.

D. Cover static-control resilient flooring until Substantial Completion.

END OF SECTION

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SECTION 09 6813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes modular, carpet tile.

B. Related Requirements:
1. Section 09 6513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
   a. Review delivery, storage, and handling procedures.
   b. Review ambient conditions and ventilation procedures.
   c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include installation recommendations for each type of substrate.

B. LEED Submittals:
1. LEED Credit IEQ 4.1, Low-Emitting Materials, Adhesives and Sealants:
   a. Manufacturer’s technical data sheet showing a printed statement of VOC content for all adhesives and sealants and demonstrating compliance with SCAQMD Rule #1168, effective July 1, 2005 and amended January 1, 2005.
2. LEED Credit IEQ 4.3, Low-Emitting Materials, Flooring:
   a. Documentation from and independent testing agency indicating compliance with testing and product requirements of CRI’s “Green Label Plus” program.

C. Shop Drawings: Show the following:
1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.

3. Type of installation.
4. Pattern of installation.
5. Pattern type, location, and direction.
6. Pile direction.
7. Type, color, and location of edge, transition, and other accessory strips.
8. Transition details to other flooring materials.

D. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet Tile: Full-size Sample.

E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockups at locations and in sizes shown on Drawings.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.10 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
   1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
   2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
   3. Warranty Period: 10 years from date of Final Completion.

PART 2 - PRODUCTS

2.1 LEED MATERIALS REQUIREMENTS

A. All VOC-containing materials applied on-site inside of the weatherproof barrier of the building shall comply with LEED credits EQ4:
   1. LEED Credit EQ4.1: Provide adhesives and sealants with VOC content and chemical component limits not exceeding the content limits defined by SCAQMD Rule #1168, July 1, 2005, amended January 1, 2005 and Green Seal GS-36, effective October 19, 2000 for aerosol adhesives.

2. LEED Credit EQ 4.3: Carpet tile shall comply with requirements of CRI's "Green Label Plus" program.

2.2 CARPET TILE PATTERN (**C1**)

A. Basis-of-Design Product: Subject to compliance with requirements, provide products by "Shaw" or approved equal

B. Collection: Melt Tile.

C. Product Number: 5T048.

D. Color: 48516 Fuse.

E. Yarn System: eco solution q nylon

F. Dye Method: 87% Solution Dyed / 13% Yarn Dyed

G. Pile Characteristic: Multi Level Pattern Loop.

H. Machine Gage: 1/12 inch.

I. Primary Backing Material: synthetic (secondary 'ecoworx' tile).

J. Size: 18 x 36 inches (45.72 cm by 91.44 cm).

K. Applied Soil-Resistance Treatment: ssp shaw soil protection

L. Installation: Brick

M. Recycled Content:
1. Pre-consumer: per Manufacturer
2. Post-consumer: per Manufacturer

N. Indoor Air Quality: Green Label Plus Certified #GLP0820.

2.3 CARPET TILE (**C2**)

A. Basis-of-Design Product: Subject to compliance with requirements, provide products by "Shaw" or approved equal

B. Collection: Still Tile.

C. Product Number: 5T051.

D. Color: 48516 Fuse.

E. Yarn System: eco solution q nylon

F. Dye Method: 87% Solution Dyed / 13% Yarn Dyed

G. Pile Characteristic: Multi Level Pattern Loop.

H. Machine Gage: 1/12 inch.

I. Primary Backing Material: synthetic (secondary 'ecoworx' tile).

J. Size: 18 x 36 inches (45.72 cm by 91.44 cm).

K. Applied Soil-Resistance Treatment: ssp shaw soil protection

L. Installation: Brick

M. Recycled Content:
1. Pre-consumer: per Manufacturer
2. Post-consumer: per Manufacturer

N. Indoor Air Quality: Green Label Plus Certified #GLP0820.

2.4 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:
   1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
   2. Remove yarns that protrude from carpet tile surface.
   3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

SECTION 09 9100 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following substrates:
   1. Exterior substrates:
      a. Steel.
      b. Galvanized metal.
   2. Interior substrates:
      a. Steel.
      b. Galvanized metal.
      c. Aluminum (not anodized or otherwise coated).
      d. Wood.
      e. Gypsum board.
      f. Cotton or canvas insulation covering.

B. Related Sections include the following:
   1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
   2. Section 09 9600 “High Performance Coatings” for special-use coatings.

1.3 DEFINITIONS

A. Gloss/ Sheen Ratings: Paint gloss shall be defined as the sheen rating of applied paint according to ASTM D523 and the following MPI values:

Gloss Level	Description	Units at 60 degrees	Units at 85 degrees
G1	Matte or Flat finish	0 to 5	10 maximum
G2	Velvet finish	0 to 10	10 to 35
G3	Eggshell finish	10 to 25	10 to 35
G4	Satin finish	20 to 35	35 minimum.
G5	Semi-gloss finish	35 to 70	
G6	Gloss finish	70 to 85	
G7	High-Gloss finish	Greater than 85	

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
   1. Submit Samples on rigid backing, 8 inches square.
   2. Step coats on Samples to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

E. LEED Submittal:
   1. Product Data for Credit EQ 4.2: For paints, including printed statement of VOC content and chemical components.

F. Planned method / procedure for cleaning galvanized steel prior to painting. Letter from manufacturer stating acceptance of method be proposed.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Applicator.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual with a minimum of five (5) years of experience in applying paints and coatings similar in material, design, and extent to those indicated for this Project whose work has resulted in applications with a record of successful in-service performance.

B. MPI Standards:
   1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
   2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

C. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
      a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft.
      b. Other Items: Architect will designate items or areas required.
   2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
   3. Final approval of color selections will be based on benchmark samples.
      a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
   1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Subject to compliance with requirements, provide products by Dunn Edwards or equal products by one of the following:
   1. Approved equal.

2.2 PAINT, GENERAL

A. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:
   1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
   2. Nonflat Paints and Coatings: VOC content of not more than 150 g/L.
   3. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
   4. Restricted Components: Paints and coatings shall not contain any of the following:

a. Acrolein.
b. Acrylonitrile.
c. Antimony.
d. Benzene.
e. Butyl benzyl phthalate.
f. Cadmium.
g. Di (2-ethylhexyl) phthalate.
h. Di-n-butyl phthalate.
i. Di-n-octyl phthalate.
j. 1,2-dichlorobenzene.
k. Diethyl phthalate.
l. Dimethyl phthalate.
m. Ethylbenzene.
n. Formaldehyde.
o. Hexavalent chromium.
p. Isophorone.
q. Lead.
r. Mercury.
s. Methyl ethyl ketone.
t. Methyl isobutyl ketone.
u. Methylene chloride.
v. Naphthalene.
w. Toluene (methylbenzene).
x. 1,1,1-trichloroethane.
y. Vinyl chloride.

C. Colors: As indicated in finish code list.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
2. Wood: 15 percent.
3. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
   2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

F. Aluminum Substrates: Remove surface oxidation.

G. Wood Substrates:
   1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
   2. Sand surfaces that will be exposed to view, and dust off.
   3. Prime edges, ends, faces, undersides, and backsides of wood.
   4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

H. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

I. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

4. Back-prime and paint plywood backer panels (electrical, telephone, and data backboards), including edges, to match wall mounted on unless otherwise indicated. If unpainted masonry or concrete wall, paint flat gray unless otherwise indicated.
5. Paint inside of light valances or light coves gloss white unless otherwise indicated.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
1. Where deep or bright colors are indicated, apply a minimum of four coats of paint to achieve satisfactory results.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
1. Mechanical Work:
   a. Uninsulated metal piping.
   b. Uninsulated plastic piping.
   c. Pipe hangers and supports.
   d. Tanks that do not have factory-applied final finishes.
   e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets for a minimum of 18 inches or beyond sight line shall be painted flat black.
   f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
2. Electrical Work:
   a. Switchgear.
   b. Panelboards.
   c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

F. Gloss level for surfaces: Unless otherwise noted**,** surfaces shall be painted in accordance with the following gloss levels:
1. Exterior surfaces:
   a. Exterior wall surfaces: G2 Velvet finish.
   b. Exterior soffits: G1 Matte or flat finish.
   c. Exterior trim: G2 Velvet finish.
   d. Scuppers, gutters, and roof leaders not factory finished: G2 Velvet finish.
   e. Exterior face of doors and windows not factory finished: G5 Semi-gloss.
   f. Metals not otherwise identified: G5 Semi-gloss.
   g. Wood not otherwise identified: G2 Velvet finish.
2. Interior surfaces:
   a. Interior wall surfaces:

1) Typical interior walls: G3 Eggshell.
2) Interior walls at high-moisture environments including public toilet rooms, kitchens, laboratories, janitor closets: G5 Semi-gloss.

b. Interior ceilings:
1) Typical interior ceilings: G1 Matte or flat finish.
2) Ceilings in high-moisture environments including public toilet rooms, kitchens, laboratories, janitor closets: G5 Semi-gloss.

c. Opaque finish trim not otherwise finished: G5 Semi-gloss.
d. Opaque finish doors and windows not factory finished: G5 Semi-gloss.
e. Cotton or canvas insulation covering: G1 Matte or flat finish.
f. Handrails and guardrails not factory finished: G5 Semi-gloss.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 SITE ENVIRONMENTAL PROCEDURES

A. Waste Management: As specified in Section 01 7419 “Construction Waste Management and Disposal”.

3.7 EXTERIOR PAINTING SCHEDULE

A. Galvanized Metal Substrates: G5 Semi-Gloss
   1. Pretreatment: Jasco Prep & Prime
   2. Prime coat: 5725 DTM
   3. Two finish coats: 5885 DTM

3.8 INTERIOR PAINTING SUBSTRATES

A. Steel Substrates: G5 Semi-Gloss
   1. Prime coat: 1725 Acry-Shield
   2. Two finish coats: 1685 Dura Poxy + or 1520 Enviro-Cote

B. Galvanized Metal Substrates: G5 Semi-Gloss
   1. Pretreatment: Jasco Prep & Prime
   2. Prime coat: 1725 Acry-Shield
   3. Two finish coats: 1685 Dura Poxy + or 1520 Enviro-Cote

C. Aluminum Substrates: G5 Semi-Gloss
   1. Pretreatment: Jasco Prep & Prime
   2. Prime coat: 1725 Acry-Shield
   3. Two finish coats: 1685 Dura Poxy + or 1520 Enviro-Cote

D. Wood Panel Substrates: Including painted plywood, medium-density fiberboard, and hardboard. G3 Eggshell or G5 Semi-Gloss
   1. Prime coat: Rust-Oleum Griptec
   2. Two G3 finish coats: 1686 Dura Poxy + or 1510 Enviro-Cote
   3. Two G5 finish coats: 1685 Dura Poxy + or 1520 Enviro-Cote

E. Gypsum Board Substrates: G1 Matte or Flat
   1. Prime coat: 971 Acry-Plex
   2. Two finish coats: 1500 Enviro-Cote

F. Gypsum Board Substrates: G3 Eggshell
   1. Prime coat: 971 Acry-Plex
   2. Two G3 finish coats: 1686 Dura Poxy + or 1510 Enviro-Cote

G. Gypsum Board Substrates: G5 Semi-Gloss
   1. Prime coat: 971 Acry-Plex
   2. Two G5 finish coats: 1685 Dura Poxy + or 1520 Enviro-Cote

END OF SECTION

SECTION 09 9600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and application of high-performance coating systems on the following substrates:
   1. Exterior Substrates:
      a. Steel.
      b. Galvanized metal.

   2. Interior Substrates:
      a. Concrete masonry units (CMU) / Concrete.
      b. Steel, including insulated metal panels
      c. Galvanized metal.
      d. Gypsum Board

B. Related Requirements:
   1. Section 05 1200 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
   2. Section 09 9100 "Painting" for general field painting.

1.3 DEFINITIONS

A. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

B. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.

B. LEED Submittals:
   1. Product Data for Credit EQ 4.2: For interior coatings, documentation including printed statement of VOC content.

C. Samples for Initial Selection: For each type of topcoat product indicated.

D. Samples for Verification: For each type of coating system and in each color and gloss of topcoat indicated.
   1. Submit Samples on rigid backing, 8 inches square.
   2. Step coats on Samples to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

E. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Coatings: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each coating system specified in Part 3.
      a. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.

B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Subject to compliance with requirements, provide products by Tnemec Company or equal products by the following:
1. Benjamin Moore & Co.
2. Dunn-Edwards Corporation.
3. Frazee Paint.
4. General Paint.
5. ICI Paints.
6. Kelly-Moore Paints.
7. Sherwin-Williams Company (The).
8. Approved equal.

B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in other Part 2 articles for the paint category indicated.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

A. Material Compatibility:
1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
3. Provide products of same manufacturer for each coat in a coating system.

B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: 250 g/L.
4. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
5. Pre-Treatment Wash Primers: 420 g/L.

C. Colors:
1. **HPC1**: Match P1, typ, u.o.n.
2. **HPC2**: Match P3 at maintenance exposed ductwork.
3. **HPC3**: Match P4 at maintenance accent

2.3 CONCRETE MASONRY UNIT PRIMERS/SEALERS

A. Block Filler:
1. Tnemec Series 130 Envirofill.

B. Primer Sealer:
1. Tnemec Series 280 Tneme-Glaze.

2.4 METAL PRIMERS

A. Primer, Zinc-Rich:
1. Tnemec Tneme-Zinc H90-97.

2.5 EPOXY COATINGS

A. Epoxy:
1. Tnemec Typoxy Series 27.

B. Modified Polyamine Epoxy:
1. Tneme-Glaze Series 280

2.6 ACRYLIC POLYMER COATINGS

A. HDP Acrylic Polymer:
1. Tnemec Enduratone Series 1028.

2.7 SOURCE QUALITY CONTROL

A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:
1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   a. Masonry (Clay and CMU): 12 percent.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions.
   1. Clean surfaces with pressurized water. Use pressure range of 100 to 600 psi at 6 to 12 inches.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
   1. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
   1. Use applicators and techniques suited for coating and substrate indicated.
   2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
   3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
   1. Contractor shall touch up and restore coated surfaces damaged by testing.
   2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Steel Substrates:
   1. Prime Coat: Tneme-Zinc 90-97.
   2. Intermediate Coat: Typoxy Series 27.
   3. Topcoat: Enduratone Series 1028.

B. Galvanized-Metal Substrates:
   1. Prime Coat: Tneme-Zinc 90-97.
   2. Intermediate Coat: Typoxy Series 27.
   3. Topcoat: Enduratone Series 1028.

3.7 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Steel Substrates:
   1. Prime Coat: Tneme-Zinc 90-97.
   2. Intermediate Coat: Typoxy Series 27.
   3. Topcoat: Enduratone Series 1028.

B. Galvanized-Metal Substrates:
   1. Prime Coat: Tneme-Zinc 90-97.
   2. Intermediate Coat: Typoxy Series 27.
   3. Topcoat: Enduratone Series 1028.

C. Concrete Masonry Unit Substrates:
   1. Block Filler: Envirofill Series 130
   2. Prime Coat: Tneme-Glaze Series 280.
   3. Finish Coat: Tneme-Glaze Series 280.

END OF SECTION

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SECTION 10 1100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Markerboards.
   2. Tackboards (factory and custom framed)

1.3 DEFINITIONS

A. Tackboard: Framed or unframed, tackable, visual display board assembly.

B. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; includes chalkboards, markerboards, and tackboards.

C. Visual Display Surface: Surfaces that are used to convey information visually, including surfaces of chalkboards, markerboards, tackboards, and surfacing materials that are not fabricated into composite panel form but are applied directly to walls.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for visual display surfaces.

B. LEED Submittals:
   1. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
   2. Product Data for Credit IEQ 4.4: For composite wood products, documentation indicating that the product contains no urea formaldehyde.

C. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.
   1. Show locations of panel joints.
   2. Show locations of special-purpose graphics for visual display surfaces.
   3. Include sections of typical trim members.

D. Samples for Initial Selection: For each type of visual display surface indicated, for units with factory-applied color finishes, and as follows:
   1. Actual sections of porcelain-enamel face sheet.
   2. Include accessory Samples to verify color selected.

E. Samples for Verification: For each type of visual display surface indicated.
   1. Visual Display Surface: Not less than 8-1/2 by 11 inches, mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
   2. Trim: 6-inch- long sections of each trim profile.
   3. Accessories: Full-size Sample of each type of accessory.

F. Product Schedule: For visual display surfaces. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.

C. Maintenance Data: For visual display surfaces to include in maintenance manuals.

D. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For visual display surfaces to include in maintenance manuals

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of motor-operated, sliding visual display units required for this Project.

B. Source Limitations: Obtain visual display surfaces from single source from single manufacturer.

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.

D. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display surfaces, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.

B. Store visual display surfaces vertically with packing materials between each unit.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication.

1.10 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Surfaces lose original writing and erasing qualities.
      b. Surfaces exhibit crazing, cracking, or flaking.
   2. Warranty Period: Life of the building.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Porcelain-Enamel Face Sheet: Porcelain-enamel-clad, ASTM A 463/A 463M, Type 1, stretcher-leveled aluminized steel, with 0.024-inch uncoated thickness; with porcelain-enamel coating fused to steel at approximately 1000 deg F.
   1. Gloss Finish: Low gloss; dry-erase markers wipe clean with dry cloth or standard eraser. Suitable for use as projection screen.
      a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
         1) Claridge Products and Equipment, Inc.; LCS-II Markerboard.
         2) Approved equal.

A. Natural Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish.

B. Particleboard: ANSI A208.1, Grade M-1, made with binder containing no urea formaldehyde.

C. Extruded Aluminum: ASTM B 221, Alloy 6063.

2.2 MARKERBOARD ASSEMBLIES

A. Porcelain-Enamel Markerboards: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction consisting of backing sheet, core material, and 0.021-inch- thick, porcelain-enamel face sheet with low-gloss finish.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. AARCO Products, Inc.
      b. Claridge Products and Equipment, Inc.
      c. Ghent Manufacturing, Inc.
      d. Marsh Industries, Inc.; Visual Products Group.
      e. Platinum Visual Systems; a division of ABC School Equipment, Inc.
      f. Approved equal.
   2. Particleboard Core: 3/8 inch thick; with 0.005-inch- thick, aluminum foil backing.
   3. Laminating Adhesive: Manufacturer's standard, moisture-resistant thermoplastic type.
   4. Size: Per drawings.

2.3 TACKBOARD ASSEMBLIES (**WC1**)

A. Basis of Design Product: Subject to compliance with requirements, provide Forbo, “Bulletin Board Cork”, or comparable product by the following:
   1. Approved equal.

B. Natural-Cork Tackboard: 1/4-inch- thick, burlap backed, natural cork sheet factory laminated to 1/4-inch- thick hardboard backing.

C. Color: 2202

D. Size: Per drawings

2.4 MARKERBOARD AND TACKBOARD ACCESSORIES

A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- thick, extruded aluminum; standard size and shape.
   1. Factory-Applied Trim: Manufacturer's standard.
   2. Custom-Applied Trim: Per drawings.

B. Chalktray (markerboards only): Manufacturer's standard, continuous.
   1. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.

C. Map Rail (markerboards only): Provide the following accessories:
   1. Display Rail: Continuous and integral with map rail; fabricated from cork approximately 1 to 2 inches wide.
   2. End Stops: Located at each end of map rail.
   3. Map Hooks and Clips: Two map hooks with flexible metal clips for every 48 inches of map rail or fraction thereof.
   4. Paper Holder: Extruded aluminum; designed to hold paper by clamping action.

2.5 FABRICATION

A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.
   1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.
   2. Provide manufacturer's standard vertical-joint spline system between abutting sections of markerboards.
   3. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.
   4. Size: Per drawings.

C. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.
   1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine walls and partitions for proper preparation and backing for visual display surfaces.

C. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.

3.3 INSTALLATION, GENERAL

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
1. Mounting Height: As indicated above finished floor to top of chalktray.

3.4 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY BOARDS AND ASSEMBLIES

A. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches o.c. Secure both top and bottom of boards to walls.

1. Field-Applied Aluminum Trim: Attach trim over edges of visual display boards and conceal grounds and clips. Attach trim to boards with fasteners at not more than 24 inches o.c.
   a. Attach chalktrays to boards with fasteners at not more than 12 inches o.c.

3.5 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION

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SECTION 10 1419 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Cast dimensional characters.

1.3 COORDINATION

A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For dimensional letter signs.
   1. Include fabrication and installation details and attachments to other work.
   2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
   1. Include representative Samples of available typestyles and graphic symbols.

D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
   1. Dimensional Characters: Half-size Sample of dimensional character.
   2. Exposed Accessories: Full-size Sample of each accessory type.

E. Delegated-Design Submittal: For signs indicated in "Performance Requirements" Article.
   1. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Deterioration of finishes beyond normal weathering.
      b. Separation or delamination of sheet materials and components.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design sign structure and anchorage of dimensional character sign type(s) to withstand design loads as indicated on Drawings.

B. Thermal Movements: For exterior fabricated channel dimensional characters, allow for thermal movements from ambient and surface temperature changes.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 DIMENSIONAL CHARACTERS

A. Cast Characters: Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. ACE Sign Systems, Inc.
      b. Allen Markings International.
      c. APCO Graphics, Inc.
      d. A. R. K. Ramos Signage Systems.
      e. ASI Sign Systems, Inc.
      f. Diskey Sign Company.
      g. Gemini Incorporated.
      h. Matthews International Corporation; Bronze Division.
      i. Metal Arts; Division of L & H Mfg. Co.
      j. Metallic Arts.
      k. Seton Identification Products.
      l. Southwell Company (The).
      m. Approved equal.
   2. Character Material: Cast aluminum.
   3. Character Height: As indicated.
   4. Thickness: Manufacturer's standard for size of character.
   5. Finishes: Black
   6. Mounting: Stud Mount with spacers (1/2”)
   7. Typeface: Futura, 7/16” stroke typ.(Avant Extra Bold, 1” stroke at Building ID signage)

2.3 DIMENSIONAL CHARACTER MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.

B. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

D. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

E. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
   1. Use concealed fasteners and anchors unless indicated to be exposed.
   2. For exterior exposure, furnish nonferrous-metal or stainless-steel devices unless otherwise indicated.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
   1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
   2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
   3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
   4. Internally brace signs for stability and for securing fasteners.
   5. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that electrical service is correctly sized and located to accommodate signs.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
   1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
   2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
   3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:
   1. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

SECTION 10 1423 – PANEL SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Panel signs.

B. Related Sections include the following:
   1. Section 01 5000 "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.
   2. Section 01 5639 "Temporary Tree and Plant Protection" for temporary protection-zone signage
   3. Division 22 Sections for labels, tags, and nameplates for plumbing systems and equipment.
   4. Division 23 Sections for labels, tags, and nameplates for HVAC systems and equipment.
   5. Division 26 Sections for illuminated Exit signs and labels, tags, and nameplates for electrical equipment.

1.3 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.

B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
   1. Provide message list for each sign, including large-scale details of wording, lettering, and braille layout.

C. Samples for Initial Selection: For each type of sign material indicated that involves color selection.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by signage manufacturer.

B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

C. Source Limitations: Obtain each sign type through one source from a single manufacturer.

D. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with California Building Code 11B-201, 11B-216, 11B-703 as adopted by authorities having jurisdiction.
   1. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:
      a. Illuminated Exit Signs: Refer to Division 26.
      b. Signs for Accessible Spaces.

1.7 PROJECT CONDITIONS

A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.8 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 PANEL SIGNS

A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
   1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch measured diagonally.

B. Panel Signs: Type, size, and shape for each as indicated.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Mohawk Sign Systems, “Mohawk 1000 ADA System”, or comparable product by one of the following:
      a. Approved Equal

C. Cast-Acrylic Sheet:
   1. Color: As selected by Architect from Manufacturers full range.

D. Phenolic-Backed Photopolymer Sheet: Provide light-sensitive, water-wash photopolymer face layer bonded to a phenolic base layer to produce a composite sheet with overall, face-layer, and base-layer thicknesses, respectively, of 0.160 inch, 0.040 inch, and 0.120 inch; and a Type D Shore durometer hardness of 80.
   1. Available Product: Subject to compliance with requirements, a product that may be incorporated into Work includes, but is not limited to, "Jet-388 Phenolic Interior Signage" by JetUSA.

E. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to comply with the following requirements:
   1. Edge Condition: Bull nose.
   2. Corner Condition: Rounded to radius indicated.

F. Graphic Content and Style: Provide sign copy that complies with requirements indicated on Drawings for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage.
   1. Font: As indicated on the Drawings
   2. Font Color: As selected by Architect from Manufacturers full range.
   3. Font Size: As indicated on the Drawings.

G. Tactile and Braille Copy: Manufacturer's standard process for producing copy complying with ADA Accessibility Guidelines and ICC/ANSI A117.1. Text shall be accompanied by California Grade 2 braille. Produce precisely formed characters with square cut edges free from burrs and cut marks.
   1. Panel Material: Opaque acrylic sheet.
   2. Raised-Copy Thickness: Not less than 1/32 inch.

H. Applied Copy: Die-cut characters from vinyl film of nominal thickness of 3 mils with pressure-sensitive adhesive backing. Apply copy to exposed face of panel sign.
   1. Panel Material: Opaque acrylic sheet.

I. Colored Coatings for Acrylic Sheet: For copy and background colors, provide Pantone Matching System (PMS) colored coatings, including inks and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for application intended.

2.3 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.4 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated.
   1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
   2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
   3. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.

B. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items, including anchor inserts, provided under other sections of Work are sized and located to accommodate signs.

C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.
   1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
   2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:
   1. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
   2. Where panel signs are scheduled or indicated to be mounted on glass, provide matching plate on opposite side of glass to conceal mounting materials.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION

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SECTION 10 2113 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Stainless-steel toilet compartments configured as toilet enclosures and urinal screens.

B. Related Sections:
   1. Section 06 1035 " Miscellaneous Rough Carpentry" for blocking.
   2. Section 10 2800 "Toilet, Bath and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. LEED Submittals:
   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.
   1. Show locations of cutouts for compartment-mounted toilet accessories.
   2. Show locations of reinforcements for compartment-mounted grab bars.
   3. Show locations of centerlines of toilet fixtures.

D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
   1. Each type of material, color, and finish required for units, prepared on 6-inch-square Samples of same thickness and material indicated for Work.
   2. Each type of hardware and accessory.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Comply with requirements in GSA's CID-A-A-60003, "Partitions, Toilets, Complete."

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 75 or less.
   2. Smoke-Developed Index: 450 or less.

C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and California Building Code Title 24 for toilet compartments designated as accessible.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.

B. Stainless-Steel Castings: ASTM A 743/A 743M.

2.2 STAINLESS STEEL UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley “Sentinel-Series” or approved equal.

B. Toilet-Enclosure Style: Overhead braced.
   1. Model: Sentinel-Series 400.

C. Urinal-Screen Style: Floor to ceiling mounted.
   1. Model: Permaseal Panel-Model #3.

D. Door, Panel, and Pilaster Construction: Two sheets meal faces with a moisture-resistant honeycomb core, adhered to the inner surface and set under pressure to cure.
   1. Color and Pattern: Stainless Steel with #4 brushed finish.

E. Finish Thickness:
   1. Stiles and doors: ¾ inch.
   2. Panels: 1 inch.

F. Hardware: 18-8, type 304 stainless steel with satin finish.

G. Latch: Vandal-resistant latch:
   1. Sliding door latch to be 14 gauge and shall slide on nylon track.
   2. Sliding door latch shall require less than 5 lbs force to operate.
      a. Twisting latch operation is not permitted.
   3. Latch track attachment to door by machine screws into factor installed threaded brass inserts.
   4. Threaded brass inserts shall be factory installed for door hinge and latch connections and shall withstand a direct pull exceeding 1,500 lbs per insert.
   5. Through-bolted, stainless steel, pin-in-head Torx sex bolt fasteners shall be used at latch keeper-to-stile connections and shall withstand direct pull force exceeding 1,500 lbs per fastener.

H. Door Pull: Manufacturer's standard “U”-shaped handles at both sides at doors that comply with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities. Mount pull 30 to 44 inches above finished floor

I. Hinges: Vandal resistant hinges:
   1. 16 gauge continuous piano hinge.
   2. All doors equipped with self-closing hinge.
   3. Continuous piano-hinge shall be attached to door and stile by theft-resistant, pin-in-head Torx stainless steel machine screws into factory installed threaded brass inserts.
   4. Furnish doors with two 11 gauge stainless steel door stop plates with attached rubber bumpers to resist door from being kicked in/ out beyond stile.
   5. Door stops and hinges shall be secured with stainless steel, pin-in-head Torx machine screws into threaded brass inserts.
   6. Threaded brass inserts shall withstand a direct pull exceeding 1,500 lbs per insert.

J. Clothes Hook:
   1. Stainless steel with projection of no more than 1 1/8 inches from face of door.

2. Secure to door by through-bolted, theft-resistant, pin-in-head Torx stainless steel fasteners. Through-bolted fasteners shall withstand direct pull force exceeding 1,500 lbs per fastener.
3. Mount at 48 inches above finished floor at accessible stall.

K. Brackets (Fittings): Vandal resistant brackets.
1. Fasteners: Through-bolted, stainless steel, pin-in-head Torx sex bolt fasteners shall be used for panel to stile connections. Through-bolted fasteners shall withstand direct pull force exceeding 1,500 lbs per fastener.
2. Mounting brackets: 18 gauge stainless steel, full height of panel.
3. U-channels shall be furnished to secure panels to stiles.
4. Angle brackets shall be furnished to secure stiles-to-walls and panels-to-walls.

L. Pilaster Shoes: Manufacturer's standard design; stainless steel.

M. Urinal-Screen Post: Manufacturer's standard post design of 1-3/4-inch- square, aluminum tube with satin finish; with shoe matching that on the pilaster.

N. Overhead Cross Bracing for Ceiling-Hung Units: Extruded aluminum, 0.65 inches with anti-grip profile and satin finish.

2.3 ACCESSORIES

A. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.4 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, in-swinging doors for standard toilet compartments and 36-inch- wide, out-swinging doors with a minimum 32-inch- wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:
   a. Pilasters and Panels: 1/2 inch.
   b. Panels and Walls: 1 inch.
2. Stirrup Brackets: Secure panels to walls with continuous brackets and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.
   a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION

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SECTION 10 2123 - CUBICLE CURTAINS AND TRACK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Curtain tracks and carriers.

2. Curtains

B. Related Requirements:

1. Section 06 1053 "Miscellaneous Rough Carpentry" for supplementary wood framing and blocking for mounting items requiring anchorage.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include durability, laundry temperature limits, fade resistance, applied curtain treatment, and fire-test-response characteristics for each type of curtain fabric indicated.
2. Include data for each type of track.

B. Shop Drawings:

1. Show layout and types of cubicles, sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.
2. Include details on blocking at soffit.

C. Samples: For each exposed product and for each color and texture specified, 10 inches (254 mm) in size.

D. Samples for Initial Selection: For each type of curtain material indicated.

E. Samples for Verification: For each type of product required, prepared on Samples of size indicated below:

1. Curtain Fabric: 10-inch- (254-mm-) square swatch or larger as required to show complete pattern repeat, from dye lot used for the Work, with specified treatments applied. Mark top and face of material.
2. Mesh Top: Not less than 10 inches (254 mm) square.
3. Curtain Track: Not less than 10 inches (254 mm) long.
4. Curtain Carrier: Full-size unit.

F. Curtain and Track Schedule: Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For curtains, track, and hardware to include in operation and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Curtain Carriers and Track End Caps: Full-size units equal to 3 percent of amount installed, but no fewer than 10 units.
2. Curtains: Full-size units: 4

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Curtains: Provide curtain fabrics with the following characteristics:

1. Launderable to a temperature of not less than 160 deg F (71 deg C).
2. Flame resistant and identical to those that have passed NFPA 701 when tested by a testing and inspecting agency acceptable to authorities having jurisdiction.

a. Identify fabrics with appropriate markings of a qualified testing agency.

2.2 CURTAIN SUPPORT SYSTEMS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Cubicle Curtain Factory “Hospital Curtains and Cubicle Curtain Track” or comparable product by one of the following:

1. Approved equal

B. Extruded-Aluminum Curtain Track: Not less than 1-3/8 inches wide by 3/4 inch high (32 mm wide by 19 mm high); with manufacturer's standard wall thickness.
   1. Finish: Baked enamel, acrylic, or epoxy.

C. Curtain Track Accessories: Fabricate splices, end caps, connectors, end stops, coupling and joining sleeves, wall flanges, brackets, ceiling clips, and other accessories from same material and with same finish as track.
   1. End Stop: Removable with carrier hook.

D. Curtain Carriers: Two nylon rollers and nylon axle with chrome-plated steel hook.

E. Exposed Fasteners: Stainless steel.

F. Concealed Fasteners: Stainless steel.

2.3 CURTAINS

A. Dressing-Area Curtain Fabric: Curtain manufacturer's standard, 100 percent polyester; inherently and permanently flame resistant, stain resistant, and antimicrobial.

   1. Products: Subject to compliance with requirements, provide the following: “Architex, Rx 8001” or comparable product by one of the following:

      a. Approved equal
   2. Content: 100% Trevira CS
   3. Width: 72”
   4. Fire Codes: NFPA701, ASTM 84-07
   5. Color: Emerald Spa

B. Curtain Grommets: Two-piece, rolled-edge, rustproof, nickel-plated brass; spaced not more than 6 inches (152 mm) o.c.; machined into top hem.

C. Mesh Top: Not less than 20-inch- (508-mm-) high mesh top of No. 50 nylon mesh.

D. Beaded-Chain Curtain Drop: 6 inches (152 mm) long; nickel-plated steel with aluminum hook.

E. Curtain Tieback: Nickel-plated brass chain; one at each curtain termination.

2.4 CURTAIN FABRICATION

A. Fabricate curtains as follows:

   1. Width: Equal to track length from which curtain is hung plus 10 percent added fullness, but not less than 12 inches (305 mm) added fullness.
   2. Length: Equal to floor-to-ceiling height, minus depth of track and carrier at top, and minus clearance above the finished floor as follows:
      a. Dressing-Area Curtains: 4 inches (102 mm).

3. Top Hem: Not less than 1 inch (25.4 mm) and not more than 1-1/2 inches (38 mm) wide, triple thickness, reinforced with integral web, and double lockstitched.
4. Mesh Top: Top hem of mesh not less than 1 inch (25.4 mm) and not more than 1-1/2 inches (38 mm) wide, triple thickness, reinforced with integral web, and double lockstitched. Double lockstitch bottom of mesh directly to 1/2-inch (13-mm) triple thickness, top hem of curtain fabric.
5. Bottom Hem: Not less than 1 inch (25.4 mm) and not more than 1-1/2 inches (38 mm) wide, double thickness and single lockstitched.
6. Side Hems: Not less than 1/2 inch (13 mm) and not more than 1-1/4 inches (32 mm) wide, with double turned edges, and single lockstitched.

B. Vertical Seams: Not less than 1/2 inch (13 mm) wide, double turned and double stitched.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install tracks level and plumb, according to manufacturer's written instructions.

B. Up to 20 feet (6.0 m) in length, provide track fabricated from single, continuous length.

1. Curtain Track Mounting: Surface.

C. Surface-Track Mounting: Fasten tracks to ceilings at intervals recommended by manufacturer. Fasten tracks to structure at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation. Attach track to ceiling as follows:

1. Mechanically fasten directly to bottom of wood framing.

D. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.

E. Curtain Carriers: Provide curtain carriers adequate for 6-inch (152-mm) spacing along full length of curtain plus an additional carrier.

F. Curtains: Hang curtains on each curtain track. Secure with curtain tieback.

END OF SECTION 10 2123

SECTION 10 2600 WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Corner guards.

B. Related Sections:
   1. Section 08 7100 "Door Hardware" for metal armor, kick, mop, and push plates.

1.3 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.

B. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
   1. Corner Guards: 12 inches long. Include examples of joinery, corners, and field splices.

1.4 INFORMATIONAL SUBMITTALS

A. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.
   1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Section 01 4000 "Quality Requirements."
   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M.

B. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

2.2 CORNER GUARDS

A. Surface-Mounted, Metal Corner Guards: Fabricated from one-piece, formed metal with formed edges; with 90- or 135-degree turn to match wall condition.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Construction Specialties Inc. CO-8 or comparable product by one of the following:
      a. American Floor Products Co., Inc.
      b. Arden Architectural Specialties, Inc.
      c. Balco, Inc.
      d. Boston Retail Products.
      e. IPC Door and Wall Protection Systems; Division of InPro Corporation.
      f. Korogard Wall Protection Systems; a division of RJF International Corporation.
      g. Pawling Corporation.
      h. Tepromark International, Inc.

i. WallGuard.com.
j. Approved equal.

2. Material: Stainless steel, Type 304.
   a. Thickness: Minimum 0.0625 inch.
   b. Finish: Directional satin, No. 4.
3. Wing Size: Nominal 2 by 2 inches.
4. Height: 48 inches, rest at top of wall base.
5. Corner Radius: 1/8 inch.
6. Mounting: Mastic Adhesive.

2.3 FABRICATION

A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.

B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.4 METAL FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Remove tool and die marks and stretch lines, or blend into finish.
   2. Grind and polish surfaces to produce uniform finish, free of cross scratches.
   3. Run grain of directional finishes with long dimension of each piece.
   4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
   1. Install impact-resistant wall protection units in locations indicated on the Drawings.
   2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.

END OF SECTION

SECTION 10 2800 - TOILET, BATH AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Public-use washroom accessories.
   2. Public-use shower room accessories.
   3. Underlavatory guards.
   4. Custodial accessories.

B. Related Sections:
   1. Section 22 4000 “Plumbing Fixtures” for shower fixtures.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:
   1. Construction details and dimensions.
   2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Material and finish descriptions.
   4. Features that will be included for Project.
   5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated.
   2. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

1.7 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.8 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide products by Bobrick Washroom Equipment, Inc or comparable product by one of the following:
   1. A & J Washroom Accessories, Inc.
   2. American Specialties, Inc.
   3. Bradley Corporation.
   4. Tubular Specialties Manufacturing, Inc.
   5. Approved equal.

B. Toilet Tissue (Roll) Dispenser:
   1. Basis-of-Design Product: Bobrick B2888
   2. Description: Single Jumbo-Roll Toilet Tissue Dispenser.
   3. Mounting: Surface.
   4. Capacity: Designed for single 10 inch toilet tissue roll.

C. Combination Towel (Roll) Dispenser/Waste Receptacle:
   1. Basis-of-Design Product: Bobrick B-3961.
   2. Description: Combination unit for dispensing preset length of roll paper towels, with removable waste receptacle.
   3. Mounting: Semi-Recessed.
   4. Minimum Towel-Dispenser Capacity: 8-inch wide, 800 foot long roll.
   5. Minimum Waste-Receptacle Capacity: 12 gal..
   6. Material and Finish: Stainless steel, No. 4 finish (satin).
   7. Liner: Reusable, vinyl waste-receptacle liner.
   8. Lockset: Tumbler type for towel-dispenser compartment and waste receptacle.

D. Liquid-Soap Dispenser:
   1. Basis-of-Design Product: Bobrick B-2112.
   2. Description: Designed for dispensing soap in liquid or lotion form.
   3. Mounting: Horizontally oriented, surface mounted.
   4. Capacity: 40 fl. oz.
   5. Materials: Stainless steel satin finish body with black molded plastic push button and spout.
   6. Lockset: Tumbler type.
   7. Refill Indicator: Window type.

E. Grab Bar:
1. Basis-of-Design Product: Bobrick B-6806 Series.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inchthick.
a. Finish: Smooth, No. 4 finish (satin).
4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: As indicated on Drawings.

F. Vendor:
1. Basis-of-Design Product: Bobrick B-3706-25
2. Type: Sanitary napkin and tampon.
3. Mounting: Recessed.
4. Capacity: 20 sanitary napkins and 30 tampons.
5. Operation: Single coin (25 cents).
6. Exposed Material and Finish: Stainless steel, No. 4 finish (satin).
7. Lockset: Tumbler type with separate lock and key for coin box.

G. Sanitary-Napkin Disposal Unit:
1. Basis-of-Design Product: Bobrick B-254.
2. Mounting: Surface mounted.
3. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

H. Seat-Cover Dispenser:
1. Basis-of-Design Product: Bobrick B-221.
2. Mounting: Surface mounted .
3. Minimum Capacity: 250 seat covers.
4. Exposed Material and Finish: Stainless steel, No. 4 finish (satin) .
5. Lockset: Tumbler type.

I. Mirror Unit:
1. Basis-of-Design Product: Bobrick B-165.
2. Frame: Stainless-steel channel .
a. Corners: Manufacturer's standard .
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
4. Size: 24 inches wide by 36 inches high.

2.3 PUBLIC-USE SHOWER ROOM ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product by Bobrick Washroom Equipment, Inc. or comparable product by one of the following:
1. A & J Washroom Accessories, Inc.

2. American Specialties, Inc.
3. Bradley Corporation.
4. Tubular Specialties Manufacturing, Inc.
5. Approved equal.

B. Folding Shower Seat:
1. Basis-of-Design Product: Bobrick B-5181.
2. Configuration: L-shaped seat, designed for wheelchair access.
3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect.
4. Mounting Mechanism: Stainless steel, No. 4 finish (satin).
5. Dimensions: 33 by 22 5/16 inches.

C. Robe Hook:
1. Basis-of-Design Product: Bobrick B-76727
2. Description: Double-prong unit.
3. Material and Finish: Stainless steel, No. 4 finish (satin).

D. Soap Dish:
1. Basis-of-Design Product: Bobrick B-76807.
2. Description: Without washcloth bar.
3. Mounting: Surface mounted.
4. Material and Finish: Stainless steel, No. 4 finish (satin).

E. Grab Bar (1 Piece Shower):
1. Basis of Design Product: Bobrick B-6861 Series
2. Mounting: Flanges with concealed fasteners
3. Outside Diameter: 1-1/2 inches.
4. Configuration and (Length): Per drawings and (manuf. Standard)
5. Material: Stainless Steel, 0.05 inch thick

2.4 UNDERLAVATORY GUARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.
3. Approved equal.

B. Underlavatory Guard:
1. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded plastic, white.

2.5 CUSTODIAL ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product by Bobrick Washroom Equipment, Inc. or comparable product by one of the following:
   1. A & J Washroom Accessories, Inc.
   2. American Specialties, Inc.
   3. Bobrick Washroom Equipment, Inc.
   4. Bradley Corporation.
   5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
   6. Tubular Specialties Manufacturing, Inc.
   7. Approved equal.

B. Utility Shelf with Mop and Broom Holder:
   1. Basis-of-Design Product: Bobrick B-224x36.
   2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
   3. Length: 36 inches.
   4. Hooks: Three.
   5. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
   6. Material and Finish: Stainless steel, No. 4 finish (satin).
      a. Shelf: Not less than nominal 0.05-inch- thick stainless steel.
      b. Rod: Approximately 1/4-inch- diameter stainless steel.

2.6 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

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SECTION 10 4116 – EMERGENCY KEY CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Emergency key switch

B. Related Requirements:

   1. Section 26 0500 "Common Work Results for Electrical" for power to key switch.

   2. Section 32 3119.13 “Decorative Metal Security Fences and Gates” for mounting bollard.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of emergency key cabinet. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, or surface-mounting method and relationships of cabinet and trim to surrounding construction.

B. Shop Drawings: For emergency key cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Product Schedule: For emergency key cabinets. Indicate whether recessed, or surface mounted. Coordinate final emergency key cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For emergency key cabinets to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate types and locations of emergency key switches with the City of Chico Fire Department.

PART 2 - PRODUCTS

2.1 EMERGENCY KEY SWITCH

A. Products: Provide products by the Knox Company or approved equal.

B. Commercial Knox Switch Model 3502:
   1. Emergency Key Switch: Recessed mount at bollard. Electrical UL and CSA Listed.
      a. Exterior Dimensions: Recess-mount: 2 13/16" x 4 ½" x 2 ¼" inches.
      b. Finish: Knox-Coat proprietary finishing process.
         1) Color: Manuf. standard
      c. Tamper seal
      d. Two position switch

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine for suitable framing depth and blocking where recessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install emergency key switches in locations and at mounting heights indicated or, if not indicated, if not indicated, at heights acceptable to authorities having jurisdiction.

B. Install bollard and switch plumb, level and without warp.

C. Provide proper support for frames.

D. Anchor frames securely in place.

E. Use manufacturer's supplied hardware.

F. Replace defective or damaged components as directed by Architect.

3.3 ADJUSTING AND CLEANING

A. Inspect and adjust locks to operate properly.

B. Touch up marred finishes, or replace emergency key cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by emergency key cabinet and mounting bracket manufacturers.

C. Replace emergency key switches and bollards that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

D. Protect switch and bollard finish from damage during construction.

END OF SECTION

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SECTION 10 4413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Fire protection cabinets for the following:
      a. Portable fire extinguishers.

B. Related Sections:
   1. Section 10 4416 "Fire Extinguishers." For fire extinguishers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
   1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
   2. Show location of knockouts for hose valves.

B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Initial Selection: For each type of fire protection cabinet indicated.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
   1. Size: 6 by 6 inches square.

E. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:
   1. Sheet: ASTM B 209.
   2. Extruded Shapes: ASTM B 221.

2.2 FIRE PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.
   1. Basis of Design Products: Subject to compliance with requirements, provide Potter Roemer LLC “Alta” or equal products by the following:
      a. Approved equal.

B. Inside Box Dimensions: 9 by 18 by 5 inches.

C. Cabinet Construction: Nonrated.

D. Cabinet Material: Steel sheet.

E. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
   1. Rolled-Edge Trim: 2 inch backbend depth.

F. Surface Mount Cabinet: Cabinet box surface mount at CMU walls.

G. Cabinet Trim Material: Extruded-aluminum shapes.

H. Door Material: Aluminum sheet.

I. Door Style: Solid Flush Panel

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide projecting lever handle with cam-action latch.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
3. Cabinet hardware shall be easy to grasp with one hand, shall not require tight grasping, pinching or twisting of the wrist to operate. Max effort to operate doors shall not exceed 5 lbs.

K. Accessories:
1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
1) Location: Applied to cabinet door.
2) Application Process: Pressure-sensitive vinyl letters.
3) Lettering Color: Black.
4) Orientation: Vertical.

L. Finishes:
1. Aluminum: Clear anodic .
2. Steel: Baked enamel or powder coat.

2.3 FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.
4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Fabricate door frames of one-piece construction with edges flanged.
3. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

2.6 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning" or SSPC-SP 8, "Pickling". After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

B. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
   1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for semirecessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below: :
   1. Fire Protection Cabinets: 48 inches above finished floor to fire extinguisher handle.

B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire protection cabinets.
2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

C. Identification: Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

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SECTION 10 4416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Related Sections:
1. Section 10 4413 "Fire Protection Cabinets."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.7 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure of hydrostatic test according to NFPA 10.
      b. Faulty operation of valves or release levers.
   2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Ansul Incorporated; Tyco International Ltd.
      b. Buckeye Fire Equipment Company.
      c. Fire End & Croker Corporation.
      d. J. L. Industries, Inc.; a division of Activar Construction Products Group.
      e. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
      f. Larsen's Manufacturing Company.
      g. Moon-American.
      h. Pem All Fire Extinguisher Corp.; a division of PEM Systems, Inc.
      i. Potter Roemer LLC.
      j. Pyro-Chem; Tyco Safety Products.
      k. Approved equal.
   2. Valves: Manufacturer's standard.
   3. Handles and Levers: Manufacturer's standard.
   4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

B. Types: Multipurpose Dry-Chemical Type in Steel Container: UL-rated 2-A:10-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.
   a. California State Fire Marshal Approved.

2.2 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Ansul Incorporated; Tyco International Ltd.
      b. Buckeye Fire Equipment Company.
      c. Fire End & Croker Corporation.
      d. J. L. Industries, Inc.; a division of Activar Construction Products Group.
      e. Larsen's Manufacturing Company.
      f. Potter Roemer LLC.
      g. Approved equal.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
   1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
      a. Orientation: Horizontal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
   1. Mounting Brackets: 48 inches above finished floor to top of fire extinguisher bracket.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION

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SECTION 10 5113 - METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Knocked-down corridor lockers.
   2. Locker benches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.

B. Shop Drawings: For metal lockers. Include plans, elevations, sections, details, and attachments to other work.
   1. Show locker trim and accessories.
   2. Include locker identification system and numbering sequence.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For metal lockers and benches, in manufacturer's standard sizes.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Full-size units of the following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than five units:
      a. Locks.
      b. Identification plates.
      c. Hooks.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

B. Deliver master and control keys to Owner by registered mail or overnight package service.

1.9 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.10 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures.
      b. Faulty operation of latches and other door hardware.
   2. Damage from deliberate destruction and vandalism is excluded.

3. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.
4. Warranty Period for Locker Benches: Manufacturers standard.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain metal lockers, locker benches, and accessories from single source from single locker manufacturer.
   1. Obtain locks from single lock manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and CAC Title 24.
   1. Provide not less than 1 shelf located no higher than 48 inches above the floor for forward or 54 inches above the floor for side reach.
   2. Provide 1 shelf located at bottom of locker no lower than 15 inches above the floor for forward or 9 inches above the floor for side reach.
   3. Provide hardware that does not require tight grasping, pinching, or twisting of the wrist, and that operates with a force of not more than 5 lbf.

2.3 KNOCKED-DOWN CORRIDOR LOCKERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Penco Products, Inc. “Vanguard Lockers”, or comparable product by one of the following:
   1. DeBorough Mfg. Co.; Worley Lockers.
   2. Lyon Workspace Products, LLC; Standard Lockers.
   3. Republic Storage Systems Company; Standard Lockers..

B. Locker Arrangement:
   1. Tier: See Drawings.
   2. Width: 12 inches.
   3. Depth: 18 inches.
   4. Unit Height: 72 inches.

C. Material: Cold-rolled steel sheet.

D. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet as follows:
   1. Tops, Bottoms, and Intermediate Dividers: 0.024-inch nominal thickness, with single bend at sides.
   2. Backs and Sides: 0.024-inch nominal thickness, with full-height, double-flanged connections.

E. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral door strike full height on vertical main frames.
   1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
   2. Frame Vents: Fabricate face frames with vents.

F. Doors: One piece; fabricated from 0.060-inch nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
   1. Doors for box lockers less than 15 inches wide may be fabricated from 0.048-inch nominal-thickness steel sheet.
   2. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
   3. Stiffeners: Manufacturer's standard full-height stiffener fabricated from 0.048-inch nominal-thickness steel sheet; welded to inner face of doors.
   4. Door Style: Vented panel as follows:
      a. Louvered Vents: No fewer than two louver openings at top and bottom, or three louver openings at top or bottom, for triple-tier lockers.

G. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
   1. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum 2 inches high. Provide no fewer than three hinges for each door more than 42 inches high.
   2. Continuous Hinges: Manufacturer's standard, steel, full height.

H. Door Handle and Latch for Box Lockers: Chrome plated zinc alloy die-cast case and handle.

I. Locks:
   1. Typical Lockers: Combination Padlocks: Provided by Owner.
   2. Accessible Locker: Keyless lock: which does not necessitate twisting of the wrist or more than 5lbf to activate:
      a. Basis of Design: Penco – Key Lock Model No. 9707.

J. Equipment: Equip each metal locker with identification plate and the following unless otherwise indicated:
   1. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.

K. Accessories:
   1. Continuous Sloping Tops: Fabricated from manufacturer's standard thickness, but not less than 0.036-inch nominal-thickness steel sheet.
      a. Closures: Vertical-end type.
      b. Sloping-top corner fillers, mitered.
   2. Recess Trim: Fabricated from 0.048-inch nominal-thickness steel sheet.

3. Filler Panels: Fabricated from manufacturer's standard thickness, but not less than 0.036-inch nominal-thickness steel sheet.
4. Finished End Panels: Fabricated from 0.024-inch nominal-thickness steel sheet.

L. Finish: Baked enamel or powder coat.
1. Color(s): As selected by Architect from manufacturer's full range.

2.4 BENCHES

A. Provide bench units with overall assembly height of 17-1/2 inches.

B. Bench Tops:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Penco Products, Inc. “Bench Tops”, or comparable product by one of the following:
a. Approved Equal
2. Size:
a. Bench Length: Per drawings.
b. Bench Depth: 20”
c. Thickness: Manufacturer’s standard (match at wet locations)
d. Wood Types:
1) Dry Locations: Manufacturer’s standard
2) Wet Locations: Teak (to match basis of design manufacturer’s product)
3. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides. Clear lacquer all sides for wet location bench tops.

C. Anchored Pedestals:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Penco Products, Inc. “Heavy Duty Bench Pedestal”, or comparable product by one of the following:
a. Approved Equal
1) Number of Pedestals: 4 per bench.

FABRICATION

D. Fabricate metal lockers square, rigid, and without warp and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

E. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

F. Knocked-Down Construction: Fabricate metal lockers using nuts, bolts, screws, or rivets for nominal assembly at Project site.

G. Accessible Lockers: Fabricate as follows:
   1. Locate bottom shelf no lower than 15 inches above the floor.
   2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.
   3. Provide recessed handle
   4. Provide I.S.A. placards. Manufacturers standard.

H. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.

I. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.

J. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.
   1. Sloping-top corner fillers, mitered.

K. Recess Trim: Fabricated with minimum 2-1/2-inch face width and in lengths as long as practical; finished to match lockers.

L. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

M. Boxed End Panels: Fabricated with 1-inch- wide edge dimension, and designed for concealing fasteners and holes at exposed ends of non-recessed metal lockers; finished to match lockers.
   1. Provide one-piece panels for double-row (back-to-back) locker ends.

N. Bases: Standard Manufacturers Front and End Bases.
   1. Color(s): As selected by Architect from manufacturer’s full range.

O. Legs: Standard Manufacturers Legs.
   1. Size: 6 inches.

2.5 STEEL SHEET FINISHES

A. Factory finish steel surfaces and accessories except stainless-steel and chrome-plated surfaces.

B. Baked-Enamel Finish: Immediately after cleaning, pretreating, and phosphatizing, apply manufacturer's standard thermosetting baked-enamel finish. Comply with paint manufacturer's written instructions for application, baking, and minimum dry film thickness.

C. Powder-Coat Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard, baked-polymer, thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install level, plumb, and true; shim as required, using concealed shims.
   1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
   2. Anchor single rows of metal lockers to walls near top and bottom of lockers.

B. Knocked-Down Metal Lockers: Assemble with standard fasteners, with no exposed fasteners on door faces or face frames.

C. Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
   1. Attach hooks with at least two fasteners.
   2. Attach door locks on doors using security-type fasteners.
   3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
      a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
      b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.
   4. Attach recess trim to recessed metal lockers with concealed clips.
   5. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
   6. Attach sloping-top units to metal lockers, with closures at exposed ends.
   7. Attach boxed end panels with concealed fasteners to conceal exposed ends of nonrecessed metal lockers.
   8. Attach finished end panels with fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

D. Bench: See drawings.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

B. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

C. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION

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SECTION 10 56 00 - STORAGE EQUIPMENT

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.1 WORK INCLUDED

A. Equipment items as listed below by Equipment Identifier:
1. 1098 Board, peg, tool (Ref. Part 2.1)
2. 1106 Cabinet, six drawer, 33 inches, underbench (Ref. Part 2.2)
3. 1140 Cabinet, flammable materials, large (Ref. Part 2.3)
4. 1185 Cabinet, storage, shop (Ref. Part 2.4)
5. 1204 Cart, cleaning (Ref. Part 2.5)
6. 1215 Chair, shop, electronic dissipative (Ref. Part 2.6)
7. 1221 Cabinet, computer (Ref. Part 2.7)
8. 1382 Pallet, storage, two drum (Ref. Part 2.8)
9. 1421 Rack, arm, single face, 6 feet wide (Ref. Part 2.9)
10. 1455 Rack, bulk storage (Ref. Part 2.10)
11. 1540 Rack, pallet, 10 feet, with deck (Ref. Part 2.11)
12. 1688 Shelving unit, 18 inch (Ref. Part 2.12)
13. 1698 Shelving unit, 18 inch, with six drawers (Ref. Part 2.13)
14. 1798 Table, receiving, steel top, 6 feet (Ref. Part 2.14)
15. 1805 Workbench, electronics, static dissipative (Ref. Part 2.15)
16. 1870 Workbench, wood top, 6 feet (Ref. Part 2.16)

B. Installation of equipment with labor, services, and incidentals necessary for complete and operational equipment installation.

C. Utilities to be roughed in at location recommended by manufacturer.

1.2 QUALITY ASSURANCE

A. Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.

1.3 SUBMITTALS

A. Product Data:
1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.
2. Restrict submitted material to pertinent data. For instance, do not include manufacturer’s complete catalog when pertinent information is contained on a single page.
3. Additional costs resulting from substitution of products other than those specified, including drawing changes and construction, will be at the expense of the contractor.

B. Operations and Maintenance Manual:
1. Submit Operations and Maintenance Manuals in accordance with Division 1- General Requirements of these specifications.

2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.
3. Description of system and components.
4. Schematic diagrams of electrical, plumbing, and compressed air system.
5. Manufacturer's printed operating instructions.
6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

1.4 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance will be based on the technical requirements herein as determined by Owner and Architect.

1.5 WARRANTY

A. Warrant work specified herein for one year from substantial completion against defects in materials, functions, and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer's recommended preventive maintenance schedule.

D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

E. All parts shall be readily available locally in the United States.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.

C. Provide equipment and material specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

PART 2 - PRODUCTS

2.1 BOARD, PEG, TOOL
Equipment Identifier: 1098

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Kennedy Manufacturing Company, Van Wert, OH (800) 413-8665
b. Model: 50004UGY

2. Alternate manufacturers: Contingent *upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Modern Metal Products, Owatonna, MN (507) 451-0882
b. Trion Industries, Inc., Wilkes-Barre, PA (570) 824-1000

B. Capacities/Dimensions:
1. Overall dimensions, nominal:
a. Length: 72 inches
b. Width: 3/8 inch
c. Height: 36 inches

C. Features/Performance/Construction:
1. The panels shall be steel reinforced with square hole perforations. Flanged panels shall be reinforced to support heavy loads.
2. Panels shall be capable of being attached to any surface that can support the weight of heavy tools (fasteners not included).
3. Panels shall be manufactured of chip resistant material that will withstand abuse over time.
4. Individual panels shall be 18 by 36 inches and be assembled so that the complete length of the four-panel system shall be 72 inches.
5. Hooks, clips, and accessories shall be heavy-duty steel and capable of locking onto the panel.
6. The tool board system shall include the following (60 piece set) items as standard:
a. Single hooks, 33 each
b. Double hooks, nine each
c. Pliers hooks, four each
d. Spring clips, 10 each
e. Screwdriver unit, one each
f. Wrench rack, one each
g. Hex key unit, one each

D. Finish: Gray, durable chip-resistant baked on finish

2.2 CABINET, FIVE DRAWER, 33 INCHES, UNDERBENCH
Equipment Identifier: 1106

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Equipto, Tatamy, PA (610) 253-2775

b. Model: 4433 with accessories

2. Alternate manufacturers: Contingent *upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Lyon Workspace Products, Montgomery, IL (630) 892-8941
   b. Stanley Storage Systems, Allentown, PA (610) 797-6600

B. Capacities/Dimensions:
1. Overall dimensions, nominal:
   a. Width: 30 inches
   b. Depth: 27-3/4 inches
   c. Height: 33-1/2 inches

2. Quantity of drawers: Six
3. Drawer capacity: 400 pounds each (minimum)
4. Drawer dimensions:
   a. Usable width: 25-1/8 inches
   b. Usable depth: 25-1/8 inches
   c. Drawer usable height (drawers numbered top to bottom):
      1) Drawer 1: 3 inches
      2) Drawers 2, 3, and 4: 4-1/2 inches
      3) Drawers 5 and 6: 6 inches

C. Features/Performance/Construction:
1. Cabinet shall be heavy gauge channel formed sheet steel with mountings permitting installation of various height drawers, front columns with drilled and tapped bolt holes.
2. Base design shall include front and rear forklift openings of ample strength to permit moving of fully loaded cabinet. Front base plate shall be provided. Base shall be drilled for bolting to the floor.
3. Drawer suspension shall be designed for total interchangeability for all drawer heights. Sealed steel roller bearing system shall permit full drawer extension at rated capacity without sagging.
4. Drawers and trays shall be fabricated of smooth sheet metal with partition and divider mounting hole grid punched on 3/4 inch centers. Drawer walls shall be slotted on 3/4 inch centers for mounting dividers and partitions.
5. Drawer pulls shall be nominal 3/4 drawer width with 1 inch high label holder provided with paper labels and protective vinyl shields and end caps.
6. Drawer dividers shall have a minimum of 12 divided sections.
7. Drawer heights shall be available in front heights of 3 to 12 inches in not over 1-1/2 inch increments.
8. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions**.**

D. Accessories:
1. Drawer divider sets:
   a. Equipto No. 4133F10, one each
   b. Equipto No. 4134F15, three each
   c. Equipto No. 4135F20, two each

E. Finish: Phosphate primer covered by durable enamel in Owner's choice of manufacturer's standard colors

2.3 CABINET, FLAMMABLE MATERIALS, LARGE
Equipment Identifier: 1140

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
a. Equipto, Tatamy, PA (610) 253-2775
b. Model: FSC 45S

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Lyon Workspace Products, Montgomery, IL (630) 892-8941
b. Justrite Manufacturing Co., Des Plaines, IL (847) 298-9250

B. Capacities/Dimensions:
1. Overall dimensions, nominal:
a. Length: 43 inches
b. Width: 18 inches
c. Height: 65 inches

2. Shipping weight, nominal: 353 pounds
3. Storage capacity: Up to nine each, 5 gallon containers

C. Features/Performance/Construction:
1. Cabinet shall comply with NFPA combustible liquids Code No. 30 and OSHA safety requirements.
2. Construction shall consist of double wall 18 gauge sheet steel with 2 inch air space between inner and outer walls.
3. Cabinet shall have a 2 inch pan-type bottom.
4. Two screened flame arrester vents per cabinet, one each at left side bottom and right side top, shall be threaded for and provided with 2 inch NPT steel plugs.
5. Leveling feet shall be provided at all four corners.
6. Electrical grounding attachments shall be provided on each side.
7. A spring-loaded fusible link with 160 degree F melting point shall actuate self closing double swinging doors mounted with full-length piano hinges. Doors shall be provided with three-point latch mechanism and key lock.
8. Two each adjustable shelves shall be provided between 5-3/8 inches from top and 7-5/16 inches from bottom on 1-5/8 inch centers.
9. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Finish: Durable enamel in safety sun yellow with "FLAMMABLE - KEEP FIRE AWAY" in minimum 4 inch bright red letters across doors

2.4 CABINET, STORAGE, SHOP
Equipment Identifier: 1185

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Equipto, Tatamy, PA (610) 253-2775
b. Model: 1710

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Lyon Workspace Products, Montgomery, IL (630) 892-8941
b. Republic Storage Systems, Canton, OH (216) 438-5800

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 36 inches
b. Width: 18 inches
c. Height: 78 inches

2. Space four shelves evenly, approximately 15 inches center to center
3. Shelf capacity: 200 pounds per shelf (minimum)

C. Features/Performance/Construction:
1. Four shelves, flanged, constructed of 18 gauge steel. Shelf adjustments on maximum 2 inch centers without removing fasteners.
2. Doors shall have a three-point locking system with factory key-lockable handle. Doors shall open a full 180 degrees and be flush mounted when closed with latching actuated cast steel handle.
3. Each door shall be hinged on three welded heavy-duty steel pin hinges.
4. Back, front, and sides shall be flush with no bolt heads on front or sides.
5. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Finish: Durable enamel in Owner's choice of manufacturer's standard colors

2.5 CART, CLEANING
Equipment Identifier: 1204

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Rubbermaid Commercial, Winchester, VA (540) 667-8700
b. Model: 6173-88

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Continental Commercial Products, Bridgeton, MO (800) 325-1051

3. Global Industrial, Washington, NY (888) 978-7759

B. Capacities/Dimensions:
1. Overall dimensions:
   a. Width: 21-3/4 inches
   b. Length: 45-7/8 inches
   c. Height: 38-3/8 inches

2. Bag capacity: 20.8 gallon
3. Weight: 50 pounds

C. Features/Performance/Construction:
1. Cart and shelves shall be constructed of high density plastic.
2. Two shelves shall be tray style with a clearance between shelves of 10 inches.
3. Casters shall be soft rubber with two casters rigid and two casters swivel.

D. Accessories:
1. Mop bucket and wringer system, Rubbermaid No. 7577-88

2.6 CHAIR, SHOP, ELECTRONIC, DISSIPATIVE
Equipment Identifier: 1215

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
   a. Lyon Workspace Products, Montgomery, IL (630) 892-8941
   b. Model: 2054N

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Equipto, Tatamy, PA (610) 253-2775
   b. Stanley Supply and Services, Inc., North Andover, MA (800) 225-5370

B. Capacities/Dimensions:
1. Overall dimensions:
   a. Length: 18 inches
   b. Width: 18 inches
   c. Height: 19 inches

2. Seat height adjustment: Adjustable up to 27 inches
3. Foot ring diameter: 20 inches
4. Capacity: 250 pounds

C. Features/Performance/Construction:
1. Chair shall have abrasion resistant fabric, 2-1/2 inches thick.
2. Chair backrest depth and height shall adjust by 3 inches.
3. Chair shall have adjustable 20 inch diameter circular foot ring.

D. Finish: ESD seat and back shall have copper fibers and ESD treatment with a durable fabric in manufacturer's standard color

2.7 CABINET, COMPUTER
Equipment Identifier: 1221

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
a. Stanley Vidmar, Allentown, PA (610) 776-3953
b. Model: PCC0340A

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Equipto, Tatamy, PA (610) 253-2775
b. Lyon Workspace Products, Montgomery, IL (630) 892-8941

B. Capacities/Dimensions:
1. Overall dimensions:
a. Width: 30 inches
b. Width: 27-3/4 inches
c. Height: 65 inches

C. Features/Performance/Construction:
1. Cabinet shall be constructed of steel.
2. Cabinet shall consist of a standard 304 housing, and a lower cabinet model PCC0340A mounted on 8 inch base.
3. Cabinet shall have a hinged upper door with viewing window, fold-away keyboard, roll-out printer shelf and locking double lower doors.
4. Cabinet shall be have a ventilation fan and six-outlet power strip.

D. Utility Requirements: Provide a standard grounded receptacle, 120 VAC, near cabinet for computer plug.

E. Finish: Durable enamel in manufacturer's standard color

2.8 PALLET, STORAGE, TWO DRUM
Equipment Identifier: 1382

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

a. Enpac Corporation, Eastlake, OH (440) 975-0070
b. Model: 5253-YE-D with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Justrite Manufacturing Co., Des Plaines, IL (708) 298-9250

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 53-1/2 inches
b. Width: 29 inches
c. Height: 17 inches

2. Capacity: 2,000 pounds, two 55-gallon drums
3. Sump capacity: 58 gallons

C. Features/Performance/Construction:
1. Pallet shall be constructed of corrosion resistant polyethylene.
2. The deck shall be open grate to contain spills.
3. The sump capacity shall meet all EPA standards for secondary spill containment and shall contain at least 10 percent of volume of storage containers or the largest container, whichever is larger.
4. Grate shall be removable.

D. Accessories:
1. Poly ramp: Enpac No. 5039-BK
2. Ramp extender: Enpac No. 5038-BK

E. Finish: Durable polyethylene in manufacturer's standard colors

2.9 RACK, ARM, SINGLE FACE, 6 FEET WIDE
Equipment Identifier: 1421

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Equipto, Tatamy, PA (610) 253-2775
b. Model: 1062-72 with 1063 end unit

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Lyon Workspace Products, Montgomery, IL (630) 892-8941
b. Modern Equipment Company, Inc., Omaha, NE (402) 341-4939

B. Capacities/Dimensions:
1. Overall dimensions (nominal):
a. Length: 72 inches

b. Width: 22-1/8 inches
c. Height: 84 inches

2. Arm capacity: 325 pounds each
3. Weight: 130 pounds

C. Features/Performance/Construction:
1. Construction: Continuously welded heavy gauge steel unit shall have three lateral brace panels and four diagonal braces.
2. Adjustment: Uprights shall be pierced on nominal 1-1/2 inch centers for vertical adjustment of arms.
3. Arms: Seven arms shall be included for each upright, 14 total per single section.
4. Row ends: An extra upright frame shall be provided to finish each row.
5. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Finish: Durable enamel in Owner's choice of manufacturer's standard color

2.10 RACK, BULK STORAGE, HEAVY DUTY
Equipment Identifier: 1455

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
a. Equipto, Tatamy, PA (610) 253-2775
b. Model: 1028D62S (starter unit) and 1028D62A (add-on unit) with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Lyon Workspace Products, Montgomery, IL (630) 892-8941
b. Republic Storage Systems, Canton, OH (216) 438-5800

B. Capacities/Dimensions:
1. Overall dimensions, nominal:
a. Length: 72 inches
b. Width: 24 inches
c. Height: 96 inches

2. Beams:
a. Capacity: 2,630 pounds per pair of beams
b. Dimensions:
1) Length: 72 inches
2) Width: 3-1/2 inches
3) Height: 96 inches

c. Number of beams per rack section: Eight total (four pairs)

3. Uprights:

a. Capacity: 8,900 pounds per upright
b. Dimensions:
1) Width: 1-5/8 inches
2) Depth, nominal: 24 inches
3) Height: 96 inches

c. Number of uprights per rack section: Two minimum

4. Weight: 220 pounds

C. Features/Performance/Construction:
1. Beams:
a. Construction: Beams shall be solid shaped welded heavy gauge steel with heavy beam clips MIG-welded to beam ends.
b. Attachment: Beam clips shall have three beam hooks each for insertion into upright slots.

2. Supports: Tie bars for each pair of beams shall fit into slots in beams. There shall be a minimum of two supports provided for each pair of beams.
3. Uprights:
a. Construction: Upright posts shall be heavy duty 1-5/8 by 1-13/16 inch welded 16 gauge steel with tubular steel cross and diagonal members.
b. Adjustment: Upright posts shall have tapered slots on 1-1/2 inch centers for vertical beam adjustment

4. Decking:
a. Construction: Decking shall be 18 gauge corrugated shaped steel.
b. Capacity: Decking shall have a capacity of 2,778 pounds but load is limited to support capacity of beams and uprights.

5. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Accessories:
1. Anchors: Equipto No. 190317A (four per starter, two per add on)

E. Finish: Durable enamel in Owner’s choice of manufacturer’s standard colors

2.11 RACK, PALLET, 10 FEET, WITH DECK
Equipment Identifier: 1540

A. Manufacturer’s Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish acceptable standards of quality, performance, features, and construction.
a. Lyon Workspace Products, Inc., Montgomery, IL (630) 892-8941
b. Model: Uprights U3612036, Beams B4600120 with decking WD5836H with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Interlake Mecalux, Naperville, IL (877) 632-2589
   b. Lista International, Holliston, MA (508) 429-1350

B. Capacities/Dimensions:
   1. Overall dimensions:
      a. Length: 126 inches
      b. Width: 42 inches
      c. Height: 120 inches

   2. Beams (six per rack):
      a. Capacity: 8,114 pounds per pair of beams
      b. Dimensions:
         1) Length: 120 inches
         2) Width: 6 inches
         3) Thickness: 2-3/4 inches

      c. Installed beam height from finished floor:
         1) Top beams: 120 inches
         2) Second beams: 72 inches
         3) Third beams: 24 inches
         4) Verify beam heights with Owner prior to installation

   3. Uprights (two per rack):
      a. Capacity: 10,627 to 32,720 pounds per pair of uprights (based on evenly distributed load)
      b. Dimensions:
         1) Thickness: 3 inches
         2) Depth: 36 inches
         3) Height: 120 inches

   4. Decking (six per rack):
      a. Capacity: 3,000 pounds
      b. Dimensions:
         1) Width: 58 inches
         2) Depth: 36 inches

C. Features/Performance/Construction:
   1. Beams:
      a. Construction: Beams shall be welded, step-type, heavy gauge steel box channel.
      b. Attachment: High tensile studs, three each on each end shall engage tapered keyhole slots in uprights. Integral safety catch automatically snaps and locks into place when beam is properly seated.

   2. Uprights:
      a. Construction: Continuously MIG welded, heavy gauge steel box section uprights shall have deep channel cross and diagonal K-brace members.

b. Adjustment: Tapered keyhole slots on 2 inch centers shall be provided for vertical beam adjustments.
c. Base plate: Heavy gauge steel shall be LAP welded to upright with holes for anchoring to floor.
d. Row ends: An extra upright frame shall be provided to finish each row as indicated on equipment drawings.

3. Decking: Continuously MIG welded, solid channel steel rib decking, including front to back supports.
4. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Accessories:
1. Anchors: Provide 4-1/2 inch foot plate with 1/2 by 3/4 inch wedge-type anchor bolts, Lyon No. 25163, each unit

E. Finish: Durable enamel in Owner's choice of manufacturer's standard colors

2.12 SHELVING UNIT, 18 INCHES
Equipment Identifier: 1688

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Equipto, Tatamy, PA (610) 253-2775
b. Model: 773-8S shelving unit (and/or 773-8A add-on with accessories)

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Lyon Workspace Products, Montgomery, IL (630) 892-8941
b. Stanley Vidmar, Allentown, PA (610) 797-6600

B. Capacities/Dimensions:
1. Overall dimensions, nominal:
a. Length: 36 inches
b. Width: 18 inches
c. Height: 84 inches

2. Weight: 170 pounds
3. Number of shelves: Eight
4. Shelf capacity: 1,000 pounds per shelf
5. Installed height from finished floor, nominal:
a. Bottom shelf: 4-1/2 inches
b. Top shelf: 84 inches
c. Space remaining bottom six shelves evenly, approximately 12 inches center to center, and the top two shelves 10-1/2 inches center to center

C. Features/Performance/Construction:

1. Shelf construction shall be double flange18 gauge steel and double flanged box-formed edges on all four sides.
2. Uprights shall be double flanged uprights with tapered bracket slots punched on 1-1/2 inch centers for vertical shelf adjustment.
3. Shelf fastening shall consist of slip-in shelf brackets which reinforce and securely lock shelf into place in all four corners.
4. Units shall share common end panels with adjoining units. Back-to-back units shall be joined with common upright joints.
5. Provide seismic bracing and anchoring to meet any local, state, and national codes and provisions.

D. Accessories:
1. Anchors, floor: For seismic bracing, Equipto No. 190317A (four per starter unit, two per add-on unit)

E. Finish: Durable enamel in owner's choice of manufacturer's standard colors

2.13 SHELVING UNIT, 18 INCHES, WITH SIX DRAWERS
Equipment Identifier: 1698

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
   a. Equipto, Tatamy, PA (610) 253-2775
   b. Model: 4205 DN with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Lyon Workspace Products., Montgomery, IL (630) 892-8941
   b. Lista International, Holliston, MA (508) 429-1350

B. Capacities/Dimensions:
1. Overall dimensions, nominal:
   a. Length: 18 inches
   b. Width: 36 inches
   c. Height: 84 inches

2. Number of shelves: Four total
3. Number of drawers: Six total
4. Shelf capacity: 1,000 pounds per shelf
5. Drawer capacity: 200 pounds per drawer (minimum)
6. Drawer dimensions, nominal:
   a. Length: 36 inches
   b. Width: 18 inches
   c. Height: 6 inches

7. Installed shelf height from finished floor, nominal (shelves numbered one through four, top to bottom):
   a. Shelf one: 74 inches
   b. Shelf two: 62 inches
   c. Shelf three: 50 inches
   d. Shelf four: 4-1/2 inches

C. Features/Performance/Construction:
1. Shelf construction shall be double flange 18 gauge steel with box-formed edges on all four sides with front and rear shelf edge reinforced channels.
2. Uprights shall be double flanged uprights with tapered bracket slots punched on 1-1/2 inch centers for vertical shelf adjustment.
3. Shelf fastening shall consist of slip-in shelf brackets which reinforce and securely lock shelf into place in all four corners.
4. Units shall share common end panels with adjoining units or common back panels when installed back-to-back. Back-to-back units shall be joined with common upright joints.
5. Rolling drawers shall be 22 gauge steel with side and back of drawer to be punched with slots to accommodate vertical partitions and dividers. Drawer roller guides to be bolted front to back at uprights.
6. Shelves to be installed above and below banks of drawers.
7. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Accessories: Drawer, 36 inches wide, six per unit, with dividers

E. Finish: Durable enamel in owner's choice of manufacturer's standard colors

2.14 TABLE, RECEIVING, STEEL TOP, 6 FEET
Equipment Identifier: 1798

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
   a. Equipto, Tatamy, PA (610) 253-2775
   b. Model: 2222D6

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Lyon Workspace Products, Montgomery, IL (630) 892-8941
   b. Penco Products, Inc., Shippack, PA (610) 666-0500

B. Capacities/Dimensions:
1. Dimensions:
   a. Length: 72 inches
   b. Width: 30 inches
   c. Height: 31-1/4 inches

2. Weight capacity: 1,700 pounds

C. Features/Performance/Construction:
1. Table top shall be constructed of 12 gauge steel.
2. Legs shall be constructed with 16 gauge steel and stabilized with welded cross members.

D. Finish: Durable enamel in manufacturer's standard colors

2.15 WORKBENCH, ELECTRONICS, STATIC DISSIPATIVE
Equipment Identifier: 1805

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Equipto, Tatamy, PA (610) 253-2775
b. Model: 388-5C with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Lyon Workspace Products, Montgomery, IL (630) 892-8941
b. Lista International Corporation, Holliston, MA (508) 429-1350

B. Capacities/Dimensions:
1. Overall dimensions, nominal:
a. Length: 60 inches
b. Width: 30 inches
c. Height: 33-1/2 inches

2. Instrument shelf:
a. Depth: 13-1/2 inches
b. Length: 60 inches
c. Height: 14 inches

3. Workbench top:
a. Length: 60 inches
b. Depth: 34 inches

4. Weight:
a. Workbench: 141 pounds
b. Instrument shelf: 56 pounds

C. Features/Performance/Construction:
1. Work surface shall be industrial quality dissipative type with 10^6 to 10^9 OHMS per square inch resistivity and be constructed of 1-3/4 inch static dissipative plastic laminate with grounding kit. The top shall have a 180 degree full wrap laminate soft edge at the front.
2. Bench legs shall have leveling guides to level the bench.
3. Instrument shelf shall be constructed of 1-3/4 inch static dissipative plastic laminate with front 180 degree full wrap laminate soft edge and have 10^6 to 10^9 OHMS per square inch resistivity. Shelf top shall be supported by steel supports on each end. One instrument shelf shall be provided per bench.

4. Comes with two pedestal legs with UL approved fused electrical outlets. All work centers include a bottom shelf and modesty panels.

D. Accessories:
1. Shelf assembly, instrument: Equipto No. 464C5 (one per bench)

E. Utility Requirements:
1. 120 VAC, 1 phase for power strip plug
2. 120 VAC, 1 phase for instrument shelf outlets
3. Provide standard grounded receptacle provided

F. Finish: Table structure shall be durable enamel in Owner's choice of manufacturer's standard colors and the worktop shall be a static dissipative laminate

2.16 WORKBENCH, WOOD TOP, 6 FEET
Equipment Identifier: 1870

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Equipto, Tatamy, PA (610) 253-2772
b. Model No.: 2223-6W

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Lyon Workspace Products, Montgomery, IL (630) 892-8941
b. Hodge Manufacturing Company, Inc., Springfield, MA (413) 781-6800

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 72 inches
b. Width: 30 inches
c. Height: 34 inches

2. Weight capacity: 1,700 pounds
3. Weight: 150 pounds

C. Features/Performance/Construction:
1. Tabletop shall be constructed of laminated hardwood, 1-3/4 inches thick.
2. Legs shall be constructed with 12 gauge steel and stabilized with welded cross members.

D. Finish: Durable enamel in Owner's choice of manufacturer's standard color

PART 3 - EXECUTION

3.1 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.

3.2 INSTALLATION

A. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect or designated representative.

B. Install equipment in accordance with plans, shop drawings, and manufacturer's instructions:
1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.
2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
3. Anchorage: Attach equipment as directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.

C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.3 TESTING

A. After final installation is complete and prior to authorizing payment, specified equipment shall be checked with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

3.4 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing and installation debris from job site.

D. Notify Architect or designated representative for acceptance inspection.

END OF SECTION 10 56 00

SECTION 10 5613 - METAL STORAGE SHELVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Four-post metal storage shelving.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal storage shelving, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance for Four-Post Metal Storage Shelving: Capable of withstanding the loads indicated according to MH 28.1.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage shelving.

B. Product Schedule: For metal storage shelving. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For metal storage shelving, accessories, and components, from manufacturer.

B. Product Certificates: For each type of metal storage shelving from manufacturer.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install metal storage shelving until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 COORDINATION

A. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving attached to wall and ceiling assemblies.

B. Coordinate locations and installation of metal storage shelving that may interfere with ceiling systems including lighting, HVAC, speakers, sprinklers, access panels, electrical switches or outlets, and floor drains.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Wire: ASTM A 899.

2.2 FOUR-POST METAL STORAGE SHELVING

A. Wire-Type, Four-Post Metal Storage Shelving: Factory-formed, field-assembled, freestanding system without back or end panels, designed for shelves to span between and be supported by corner posts, with shelves adjustable over the entire height of shelving unit. Fabricate initial shelving unit with a post at each corner. Fabricate additional shelving units similarly, so each unit is independent. Provide adjustable top and bottom shelves, adjustable intermediate shelves, and accessories indicated.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Metro “Super Adjustable Super Erecta Wire Shelves” or comparable product by one of the following:

      a. Approved equal

   2. Load-Carrying Capacity per Shelf: 800 lbs. (48” or less), 600 lbs. (48” or greater)
   3. Posts: Fabricated from 1-inch- (25-mm-) OD, round tubing of indicated material; with grooves or notches at 1 inch (25 mm) o.c. to receive shelf-to-post connectors. Label posts with numbers at not less than 2 inches (51 mm) o.c. for determining shelf height.

      a. Post Material: Steel.
      b. Post Cap: Nylon or plastic.

4. Truss-Type Wire Shelves: Steel wire-over-wire construction, with downturned wire truss edges; with manufacturer's standard post collar, designed to engage collet (wedge), welded at each corner.
5. Shelf Quantity: 3 shelves in addition to top and bottom shelves
6. Shelf-to-Post Connectors: Manufacturer's standard corner release system.
7. Overall Unit Height (including stem casters): 80 inches (2134 mm).
8. Model (Quantity):
   a. A2460NC: 4
   b. A3060NC: 5
   c. A1848NC: 1
   d. A3036NC: 2
   e. A3048NC: 6

9. Steel Finish: Manufacturer's standard chrome plated.

10. Accessories:
    a. Stem Casters

2.3 FABRICATION

A. Shop Fabrication: Prefabricate shelving components in shop to greatest extent possible to minimize field fabrication; temporarily preassemble shelving components where necessary to ensure that field-assembled components fit together properly. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Fabricate metal storage shelving square and rigid, with posts plumb and true and shelves flat and free of dents or distortion. Fabricate connections to form a rigid structure, free of buckling and warping.

1. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
2. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
3. Build in straps, plates, brackets, and other reinforcements as needed to support shelf loading.
4. Cut, reinforce, drill, and tap metal fabrications to receive hardware, fasteners, and similar items.

C. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.

D. Form edges and corners free of sharp edges or rough areas. Fold back and crimp exposed edges of unsupported sheet metal to form a 1/2-inch- (13-mm-) wide hem on the concealed side; ease edges of metal plate to radius of approximately 1/32 inch (0.8 mm). Shear and punch metals cleanly and accurately. Remove burrs.

E. Weld corners and seams continuously to develop strength, minimize distortion, and maintain the corrosion resistance of base metals. At exposed locations, finish welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces before finishing.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning" or SSPC-SP 8, "Pickling."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine floors for suitable conditions where metal storage shelving will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Vacuum finished floor and wet mop resilient flooring over which metal storage shelving is to be installed.

3.3 INSTALLATION

A. Install metal storage shelving level, plumb, square, rigid, true, and with shelves flat and free of dents or distortion. Make connections to form a rigid structure, free of buckling and warping.

1. Install shelves in each shelving unit at spacing indicated on Drawings or, if not indicated, at equal spacing.
   a. Four-Post Metal Storage Shelving: Install four clips, one at each post, for support of each shelf; with clips fully engaged in post perforations.

3.4 ADJUSTING

A. Adjust metal storage shelving so that connectors and other components engage accurately and securely.

B. Adjust and lubricate operable components to operate smoothly and easily, without binding or warping. Check and readjust operating hardware.

C. Touch up marred finishes or replace metal storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.

D. Replace metal storage shelving that has been damaged or has deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 11 11 00 - VEHICLE SERVICE EQUIPMENT

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.1 WORK INCLUDED

A. Equipment items as listed below by Equipment Identifier:
1. 2158 Compressor, air, receiver mounted, 5 HP, duplex (Ref. Part 2.1)
2. 2160 Compressor, air, vertical receiver mounted, 5 HP (Ref. Part 2.2)
3. 2165 Compressor, air, rec. mtd., 25 HP duplex (Ref. Part 2.3)
4. 2226 Dryer, air, refrigerated, 25 CFM (Ref. Part 2.4)
5. 2228 Dryer, air, refrigerated, 50 CFM (Ref. Part 2.5)
6. 2230 Dryer, air, refrigerated, 200 CFM (Ref. Part 2.6)
7. 7250 Hose and dispenser (CG) (Ref. Part 2.7)
8. 7255 Hose and dispenser (GO) (Ref. Part 2.8)
9. 7510 Pump, air piston (CG), with hoist (Ref. Part 2.9)
10. 7520 Pump, air piston, 10:1 ratio (ATF1, ATF2, EO1, EO2, GO) (Ref. Part 2.10)
11. 7531 Pump, diaphragm, non-mixing, 50 GPM (EC1, EC2) (Ref. Part 2.11)
12. 7532 Pump, diaphragm (DEF) (Ref. Part 2.12)
13. 7540 Pump, diaphragm, used fluid evacuation (UO) (Ref. Part 2.13)
14. 7541 Pump, diaphragm, used fluid evacuation (UC) (Ref. Part 2.14)
15. 7700 Reel banks, general (Ref. Part 2.15)
16. 7711 Reel bank (CA) (Ref. Part 2.16)
17. 7760 Reel bank (CA, DEF, EC1, EC2, EO1, EO2) (Ref. Part 2.17)
18. 7790 Reel bank (ATF1, ATF2, CA, CG, EC1, EC2, EO1, EO2, GO) (Ref. Part 2.18)
19. 7950 Tank, double wall, cube, 120 gallon (ATF1, ATF2, EC1, EC2, EO1, EO2, GO, UC) (Ref. Part 2.19)
20. 7960 Tank, double wall, cube, 280 gallon (EC2, EO2) (Ref. Part 2.20)
21. 7970 Tank, double wall, cube, 500 gallon (UO) (Ref. Part 2.21)
22. 7996 Drain pan, used oil, rolling (Ref. Part 2.22)
23. 7997 Drain pan, used coolant, rolling (Ref. Part 2.23)
24. 7998 Receiver, used coolant, 25 gallon (Ref. Part 2.24)
25. 7999 Receiver, used oil, 25 gallon (Ref. Part 2.25)

B. Roughing-in installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.

1.2 REFERENCES

A. ASME Code for Unfired Pressure Vessels

1.3 QUALITY ASSURANCE

A. Manufacturer’s Representative:
1. Installation: Provide a qualified manufacturer’s representative at site to supervise work related to equipment installation, check out, and start up.

2. Training: Provide a qualified manufacturer's representative to provide training to Owner's maintenance personnel in operation and maintenance of specified equipment.

1.4 SUBMITTALS

A. Product Data:
1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.
2. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

B. Operations and Maintenance Manual:
1. Submit Operations and Maintenance Manuals in accordance with Division 1- General Requirements of these specifications.
2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.
3. Description of system and components.
4. Schematic diagrams of electrical, plumbing, and compressed air system.
5. Manufacturer's printed operating instructions.
6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

C. Shop Drawings: Submit Shop Drawings in accordance with of Division 1 - General Requirements of these specifications.

D. Include certified data for each unit and accessory system indicating the following:
1. Air compressor performance curves at summer design condition
2. Intercooler performance at summer design condition
3. Air dryer performance at 38 degrees F, dew point at 175 PSIG
4. Indicate components, assembly, dimensions, weights and loadings, required clearances, location and size of field connections, intake air filter outline, blow-off silencer outline, main motor drive data, aftercoolers, control panel, and electrical pneumatic schematics.

1.5 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance will be based on the technical requirements herein as determined by Owner and Architect.

1.6 WARRANTY

A. Warrant work specified herein for one year from substantial completion against defects in materials, functions, and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer's recommended preventive maintenance schedule.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.

C. Provide equipment and material specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.8 LABELING

A. Manufacturer shall securely attach in a prominent location, on each major item of equipment, a non-corrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.

B. All electrical equipment and materials shall be new and shall be listed by Underwriter's Laboratories, Inc. (UL) in categories for which standards have been set by that agency and labeled as such in the manufacturer's plant.

C. Provide air receivers meeting requirements of ASME Code for Unfired Pressure Vessels and carry ASME approval stamp.

PART 2 - PRODUCTS

2.1 COMPRESSOR, AIR, RECEIVER MOUNTED, 5 HP DUPLEX
Equipment Identifier: 2158

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
   a. Champion, Princeton, IL (815) 875-3321
   b. Model: HR5D-8 with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Ingersoll Rand, Davidson, NC (704) 896-4000
   b. Quincy Compressor, Quincy, IL (217) 222-2700

B. General Description: Provide duplex compressor unit consisting of air-cooled motor compressors (10 HP), air receiver, after cooler, pressure reducing station, spring isolators and operating controls.

C. Capacities/Dimensions:

1. Overall dimensions:
   a. Length: 66-3/4 inches
   b. Width: 28 inches
   c. Height: 51-3/4 inches

2. Boltdown dimensions:
   a. Length: 32 inches
   b. Width: 18-3/4 inches

3. Weight (approximate): 755 pounds
4. Motors: Unit has two 5 HP motors
5. Receiver: 80 gallons
6. Rating: 125 PSIG
7. Speed: 805 RPM
8. Displacement: 47 CFM
9. Delivery: 38.2 CFM
10. Bore diameters: 4-5/8 and 2-1/2 inches
11. Stroke: 3 inches
12. Number of cylinders: Two
13. Output valve: 3/4 inch NPT(F)

D. Features/Performance/Construction:

1. Compressor construction:
   a. Construct compressor unit with cast iron housing and head, heat treated forged steel or ductile iron shaft, aluminum alloy connection rods, aluminum pistons with lubricated carbon steel rings, high-strength alloy suction and discharge valves. Statically and dynamically balance rotating parts.
   b. Mount motor and compressor on one-piece ribbed cast iron or welded steel base with provision for V-belt adjustment.

2. After cooler:
   a. Provide air compressor with air after cooler suitable for operation under 135 PSIG working pressure.
   b. Provide a belt guard style after cooler mounted on the compressor belt guard.
   c. After cooler capacity to cool discharge air to within 25 degrees F of ambient air temperature with compressors operating at specified capacity.

3. Air receiver:
   a. Provide vertical or horizontal receiver stamped ASME rated for working pressure of 200 PSI. Flange or screw inlet and outlet connections, welded steel construction.
   b. Fittings to include adjustable pressure regulator, safety valve, pressure gauge, drain cock, and automatic pneumatic tank drain.

4. Pressure reducing valve:

a. Provide pressure reducing stations complete with automatic reducing valve and bypass, and low pressure side relief valve and gauge.
b. Compressor shall be provided with automatic start/stop capacity controls. In addition, provide centrifugal unloading to ensure for an unloaded compressor at start-up.
c. Valve capacity suitable to compressor reduce pressure from 50 PSI to 180 PSI. Pressure reducing valve to be adjustable upward from reduced pressure.
d. Provide valves with bronze or semi-steel bodies with stainless steel springs, stems, and seats.

E. Controls:
1. Pressure switch to cutout at 100 PSI with minimum differential of 20 PSI.
2. Compressor regulation through a lead-lag switch
3. Provide electrical automatic alternation. In the event one compressor fails, another compressor automatically maintains air pressure.

F. Accessories:
1. Condensate filter: Champion No. CFF60A
2. Vibration isolators: Champion No. VI
3. Air-cooled aftercoolers: Champion No. ACAC
4. Automatic tank drain: Champion No. ATD-P
5. Low-level oil monitor: Champion No. LOLM, two per unit

G. Utility Requirements:
1. Electrical: 460 VAC, 3 phase, 10 HP, 30 A, provide disconnect
2. Compressed air: 3/4 inch connection, 38.2 CFM, 125 PSI

H. Finish: Durable enamel in manufacturer's standard color

2.2 COMPRESSOR, AIR, VERTICAL RECEIVER, 5 HP
Equipment Identifier: 2160

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
a. Champion, Princeton, IL (815) 875-3321
b. Model: VR 5-8 with accessories (Reference Service Equipment Details)

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Ingersoll Rand, Davidson, NC (704) 896-4000
b. Quincy Compressor, Quincy, IL (217) 222-7700

B. General Description: Provide compressor unit consisting of air-cooled motor compressors, air receiver, after cooler, pressure reducing station, spring isolators, and operating controls.

C. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 32 inches

b. Width: 24 inches
c. Height: 77 inches

2. Boltdown dimensions: Four on 28 inch radius
3. Weight (approximate): 535 pounds
4. Output valve: 3/4 inch NPT(F)
5. Receiver: 80 gallons
6. Rating: 125 PSIG
7. Speed: 805 RPM
8. Displacement: 23.5 CFM
9. Delivery: 19.1 CFM
10. Bore diameters: 4-5/8 and 2-1/2 inches
11. Stroke: 3 inches
12. Number of cylinders: Two

D. Features/Performance/Construction:
1. Compressor construction:
a. Construct compressor unit with cast iron housing and head, heat treated forged steel or ductile iron shaft, aluminum alloy connection rods, aluminum pistons with lubricated carbon steel rings, high-strength alloy suction and discharge valves. Statically and dynamically balanced rotating parts.
b. Mount motor and compressor on one-piece ribbed cast iron or welded steel base with provision for V-belt adjustment.

2. After cooler:
a. Provide air compressor with air after cooler suitable for operation under 135 PSIG working pressure.
b. Provide a belt guard style after cooler mounted on the compressor belt guard.
c. After cooler capacity to cool discharge air to within 25 degrees F of ambient air temperature with compressors operating at specified capacity.

3. Air receiver:
a. Provide vertical or horizontal receiver stamped ASME rated for working pressure of 200 PSI. Flange or screw inlet and outlet connections, welded steel construction.
b. Fittings to include adjustable pressure regulator, safety valve, pressure gauge, drain cock, and automatic pneumatic tank drain.

4. Pressure reducing valve:
a. Provide pressure reducing stations complete with automatic reducing valve and bypass, and low pressure side relief valve and gauge.
b. Compressor shall be provided with automatic start/stop capacity controls. In addition, provide centrifugal unloading to ensure for an unloaded compressor at start-up.
c. Valve capacity suitable to compressor reduce pressure from 50 PSI to 180 PSI. Pressure reducing valve to be adjustable upward from reduced pressure.
d. Provide valves with bronze or semi-steel bodies with stainless steel springs, stems, and seats.

E. Controls:
1. Pressure switch to cutout at 100 PSI with minimum differential of 20 PSI.

2. Provide electrical automatic alternation. In the event one compressor fails, another compressor automatically maintains air pressure.

F. Accessories:
1. Magnetic starter
2. Vibration isolators
3. Automatic pneumatic tank drain
4. Oil monitor
5. Air-cooled aftercooler
6. Condensate filter: Champion No. CFF20
7. Conversion kit, 460 VAC: Champion No. CC1047667

G. Utility Requirements: 460 VAC, 3 phase, 5 HP, provide disconnect

H. Finish: Durable enamel in manufacturer's standard color

2.3 COMPRESSOR, AIR, RECEIVER MOUNTED, 25 HP DUPLEX
Equipment Identifier: 2165

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified by manufacturer's name and model to establish acceptable standard of quality, performance, features, and construction.
a. Champion, Princeton, IL (815) 875-3321
b. Model: HRA25-D-25 with accessories (Reference Service Equipment Details)

2. Alternate manufacturers: *Contingent upon compliance with these specification* and documentation requirements set forth in SUBMITALS equipment produced by other manufacturers, including the following, *may* be considered as an equal.
a. Ingersoll Rand, Davidson, NC (704) 896-4000
b. Quincy Compressor, Quincy, IL (217) 222-7700

B. General Description: Provide duplex compressor unit consisting of air-cooled motor compressors, air receiver, after cooler, pressure reducing station, spring isolators and operating controls.

C. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 89 inches
b. Width: 60-1/2 inches
c. Height: 75-1/4 inches

2. Boltdown dimensions:
a. Length: 52-1/4 inches
b. Width: 48-1/4 inches
3. Weight (approximate): 2,940 pounds
4. Output valve: 1-1/4 inches NPT (F)
5. Receiver: 250 gallons
6. Rating: 175 PSIG
7. Speed: 770 RPM
8. Displacement: 218.8 CFM, 109.4 CFM each

9. Delivery: 180.2 CFM, 90.1 CFM each
10. Bore diameters: 6-1/4 and 3-1/4
11. Stroke: 4 inches
12. Number of cylinders: Four

D. Features/Performance/Construction:
1. Compressor construction:
   a. Construct compressor unit with cast iron housing and head, heat treated forged steel or ductile iron shaft, aluminum alloy connection rods, aluminum pistons with lubricated carbon steel rings, high-strength alloy suction and discharge valves. Statically and dynamically balance rotating parts.
   b. Mount motor and compressor on one-piece ribbed cast iron or welded steel base with provision for V-belt adjustment.

2. After cooler:
   a. Provide air compressor with air after cooler suitable for operation under 135 PSIG working pressure.
   b. Provide a belt guard style after cooler mounted on the compressor belt guard.
   c. After cooler capacity to cool discharge air to within 25 degrees F of ambient air temperature with compressors operating at specified capacity.

3. Air receiver:
   a. Provide vertical or horizontal receiver stamped ASME rated for working pressure of 200 PSI. Flange or screw inlet and outlet connections, welded steel construction.
   b. Fittings to include adjustable pressure regulator, safety valve, pressure gauge, drain cock, and automatic pneumatic tank drain.

4. Pressure reducing valve:
   a. Provide pressure reducing stations complete with automatic reducing valve and bypass, and low pressure side relief valve and gauge.
   b. Compressor shall be provided with automatic start/stop capacity controls. In addition, provide centrifugal unloading to ensure for an unloaded compressor at start-up.
   c. Valve capacity suitable to compressor reduce pressure from 50 PSI to 180 PSI. Pressure reducing valve to be adjustable upward from reduced pressure.
   d. Provide valves with bronze or semi-steel bodies with stainless steel springs, stems, and seats.

E. Controls:
1. Pressure switch to cutout at 100 PSI with minimum differential of 20 PSI.
2. Provide electrical automatic alternation. In the event one compressor fails, another compressor automatically maintains air pressure.

F. Accessories:
1. Condensation filter: Champion No. CFF250A
2. Conversion kit: Champion No. NEMA1
3. Vibration isolators: Champion No. VI
4. Air-cooled after coolers: Champion No. ACAC
5. Automatic tank drain: Champion No. ATD-P
6. Low level oil monitor: Champion No. LOLM (two each)

G. Utility Requirements: 460 VAC, 3 phase, 50 HP total (25 HP per motor)

H. Finish: Durable enamel in manufacturer's standard color

2.4 DRYER, AIR, REFRIGERATED, 25 CFM
Equipment Identifier: 2226

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Champion, Princeton, IL (815) 875-3321
b. Model: CRN25

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Ingersoll Rand Co., Davidson, NC (704) 896-4000
b. Quincy Compressor, Quincy, IL (217) 222-7700

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 19 inches
b. Width: 21 inches
c. Height: 26 inches

2. Weight: 142 pounds
3. Capacity:
a. 38 degrees F: 25 CFM
b. 50 degrees F: 32.5 CFM

4. Drain connection: 1/2 inch NPT(F)
5. Air connection: 1/2 inch NPT(M)
6. Maximum working pressure: 232 PSIG (Level 1 controller standard)

C. Features/Performance/Construction:
1. Provide refrigerated air dryer of self-contained mechanical refrigeration type complete with heat exchanger, refrigeration compressor, moisture removal trap, internal wiring and piping, and full refrigerant charge.
2. Provide air inlet and outlet connections at same level and factory insulated.
3. Heat exchangers to consist of air-to-air and refrigerant-to-air coils. Provide centrifugal type moisture separator located at discharge of heat exchanger. Provide heat exchangers with automatic control system to bypass refrigeration system on low or no load condition.
4. Refrigeration unit of hermetically sealed type to operate continuously to maintain specified 38 degree F dew point. House unit in steel cabinet provided with access door and panel for maintenance and inspection.
5. Provide dryer with air inlet temperature gauge, air inlet pressure gauge, ON/OFF switch, high temperature LED, status indicators, refrigerant gauge, and Level 1 controller.
6. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Utility Requirements: 220 VAC**,** 1 phase, 1/4 HP

E. Finish: Durable enamel in manufacturer's standard color

2.5 DRYER, AIR, REFRIGERATED, 100 CFM
Equipment Identifier: 2228

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Champion, Princeton, IL (815) 875-3321
b. Model: CRN100 with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Ingersoll Rand, Davidson, NC (704) 896-4000
b. Quincy Compressor, Quincy, IL (217) 222-7000

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 29 inches
b. Width: 20 inches
c. Height: 38 inches

2. Capacity:
a. 38 degrees F: 100 CFM
b. 50 degrees F: 130 CFM

3. Drain connection: 1 inch NPT(F)
4. Weight: 251 pounds

C. Features/Performance/Construction:
1. Provide refrigerated air dryer of self-contained mechanical refrigeration type complete with heat exchanger, refrigeration compressor, moisture removal trap, internal wiring and piping, and full refrigerant charge.
2. Provide air inlet and outlet connections at same level and factory insulated.
3. Heat exchangers to consist of air-to-air and refrigerant-to-air coils. Provide centrifugal type moisture separator located at discharge of heat exchanger. Provide heat exchangers with automatic control system to bypass refrigeration system on low or no load condition.
4. Refrigeration unit of hermetically sealed type to operate continuously to maintain specified 35 degree F dew point. House unit in steel cabinet provided with access door and panel for maintenance and inspection.
5. Provide dryer with air inlet temperature gauge, air inlet pressure gauge, ON/OFF switch, high temperature LED, status indicators, refrigerant gauge, and Level 1 controller (standard).
6. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Accessories:

1. Oil remover: Champion No. Option F, Grade E

E. Utility Requirements:
1. Electrical: 120 VAC, 1 phase, 1/2 HP, 10.2 A, provide standard grounded receptacle
2. Compressed air: 1 inch connection, 100 CFM, 232 PSI

F. Finish: Durable enamel in manufacturer's standard color

2.6 DRYER, AIR, REFRIGERATED, 200 CFM
Equipment Identifier: 2230

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
a. Champion, Princeton, IL (815) 875-3321
b. Model: CRN200 (Reference Service Equipment Details)

2. Alternate manufacturers: *Contingent upon compliance with these specification* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Ingersoll Rand, Davidson, NC (704) 896-4000
b. Quincy Compressor, Quincy, IL (217) 222-7700

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 34 inches
b. Width: 32 inches
c. Height: 39 inches

2. Weight: 425 pounds
3. Capacity:
a. 38 degrees F: 200 CFM
b. 50 degrees F: 250 CFM

4. Drain connection: 1-1/2inch NPT(F)
5. Air connection: 1-1/2 inch NPT(M)
6. Maximum working pressure: 232 PSIG with (Level 2 controller standard)

C. Features/Performance/Construction:
1. Provide refrigerated air dryer of self-contained mechanical refrigeration type complete with heat exchanger, refrigeration compressor, moisture removal trap, internal wiring and piping, and full refrigerant charge.
2. Provide air inlet and outlet connections at same level and factory insulated.
3. Heat exchangers to consist of air-to-air and refrigerant-to-air coils. Provide centrifugal type moisture separator located at discharge of heat exchanger. Provide heat exchangers with automatic control system to bypass refrigeration system on low or no load condition.
4. Refrigeration unit of hermetically sealed type to operate continuously to maintain specified 35 degrees F dew point. House unit in steel cabinet provided with access door and panel for maintenance and inspection.

5. Provide dryer with air inlet temperature gauge, air inlet pressure gauge, ON/OFF switch, high temperature LED, status indicators, refrigerant gauge, and Level 2 controller.
6. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Utility Requirements: 460 VAC, 3 phase, 1 HP, provide disconnect

E. Finish: Durable enamel in manufacturer's standard color

2.7 HOSE AND DISPENSER (CG)
Equipment Identifier: 7250

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Graco Incorporated, Minneapolis, MN (612) 623-6000
b. Model: 109165 and 242056 with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Balcrank Products, Inc., Weaverville, NC (828) 645-4261
b. Lincoln (A Pentair Company), St. Louis, MO (314) 679-4200

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 10 inches
b. Width: 2 inches
c. Height: 2 inches

2. Hose diameter: 3/8 inch ID
3. Material inlet: 1/4 inch NPT(M)
4. Material outlet: 1/4 inch NPT(M)
5. Maximum working pressure: 4,000 PSI
6. Hose length: 15 feet

C. Features/Performance/Construction:
1. Hose: Product hose shall be wire reinforced; 3/8 inch ID, and be pressure rated at 4,000 PSI minimum, Graco No. 109165
2. Delivery kit:
a. Control handle shall be high pressure type with 1/4 inch NPT(F) inlet and outlet, Graco No. 242056
b. Nozzle shall be curved and include hydraulic coupler, Graco No. 200389
c. Hardware: Assembly shall include a "Z" type swivel, Graco No. 202577
d. Connector/shut-off valve: Graco No. 202869
e. Mounting bracket for dispenser

D. Accessories:
1. Hose hanger: Liberty Garden Products (336) 992-3595 No. 691, one each

E. Utility Requirements: Provide process piping from product pumps to point of connection

2.8 HOSE AND DISPENSER (GO)
Equipment Identifier: 7255

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Graco, Incorporated, Minneapolis, MN (612) 623-6000
b. Model: 220592 247713 with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Balcrank Products, Inc., Weaverville, NC (828) 645-4261
b. Lincoln (A Pentair Company), St. Louis, MO (314) 679-4200

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 10 inches
b. Width: 2 inches
c. Height: 2 inches

2. Hose length: 16 feet
3. Material inlet: 1/2 inch NPT(F)
4. Material outlet: 1/2 inch NPT(F)
5. Flow rate: 5 GPM minimum
6. Maximum working pressure: 1,500 PSI

C. Features/Performance/Construction:
1. Hose: Product hose shall be wire reinforced, 1/2 inch ID, and be pressure rated at 3,000 PSI minimum, included with hose
2. Dispense valve: Non metered type with built-in swivel, flexible extension, and automatic non-drip quick-close nozzle included with dispenser
3. Connector/shut-off valve: Graco No. 202869
4. In line meter shall register increments of pints from 1 to 8, and have fluid inlet of 1/2 inch NPT(F) and outlet of 1/2 inch NPT(F) (Graco No. SDP-15)

D. Accessories:
1. Hose hanger: Liberty Garden Products (336) 992-3595 No. 691, one each

E. Utility Requirements: Contractor shall provide process piping from product pumps to point of connection.

2.9 PUMP, AIR PISTON (CG), WITH HOIST
Equipment Identifier: 7510

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified by manufacturer's name and model to establish acceptable standard of quality, performance, features and construction.
   a. Graco, Incorporated, Minneapolis, MN (612) 623-6000
   b. Model: 226018 with accessories (Reference Chassis Grease Pump and Drum Detail)

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITALS equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Balcrank Corporation, Inc., Weaverville, NC (828) 645-4261
   b. Lincoln Industrial Corporation St. Louis, MO (314) 679-4200

B. Capacities/Dimensions:
1. Overall dimensions:
   a. Length: 24 inches
   b. Width: 30 inches
   c. Height: 56 inches

2. Products: Chassis grease (CG)
3. Maximum fluid pressure: 4,000 PSI
4. Air motor diameter: 4-1/4 inches
5. Operating range: 40 to 150 PSI
6. Maximum continuous duty flow rate: 3.35 pounds per minute
7. Air consumption (approximate) at 1 GPM at 70 PSI: 19 CFM
8. Air inlet: 1/2 inch NPT(F)
9. Material outlet: 3/8 inch NPT(F)
10. Material inlet: Slotted

C. Features/Performance/Construction:
1. Provide pneumatic operated piston pump operable with maximum air pressure of 150 PSI.
2. Provide with complete assembly, including combination air filter, regulator, pressure gauge, lubricator, air and product valves, and hose and fitting kit suitable for product.
3. Air motor shall be a non-corrosive design with no metal-to-metal contact compatible with product being delivered.
4. Provide base, inductor plate, elevator, and carriage support system for chassis grease pump with inductor plate.
5. Provide connection from pump back to product tank for proper drain back of fluid in piping riser line and pump.
6. Provide compressed air runaway valve before product fluid pump to eliminate unregulated fluid flow in the event of a product pipe break.

D. Accessories:
1. Air regulator: Graco No. 104266
2. Gauge: Graco No. 100960

E. Utility Requirements: Compressed air, 3/4 inch line at 100 PSI

2.10 PUMP, AIR PISTON 10:1 RATIO (ATF1, ATF2, EO1, EO2, GO)
Equipment Identifier: 7520

A. Manufacturer's Reference:
   1. Prime manufacturer: Specifications are based on equipment identified by manufacturer's name and model to establish acceptable standard of quality, performance, features and construction.
      a. Graco, Incorporated, Minneapolis, MN (612) 623-6000
      b. Model: 225853 Fire ball with accessories (Reference Tank Mounted Pump and Tank Detail)

   2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
      a. Balcrank Corporation., Weaverville, NC (828) 645-4261
      b. Lincoln Industrial Corporation, St. Louis, MO (314) 679-4200

B. Capacities/Dimensions:
   1. Overall dimensions:
      a. Diameter: 6 inches
      b. Height: 12 inches

   2. Products: Engine oil (EO), gear oil (GO), automatic transmission fluid (ATF)
   3. Maximum fluid pressure: 1,800 PSI
   4. Air motor diameter: 4-1/4 inches
   5. Operating range: 40 to 180 PSI
   6. Continuous duty flow rate: 3 to 4 GPM
   7. Air consumption (approximate) at 100 PSI: 32 CFM
   8. Air inlet: 1/2 inch NPT (F)
   9. Material outlet: 3/4 inch NPT(F)
   10. Material inlet: 1-1/2 inch NPT(F)

C. Features/Performance/Construction:
   1. Provide pneumatic operated piston pump operable with maximum air pressure of 180 PSI.
   2. Provide with complete assembly, including adapters for mounting on storage tanks, combination air filter, regulator, pressure gauge, lubricator, air and product valves, and hose and fitting kit suitable for product.
   3. Air motor shall be a non-corrosive design with no metal-to-metal contact compatible with product being delivered.
   4. Provide thermal relief valves for the pumping system.
   5. Provide connection from pump back to product tank for proper drain back of fluid in piping riser line and pump.
   6. Provide compressed air runaway valve before product fluid pump to eliminate unregulated fluid flow in the event of a product pipe break.

D. Accessories:
   1. Air regulator, 1/2 inch: Graco No. 104266
   2. Pressure gauge: Graco No. 100906
   3. Low level cut off: Graco No. 203688

E. Utility Requirements: Compressed air, 1/2 inch connection, 100 PSI, 32 CFM; provide filter, regulator, and valves

2.11 PUMP, DIAPHRAGM, NON-MIXING, 50 GPM (EC1, EC2)
Equipment Identifier: 7531

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified by manufacturer's name and model to establish minimal acceptable standards of quality, performance, features and construction.
a. Graco, Inc., Minneapolis, MN (612) 623-6000
b. Model: 647016 with accessories (Reference Wall Mounted Pump and Tank Detail)

2. Alternate manufacturers: *Contingent upon compliance with these specification* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Balcrank Corporation, Weaverville, NC (828) 645-4261
b. Lincoln Industrial Corporation, St. Louis, MO (314) 679-4300

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 14-3/4 inches
b. Width: 10-1/4 inches
c. Height: 16 inches

2. Products: Engine coolant (EC)
3. Pump ratio: 1:1
4. Maximum air pressure: 125 PSI
5. Free flow rate: 50 GPM
6. Air consumption (approximate): 67 CFM
7. Air inlet: 1/2 inch NPT(F)
8. Fluid outlet: 1 inch NPT(M)
9. Fluid inlet: 1 inch NPT(M)

C. Features/Performance/Construction:
1. Provide pneumatic operated diaphragm pump operable with maximum air pressure of 125 PSI.
2. Pump shall be provided in complete assembly, include the following accessories for mounting on adjacent wall: Package includes - pump, air regulator, fluid connection hose, air shut-off valve, wall mount bracket, suction hose, and thermal relief kit.
3. Materials: Compatible with product being delivered.
4. Pump shall handle oil, hydraulic oil, automatic transmission fluid, anti-freeze, windshield washer fluid, water, or fuel.
5. Provide connection from pump back to product tank for proper drain back of fluid in piping riser line and pump.
6. Provide compressed air runaway valve before product fluid pump to eliminate unregulated fluid flow in the event of a product pipe break.

D. Accessories:
1. Air line filter: Graco No. 106149
2. Quick connect air coupler: Graco No. 110199
3. Quick connect air nipple: Graco No. 110196
4. Bleed type air shut-off valve: Graco No. 110225

5. Air runaway valve (stop pump from cavitating when empty): Graco No. 224040
6. Thermal relief kit: Graco No. 238428
7. Grounding wire and clamp: Graco No. 238909
8. Suction hose kit: Graco No. 236054
9. Wall mount bracket: Graco No. 24C637

E. Utility Requirements:
1. Plumbing:
a. Compressed air: 125 PSI, 67 CFM, 1/2 inch NPT(F)
b. Provide filter, regulator, and valves

2.12 PUMP, DIAPHRAGM (DEF)
Equipment Identifier: 7532

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified by manufacturer's name and model to establish minimal acceptable standards of quality, performance, features and construction.
a. Graco, Inc., Minneapolis, MN (612) 623-6000
b. 24G745 (Husky 515)

2. Alternate manufacturers: *Contingent upon compliance with these specification* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Balcrank Corporation, Inc., Weaverville, NC (828) 645-4261
b. Lincoln Industrial Corporation, St. Louis, MO (314) 679-4300

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 15 inches
b. Width: 10 inches
c. Height: 16 inches

2. Products: Diesel exhaust fluid (DEF)
3. Pump ratio: 1:1
4. Free flow rate: 15 GPM
5. Fluid outlet: 3/4 inch NPT(F)
6. Fluid inlet: 3/4 inch NPT(F)
7. Pump weight: 6.5 pounds

C. Features/Performance/Construction:
1. Provide pneumatic operated diaphragm pump operable with maximum air pressure of 100 PSI.
2. Pump shall be provided in complete assembly, include accessories for mounting on adjacent wall (see Accessories).
3. Materials: Compatible with product being delivered.
4. Pump shall handle diesel exhaust fluid
5. Provide connection from pump back to product tank for proper drain back of fluid in piping riser line and pump.

6. Operating temperature shall be between 40 and 80 degrees F.

D. Accessories:
1. Regulator/filter assembly: Graco No. 224024, 1/4 NPT(F)
2. Quick connect inlet kit: Graco No. 24F532, 1/4 inch NPT
3. Bleed-type air shut off valve: Graco No. 24F529, 1/2 inch NPT (Relieves trapped air down line of valve)
4. Inlet hose: Graco No. 124581, 3/4 inch NPT(F)
5. Wall mounted bracket: Graco No. 110223
6. Vent: Graco No. 110223
7. Air safety valve: Graco No. 124963

E. Utility Requirements:
1. Compressed air: 1/4 inch connection, 28 CFM, 100 PSI

2.13 PUMP, DIAPHRAGM, USED FLUID EVACUATION (UO)
Equipment Identifier: 7540

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified by manufacturer's name and model to establish acceptable standards of quality, performance, features and construction.
a. Graco, Inc., Minneapolis, MN (612) 623-6000
b. Model: 647016 with accessories (Reference Used Fluid Pump Detail)

2. Alternate manufacturers: *Contingent upon compliance with these specification* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Balcrank Corporation, Weaverville, NC (800) 533-9655
b. Lincoln Industrial Corporation, St. Louis, MO (314) 679-4300

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 14-3/4 inches
b. Width: 10-3/4 inches
c. Height: 16 inches

2. Products: Used oil (UO)
3. Pump ratio: 1:1
4. Maximum air pressure: 125 PSI
5. Maximum fluid outlet pressure: 100 PSI
6. Free flow rate: 50 GPM
7. Continuous duty delivery: 2.4 GPM
8. Air consumption (approximate): 67 CFM
9. Air inlet: 1/2 inch NPT(F)
10. Fluid outlet: 1 inch NPT(M)
11. Fluid inlet: 1 inch NPT(M)
12. Regulator: 1/2 inch NPT(F)
13. Filter: 1/2 inch NPT(F)

C. Features/Performance/Construction:
1. Diaphragm pump shall provide 125 PSI air pressure for pump size and capacity as scheduled.
2. Pump shall be provided in complete assembly, including accessories for mounting on walls or adjacent to storage tanks as scheduled, combination air filter, regulator, coupler, nipple, air valve, wall bracket, relief kit, relief valves, wire and clamp, hose kit, adapter kit, and dual inlet manifold suitable for this product.
3. Materials: Compatible with product being delivered.
4. Pump shall handle oil, hydraulic oil, automatic transmission fluid, anti-freeze, windshield washer fluid, water, or fuel.
5. Pump shall have a tank monitoring system that shuts off the pump via solenoid valve when the used fluid tank is full.
6. Monitoring system shall notify users with a strobe light and an audible alarm system.
7. Audible alarm shall be a minimum of 250 milliamps.

D. Accessories**:**
1. Wall bracket accessory kit: Graco Model No. 24C637
2. Regulator/filter assembly: Graco Model No. 246947, 1/2 inch NPT(f), and appropriate fittings and hoses for a complete and operable installation
3. Fluid installation kit: Graco Model No. 240685, includes swivel union, 4 foot coupled fluid hose, short nipple, y-strainer, 10 foot coupled fluid hose, ball valve, elbow, and nipple
4. Drum adapter kit: Graco Model No. 240832, includes elbow, nipple, valve, male and female camlock couplers
5. Grounding wire and clamp: Graco Model No. 238909
6. Quick connect air coupler: Graco Model No. 110199, 1/2 inch NPT
7. Quick connect air nipple: Graco Model No. 110196, 1/2 inch NPT
8. Air muffler: Graco Model No. 112182
9. Tank monitoring system:
   a. Manufacturer: BJ Enterprises, (800) 457-0749
   b. Tank monitoring system power supply: BJE Model No. 007-7575, with strobe light, one each
   c. Solenoid valve should be located on the main level. Run separate compressed air piping to the pump.
   d. Solenoid valve: BJE Model No. 007SV-7580, one each

10. Provide label “USED OIL” on pump to identify product (minimum 1 inch lettering)

E. Utility Requirements:
1. Tank monitor: 120 VAC, 1 phase, 2 A, standard grounded receptacle
2. Compressed air: 125 PSI, 67 CFM, 1/2 inch NPT(F), provide filter, regulator, and valves

2.14 PUMP, DIAPHRAGM, USED FLUID EVACUATION (UC)
Equipment Identifier: 7541

A. Manufacturer’s Reference:
1. Prime manufacturer: Specifications are based on equipment identified by manufacturer’s name and model to establish acceptable standards of quality, performance, features and construction.
   a. Graco, Inc., Minneapolis, MN (612) 623-6000
   b. Model: 647016 with accessories (Reference Used Fluid Pump Detail)

2. Alternate manufacturers: *Contingent upon compliance with these specification* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Balcrank Corporation, Weaverville, NC (800) 533-9655
   b. Lincoln Industrial Corporation, St. Louis, MO (314) 679-4300

B. Capacities/Dimensions:
1. Overall dimensions:
   a. Length: 14-3/4 inches
   b. Width: 10-3/4 inches
   c. Height: 16 inches

2. Products: Used coolant (UC)
3. Pump ratio: 1:1
4. Maximum air pressure: 125 PSI
5. Maximum fluid outlet pressure: 100 PSI
6. Free flow rate: 50 GPM
7. Continuous duty delivery: 2.4 GPM
8. Air consumption (approximate): 67 CFM
9. Air inlet: 1/2 inch NPT(F)
10. Fluid outlet: 1 inch NPT(M)
11. Fluid inlet: 1 inch NPT(M)
12. Regulator: 1/2 inch NPT(F)
13. Filter: 1/2 inch NPT(F)

C. Features/Performance/Construction:
1. Diaphragm pump shall provide 125 PSI air pressure for pump size and capacity as scheduled.
2. Pump shall be provided in complete assembly, including accessories for mounting on wall or adjacent to storage tanks as scheduled, combination air filter, regulator, coupler, nipple, air valve, wall bracket, relief kit, relief valves, wire and clamp, hose kit, adapter kit, and dual inlet manifold suitable for this product.
3. Materials: Compatible with product being delivered.
4. Pump shall handle oil, hydraulic oil, automatic transmission fluid, anti-freeze, windshield washer fluid, water, or fuel.
5. Pump shall have a tank monitoring system that shuts off the pump via solenoid valve when the used fluid tank is full.
6. Monitoring system shall notify users with a strobe light and an audible alarm system.
7. Audible alarm shall be a minimum of 250 milliamps.

D. Accessories:
1. Wall bracket kit: Graco Model No. 24C637
2. Regulator/filter assembly: Graco Model No. 246947 and appropriate fittings and hoses, for a complete and operable installation, 1/2 inch NPT(f),
3. Fluid installation kit: Graco Model No. 240685, include swivel union, 4 foot coupled fluid hose, short nipple, y-strained, 10 foot coupled fluid hose, ball valve, elbow, and nipple
4. Drum adapter kit, Graco Model No. 240832, includes elbow, nipple valve, male and female camload couplers
5. Grounding wire/clamp: Graco Model No. 238909
6. Quick connect air coupler: Graco Model No. 110199, 1/2 inch NPT
7. Quick connect air nipple: Graco Model No. 110196, 1/2 inch NPT

8. Air muffler: Graco Model No. 112182
9. Tank monitoring system
    a. Manufacturer: BJ Enterprises, (800) 457-0749
    b. Tank monitoring system power supply: BJ Enterprises (800) 547-0749 Model No. 007-7575 with strobe light, one each
    c. Solenoid valve should be located on the main level. Run separate compressed air piping to the pump.
    d. Solenoid valve: BJ Enterprises Model No. 007SV-7580, one each

10. Provide label “USED COOLANT” on pump to identify product (minimum 1 inch lettering)

E. Utility Requirements:
1. Tank Monitor: 120 VAC, 2 A, standard grounded receptacle
2. Compressed air: 125 PSI, 67 CFM, 1/2 inch NPT(F), provide filter, regulator, and valves

2.15 REEL BANKS, GENERAL
Equipment Identifier: 7700

A. Manufacturer’s Reference:
1. Prime manufacturer: Specifications are based on equipment identified by manufacturer's name and model to establish acceptable standards of quality, performance, features and construction.
    a. Graco, Incorporation, Minneapolis, MN (612) 623-6000
    b. XD Series

2. Alternate manufacturers: *Contingent upon compliance with these specification* and documentation requirements set forth in SUBMITALS equipment produced by other manufacturers, including the following, *may be* considered as equal.
    a. Lincoln Industrial Corporation, St. Louis, MO (314) 679-4200
    b. Balcrank Corporation, Weaverville, NC (828) 645-4261

B. General Description: High performance, heavy duty hose reels. Reels are available for the following products:
1. Automatic transmission fluid (ATF): Graco No. HSM65B
2. Compressed air (CA): Graco No. HSL56B
3. Chassis grease (CG): Graco No. HSH55B
4. Diesel exhaust fluid (DEF): Graco No. HSDD5B
5. Engine coolant (EC): Graco No. HSL65B
6. Engine oil (EO): Graco No. HSM65B
7. Gear oil (GO): Graco No. HSM65B

C. Capacities/Dimensions:
1. Overall reel dimensions, XD20 series (ATF, CA, CG, EC, EO, GO) nominal:
    a. Width: 7.5 inches
    b. Height: 25.5 inches
    c. Length: 20 inches

2. Overall reel dimensions, XD30 series, nominal:
    a. Width: 9 inches
    b. Height: 22.12 inches

c. Length: 27.60 inches

3. Reel fluid inlet:
   a. CA: 1/2 inch NPT(M)
   b. CG: 3/8 inch NPT(M)
   c. ATF, EC, EO, GO: 1/2 inch NPT(M)
   d. DEF: 3/4 inch NPT(M)

4. Hose:
   a. CA:
      1) Length: 65 feet
      2) Inside diameter: 3/8 inch
      3) Working pressure: 180 PSI

   b. CG:
      1) Length: 50 feet
      2) Inside diameter: 3/8 inch
      3) Working pressure: 4,000 PSI

   c. DEF:
      1) Length: 50 feet
      2) Inside diameter: 3/4 inch
      3) Working pressure: 50 PSI

   d. GO:
      1) Length: 50 feet
      2) Inside diameter: 1/2 inch
      3) Working pressure: 1,500 PSI

   e. ATF, EC, EO:
      1) Length: 50 feet
      2) Inside diameter: 1/2 inch
      3) Working pressure: 1,000 PSI

D. Features/Performance/Construction:
   1. Reels:
      a. Construction: Frames, discs, and drum shall be fabricated of heavy gauge steel.
      b. Double pedestal arm: Reel frame shall have double pedestal arms that are welded and gusseted.
      c. Hose guide arm: Reel hose guide arm shall be adjustable with nylon rollers on all four sides of roller assembly at hose opening.
      d. Rewind mechanism: Reel spring shall be enclosed and fastened to reel drum with a reinforcing clip.
      e. Bearings and ratchet latch: Reel shall have permanently lubricated bearings and extra large ratchet latch with audible hose position lock.

   2. Ball stop: Adjustment of hose extension length shall be permitted by ball stop:
      a. 3/8 inch hose, Graco No. 218341, one per hose reel
      b. 1/2 inch hose, Graco No. 218341, one per hose reel
      c. 3/4 inch hose, Graco No. 237873, one per hose reel

3. Hose covers and tubes: Chassis grease hose shall have Buna-N tube and Buna-N PVC cover. All other commodity hoses shall have Buna N nitrile tube with nitrile PVC cover.
4. Delivery kits: Each commodity hose shall be fitted with the dispensing control as listed.
   a. ATF: Electronic in-line style english metered totalizing dispenser (up to 5 GPM) set to dispense in quarts to 0.01 increments, Graco No. 255351
   b. CA: Quick disconnect air coupler with necessary adapter fitting, Industrial Interchange Series 3/8 inch female
   c. CG: High pressure control valve with knurled grip body, 1/4 inch, Graco No. 242056 with taper nose coupler and extension; "Z" swivel, Graco No. 202577
   d. DEF: Dispense nozzles with swivel, Graco No. 24F529 and in-line meter, Graco No. 24H293
   e. EC: Electronic in-line style english metered totalizing dispenser (up to 5 GPM) set to dispense in pints to 0.01 increments, Graco No. 255356
   f. EO: Electronic in-line style english metered totalizing dispenser set to dispense (to 5 GPM) in quarts to .01 increments, Graco No. 255200
   g. GO: Electronic in-line style english metered totalizing dispenser set to dispense(up to 5 GPM) in pints to 0.01 increments, Graco No. 255352

5. Inlet hose kit: Each commodity reel shall be fitted with the inlet hose kit as listed.
   a. CA: 1/2 inch ID by 24 inches, medium pressure hose and fittings, rated for 2,000 PSI, Graco No. 218549, one each
   b. CG: 3/8 inch ID by 24 inches, high pressure hose and fittings, rated for 4,000 PSI, Graco No. 218550, one each
   c. ATF, EC, EO: 1/2 inch ID by 24 inches, medium pressure hose and fittings, rated for 2,000 PSI, Graco No. 218549, one each
   d. DEF: 3/4 inch ID by 24 inches, medium pressure hose and fittings, rated for 1,250 PSI, Graco No. 124875, one each

6. Mounting bracket: Graco No. 204741, one per three reels
7. Identification labels: Each commodity reel shall have a 3/4 by 4-1/4 inch metal identification label indicating the commodity, attached adjacent to each hose guide arm roller assembly. Label kits including label and mounting hardware as listed for each commodity.
   a. ATF: Graco No. 218673
   b. CA: Graco No. 218675
   c. CG: Graco No. 218671
   d. DEF: Provide a fabricated identification label similar to the other specified commodities.
   e. EC: Similar to Graco No. 218677
   f. EO: Similar to Graco No. 218670
   g. GO: Similar to Graco No. 218672

8. Mounting channel supply as required for specific reel bank:
   a. One reel: Graco No. 24A219
   b. Two reels: Graco No. 24A220
   c. Three reels: Graco No. 24A221
   d. Six reels: Graco No. 24A222

E. Accessories:
   1. Fluid solenoid valve: Graco Horizon System No. 215487
   2. Pulse meter: Graco No. 215474

F. Utility Requirements: Contractor shall provide process piping from product pumps to point of connection for each reel specified herein.

G. Finish: Durable enamel in manufacturer's standard color

2.16 REEL BANK, ONE COMMODITY (CA)
Equipment Identifier: 7711

A. Reel bank shall consist of one each (CA) reel as delineated in part 2.14 REEL BANKS, GENERAL of this specification section.

B. Reference Service Equipment Details

2.17 REEL BANKS, SIX COMMODITY (CA, DEF, EC1, EC2, EO1, EO2)
Equipment Identifier: 7760

A. Reel bank shall consist of one each (CA) reel, one each (DEF) reel, one each (EC1) reel, one each (EC1) reel, one each (EO1) reel, one each (EO2) reel as delineated in part 2.14 REEL BANKS, GENERAL of this specification section.

B. Reference Service Equipment Details

2.18 REEL BANKS, NINE COMMODITY (ATF1, ATF2, CA, CG, EC1, EC2, EO1, EO2, GO)
Equipment Identifier: 7790

A. Reel bank shall consist of one each (ATF1) reel, one each (ATF2) reel, one each (CA) reel, one each (CG) reel, one each (EC1) reel, one each (EC2) reel, one each (EO1) reel, one each (EO2), and one each (GO) reel as delineated in part 2.14 REEL BANKS, GENERAL of this specification section.

B. Reference Service Equipment Details

2.19 TANK, DOUBLE WALL, CUBE, 120 GALLON (ATF1, ATF2, EC1, EC2, EO1, EO2, GO, UC)
Equipment Identifier: 7950

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimum acceptable standards of quality, features, performance, and construction.
   a. Containment Solutions, Bakersfield, CA (800) 486-4305
   b. Model: LC120DW (Reference Service Equipment Details)

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Dynafab Corp., Houston, TX (281) 590-5467
   b. Highland Tank and Manufacturing., Stoystown, PA (814) 893-5701

B. Capacities/Dimensions:
1. Overall dimensions:

a. Length: 38 inches
b. Width: 34 inches
c. Height: 37 inches

2. Capacity: 120 gallons

C. Features/Performance/Construction:
1. Above ground used oil collection and fluid storage systems shall be constructed in accordance with national, state, and locally recognized *Above Ground Storage Tank* standards, including: Uniform Fire Code, Nation Fire Protection Association 30, 30A, and 31, Underwriters Laboratory Standard 142-for single wall tanks.
2. The components of the system shall be assembled and tested at the factory and shall be covered under warranty.
3. The above ground double wall tank shall be designed and UL listed as an atmospheric tank with a maximum working pressure of 1 PSI.
4. The primary and secondary storage tanks shall have passed a proof of design hydrostatic pressure test of 25 PSI.
5. The above ground double wall tank shall be equipped with nine NPT openings including two for primary and secondary emergency venting as required by UL-142.
6. Primary tank enclosure:
   a. Primary storage tank shall be rectangular in design and constructed with ASTM A-569 or A-36 carbon steel with continuous welds. Tank shall be equipped with lifting lugs.
   b. Primary storage tank shall be constructed and pressure tested (minimum 3 to 5 PSI) in accordance with UL-142 standards and carry the appropriate marking.
   c. Tank enclosure shall be supported by two 4-inch high steel support feet channels with internal anchoring holes to maintain ground clearance. (Remove support feet channels prior to installation)

7. Secondary tank enclosure:
   a. Secondary storage tank shall be a rectangular design constructed with ASTM A-569 or A-36 carbon steel with continuous welds and listed by Underwriters Laboratories as secondary containment.
   b. Secondary enclosure shall provide a minimum of 110 percent secondary containment.
   c. Secondary enclosure shall be equipped with a 2 inch monitoring port and a 4 or 6 or 8 inch emergency vent port as required by Underwriters Laboratories.
   d. Secondary storage tank shall be constructed and pressure tested (minimum 3 to 5 PSI) in accordance with UL-142 standards and carry the appropriate marking.

8. Installation of tank shall include seismic bracing and anchoring to meet all local, state, and federal codes and provisions.

D. Accessories:
1. Tank gauge: Double float (one each)
2. Primary venting: 4 inch (one each)
3. Secondary venting: 4 inch (one each)
4. Spill box: 7 gallon, 12 inch (one each)
5. Tank monitoring system with alarm: BJ Enterprises, (800) 457-0749, Model No. 007 (for used coolant tank)

E. Utility Requirements:

1. Tank Monitoring system: 120 VAC, 1 phase, 20 A, provide standard grounded receptacle

F. Finish: Durable enamel in manufacturer's standard color

2.20 TANK, DOUBLE WALL, CUBE, 280 GALLON (EC2, EO2)
Equipment Identifier: 7960

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimum acceptable standards of quality, features, performance, and construction.
a. Containment Solutions, Bakersfield, CA (800) 486-4305
b. Model: LC280DW (Reference Service Equipment Details)

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Dynafab Corp., Houston, TX (281) 590-5467
b. Highland Tank and Manufacturing., Stoystown, PA (814) 893-5701

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 58 inches
b. Width: 34 inches
c. Height: 49 inches

2. Capacity: 280 gallons

C. Features/Performance/Construction:
1. Above ground used oil collection and fluid storage systems shall be constructed in accordance with national, state, and locally recognized *Above Ground Storage Tank* standards, including: Uniform Fire Code, Nation Fire Protection Association 30, 30A, and 31, Underwriters Laboratory Standard 142-for single wall tanks.
2. The components of the system shall be assembled and tested at the factory and shall be covered under warranty.
3. The above ground double wall tank shall be designed and UL listed as an atmospheric tank with a maximum working pressure of one PSI.
4. The primary and secondary storage tanks shall have passed a proof of design hydrostatic pressure test of 25 PSI.
5. The above ground double wall tank shall be equipped with nine NPT openings including two for primary and secondary emergency venting as required by UL-142.
6. Primary tank enclosure:
a. Primary storage tank shall be rectangular in design and constructed with ASTM A-569 or A-36 carbon steel with continuous welds. Tank shall be equipped with lifting lugs.
b. Primary storage tank shall be constructed and pressure tested (minimum 3 to 5 PSI) in accordance with UL-142 standards and carry the appropriate marking.
c. Tank enclosure shall be supported by two 4-inch high steel support feet channels with internal anchoring holes to maintain ground clearance.

7. Secondary tank enclosure:

a. Secondary storage tank shall be a rectangular design constructed with ASTM A-569 or A-36 carbon steel with continuous welds and listed by Underwriters Laboratories as secondary containment.
b. Secondary enclosure shall provide a minimum of 110 percent secondary containment.
c. Secondary enclosure shall be equipped with a 2 inch monitoring port and a 4 or 6 or 8 inch emergency vent port as required by Underwriters Laboratories.
d. Secondary storage tank shall be constructed and pressure tested (minimum 3 to 5 PSI) in accordance with UL-142 standards and carry the appropriate marking.

8. Installation of tank shall include seismic bracing and anchoring to meet all local, state, and federal codes and provisions.

D. Accessories:
1. Tank gauge: Double float (one each)
2. Primary venting: 4 inch (one each)
3. Secondary venting: 4 inch (one each)
4. Spill box: 7 gallon, welded to tank

E. Finish: Durable enamel in manufacturer's standard color

2.21 TANK, DOUBLE WALL, CUBE, 500 GALLON (UO)
Equipment Identifier: 7970

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimum acceptable standards of quality, features, performance, and construction.
a. Containment Solutions, Conroe, TX (936) 756-7731
b. Model: LC500DW (Reference Service Equipment Details)

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Dynafab Corp., Houston, TX (281) 590-5467
b. Highland Tank and Manufacturing., Stoystown, PA (814) 893-5701

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 61 inches
b. Width: 46 inches
c. Height: 61 inches

2. Capacity: 500 gallons

C. Features/Performance/Construction:
1. Above ground used oil collection and fluid storage systems shall be constructed in accordance with national, state, and locally recognized *Above Ground Storage Tank* standards, including: Uniform Fire Code, Nation Fire Protection Association 30, 30A, and 31, Underwriters Laboratory Standard 142-for single wall tanks.

2. The components of the system shall be assembled and tested at the factory and shall be covered under warranty.
3. The above ground double wall tank shall be designed and UL listed as an atmospheric tank with a maximum working pressure of one PSI.
4. The primary and secondary storage tanks shall have passed a proof of design hydrostatic pressure test of 25 PSI.
5. The above ground double wall tank shall be equipped with nine NPT openings including two for primary and secondary emergency venting as required by UL-142.
6. Primary tank enclosure:
   a. Primary storage tank shall be rectangular in design and constructed with ASTM A-569 or A-36 carbon steel with continuous welds. Tank shall be equipped with lifting lugs.
   b. Primary storage tank shall be constructed and pressure tested (minimum 3 to 5 PSI) in accordance with UL-142 standards and carry the appropriate marking.
   c. Tank enclosure shall be supported by two 4 inch high steel support feet channels with internal anchoring holes to maintain ground clearance.

7. Secondary tank enclosure:
   a. Secondary storage tank shall be a rectangular design constructed with ASTM A-569 or A-36 carbon steel with continuous welds and listed by Underwriters Laboratories as secondary containment.
   b. Secondary enclosure shall provide a minimum of 110 percent secondary containment.
   c. Secondary enclosure shall be equipped with a 2 inch monitoring port and a 4 or 6 or 8 inch emergency vent port as required by Underwriters Laboratories.
   d. Secondary storage tank shall be constructed and pressure tested (minimum 3 to 5 PSI) in accordance with UL-142 standards and carry the appropriate marking.

8. Installation of tank shall include seismic bracing and anchoring to meet all local, state, and federal codes and provisions.

D. Accessories:
1. Double float tank gauge, calibrated by gallons or inches (Scully or equal)
2. Venting: Primary - 4 inches NPT(M); Secondary - 6 inches NPT(M)
3. Spill box, 7 gallon, welded to tank
4. Tank monitoring system with alarm: BJ Enterprises, (800) 457-0749, Model No. 007

E. Utility Requirements
1. Tank monitoring system: 120 VAC, 1 phase, 2 A, provide standard grounded receptacle
2. Vent 2 inches through roof

F. Finish: Durable enamel in manufacturer’s standard color

2.22 DRAIN PAN, USED OIL, ROLLING
Equipment Identifier: 7996

A. Manufacturer’s Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimal acceptable standards of quality, features, performance, and construction.
   a. Graco, Incorporated, Minneapolis, MN (612) 623-6000
   b. Model: 218 969 with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Balcrank Products, Inc., Weaverville, NC (828) 645-4261
   b. Lincoln (A Pentair Company) St. Louis, MO (314) 679-4200

B. Capacities/Dimensions:
1. Overall dimensions:
   a. Length: 24 inches
   b. Width: 33 inches
   c. Height: 11 inches

2. Wheels: 3 inches
3. Track width: 39 to 46 inches
4. Running width: 2-1/2 inches
5. Capacity: 30 gallons

C. Features/Performance/Construction:
1. Drain pan wheels shall be adjustable to fit pit opening width of 39 to 46 inches.
2. Wheels: Drain pan shall be equipped with four wheels, each having a 3 inch diameter minimum suitable for rolling in 4 by 2 inch steel channels recessed in inspection pit walls below the top edge of the finished shop floor.
3. Drain: The drain pan shall be equipped with 1/4 turn shut-off valve and dry break disconnect coupler with 6 feet of 1-1/2 inch suction hose for emptying pan.
4. Hose shall be hard plumbed to the used oil tank. Provide a wall mounted hook for storing hose/coupler assembly when not in use.
5. Unit shall be constructed of 12 gauge steel.
6. The unit shall contain anti-splash grill and baffles to provide for large drain area and prevent spills.
7. The unit shall include following as standard equipment:
   a. 1-1/2 inch NPT drain valve
   b. 1-1/2 inch NPT quick coupler (two)
   c. 1-1/2 inch NPT coupler cap
   d. 1-1/2 inch NPT camlock

D. Accessories:
1. Hose, 6 feet at 1-1/2 inch diameter: No. 108205
2. "J" hook to hold hose at coupler

E. Finish:
1. Primed and finished in Owner's choice of manufacturer's standard enamel.
2. Provide "USED OIL" label in minimum 2 inch high painted red letters on both long sides of drain pan.

2.23 DRAIN PAN, USED COOLANT, ROLLING
Equipment Identifier: 7997

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
   a. Graco, Incorporated, Minneapolis, MN (612) 623-6000
   b. Model: 218 969 with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Balcrank Products, Inc., Weaverville, NC (828) 645-4261
   b. Lincoln (A Pentair Company) St. Louis, MO (314) 679-4200

B. Capacities/Dimensions:
1. Overall dimensions:
   a. Length: 24 inches
   b. Width: 33 inches
   c. Height: 11 inches

2. Wheels: 3 inches
3. Track width: 39 to 46 inches
4. Running width: 2-1/2 inches
5. Capacity: 30 gallons

C. Features/Performance/Construction:
1. Drain pan wheels shall be adjustable to fit pit opening width of 39 to 46 inches.
2. Wheels: Drain pan shall be equipped with four wheels, each having a 3 inch diameter minimum suitable for rolling in 4 by 2 inch steel channels recessed in inspection pit walls below the top edge of the finished shop floor.
3. Drain: The drain pan shall be equipped with 1/4 turn shut-off valve and dry break disconnect coupler with 6 feet of 1-1/2 inch suction hose for emptying pan.
4. Hose shall be hard plumbed to the used coolant tank.
5. Unit shall be constructed of 12 gauge steel.
6. The unit shall contain anti-splash grill and baffles to provide for large drain area and prevent spills.
7. The unit shall include following as standard equipment:
   a. 1-1/2 inch NPT drain valve
   b. 1-1/2 inch NPT quick coupler
   c. 1-1/2 inch NPT coupler cap
   d. 1-1/2 inch NPT camlock

D. Accessories:
1. Hose, 6 feet at 1-1/2 inch diameter: No. 108205
2. "J" hook to hold hose at coupler

E. Finish:
1. Primed and finished in Owner's choice of manufacturer's standard enamel
2. Provide "USED COOLANT" label in minimum 2 inch high painted red letters on both long sides of drain pan

2.24 RECEIVER, USED COOLANT, 25 GALLONS
Equipment Identifier: 7998

A. Manufacturer's Reference:
   1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
      a. Graco, Incorporated, Minneapolis, MN (612) 623-6000
      b. Model: 248632

   2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
      a. Balcrank Corporation, Weaverville, NC (828) 645-4261
      b. Lincoln (A Pentair Company), St. Louis, MO (314) 679-4200

B. Capacities/Dimensions:
   1. Dimensions:
      a. Length: 25 inches
      b. Width: 25 inches
      c. Height: 45 to 72 inches

   2. Dry weight: 54 pounds
   3. Fluid inlet/inspection port size: 3 inch (76 millimeter) buttress
   4. Fluid outlet fitting size: 3/4 inch NPT
   5. Collection funnel size: 22 by 24 inches
   6. Capacity: 25 gallons

C. Features/Performance/Construction:
   1. Unit shall be constructed of heavy duty, durable UV-stabilized polymer.
   2. The unit shall include a gravity feed drain valve and a quick disconnect method of suction-evacuation from the top of the unit.
   3. The unit shall be mounted on semi-pneumatic, synthetic rubber wheels and polyurethane front casters.
   4. The unit shall contain a funnel assembly capable of extending to 72 inches.
   5. The unit shall be dent, rust, and corrosion resistant.

D. Finish: UV-stabilized polymer complete with necessary markings to readily identify contents.

2.25 RECEIVER, USED OIL, 25 GALLONS
Equipment Identifier: 7999

A. Manufacturer's Reference:
   1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
      a. Graco, Incorporated, Minneapolis, MN (612) 623-6000
      b. Model: 238866

   2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
      a. Balcrank Corporation, Weaverville, NC (828) 645-4261

b. Lincoln, A Pentair Company, St. Louis, MO (314) 679-4200

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 24 inches
b. Width: 24 inches
c. Height: 69 inches

2. Fluid inlet/inspection port size: 3 inch (76 millimeter) buttress
3. Fluid outlet fitting size: 3/4 inch NPT
4. Collection funnel size: 22 by 24 inches
5. Capacity: 25 gallons

C. Features/Performance/Construction:
1. The unit shall be constructed of heavy duty, durable UV-stabilized polymer.
2. The unit shall include a gravity feed drain valve and a quick disconnect method of suction-evacuation from the top of the unit.
3. The unit shall be mounted on semi-pneumatic, synthetic rubber wheels and polyurethane front casters.
4. The unit shall contain a funnel assembly capable of extending to 72 inches.
5. The unit shall be dent, rust, and corrosion resistant.

D. Finish: UV-stabilized polymer complete with necessary markings to readily identify contents.

PART 3 - EXECUTION

3.1 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

B. Inspect equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.

3.2 INSTALLATION

A. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect.

B. Install equipment in accordance with plans, shop drawings, and manufacturer’s instructions:
1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.
2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
3. Anchorage: Attach equipment as detailed or directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.
4. Air compressor and dryer system:

a. Install compressor unit on concrete foundation with sole plates and isolators. Level, grout, and bolt in place.
b. Make air cock and drain connection on horizontal casing.
c. Install line size ball valve and anti-return valve on compressor discharge.
d. Install replaceable cartridge type filter silencer of adequate capacity for each compressor.
e. Install condensate filter between compressor and dryer
f. Connect condensate drains to nearest floor drain.
g. Install valved bypass around air dryer. Factory insulate inlet and outlet connections.
h. Install takeoffs to outlets from top of main with shutoff valve after takeoff.

5. Fluid storage tanks:
   a. Tank shall be seismically braced and anchored to meet all local, state, and federal codes and provisions.
   b. Used oil tank shall be vented to the outside of the building.
   c. Remove support feet channels prior to final installation.

C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.3 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

3.4 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing and installation debris from job site.

D. Notify Architect or designated representative for acceptance inspection.

3.5 TRAINING

A. Direct the technical representative to provide specified hours of training to designated Owner's maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.
   1. 2158 Compressor, air, receiver mounted, 5 HP, duplex; 1 hour (minimum)
   2. 2160 Compressor, air, vertical receiver mounted, 5 HP; 2 hours (minimum)
   3. 2165 Compressor, air, rec. mtd., 25 HP duplex; 2 hours (minimum)
   4. 2226 Dryer, air, refrigerated, 25 CFM; 0.5 hours (minimum)
   5. 2228 Dryer, air, refrigerated, 50 CFM; 1 hour (minimum)
   6. 2230 Dryer, air, refrigerated, 200 CFM; 1 hours (minimum)
   7. 7250 Hose and dispenser (CG); 0.5 hours (minimum)
   8. 7255 Hose and dispenser (GO); 0.5 hours (minimum)

9. 7520 Pump, air piston, 10:1 ratio (ATF1, ATF2, EO1, EO2, GO); 0.5 hours (minimum)
10. 7531 Pump, diaphragm, non-mixing, 50 GPM (EC1, EC2); 1 hour (minimum)
11. 7532 Pump, diaphragm (DEF); 1 hour (minimum)
12. 7540 Pump, diaphragm, used fluid evacuation (UO); 0.5 hours (minimum)
13. 7541 Pump, diaphragm, used fluid evacuation (UC); 0.5 hours (minimum)
14. 7950 Tank, double wall, cube, 120 gallon (ATF1, ATF2, EC1, EC2, EO1, EO2, GO, UC); 1 hour (minimum)
15. 7960 Tank, double wall, cube, 280 gallon (EC2, EO2); 1 hour (minimum)
16. 7970 Tank, double wall, cube, 500 gallon (UO);1 hour (minimum)

B. Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.

END OF SECTION 11 11 00

SECTION 11 11 26 - VEHICLE WASH EQUIPMENT

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.1 WORK INCLUDED

A. Equipment items as listed below by Equipment Identifier:
   1. 3824 Washer, vehicle, gantry, three brush, with reclamation (Ref. Part 2.1)

B. Installation:
   1. General Contractor shall provide final connection of equipment to all utilities, including disconnects, floor, piping and conduit structures, with labor services and incidentals necessary for complete and operational equipment installation.
   2. Manufacturer's Representative shall provide piping, wiring, and switching between equipment and roughed-in utilities and equipment connections. Installer is responsible for all system wiring and plumbing for a complete operation of wash equipment after installation.
   3. General Contractor shall coordinate all washer features which interface with building systems that are required beyond the roughed-in utilities and equipment disconnects between wash equipment components with the manufacturer before construction of building and approval of the manufacturer's shop drawings.

1.2 QUALITY ASSURANCE

A. Experience: Equipment shall be produced by a manufacturer of established reputation with a minimum of 5 years experience supplying specified equipment.

B. Manufacturer's Representative:
   1. Installation: Provide a qualified manufacturer's representative at site to supervise work related to equipment installation, check out, and start up.
   2. Training: Provide technical representative to provide training to Owner's maintenance personnel in operation and maintenance of specified equipment.
   3. Service: Provide a qualified manufacturer's representative to respond within 24 hours of a malfunction with the equipment during the warranty period.

C. Performance:
   1. Manufacturer's representative of the washer and water reclamation system shall be responsible for the design of a washer and reclaim that satisfactorily washes the owner's vehicle fleet.
   2. The equipment shall satisfactorily wash up to approximately eight vehicles per hour.
   3. The amount of detergent used per vehicle to remove road film shall not exceed 0.4 gallons. The evaluation of the system capability to remove road film shall be determined only after the vehicles have dried after the washing has been completed.
   4. Manufacturer or Supplier shall guarantee the control of any unpleasant odors created by the water reclamation system for the warranty period after final acceptance. Manufacturer or Supplier shall, as necessary, take whatever action is required, without cost to the owner, to correct any odor created by the wash system without the use of chemicals during the warranty period.

1.3 SUBMITTALS

A. Product Data: Submit Product Data in accordance with Division 1 of these specifications.

B. Operations and Maintenance Manual:
1. Submit Operations and Maintenance Manuals in accordance with Division 1- General Requirements of these specifications.
2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.
3. Description of system and components.
4. Schematic diagrams of electrical, plumbing, and compressed air system.
5. Manufacturer's printed operating instructions.
6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

C. Shop Drawings: Submit Shop Drawings in accordance with Division 1.

1.4 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance will be based on the technical requirements herein as determined by Owner and Architect.

1.5 WARRANTY

A. Warranty work against defects in materials, functions and workmanship specified herein shall be good for 1 year from substantial completion.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer's recommended preventive maintenance schedule.

D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

E. All parts shall be readily available locally in the United States.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.

C. Provide equipment and materials specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.7 LABELING

A. Manufacturer shall securely attach in a prominent location, on each major item of equipment, a non-corrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.

B. Label all piping in vehicle wash and water reclaim systems as to its function and flow directions.

C. All electrical equipment and materials shall be new and shall be listed by Underwriter's Laboratories, Inc. (UL) in categories for which standards have been set by that agency and labeled as such in the manufacturer's plant.

PART 2 - PRODUCTS

2.1 WASHER, VEHICLE, GANTRY, THREE BRUSH, WITH RECLAMATION
Equipment Identifier: 3824

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction
a. Westmatic, Buffalo, NY (866) 747-4567
b. Model No.: Multiwash three brush rollover

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.
a. Interclean, Yspilanti, MI (734) 975-2967
b. Ross and White, Cary, IL (847) 516-3900

B. General Description:
1. Wash system:
a. The wash system shall be a heavy-duty, three-brush rollover wash system capable of washing a high volume of the Owner's fleet including: 30- to 40-foot buses, and 23-foot paratransit buses.
b. The machine shall control the wash process to provide a consistent wash result without relying on the judgment of individual drivers.
c. The unit shall be manufactured according to quality assurance standards of ISO 9001 and environmental standards of ISO 14001.
d. This system shall be capable of washing the front and rear of vehicles several times on a single wash pass and includes mirror detection. The machine shall fully control the degree of brush pressure on the vehicle and it shall automatically self-adjusts as required.
e. The wash functions of this system shall operate automatically.

f. The system shall be complete with all control systems, metering devices, drive motors, pump stations, and boom assemblies.

2. Operation:
   a. Vehicles entering the wash area shall stop just before entering the rollover gantry. The Driver shall be signaled to STOP by a red traffic light.
   b. The Driver shall select the wash program on the main control box and starts the machine.
   c. The brushes shall move to the front of the vehicle. The front area shall be cleaned by overlapping side brushes or the roof brush, or both depending on the selected wash program.
   d. Once the front cleaning function is complete, the brushes shall withdraw and move automatically around the mirrors.
   e. The machine shall wash the sides and the roof of the vehicle.
   f. The side brushes shall then move into the back of the vehicle, cleaning with overlapping side brushes or the roof brush, or both depending on selected wash program. Alternate program choices shall be available to accommodate different styles of vehicles within the fleet.
   g. Once the rear has been cleaned, the machine shall rinse the vehicle and then return to home position. The Driver shall be signaled to EXIT the wash by a green traffic light.

C. Capacities/Dimensions (nominal):
1. Wash system:
   a. Length: 189-3/8 inches
   b. Width: 840 inches
   c. Height: 216-1/4 inches

2. Vehicle dimensions:
   a. Length: 45 feet, maximum
   b. Width: 10 feet, maximum
   c. Height: 12 feet, maximum

D. Features/Performance/Construction:
1. Brush machine housing:
   a. All frame and steel components shall be hot dipped galvanized. The frame structure of the gantry shall be enclosed with painted galvanized sheet metal and PVC splash guards. Each side of the gantry shall have a cabinet door, gaining access to machine components and controls. All gearboxes and motors shall be encased inside the machine for the highest quality of protection against water. Floor rails shall be hot dipped galvanized and equipped with derailing protection system. The gantry shall be direct driven via VFD-motors. (Variable Frequency Drive). Chain drive is unacceptable.
   b. All frame structures shall be hot dip galvanized steel.

2. Brushes:
   a. The system shall be equipped with two vertical side brushes and one horizontal roof brush. The side brushes (1 and 2) shall be suspended and full length, capable of washing the vehicle's front if desired, as well as the rear of the vehicle multiple times with an overlapping movement. This set

of brushes shall wash the vehicle's sides and shall be equipped with mirror detection. This function shall be capable of multiple programs to accommodate various styles of vehicles that exist in the fleet presently, and any future styles that may be procured during the lifetime of the wash system. Pneumatics is not acceptable to control the brushes.

b. Brush pressure shall be electrically driven, with the inclusion of an amperage meter for all brushes (1, 2, and 3), which is to constantly monitor pressure on the vehicle's surface. The movement of the overlapping side brushes shall be electrically controlled with motors and worm gearboxes via maintenance-free steel reinforced cog belts. Movement via gravity alone, pneumatics, or hydraulics is not acceptable. The movement of the roof brush is electrically controlled with motors and worm gearboxes via maintenance-free cog belts.

c. Should pressure become too high due to malfunction or driver error, the system shall automatically shut down to prevent damage. The cause of the shut down shall be indicated on an LCD Touch Screen within the control panel. Reactivation of the system shall be achieved by resetting the alarm/breaker switch.

d. Brush pressure shall be self-monitoring and self-adjusting to pre-programmed levels prior to the commencement of each wash.

e. Bristles shall be polyethylene material that is "X" grooved to facilitate water and detergent delivery. The tips shall be flagged to provide soft touch to prevent scratching to glass and paint. Each brush section shall consist of a pliable plastic backing which is mounted to a 4-3/4 inch hot dip galvanized steel shaft with a wall thickness of 0.16 inch. Aluminum is unacceptable. The design shall be such that all sections for the side brushes shall be full density with a minimum of 84 tips per square inches on all brush sections. Sections of less density brushes are not acceptable.

f. Brushes shall have a provision of water and detergent delivery. The mixture of detergent to the brushes shall be adjustable from the floor level allowing for adaptation to wash conditions. Piping shall be galvanized with brass spray tips.

g. Brushes shall be driven by high-efficiency, energy efficient and durable 3 HP, 3 phase, 60 Hz TEFC electric motors.

3. Supply cables and cable support:

a. The festoon system shall consist of a C-profile with trolley wagons. All steel details shall be hot dipped galvanized including the brackets for fastening to the wall.

4. Detergent injection pump:

a. The dosing pump for detergent distribution to the brushes shall be a self-priming diaphragm pump. The pump shall consist of:

1) A cabinet incorporating the drive unit and the electronics.

2) A dosing head with back plate, diaphragm valves, connections and vent valve.

3) As the pump is always dosing at full stroke length, it shall ensure the same high accuracy and suction capability, irrespective of the capacity, which shall be infinitely variable in the ratio 1:100. The

pump shall feature a user friendly control panel which gives access to the pump functions.

5. Final rinse arch:
   a. The final rinse spray arch shall consist of a 3/4 inch galvanized pipe equipped with no less than 20 brass spray tips, mounted on a galvanized frame. Components such as plastic tips, or PVC pipe, are not acceptable.
   b. The system shall provide a complete rinse utilizing no more than 30 GPM at 45 PSI.

6. Tire guide rails:
   a. The tire guide rails shall be flared at the entrance to facilitate entrance into the wash. The guide rails shall be constructed of 4 inch tubular steel pipe. Rail height shall not exceed 6 inches. All sections shall be smoothly finished to avoid damage to tires. Rails shall be anchored to the floor with 1/2 inch galvanized or non-corrosive concrete lag bolts.
   b. All components of the tire guide rails shall be hot dip galvanized steel.

7. Water softener:
   a. Installation shall include a commercial services water softener capable of supplying soft water with excellent abilities of hardness removal.
   b. The softener shall have a corrosion resistant multi-port hydraulic valve with a bypass valve. Flow regulators shall be self-adjusting providing uniform flow rates regardless of pressure. The unit is to be modular in design will all service parts contained within removable cartridges.
   c. All softener regeneration cycle times shall be fully adjustable. Error diagnostics shall also be displayed for troubleshooting assistance. The unit shall have a battery backup for memory retention, negating the need to reprogram in the event of power interruption.
   d. Tanks shall be designed for a working pressure of 100 PSI. The pressure vessel shall be constructed of non-corrosive reinforced fiberglass, containing high efficiency softening resin with no color throw, and long life physical stability. A 40 gallon brine tank shall be equipped with a float operated shut-off to prevent brine tank overflow shall be included.
   e. The system shall contain one shutoff valve on the main water feed into the water softener, and one shutoff on each of the fresh water lines leading to the wash unit and the chemical mixing systems.
   f. A by-pass valve shall be included in case of trouble or service for the water softener.

8. Water recycling system:
   a. Shall be used to achieve highest economical level of water recycling without the use of any chemical additives.
   b. Shall recycle 85 percent of used water, minimum.
   c. Shall include stainless steel hydro-cyclones as mechanical purifying unit.
   d. Shall be capable of purification level down to 10 microns density 2 with dirt load of 1 gram per liter.
   e. Fresh water cross-over shall be included (in case of disrupted operation).
   f. Submersible pump for recycled water shall be mounted in ground tank.

g. Two multi-stage vertical stainless steel centrifugal pumps shall be included (one filter pump and one wash water feed pump), each with a 3 HP direct drive motor. Capacity of each pump is 44 GPM at 71 PSI. All vital parts shall be polished stainless steel SIS 2333.

h. All pumps shall be designed for dirty water with oil resistant gaskets and ceramic seals.

i. Shall include buffer tank, 137 gallons (520 liters), manufactured in plastic with automatic refill and level control. Shall include low water level pump protection.

j. Shall include hot dipped galvanized framework. System shall be skid mounted, pre-wired, and pre-plumbed.

k. System shall include generator for removal of bacteria and odors in recycled water. Generator shall be completely automatic function producing approximately 5 grams of ozone per hour.

9. Heat tracing:

a. All water lines and chemical line(s) to gantry system shall be heat-traced.

10. Controls:

a. The system shall be equipped with self-diagnostic software that indicates any errors, malfunctions, or other stoppages on a display screen. The nature of the shut down shall be displayed on the LCD Touch Screen mounted in the XBT-control panel. The terminal shall have three different color backgrounds depending on the status of the machine. Green for OPERATIONAL MODE, Orange for EMERGENCY STOP and Red for ALARM. The XBT terminal in the machines electric main control box shall adjust the load sensitivity using power relays. The main control box with the control panel shall be mounted on the left hand side of the gantry.

b. The system shall include a counter which displays the number of washes performed, both collectively and in various programs chosen. The system shall contain the capability to perform numerous unique wash programs for differing wash choices. Alternate wash selections can be activated by the driver on a control panel prior to commencing the wash. The M340 PLC-steering shall control and monitor the entire cleaning process.

c. All electrical components and cabinet shall be UL/ULC listed. All control panels shall be UL/ULC listed as a complete enclosed industrial control panel.

d. There shall be four emergency stop buttons, located on each corner of the machine including one on the main control box.

e. The main control box shall include an XBT-control panel with a LCD Touch Screen to provide the following standard functions:

1) Wash Program 1: Paratransit Bus
2) Wash Program 2: Transit Bus (Flat nose Bus)
3) Wash Program 3: Truck
4) Wash Program 4: Minivan
5) Wash Program 5: Car
6) Side Brushes On/Off
7) Roof Brush On/Off
8) Detergent Arch On/Off (Optional)

9) Start Wash Machine “Enter”
10) Reset Wash Machine
11) Roof Brush Up
12) Side Brushes Apart
13) Manual Operation (Service Menu)
14) Drive-through Mode (Optional)
15) Master Menu
16) Emergency Stop
17) Emergency Stop Reset
18) The manual system shall be capable of over-riding the automated programmed selection.

E. Utility Requirements:
1. Ozone generator: 120 VAC, 1 phase, 5 A
2. Gantry: 460 VAC, 3 phase, 20 A
3. Gantry: 120 VAC, 1 phase, 5 A
4. Pump control panel: 460 VAC, 3 phase, 60 A
5. Plumbing:
a. Domestic water: 1-1/2 inch connection, 60 PSI
b. Compressed air: 1/2 inch connection, 60 PSI

F. Finish: All fabricated sections of the washer frame and miscellaneous structures shall be hot dip galvanized after fabrication per ASTM A123 or A385. Metallic surfaces not suitable for galvanizing shall be coated with 95 percent zinc primer and covered with industrial grade enamel. All erection bolts shall be plated Grade 5.

PART 3 - EXECUTION

3.1 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.

C. Report in writing to the Architect, any damaged, missing or incomplete scheduled equipment, and improper rough-in work or utility stub-outs.

3.2 INSTALLATION

A. Manufacturer’s representative shall be responsible for complete operational equipment installation.

B. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect or designated representative.

C. Install equipment in accordance with plans, shop drawings, and manufacturer’s instructions:

1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.
2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
3. Anchorage: Attach equipment as directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.
4. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

D. Manufacturer shall provide an initial fill of all soap and solution tanks with the recommended brand of chemicals. A list of all recommended chemicals shall be provided to the owner.

3.3 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specification in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

B. Each washer shall be performance tested by consecutively washing, without human assistance and without Manufacturer's representative personnel involvement, up to about three vehicles of owners choosing within 30 minutes.

C. Prior to final acceptance of the Vehicle Wash Equipment by the Owner, the Manufacturer's Representative shall demonstrate the continuous operating capacity of the Reclamation System in relation to the Wash Equipment. During the 60-minute test, no manual adjustments or overrides are allowed and no solenoid shall be allowed to fill the reclamation tank with fresh water should the sump pump capacity be not able to keep the recycled water tank full.

D. Equipment shall not damage vehicles, including mirrors, windshield wipers and windows, or equipment itself.

E. Malfunctions during testing shall be corrected within 5 days and re-tested. Malfunctions during second testing shall be corrected within 5 days and re-tested.

F. Inadequate Performance: If equipment fails third test, Owner may elect to have all specified Vehicle Wash Equipment and any associated water reclamation system removed from site at no cost or obligation to Owner.

G. The vehicle air dryer must be able to dry off a line of consecutive vehicles going through the wash with no more than 6 feet separating each vehicle. If the wash system is unable to perform the above requirements, it is not acceptable.

H. All damage to the machine that is incurred as a result of the test shall be the responsibility of the manufacturer/supplier.

I. Vehicle was equipment shall not damage vehicles, including mirrors, windshield wipers or windows, or the equipment itself.

J. Inadequate performance: If equipment fails the third test, Owner may elect to have all specified vehicle wash equipment and any associated water reclaim system removed from site at no cost or obligation to the Owner.

3.4 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing or installation debris from job site.

D. Notify Architect or designated representative for acceptance inspection.

3.5 TRAINING

A. Direct the technical representative to provide specified hours of training to designated Owner's maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.
1. 3824 Washer, vehicle, gantry, three brush, with reclamation; 2 hours (minimum)

B. Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.

END OF SECTION 11 11 26

SECTION 11 11 29 - SHOP EQUIPMENT

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.1 WORK INCLUDED

A. Equipment items as listed below by Equipment Identifier:
1. 1200 Cart, parts (Ref. Part 2.1)
2. 2085 Buffer/grinder, 8 inch, with pedestal (Ref. Part 2.2)
3. 2205 Drill press, variable speed, 15 inch (Ref. Part 2.3)
4. 2220 Drill press, variable speed, 20 inch (Ref. Part 2.4)
5. 2340 Scrubber, floor, 28 inch path, mobile, battery operated (Ref. Part 2.5)
6. 2360 Lathe, brake drum (Ref. Part 2.6)
7. 2525 Press, air/hydraulic, 25 ton (Ref. Part 2.7)
8. 2690 Saw, band, horizontal (Ref. Part 2.8)
9. 2698 Saw, cutoff, abrasive, 14 inch (Ref. Part 2.9)
10. 2832 Vise, combination, swivel base, 5 inch (Ref. Part 2.10)
11. 2880 Vise, electronics, swivel base (Ref. Part 2.11)
12. 2915 Welder, MIG, portable, with wire feed (Ref. Part 2.12)
13. 3280 Extractor, fume, welding, portable, 800 CFM (Ref. Part 2.13)
14. 3540 Tank, parts cleaning, 15 gallon (Ref. Part 2.14)
15. 3783 Parts washer, automatic, front load (Ref. Part 2.15)
16. 5558 Lift, platform, work, mobile (Ref. Part 2.16)
17. 9315 Cover, safety, metal, rolling (Ref. Part 2.17)
18. 9340 Kit, spill containment, with waste drum (Ref. Part 2.18)
19. 9350 Counting machine, currency (Ref. Part 2.19)
20. 9360 Counter/sorter, coin (Ref. Part 2.20)
21. 9510 Harness, safety, i-beam, trolley, self retracting (Ref. Part 2.21)
22. 9565 Probe, farebox, software system (Ref. Part 2.22)

B. Roughing-in, installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.

C. Piping, wiring, and switching between equipment and utilities.

1.2 QUALITY ASSURANCE

A. Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.

B. Manufacturer’s Representative:
1. Installation: Provide a qualified manufacturer’s representative at site to supervise work related to equipment installation, check out, and start up.
2. Training: Provide technical representative to provide training to Owner’s maintenance personnel in operation and maintenance of specified equipment.

1.3 SUBMITTALS

A. Product Data:
   1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.
   2. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

B. Operations and Maintenance Manual:
   1. Submit Operations and Maintenance Manuals in accordance with Division 1- General Requirements of these specifications.
   2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.
   3. Description of system and components.
   4. Schematic diagrams of electrical, plumbing, and compressed air system.
   5. Manufacturer's printed operating instructions.
   6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

C. Shop Drawings:
   1. Submit Shop Drawings in accordance with of Division 1 - General Requirements of these specifications.
   2. Submit site specific installation drawings and procedures.

1.4 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance will be based on the technical requirements herein as determined by Owner and Architect.

1.5 WARRANTY

A. Warrant work specified herein for one year from substantial completion against defects in materials, functions, and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish.

D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

E. All parts shall be readily available locally in the United States.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.

C. Provide equipment and materials specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.7 LABELING

A. Manufacturer shall securely attach in a prominent location, on each major item of equipment, a non-corrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.

B. All electrical equipment and materials shall be new and shall be listed by Underwriter's Laboratories, Inc. (UL) in categories for which standards have been set by that agency and labeled as such in the manufacturer's plant.

PART 2 - PRODUCTS

2.1 CART, PARTS
Equipment Identifier: 1200

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
   a. Pucel Enterprises, Inc., Cleveland, OH (216) 881-4604
   b. Model No.: 2448-DT-3-P

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Hodge Manufacturing Company, Inc., Springfield, MA (413) 781-6800
   b. Equipto, Tatamy, PA (610) 253-2775

B. Capacities/Dimensions:
1. Cart capacity: 1,000 pounds (minimum)
2. Overall dimensions:
   a. Length: 24 inches
   b. Width: 48 inches
   c. Height: 32-1/2 inches

C. Features/Performance/Construction:
1. Cart and shelves shall be constructed of 12 gauge steel.
2. Shelves shall be tray style with a clearance between shelves of 10 inches.
3. Casters shall be phenolic with two casters rigid and two casters swivel. Casters shall be able to accommodate 1,000 pounds.

D. Finish: Durable enamel in Owner's choice of manufacturer's standard colors

2.2 BUFFER/GRINDER, 8 INCHES, WITH PEDESTAL
Equipment Identifier: 2085

A. Manufacturer's Reference:
   1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
      a. Baldor Electric Co. , Fort Smith, AR (479) 646-4711
      b. Model No.: 8250W with accessories

   2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
      a. Delta Machinery, Jackson, TN (800) 223-7278
      b. Cincinnati Electric Tool, Inc., Cleves, OH (513) 941-5000

B. Capacities/Dimensions:
   1. Overall dimensions:
      a. Length: 24 inches
      b. Width: 13 inches
      c. Height: 47 inches

   2. Wheel:
      a. Diameter: 8 inches
      b. Thickness: 1 inch
      c. Bore: 3/4 inch

   3. Distance between wheels: 16-5/8 inches.
   4. Height to center of spindle: 39-3/8 inches.
   5. Motor: 3/4 HP, 3,600 RPM

C. Features/Performance/Construction:
   1. Motor shall be totally enclosed, direct drive motor rated for continuous service, with permanently lubricated ball bearings.
   2. Wheels shall consist of one medium grit and one general purpose wire type.
   3. Wheel guards shall be adjustable for wheel wear and shall include adjustable work rests and spark breakers.
   4. Quenching pot shall be mounted on pedestal that supports grinder.

D. Controls: Push button magnetic starter shall have "On/Off" push button switch; motor thermal

E. Accessories:
   1. Illuminated eye shield: No. GA9S
   2. Pedestal, cast iron: No. GA16 (one each)

F. Utility Requirements: 120 VAC, 1 phase, 3/4 HP, 4.8 A, provide standard grounded receptacle

G. Finish: Durable enamel in manufacturer's standard color

2.3 DRILL PRESS, VARIABLE SPEED, 15 INCHES
Equipment Identifier: 2205

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
   a. WMH Tool Group/Jet/Wilton, La Vergne, Tennessee (615) 793-8900
   b. Model: J-2500 with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Palmgren Tools, Chicago, IL (773) 265-5700
   b. Emerson-RIDGID, St. Louis, MO (314) 553-2000

B. Capacities/Dimensions:
1. Overall dimensions, nominal:
   a. Length 13 inches
   b. Width: 31 inches
   c. Height: 63 inches

2. Range of spindle speed: 200 to 3630 RPM
3. Working dimensions: Spindle to base: 48-3/4 inches
4. Table working surface:
   a. Width: 11-1/2 inches
   b. Depth: 11-1/2 inches
   c. Tilt range: 45 degrees to left and right

5. Base working surface:
   a. Width: 11 inches
   b. Depth: 19-1/2 inches

6. Capacities:
   a. Spindle taper: 2 degrees morse taper
   b. Spindle travel: 3-1/8 inches
   c. Drill to center of circle: 15 inch diameter
   d. Quill: Ground steel 1-7/8 inch diameter

C. Features/Performance/Construction:
1. Drill press shall have a cast iron head.
2. Drill press shall have a larger quill for greater accuracy.
3. Head casting shall feature a permanently lubricated ball bearing spindle assembly, using four heavy duty ball bearings mounted in an enclosed quill for extended lift.
4. Large ground steel column diameter for maximum head and table support.
5. Hinged metal belt and table support.
6. Accurate depth stop displays inch/mm and has quick set bolt for fast, accurate adjustments.
7. 5/8 drill chuck and arbor.
8. Power cord shall have three-wire grounding cord with three-prong plug.

D. Controls: Push-button switch shall include shrouded START button and protruding STOP button. Switches and other electrical controls shall meet applicable National Electrical Code requirements.

E. Accessories:
1. Taper mount chuck: Jet Model No. TDC-501

F. Utility Requirements: 120 VAC, 1 phase, 3/4 HP, provide standard grounded receptacle

2.4 DRILL PRESS, VARIABLE SPEED, 20 INCHES
Equipment Identifier: 2220

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
a. Clausing Industrial, Kalamazoo, MI (269) 345-7155
b. Model: 2277 with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. WMH Tool Group/Jet/Wilton, La Vergne, TN (615) 793-8900
b. Dake Machine Tools, Grand Haven, MI (800) 937-3253

B. Capacities/Dimensions:
1. Overall dimensions, nominal:
a. Length: 22 inches
b. Width: 36 inches
c. Height: 66 inches

2. Working dimensions:
a. Chuck to table: 33 inches
b. Chuck to base: 43 inches

3. Table working surface:
a. Width: 22 inches
b. Depth: 19-1/2 inches
c. Tilt range: 90 degrees to left and right

4. Base working surface:
a. Width: 15-1/2 inches
b. Depth: 13 inches

5. Motor: 1.5 HP
6. Speed: 150 to 2,000 RPM
7. Capacities:
a. Spindle: 3MT, 1.74 inches
b. Spindle travel: 6-1/2 inches
c. Drill to center of circle: 20 inch diameter
d. Hand feed: 1.25 inch diameter

e. Column: Ground steel, 4 inches diameter and 1/2 inch wall thickness

C. Features/Performance/Construction:
1. Speed control shall permit positive speed changing while machine is running and hold speed setting constant under all load conditions.

2. Belt drive shall remain aligned and automatically maintain full power transmission to spindle at all times.
3. Work table shall have slots, side ledges, and machined front apron with mounting holes shall be provided for clamping of work with mounting holes.
4. Tilt table shall have scale to provide accurate readings to 90 degrees right and left with index pin at level and 45 degrees left and right positions.
5. Table lock shall have expanding bushing to provide rigid positioning of tables at any angle.
6. Hand gear crank shall be provided for table adjustment.
7. Safety features shall include self-ejecting chuck key and completely enclosed drive belt and pulleys.
8. Motor shall be totally enclosed fan-cooled (TEFC):
   a. Power cord shall have three-wire grounding cord with three-prong plug.

D. Controls:
1. Push-button switch shall include shrouded START button and protruding STOP button. Switches and other electrical controls shall meet applicable National Electrical Code requirements.
2. Depth control shall be self-locking adjustable feed depth stop.
3. Function controls shall provide manual speed selection and feed via knobbed spoked wheels.

E. Accessories:
1. Chuck: Clausing No. 1897
2. Arbor adapter: Clausing No. 1898

F. Utility Requirements: 460 VAC, 3 phase, 1-1/2 HP, provide disconnect

2.5 SCRUBBER, FLOOR, 28 INCH PATH
Equipment Identifier: 2340

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
   a. Tennant, Minneapolis, MN (763) 540-1200
   b. Model: 5700-700 D fast detergent

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Clarke , Plymouth, MN (314) 721-7255
   b. American Lincoln, Marietta, GA (816) 213-3025

B. Capacities/Dimensions:
1. Overall dimensions:
   a. Length: 64 inches
   b. Width: 37-1/2 inches
   c. Height: 43 inches

2. Motors:
   a. Scrubbing system: 0.6 HP
   b. Transaxle: 0.5 HP

C. Features/Performance/Construction:
1. The unit shall include an operator console with adjustable height.
2. Operator console shall have a battery level indicator, condition meter, and brush pressure gauge.
3. The unit shall have pneumatic tires.
4. The unit shall have an integral battery charger with cord to plug into a standard grounded receptacle for charging.
5. Automatic scrubber shall be capable of operating for two hours without recharging.
6. The unit shall have a cleaning path of 28 inches.
7. Frame and scrub head linkage shall be protected from damage during a collision when operating unit.
8. Recover tank filter shall prevent contaminants from entering the vacuum.
9. Recovery system shall include a 30-gallon polyethylene solution tank, 30 gallon polyethylene recovery tank, and a 10 gallon demisting chamber.
10. The unit shall include two non-scuff polypropylene disk brushes standard. Accessories should include additional pads, minimum six.

D. Detergent:
1. Chemical shall be foam-activated
2. Chemical shall have three grades, from light-duty cleaner to heavy-duty de-greaser
3. High traction shall be certified by NFSI

E. Controls:
1. Single button operation to lower scrub head and set down pressure.
2. Push button water and brush start button.

F. Utility Requirements: Electrical - 120 VAC, 20 A; battery powered, provide receptacle adjacent to equipment storage position

2.6 LATHE, BRAKE DRUM
Equipment Identifier: 2360

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Ammco Tools, La Vergne, TN, (800) 688-6496
b. Model: 4000B with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Gamco Co. Inc., Chicago, IL (773) 436-0022
b. Hunter Engineering Co., Bridgeton, MI (314) 731-3020

B. Capacities/Dimensions:
1. Overall dimensions, less accessories:
a. Length: 48 inches
b. Width: 34-1/2 inches
c. Height: 47 inches

2. Motor: 1 HP
3. Drum capacity range:

a. Diameter: 6 to 28 inches
b. Depth: 6.875 inches

4. Rotor width: Up to 1.69 inches
5. Spindle speed: 100, 200 RPM
6. Bearing surface: 40 square inches, minimum
7. Arbor capacity:
   a. Up to 100 pounds with standard 1 inch spindle.
   b. Up to 200 pounds with optional 1.875 inch spindle.

8. Spindle diameter: 2.875 inches

C. Features/Performance/Construction:
1. Spindle feed shall be infinitely variable from 0.002 inches to .020 inches per revolution.
2. Three speed pulleys shall allow optimum RPM selection.
3. Lathe shall be capable of machining drums and rotors on most passenger cars, light trucks, and some medium duty trucks.
4. Twin cutter tool shall simultaneously resurface both sides of the rotor.
5. Self lubrication shall begin when unit is switched to the on position.
6. Depth-of-cut dials shall be calibrated in both thousandths of inches and tenths of millimeters for precise control of stock removal.
7. Hex boring bar shall guarantee correct tool angle.
8. Housing shall be heavy fabricated steel and cast iron base enclosing motor drive, and have bolt holes for attachment to slab.
9. Arbors shall be hardened and ground for durability and smooth operation.
10. Standard items:
    a. 1 inch centering cone spring
    b. 1 inch arbor
    c. 1 inch hubless drum adaptor: 5.625 inches
    d. 1 inch hubless drum adaptor: 5.750 inches
    e. 1 inch arbor nut
    f. 1 inch hubless adaptor: 3.625 inches
    g. 1 inch hubless adaptor: 4.500 inches
    h. Centering cone: 3.421 by 4.031 inches
    i. Centering cone: 2.890 by 3.500 inches
    j. Centering cone: 2.650 by 3.224 inches
    k. Centering cone: 2.328 by 2.968 inches
    l. Centering cone: 1.703 by 2.750 inches
    m. Centering cone: 1.187 by 2.250 inches
    n. Centering cone: 1.250 by 1.750 inches
    o. 1 inch self aligning spacer
    p. 1 inch self-aligning spacer: 0.5 inch long
    q. 1 inch double taper adaptor: 1.322 by 1.670 inches
    r. 1 inch double taper adaptor: 1.362 by 1.710 inches
    s. 1 inch double taper adaptor: 1.711 by 2.073 inches
    t. 1 inch double taper adaptor: 2.074 by 2.440 inches
    u. 1 inch double taper adaptor: 2.441 by 2.897 inches
    v. 1.0625 by 1.25 inches and 0.3125 by 0.375 inch wrenches
    w. 1.75 inch drum silencer band

x. Heavy-duty boring bar
y. Twin cutter
z. Ventilated rotor silencer band
aa. Solid rotor silencer band
bb. Safety shield
cc. Negative rake tool bit assembly
dd. RH negative rake tool bit assembly
ee. LH negative rake tool bit assembly
ff. Brake specifications manual
gg. Adjustable 100 watt work lamp

D. Controls: Thermal overload motor protection

E. Accessories:
1. Lathe bench: Ammco No. 2500
2. Cutter tool set: Ammco No. 7999
3. Adapter set: Ammco No. 9310
4. Clamping plate set: No. 8888 (vehicle)
5. Clamping plate set: No. 8889 (light truck)

F. Utility Requirements: 120 VAC, 1 phase, 1 HP, 20 A, provide standard grounded receptacle

G. Finish: Durable enamel in manufacturer's standard colors

2.7 PRESS, AIR/HYDRAULIC, 25 TON
Equipment Identifier: 2525

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
a. Dake, Grand Haven MI (616) 842-7110
b. Model: 6-225

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. OTC (Division of SPX), Owatonna, MN (507) 455-7000
b. Ram-Pac Industries, New Berlin, WI (877) 385-8502

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 42-1/2 inches
b. Width 30 inches
c. Height: 81 inches

2. Weight: 750 pounds
3. Ram speed: 110 inches per minute (advance), 6 inches per minute press
4. Capacity: 25 tons
5. Inside width: 33-1/2 inches
6. Width between table rails: 5-3/16 inches

7. Minimum ram to table: 1 inch
8. Maximum ram to table: 36 inches
9. Ram travel: 10 inches
10. Horizontal workload travel: 13-1/2 inches
11. Number of pumps: One
12. Air pressure: 90 to 160 pounds

C. Features/Performance/Construction:
1. Head and bed rails shall be constructed of channel steel with channel ends and corners cut and ground.
2. Pumps shall be accessory, air-operated hydraulic-type with spring return, rapid arm advance to work with 20 percent of full capacity and hardened and ground pump plungers with bronze guides in honed cylinders. Shelf construction shall be double flanged 18 gauge steel with box-formed edges on all four sides with front and rear shelf edge reinforcing channels.
3. Pump control shall be maintained by manual speed control knob for selecting low or high range advance and working force.
4. Table shall be vertically adjustable with self-locking winch mounted inside of frame.
5. Pressure gauge shall be high precision, liquid fillable, stainless steel cased, and shall be calibrated in tons and psi.
6. Equipment protection package shall include by-pass hold to prevent over extension of ram and maximum capacity relief valve to present loading more than 110 percent of press capacity.
7. Standard equipment: Two forged steel table plates and two forged steel V-blocks.

D. Utility Requirements:
1. Compressed air: 1/4 NPT connection, 24 CFM, 160 PSI

E. Finish: Durable enamel in manufacturer's standard color

2.8 SAW, BAND, HORIZONTAL
Equipment Identifier: 2690

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. WMH Tool Group/Jet, Elgin, IL (888) 804-7129
b. Model: HBS-916W, stock number 414468

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Lobo Power Tools Inc., Pico Rivera, CA (562) 949-3747
b. Dake Machine Tools, Grand Haven, MI (800) 937-3253

B. Capacities/Dimensions:
1. Overall dimensions, nominal:
a. Length: 65 inches
b. Width: 28 inches
c. Height: 42 inches

2. Blade:
a. Length: 1 by 0.32 by 119-1/2 inches

b. Width: 1 inch

3. Blade wheels: 13 inches
4. Speed settings: 82, 132, 170, 235 FPM
5. Weight, nominal: 625 pounds
6. Motor: 1-1/2 HP
7. Motor speed: 1,725 RPM

C. Features/Performance/Construction:
1. Motor control with 24 volt on-off key lock switch, magnetic starter, transformer and overload protection.
2. Blade is fully guarded regardless of blade guide position.
3. Coolant system with regulator valve to provide even flow of coolant to blade from 4-1/2 gallon coolant tank.
4. Quick positioning vise with fully adjustable jaws swivels to 45 degrees.
5. Large handwheel and built-in gauge for easy blade tensioning.

D. Controls: On-off key lock switch, magnetic starter, and transformer and overload protection shall meet applicable National Electrical Code requirements.

E. Utility Requirements: 120 VAC, 1 phase, 1-1/2 HP, provide standard grounded receptacle

F. Finish: Durable enamel in manufacturer's standard color

2.9 SAW, CUTOFF, ABRASIVE, 14 INCHES
Equipment Identifier: 2698

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Makita, La Mirada, CA (770) 932-2901
b. Model: 2414 NB

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Delta Machinery, Jackson, TN (800) 223-7278
b. Milwaukee Tool and Equipment Co., Milwaukee, WI (414) 645-0200

B. Capacities/Dimensions:
1. Overall dimensions, nominal:
a. Length: 22 inches
b. Width: 11 inches
c. Height: 16 inches
2. Blade diameter: 14 inches
3. Cutting capacity:
a. 90 degrees: 4-1/2 inches
b. 45 degrees: 4-1/2 inches

4. Weight, nominal: 44 pounds

5. Arbor: 1 inch
6. Motor: 15 A

C. Features/Performance/Construction:
1. Blade shall be able to cut most types of ferrous materials.
2. Saw shall include a clamp to hold workpiece securely in place while cutting.
3. Saw shall come equipped with a spindle lock.
4. Saw shall have a quick-release type vise.

D. Utility Requirements:

1. Electrical: 120 VAC, 15 A

E. Finish: Durable enamel in manufacturer's standard color

2.10 VISE, COMBINATION, SWIVEL BASE, 5 INCHES
Equipment Identifier: 2832

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. WMH Tool Group/Wilton, LaVergne, TN (615) 793-8900
b. Model No.: 1755

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Ridgid Tool Co., Elyria, OH (440) 324-5544
b. Milwaukee Tool, Brookfield, WI (414) 645-0200

B. Capacities/Dimensions:
1. Overall dimensions, nominal:
a. Length: 17-1/4 inches
b. Width: 9 inches
c. Height: 9-1/4 inches

2. Weight: 51.55 pounds
3. Jaw width: 5-1/2 inches
4. Jaw opening: 5 inches
5. Throat depth: 3-3/4 inches
6. Pipe capacity: 1/4 to 3 inches

C. Features/Performance/Construction:
1. Slide bar shall be machined steel and be oil port operable in machined channel.
2. Base shall swivel 360 degrees and have locking device.
3. Construction shall be semi-steel cast body and have hardened steel nut and screw.
4. Jaws shall have replaceable facings.

2.11 VISE, ELECTRONICS, SWIVEL BASE
Equipment Identifier: 2880

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Panavise, Reno, NV (775) 850-2900
b. Model: 350

B. Capacities/Dimensions:
1. Overall dimensions, nominal:
a. Length: 12 inches
b. Width: 12 inches
c. Height: 8 inches

2. Jaw opening: 9 inches
3. Throat depth: 1-7/8 inches
4. Weight : 5 pounds

C. Features/Performance/Construction:
1. Slide bar shall be machined steel and move smoothly and precisely.
2. Base shall have 360 degree swivel base, tilting capabilities and have a locking device.
3. Base shall be capable of bolting to a workbench.
4. Jaws shall have replaceable anti-static facings capable of holding odd shaped objects gently.

2.12 WELDER, MIG, PORTABLE, WITH WIRE FEED
Equipment Identifier: 2915

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Lincoln Electric, Cleveland, OH (216) 481-8100
b. Model: K3068-2 with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Miller Electric Manufacturing Co., Appleton, WI (800) 426-4553
b. Hobart Welding Products, Appleton, WI (800) 626-9420

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 19 inches
b. Width: 39 inches
c. Height: 32 inches

2. Weight (gross): 220 pounds
3. Power source:
a. Output rating: 26 volts DC at 250 welding amps DC at 40 percent duty cycle on 60 hertz
b. Welding ranges:
1) Low: 10 to 20 volts (approximately)
2) High: 20 to 30 volts (approximately)

c. Maximum open circuit voltage: 40 volts
d. Input rating:
   1) Line voltage: 230/460/575
   2) Cycle: 60 hertz
   3) Phase: Single
   4) Line amps at rated load of 200 amps, 28 volts, 60 percent duty cycle: 44/38/19/15
   5) KVA at rated load: 8.75
   6) KVA at no load: 0.7
   7) KW at rated load: 8.0
   8) KW at no load: 0.35
   9) Power factor at rated load: 91 percent
   10) Efficiency at rated load: 70 percent

e. Voltage adjustment: 18 steps, total
f. Grounding clamp cable length: 10 feet

4. Wire feeder:
   a. Speed adjustment: 50 to 700 IPM
   b. Wire sizes:
      1) Solid: 0.24 through 0.045 inches
      2) Aluminum: 3/64 inches
      3) Stainless: 0.030 through 0.045 inches
      4) Flux-cored: 0.035 through 0.045 inches

5. Welding gun:
   a. Cable length: 15 feet
   b. Duty cycle:
      1) 100 percent at 200 amps with CO_2 gas
      2) 100 percent at 100 amps with mixed gases

C. Features/Performance/Construction:
1. Cabinet: Power source and wire feeder shall be housed in a heavy gauge metal cabinet with two lifting eyes.
2. Portable mounting: Welder shall be mounted on a portable base dolly that has two eight-inch diameter fixed rear wheels and two four-inch swivel front wheels. Dolly shall have provisions for mounting and securing a standard gas bottle at rear of the power supply.
3. Power source: The single phase 50/60 hertz constant voltage DC power supply shall have the following standard features:
   a. Voltage adjustment: There shall be a high/low voltage adjustment slide switch with nine voltage steps in each range.
   b. Fan cooling: Unit shall have a heavy duty fan for cooling.

4. Wire feeder: The built-in wire feeder shall be mounted in a compartment with hinged door to protect components.
   a. Wire feeder shall be a heavy duty, two-roll type with quick disconnect for welding gun.
   b. Spools: Wire feeder shall use either 25, 30, or 45 pound spools and shall handle 10 pound spools with optional spacer.
   c. Braking: The wire feed motor shall have dynamic braking which stops the feed motor when gun trigger is released, preventing wire overrun, reducing crater sticking and simplifying restriking.
   d. Gas solenoid valve: Gas solenoid valve shall be a standard provision.

e. Feed roll pressure adjustment: Spring type feed roll pressure adjustment shall be provided.
f. Feed rolls: Feed rolls shall be insulated.

5. Welding gun: The welding gun shall be light weight and easy to maneuver with rugged lightweight flexible cable and slip-on nozzles with screw-in tips. Molded strain reliefs shall be provided at wire feeder and at the gun. Gun trigger control circuit shall be low voltage (24 volt) for safety assurance.
6. Power cord: Minimum 10 foot long power cord shall be provided with plug compatible with welding receptacles.

D. Controls: All controls, including ON/OFF switch, voltage selector controls, wire feed speed control, and spool gun control module shall be mounted on sloped front panel of welder cabinet for easy access and visibility. Welder shall include all necessary step down transformers, converters or other voltage reducing equipment required for operation of individual components from a single input power source. Switching and controls shall have automatic reset and protection against thermal overload, high current overload, short circuit, and extended overload at high operating currents. Switching, controls, and electrical components shall meet National Electrical Code requirements.

E. Accessories:
1. Dual cylinder mounting kit: Lincoln No. K1702-1
2. Spool gun: Aluminum wire, Lincoln No. K2490-1, one each
3. Canvas cover: Lincoln No. K2378-1
4. Control cable extension: Lincoln No. K2519-1
5. Spindle adapter for small spools: Lincoln No. K468

F. Utility Requirements:
1. 460 VAC, 1 phase, 50 A, provide special purpose outlet
2. Receptacle is NEMA 6-50 plug

G. Finish: Durable enamel in manufacturer's standard color.

2.13 EXTRACTOR, FUME, WELDING, PORTABLE, 800 CFM
Equipment Identifier: 3280

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Airflow Systems, Inc., Dallas, TX (214) 503-8008
b. Model: PCH-1 with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Plymovent, Edison, NJ (908) 417-0808
b. American Air Filter International, Louisville, KY (800) 477-1214

B. Capacities/Dimensions:
1. Overall dimensions, nominal:
a. Length: 37-1/2 inches
b. Width: 24 inches
c. Height: 91-1/4 inches

2. Motor: 1.5 HP
3. Air flow: 800 CFM
4. Coverage: Arc of 360 degrees and 10 foot radius
5. Weight, nominal: 255 pounds
6. Drawer capacity: 5 gallons
7. Tube diameter: 8 inches, nominal

C. Features/Performance/Construction:
1. Unit hose arm shall be equipped with friction release joint adjustment for positioning. The hose shall be an 8 inch diameter flexible hose attached to an aluminum alloy pick-up hood.
2. Unit shall be equipped with two 6-3/4 inch casters in front and two 4 inch casters in back, and a handle for portability.
3. Unit shall be equipped with side hinged access door for service and pull out drawer in base for dust removal.
4. Unit power supply shall be equipped with three prong plug on power cord.
5. Cabinet of unit shall be low profile to provide a low center of gravity.
6. Filter unit shall be constructed of 16 gauge welded steel.

D. Accessories:
1. Pressure gauge kit: Airflow No. PG6
2. 7 inch diameter by 10 foot large Airflow E-Z arm extractor
3. 1.5 HP upgrade
4. After-filters: 99.7 percent HEPA and odor modules, one each

E. Controls: ON/OFF power switch

F. Utility Requirements: 120 VAC, 1 phase, 1.5 HP, 15 A

G. Finish: Durable enamel in manufacturer's standard color

2.14 TANK, PARTS CLEANING
Equipment Identifier: 3540

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
a. Graymills, Chicago, IL (773) 248-6825
b. Model: PL36-A with Accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Peterson Machine Tool, Council Grove, KS (800) 255-6308
b. Kwik-way Manufacturing Co., Marion, IA (319) 377-9421

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 36 inches
b. Width: 22 inches
c. Height: 60 inches

2. Tank shelf area:
   a. Width: 29-1/2 inches
   b. Depth: 22 inches

3. Fluid capacity: 20 gallons, maximum

C. Features/Performance/Construction:
1. Motor shall be variable speed air operated pump motor with screened intake
2. Flush hose shall be flexible metal with stream nozzle.
3. Workshelf shall be sloped and removable.
4. Filtration: Sludge collector and filter tray assembly easily removed for cleaning.
5. Safety: Spring loaded fusible link safety cover automatically closes at 165 degrees F.
6. Construction shall be of 16 gauge steel front, side, bottom, and rear panels.
7. Tank shall have a bottom drain for cleaning.

D. Accessories:
1. Sludge collector: No. 432-36376
2. Drain shelf: No. L-61 (optional)

E. Utility Requirements: 120 VAC, 1 phase, provide standard grounded receptacle

F. Finish: Durable enamel in manufacturer's standard color

2.15 PARTS WASHER, AUTOMATIC, FRONT LOAD
Equipment Identifier: 3783

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimum acceptable standards of quality, features, performance, and construction.
   a. Better Engineering, Baltimore, MD (410) 931-0000
   b. Model: F-3000-P with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Cuda Cleaning Systems, Calumet, MI (906) 482-1600
   b. Landa, Inc., Camas, WA (360) 833-9100

B. Capacities/Dimensions:
1. Overall dimensions:
   a. Width: 45 inches
   b. Depth: 62 inches
   c. Height: 69 inches

2. Interior working dimensions:
   a. Turntable diameter: 30 inches
   b. Turntable area: 710 square inches
   c. Working height: 36 inches

3. Load capacity: 750 pounds
4. Pump performance: Total output - 75 GPM at 60 PSI
5. Sump capacity: 95 gallons
6. Nozzles: 18 Stainless Steel

C. Features/Performance/Construction:
1. Cabinet construction: the cabinet shall be constructed of mild steel - structural and sheet metal. The thickness of the sheet metal shall be 1/8 to 3/16 inch.
2. The Purifier Filtration System:
   a. Removable stainless steel chip basket that is above the tank solution level; the chip basket filters the solution before it returns to the holding tank.
   b. A deflector plate beneath the chip basket that directs the return solution flow to the sediment trap area of the holding tank.
   c. A 5 inch pitch on the tank floor which forces sediment to the rear of the unit.
   d. A 2 inch deep by 10 inch wide canal which runs the width of the machine to trap sediment. Removable tank cover plates provide access to this sediment trap.
   e. A motorized oil skimmer
      1) Wheel diameter: 12 to 16 inches
      2) NEMA 2-11 drive motor coupled to a slip clutch.
      3) Automatically controlled with a 24-hour/seven-day timer.

3. Turntable/parts basket/drive system:
   a. Turntable rim and spokes have minimal thickness of 3/16 inch.
   b. Friction drive system foam filled tire spring loaded against turntable rim.
   c. TEFC drive motor.
   d. Removable parts basket 6 inch high sidewall/1 inch open mesh.

4. Pumps:
   a. Vertically mounted/pump end submerged no seals.
   b. TEFC motor extended motor shaft (no couplings) connects directly to impeller.

5. Provide two tank drainage ports on rear wall (one left/one right/use either).
6. Provide one tank overflow port above normal solution level.
7. Machine supported off the ground with 4 inch high forklift channels.
8. Removable cover plates in front and rear of tank.
9. Heating system/holding tank:
   a. Standard heating system is electric
   b. Heating system is automatically turned on and off with a 24-hour/seven-day timer

10. Spray manifolds:
    a. Stainless steel, “V” jet spray nozzles
    b. Manifolds positioned above, below, and on the outside of the turntable
    c. Manifolds positioned above, below, and on the outside of the turntable
    d. On top loading models, overhead manifolds retract with the lid

11. Fresh rinse cycle:
    a. Automatically follows the wash stage
    b. Duration controlled by an adjustable timer inside the control box
    c. Parts sprayed with fresh water (4 GPM)
    d. Rinse water is automatically diverted to drain (not allowed to enter and overflow wash tank)

e. Delay stage in between wash and rinse cycles prevents cross contamination

12. Re-circulated rinse stage:
    a. Works the same as ARC-11 (see above) except water is re-circulated from auxiliary tank
    b. 50 gallon, stainless steel tank for “rinse” water
    c. 2.0 HP vertical (seal-less) mild steel pump
    d. Rinse tank has auto water level control
    e. Rinse tank thermostat controls and heaters (9 kW) are separate from wash tank

13. Air drying system:
    a. Drying stage automatically follows last wash or rinse stage
    b. Time of dry stage controlled by an adjustable timer inside the control box
    c. Regenerative blower is mounted to the machine to supply high velocity airflow
    d. Air knives are positioned inside the cleaning chamber as specified by the customer
    e. A silencer/filter is attached to the intake of the regenerative blower
    f. Air manifolds are purged after wash cycle

14. Automatic steam exhaust:
    a. Cast aluminum direct driven fan evacuates steam from the cleaning chamber
    b. 425 CFM at 1/4 inch static pressure
    c. Three mode selector switch on control panel:
        1) On: Steam exhaust fan runs continually (when machine is powered up)
        2) Auto: Steam exhaust fan runs during cleaning cycle until door is opened
        3) Off: Steam exhaust fan is off

    d. Condensate return line feeds condensed water back to the wash holding tank, preventing the accumulation of water in the fan housing

15. Air heating system:
    a. Air from the regenerative blower is run through an electric air heater to raise the air temperature to 250 degrees F or higher (consult dealer for recommended kW and air temperature)
    b. Features/performance/construction:
        1) Low watt density, industrial, “Fire bar” style heating element
        2) Insulated heating chamber.
        3) System is controlled with a special “PID” (Proportional Integral Derivative) thermostat that shall modulate the air temperature close to the set point.
        4) An “SSR” (Solid State Relay) used in lieu of a conventional contactor.
        5) A secondary “High Limit” thermostat shall shut down the system if the surface temperature of the air heaters ever gets too high.

16. In-line strainers:
    a. Installed between pump and spray manifolds to prevent clogged nozzles
    b. Removable screen with 1/32 inch perforations
    c. Hayward brand (100 GPM rating)
    d. Pressure gauge indicates when filter must be cleaned

17. Micron filters:
    a. Filter housing with micron rated bag installed between pump and spray manifolds
    b. Prevents redeposition of fine particles
    c. Rosedale brand with hinged top and eye bolts (not band clamp style)

d. Provide 100 GPM rating and large capacity bag filter to trap suspended particles as small as 1 micron
e. Pressure gauge indicates when filter has to be changed

18. Lower water shutdown:
    a. Protects the pump and heating system by shutting everything down when the water level reaches a critical low point
    b. An indicator light notifies the operator to correct the water level
    c. The float sensor is impervious to sticking or jamming. There are no pivot points or sleeves below the solution level.

19. Low water shutdown and fill:
    a. Includes the LWS-11 control plus an automatic water fill system
    b. Whenever the float sensor is not in its' high position, a solenoid valve opens to fill the tank
    c. Fill solenoid is deactivated during the cleaning cycle and for 30 seconds after the completion of the cleaning cycle to prevent a false "fill" signal
    d. Water is added in small increments (when the water level drops as little as 1/16 inch) preventing a big drop in tank temperature that would otherwise occur if a lot of cold water was added at once

20. Beacon light:
    a. Flashes at end of cycle
    b. Mounted for visibility from all directions
    c. Light is 3 inches round by 4 inches high

21. Basket coatings:
    a. Removable parts baskets vinyl coated to prevent scratching of parts

22. Hand cleaning tray:
    a. 24 by 18 by 4 inches stainless steel tray mounted on the side of the washer
    b. Exact location dependent on other options (consult dealer)
    c. Stainless pump (controlled with on/off switch) directs cleaning fluid through a hand brush
    d. Fluid is recirculated from the Purifier's holding tank
    e. Can be used at any time, regardless if Purifier is "in cycle"

23. Small parts baskets:
    a. Rectangular basket with handles and a hinged lid, 1/16 inch perforations
    b. Recommended for small parts that could otherwise get blown-out of the standard parts basket
    c. SPB-11 measures 12 by 6 by 6 inches
    d. SPB-22 measures 15 by 9 by 6 inches

D. Controls:
1. NEMA 12 control panel and junction boxes
2. 110 volt controls
3. Motorized, 30 minute wash
4. Two channel 24-hour/seven-day timer to automatically control heating system and oil skimmer
5. Panel mounted thermostat with digital read-out
6. "Jog" button for turntable
7. "Wash" and "heat" indicator lights
8. Door/lid limit switch
9. All control circuits are individually fused

E. Accessories:
1. Steam exhaust system: Better Engineering No. ASX-11
2. Low water shut-down and fill: Better Engineering No. LWS-F1
3. In-line strainer: Better Engineering No. ILS-11-100

F. Utility Requirements:
1. Electrical: 460 VAC, 3 phase, 5 HP, 46 A, provide disconnect
2. Plumbing:
   a. Water: 1/2 inch, 10 to 12 GPM at standard pressure, 50 to 150 PSI, backflow device

3. Mechanical:
   a. 4 inch diameter to equipment
   b. Vent to exterior
   c. Provide 8 inch diameter flue to exterior

G. Finish: Prime washer with epoxy compatible primer and finish with epoxy enamel in manufacturer's standard color

2.16 LIFT, PLATFORM, WORK, MOBILE
Equipment Identifier: 5558

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
   a. LPI Inc., Eau Claire, WI (715) 839-8280
   b. Model: TK-48-S with accessories

2. Alternate manufacturers: Contingent *upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Titan Air Inc., Oseo, WI (715) 597-2050

B. Capacities/Dimensions:
1. Overall dimensions:
   a. Length: 120 inches
   b. Width: 41 inches
   c. Overall height: 60 inches

2. Platform dimensions:
   a. Platform length: 120 inches
   b. Platform width: 41 inches (without lights)
   c. Lowered height: 18 inches (top of platform)

3. Vertical travel: Up to 48 inches
4. Net weight: 1,700 pounds
5. Lifting capacity:
   a. Uniform load: 1,000 pounds
   b. Concentrated load: 300 pounds

6. Lifting speed:

a. Z axis: 15 FPM (minimum)
b. X axis: 40 FPM (maximum)

7. Motor: Pneumatic powered, 50 SCFM at 90 PSI

C. Features/Performance/Construction:
1. Unit shall be pneumatic/hydraulic powered.
2. Guide system: Two cam followers, one at each end of the lift, which will travel in a 2 inch wide by 2 inch high rail in the floor. The guide rail shall run the full length of desired travel area.
3. Platform shall have handrails 40 inches high and toe boards 4 inches high.
4. Platform shall have a self-closing hinged gate on one of the narrow sides of the basket, 27 inches wide minimum.
5. Elevated height: Stops shall be provided limiting elevated height to provide between 3 and 5 inches of clearance as required by OSHA between top of guardrail and building structure. Stops shall be installed in the field to limit travel to specified clearance to underside of floor.
6. Standard features include:
   a. Emergency stop
   b. OSHA approved shut off/lockout valve
   c. Filter/regulator/lubricator
   d. Auxiliary air supply in basket
   e. Holding valves to prevent descent of lift if hydraulic system fails
   f. Auxiliary air supply for lowering lift from basket
   g. Z-axis ground level control station (lowers only)

7. Festooning system:
   a. Festoon shall be LPI No. LPST-6015-IK or equal.
   b. Festoon track shall be mounted to the underside of the floor above. Track shall have carriers for 60 feet of travel and 60+10 feet of 1/2 inch air hose assembly and lighting power cable.
   c. Festoon system shall include a minimum of six trolleys.
   d. Drag arm shall be connected to the base of the platform unit and extend vertically 10 inches from the underside of the floor above.
   e. Drag arm shall be attached to the main air supply and power through the festooning system.
   f. Festooning system shall be capable of carrying two additional lines up to 3/4 inch in diameter.

8. Lights:
   a. Explosion proof fluorescent light fixtures LDPI model 380-T5HO-2L-4-UNV or equal. Each fixture shall be furnished with two lamps (4 foot in length). Explosion proof fluorescent fixtures shall be mounted to the side rails of the lift so that they are angled upwards towards the inspection pit opening. Provide four per unit.
   b. Power cable and wiring of fixtures shall be provided and installed by contractor. Explosion proof per code.
   c. Explosion rated on/off switch shall be mounted on lift next to operator control panel.

9. Tool tray shall be mounted on the side rail with clips for ease of removal. Tool tray shall be 6 by 30 by 3 inches.

D. Controls:
1. Control box shall be mounted on the end railing and operated with a foot pedal controller.
2. Controls shall have a z-axis hand control with emergency stop.
3. Provide a muffler for air motor.

E. Accessories:
1. Overhead festooning installation kit, 60-foot track: No. LPST-6015-IK
2. Explosion-proof light kit, four kits required, two per side: No. 205-0120
3. Foot valve kit: No. 202-1851
4. Bumper stop assembly, two stops required, one per end: No. 205-0693
5. Explosion-proof on/off switch, lights: No. 205-0107

F. Utility Requirements:
1. Compressed air: 3/4 inch, 50 SCFM, 90 PSI
2. Lighting: 120 VAC

G. Finish: Durable and in manufacturer's standard color

2.17 COVER, SAFETY, METAL, ROLLING
Equipment Identifier: 9315

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Unilube Systems, LTD., Ft. Worth, TX (817) 222-2253
b. Model: Pit Guard, Pit Cover

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers *may* be considered as equal.
a. Devon Industries, Oklahoma City, OK (405) 943-3881

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 45 inches
b. Width: 42 inches
c. Height: 1-7/8 inches

2. Inspection pit span: Field measure prior to order
3. Inspection pit length: Field measure prior to order
4. Pit cover size:
a. Custom length and width per inspection pit; provide inspection pit dimensions prior to order
b. Height: 1-7/8 inches

5. Weight: 35 to 38 pounds per pit cover
6. Capacity: 1 ton, minimum

C. Features/Performance/Construction:
1. Pit cover shall be constructed of welded metal tubing, flat bar, and expanded metal.
2. Wheels shall be attached to frame with rivets
3. Covers roll on top of each other.
4. Pit covers shall cover entire pit opening including stairs (if applicable).

D. Finish: Manufacturer's standard color safety yellow, powder coat paint

2.18 KIT, SPILL CONTAINMENT, WITH WASTE DRUM
Equipment Identifier: 9340

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
a. Enpac Corporation, Eastlake, OH (440) 975-0070
2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Justrite Manufacturing Co., Des Plaines, IL (708) 298-9250
b. Chem-Tex Incorporated, Lumberland, RI (401) 305-3030

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 20 inches
b. Width: 14-1/2 inches
c. Height: 33 inches

2. Weight: 47.2 pounds
3. Absorbs: 25 gallons

C. Features/Performance/Construction:
1. Spill locker shall be of cold-rolled steel construction.
2. Spill locker shall include:
a. Jug ENSORB or approved equal, one each
b. Pads, 50 each
c. Pillows, six each
d. Medium socks, seven each
e. Wipes, 50 each
f. Disposable bags and ties, four each
g. Goggles, two each
h. Nitrile gloves, two each
i. Locker hand seal, one each
j. Emergency response guide, one each
k. Instruction sheet, one each

3. Accessories:
a. 30 gallon drum: Enpac No. 1230-YE

D. Finish: Durable enamel in manufacturer's standard colors

2.19 COUNTING MACHINE, CURRENCY
Equipment Identifier: 9350

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Cummins Allison, Burbank, CA (800) 477-1775

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers *may* be considered as equal.
   a. Billcon, Torrance, CA (310) 328-1775

B. Capacities/Dimensions:
1. Overall dimensions (nominal):
   a. Length: 13-1/2 inches
   b. Width: 13 inches
   c. Height: 9-1/2 inches

2. Document size range:
   a. Minimum: 2 by 4 inches
   b. Maximum: 3-1/2 by 6-1/2 inches

3. Net weight: 29.7 pounds
4. Hopper capacity: Up to 500 notes
5. Stacker capacity: Up to 200 notes
6. Pocket capacity: Up to 100 bills
7. Throughput speeds:
   a. High: 1,200 notes per minute
   b. Low: 600 notes per minute

C. Features/Performance/Construction:
1. Counter must have the ability to identify and value notes regardless of orientation.
2. Counter must have the capacity to discern if notes are stuck together, damaged, or folded and adjust without operator adjustment.
3. Counter shall value balance mixed denominations.
4. Counter shall identify rogue notes in a single denomination pack.
5. Counter shall simultaneously value balance and split pre-sorted packs.
6. Counter shall face and orient notes.
7. LCD display shall have a minimum of five digits for count, three digits for batch, and eight digits for value.
8. LCD display shall provide clear function status and operational messages.
9. Built in printer shall display detailed receipt for each batch total, sub total, and period (grand) total.
10. Counter shall provide a port for interface to a printer and PC.
11. Security features: Magnetic presence strip detection (US bills only)

D. Controls: ON/OFF power switch

E. Utility Requirements: 120 VAC, 1 phase, 1.25 A, provide standard grounded receptacle

F. Finish: Durable enamel in manufacturer's standard color

2.20 COUNTER/SORTER, COIN
Equipment Identifier: 9360

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
   a. Cummins Allison, Burbank, CA (800) 477-0417
   b. Model No.: Jetscan ifx i100

B. Capacities/Dimensions:
1. Overall dimensions (nominal):
   a. Length: 26-14 inches
   b. Width: 23-1/2 inches
   c. Height: 42-1/4 inches

2. Coin size range:
   a. Diameter: 0.56 inch to 1.53 inches
   b. Thickness: 0.04 inch to 0.12 inch

3. Inspection pan capacity: Up to 5,000 dimes
4. Coin feeder capacity: Up to 10,000 dimes
5. Processing speed: Variable to 6,000 coins per minute
6. Weight (nominal): 200 pounds

C. Features/Performance/Construction:
1. Counter/sorter shall be capable of sorting up to nine different denominations.
2. Counter/sorter shall have fully adjustable bag stops.
3. Counter/sorter shall incorporate a graphical display to provide clear function status and operational messages.
4. Counter/sorter shall incorporate four serial ports to interface with other cash settlement systems and peripheral currency counting equipment.
5. Built in printer shall display detailed receipt for each batch total, sub total, and period (grand) total.
6. Security features:
   a. Operating information lock-out
   b. Battery backup
   c. Standard security doors

D. Controls: ON/OFF power switch

E. Accessories:
1. Security doors
2. Communications kit
3. Magnet kit
4. Lift tray
5. Flat tray
6. Printer kit, includes tray (12 by 12 inch)

F. Utility Requirements: 120 VAC, 1 phase, 9 A, provide standard grounded receptacle

G. Finish: Durable enamel in manufacturer's standard color

2.21 HARNESS, SAFETY, I-BEAM TROLLEY, SELF RETRACTING
Equipment Identifier: 9510

A. Manufacturer's Reference:
   1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
      a. DBI-SALA, Red Wing MN (800) 328-6146
      b. Model No.: 1101643 with accessories

   2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
      a. Hy-Safe Technology, Union Grove, WI (800) 642-0775

B. Capacities/Dimensions:
   1. Overall dimensions:
      a. Length: 9 inches
      b. Width: 12 inches
      c. Height: 9 inches

   2. Self-retracting lifeline:
      a. Height: 10 inches
      b. Length: 10 inches
      c. Width: 3 inches

   3. Trolley anchorage connector:
      a. Height: 9 inches
      b. Length: 9 inches
      c. Width: 12 inches

C. Features/Performance/Construction:
   1. Harness shall be constructed with hip padding for support and loops for tool attachment.
   2. Self-retracting lifeline:
      a. Housing shall be constructed of impact resistant polyurethane
      b. Self locking anchorage snap hook shall posses an impact indicating swivel
      c. Unit shall possess disk type speed sensing brakes with cam-rocker engagement and anti-lock-up on retraction.
      d. Lifeline shall be at least a 50 foot length of 3/16 inch galvanized wire rope.
      e. Shall meet OSHA and CSA standards

   3. Trolley anchorage connector:
      a. Shall fit I-beams with 3 to 8 inch flange width, thickness up to 11/16 inch
      b. Shall have trolley guards to protect wheels and keep beam clear of debris
      c. Shall meet or exceed all applicable industry safety standards including OSHA, ANSI, and ANSI Z359
      d. Shall be designed to be used with only one harness attachment at a time

   4. Anchorage connector carabineer:
      a. Self closing/self locking gate
      b. Gate opening: 11/16 inch
      c. High strength stainless steel construction with a minimum tensile strength of 5,000 pounds

5. Entire system shall be capable of arresting a 6 foot fall of a combined weight (person, clothing, and tools) of 310 pounds.

D. Accessories:
1. 50-foot self-retracting lifeline: No. 3504450
2. Trolley connector: No. 2103143
3. Carabineer: No. 2000112

E. Finish: Harness, lanyard, and trolley assembly shall be in one of the standard colors and finishes available through the manufacturer.

2.22 PROBE, FAREBOX, AND SOFTWARE SYSTEM
Equipment Identifier: 9565

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

a. Genfare, Elk Grove Village, IL (847) 593-8855
b. Model: Data collection probe and recording system

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers *may* be considered as equal.

B. General Description

1. The data collection and reporting system (DCRS) shall communicate with the fareboxes to extract transaction and event data and download operating parameters and related information. The DCRS shall communicate with the vault to extract cashbox identification from cashboxes inserted in the receiver. The DCRS shall provide data probes linked to an PC-compatible computer capable of extracting and storing data from the bus fareboxes during routine servicing. The data system shall be capable of generating comprehensive management reports for use by the Owner.

2. System equipment: Equipment shall include but not be limited to the following:

a. One data probe, with junction box, probe holder, lock box to secure the probe when not in use, interconnecting cabling, and an isolation box for transient voltage protection.
b. Computer system consisting of a PC-compatible computer with display and keyboard, laser printer, and other hardware and software. Computer equipment to be provided by Owner.
c. Uninterruptible power supply (UPS) for computer system, isolation box, and cashbox I.D. computer. UPS to be provided by Owner.
d. Data collection software and single site use license.
e. Cashbox ID computer.
f. Miscellaneous hardware as required for a complete and operable installation.

C. Features/Performance/Construction:

1. Data probe:

a. A data probe shall be provided to permit bi-directional communications between the farebox and the data system by means of infrared technology.
b. The probe shall be a handheld device positioned and touched to a mating data port on the farebox, requiring no plugs or physical electrical contact.
c. The case of the data probe shall be a hardened aluminum extrusion or casting, containing the necessary hardware for communication between the probe and the farebox.
d. The probe shall be configured with a window of infrared-transparent plastic behind which is a communications link composed of an LED and photosensor.
e. A slot shall be provided within the extrusion to support the probe printed circuit board.
f. A strain relief shall be provided to support the data cable.
g. The data probe and cabling shall be capable of withstanding extended operations under extreme temperature and humidity variations and shall be impervious to degradation due to diesel fuel, gasoline, oil, transmission fluid, road salts, and sunlight.
h. The data probe shall be capable of withstanding being dropped from a height of three feet onto a concrete surface with no resulting loss of operation.
i. An LED lamp shall be provided in an easy-to-see location on the probe to aid in proper orientation and operation of the data probe.
j. The LED shall pulse at a rate of once per second to indicate that the data computer is operational and the data probe is ready for use.
k. Probe shall interface with the farebox data port and LED shall flicker while data is being exchanged and then glow steadily for 5 seconds to indicate that transmission has been completed.

2. Data probe cable: The data cable shall be custom made with three twisted wire pairs, a shield, and a heavy polyurethane jacket flexible at low temperatures and resistant to salt, moisture, abrasion and fuel. Cable length shall be 25 feet. The cable shall be supported in the center by a retractor mechanism designed to hold the cable out of the way when not in use. The retractor shall be attached to a supporting pole. A probe holder shall be provided to hold the data probe between uses and a lockable box shall be provided to hold the data probe when not in use.
3. Junction box: Each data probe cable shall terminate in a junction box containing one or more connectors for the data probe cable(s) and a terminal strip for a cable connecting the junction box to the central isolation box. Junction boxes shall be mounted on the supporting pole or to an existing structure, as appropriate
4. Supporting poles: Data probe supporting poles and all other equipment shall be properly grounded for lightning protection through existing electrical outlets. The data probe printed circuit board and isolation boxes shall have transient protection circuits.
5. Interconnection cable: Each data probe junction box shall be connected to a central isolation box. Both ends of the cable shall attach to screw terminals. Maximum cable length is not to exceed 1,500 feet.
6. Central isolation box: The data probe subsystem shall include an isolation box designed to protect the data computer and its operator from a near-hit by lightning. The isolation box shall contain a separate opto-isolating printed circuit board for each data probe powered from a common power supply. Terminal strips shall be provided for connection to each of the data probes. The isolation box shall typically be mounted on a wall within 10 feet of the data computer, where its case can be properly grounded. Cables shall connect the isolation box to the data computer. The isolation box shall have its own 110 VAC grounded power cord.
7. Computer equipment: Computer equipment to be provided by Owner.

D. Utility Requirements:

1. Electrical: 120 VAC, 20 A

PART 3 - EXECUTION

3.1 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

B. Inspect delivered equipment for damage from shipping and exposure to weather.

C. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items.

3.2 INSTALLATION

A. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect or designated representative.

B. Install equipment in accordance with plans, shop drawings, and manufacturer's instructions:
1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.
2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
3. Anchorage: Attach equipment as directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.

C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.3 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

3.4 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing and installation debris from job site.

D. Notify Architect or designated representative for acceptance inspection.

3.5 TRAINING

A. Direct the technical representative to provide specified hours of training to designated Owner's maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.
1. 2085 Buffer/grinder, 8 inch, with pedestal; 0.5 hours (minimum)
2. 2205 Drill press, variable speed, 15 inch; 1 hour (minimum)
3. 2220 Drill press, variable speed, 20 inch; 0.5 hours (minimum)

4. 2340 Scrubber, floor, 28 inch path, mobile, battery operated; 0.5 hours (minimum)
5. 2360 Lathe, brake drum; 2 hours (minimum)
6. 2525 Press, air/hydraulic, 25 ton; 1 hour (minimum)
7. 2690 Saw, band, horizontal; 1 hour (minimum)
8. 2698 Saw, cutoff, abrasive, 14 inch; 0.5 hours (minimum)
9. 2915 Welder, MIG, portable, with wire feed; 1 hour (minimum)
10. 3280 Extractor, fume, welding, portable, 800 CFM; 1 hour (minimum)
11. 3540 Tank, parts cleaning, 15 gallon; 0.5 hours (minimum)
12. 3783 Parts washer, automatic, front load; 2 hours (minimum)
13. 5558 Lift, platform, work, mobile; 2 hours (minimum)
14. 9340 Kit, spill containment, with waste drum; 2 hours (minimum)
15. 9360 Counter/sorter, coin; 1 hour (minimum)
16. 9510 Harness, safety, i-beam, trolley, self retracting; 0.5 hours (minimum)
17. 9565 Probe, farebox, software system; 4 hours (minimum)

B. Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.

END OF SECTION 11 11 29

SECTION 11 24 19 - VACUUM EQUIPMENT

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.1 WORK INCLUDED

A. Equipment items as listed below by Equipment Identifier:
   1. 3459 Reel, vehicle exhaust, motor operated, individual fan, 6 inch hose (Ref. Part 2.1)
   2. 3610 Vacuum, vehicle (Ref. Part 2.2)

B. Roughing-in, installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.

C. Piping, ductwork, wiring, and switching between equipment and utilities.

1.2 QUALITY ASSURANCE

A. Experience: Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.

B. Manufacturer's Representative:
   1. Installation: Provide a qualified manufacturer's representative at site to perform work related to equipment installation, check out and start up.
   2. Training: Provide technical representative to train Owner's maintenance personnel in operation and maintenance of specified equipment.

1.3 SUBMITTALS

A. Product Data: Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

B. Operations and Maintenance Manual:
   1. Submit Operations and Maintenance Manuals in accordance with Division 1- General Requirements of these specifications.
   2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.
   3. Description of system and components.
   4. Schematic diagrams of electrical, plumbing, and compressed air system.
   5. Manufacturer's printed operating instructions.
   6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

C. Shop Drawings: Submit Shop Drawings in accordance with Division 1 - General Requirements of these specifications.

1.4 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, will be at the expense of the Contractor.
   1. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance will be based on the technical requirements herein as determined by Owner and Architect.

1.5 WARRANTY

A. Warrant work specified herein for one year from acceptance by Owner against defects in materials, function and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish.

D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

E. All parts must be readily available locally in the United States.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer’s containers, appropriately packaged and/or crated for protection during domestic shipment and in humid, dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title of this specification.

C. Provide equipment with materials specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.7 LABELING

A. Manufacturer will securely attach in a prominent location on each major item of equipment a noncorrosive nameplate showing manufacturer’s name, address, model number, serial number, and pertinent utility or operating data.

B. All electrical equipment and materials shall be new and shall be listed by Underwriter’s Laboratories, Inc. (U.L.) in categories for which standards have been set by that agency and labeled as such in the manufacturer’s plant.

PART 2 - PRODUCTS

2.1 REEL, VEHICLE EXHAUST, MOTOR OPERATED, INDIVIDUAL FAN, 6 INCH HOSE
Equipment Identifier: 3459

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimum acceptable standards of quality, features, performance, and construction.
   a. Nederman, Westland, MI (734) 729-3344
   b. Model No.: 865/#20802865 with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in Section 01300 SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. Plymovent, Edison, NJ (732) 417-0808
   b. Monoxivent, Rock Island, IL (309) 794-1000

B. Capacities/Dimensions:
   1. Overall dimensions:
      a. Length: 45-1/2 inches
      b. 31-1/8 inches
      c. 32-7/8 inches

   2. Exhaust hose:
      a. Diameter: 6 inches
      b. Length: 33 feet

   3. Exhaust fan:
      a. Motor: 2 HP
      b. Air volume: 800 CFM at 7 inches of static pressure

   4. Drum storage capacity hose length: 29 feet, 6 inches

C. Features/Performance/Construction:
   1. Exhaust hose drum
      a. The drum, model number 20802865, shall consist of an aluzinc-lined metal cylinder bolted to two metal ends. Inside the drum there is a flexible 6-1/4 inch pipe which links the hose and the swivel.
      b. The stand shall consist of two aluzinc-lined supports and two aluzinc-plated steel tubes.
      c. The hose guide shall guide the hose on the first evolution of the drum.
      d. The connecting tube of aluminum, flexible, 6-1/4 inch diameter, 12 inch length, shall be used in a straight position when bends are needed in the duct system.

   2. Exhaust fan:
      a. Each exhaust hose reel shall have an individual exhaust fan which shall be mounted directly to the drum. Exhaust fan shall be Nederman series N27, No. 14514322.
      b. Exhaust fan shall be a centrifugal type fan constructed of powder coated steel.
      c. Fan mount for mounted to the exhaust reel shall be Nederman Model No. 20373556

   3. Exhaust hose:
      a. The hose shall be constructed of high temperature fabric with an external steel helix. Hose shall be designed for high temperatures from CNG buses.
         1) First 10 feet shall be resistant to temperatures up to 1,200 degrees F, NFC 6.5 Nederman Model No. 20824562

2) Second 20 feet shall be resistant to temperature up to 1,000 degrees F hose, NFC 3.5 Nederman Model No. 87800020.

b. Hose stop shall be adjustable so that the hose will hang at any required height.

4. Exhaust extraction nozzle:
   a. Nozzle shall be capable of withstanding temperatures up to 1,200 degrees F.
   b. Steel exhaust extraction nozzle 6 inch diameter with lifting sleeve (no clamp), Nederman Model No. 20804761
   c. A steel mesh inlet guard shall be used to prevent passage of debris to hose.

D. Controls:
1. Remote control shall be pendent station switch, Nederman Model No. 20373712 and shall contain switches for hose up, hose down. Fan ON/OFF shall be controlled by pendant switch.
2. Limit switches:
   a. Limit switch shall stop drum rotation during hose coil/recoil and prevent damages to the hose.
   b. Lower limit switch shall stop drum rotation when hose has uncoiled from drum to prevent recoil.
   c. Upper limit switch shall override the remote switch and disengage supply current to the motor and override the remote switch when the hose is totally coiled.

E. Accessories:

1. Lift pole (nozzle): No. 20374287
2. Control box: No. 87000295
3. Exhaust cane nozzle: No. 20801961

F. Utility Requirements:
1. Fan: 460 VAC, 3 phase, 2 HP
2. Controls: 120 VAC, 1/2 HP
3. Provide disconnect

2.2 VACUUM, VEHICLE
Equipment Identifier: 3610

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
   a. J.E Adams Industries, Cedar Rapids, IA (319) 363-0237
   b. Model No.: 9235-3 with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
   a. AutoVac Industrial Vacuum, Lake Tahoe, NV (888) 628-8862
   b. Eurovac, Valley City, OH (907) 738-9255

B. General Description:

1. Operation: Dry type vacuum system shall be complete with stationary, self contained central vacuum unit, necessary piping and fittings, hoses, and tools for vacuuming interiors of buses and vehicles.
2. Major components:
   a. Vacuum producer (exhauster): One each
   b. Separator: One each
3. Piping and fittings: Provide necessary piping, fittings, and hose inlets for each workstation.
4. Workstation: Provide a complete set of necessary hose, hangers, and cleaning tools as specified herein for each unit.

C. Capacities/Dimensions:
1. Overall dimensions, vacuum unit (nominal):
   a. Diameter: 24 inches
   b. Height: 54 inches
2. Motor performance: 210 CFM
3. Dirt capacity: 2.0 cubic feet
4. Hose and fittings:
   a. Hose diameter: 2 inch hose shall be provided for optimum working suction at workstations.
   b. Fittings and seals: Fittings and seals shall be properly sized for the pipe diameters and to provide a leak-free installation.
5. Weight, nominal: 135 pounds
6. Number of workstations: One at each unit

D. Features/Construction:
1. System configuration: Vacuum producer (exhauster) and separator shall be a freestanding integral unit mounted on a common structural steel base or tube.
2. Vacuum housing shall be constructed of 18 gauge stainless steel.
3. Vacuum producer motor: Three, two-stage, single speed bypass motors.
4. Vacuum shall incorporate a timer device.
5. Workstations: Each workstation shall be complete and operable with the following components
   a. Hose: 25 feet long, 2 inch diameter, static proof, heavy duty PVC with male and female couplings.
   b. Cleaning tool: Auto type cleaning tool, 4-1/2 inch, one per station.
   c. Hose rack: 18 gauge stainless steel.

E. Controls:
1. System START/STOP electrical 9225PBK controls shall be pre-wired in a NEMA 4 type enclosure mounted on the unit adjacent to the hose inlet.
2. Solid state timer shall be set to 13 minutes. To be mounted on unit adjacent to controls.
3. All electrical components shall meet applicable National Electrical Code requirements for an intense wet environment.
4. Motor pushbutton START/STOP controls and indicator light shall be mounted on unit.

F. Accessories:
1. Dirt bin: J.E. Adams No. 8080

2. Push button starter: J.E. Adams No. 922PBK
3. 25 foot hose: J.E. Adams No. 2037
4. Coupler, hose: J.E. Adams No. 2081

G. Utility Requirements:
1. 120 VAC, 1 phase, 30 A, provide j-box
2. Requires a dedicated circuit and hardwire connection.

H. Finish: Stainless steel

PART 3 - EXECUTION

3.1 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

B. Inspect delivered equipment for damage from shipping and exposure to weather.

C. Compare delivered equipment with packing lists and specifications to assure receipt of all items.

3.2 INSTALLATION

A. Perform work under direct supervision of Foreman or Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect or designated representative.

B. Install equipment in accordance with plans, shop drawings and manufacturer's instructions:
1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level, plumb and at right angles to adjacent work.
2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
3. Anchorage: Attach equipment securely to floor, as directed by Architect or designated representative, to prevent damage resulting from inadequate fastening. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.

C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.3 CLEANING

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing and installation debris from job site.

D. Notify Architect or designated representative for acceptance inspection.

3.4 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

3.5 TRAINING

A. Direct the technical representative to provide specified hours of training to designated Owner's maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.
   1. 3459 Reel, vehicle exhaust, motor operated, individual fan, 6 inch hose; 1 hour (minimum)
   2. 3610 Vacuum, vehicle; 0.5 hours (minimum)

B. Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.

END OF SECTION - 11 24 19

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SECTION 11 3100 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Refrigeration appliances.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include operating characteristics, dimensions of individual appliances, and finishes for each appliance.

B. LEED Submittals:
   1. Product Data for Credit EA 1.4: For appliances indicated, documentation that products are ENERGY STAR rated.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates: Signed by manufacturers certifying that products comply with requirements.

B. Warranties: Special warranties specified in this Section.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.

B. Source Limitations: Obtain residential appliances through one source.

C. Product Options: Information on Drawings and in Specifications establishes requirements for product's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

D. Regulatory Requirements: Comply with provisions of the following product certifications:
1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." CAC Title 24.
1. Operable Parts: Provide controls with forward reach no higher than 48 inches above the floor, horizontal front reach no more than 25 inches, horizontal side reach no more than 24 inches, and that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
2. Refrigerator/Freezer: Provide 50 percent of freezer space within 54 inches of the floor.

F. Energy Ratings: Provide residential appliances that carry labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the FTC Appliance Labeling Rule.
1. Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.

1.7 WARRANTY

A. Special Warranties: Manufacturer's standard form in which manufacturer of each appliance specified agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
1. Refrigerator/Freezer: Five-year limited warranty for onsite service on the sealed refrigeration system.

PART 2 - PRODUCTS

2.1 REFRIGERATOR/ FREEZERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:

1. Amana; a division of Whirlpool Corporation.
2. Electrolux Home Products (Frigidaire).
3. General Electric Company (GE).
4. KitchenAid; a division of Whirlpool Corporation.
5. Whirlpool Corporation.
6. Approved equal.

B. Refrigerator/Freezer: Two-door refrigerator/freezer with freezer on top and complying with AHAM HRF-1.
1. Basis-of-Design Product: General Electric GTH18ISX.
2. Type: Freestanding.
3. Dimensions:
a. Width: 29 ½ inches.
b. Depth: 30 ¼ inches.
c. Height: 66 1/8 inches.
4. Storage Capacity:
a. Refrigeration Compartment Volume: 12.93 cu. ft.
b. Freezer Volume: 5.09 cu. ft.
c. Shelf Area: Three adjustable glass shelves, 21.9 sq. ft.
5. Refrigerator Features:
a. Interior light in refrigeration compartment.
b. Compartment Storage: vegetable crisper and meat compartment.
c. Door Storage: Gallon milk-container storage.
6. Freezer Features: One freezer compartment(s) with door(s).
a. Automatic defrost.
7. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
8. Appliance Color/Finish: Stainless steel.

2.2 FINISHES, GENERAL

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before equipment installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written instructions.

B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

C. Utilities: Comply with plumbing and electrical requirements.

3.3 CLEANING AND PROTECTION

A. Tests and Inspections:
1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After installation, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

B. An appliance will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION

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SECTION 11 5200 - AUDIO-VISUAL EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Manually operated projection screens.

B. Related Sections:
   1. Section 05 5000 “Metal Fabrications” for slotted channel framing for projector mount installation.
   2. Section 06 4053 "Miscellaneous Rough Carpentry" for wood backing for screen installation.
   3. Division 26 Sections for electrical service and connections including device boxes for switches and conduit, where required, for low-voltage control wiring.

1.3 DEFINITIONS

A. Gain of Front-Projection Screens: Ratio of light reflected from screen material to that reflected perpendicularly from a magnesium carbonate surface as determined per SMPTE RP 94.

B. Half-Gain Angle: The angle, measured from the axis of the screen surface to the most central position on a perpendicular plane through the horizontal centerline of the screen where the gain is half of the peak gain.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For projection screens. Show layouts and types of projection screens. Include the following:
   1. For manually operated projection screens:
      a. Drop lengths.
      b. Anchorage details.
      c. Accessories.
      d. Location of screen centerline relative to ends of screen case.
      e. Location of wiring connections for electrically operated units.

f. Location of seams in viewing surfaces.
g. Drop lengths.
h. Anchorage details, including connection to supporting structure for suspended units.
i. Details of juncture of exposed surfaces with adjacent finishes.
j. Accessories.

C. Samples for Initial Selection: For finishes of surface-mounted screen cases.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For projection screens to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations for Projection Screens: Obtain projection screens from single manufacturer. Obtain accessories, including necessary mounting hardware, from screen manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Environmental Limitations: Do not deliver or install projection screens until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.8 COORDINATION

A. Coordinate layout and installation of projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC equipment, fire-suppression system, and partitions.

PART 2 - PRODUCTS

2.1 MANUALLY OPERATED PROJECTION SCREENS

A. General: Manufacturer's standard spring-roller-operated units, consisting of case, screen, mounting accessories, and other components necessary for a complete installation.

1. Screen Mounting: Top edge securely anchored to a 3-inch- (75-mm-) diameter, rigid steel roller; bottom edge formed into a pocket holding a tubular metal slat, with ends of slat protected by plastic caps, and with a saddle and pull attached to slat by screws.
2. Tab Tensioning: Provide units that have a durable low-stretch cord, such as braided polyester, on each side of screen connected to edge of screen by tabs to pull screen flat horizontally.

B. Surface-Mounted, Metal-Encased, Manually Operated Screens: Units designed and fabricated for surface mounting on wall or ceiling, fabricated from formed-steel sheet not less than 0.027 inch (0.7 mm) thick or from aluminum extrusions; with flat back design and vinyl covering or baked-enamel finish. Provide units with matching end caps and concealed mounting.

1. Products: Subject to compliance with requirements, provide the following: “Da-Lite Screen Company; Model C w/ CSR or approved equal.
   a. Wall Bracket: Fixed Length 6”, Color: White
   b. Screen Size: 60” x 96”
   c. Pull Rod: 38 inches, zinc plated with plastic handle grip.
   d. Format:16:10 Wide:
   e. Screen Case Color: White

2.2 FRONT-PROJECTION SCREEN MATERIAL

A. Matte-White Viewing Surface: Peak gain not less than 0.9, and gain not less than 0.8 at an angle of 50 degrees from the axis of the screen surface.
1. Basis of Design Product: Subject to compliance with requirements, provide Da-Lite Screen Company; Matte White or the following:
   a. Approved equal.

B. Material: Vinyl-coated, glass-fiber fabric or vinyl sheet.

C. Mildew-Resistance Rating: 0 or 1 when tested according to ASTM G 21.

D. Flame Resistance: Passes NFPA 701.

E. Flame-Spread Index: Not greater than 75 when tested according to ASTM E 84.

F. Seams: Where length of screen indicated exceeds maximum length produced without seams in material specified, provide screen with horizontal seam placed as follows:

G. Seamless Construction: Provide screens, in sizes indicated, without seams.

H. Edge Treatment: Black masking borders.

PART 3 - EXECUTION

3.1 FRONT-PROJECTION SCREEN INSTALLATION

A. Install front-projection screens at locations indicated to comply with screen manufacturer's written instructions.

B. Install front-projection screens with screen cases in position and in relation to adjoining construction indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.

3.2 CLEANING AND PROTECTION

A. Clean viewing surfaces in accordance with manufacturer’s instructions.

B. Protect screens and mounts from damage.

END OF SECTION

SECTION 11 81 00 - MATERIAL HANDLING EQUIPMENT

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.1 WORK INCLUDED

A. Equipment items as listed below by Equipment Identifier:
   1. 5404 Forklift, electric, 4,000 pounds (Ref. Part 2.1)

B. Roughing-in installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.

1.2 QUALITY ASSURANCE

A. Manufacturer's Representative:
   1. Installation: Provide a qualified manufacturer's representative at site to supervise work related to equipment installation, check out, and start up.
   2. Training: Provide a qualified manufacturer's representative to provide training to Owner's maintenance personnel in operation and maintenance of specified equipment.

1.3 SUBMITTALS

A. Product Data:
   1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.
   2. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.
   3. Additional costs resulting from substitution of products other than those specified, including drawing changes and construction, will be at the expense of the contractor.

B. Operations and Maintenance Manual:
   1. Submit Operations and Maintenance Manuals in accordance with Division 1- General Requirements of these specifications.
   2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.
   3. Description of system and components.
   4. Schematic diagrams of electrical, plumbing, and compressed air system.
   5. Manufacturer's printed operating instructions.
   6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

C. Shop Drawings: Submit Shop Drawings in accordance with of Division 1 - General Requirements of these specifications.

1.4 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance will be based on the technical requirements herein as determined by Owner and Architect.

1.5 WARRANTY

A. Warrant work specified herein for one year from substantial completion against defects in materials, functions, and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer's recommended preventive maintenance schedule.

D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

E. All parts shall be readily available locally in the United States.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.

C. Provide equipment and material specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.7 LABELING

A. Manufacturer shall securely attach in a prominent location, on each major item of equipment, a non-corrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.

B. All electrical equipment and materials shall be new and shall be listed by Underwriter's Laboratories, Inc. (UL) in categories for which standards have been set by that agency and labeled as such in the manufacturer's plant.

PART 2 - PRODUCTS

2.1 FORK LIFT, ELECTRIC, 4,000 POUNDS
Equipment Identifier: 5404

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Clark Material Handling Company, Lexington, KY (859) 422-6400
b. Model No.: NPR20 with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Hyster Company, Danville, IL (253) 561-7113
b. Mitsubishi Forklifts, Houston, TX (713) 365-1000

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 70-1/4 inches
b. Width: 40-1/4 inches
c. Height: 95 inches

2. Turning radius: 66-1/2 inches
3. Rated capacity: 4,000 pounds
4. Mast dimensions/capacities:
a. 24 inch load center
b. Fork length: 48.1 inches
c. Lift height: 210 inches
d. Height fully extended: 258 inches

5. Weight: 6,940 pounds
6. Power: 24/36 volt

C. Features/Performance/Construction:
1. Unit shall contain a battery with 6 hour rate maximum.
2. Unit shall have urethane tires.
3. Unit shall have automatic, spring applied parking brake
4. Unit shall have hydraulic assist, variable steering.
5. Unit shall have a service brake consisting of a drum and shoe.
6. Drive motor and steer/auxiliary motor shall be controlled by transistor, infinite.

D. Utilities Requirements:
1. Battery charger: 460 VAC, 3 phase, 30 A
2. Provide dedicated circuit

PART 3 - EXECUTION

3.1 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

B. Inspect equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.

3.2 INSTALLATION

A. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect.

B. Install equipment in accordance with plans, shop drawings, and manufacturer's instructions:
1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.
2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
3. Anchorage: Attach equipment as detailed or directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.

C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.3 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

3.4 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing and installation debris from job site.

D. Notify Architect or designated representative for acceptance inspection.

3.5 TRAINING

A. Direct the technical representative to provide specified hours of training to designated Owner's maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.
1. 5404 Forklift, electric, 4,000 pounds; 1 hour (minimum)

B. Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.

END OF SECTION 11 81 00

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SECTION 12 2413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Manually operated roller shades with single and double rollers.
2. Motor-operated roller shades, including motor operator, controls and mounting hardware with single and double rollers.

B. Related Requirements:
1. Section 06 1053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
2. Section 07 9200 “Joint Sealants” for sealants at perimeter of shade system
3. Section 26 0500 “Common Work Results for Electrical” for electrical supply, conduit, and wiring for motorized shades.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. LEED Submittals:
1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

C. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

D. Samples: For each exposed product and for each color and texture specified, 10 inches long.

E. Samples for Initial Selection: For each type and color of shadeband material.
1. Include Samples of accessories involving color selection.

F. Samples for Verification: For each type of roller shade.
   1. Shadeband Material: Not less than 10 inches square. Mark inside face of material if applicable.
   2. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
   3. Installation Accessories: Full-size unit, not less than 10 inches long.

G. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material, signed by product manufacturer.

C. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roller shades to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide products by Draper Inc. “Manual and Motorized FlexShade” or comparable product by one of the following:
1. Approved equal.

B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS <**RS01, RSOM 2**>

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
1. Bead Chains: Manufacturer's standard stainless steel.
   a. Loop Length: Full length of roller shade.
   b. Limit Stops: Provide upper and lower ball stops.
   c. Chain-Retainer Type: Chain tensioner, jamb mounted.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
1. Roller Drive-End Location: Right side of inside face of shade.
2. Direction of Shadeband Roll: Regular, from back of roller.

3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

E. Shadebands:
1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
a. Type: Enclosed in sealed pocket of shadeband material.

F. Installation Accessories:
1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
a. Shape: L-shaped.
b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 4 inches.
2. Endcap Covers: To cover exposed endcaps.
3. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 MANUALLY OPERATED SHADES WITH DOUBLE ROLLERS <**RS02**>

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
1. Bead Chains: Manufacturer's standard metal.
a. Loop Length: Full length of roller shade.
b. Limit Stops: Provide upper and lower ball stops.
c. Chain-Retainer Type: Chain tensioner, jamb mounted.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
1. Double-Roller Mounting Configuration: Offset, outside roller over and inside roller under.
2. Inside Roller:
a. Drive-End Location: Right side of inside face of shade.
b. Direction of Shadeband Roll: Regular, from back of roller.
3. Outside Roller:
a. Drive-End Location: Right side of inside face of shade.
b. Direction of Shadeband Roll: Regular, from back of roller.
4. Shadeband-to-Roller Attachment: Manufacturer's standard method.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

E. Inside Shadebands:
1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
a. Type: Enclosed in sealed pocket of shadeband material.

F. Installation Accessories:
1. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than 4 inches.
2. Endcap Covers: To cover exposed endcaps.
3. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.4 MOTOR-OPERATED, SINGLE-ROLLER SHADES <**RS03**>

A. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Electric Motor: Manufacturer's standard tubular, enclosed in roller.
a. Electrical Characteristics: Single phase, 110 V, 60 Hz.
3. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
1. Roller Drive-End Location: Per Drawings.
2. Direction of Shadeband Roll: Regular, from back of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to five inline rollers that are operated by one roller drive-end assembly.

E. Installation Accessories:
1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
a. Shape: L-shaped.
b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 3 inches (76 mm).
2. Endcap Covers: To cover exposed endcaps.

2.5 MOTOR-OPERATED, DOUBLE-ROLLER SHADES <**RSO1 M**>

A. Motorized Operating Systems: Provide factory-assembled, shade-operator systems of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Electric Motor: Manufacturer's standard tubular, enclosed in rollers.
a. Electrical Characteristics: Single phase, 110 V, 60 Hz.
3. Limit Switches: Adjustable switches, interlocked with motor controls and set to stop shade movement automatically at fully raised and fully lowered positions. Separate switching for light filtering fabric and light blocking fabric.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shades for service.
1. Double-Roller Mounting Configuration: Offset, outside shade over and inside shade under.
2. Inside Roller:
a. Drive-End Location: Right side of inside face of shade.
b. Direction of Shadeband Roll: Regular, from back of roller.
3. Outside Roller:
a. Drive-End Location: Left side of inside face of shade.
b. Direction of Shadeband Roll: Regular, from back of roller.
4. Shadeband-to-Roller Attachment: Manufacturer's standard method.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to five inline rollers into a multiband shade that is operated by one roller drive-end assembly.

E. Installation Accessories:
1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
a. Shape: L-shaped.
b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 3 inches (76 mm).
2. Endcap Covers: To cover exposed endcaps.
3. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than 5 inches (127 mm).
b. Provide pocket with lip at lower edge to support acoustical ceiling panel.

2.6 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
1. Basis of Design: Draper, Inc. “Green Screen Revive 5%”
2. Type: 100 percent polyester yarn
3. Openness Factor: 5 percent.
4. Color: Stone

C. Light-Blocking Fabric: Opaque fabric, stain and fade resistant.
1. Basis of Design: Draper, Inc. “SheerWeave SW7500”
2. Type: Manuf. Standard
3. Color: Midnight

2.7 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
1. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

SECTION 12 3616 - METAL COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes stainless-steel countertops.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:
   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
   2. Product Data for Credit IEQ 4.1: For sealant, documentation including printed statement of VOC content.

C. Shop Drawings: Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver metal countertops only after casework has been completed in installation areas.

B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of construction to receive metal countertops by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

B. Sealant for Countertops: Manufacturer's standard sealant of characteristics indicated below that complies with applicable requirements in Section 079200 "Joint Sealants."
   1. Joint Sealant: Single component, nonsag, neutral curing, silicone; Class 25.
   2. Color: Clear.
   3. Sealant shall have a VOC content of 250 g/L or less.

2.2 STAINLESS-STEEL

A. Countertops: Fabricate from 0.062-inch- thick, stainless-steel sheet. Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide front and end overhang of 1 inch over the base cabinets.
   1. Joints: Fabricate countertops without field-made joints.
   2. Weld shop-made joints.
   3. Sound deaden the undersurface with heavy-build mastic coating.
   4. Extend the top down to provide a 1-inch- thick edge with a 1/2-inch return flange.
   5. Form the backsplash coved to and integral with top surface, with a 1/2-inch- thick top edge and 1/2-inch return flange.
   6. Size / Corners: Per drawings

2.3 STAINLESS-STEEL FINISH

A. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of metal countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install metal countertops level, plumb, and true; shim as required, using concealed shims.

B. Field Jointing: Where possible, make field jointing in the same manner as shop jointing; use fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

C. Secure tops to cabinets with Z- or L-type fasteners or equivalent; use two or more fasteners at each front, end, and back.

D. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.

E. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

F. Wall-Mounted Shelves: Fasten to masonry, partition framing, blocking, or reinforcements in partitions. Fasten each shelf through upturned back edge at not less than 24 inches o.c.

3.3 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed on completion of installation.

B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

C. Protection: Provide 6-mil plastic or other suitable water-resistant covering over the countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION

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SECTION 12 3623.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes plastic-laminate countertops.

B. Related Sections:
1. Section 05 5000 “Metal Fabrications” for countertop supports.
2. Section 06 4116 “Plastic Laminate Faced Architectural Cabinets” for architectural cabinets.
3. Section 12 3661.16 “Solid Surfacing Countertops”, for solid surface countertops.

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site. Coordinate schedule with pre-installation conference for wood-veneer-faced cabinets and solid-surface countertops.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products high-pressure decorative laminate and adhesive for bonding plastic laminate.

B. LEED Submittals:
1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
3. Certificates for Credit MR 7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification and chain-of-custody requirements. Include statement indicating cost for each certified wood product.
4. Product Data for Credit IEQ 4.1: For installation adhesives, including printed statement of VOC content.

5. Product Data for Credit IEQ 4.4: For adhesives and composite wood products, documentation indicating that products contain no urea formaldehyde.

C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
1. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers and other items installed in plastic-laminate countertops.
2. Apply WI Certified Compliance Program label to Shop Drawings.

D. Samples for Initial Selection:
1. Plastic laminates.

E. Samples for Verification:
1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Woodwork Quality Standard Compliance Certificates:
1. WI Certified Compliance Program certificates.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a licensee of WI's Certified Compliance Program.

B. Installer Qualifications: Fabricator of products or licensee of WI's Certified Compliance Program.

C. Certified Compliance
1. Before delivery to the jobsite the woodwork supplier shall provide a Woodwork Institute Certified Compliance Certificate indicating the millwork products being supplied and Certifying that these products fully meet the requirements of the Grade or Grades specified.
2. Each elevation of casework, each laminated plastic top, and each solid surface top shall bear a Woodwork Institute Certified Compliance Label.
3. At completion of installation the woodwork installer shall provide a Woodwork Institute Certified Compliance Certificate indicating the products installed, and Certifying that the installation of these products fully meets the requirements of the Grade or Grades specified.
4. All fees charged by the Woodwork Institute for their Certified Compliance Program are the responsibility of the millwork manufacturer and/or installer and shall be included in their bid.

D. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas. If countertops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE COUNTERTOPS (**PL2**)

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.
   1. Provide labels and certificates from WI certification program indicating that countertops, including installation, comply with requirements of grades specified.
   2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Premium.

C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.
   1. Basis of Design: Subject to compliance with requirements, provide Formica “Laminate” or the following:
      a. Approved equal.

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   1. As selected by Architect from manufacturer's full range in the following categories:
      a. Solid colors, matte finish.
      b. Solid colors with core same color as surface, matte finish.
      c. Patterns, matte finish.

E. Edge Treatment: Same as laminate cladding on horizontal surfaces.

F. Core Material: Particleboard or medium-density fiberboard.

G. Core Material at Sinks: Particleboard made with exterior glue, medium-density fiberboard made with exterior glue or exterior-grade plywood.

H. Core Thickness: 3/4 inch.
   1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.

I. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

J. Paper Backing: Provide paper backing on underside of countertop substrate.

K. Locations: All countertops, unless specified in separate specification section.

L. Color: 6610-SP Endless Graytone

2.2 ACCESSORIES

A. Grommets for Cable Passage through Countertops: 1-1/4-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.
   1. Product: Subject to compliance with requirements, provide "OG series" by Doug Mockett & Company, Inc.
   2. Locations: Per drawings

2.3 MISCELLANEOUS MATERIALS

A. Adhesives: Do not use adhesives that contain urea formaldehyde.

B. VOC Limits for Installation Adhesives and Sealants: Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Wood Glues: 30 g/L.
   2. Multipurpose Construction Adhesives: 70 g/L.
   3. Structural Wood Member Adhesive: 140 g/L.
   4. Architectural Sealants: 250 g/L.

2.4 FABRICATION

A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:
   1. Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.

B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
   2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
   1. Seal edges of openings in countertops with a coat of varnish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
   1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
   2. Seal edges of cutouts by saturating with varnish.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

F. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean countertops on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

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SECTION 12 3661.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Solid-surface-material countertops and backsplashes.

B. Related Sections:
   1. Section 05 5000 “Metal Fabrications” for countertop supports.
   2. Section 22 0000 "Plumbing" for sinks and plumbing fittings.

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site. Coordinate schedule with pre-installation conference for wood-veneer-faced cabinets and plastic-laminate-clad countertops.

1.4 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. LEED Submittals:
   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
   2. Certificates for Credit MR 6: Chain-of-custody certificates indicating that wood products comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
   3. Product Data for Credit IEQ 4.4: For adhesives and composite wood products, documentation indicating that product contains no urea formaldehyde.

C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

D. Samples for Initial Selection: For each type of material exposed to view.

E. Samples for Verification: For the following products:
1. One full-size solid-surface-material countertop, with front edge and backsplash, 8 by 10 inches, of construction and in configuration specified.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Woodwork Quality Standard Compliance Certificates:
1. WI Certified Compliance Program certificates.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a licensee of WI's Certified Compliance Program.

B. Installer Qualifications: Fabricator of products or licensee of WI's Certified Compliance Program.

C. Certified Compliance
1. Before delivery to the jobsite the woodwork supplier shall provide a Woodwork Institute Certified Compliance Certificate indicating the millwork products being supplied and Certifying that these products fully meet the requirements of the Grade or Grades specified.
2. Each elevation of casework, each laminated plastic top, and each solid surface top shall bear a Woodwork Institute Certified Compliance Label.
3. At completion of installation the woodwork installer shall provide a Woodwork Institute Certified Compliance Certificate indicating the products installed, and Certifying that the installation of these products fully meets the requirements of the Grade or Grades specified.
4. All fees charged by the Woodwork Institute for their Certified Compliance Program are the responsibility of the millwork manufacturer and/or installer and shall be included in their bid.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID-SURFACE-MATERIAL COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.
1. Provide labels and certificates from WI certification program indicating that countertops, including installation, comply with requirements of grades specified.

B. Grade: Premium.

C. Configuration: Provide countertops with the following front and backsplash style:
1. Front: 1 ½ inch, straight, slightly eased at top.
2. Backsplash: Straight, slightly eased at corner.
3. Endsplash: Matching backsplash.

D. Countertops: 1-inch- thick, solid surface material with front edge built up with same material.

E. Backsplashes: 1/2-inch- thick, solid surface material.

F. Fabrication: Fabricate tops in one piece with shop-applied edges unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
1. Fabricate with loose backsplashes for field assembly.

2.2 COUNTERTOP MATERIALS (**SSM1, SSM2**)

A. Adhesives: Adhesives shall not contain urea formaldehyde.

B. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
1. Manufacturers: Subject to compliance with requirements, provide Paperstone or:
a. Approved equal.
2. Type: Provide Standard Type unless Special Purpose Type is indicated.
a. Edge Profiles: 1/8” Roundover (Top and Bottom)
b. Thickness: 1”
c. Texture: “Scotch-Brite”
d. Flame Spread: 20 maximum
e. Color: Gunmetal
f. Location: Rooms 125, 135.
g. Grommets: Per drawings

C. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
1. Manufacturers: Subject to compliance with requirements, provide DuPont Corian “Terra Collection” or:
a. Approved equal.
2. Type: Provide Standard Type unless Special Purpose Type is indicated.

a. Edge Profiles: 1/8” Roundover (Top and Bottom)
b. Front Faceplates: At all vanity brackets per drawings.
c. Thickness: 1”
d. Texture: Manufacturer’s standard
e. Color: Anthracite
f. Location: Restrooms and shower rooms

PART 3 - EXECUTION

3.1 INSTALLATION

A. Grade: Premium.

B. Install countertops level to a tolerance of 1/8 inch in 8 feet.

C. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

END OF SECTION

SECTION 12 4813 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Entrance tiles in recessed frames.

B. Related Sections include the following:
   1. Section 03 3000 "Cast-in-Place Concrete" for slab depression for recessed mats and frames.
   2. Section 12 4816 "Entrance Floor Grilles" for rigid foot grilles and frames.

1.3 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show the following:
   1. Divisions between mat sections.
   2. Perimeter floor moldings.

C. Samples for Initial Selection: For each type of product indicated.

D. Samples for Verification: For each type of product indicated.
   1. Entrance Tiles: 12-inch- square.
   2. Frame Members: 12-inch- long Sample of each type and color.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For floor mats and frames to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Entrance Tiles: Full-size units equal to 2 percent of amount installed for each size, color, and pattern indicated, but no fewer than 10 units.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain floor mats and frames through one source from a single manufacturer.

B. Accessibility Requirements: Provide installed floor mats that comply with Section 4.5 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1.7 PROJECT CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.

1.8 COORDINATION

A. Coordinate size and location of recesses in concrete with installation of finish floors to receive floor mats and frames.

PART 2 - PRODUCTS

2.1 ENTRANCE TILES (**EFM1**)

A. Basis-of-Design Product: Subject to compliance with requirements, provide Lees “Tuff Stuff StepUp Modular” or by one of the following:
1. approved equal.

B. Carpet-Type Tiles:
1. Style No.: Wrought Iron
2. Color: 00438
3. Fiber Type: Fortis nylon 6,6 with Nylon 6,6 scraper yarn.
4. Pile Characteristic: Performance tip shear.
5. Gage: 5/32 inch.
6. Backing Material: ICT - Fiberglass-reinforced thermoplastic composite tile.
7. Size: Per drawings
8. Fiber Technology: Sentry Soil Protection.
9. Face Weight: 38 oz./ sq. yd.
10. Installation: Monolithic

C. Recessed Frames:
   1. Extruded Aluminum: ASTM B 221, Alloy 6061-T6 or Alloy 6063-T5, T6, or T52.
   2. Color: Mill-finish

2.2 CONCRETE FILL AND GROUT MATERIALS

A. Provide concrete grout and fill equivalent in strength to cast-in-place concrete slabs for recessed mats and frames. Use aggregate no larger than one-third fill thickness.

2.3 FABRICATION

A. Recessed Frames: As indicated, for permanent recessed installation, complete with corner pins or reinforcement and anchorage devices.
   1. Fabricate edge-frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.

B. Coat surfaces of aluminum frames that will contact cementitious material with manufacturer's standard protective coating.

2.4 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install recessed mat frames to comply with manufacturer's written instructions. Set mat tops at height recommended by manufacturer for most effective cleaning action; coordinate top of mat surfaces with bottom of doors that swing across mats to provide clearance between door and mat.

1. For installation in polished concrete flooring areas, provide allowance for grinding and polishing of polished concrete without grinding surface of recessed frames. Coordinate with other trades as required.
2. Install necessary shims, spacers, and anchorages for proper location and secure attachment of frames.
3. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.

3.3 PROTECTION

A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Final Completion.

END OF SECTION

SECTION 12 4816 - ENTRANCE FLOOR GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes recessed foot grilles and frames.

B. Related Sections include the following:
   1. Section 03 3000 "Cast-in-Place Concrete" for slab depression grouting and filling for recessed foot grilles and frames.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide foot grilles and frames capable of withstanding the following loads and stresses:
   1. Uniform floor load of 300 lbf/sq. ft.
   2. Wheel load of 350 lb per wheel.

B. Coefficient of Friction: 0.60 minimum per ASTM D2047.

1.4 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for foot grilles and frames.

B. Shop Drawings: Show the following:
   1. Items penetrating foot grilles and frames, including the following:
      a. Door control devices.
   2. Divisions between grille sections.
   3. Perimeter floor moldings.

C. Samples for Initial Selection: For each type of product involving color selection.

D. Samples for Verification: For each type of product indicated.
   1. Foot Grille: 12-inch- square assembled sections.
   2. Frame Members: 12-inch- long Sample of each type and color.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For foot grilles and frames to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain foot grilles and frames through one source from a single manufacturer.

B. Accessibility Requirements: Provide installed foot grilles that comply with Section 4.5 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1.7 PROJECT CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.

1.8 COORDINATION

A. Coordinate size and location of recesses in concrete to receive foot grilles and frames.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide ARDEN Architectural Specialties, Inc. “eleGril” Model SS-38G or a comparable product by one of the following:
1. Approved equal.

2.2 MATERIALS

A. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with A60 zinc-iron-alloy (galvannealed) coating or with G60 mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924/A 924M.

B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

C. Stainless-Steel Angles: ASTM A 276 or ASTM A 479/A 479M, corrosion resistant, Type 304.

2.3 FOOT GRILLES (**EFG1**)

A. General: Provide manufacturer's standard foot-grille assemblies consisting of treads of type and profile indicated, interlocked or joined together by cross members, and with support legs (if any) and other components needed to produce a complete installation.

B. Stainless-Steel Foot Grille: Type 304.
1. Surface Treads: 0.093-by-0.156-inch wire with 0.140-inch- wide openings between wires.
2. Support Rods: Spaced 1 inch o.c., welded to each wire.
3. Stainless-Steel Finish: Mill finish.
4. Grille Size: As indicated.

C. Lockdown: Hidden.

2.4 FRAMES

A. Provide manufacturer's standard frames of size and style for grille type, for permanent recessed installation in subfloor, complete with installation anchorages and accessories. Unless otherwise indicated, fabricate frame of same material and finish as grilles.

2.5 FABRICATION

A. Shop fabricate foot grilles to greatest extent possible in sizes as indicated. Unless otherwise indicated, provide each grille as a single unit; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in grilles are necessary, space symmetrically and away from normal traffic lanes.

B. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.7 STAINLESS-STEEL FINISHES

A. Mill finish.

B. Directional Satin Finish: No. 4.
1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, size, minimum recess depth, and other conditions affecting installation of foot grilles and frames.

B. Examine roughing-in for drainage piping systems to verify actual locations of piping connections before foot grille and frame and drain pan installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install recessed foot grilles and frames to comply with manufacturer's written instructions at locations indicated and with top of foot grilles and frames in relationship to one another and to adjoining finished flooring as recommended by manufacturer. Set foot-grille tops at height for most effective cleaning action. Coordinate top of foot-grille surfaces with doors that swing across grilles to provide clearance under door.

3.3 PROTECTION

A. After completing frame installations, provide temporary filler of plywood or fiberboard in foot-grille recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Final Completion.

END OF SECTION

SECTION 12 9300 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 SCOPE OF WORK

The work included in this section generally consists of providing all labor, equipment and materials necessary to install all site furnishings complete as shown on the plans and as described herein.

1.2 RELATED SECTIONS

A. A. Division 03 Section "Cast-in-Place Concrete" for installation of pipe sleeves cast, installation of anchor bolts cast, or formed voids in concrete footings.

B. Division 31 Section "Earth Moving" for excavation for installation of concrete footings.

1.3 SUBMITTALS

Submit 6 copies of manufacturer's cut sheet and specification for approval within two weeks of notice to proceed.

1.4 DELIVERY, STORAGE AND HANDLING

Contractor assumes all responsibility for storage of all materials relative to this project, including liability for losses or damages from any cause as a result of such storage.

1.5 PROJECT CONDITIONS – PROTECTION

A. After site furnishings are installed, all damage to surrounding paving, turf, and irrigation system shall be repaired by the contractor at the contractor's expense.

B. All trees and shrubs in and around the project site shall be protected by the contractor and, if damaged, replaced at the contractor’s expense. This provision is in effect until acceptance by owner of the complete project

1.6 LOCATION INSPECTION

No equipment, apparatus or foundations for same shall be placed until location stakes have been inspected and accepted by the Owner of Chico.

1.7 GUARANTEE & LIABILITY INSURANCES

A. Manufacturer shall guarantee all materials and workmanship for a period of one (1) year exclusive of vandalism.

B. The manufacturer will be required to provide complete installation drawings including specifications and a replacement parts list for all products.

C. Contractor shall provide a written guarantee on his firm's letterhead for all materials and workmanship for a period of one (1) year, exclusive of vandalism. Written guarantee shall be submitted to the Owner at the final inspection prior to final acceptance of the work.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:

1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
2. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
3. Structural Pipe and Tube: ASTM B 429.
4. Sheet and Plate: ASTM B 209 (ASTM B 209M).
5. Castings: ASTM B 26/B 26M.

B. Steel and Iron: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53, or electric-resistance-welded pipe complying with ASTM A 135.
3. Tubing: Cold-formed steel tubing complying with ASTM A 500.
4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500; zinc coated internally and externally.
5. Sheet: Commercial steel sheet complying with ASTM A 1011/A 1011M.
6. Expanded Metal: Carbon-steel sheets, deburred after expansion, and complying with ASTM F 1267.
7. Malleable-Iron Castings: ASTM A 47/A 47M, grade as recommended by fabricator for type of use intended.
8. Gray-Iron Castings: ASTM A 48/A 48M, Class 200.

C. Stainless Steel: Free of surface blemishes and complying with the following:
1. Sheet, Strip, Plate, and Flat Bars: ASTM A 666.
2. Pipe: Schedule 40 steel pipe complying with ASTM A 312/A 312M.
3. Tubing: ASTM A 554.

D. Fiberglass: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and manufacturer's standard finish.

E. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.
1. Polyethylene: Fabricated from virgin plastic HDPE resin.
2. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial

quality, tamperproof, vandal and theft resistant, concealed, recessed, and capped or plugged.

3. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107; recommended in writing by manufacturer, for exterior applications.
4. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.
5. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:
   a. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil (0.0076 mm) thick.
   b. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

2.2 FABRICATION

A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces.

E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

F. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.3 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.4 ALUMINUM FINISHES

Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.5 STEEL AND GALVANIZED STEEL FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

B. PVC Finish: Manufacturer's standard, UV-light stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.

2.6 IRON FINISHES

Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.7 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

PART 3 – EXECUTION

3.1 LAYOUT

Contractor shall stake/mark locations for all slabs and foundations and shall obtain the approval of their location from Landscape Architect prior to commencing any digging. Locations shall be adjusted to provide minimum clear distances required from all edges of slabs, trees, irrigation heads, or other obstructions.

3.2 CONCRETE WORK

All concrete work shall conform to the Standard Plans, and those of Section 02515. Contractor shall obtain the approval of all forming from the Landscape Architect prior to pouring any concrete slabs. Foundations holes shall be inspected and approved by the Public Works Inspector prior to pouring concrete.

3.3 INSTALLATION

A. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

B. Install site furnishings level, plumb, true, and securely anchored and positioned at locations indicated on Drawings.

C. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch (19 mm) larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

D. All site furnishings shall be installed with vandal-proof hardware or made vandal-proof (deforming or peening).

E. Maintain specific required distance between top of paving and product, drinking fountain, bench, etc).

F. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

G. All products to be installed according the manufacturers' specifications. If discrepancies occur, notify Owner's Representative as soon as possible before proceeding with installation.

H. Contractor to repair, repaint all minor damage during installation.

3.4 PROTECTION OF EXISTING IMPROVEMENTS

Contractor shall protect all existing improvements from damage. All disturbed landscape areas shall be fine graded filling all depressions, wheel ruts and irregularities and shall be finished per plan. Contractor shall make all repairs and restore all damaged landscape areas at his sole expense.

3.5 CLEAN-UP

A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

B. Contractor shall clean up and legally dispose of all unused materials, excess soil, and debris at regular intervals throughout the duration of the work, and as directed by the Architect.

END OF SECTION

SECTION 14 45 00 - VEHICLE LIFTS

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.1 WORK INCLUDED

A. Equipment items as listed below by Equipment Identifier:
   1. 5414 Jack stand, lift, portable (Ref. Part 2.1)
   2. 5690 Lift, axle, scissor, adjustable, 60,000 pounds (Ref. Part 2.2)

B. Roughing-in, installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.

C. Piping, wiring, and switching between equipment and utilities.

1.2 QUALITY ASSURANCE

A. Experience: Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.

B. Quality standards shall meet or exceed ISO-9001 and be certified by the Automotive Lift Institute (ALI).

C. Manufacturer's Representative:
   1. Installation: Provide a qualified manufacturer's representative at site to supervise work related to equipment installation, check out, and start up.
   2. Training: Provide technical representative to provide training to Owner's maintenance personnel in operation and maintenance of specified equipment.
   3. Quality standards shall meet or exceed ISO-9001.

1.3 SUBMITTALS

A. Product Data: Submit Product Data in accordance with Division 1 of these specifications.

B. Operations and Maintenance Manual:
   1. Submit Operations and Maintenance Manuals in accordance with Division 1- General Requirements of these specifications.
   2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.
   3. Description of system and components.
   4. Schematic diagrams of electrical, plumbing, and compressed air system.
   5. Manufacturer's printed operating instructions.
   6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

C. Shop Drawings:

1. Submit Shop Drawings in accordance with Division 1 - General Requirements.
2. Submit site specific installation drawings and procedures.

1.4 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance will be based on the technical requirements herein as determined by Owner and Architect.

1.5 WARRANTY

A. Warrant work specified herein for one year from substantial completion against defects in materials, functions, and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer’s recommended preventive maintenance schedule.

D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

E. All parts shall be readily available locally in the United States.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer’s containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.

1.7 LABELING

A. Manufacturer shall securely attach in a prominent location, on each major item of equipment, a non-corrosive nameplate showing manufacturer’s name, address, model number, serial number, and pertinent utility or operating data.

B. Manufacturer shall securely attach the ALI label of the Automotive Lift Institute.

C. All electrical equipment and materials shall be new and shall be listed by Underwriter’s Laboratories, Inc. (UL) in categories for which standards have been set by that agency and labeled as such in the manufacturer’s plant.

PART 2 - PRODUCTS

2.1 JACK STAND, LIFT, PORTABLE
Equipment Identifier: 5414

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Stertil Koni, Stevensville, MD (800) 336-6637
b. Model No.: SKCP-5278-09

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.
a. Rotary Lift, Madison, IN (800) 640-5438
b. SEFAC, Inc., Baltimore, MD (800) 826-3486

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 31 inches
b. Width: 31 inches
c. Height: 52 inches

2. Rated capacity: 9 tons

C. Features/Performance/Construction:
1. Automatic valve shall prevent overloading.
2. Stand shall be steel construction.
3. Handle shall have infinite adjustment positions.
4. Handle shall fold away.
5. Stand shall be mounted on two hard rubber wheels.
6. Stand shall adjust height with one tall continuous screw.

D. Finish: Durable enamel in manufacturer's standard colors

2.2 LIFT, AXLE, SCISSOR, ADJUSTABLE, 60,000 POUNDS
Equipment Identifier: 5690

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Stertil Koni, Stevensville, MD (800) 336-6637
b. Model No.: ECO-60

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers *may* be considered as equal.
a. Rotary Lift, Madison, IN (812) 273-1622

B. General Description: The lift shall consist of two lifting units in line with the longitudinal axis of the vehicle, each lifting unit so equipped as to engage the axle and/or suspension as specified herein. One of the two lifting units will be movable fore and aft to affect the variable spacing between lifting mechanisms. The other lifting unit shall be fixed.

C. Capacities/Dimensions:
1. Control console dimensions:
   a. Width: 24-13/16 inches
   b. Depth: 25-3/16 inches
   c. Height: 47-1/16 inches

2. Lift capacities:
   a. Fixed: 30,000 pounds
   b. Movable: 30,000 pounds
   c. Total: 60,000 pounds

3. Lift rise: 70 inches net rise
4. Lifting rate: 90 seconds, 45 inches per minute, minimum
5. Maximum depth below finished floor for any structural component member: 34 inches, maximum

6. Travel range: 17 feet
7. Wheel base range: 198 to 348 inches
8. Drive-over capacity for interlocking extruded structural aluminum cover: 13,500 pounds

D. Features/Performance/Construction:
1. Lift units:
   a. Lift units and continuous recess insert shall be completely removable with no lift components or structural framing permanently embedded in the concrete.
   b. Lift unit shall be a hydraulically powered, mechanically articulating scissor lift, complete with a mechanical locking system.
   c. Lift unit shall be constructed of 2 inch thick bars, 2 inch thick inner leg assembly weldments, 2 inch diameter 4140 pins, greaseless polygon bushings, a 3/4 inch thick T-1 steel dual lock-jaw weldment, 7 inch diameter single-acting hydraulic cylinder, and UHMW slide blocks.
   d. All steel surfaces shall be powder coated.
   e. By means of a centering link, the lifting structure shall articulate symmetrically about the longitudinal axis of the vehicle to maintain the lift directly centered under the vehicle as it raises and lowers.

2. Movable carriage unit:
   a. The movable lifting unit shall relocate horizontally fore and aft while in the fully retracted position.
   b. When the entire travel frame insert has the covers in place and the lift is operational, it forms a continuous recess that shall meet the following design and performance criteria:
      1) The movable lift unit shall not be required to recess, or park, in only one “pocketed” location.
      2) The movable lifting unit may be recessed below finished floor at any position between the minimum and maximum dimensions of the travel range.

3) The movable lifting unit shall be capable of fore and aft travel while recessed below the floor.

c. Maximum depth below finished floor for the continuous recess insert, rear lifting unit or any fixed or movable component shall be 34 inches.
d. The movable steel box insert shall have an open floor design, mounted off the concrete floor of the trench to allow for the collection, cleaning and drainage of all liquids and solids that accumulate in the trench.
e. The aluminum covers for the movable mechanism shall be anodized structural 6061 aluminum extrusions engineered to accept a 7,500 pound point load on a contact area of 2 by 2 inches and shall be shaped to include a full-length interlocking hinge. Covers shall fit together tightly and uniformly to promote smooth travel so as to prevent jamming and twisting. The covers shall be able to accept a 13,500 pound driver over load on a 6 by 9 inch contact area.
f. The travel frame shall have a machined UHMW cover guide blocks at each end that taper and self-align the covers of the lift unit as the covers travel in and out of the recess.
g. The movable lifting unit and the covers shall bear on and slide over low friction, low maintenance, low wearing UHMW surfaces for low friction and minimal maintenance.
h. The hydraulically powered carriage drive shall have rack and gear arrangement on both the left and right sides for smooth and even fore-aft travel without binding.
i. The rack shall be inverted and positioned under the load channel of the insert where it is protected so as not to collect dirt, grease etc.
j. All hydraulic and compressed air service lines shall be fed from the control console to the insert through one PVC pipe chase way per unit.
k. All low voltage intrinsically safe electric service lines shall be fed from the control console to the insert through one 3/4 inch rigid conduit per unit installed to meet local codes.

3. Fixed lifting unit:
   a. The rear stationary lift shall be of the same design and construction as the front lift unit.
   b. The rear lift unit shall be drop-in, bolt-in place and bolted in-place with eight 7/8 inch stainless steel anchors.

4. Hydraulic system:
   a. System shall be comprised of two high pressure, low volume single acting 7 inch diameter cylinders, one at each lifting unit.
   b. High pressure seals shall be internal to the cylinder where they are protected from salt, dirt etc.
   c. Combined, the two cylinders shall only require 7 gallons of AW 32 hydraulic oil for lifting the full height.
   d. Each cylinder shall have a hose break velocity fuse (safety check valve) integrally mounted to prevent excessive loss of fluid from the cylinder.
   e. The hoses shall be steel reinforced construction and JIC fittings throughout.
   f. The hoses feeding the front movable lift carriage shall be supported and contained by a cable carrier to prevent the hoses from dragging or tangling.
   g. The lift shall be driven by a two power units, readily available as an off-the-shelf component.

5. Safety devices:
   a. Each lifting unit shall be equipped with double lock jaw, gravity engaging, mechanical locks with the first lock position engaging at a minimum height of 18 inches
   b. Number of Mechanical Lock Stops: 12, minimum.
   c. Vertical height spacing between each lock stop: 6 inches, maximum.
   d. The mechanical locks shall be made of high strength T-1 steel.
   e. All push buttons shall be of momentary contact, dead man type.

E. Controls:
1. The control system shall conform to all current NEC, UL 201, and OSHA codes.
2. The control system shall be PCB operated and continuously monitor all operation functions and safety systems of the lifting units. The control system shall utilize intrinsically safe inclinometers to constantly monitor the elevation of the lifting units to ensure synchronized operation.
3. The control system shall have a provision to allow the operator to electronically restrict the maximum lifting height.
4. The control system shall provide audio and visual feedback that communicates with the operator. The control system shall facilitate troubleshooting by providing no less than 44 fault codes displayed in numeric fashion on the PCB.
5. The enclosure for electrical control components shall be IP 54 rated and have the following controls mounted on the front cover
   a. Disconnect switch, 3 phase
   b. Push buttons for Lift Raise, Lower, and Unlock
   c. Selector button for synchronized, moveable, or fixed lifting
   d. Push buttons for hydraulic moveable carriage drive

6. The control console shall be equipped with a main power disconnect switch which interrupts all incoming power. Main power disconnect shall be lock-out capable.
7. Console access panels shall have key-hole slots and recessed handles for easy removal and installation.
8. The control system shall include, on the control box face, a blue HOME indicator lamp. This lamp shall illuminate when all lifting units are fully retracted to inform the operator that the bay is clear to allow entry and exit by the vehicle.
9. The control system shall automatically prohibit horizontal movement of the moveable lifting unit when raised above 12 inches above finished floor.
10. The control system shall have a provision to allow the operator to open the mechanical locks during rising to reduce noise emission.
11. The control system shall be equipped with an AWBP (automatic wheel base positioning) system that allows the operator to program not less than 14 wheelbase positions into the control system.

F. Accessories:
1. Adapters:
   a. The lift system shall include a variety of axle engaging accessory adapters designed to raise heavy vehicles by the axles or chassis. The accessory adapters shall be easily removed for storage and/or change out.
   b. Adapter adjustment: Minimum 13.25 inches, maximum 56 inches
   c. Bolster width: 40 inches, minimum.

d. Bolster and base adapter for both lifting units, movable and fixed, shall recess below finished floor.
e. Base adapter shall be restrained to prevent over extension.
f. Removal of the base adapters can be accomplished by pulling-up a spring loaded pin and sliding adapter off bolster.
g. The base adapter shall have at least a five-hole pattern that will allow every accessory adapter to be used in the reverse direction, allowing for up to eight positions of the accessory adapter on the base adapter.

2. Remote operators station
   a. Industrial remote shall be rated for use in NEC Class 1, Div 2, Group hazardous locations.
   b. Remote shall be connected to the control console through a multi-conductor, military-style DIN connector. Standard cable length shall be 35 feet.
   c. Remote shall allow operator full function control of the lift, with the following :
      1) Push/pull e-stop button
      2) Push buttons for lift raise, lower, and unlock
      3) Selector button for synchronized, front, or rear lifting
      4) Push buttons for hydraulic movable carriage drive

   d. Remote control shall be equipped with an emergency E-Stop button that de-energizes power to all outputs of the PCB. Re-activation of the control system requires resetting the E-stop and re-energizing the control system
   e. The control box shall have a provision to disable operation of the remote control during lowering when the bolster is below 12 inches A.F.F.

G. Utility Requirements:
   1. Controls: 460 VAC, 3 phase, 10 HP, 15 A
   2. Compressed air: 1/2 inch connection, 5 CFM, 90 PSI

PART 3 - EXECUTION

3.1 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.

C. Report in writing to the Architect, any damaged, missing or incomplete scheduled equipment and improper rough-in or utility stub-outs.

3.2 INSTALLATION

A. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect or designated representative.

B. Install equipment in accordance with plans, shop drawings, and manufacturer’s instructions:

1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.
2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
3. Anchorage: Attach equipment as directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.
4. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.3 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

B. Each lift shall be tested with the vehicle types operated by the Owner.

3.4 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing and installation debris from job site.

D. Notify Architect or designated representative for acceptance inspection.

3.5 TRAINING

A. Direct the technical representative to provide specified hours of training to designated Owner's maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.
   1. 5690 Lift, axle, scissor, adjustable, 60,000 pounds; 1 hour (minimum)

B. Demonstrate each lift operation utilizing each of the vehicle types operated by Owner.

C. Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.

END OF SECTION 14 45 00

SECTION 21 05 00 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes complete fire suppression system including sprinkler system and fire department connections.

1.2 SYSTEM DESCRIPTION

A. Sprinkler System: Conform to the following criteria:
   1. Coverage for entire building.
   2. Design system hydraulically to NFPA 13.
   3. System performance to achieve light hazard occupancy requirements.

1.3 SUBMITTALS

A. Shop Drawings: Indicate pipe layout, supports, components, accessories, sizes, and hydraulic calculations.

B. Product Data: Submit data for pipe materials used, valves, manufacturer's catalog sheet for equipment indicating rough-in size, finish, accessories, and power requirements.

C. Manufacturer's Certificate: Certify system has been tested and meets or exceeds specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of sprinkler heads.

B. Operation and Maintenance Data: Submit description of components of system, servicing requirements, record drawings, inspection data, and parts lists.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with:
   1. Sprinkler Systems: NFPA 13.

B. Maintain one copy of each document on site.

C. Design fire suppression system under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of California.

PART 2 - PRODUCTS

2.1 PIPE AND TUBE

A. Steel Pipe: ASTM A53, Grade B, black.

1. Steel Fittings: ASME B16.9, wrought steel, butt welded; ASME B16.25, butt weld ends; ASTM A234/A234M, wrought carbon steel and alloy steel; ASME B16.5, steel flanges and fittings.
2. Cast Iron Fittings: ASME B16.4, threaded fittings.
3. Malleable Iron Fittings: ASME B16.3, threaded type; ASTM A47.
4. Mechanical Grooved Couplings: Malleable iron housing, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.2 GATE VALVES

A. Up to and including 2 inches: Bronze body and trim, rising stem, hand wheel, solid wedge or disc, threaded ends.

B. Over 2 inches: Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, hand wheel, OS&Y, solid bronze or cast iron wedge, flanged or grooved ends.

2.3 CHECK VALVES

A. Up to and including 2 inches: Bronze body and swing disc, rubber seat, threaded ends.

B. Over 2 inches: Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged ends.

C. 4 inches and Over: Iron body, bronze disc with stainless steel spring, resilient seal and threaded, wafer or flanged ends.

2.4 DRAIN VALVES

A. Bronze compression stop with hose thread nipple and cap.

B. Brass ball valve with cap and chain, 3/4 inch hose thread.

2.5 SPRINKLERS

A. Furnish materials in accordance with California Fire Code and NFPA 13.

B. Suspended Ceiling Type: Semi-recessed pendant type with chrome plated finish, and matching escutcheon.

C. Exposed Area Type: Standard upright type with brass finish.

D. Sidewall Type: Semi-recessed horizontal sidewall type chrome plated finish with matching escutcheon.

E. Guards: Finish to match sprinkler head.

2.6 SPRINKLER PIPING SPECIALTIES

A. Furnish materials in accordance with California Fire Code and NFPA 13.

B. Wet Pipe Sprinkler Alarm Valve: Check type valve with electrically or hydraulically operated alarms, with pressure retard chamber and variable pressure trim.

C. Electric Alarm: Electrically operated red enameled gong with pressure alarm switch.

D. Water Flow Switch: Vane type switch with two contacts.

2.7 FIRE DEPARTMENT CONNECTION

A. Type: Free standing type with ductile iron pedestal red enamel finish.

B. Outlets: Two way with thread size to suit fire department hardware; threaded dust cap and chain of matching material and finish.

C. Drain: 3/4 inch automatic drip, to outside.

D. Label: "Standpipe - Fire Department Connection."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance NFPA 13.

B. Ream pipe and tube ends to full inside diameter. Remove burrs and bevel plain end ferrous pipe.

C. Remove scale and foreign material, inside and outside, before assembly.

D. Install sleeves where penetrating footings, floors, or walls. Seal pipe and sleeve penetration to maintain fire resistance equivalent to fire separation of footings, floors, or walls.

E. Install pipe runs to minimize obstruction to other work. Offset around ductwork.

F. Install piping in concealed spaces above finished ceilings.

G. Install gate valves for shut-off or isolating service.

H. Install drain valves at main shut-off valves, low points of piping and apparatus.

I. Install heads to coordinate with reflected ceiling plan. Center two directions in ceiling tiles.

J. Protection:
   1. Apply temporary tape or paper cover to sprinkler heads to protect from painting.
   2. Protect concealed sprinkler head cover plates from painting.

K. Interface sprinkler system with building fire and smoke alarm system.

L. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent Siamese connectors to allow full swing of fire department wrench handle.

M. Flush entire piping system of foreign matter.

N. Hydrostatically test entire system. Schedule test to be witnessed by Fire Marshal and Architect/Engineer.

END OF SECTION 21 05 00

SECTION 22 05 00 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Identification for Plumbing Piping and Equipment.
   2. Sleeves.
   3. Mechanical sleeve seals.
   4. Formed steel channel.

1.2 SUBMITTALS

A. Shop Drawings: Submit for piping and equipment identification list of wording, symbols, letter size, and color coding for pipe identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

B. Product Data for Pipe and Equipment Identification: Submit for mechanical identification manufacturers catalog literature for each product required.

C. Samples for Pipe and Equipment Identification: Submit two tags, 1-1/2 inches in size. Submit two labels, 1.9 x 0.75 inches in size.

PART 2 - PRODUCTS

2.1 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

A. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light background color.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light background color, minimum 1-1/2 inches diameter.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener. Color and Lettering: Conform to ASME A13.1.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Color and Lettering: Conform to ASME A13.1.

E. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.2 SLEEVES

A. Sleeves for Pipes through Non-fire Rated Floors: 18 gage thick galvanized steel.

B. Sleeves for Pipes through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel. Provide water stop collars at potentially wet floors and walls.

C. Sealant: Latex; refer to Section 07 92 00.

2.3 MECHANICAL SLEEVE SEALS

A. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.4 FORMED STEEL CHANNEL

A. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive sleeves.

3.2 INSTALLATION - PIPING AND EQUIPMENT IDENTIFICATION

A. Install plastic nameplates with adhesive.

B. Install plastic tags with corrosion resistant metal chain.

3.3 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with mechanical sleeve seals.

B. Set sleeves in position in forms. Provide reinforcing around sleeves.

C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

E. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with stuffing insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

F. Install stainless steel escutcheons at finished surfaces.

END OF SECTION 22 05 00

SECTION 22 07 00 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Plumbing piping insulation, jackets and accessories.
   2. Plumbing equipment insulation, jackets and accessories.

1.2 SUBMITTALS

A. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.

B. Manufacturer's Installation Instructions: Submit manufacturer's published literature indicating proper installation procedures.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.

B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

B. Maintain temperature before, during, and after installation for minimum period of 24 hours.

PART 2 - PRODUCTS

2.1 PIPE INSULATION

A. TYPE P-1: ASTM C547, molded glass fiber pipe insulation.
   1. Thermal Conductivity: 0.23 at 75 degrees F.

2. Operating Temperature Range: 0 to 850 degrees F.
3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.
4. Jacket Temperature Limit: minus 20 to 150 degrees F.

B. TYPE P-5: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular.
1. Thermal Conductivity: 0.27 at 75 degrees F.
2. Operating Temperature Range: Range: Minus 70 to 180 degrees F.

2.2 PIPE INSULATION JACKETS

A. Vapor Retarder Jacket:
1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.

B. PVC Plastic Pipe Jacket:
1. Product Description: ASTM D1784, One piece molded type fitting covers and sheet material, off-white color.
2. Thickness: 15 mil.
3. Connections: Tacks.

C. Stainless Steel Pipe Jacket:
1. ASTM A167 Type 304 stainless steel.
2. Thickness: 0.010 inch thick.
3. Finish: Smooth.
4. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

2.3 PIPE INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Insulating Cement: ASTM C195; hydraulic setting on mineral wool.

D. Adhesives: Compatible with insulation.

2.4 EQUIPMENT INSULATION

A. TYPE E-1: ASTM C553; glass fiber, flexible or semi-rigid, noncombustible.
1. Thermal Conductivity: 0.24 at 75 degrees F.
2. Operating Temperature Range: 0 to 450 degrees F.
3. Density: 1.5 pound per cubic foot.

B. TYPE E-8: ASTM C534, Type II, flexible, closed cell elastomeric insulation, sheet.
1. Thermal Conductivity: 0.27 at 75 degrees F.
2. Operating Temperature Range: Range: Minus 70 to 220 degrees F.

2.5 EQUIPMENT INSULATION JACKETS

A. PVC Plastic Equipment Jacket:
1. Product Description: ASTM D1784, sheet material, off-white color.
2. Minimum Service Temperature: -40 degrees F.
3. Maximum Service Temperature: 150 degrees F.
4. Moisture Vapor Transmission: ASTM E96; 0.002 perm-inches.
5. Thickness: 15 mil.
6. Connections: Brush on welding adhesive.

B. Stainless Steel Equipment Jacket:
1. ASTM A167 Type 304 stainless steel.
2. Thickness: 0.010 inch thick.
3. Finish: Smooth.
4. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

C. Vapor Retarder Jacket:
1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.

2.6 EQUIPMENT INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

D. Adhesives: Compatible with insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify piping and equipment has been tested before applying insulation materials.

B. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION - PIPING SYSTEMS

A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.

B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions.

C. Piping Systems Conveying Fluids Below Ambient Temperature:

1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.

D. Hot Piping Systems less than 140 degrees F:
1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
3. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.

E. Hot Piping Systems greater than 140 degrees F:
1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
3. Insulate flanges and unions at equipment.

F. Inserts and Shields:
1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.
2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.
    a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
    b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.
3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.

G. Insulation Terminating Points:
1. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping at union upstream of the coil control valve.
2. Condensate Piping: Insulate entire piping system and components to prevent condensation.

H. Closed Cell Elastomeric Insulation:
1. Push insulation on to piping.
2. Miter joints at elbows.
3. Seal seams and butt joints with manufacturer’s recommended adhesive.
4. When application requires multiple layers, apply with joints staggered.
5. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.

I. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

J. Piping Exterior to Building: Provide vapor retarder jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with stainless steel jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal piping.

K. Buried Piping: Insulate only where insulation manufacturer recommends insulation product may be installed in trench, tunnel or direct buried. Install factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with 1 mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.

L. Prepare pipe insulation for finish painting. Refer to Section 09 91 00.

3.3 INSTALLATION - EQUIPMENT

A. Factory Insulated Equipment: Do not insulate.

B. Exposed Equipment: Locate insulation and cover seams in least visible locations.

C. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

D. Equipment Containing Fluids Below Ambient Temperature:
1. Insulate entire equipment surfaces.
2. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
3. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
4. Finish insulation at supports, protrusions, and interruptions.

E. Equipment Containing Fluids 140 degrees F Or Less:
1. Do not insulate flanges and unions, but bevel and seal ends of insulation.
2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
3. Finish insulation at supports, protrusions, and interruptions.

F. Equipment Containing Fluids Over 140 degrees F:
1. Insulate flanges and unions with removable sections and jackets.
2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
3. Finish insulation at supports, protrusions, and interruptions.

G. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

H. Equipment Located Exterior to Building: Install vapor barrier jacket or finish with glass mesh reinforced vapor barrier cement. Cover with stainless steel jacket with seams located on bottom side of horizontal equipment.

I. Nameplates and ASME Stamps: Bevel and seal insulation around; do not cover with insulation.

J. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.

K. Prepare equipment insulation for finish painting. Refer to Section 09 91 00.

3.4 SCHEDULES

A. Water Supply Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Domestic Hot Water Supply and Recirculation	P-1	1-1/4 inches and smaller 1-1/2 inches and larger	0.5 1.0
Domestic Cold Water	P-1 or P-5	1-1/4 inches and smaller 1-1/2 inches and larger	0.5 1.0

END OF SECTION 22 07 00

SECTION 22 10 00 - PLUMBING PIPING AND PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe hangers and supports.
2. Pipe and pipe fittings.
3. Valves.
4. Piping specialties.
5. Plumbing drainage specialties.
6. Plumbing supply specialties.
7. Plumbing pumps.

1.2 SUBMITTALS

A. Product Data:
1. Pipe Hangers and Supports: Submit manufacturer's catalog data including load carrying capacity.
2. Valves: Submit manufacturer's catalog information with valve data and ratings for each service.
3. Plumbing drainage specialties: Submit manufacturer's catalog information with sizes, capacities, rough-in requirements, service sizes, and finishes.
4. Plumbing supply specialties: Submit manufacturer's catalog information with sizes, capacities, rough-in requirements, service sizes, and finishes.
5. Pumps: Include capacities, pump curves, equipment performance, and electrical characteristics.

B. Pipe Hangers and Supports: Design data, indicate pipe sizes, load carrying capacity of trapeze, multiple pipe, and riser support hangers.

C. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit spare parts lists and maintenance procedures.

1.4 WARRANTY

A. Furnish five-year manufacturer warranty for pumps.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Conform to ASME B31.9.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

C. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

D. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.

E. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

F. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

G. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

H. Vertical Support: Steel riser clamp.

I. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

J. Floor Support for Hot Pipe Sizes to 4 inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

K. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.

2.2 PIPES AND TUBES

A. Sanitary Sewer Piping, Buried Within 5 Feet of Building and Sanitary Sewer Piping, above Grade:
1. Cast Iron Pipe: ASTM A74, service weight, with neoprene gaskets.
2. Cast Iron Pipe: CISPI 301, hubless, service weight, with neoprene gaskets and stainless steel clamps.

B. Water Piping, Buried Within 5 Feet of Building:
1. Copper Tubing: ASTM B42, annealed without fittings.

C. Water Piping, above Grade:
1. Copper Tubing: ASTM B88, Type L, hard drawn, with cast brass or wrought copper fittings and Grade 95TA solder joints.
2. Galvanized Steel Pipe (Cold Water Only Sizes 4 inch and Larger): ASTM A53/A53M, Grade B, Schedule 40 with cast iron fittings and grooved mechanical couplings.

D. Storm Water Piping, Buried Within 5 Feet of Building and Storm Water Piping, above Grade:
1. Cast Iron Pipe: ASTM A74 service weight with neoprene gaskets.
2. Cast Iron Pipe: CISPI 301, hubless, service weight with neoprene gaskets and stainless steel clamps.

E. Equipment Drains and Overflows:
1. Copper Tubing: ASTM B88, Type L, hard drawn, cast brass, wrought copper or mechanically extracted fittings, lead free solder joints.
2. PVC Pipe: ASTM D1785, Schedule 40, PVC fittings, solvent weld joints.

F. Flue Condensate Drain Piping:

1. PVC Pipe: ASTM D1785, Schedule 80, polyvinyl chloride (PVC) material.
   a. Fittings: ASTM D2466, Schedule 80, PVC.
   b. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement. Prime joints with a contrasting color.

2.3 VALVES

A. Gate Valves:
   1. Up to 2 inches: Bronze body, bronze trim, non-rising stem, hand wheel, inside screw, double wedge disc, soldered or threaded.
   2. Over 2 inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, solid wedge, flanged or grooved ends.

B. Ball Valves:
   1. Up to 2 inches: Bronze or stainless steel one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends.
   2. Over 2 inches: Cast steel flanged body, chrome plated steel ball, Teflon seat and stuffing box seals and lever handle.

C. Plug Valves:
   1. Up to 2 inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends.
   2. Over 2 inches: Cast iron body and plug, pressure lubricated, Teflon packing, flanged ends.

D. Butterfly Valves:
   1. Up To 2 inches: Bronze body, stainless steel disc, resilient replaceable seat, threaded ends, extended neck, 10-position lever handle.
   2. Over 2 inches: Iron body, chrome plated iron disc, resilient replaceable seat, wafer or lug ends, extended neck, 10 position lever handle.

E. Swing Check Valves:
   1. Up to 2 inches: Bronze body and swing disc, solder or threaded ends.
   2. Over 2 inches: Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

F. Spring Loaded Check Valves:
   1. Iron body, bronze trim with threaded, wafer or flanged ends and stainless steel spring with renewable composition disc.

G. Relief Valves:
   1. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.

H. Water Pressure Regulator
   1. Bronze construction, stainless steel seat, stainless steel integral strainer, high temperature diaphragm, union inlet, and built-in thermal expansion bypass equalizer.

2.4 PIPING SPECIALTIES

A. Flanges, Unions, and Couplings:

1. Pipe Size 2 inches and Under: Malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
2. Pipe Size Over 2 inches: Forged steel flanges for ferrous piping; bronze flanges for copper piping; preformed neoprene gaskets.
3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Strainers:
1. Size 2 inches and Under: Threaded brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
2. Size 2-1/2 inch to 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

C. Flexible Connectors:
1. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure 300 psig.

D. Pressure Gages:
1. Gage: ASME B40.1, UL 393 with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
   a. Case: Steel.
   b. Bourdon Tube: Brass.
   c. Dial Size: 2-1/2 inch diameter.
   d. Mid-Scale Accuracy: One percent.
   e. Scale: Both psi and kPa.

E. Thermometers:
1. Stem Type Thermometer: ASTM E1, adjustable angle, red appearing mercury, lens front tube, cast aluminum case with enamel finish.
   a. Size: 7 inch scale.
   b. Window: Clear glass.
   c. Stem: Brass, 3/4 inch NPT, 3-1/2 inch long.
   d. Accuracy: ASTM E77 2 percent.
   e. Calibration: Both degrees F and degrees C.
2. Dial Type Thermometer: ASTM E1, stainless steel case, bimetallic helix actuated with silicone fluid damping, white with black markings and black pointer hermetically sealed lens, stainless steel stem.
   a. Size: 2-1/2 inch diameter dial.
   b. Lens: Clear glass.
   c. Accuracy: 1 percent.
   d. Calibration: Both degrees F and degrees C.

2.5 PLUMBING DRAINAGE SPECIALTIES

A. Floor Drains:
1. Manufacturer:
   a. Zurn, Model Z-415-B.
   b. Substitutions: Permitted.
2. Floor Drain (FD-1): Lacquered cast iron two piece body with double drainage flange, weep holes, adjustable collar, and round, adjustable nickel-bronze strainer.
3. Provide trap primer connection on floor drains where indicated on the Drawings.

B. Floor Sinks:
1. Floor Sink (FS-1): 12 x 12 inch enameled cast iron body with dome strainer and seepage flange.
2. Floor Sink: 4 x 8 inch enameled cast iron body with integral seepage pan, and dome strainer.

C. Cleanouts:
1. Finished Floor: Lacquered cast iron body with anchor flange, reversible clamping collar, and adjustable nickel-bronze round scored cover in service areas and round depressed cover to accept floor finish in finished floor areas.
2. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.6 PLUMBING SUPPLY SPECIALTIES

A. Water Meters:
1. Cold water construction, no lead, pulse output. Meters shall meet LEED minimum project requirements for monitoring water and energy use.
   a. Maintenance Building: 2-inch, cold water, 52 gpm, 74 psi maximum pressure, high flow turbine meter, unleaded bronze main case, meets ANSI/AWWA C701 Class 2 standard, for vertical applications. E-Mon model WMIP-TM13-2-NL-G-ECH-10 or equal.
   b. Administration Building: 2-inch, cold water, 55 gpm, 74 psi maximum pressure, multi-jet meter, unleaded brass body, meets ANSI/AWWA C708 accuracy standards, for horizontal applications. E-Mon model WMIP-MMAG-2-NL-G-PR-10-CONS or equal.

B. Backflow Preventers:
1. Reduced Pressure Backflow Preventers: ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; pressure relief valve located between check valves; third check valve opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

C. Water Hammer Arrestors:
1. Stainless steel construction, bellows type, Zurn Shoktrol Z-1700.

D. Thermostatic Mixing Valves:
1. Capacity 10 gpm at 45 psi differential, with check valve, volume control shut-off valve on outlet, stem type thermometer on outlet, strainer stop check on inlet, mounted in lockable cabinet of 16 gage prime coated steel.

E. Hose Bibbs/Hydrants:
1. Interior Hose Bibs: Bronze or brass, replaceable hexagonal disc, hose thread spout, chrome plated with vacuum breaker.
2. Wall Hydrant: Non-freeze, self-draining type with chrome plated lockable recessed box hose thread spout, removable key, and vacuum breaker.

F. Diaphragm-type Compression Tanks:
1. Construction: Welded steel, ASME tested and stamped; rated for working pressure of 125 psig, with flexible diaphragm sealed into tank, and steel legs or saddles.
2. Accessories: Pressure gage and air-charging fitting and drain.

2.7 IN-LINE CIRCULATOR PUMPS

A. Construction: Bronze casing, bronze impeller, alloy steel shaft with integral thrust collar and two oil-lubricated bronze-sleeve bearings and mechanical seal.

2.8 SUMP PUMPS

A. Basis of design: scheduled on drawings.

B. Construction: Cast iron base and housing, explosion resistant submersible sewage pump, bronze impeller, stainless steel shaft with carbon/ceramic seal, automatic level controls, ¾" solids, 45 gpm at 40 ft head, ½ HP, 115 V, 15.5 Amps, 3450 RPM, 20 ft cord and pigtail, 1-1/2" discharge, thermal protection, FM approved.

2.9 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Electrical characteristics.
1. 120 volts, single phase, 60 Hz.

B. Disconnect Switch: Locate within sight of equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify excavations are to required grade, dry, and not over-excavate.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside piping before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION - INSERTS

A. Install inserts for placement in concrete forms.

B. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

3.4 INSTALLATION - PIPING SYSTEMS

A. Install dielectric connections wherever jointing dissimilar metals.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Route piping parallel to building structure and maintain gradient.

D. Install piping to maintain headroom. Group piping to conserve space. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Sleeve pipe passing through partitions, walls and floors.

H. Install piping system allowing clearance for installation of insulation and access to valves and fittings.

I. Install identification on piping systems including underground piping. Refer to Section 22 05 00, COMMON WORK RESULTS FOR PLUMBING.

J. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

3.5 INSTALLATION - VALVES

A. Install valves with stems upright or horizontal, not inverted.

B. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install ball or butterfly valves for throttling, bypass, or manual flow control services.

D. Provide lug end butterfly valves adjacent to equipment when functioning to isolate equipment.

E. Install spring loaded check valves on discharge of pumps.

F. Install 3/4-inch ball drain valves at low points of piping and at equipment.

3.6 INSTALLATION - PIPING SPECIALTIES

A. Install pressure gages with pulsation dampers. Provide needle valve or ball valve to isolate each gage. Extend nipples to allow clearance from insulation.

B. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Allow clearance from insulation.

C. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

D. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

E. Provide drain and hose connection with valve on strainer blow down connection.

F. Test backflow preventers in accordance with ASSE 5013.

3.7 INSTALLATION - PLUMBING SUPPLY PIPING

A. Install water meters with at least ten pipe diameters of straight pipe before the meter, and five diameters of straight pipe after the meter.

B. Install water piping in accordance with ASME B31.9.

C. Excavate and backfill in accordance with Section 31 23 00, TRENCH EXCAVATION AND BACKFILL.

D. Establish elevations of buried piping outside the building to obtain not less than 2 ft of cover.

E. Provide support for utility meters in accordance with requirements of utility companies.

F. Slope water piping and arrange to drain at low points.

G. Install piping from relief valves, back-flow preventers and drains to nearest floor drain.

H. Install water hammer arrestors complete with accessible isolation valve on hot and/or cold water supply piping to lavatories, sinks, and flush fixtures.

I. Provide water service complete with approved reduced pressure back-flow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.

J. Install flow controls in water circulating systems as indicated on Drawings.

K. Provide noise and vibration isolation for piping installed in wall studs in office areas to minimize the transmission of noise and vibration.

3.8 INSTALLATION - PLUMBING DRAINAGE PIPING

A. Install bell and spigot pipe with bell end upstream.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Install with clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Establish elevations of buried piping outside building to provide not less than 2 ft of cover.

F. Install piping penetrating roofed areas to maintain integrity of roof assembly.

G. Excavate and backfill in accordance with Section 31 23 00, TRENCH EXCAVATION AND BACKFILL.

H. Install bell and spigot pipe with bell end upstream.

I. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.

J. Test drainage piping in accordance with local code requirements.

K. Provide acid neutralization traps for flue condensate drains.

L. Provide water piping between trap primer valves and floor drains where indicated on the Drawings.

3.9 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

G. Support riser piping independently of connected horizontal piping.

H. Provide copper plated hangers and supports for copper piping.

I. Design hangers for pipe movement without disengagement of supported pipe.

J. Prime coat exposed steel hangers and supports. Refer to Section 09 91 00 Painting. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.10 INSTALLATION - PUMPS

A. Install line size shut-off valve and strainer on pump suction. Install line size check valve, shut-off valve, and balancing valve on pump discharge.

3.11 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean. Verify pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

B. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual. Bleed water from outlets to accomplish distribution.

C. Maintain disinfectant in system for 24 hours. When final disinfectant residual tests less than 25 mg/L, repeat treatment.

D. Flush disinfectant from system. Take samples no sooner than 24 hours after flushing, and analyze in accordance with AWWA C601.

3.12 SERVICE CONNECTIONS

A. Install sanitary and storm sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and verify proper slope for drainage.

B. Install new water service complete with water meter with by-pass valves. Install sleeve around service main to 1 inch above floor and 6 inch minimum below slab on grade.

C. Install new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 9 inch wc.

3.13 SCHEDULES

A. Pipe Hanger Spacing:

PIPE MATERIAL	MAXIMUM HANGER SPACING Feet	HANGER ROD DIAMETER Inches
Cast Iron (All Sizes)	5	5/8
Cast Iron (All Sizes) with 10 foot length of pipe	10	5/8
Copper Tube, 1-1/4 inches and smaller	6	1/2
Copper Tube, 1-1/2 inches and larger	10	1/2
PVC (All Sizes)	4	3/8
Steel, 3 inches and smaller	12	1/2
Steel, 4 inches and larger	12	5/8

END OF SECTION 22 10 00

SECTION 22 30 00 - PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Water heaters.
   2. Ice Machines.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's literature for plumbing equipment.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit literature and parts list.

1.4 QUALITY ASSURANCE

A. Water Heater Performance Requirements: Equipment efficiency not less than prescribed by ASHRAE 90.1 when tested in accordance with DOE 10 CFR.

B. Ice Machine Performance Requirements: Equipment efficiency not less than prescribed by Federal Energy Efficiency Regulations.

1.5 WARRANTY

A. Furnish five-year manufacturer warranties for water heaters.

B. Furnish five-year manufacturer warranties for ice machines.

PART 2 - PRODUCTS

2.1 TANK GAS WATER HEATERS

A. Manufacturers:
   1. A. O. Smith
   2. State Industries
   3. Substitutions: Permitted.

B. Description: Factory – assembled and wired, vertical storage, natural gas fired, power venting or direct venting, condensing type.
   1. Input: As scheduled on Drawings
   2. Minimum recovery as scheduled on Drawings
   3. Thermal efficiency: Minimum 95%
   4. Maximum working pressure: 160 psi

C. Unit Construction: UL listed steel vessel: glass lined with powered anode, with high temperature limit thermostat and ASME rated temperature and pressure relief valve.
   1. Interior Finish: Corrosion-resistant metal or materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
   2. Insulation: Comply with ASHRAE 90.1.
   3. Jacket: Steel, with enameled finish.

D. Burner: For use with submerged combustion chamber and natural gas fuel, direct spark ignition, and complying with appropriate requirements of UL 795.

2.2 ICE MACHINE

A. Manufacturers:
   1. Scotsman Ice Systems
   2. Substitutions: Permitted

B. Description:
   1. Scotsman Model C0322MA-1, cube ice maker, with air-cooled condenser unit.
   2. Scotsman Model B322S Modular ice bin.
   3. AHRI certified.
   4. ISO 9001:2008 certified.
   5. Energy Star.
   6. NSF listed.

C. Unit Construction:
   1. Ice maker mounted on top of ice bin.
   2. Stainless steel finish, removable access panels.
   3. Ice level control.
   4. Network capable control.

D. Capacity:
   1. 255 lb in 24 hour, AHRI volume production with 90F air and 70F water.
   2. 290 lb AHRI certified bin capacity.
   3. 19.0 gallons potable water usage per 100 lb ice.
   4. 5,200 Btu/hr heat rejection.

E. Operating Requirements:
   1. 115V, 60 hz, 1 phase, 12.7 Ampacity, 15 Amp max fuse size.
   2. 50F to 100F air temperature.
   3. 40F to 100F water temperature.
   4. 20 psig to 80 psig water pressure.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install water heaters in accordance to UL requirements. Coordinate with plumbing piping and mechanical work to achieve operating system.

B. Install the following accessories:
   1. Wells for temperature regulator sensor at heated water outlet.
   2. ASME rated pressure and temperature relief valve on heated water discharge.
   3. ASME rated pressure relief valves from taps on heated waterside, set at 120 psi.
   4. Thermometers and pressure gauge taps on water inlets and outlets. Refer to Section 22 10 00.

C. Install piping from relief valves and drain valves to nearest floor drain or mop sink.

D. Install seismic restraint for tanks, anchored to building structural framing members.

E. Clean and flush tanks prior to delivery to site. Keep openings sealed until pipe connections are made.

F. On tanks, install drain at water inlet and outlet, thermometer with range of 40 to 200 degrees F, and ASME pressure relief valve suitable for maximum working pressure.

G. Install ice machine with local water filtration.

H. Install ice machine with 6-inches space at left, back and right side for ventilation and utility connections

END OF SECTION 22 30 00

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SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Water closets.
2. Urinals.
3. Lavatories.
4. Wash sinks.
5. Sinks.
6. Showers.
7. Drinking fountains.
8. Water bottle filling stations.
9. Mop sinks.
10. Eyewash/shower.
11. Emergency eyewash..

1.2 SUBMITTALS

A. Product Data: Submit manufacturer’s literature for plumbing fixtures.

1.3 SUSTAINABLE DESIGN SUBMITTALS

A. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
1. Water Efficiency Certificates:
a. Certify plumbing fixture flow rates.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit literature and parts list.

1.5 WARRANTY

A. Furnish three (3)-year manufacturer warranties for plumbing fixtures.

PART 2 - PRODUCTS

2.1 FLUSH VALVE WATER CLOSETS – WALL MOUNT ADA (WC1)

A. Manufacturer:
1. Basis of design scheduled on drawings.
2. Substitutions: Permitted.

B. Bowl: Wall mounted, ADA compliant, vitreous china closet with elongated rim, 1-1/2 inch spud, china bolt caps; maximum 1.28/1.1 gallon dual flush volume.

C. Flush Valve: Electronic, sensor activated, battery powered, with manual button, ADA compliant, Basis of design scheduled on drawings. Exposed chrome plated, diaphragm type, escutcheon, seat bumper, integral screwdriver stop and vacuum breaker.

D. Seat: Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

2.2 FLUSH VALVE WATER CLOSETS – FLOOR MOUNT ADA (WC2)

A. Manufacturer:
1. Basis of design scheduled on drawings.
2. Substitutions: Permitted.

B. Bowl: Floor mounted, ADA compliant, vitreous china closet with elongated rim, 1-1/2 inch spud, china bolt caps; maximum 1.28/1.1 gallon dual flush volume.

C. Flush Valve: Electronic, sensor activated, battery powered, with manual button, ADA compliant, Basis of design scheduled on drawings. Exposed chrome plated, diaphragm type, escutcheon, seat bumper, integral screwdriver stop and vacuum breaker.

D. Seat: Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

2.3 WALL HUNG URINALS (UR)

A. Manufacturer:
1. Basis of design scheduled on drawings.
2. Substitutions: Permitted.

B. Urinal: Vitreous china, ADA compliant, wall hung urinal with 14” rim, integral trap, vandal resistant outlet strainer, 3/4-inch top spud, steel supporting hanger; maximum 1/8-gallon flush volume.

C. Flush Valve: Ultra low consumption, battery powered, sensor activated, exposed chrome plated, diaphragm type with escutcheon, integral screwdriver stop, vacuum breaker. Basis of design scheduled on drawings.

D. Wall Mounted Carrier: Cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.4 LAVATORY (LV1)

A. Manufacturer:
1. Basis of design scheduled on drawings.
2. Substitutions: Permitted.

B. Vitreous China Counter Mounted Basin: ADA compliant, Vitreous china wall-hung lavatory 21 x 18 inch minimum, with drillings for concealed arm carrier, rectangular basin with soap dispenser hole on left front overflow.

C. Trim: Chrome plated, solar powered, battery backup, sensor activated, metered mixing faucet with aerator with maximum 0.5 gpm flow, Basis of design scheduled on drawings; open grid strainer, chrome plated brass P-trap with soap dispenser and arm with escutcheon.

D. Wall Mounted Carrier: Cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

2.5 WALL HUNG LAVATORY (LV2)

A. Manufacturer:
1. Basis of design scheduled on drawings.
2. Substitutions: Permitted.

B. Vitreous China Wall Hung Basin: ADA compliant, Vitreous china wall-hung lavatory 21 x 18 inch minimum, with drillings for concealed arm carrier, rectangular basin with soap dispenser hole on left front overflow.

C. Trim: Chrome plated, solar powered, battery backup, sensor activated, metered mixing faucet with aerator with maximum 0.5 gpm flow, Basis of design scheduled on drawings; open grid strainer, chrome plated brass P-trap with soap dispenser and arm with escutcheon.

D. Wall Mounted Carrier: Cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

2.6 SEMI-CIRCULAR WASH SINK (HWS)

A. Manufacturer:
1. Basis of design scheduled on drawings.
2. Substitutions: Permitted.

B. Stainless steel, semi-circular, shallow bowl, wash fountain, 24” diameter, ADA compliant, standard height, spray head for 3 users, with sensor-activated solenoid valves, 0.5 gpm flow restrictors.

C. Off-line vent with supplies from below.

D. Liquid soap dispenser.

E. Backsplash.

2.7 DOUBLE BOWL, STAINLESS STEEL, RIMMING SINK (SK)

A. Manufacturer:
1. Basis of design scheduled on drawings.
2. Substitutions: Permitted.

B. Double Compartment Bowl: Double compartment 37 x 22 x 6-1/2 inch outside dimensions, 20 gage, Type 304 stainless steel, self-rimming with undercoating, 3-1/2 inch crumb cups and chromed brass drain, ledge back drilled for trim.

C. Trim: Chrome plated brass supply with 8 inch gooseneck swing spout, water economy aerator with maximum 1.5 gpm flow, indexed 4 inch wristblade handle, ADA compliant, basis of design scheduled on Drawings; chrome plated brass P-trap with clean-out plug and arm with escutcheon.

2.8 BUILT-IN ADA SHOWER (SHR)

A. Manufacturer:
1. Basis of design scheduled on drawings Commercial Shower System Kit.

B. Trim: Concealed shower supply with pressure balanced mixing valves, with flow control and flanged shower head with maximum 1.5 gpm flow, with hand-shower bracket, diverter valve with lever handle, in-line vacuum breaker, recessed soap dish, two-wall grab bar.

2.9 DRINKING FOUNTAINS (DF)

A. Manufacturer:
1. Haws Basis of design scheduled on drawings.
2. Substitutions: Permitted.

B. Fountain: Two-level, barrier-free, wall-mount, Type 304 stainless steel, with elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button handle, access cover plate, mounting bracket, screwdriver stop.

2.10 WATER BOTTLE FILLING STATION (WS)

A. Manufacturer:
1. Basis of design scheduled on drawings.
2. Substitutions: Permitted.

B. Station: Wall surface mount, barrier-free ADA compliant, lead-free certified to NSF/ANSI 61 and 372, stainless steel, with mechanical activation, 1 gallon per minute, laminar flow, mounting bracket, screwdriver stop, drain.

2.11 MOP SINKS (MS)

A. Manufacturers:
1. Basis of design scheduled on drawings.
2. Substitutions: Permitted.

B. Bowl: 28 x 28 x 8 inch deep, porcelain enameled cast iron roll-rim sink, with 5 inch high back, with rim guard, chrome plated strainer.

C. Trim: Exposed wall type supply with lever handles, basis of design scheduled on drawings, spout wall brace, vacuum breaker, hose end spout, pail hook, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges. Five feet of 1/2 inch diameter plain end reinforced rubber hose, hose clamp and mop hanger.

2.12 COMBINATION EYEWASH AND SHOWER (EWS)

A. Manufacturer:
1. Basis of design scheduled on drawings.
2. Substitutions: Permitted.

B. Shower: 10 inch diameter stainless steel head, chrome plated brass valve with stay-open ball valve, pull-rod and triangular handle.

C. Bowl: 10 inch diameter stainless steel bowl, twin eye/face sprayheads, chrome plated brass valve with push handle.

2.13 EMERGENCY EYEWASH (EEW)

A. Manufacturer:
1. Basis of design scheduled on drawings.
2. Substitutions: Permitted.

B. Bowl: 10 inch diameter stainless steel bowl, twin eye/face sprayheads, chrome plated brass valve with push handle.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify adjacent construction is ready to receive rough-in work of this section.

B. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough in and installation.

3.2 INSTALLATION

A. Install each fixture with chrome plated rigid or flexible supplies with screwdriver stops, reducers, and escutcheons.

B. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

END OF SECTION 22 40 00

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SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Identification for HVAC Piping and Equipment.
   2. Sleeves.
   3. Mechanical sleeve seals.
   4. Formed steel channel.

1.2 SUBMITTALS

A. Shop Drawings: Submit for piping and equipment identification list of wording, symbols, letter size, and color coding for pipe identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

B. Product Data for Pipe and Equipment Identification: Submit for mechanical identification manufacturers catalog literature for each product required.

C. Samples for Pipe and Equipment Identification: Submit two tags, 1-1/2 inches in size. Submit two labels, 1.9 x 0.75 inches in size.

PART 2 - PRODUCTS

2.1 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

A. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light background color.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light background color, minimum 1-1/2 inches diameter.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener. Color and Lettering: Conform to ASME A13.1.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Color and Lettering: Conform to ASME A13.1.

E. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.2 SLEEVES

A. Sleeves for Pipes through Non-fire Rated Slab Floors: 18 gage thick galvanized steel.

B. Sleeves for Pipes through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.

C. Sleeves for Round Ductwork: Galvanized steel.

D. Sleeves for Rectangular Ductwork: Galvanized steel or wood.

E. Sealant: Acrylic, Refer to Section 07 92 00.

2.3 MECHANICAL SLEEVE SEALS

A. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.4 FORMED STEEL CHANNEL

A. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive sleeves.

3.2 INSTALLATION - PIPING AND EQUIPMENT IDENTIFICATION

A. Install plastic nameplates with adhesive.

B. Install plastic tags with corrosion resistant metal chain.

3.3 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with mechanical sleeve seals.

B. Set sleeves in position in forms. Provide reinforcing around sleeves.

C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

D. Extend sleeves through slab floors 1 inch above finished floor level. Caulk sleeves.

E. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with stuffing insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

F. Install stainless steel escutcheons at finished surfaces.

END OF SECTION 23 05 00

SECTION 23 05 93 - TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Testing, adjusting, and balancing of air systems.
   2. Testing, adjusting, and balancing of hydronic systems.
   3. Measurement of final operating condition of HVAC systems.

1.2 REFERENCES

A. Associated Air Balance Council:
   1. AABC MN-1 - National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
   1. ASHRAE 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems.

C. Natural Environmental Balancing Bureau:
   1. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

1.3 SUBMITTALS

A. General Conditions - Submittals.

B. Prior to commencing Work, submit proof of latest calibration date of each instrument.

C. Test Reports: Indicate data on forms prepared following ASHRAE 111 or NEBB Report forms.

D. Field Reports: Indicate deficiencies preventing proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

E. Submit draft copies of report for review prior to final acceptance of Project.

F. Furnish reports in soft cover, letter size, binder manuals, complete with table of contents page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

1.4 CLOSEOUT SUBMITTALS

A. General Conditions – Contract Closeout.

B. Project Record Documents: Record actual locations of flow measuring stations.

C. Operation and Maintenance Data: Furnish final copy of testing, adjusting, and balancing report inclusion in operating and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with AABC MN-1 National Standards for Field Measurement and Instrumentation, Total System Balance or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

B. Prior to commencing Work, calibrate each instrument to be used. Upon completing Work, recalibrate each instrument to assure reliability.

1.6 QUALIFICATIONS

A. Agency: Company specializing in testing, adjusting, and balancing of systems specified in this section with minimum three years experience certified by AABC or certified by NEBB.

B. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor.

1.7 SEQUENCING

A. Sequence balancing between completion of systems tested and Date of Substantial Completion.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify systems are complete and operable before commencing work. Verify the following:
1. Systems are started and operating in safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place or in normal position.
15. Service and balancing valves are open.

3.2 PREPARATION

A. Furnish instruments required for testing, adjusting, and balancing operations.

B. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

3.3 INSTALLATION TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 10 percent of design.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4 ADJUSTING

A. Verify recorded data represents actual measured or observed conditions.

B. Permanently mark settings of dampers and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.

D. Report defects and deficiencies noted during performance of services, preventing system balance.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.5 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to obtain required or design supply, return, outside air, and exhaust air quantities.

B. Make air quantity measurements in main ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Use volume control devices to regulate air quantities only to extent adjustments do not create objectionable air motion or sound levels. Effect volume control by using volume dampers located in ducts.

E. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes to vary fan speed. Vary branch air quantities by damper regulation.

F. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

G. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across fan. Make allowances for 50 percent loading of filters.

3.6 WATER SYSTEM PROCEDURE

A. Adjust water systems after air balancing to deliver design quantities within previously stated tolerances.

B. Change system balance with automatic control valves fully open to heat transfer elements.

3.7 RADIANT HEATING SYSTEM PROCEDURE

A. Adjust systems to obtain specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

B. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

C. Where available pump capacity is less than total flow requirements or individual system parts, simulate full flow in one part by temporary restriction of flow to other parts.

D. Heating hot water piping (copper) shall be tested and proved tight under a water pressure of 150 psi measured at the highest point in the system. Tests shall be conducted before pipes are concealed.

E. Radiant heat tubing system shall be pressurized, with water or air, in accordance with applicable codes, to a pressure of 60 psig 24 hours prior to encasement in the radiant slab. The tubing system shall remain at this pressure during the slab installation and cutting of control joints in slab, and for a minimum of 24 hours thereafter to ensure system integrity.

F. Final pressures at the end of test period shall be no more nor less than that caused by expansion or contraction of the test medium due to temperature changes.

G. Tests shall be applied for a minimum period of four (4) hours, or until tests are complete.

H. Check of system during application of test pressure shall include visual check for water leakage.

I. Adjust all temperature controls to normal operating limits.

J. Adjust all pumps.

K. Test and prove operation of all safety devices, controls and alarms.

L. Test boiler and safety controls for proper operation.

3.8 SCHEDULES

A. Equipment Requiring Testing, Adjusting, and Balancing:
   1. Indoor Central-Station Air-Handling Unit

2. Exhaust Fans.
3. Air Outlets and Inlets.
4. HVAC Pumps.
5. Hydronic Radiant Heating System.

B. Report Forms
   1. Title Page:
      a. Name of Testing, Adjusting, and Balancing Agency
      b. Address of Testing, Adjusting, and Balancing Agency
      c. Telephone and facsimile numbers of Testing, Adjusting, and Balancing Agency
      d. Project name
      e. Project location
      f. Project Architect
      g. Project Engineer
      h. Project Contractor
      i. Project altitude
      j. Report date
   2. Summary Comments:
      a. Design versus final performance
      b. Notable characteristics of system
      c. Description of systems operation sequence
      d. Summary of outdoor and exhaust flows to indicate building pressurization
      e. Nomenclature used throughout report
      f. Test conditions
   3. Instrument List:
      a. Instrument
      b. Manufacturer
      c. Model number
      d. Serial number
      e. Range
      f. Calibration date
   4. Air Moving Equipment:
      a. Location
      b. Manufacturer
      c. Model number
      d. Serial number
      e. Arrangement/Class/Discharge
      f. Air flow, specified and actual
      g. Return air flow, specified and actual
      h. Outside air flow, specified and actual
      i. Return air temperature, specified and actual
      j. Outside air temperature, specified and actual
      k. Total static pressure (total external), specified and actual
      l. Inlet pressure
      m. Discharge pressure
      n. Sheave Make/Size/Bore
      o. Number of Belts/Make/Size
      p. Fan RPM
      q. Heating Coil Data:

1) Identification/number
2) Location
3) Service
4) Manufacturer
5) Air flow, design and actual
6) Entering air temperature, design and actual
7) Leaving air temperature, design and actual
8) Air pressure drop, design and actual
9) Water flow, design and actual
10) Water pressure drop, design and actual
11) Entering water temperature, design and actual
12) Leaving water temperature, design and actual

r. Electric Motors
1) Manufacturer
2) Model/Frame
3) HP/BHP and KW
4) Phase, voltage, amperage; nameplates, actual, no load
5) RPM
6) Service factor
7) Starter size, rating, heater elements
8) Sheave Make/Size/Bore

s. Pump Data:
1) Identification number
2) Manufacturer
3) Size/model
4) Impeller
5) Services
6) Design flow rate, pressure drop, BHP and kW
7) Actual flow rate, pressure drop, BHP and kW
8) Discharge pressure
9) Suction pressure
10) Total operating head pressure
11) Shut off, discharge and suction pressures
12) Shut off, total head pressure

5. Exhaust Fan Data:
a. Location
b. Manufacturer
c. Model number
d. Serial number
e. Air flow, specified and actual
f. Total static pressure (total external), specified and actual
g. Inlet pressure
h. Discharge pressure
i. Sheave Make/Size/Bore
j. Number of Belts/Make/Size
k. Fan RPM
l. Electric Motors:
1) Manufacturer
2) Model/Frame

3) HP/BHP and kW
4) Phase, voltage, amperage; nameplate, actual, no load
5) RPM
6) Service factor
7) Starter size, rating, heater elements
8) Sheave Make/Size/Bore

6. Duct Traverse:
   a. System zone/branch
   b. Duct size
   c. Area
   d. Design velocity
   e. Design air flow
   f. Test velocity
   g. Test air flow
   h. Duct static pressure
   i. Air temperature
   j. Air correction factor
7. Air Distribution Test Sheet:
   a. Air terminal number
   b. Room number/location
   c. Terminal type
   d. Terminal size
   e. Area factor
   f. Design velocity
   g. Design air flow
   h. Test (final) velocity
   i. Test (final) air flow
   j. Percent of design air flow
8. Hydronic Radiant Heating System
   a. Circuit identification/number
   b. Water flow, design and actual
   c. Water pressure drop, design and actual
   d. Entering water temperature, design and actual
   e. Leaving water temperature, design and actual

END OF SECTION 23 05 93

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SECTION 23 07 00 - HVAC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. HVAC piping insulation, jackets and accessories.
   2. HVAC equipment insulation, jackets and accessories.
   3. HVAC ductwork insulation, jackets, and accessories.

1.2 SUBMITTALS

A. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.

B. Manufacturer's Installation Instructions: Submit manufacturer's published literature indicating proper installation procedures.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84, UL 723, and NFPA 255.

B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer’s identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

B. Maintain temperature before, during, and after installation for minimum period of 24 hours.

PART 2 - PRODUCTS

2.1 PIPE INSULATION

A. TYPE P-1: Preformed Fiberglass Pipe Insulation: ASTM C547; rigid molded, noncombustible.

1. k (ksi) Factor: 0.23 at 75 degrees F.
2. Maximum service temperature: 850 degrees F.
3. Maximum Flame Spread Index: 25; Maximum Smoke Developed Index: 50.

B. TYPE P-2: Cellular Foam: ASTM C534; flexible, cellular elastomeric, molded or sheet.
1. Thermal Conductivity: 0.25 Btu-in/hr-ft^2-degrees F at 75 degrees F.
2. Maximum Service Temperature: 210 degrees F.
3. Connection: Waterproof vapor retarder adhesive.

2.2 PIPE INSULATION JACKETS

A. Vapor Retarder Jacket:
1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.

B. PVC Plastic Pipe Jacket:
1. Product Description: ASTM D1784, One piece molded type fitting covers and sheet material, off-white color.
2. Thickness: 15 mil.
3. Connections: Tacks or pressure sensitive tape.

C. Outdoor Pipe Jacket:
1. ASTM A167 Type 304 stainless steel.
2. Thickness: 0.010-inch thick.
3. Finish: Smooth.
4. Metal Jacket Bands: 3/8 inch wide; 0.010-inch thick stainless steel.

2.3 PIPE INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Insulating Cement: ASTM C195; hydraulic setting on mineral wool.

D. Adhesives: Compatible with insulation.

2.4 EQUIPMENT INSULATION

A. TYPE E-1: ASTM C553; glass fiber, flexible or semi-rigid, noncombustible.
1. Thermal Conductivity: 0.24 at 75 degrees F.
2. Operating Temperature Range: 0 to 450 degrees F.
3. Density: 1.5 pound per cubic foot.

B. TYPE E-2: ASTM C534, Type II, flexible, closed cell elastomeric insulation, sheet.
1. Thermal Conductivity: 0.27 at 75 degrees F.
2. Operating Temperature Range: Range: Minus 70 to 220 degrees F.

2.5 EQUIPMENT ACOUSTICAL INSULATION JACKETS

A. PVC Plastic Equipment Jacket:
1. Product Description: ASTM D1784, sheet material, off-white color, acoustical jacket.
2. Minimum Service Temperature: -40 degrees F.
3. Maximum Service Temperature: 150 degrees F.
4. Moisture Vapor Transmission: ASTM E96; 0.002 perm-inches.
5. Thickness: 30 mil.
6. Sound Transmission Loss: Min. 20 dB
7. Noise Reductions Coefficient: 0.65-1.05
8. Connections: Brush on welding adhesive.

B. Vapor Retarder Jacket:
1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.

2.6 EQUIPMENT INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

D. Adhesives: Compatible with insulation.

2.7 DUCTWORK INSULATION

A. TYPE D-1: ASTM C1290, Type III, flexible glass fiber, commercial grade with factory applied reinforced aluminum foil jacket meeting ASTM C1136, Type II.
1. Thermal Conductivity: 0.30 at 75 degrees F.
2. Maximum Operating Temperature: 250 degrees F.
3. Density: 0.75 pound per cubic foot.

B. TYPE D-2: ASTM C1290, Type III, acoustical insulation, flexible glass fiber, commercial grade with factory applied reinforced aluminum foil jacket meeting ASTM C1136, Type II.
1. Thermal Conductivity: 0.30 at 75 degrees F.
2. Maximum Operating Temperature: 250 degrees F.
3. Density: 0.75 pound per cubic foot.

C. TYPE D-3: ASTM C1071, Type II, rigid, glass fiber acoustical duct liner with coated and washable air side.
1. Thermal Conductivity: 0.23 at 75 degrees F.
2. Density: 3.0 pound per cubic foot.
3. Maximum Operating Temperature: 250 degrees F.
4. Maximum Air Velocity: 4,000 feet per minute.

2.8 DUCTWORK INSULATION JACKETS

A. Vapor Retarder Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture vapor transmission: ASTM E96; 0.02 perm.
3. Secure with pressure sensitive tape.

B. Outdoor Duct Jacket: Asphalt impregnated and coated sheet 50 lb/square.

2.9 DUCTWORK INSULATION ACCESSORIES

A. Vapor Retarder Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

B. Vapor Retarder Lap Adhesive: Compatible with insulation.

C. Adhesive: Waterproof , ASTM E162 fire-retardant type.

D. Liner Fasteners: Galvanized steel, impact applied with integral head.

E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

F. Lagging Adhesive: Fire resistive to ASTM E84.

G. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad.

H. Adhesives: Compatible with insulation.

I. Membrane Adhesives: As recommended by membrane manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify piping, equipment and ductwork has been tested before applying insulation materials.

B. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION - PIPING SYSTEMS

A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.

B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent fire-stopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions.

C. Piping Systems Conveying Fluids Below Ambient Temperature:

1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.

D. Glass Fiber Board Insulation:
1. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
2. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
3. Cover wire mesh or bands with cement to a thickness to remove surface irregularities.

E. Hot Piping Systems less than 140 degrees F:
1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
3. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.

F. Hot Piping Systems greater than 140 degrees F:
1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
3. Insulate flanges and unions at equipment.

G. Inserts and Shields:
1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.
2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.
    a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
    b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.
3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.

H. Insulation Terminating Points:
1. Coil Branch Piping 1 inch and Smaller: Terminate hot water pipe insulation at union upstream of the coil control valve.
2. Condensate Piping: Insulate entire piping system and components to prevent condensation.

I. Closed Cell Elastomeric Insulation:
   1. Push insulation on to piping.
   2. Miter joints at elbows.
   3. Seal seams and butt joints with manufacturer's recommended adhesive.
   4. When application requires multiple layers, apply with joints staggered.
   5. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.

J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers or stainless steel jacket.

K. Piping Exterior to Building: Provide vapor retarder jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with stainless steel jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal piping.

L. Buried Piping: Insulate only where insulation manufacturer recommends insulation product may be installed in trench, tunnel or direct buried. Install factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with 1 mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.

M. Prepare pipe insulation for finish painting. Refer to Section 09 91 00.

3.3 INSTALLATION - EQUIPMENT

A. Factory Insulated Equipment: Do not insulate.

B. Exposed Equipment: Locate insulation and cover seams in least visible locations.

C. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

D. Equipment Containing Fluids Below Ambient Temperature:
   1. Insulate entire equipment surfaces.
   2. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
   3. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
   4. Finish insulation at supports, protrusions, and interruptions.

E. Equipment Containing Fluids 140 degrees F or Less:
   1. Do not insulate flanges and unions, but bevel and seal ends of insulation.
   2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
   3. Finish insulation at supports, protrusions, and interruptions.

F. Equipment Containing Fluids Over 140 degrees F:
   1. Insulate flanges and unions with removable sections and jackets.
   2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
   3. Finish insulation at supports, protrusions, and interruptions.

G. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

H. Equipment Located Exterior to Building: Install vapor barrier jacket or finish with glass mesh reinforced vapor barrier cement. Cover with stainless steel jacket with seams located on bottom side of horizontal equipment.

I. Nameplates and ASME Stamps: Bevel and seal insulation around; do not cover with insulation.

J. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.

K. Prepare equipment insulation for finish painting. Refer to Section 09 91 00.

3.4 INSTALLATION - DUCTWORK SYSTEMS

A. Duct dimensions indicated on Drawings are finished inside dimensions.

B. Insulated ductwork conveying air below ambient temperature:
   1. Provide insulation with vapor retarder jackets.
   2. Finish with tape and vapor retarder jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C. Insulated ductwork conveying air above ambient temperature:
   1. Provide with or without standard vapor retarder jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. Ductwork Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with aluminum jacket.

E. External Glass Fiber Duct Insulation:
   1. Secure insulation with vapor retarder with wires and seal jacket joints with vapor retarder adhesive or tape to match jacket.
   2. Secure insulation without vapor retarder with staples, tape, or wires.
   3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
   4. Seal vapor retarder penetrations by mechanical fasteners with vapor retarder adhesive.
   5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

F. External Elastomeric Duct Insulation:
1. Adhere to clean oil-free surfaces with full coverage of adhesive.
2. Seal seams and butt joints with manufacturer's recommended adhesive.
3. When application requires multiple layers, apply with joints staggered.
4. Insulate standing metal duct seams with insulation of like material and thickness as adjacent duct surface. Apply adhesive at joints with flat duct surfaces.
5. Lift ductwork off trapeze hangers and insert spacers.

G. Duct and Plenum Liner:
1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners. Comply with SMACNA Standards for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Cut insulation for tight overlapped corner joints. Support top pieces of liner at edges with side pieces.

3.5 SCHEDULES

A. Heating Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Heating Water Supply and Return 105 to 140 degrees F	P-1	1-1/4 inches and smaller 1-1/2 inches and larger	0.5 1.0
Domestic Hot Water Supply 105 to 140 degrees F	P-2	1-1/4 inches and smaller 1-1/2 inches and larger	0.5 1.0

B. Ductwork Insulation Schedule:

DUCTWORK SYSTEM	INSULATION TYPE	INSULATION THICKNESS inches
Outside Air intake (internal acoustical lining D-3 with external acoustical insulation D-2)	D-3; D-2	2; 4
Beneath ECU-1	E-1	Fill Cavity
Supply Ducts (internal acoustical lining D-3 for 10', with external acoustical insulation D-2 for 10').	D-3, D-2	2; 4
Return Ducts (internal acoustical lining D-3 for 10').	D-3	2

END OF SECTION 23 07 00

SECTION 23 08 00 – HVAC COMMISSIONING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Commissioning description.
2. Commissioning responsibilities.

1.2 COMMISSIONING DESCRIPTION

A. Commissioning process includes the following tasks:
1. Testing and startup of equipment and systems.
2. Equipment and system verification checks.
3. Assistance in functional performance testing to verify testing and balancing, and equipment and system performance.
4. Provide qualified personnel to assist in commissioning tests, including seasonal testing.
5. Complete and endorse functional performance test checklists provided by Commissioning Authority to assure equipment and systems are fully operational and ready for functional performance testing.
6. Provide equipment, materials, and labor necessary to correct deficiencies found during commissioning process to fulfill contract and warranty requirements.
7. Provide operation and maintenance information and record drawings to Commissioning Authority for review verification and organization, prior to distribution.
8. Provide assistance to Commissioning Authority to develop, edit, and document system operation descriptions.
9. Provide training for systems specified in this Section with coordination by Commissioning Authority.

B. Equipment and Systems to Be Commissioned:
1. Pumps.
2. Boilers and automatic temperature controls.
3. Piping systems.
4. Ductwork.
5. Indoor central-station air-handling units and automatic temperature controls.
6. Fans.
7. Radiant floor heating system.
8. Testing, Adjusting and Balancing work.
9. Compressed air system.
10. Lube equipment systems.
11. Wash equipment.
12. Vehicle exhaust systems.

C. Perform seasonal function performance tests for the following equipment and systems:
1. Indoor central-station air-handling units.
2. Boilers.

1.3 COMMISSIONING SUBMITTALS

A. Draft Forms: Submit draft of system verification form and functional performance test checklist.

B. Test Reports: Indicate data on system verification form for each piece of equipment and system as specified. Use AABC forms as guidelines.

C. Field Reports: Indicate deficiencies preventing completion of equipment or system verification checks equipment or system to achieve specified performance.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record revisions to equipment and system documentation necessitated by commissioning.

B. Operation and Maintenance Data: Submit revisions to operation and maintenance manuals when necessary revisions are discovered during commissioning.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with AABC.

B. Maintain one copy of each document on site.

1.6 COMMISSIONING RESPONSIBILITIES

A. Equipment or System Installer Commissioning Responsibilities:
1. Attend commissioning meetings.
2. Ensure temperature controls installer performs assigned commissioning responsibilities as specified below.
3. Ensure testing, adjusting, and balancing agency performs assigned commissioning responsibilities as specified.
4. Provide instructions and demonstrations for Owner’s personnel.
5. Ensure subcontractors perform assigned commissioning responsibilities.
6. Ensure participation of equipment manufacturers in appropriate startup, testing, and training activities when required by individual equipment specifications.
7. Develop startup and initial checkout plan using manufacturer’s startup procedures and functional performance checklists for equipment and systems to be commissioned.
8. During verification check and startup process, execute related portions of checklists for equipment and systems to be commissioned.
9. Perform and document completed startup and system operational checkout procedures, providing copy to Commissioning Authority.
10. Provide manufacturer’s representatives to execute starting of equipment. Ensure representatives of Air Handling Unit is available and present on site for a minimum of 4 days, and representative of Boilers is available and present on site for a minimum of one day. Manufacturer’s representatives shall be in attendance for duration to complete tests, adjustments and problem-solving.
11. Coordinate with equipment manufacturers to determine specific requirements to maintain validity of warranties.

12. Provide personnel to assist Commissioning Authority during equipment or system verification checks and functional performance tests.
13. Prior to functional performance tests, review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during tests.
14. Prior to startup, inspect, check, and verify correct and complete installation of equipment and system components for verification checks included in commissioning plan. When deficient or incomplete work is discovered, ensure corrective action is taken and re-check until equipment or system is ready for startup.
15. Provide factory supervised startup services for equipment and systems. Coordinate work with manufacturer and Commissioning Authority.
16. Perform verification checks and startup on equipment and systems as specified.
17. Assist Commissioning Authority in performing functional performance tests on equipment and systems as specified.
18. Perform operation and maintenance training sessions scheduled by Commissioning Authority.
19. Conduct system orientation and inspection.

B. Temperature Controls Installer Commissioning Responsibilities:
   1. Attend commissioning meetings.
   2. Review design for ability of systems to be controlled including the following:
      a. Confirm proper hardware requirements exist to perform functional performance testing.
      b. Confirm proper safeties and interlocks are included in design.
      c. Confirm proper sizing of system control valves and actuators and control valve operation will result capacity control identified in Contract Documents.
      d. Confirm proper sizing of system control dampers and actuators and damper operation will result in proper damper positioning.
      e. Confirm sensors selected are within device ranges.
      f. Review sequences of operation and obtain clarification from Architect/Engineer.
      g. Provide written sequences of operation for packaged controlled equipment. Equipment manufacturers' stock sequences may be included, when accompanied by additional narrative to reflect Project conditions.
   3. Inspect, check, and confirm proper operation and performance of control hardware and software provided in other sections.
   4. Submit proposed procedures for performing automatic temperature control system point-to-point checks to Commissioning Authority and Architect/Engineer.
   5. Inspect check and confirm correct installation and operation of automatic temperature control system input and output device operation through point-to-point checks.
   6. Perform training sessions to instruct Owner's personnel in hardware operation, software operation, programming, and application in accordance with commissioning plan.
   7. Demonstrate system performance and operation to Commissioning Authority during functional performance tests including each mode of operation.
   8. Provide control system technician to assist during Commissioning Authority verification check and functional performance testing.
   9. Provide control system technician to assist testing, adjusting, and balancing agency during performance of testing, adjusting, and balancing work.
   10. Assist in performing operation and maintenance training sessions scheduled by Commissioning Authority, and provide video tapes of training sessions for boilers and air handler.

C. Testing, Adjusting, and Balancing Agency Commissioning Responsibilities:

1. Attend commissioning meetings.
2. Participate in verification of testing, adjusting, and balancing report for verification or diagnostic purposes. Repeat sample of 10 percent of measurements contained in testing, adjusting, and balancing report as selected by Commissioning Authority.
3. Assist in performing operation and maintenance training sessions scheduled by Commissioning Authority.

1.7 COMMISSIONING MEETINGS

A. Attend initial commissioning meeting and progress commissioning meetings as required by Commissioning Authority.

1.8 SCHEDULING

A. Prepare schedule indicating anticipated start dates for the following:
1. Piping system pressure testing.
2. Piping system flushing and cleaning.
3. Ductwork cleaning.
4. Ductwork pressure testing.
5. Equipment and system startups.
6. Automatic temperature control systems checkout.
7. Testing, adjusting, and balancing.
8. System orientation and inspections.
9. Operation and maintenance manual submittals.
10. Training sessions.

B. Schedule seasonal tests of equipment and systems during peak weather conditions to observe full-load performance.

C. Schedule occupancy sensitive tests of equipment and systems during conditions of both minimum occupancy and maximum use.

1.9 COORDINATION

A. Notify Commissioning Authority minimum of four weeks in advance of the following:
1. Scheduled equipment and system startups.
2. Scheduled automatic temperature control systems checkout.
3. Scheduled start of testing, adjusting, and balancing work.

B. Coordinate programming of automatic temperature control systems with construction and commissioning schedules.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install additional balancing dampers, balancing valves, access doors, test ports, and pressure and temperature taps required by Commissioning Authority.

B. Place systems and equipment into full operation and continue operation during each working day of commissioning.

C. Install replacement sheaves and belts to obtain system performance, as requested by Commissioning Authority.

D. Install test holes in ductwork and plenums as requested by Commissioning Authority for taking air measurements. Refer to Section 23 05 93 Testing, Adjusting and Balancing.

E. Prior to start of functional performance test, install replacement filters in equipment.

3.2 COMMISSIONING

A. Seasonal Sensitive Functional Performance Tests:
   1. Test heating equipment at winter design temperatures.
   2. Test cooling equipment at summer design temperatures with fully occupied building.
   3. Participate in testing delayed beyond Final Completion to test performance at peak seasonal conditions.

B. Be responsible to participate in initial and alternate peak season test of systems required to demonstrate performance.

C. Occupancy Sensitive Functional Performance Tests:
   1. Test equipment and systems affected by occupancy variations at minimum and peak loads to observe system performance.
   2. Participate in testing delayed beyond Final Completion to test performance with actual occupancy conditions.

END OF SECTION 23 08 00

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SECTION 23 09 00 - HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Control units.
2. Control panel enclosures.
3. Alarm system.
4. Control valves.
5. Electric valve actuators.
6. Thermostats.
7. Time clocks.
8. Duct-mounted smoke detector.
9. Differential pressure monitor.
10. Sequences of operations.

B. Provide conduit and electrical wiring for complete system.

1.2 SUBMITTALS

A. Shop Drawings: Indicate operating data, system drawings, piping and wiring diagrams, and written detailed operational description of sequences.
1. Include trunk cable schematic showing programmable control unit locations and trunk data conductors.
2. List connected data points, including connected control unit, or output and input device.
3. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
4. Label with settings, adjustable range of control and limits. Include written description of final control sequence.
5. Include flow diagrams for each control system, graphically depicting control logic.
6. Include description and sequence of operation of operating, user, and application software.
7. Submit schedule of valves indicating size, flow, and pressure drop for each valve.
8. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

B. Product Data: Submit description and engineering data for each control system component. Include sizing. Submit data for each system component and software module.

1.3 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of controls including thermostats remotely located from equipment in pipes ducts and walls.

B. Operation and Maintenance Data: Submit:
1. Systems descriptions, set points, and controls settings and adjustments.
2. Inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

3. Interconnection wiring diagrams complete field installed systems with identified and numbered system components and devices.
4. Keyboard illustrations and step-by-step procedures indexed for each operator function.

1.4 MAINTENANCE SERVICE

A. Furnish manufacturer's maintenance services on control system for one year from Date of Substantial Completion.

B. Furnish complete service of controls systems, including callbacks. Make minimum of 4 complete normal inspections of approximately 8 hours duration in addition to normal service calls to inspect, calibrate, and adjust controls. Submit written report after each inspection.

PART 2 - PRODUCTS

2.1 CONTROL UNITS

A. Units: Modular in design and consisting of processor board with programmable RAM memory, local operator access and display panel, and integral interface equipment.

B. Battery Backup: For minimum of 100 hours for complete system including RAM without interruption, with automatic battery charger.

C. Control Units Functions:
1. Monitor or control each input/output point.
2. Independent with hardware clock/calendar and software to maintain control independently.
3. Acquire, process, and transfer information to operator station or other control units on network.
4. Accept, process, and execute commands from other control unit's or devices or operator stations.
5. Access both database and control functions simultaneously.
6. Record, evaluate, and report changes of state or value occurring among associated points. Unit continues to perform associated control functions regardless of status of network.

D. Input/output Capability:
1. Discrete/digital input (contact status).
2. Discrete/digital output.
3. Analog input.
4. Analog output.
5. Pulse input (5 pulses/second).
6. Pulse output (0-655 seconds in duration with 0.01 second resolution).

E. Furnish control units with minimum 30 percent spare capacity.

F. Test Mode Operation: Place input/output points in test mode to allow testing and developing of control algorithms on line without disrupting field hardware and controlled environment.

2.2 LOAD CONTROL PROGRAMS

A. General: Support inch-pounds and S.I. metric units of measurement.

B. Duty Cycling: Periodically stops and starts loads, based on space temperature, and according to various On/Off patterns.

C. Automatic Time Scheduling: Automatic start/stop/scheduling of building loads.

D. Start/Stop Time Optimization: Perform optimized start/stop as function of outside conditions, inside conditions, or both.

E. Night Setback/Setup Program: Reduce heating space temperature setpoint or raise cooling space temperature setpoint during unoccupied hours; in conjunction with scheduled start/stop and optimum start/stop programs.

2.3 HVAC CONTROL PROGRAMS

A. General: Support inch-pounds and S.I. metric units of measurement.

B. Optimal run time.

C. Supply air reset.

D. Enthalpy switchover.

2.4 CONTROL PANEL ENCLOSURES

A. Furnish for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gages, pilot lights, push buttons and switches flush on cabinet panel face.

B. Construction: NEMA 250, Type 1 steel enclosure indoors; NEMA 250, Type 4 outdoors.

C. Covers: Continuous hinge, held closed by flush latch operable by key.

D. Enclosure Finish: Manufacturer’s standard enamel.

2.5 ALARMS

A. At alarm condition indication light flashes.

B. Status lights shall serve the purpose of an alarm for central air handling units at control panel displays.

2.6 CONTROL VALVES AND ACTUATORS

A. Air Handling Unit Control Valve
   1. Manufacturers:
      a. Tekmar

b. Substitutions: Permitted.

2. Brass body, self balancing control valve, 3-way, pressure independent, wafer style for flanged connections, with stainless steel regulator and brass stem, position display actuator, 3-point floating input, 24 VAC, 150 sec, IP 44 housing. Tekmar 714 valve with Tekmar 741 actuator, or equal.
   a. ECU-1: 84 gpm maximum flow, 3-inch size, Cv=117.
   b. ECU-2: 68 gpm maximum flow, 2-1/2-inch size, Cv=74.

B. Radiant Zone Control Valve manifolds
1. Manufacturers:
   a. Watts Radiant
   b. Substitutions: Permitted.
2. Stainless Steel supply manifolds with components supplied by manufacturer including built-in balancing valves, brass return manifolds, support brackets, tube bend supports, temperature gauges, isolation ball valves, drain ports, and electric control heads as required.

2.7 THERMOSTATS

A. Cooling Thermostat: Digital with LCD display, day-night override button, and set point slide adjustment override options. Set point slide adjustment capable of being software limited by automation system to limit amount of room adjustment.

B. Heating Thermostats with In-Floor Sensors:
1. Wall thermostat with remote thermistor bulb sensor. Tekmar Net 2 with Tekmar 079 floor sensor or equal.
2. Averaging service remote bulb element: 20 feet.
3. Furnish with with cast device junction box, malleable iron, deep, with (2) ¾" hubs, with blank top, to serve as pull box for in-slab sensor. Appleton FDC-1-75 or equal.

2.8 TIME CLOCKS

A. Solid state programmable time control with minimum separate programs for each zone, 24 hour battery carry over, 7 day programming with 20 programmable holidays, system fault alarm.

2.9 CONTROL SYSTEM COMPONENTS

A. Temperature Sensors:
1. Type: Resistance temperature detector (RTD) or thermistor.
2. Accuracy:
   a. Plus or minus 1 degree F for standard applications. Where high accuracy is required, furnish accuracy of plus or minus 0.2 degrees F.
   b. Sensing Accuracy: Plus or minus 0.5 degree F.
   c. Display Accuracy and Resolution: Minimum of plus or minus 1 degree F.
3. Outside Air Sensors: Watertight inlet fitting, furnish with shield from direct sunlight.
4. Duct Temperature Sensors:
   a. Rigid or averaging type as indicated in sequence of operations. Averaging sensor minimum length: 5 feet in length.
5. Piping Temperature Sensors: Furnish with separable brass well.

6. Slab Temperature Sensors: Furnish remote thermistor bulb type with minimum of 20 feet of cable.

B. Differential Pressure Switches:
1. Furnish as specified in sequences of operation for status purposes in water and air applications.
2. Fully adjustable differential pressure settings.
3. UL Listed, SPDT snap-acting, pilot duty rated (125 VA minimum).
4. NEMA 250 Type 1 enclosure.
5. Scale range and differential suitable for intended application.

C. Water Flow Switches:
1. Paddle type with stainless steel or bronze paddle.
2. UL Listed, SPDT snap-acting with pilot duty rating (125 VA minimum).
3. Appropriate scale range and differential adjustment.
4. Adjustable sensitivity.
5. NEMA 250 Type 1 enclosure.

D. Occupancy Sensor: Passive infrared, with time delay, daylight sensor lockout, sensitivity control, and 180 degree field of view with vertical sensing adjustment, for flush mounting.

E. Pump Sequence Control Panel:
1. Designed to operate two pumps by providing standby or staging operation, providing lead/lag capability to duplex pumps.
2. With outdoor sensor, warm weather shut down, equal run time rotation, exercising, alert per pump, adjustable flow proof delay, CSA C US certified, 3 year warranty.
3. Tekmar Pump Sequencer 132 or equal.

F. Zone microprocessor control:
1. Radiant heating zone microprocessor control, Tekmar 313 or equal.

G. Temperature Difference Controller:
1. To provide a 0-10 vdc output for pump control. Sorel Temperature Difference Controller TDC4 or equal.

H. Air Handling Unit Control System:
1. Pre-programmed control panel for central air-handling unit to be mounted to unit prior to shipment. Pre-installed control devices internal to central air-handling unit shall be pre-wired to central air-handling unit control panel prior to shipment. Wiring to central air-handling unit control panel for control devices shipped loose with central air-handling unit shall be provided by contractor including all solenoid valves, hot water coil valve, interlock relay for rooftop exhaust fan, duct mounted air temperature sensors, averaging thermostats, and remote LCD display control panel at lower level of building.

2.10 DUCT-MOUNTED SMOKE DETECTOR

A. Provide a duct mounted smoke detector in each supply air system in excess of 2,000 cubic feet per minute, for automatic shut-off upon detection of smoke in the main supply duct.

B. Product Description: Ionization type, approved and listed by the California State Fire Marshal, with the following features:
   1. Auxiliary SPDT relay contact.
   2. Key-operated normal-reset-test switch.
   3. Duct sampling tubes extending width of duct.
   4. Visual indication of detector actuation.
   5. Duct-mounted housing.

C. Furnish four-wire detector with separate power supply and signal circuits.

2.11 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Electrical characteristics.
   1. 120 volts, single phase, 60 Hz.

B. Disconnect Switch: Factory mount in control panel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify conditioned power supply is available to panels and to operator workstation.

B. Verify field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

C. Coordinate installation of system components with installation of mechanical systems equipment including air handling units, boiler pumps and air terminal units.

3.2 INSTALLATION

A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.

B. Install software in control units and in operator workstation. Implement features of programs to specified requirements and appropriate to sequence of operation.

C. Install with 120 volts alternating current, 15 amp dedicated emergency power circuit to each programmable control unit.

D. Install thermostats, space temperature sensors, and other exposed control sensors after locations are coordinated with other Work.

E. Install thermostats 48 inches above floor, and space temperature sensors and other exposed control sensors 60 inches above floor. Align with light switches.

F. Install outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield as required.

G. Provide separable sockets for liquids and flanges for air bulb elements.

H. Install valves with position indicators and with pilot positioners where sequenced with other controls.

I. Individually calibrate outside air measuring and modulation device to proper airflow set points.

J. Install control panels adjacent to associated equipment on vibration free walls or freestanding supports. Install engraved plastic nameplates for instruments and control components inside cabinets and engraved plastic nameplates on each cabinet face. Label with appropriate equipment or system designation.

K. Install “hand/off/auto” selector switches to override automatic interlock controls when switch is in “hand” position.

L. Install duct smoke detectors in the main supply duct in accordance with NFPA 72, California Building Codes and California Fire Codes. Factory installed smoke detectors in listed air moving equipment may be used in lieu of field installed smoke detectors in the main supply duct. Power duct smoke detectors from the air moving equipment, provide auxiliary contacts to fire alarm, and demonstrate shut-down and signaling.

3.3 FIELD QUALITY CONTROL

A. Start and commission systems. Allow adequate time for start-up and commissioning prior to placing control systems in permanent operation. Allow 1 day for start-up of radiant heating system.

B. Furnish service technician employed by system installer on site to instruct Owner’s representative in operation of systems plant and equipment.

C. After completion of installation, test and adjust control equipment. Submit data showing set points and final adjustments of controls.

D. 7-day Trend Reports. Provide trend reports over one week period for each HVAC system controlled and for each sequence of operation, plotting functional status and value over time. Repeat reporting until all systems meet approved sequences of operation.

3.4 DEMONSTRATION AND TRAINING

A. Furnish basic operator training for 4 persons designated by Owner. Provide video tape of all training sessions. Include a minimum of 2 days instructor time for the boilers and 1 day for the air handler. Furnish training on site.

B. Demonstrate complete operation of systems, including sequence of operation prior to Date of Substantial Completion.

C. Demonstrate complete and operating system to Owner.

3.5 SEQUENCE OF OPERATION

A. SEQUENCE OF OPERATION FOR ECU-1:
   1. Indirect Direct Evaporative Cooling Unit with Hot Water Coil and DX Cooling, ECU-1, serves

the Administration Building.

2. Unit Control Overview:
   a) When the unit start sequence has been initiated, ECU-1 shall maintain an average occupied cooling supply air (SA) setpoint temperature of 62 degrees Fahrenheit (adjustable). Optimal start shall be initiated when the average zone temperature is below or above the low/high limit temperature setpoint or a start enable needs to be initiated before the scheduled output is on. The SA reset shall be reset from the average zone deviation. Both the low/high zone deviation and the low/high SA setpoint shall be adjustable from the EMCS graphical user interface (GUI).

3. Unit Start/Stop sequence:
   a) The start sequence shall be initiated whenever the HAND-OFF-AUTO (HOA) switch is placed in the HAND position, or when the energy management control system, (EMCS), Remote Enable Contact is closed while the HOA switch is in the AUTO position. This shall be a remote enable sent from the EMCS to ECU-1 through the BACnet IP connection. The supply and exhaust fan control sequence shall then be executed. ECU shall be capable of occupied and unoccupied modes, with setback temperature of 55 degrees Fahrenheit (adjustable) in heating and setup temperature of 85 degrees Fahrenheit (adjustable) in cooling.
   b) The stop sequence shall include an automatic media dry-out cycle after direct evaporative cooling mode allowing the supply fan to operate for 30 minutes (adjustable) in order to dry-out the evaporative media prior to unit shut down. A manual stop in the HAND position shall terminate the automatic dry-out cycle immediately as a service function.

4. Supply and Exhaust Fans:
   a) The fan motors shall be started immediately, according to the programmed occupancy schedule, and go to the minimum frequency setting on the VFD when the start sequence is completed. Once fan operation has been proven by the respective airflow proving switches, the supply fan speed will modulate to maintain the SA static pressure setpoint (adjustable). The exhaust fan speeds shall modulate to maintain the space static pressure setpoint (adjustable).
   b) Airflow status shall be monitored by airflow switches. If the switches are not made within three minutes after initial start-up, or more than thirty seconds after the unit is running, a fan alarm will be generated and the unit will shut down. The HOA switch or the unit enable value shall be cycled off to reset the fan alarm.
   c) After airflow has been proven and as long as a fan alarm does not exist, the following sequence of operation for component control shall be allowed to execute:

5. Indirect Evaporative Cooling Heat Exchanger Face and Bypass Dampers:
   a) When indirect evaporative cooling (IEC) is enabled by ECU controls, the IEC face and bypass dampers shall modulate to maintain the SA temperature at the SA temperature setpoint plus the SA temperature differential for the IEC face and bypass dampers cooling mode setpoint. As the SA temperature drops below this calculated setpoint, the face damper shall modulate closed and the bypass damper shall modulate open to mix warmer outside air bypass air with cooler air flowing through the IEC heat exchanger.
   b) If IEC is not enabled, the face and bypass dampers shall modulate to maintain the SA temperature at the SA temperature setpoint plus the SA temperature differential for the IEC face and bypass dampers heating mode setpoint. As the SA temperature rises above this

calculated setpoint, the face damper shall modulate closed and the bypass damper shall modulate open to mix cooler outside air bypass air with warmer air flowing through the IEC heat exchanger.

c) In the warm-up mode, the IEC face and bypass dampers shall both be 100% open.

6. Directive Evaporative Cooling Face and bypass Dampers:
   a) When direct evaporative cooling (DEC) is enabled by ECU controls, the DEC face and bypass dampers shall modulate to maintain the SA temperature at the SA temperature setpoint plus the SA temperature differential for the DEC face and bypass dampers cooling mode setpoint. As the SA temperature drops below this calculated setpoint, the face damper shall modulate closed and the bypass damper will modulate open to mix warmer bypass air with cooler air flowing through the DEC / DX cooling sections.
   b) If DEC is not enabled, the face and bypass dampers shall modulate to maintain the SA temperature at the SA temperature setpoint plus the SA temperature differential for the DEC face and bypass dampers heating mode setpoint. As the SA temperature rises above this calculated setpoint, the face damper shall modulate closed and the bypass damper shall modulate open to mix cooler outside air bypass air with warmer air flowing through the DEC / DX cooling sections.
   c) If the direct expansion (DX) cooling coil or the hot water (HW) heating coil is enabled, the DEC face dampers shall fully open and bypass dampers shall fully close.
   d) In the warm-up mode, the DEC face dampers shall fully open and bypass dampers shall fully close, outside air (OA) dampers shall fully close and recirculation dampers shall fully open.

7. Hot Water Preheating:
   a) Preheating shall be enabled when the OA temperature is less than the SA temperature setpoint plus the OA temperature differential to enable HW heating setpoint, or the warm-up mode is set to be ON. The HW valve shall modulate to maintain SA temperature at SA temperature setpoint plus the SA temperature differential for HW heating setpoint. The OA temperature differential to enable HW heating setpoint shall be 20 degrees Fahrenheit (adjustable).

8. Indirect Evaporative Cooling:
   a) The IEC sump shall be enabled and filled when the OA temperature is greater than the SA temperature setpoint plus the OA temperature differential to enable IEC sump setpoint, and the unit is not currently in the scheduled dump mode. The IEC sump shall be disabled but remain filled when the OA temperature drops below the calculated IEC change over setpoint. The IEC sump shall be disabled and dumped immediately when the OA temperature drops below the minimum temperature for sump and DX coil operation setpoint.
   b) The IEC pump shall cycle on when the IEC sump is enabled and full. The pump shall continue to run according to the fan and damper control sequences above, but shall not run during dump and flush cycles.
   c) Whenever the sump is filled, it shall remain filled until the unit is manually shut down or the regularly scheduled dump occurs once a week on Saturday (adjustable). The Dump Schedule Time shall initiate a sump dump for fifty-five minutes followed by a sump flush for five minutes. The fans shall be forced to run for the IEC sump dry out time (adjustable) after the pump has been disabled.

9. Direct Evaporative Cooling:
   a) The DEC sump shall be enabled and filled when the OA temperature is greater than the SA temperature setpoint plus the OA temperature differential to enable DEC sump setpoint, the OA dewpoint maximum to allow DEC sump, and the unit is not currently in the scheduled dump mode. The DEC sump shall also be enabled and filled when the return air (RA) dewpoint is less than the RA dewpoint to enable DEC humidification. The DEC sump shall be disabled but remain filled when the OA temperature drops below the calculated DEC change over setpoint. The DEC sump shall be disabled and dumped immediately when the OA temperature drops below the minimum temperature for sump and DX cooling coil operation setpoint.
   b) The DEC pump shall cycle on when the DEC sump is enabled and full, the RA dewpoint is less than the RA dewpoint maximum to allow DEC pump setpoint, and the SA dewpoint is less than the SA dewpoint maximum to allow DEC Pump setpoint. The DEC pump shall also run when the DEC sump has been filled for humidification. The pump shall continue to run according to the fan and damper control sequences above, but shall not run during dump and flush cycles.
   c) Whenever the DEC sump is filled, it shall remain filled until the unit is manually shut down or the regularly scheduled dump occurs once a week on Saturday (adjustable). The Dump Schedule Time shall initiate a sump dump for fifty-five minutes followed by a sump flush for five minutes. The fans shall be forced to run for the IEC sump dry out time (adjustable) after the pump has been disabled.

10. DX Cooling:
   a) DX cooling shall be enabled when OA temperature is greater than the SA temperature setpoint plus the OA temperature differential to enable DX cooling setpoint. Compressors shall be staged in the DX cooling mode to control the SA temperature to the SA temperature setpoint plus the SA temperature differential to enable DX cooling. The EA fan VFD output shall be at or above the EA VFD minimum speed for DX cooling setpoint.

11. Alarms:
   a) The unit shall shut down, signal an alarm, and require manual reset, (by cycling the HOA off, or the unit enable value is cycled off), if:
      1) One of the fans fail.
      2) One of the VFDs fail.
      3) The freezestat has tripped more than three times in one hour.
      4) The supply air discharge static pressure exceeds its setpoint.
      5) The return air negative static pressure drops below its setpoint.
   b) The unit shall shut down, signal an alarm and automatically restart if:
      1) The freezestat trips.
      2) The power monitor input opens.
      3) The smoke detector input opens.
   c) The unit shall signal an alarm but continue to operate if:
      1) SA filter input status closes.
      2) RA filter input status closes.
      3) One of the compressors fail.
      4) The water hardness in the IEC sump or DEC sump exceeds 550 ppm.

B. SEQUENCE OF OPERATION FOR ECU-2:
1. Indirect Direct Evaporative Cooling Unit with Hot Water Coil, ECU-2, serves the Maintenance Building.

2. Unit Control Overview:
   a) When the unit start sequence has been initiated, ECU-2 shall maintain an average occupied cooling supply air (SA) setpoint temperature of 62 degrees Fahrenheit (adjustable). Optimal start shall be initiated when the average zone temperature is below or above the low/high limit temperature setpoint or a start enable needs to be initiated before the scheduled output is on. The SA reset shall be reset from the average zone deviation. Both the low/high zone deviation and the low/high SA setpoint are adjustable from the EMCS graphical user interface (GUI).

3. Unit Start/Stop Sequence:
   a) The start sequence shall be initiated whenever the HAND-OFF-AUTO (HOA) switch is placed in the HAND position, or when the energy management control system, (EMCS), Remote Enable Contact is closed while the HOA switch is in the AUTO position. This shall be a remote enable sent from the EMCS to ECU-2 through the BACnet IP connection. The supply and exhaust fan control sequence will then be executed. ECU shall be capable of occupied and unoccupied modes, with setback temperature of 55 degrees Fahrenheit (adjustable) in heating and setup temperature of 85 degrees Fahrenheit (adjustable) in cooling.
   b) The stop sequence shall include an automatic media dry-out cycle after direct evaporative cooling mode allowing the supply fan to operate for 30 minutes (adjustable) in order to dry-out the evaporative media prior to unit shut down. A manual stop in the HAND position shall terminate the automatic dry-out cycle immediately as a service function.

4. Supply and Exhaust Fans:
   a) The fan motors shall be started immediately, according to the programmed occupancy schedule, and go to the minimum frequency setting on the VFD when the start sequence is completed. Once fan operation has been proven by the respective airflow proving switches, the supply fan speed will modulate to maintain the SA static pressure setpoint (adjustable). The exhaust fan speeds shall modulate to maintain the space static pressure setpoint (adjustable).
   b) Airflow status shall be monitored by airflow switches. If the switches are not made within three minutes after initial start-up, or more than thirty seconds after the unit is running, a fan alarm will be generated and the unit will shut down. The HOA switch or the unit enable value shall be cycled off to reset the fan alarm.
   c) After airflow has been proven and as long as a fan alarm does not exist, the following sequence of operation for component control shall be allowed to execute:

5. Indirect Evaporative Cooling Heat Exchanger Face and Bypass Dampers:
   a) When indirect evaporative cooling (IEC) is enabled by ECU controls, the IEC face and bypass dampers shall modulate to maintain the SA temperature at the SA temperature setpoint plus the SA temperature differential for the IEC face and bypass dampers cooling mode setpoint. As the SA temperature drops below this calculated setpoint, the face damper will modulate closed and the bypass damper will modulate open to mix warmer outside air bypass air with cooler air flowing through the IEC heat exchanger.
   b) If IEC is not enabled, the face and bypass dampers will modulate to maintain the SA temperature at the SA temperature setpoint plus the SA temperature differential for the IEC face and bypass dampers heating mode setpoint. As the SA temperature rises above this calculated setpoint, the face damper will modulate closed and the bypass damper shall

modulate open to mix cooler outside air bypass air with warmer air flowing through the IEC heat exchanger.

c) In the warm-up mode, the IEC face and bypass dampers will both be 100% open.

6. Directive Evaporative Cooling Face and Bypass Dampers:
   a) When direct evaporative cooling (DEC) is enabled by ECU controls, the DEC face and bypass dampers shall modulate to maintain the SA temperature at the SA temperature setpoint plus the SA temperature differential for the DEC face and bypass dampers cooling mode setpoint. As the SA temperature drops below this calculated setpoint, the face damper will modulate closed and the bypass damper will modulate open to mix warmer bypass air with cooler air flowing through the DEC section.
   b) If DEC is not enabled, the face and bypass dampers will modulate to maintain the SA temperature at the SA temperature setpoint plus the SA temperature differential for the DEC face and bypass dampers heating mode setpoint. As the SA temperature rises above this calculated setpoint, the face damper will modulate closed and the bypass damper shall modulate open to mix cooler outside air bypass air with warmer air flowing through the DEC section.
   c) If the hot water (HW) heating coil is enabled, the DEC face dampers shall fully open and bypass dampers shall fully close
   d) In the warm-up mode, the DEC face dampers shall fully open and bypass dampers shall fully close, outside air (OA) dampers shall fully close and recirculation dampers shall fully open.

7. Hot Water Preheating:
   a) Preheating shall be enabled when the OA temperature is less than the SA temperature setpoint plus the OA temperature differential to enable HW heating setpoint, or the warm-up mode is set to be ON. The HW valve shall modulate to maintain SA temperature at SA temperature setpoint plus the SA temperature differential for HW heating setpoint.

8. Indirect Evaporative Cooling:
   a) The IEC sump shall be enabled and filled when the OA temperature is greater than the SA temperature setpoint plus the OA temperature differential to enable IEC sump setpoint, and the unit is not currently in the scheduled dump mode. The IEC sump shall be disabled but remain filled when the OA temperature drops below the calculated IEC change over setpoint. The IEC sump shall be disabled and dumped immediately when the OA temperature drops below the minimum temperature for sump operation setpoint.
   b) The IEC pump shall cycle on when the IEC sump is enabled and full. The pump shall continue to run according to the fan and damper control sequences above, but shall not run during dump and flush cycles.
   c) Whenever the sump is filled, it shall remain filled until the unit is manually shut down or the regularly scheduled dump occurs once a week on Saturday (adjustable). The Dump Schedule Time shall initiate a sump dump for fifty-five minutes followed by a sump flush for five minutes. The fans shall be forced to run for the IEC sump dry out time (adjustable) after the pump has been disabled.

9. Direct Evaporative Cooling:
   a) The DEC sump shall be enabled and filled when the OA temperature is greater than the SA temperature setpoint plus the OA temperature differential to enable DEC sump setpoint, the OA dewpoint maximum to allow DEC sump, and the unit is not currently in the scheduled dump mode. The DEC sump shall also be enabled and filled when the return air (RA)

dewpoint is less than the RA dewpoint to enable DEC humidification. The DEC sump shall be disabled but remain filled when the OA temperature drops below the calculated DEC change over setpoint. The DEC sump shall be disabled and dumped immediately when the OA temperature drops below the minimum temperature for sump operation setpoint.

b) The DEC pump shall cycle on when the DEC sump is enabled and full, the RA dewpoint is less than the RA dewpoint maximum to allow DEC pump setpoint, and the SA dewpoint is less than the SA dewpoint maximum to allow DEC Pump setpoint. The DEC pump shall also run when the DEC sump has been filled for humidification. The pump shall continue to run according to the fan and damper control sequences above, but shall not run during dump and flush cycles.

c) Whenever the DEC sump is filled, it shall remain filled until the unit is manually shut down or the regularly scheduled dump occurs once a week on Saturday (adjustable). The Dump Schedule Time shall initiate a sump dump for fifty-five minutes followed by a sump flush for five minutes. The fans shall be forced to run for the IEC sump dry out time (adjustable) after the pump has been disabled.

10. Alarms:
    a) The unit shall shut down, signal an alarm, and require manual reset, (by cycling the HOA off, or the unit enable value is cycled off), if:
        1) One of the fans fail.
        2) One of the VFDs fail.
        3) The freezestat has tripped more than three times in one hour.
        4) The supply air discharge static pressure exceeds its setpoint.
        5) The return air negative static pressure drops below its setpoint.
    b) The unit shall shut down, signal an alarm and automatically restart if:
        1) The freezestat trips.
        2) The power monitor input opens.
        3) The smoke detector input opens.
    c) The unit shall signal an alarm but continue to operate if:
        1) SA filter input status closes.
        2) RA filter input status closes.
        3) One of the compressors fail.
        4) The water hardness in the IEC sump or DEC sump exceeds 550 ppm.

C. SEQUENCE OF OPERATION FOR VAV BOX COOLING ONLY:
1. VAV air distribution serves VAV zones the Administration Building and the Maintenance Building.
    a) Each VAV box will be controlled by its own temperature unit controller.
    b) A wall mounted zone electronic temperature sensor shall have push buttons for override and warmer/cooler adjustment.
    c) Multiple units will be controlled by common thermostat only where shown on the drawings.
    d) Cooling operation: The temperature unit controller shall compare the cooling setpoint with the space temperature and signal the modulation box damper to vary the supply air quantity being delivered to the zone. Cooling setpoint temperature = 74 degrees Fahrenheit (adjustable).
    e) The following items shall be monitored:
        1) Room temperature.
        2) SA temperature.

D. SEQUENCE OF OPERATION FOR EXHAUST FANS:

1. Control sequences for exhaust fans:
   a) General rooftop exhaust fans: Interlock general rooftop exhaust operation to central air-handling unit operation.
   b) Exhaust fan serving Maintenance Pit: Interlock fan to operate with programmed building occupancy schedule.
   c) Rooftop exhaust fans serving office areas and toilets: Start and operate fan during normally scheduled occupied hours only. Fan shall stop and remain off during unoccupied periods.
   d) Exhaust fans serving mechanical rooms and electrical rooms: Start and operate fan when room temperature rises to 85F or greater. Fan shall stop and remain off when room temperature drops to 75F or less.
   e) Bus Wash Bay exhaust fan: Start fan when a bus enters the Bus Wash Bay and operate fan while bus is inside the Bus Wash Bay. Fan shall stop 5 minutes after last bus leaves the Bus Wash Bay and remain off.

E. SEQUENCE OF OPERATION FOR HHW-1 SYSTEM:
1. The heating hot water system HHW-1 is a primary only loop system, and serves the Administration Building.
2. System Control Overview:
   a) Boilers B-1A and B-1B shall be controlled by the main boiler control panel and the sub boiler control panel. The boiler control panel shall be programmable at a panel located on or near the boiler and shall have commands to control the following:
      1) Boiler B-1A, boiler B-1B, and loop circulation pump P-1A and loop circulation pump P-1B.
      2) Lead/lag rotation of boilers on a daily basis.
      3) Option of Lo/Hi/Lo/Hi or Lo/Lo/Hi/Hi sequencing of boilers. Lag boiler shall fire when lead boiler has reached full fire capacity, or fire both lead and lag boilers on lowest fire stage then stage both to higher firing rates.
      4) Seasonal enable flag is based off of month of the year, October through May (adjustable). If the current month is between starting month and ending month, then enable flag is off. If the current month is between ending month and starting month, then enable flag is on.
      5) The boilers are enabled only when:
         i. The programmed schedule is on.
         ii. The outside air (OA) temperature is less than the HW system outside air lockout temperature (adjustable).
         iii. Any of the HW valves are calling for heat, in either occupied or unoccupied mode.
         iv. Seasonal enable flag is on.
3. The main boiler control panel shall monitor the HW loop supply and return temperatures, stage boilers on, adjust the firing rate, and automate both boilers to function as a unit to maintain loop setpoint temperature. The lead boiler shall be enabled based upon outside air temperature, 68 degrees Fahrenheit (adjustable).
4. The loop pumps P-1A and P-1B shall rotate lead/lag on a daily basis, and the VFDs on the pumps shall modulate to maintain a constant differential pressure across the heating water supply (HWS) and heating water return (HWR) headers.

5. Reset heating hot water temperature based upon outside air temperature, with minimum and maximum ranges set at terminal. HWS = 180 degrees Fahrenheit when outside air temperature = 24 degrees Fahrenheit, and HWS = 120 degrees Fahrenheit when outside air temperature = 60 degrees Fahrenheit, with a straight line relationship between points.
6. The following displays and commands shall be available:
   a) Current HWS and HWR temperatures.
   b) Current status commanded for each boiler.
   c) Current status of start/stop command at each pump.
   d) Current switch status at each pump.
   e) Runtime totalization (up to 64,000 hours).
   f) Trend logs.
   g) Alarm history.
   h) Fail indication of pumps.
7. Setpoints shall be interlocked between heating and cooling to prevent simultaneous heating and cooling. Set deadband between heating and cooling at 2-3 degrees Fahrenheit (adjustable).

F. SEQUENCE OF OPERATION FOR RADIANT CEILING PANEL HEATING SYSTEM:
   1. The radiant ceiling panel heating system serves the Administration Building.
   2. System Control Overview:SYSTEM CONTROL OVERVIEW:
      a) Each radiant ceiling panel heating zone shall be directly controlled by its own controller. The zone consists of ceiling mounted hydronic radiant panels with tubing circuit(s) and zone valve(s).
      b) A wall mounted zone thermostat with room setpoint adjustment and room air temperature sensor shall be furnished for occupant control.
      c) In heating mode the controller compares the heating setpoint temperature with the room air temperature and modulates the zone valve(s) to maintain heating setpoint temperature.
      d) All temperature sensors shall be factory calibrated to +/- ½ degree Fahrenheit. All sensors shall be interchangeable with no calibration required.
      e) The following items shall be monitored:
         1) Room temperature.

G. SEQUENCE OF OPERATION FOR HHW-2 SYSTEM:
   1. The heating hot water system HHW-2 is a primary only loop system, and serves the Maintenance Building.
   2. System Control Overview:
      a) Boilers B-2A and B-2B shall be controlled by the main boiler control panel and the sub boiler control panel. The boiler control panel shall be programmable at a panel located on or near the boiler and shall have commands to control the following:
         1) Boiler B-2A, boiler B-2B, and loop circulation pump P-2A and loop circulation pump P-2B.
         2) Lead/lag rotation of boilers on a daily basis.
         3) Option of Lo/Hi/Lo/Hi or Lo/Lo/Hi/Hi sequencing of boilers. Lag boiler shall fire when lead boiler has reached full fire capacity, or fire both lead and lag boilers on lowest fire stage then stage both to higher firing rates.
         4) Seasonal enable flag is based off of month of the year, October through May (adjustable). If the current month is between starting month and ending month,

then enable flag is off. If the current month is between ending month and starting month, then enable flag is on.

b) The boilers are enabled only when:
c) The programmed schedule is on.
d) The outside air (OA) temperature is less than the HW system outside air lockout temperature (adjustable).
e) Any of the HW valves are calling for heat, in either occupied or unoccupied mode.
f) Seasonal enable flag is on.
g) The main boiler control panel shall monitor the HW loop supply and return temperatures, stage boilers on, adjust the firing rate, and automate both boilers to function as a unit to maintain loop setpoint temperature. The lead boiler shall be enabled based upon outside air temperature, 68 degrees Fahrenheit (adjustable).

3. The loop pumps P-2A and P-2B shall rotate lead/lag on a daily basis, and the VFDs on the pumps shall modulate to maintain a constant differential pressure across the heating water supply (HWS) and heating water return (HWR) headers.
4. Reset heating hot water temperature based upon outside air temperature, with minimum and maximum ranges set at terminal. HWS = 180 degrees Fahrenheit when outside air temperature = 24 degrees Fahrenheit, and HWS = 120 degrees Fahrenheit when outside air temperature = 60 degrees Fahrenheit, with a straight line relationship between points.
5. The following displays and commands shall be available:
   a) Current HWS and HWR temperatures.
   b) Current status commanded for each boiler.
   c) Current status of start/stop command at each pump.
   d) Current switch status at each pump.
   e) Runtime totalization (up to 64,000 hours).
   f) Trend logs.
   g) Alarm history.
   h) Fail indication of pumps.
6. Setpoints shall be interlocked between heating and cooling to prevent simultaneous heating and cooling. Set deadband between heating and cooling at 2-3 degrees Fahrenheit (adjustable).

H. SEQUENCE OF OPERATION FOR RADIANT SLAB HEATING SYSTEM:
1. The radiant slab heating system serves the Maintenance Building.
2. System control Overview::
   a) Each slab heating zone shall be directly controlled by its own controller. The zone consists of in-slab hydronic tubing circuit(s) and zone valve(s).
   b) A wall mounted zone thermostat with room setpoint adjustment and in-slab temperature sensor shall be furnished for occupant control.
   c) In heating mode the controller compares the heating setpoint temperature with the slab temperature and modulates the zone valve(s) to maintain heating setpoint temperature.
   d) Removable temperature sensors shall be placed in conduit permanently embedded in concrete slab. All temperature sensors shall be factory calibrated to +/- ½ degree Fahrenheit. All sensors shall be interchangeable with no calibration required.
   e) The following items shall be monitored:
      1) Slab temperature.

END OF SECTION 23 09 00

SECTION 23 10 00 - FACILITY FUEL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Diesel fuel oil and gasoline tanks, piping, and accessories located outside buildings and underground as shown on contract drawings. Refer to contract drawings for type of fuel and for tank capacities.

B. Tank fluid level monitoring and alarm systems.

C. Leak detection system for tanks, sumps and underground piping.

1.2 RELATED WORK

A. Excavation and backfill for underground tanks and piping: Section 31 00 00, EARTHWORK.

B. Section 23 20 00, COMMISSIONING OF FACILITY FUEL SYSTEMS.

C. Section 22 05 00, COMMON WORK RESULTS FOR PLUMBING.

D. Underground conduit systems for tank fluid level monitors and tank and piping leak detectors: Section 26 05 33, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.

E. Section 23 12 13, FACILITY FUEL PUMPS AND DISPENSERS.

1.3 QUALITY ASSURANCE

A. Approval by Owner's Representative is required of products or services of proposed manufacturers, suppliers and installers, and will be based on Contractor's certification that:
   1. Manufacturers regularly and currently manufacture tanks, tank and piping accessories, tank fluid level monitoring and leak detection systems, fuel quality management systems.
   2. The design and size of each item of equipment provided for this project is of current production and has been in satisfactory operation on at least three installations for approximately three years. Current models of fluid level and leak detection systems with less than three years of service experience are acceptable if similar previous models from the same manufacturer have at least three years of service experience.

B. Apply and install materials, equipment and specialties in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract drawings and specifications shall be referred to the Owner's Representative for resolution. Provide copies of installation instructions to the Owner's Representative two weeks prior to commencing installation of any item.

C. All equipment shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components or overall assembly.

D. Tank and piping installation contractor shall be certified as acceptable by local and state pollution control authorities.

E. Entire installation shall conform to requirements of local and state pollution control authorities.

F. Assembly of High Density Polyethylene (HDPE) Plastic Piping: Installation personnel shall have been trained, tested and certified under a procedure approved by the manufacturer of the piping. Proof of certification, in writing, shall be provided to the Owner's Representative.

G. Where specified codes or standards conflict, consult the Owner's Representative.

H. Label of Conformance (definition): Labels of accredited testing laboratories showing conformance to the standards specified.

I. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a safe, complete and fully operational system which conforms to contract requirements and in which no item is subject to conditions beyond its design capabilities.

1.4 SUBMITTALS

A. Submit in accordance with Division1.

B. Underground Tanks
1. Drawings of tanks, anchoring devices, tank filling and submersible pump access sumps, tank annular brine monitoring sump, tank manholes, tank manhole enclosures, and all accessories. Include overall dimensions and dimensional locations and sizes of all anchoring devices, pipe connections, and access openings.
2. Manufacturer's installation instructions describing recommended foundation, bedding and backfill material, support and anchoring devices, and method of installation.
3. Weight of entire tank assemblies, empty and flooded.
4. Certification of compliance with specified standards.
5. Data certifying that tanks are designed for surcharge loads of backfill, traffic and other construction.
6. Design and construction of tanks, secondary containment, pipe connections, manholes, anchoring devices and ballasts, and access doors for tank manhole enclosures.

C. High Density Polyethylene (HDPE) Fuel Piping
1. ASTM and UL compliance.
2. Grade, class or type, schedule number.
3. Manufacturer.
4. Pressure and Temperature Rating.
5. Catalog Cuts.
6. Complete dimensional layout with all piping and appurtenances.
7. Shop Drawings.

D. Pipe Fittings, Unions, Flanges
1. ASTM and UL compliance.
2. ASTM standards number.

3. Catalog cuts.
4. Pressure and temperature rating.

E. Foot Valves, Check Valves, Isolation Valves, Overfill Prevention Valves
1. Catalog cuts showing design and construction.
2. Pressure and temperature ratings.
3. Pressure loss and flow rate data.
4. Materials of construction.
5. Accessories.

F. High Density Polyethylene Secondary Containment System for Fuel Piping
1. Sizes, materials, construction of containment system including end seals, sumps, manholes, coatings and pipe supports.
2. Shop Drawings.
3. Installation instructions.

G. Leak Detection System
1. Drawings, description and performance data on sensors, control units.
2. Description of operation.
3. Shop Drawings.
4. Installation and operating instructions.
5. Data on interconnecting wiring systems to be furnished.

H. Tank Fluid Level Monitoring Instrumentation System
1. Drawings showing instruments and in-tank sensing units, with dimensions.
2. Shop Drawings of all elements of system.
3. Installation instructions.

I. Tank and Piping Accessories
1. Design, construction, and dimensions of vent caps, fill boxes, fill caps, spill containers and other accessories.

J. Fuel Pumping System
1. Drawings and description of all components and arrangement of system.
2. Design and performance of pumps.
3. Catalog data and operation of control system.
4. Installation instructions.

1.5 DELIVERY, STORAGE AND HANDLING

A. Protection of Equipment
1. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Contractor has been reimbursed for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
2. Place damaged equipment in first class, new operating condition; or, replace same as determined and directed by the Owner's Representative. Such repair or replacement shall be at no additional cost to the Government.

3. Protect new equipment and piping systems against entry of foreign matter on the inside. Clean both inside and outside before painting or placing equipment in operation.
4. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.
5. Protect plastic piping and tanks from ultraviolet light (sunlight).

B. Cleanliness of Equipment and Piping
1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.
2. Piping systems shall be flushed, blown or pigged as necessary to provide clean systems.
3. Clean interior of all tanks prior to delivery for beneficial use by the Government.
4. Contractor shall be fully responsible for all costs, damages and delay arising from failure to provide clean systems and equipment.

1.6 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.

B. Federal Specifications (Fed. Spec.)
1. A-A-60005 Frames, Covers, Grating, Steps, Sump and Catch Basin, Manhole

C. National Electrical Manufacturers Association (NEMA)
1. 250-08 Enclosures for Electrical Equipment (1000 Volts Maximum)

D. National Fire Protection Association (NFPA)
1. 30-12 Flammable and Combustible Liquids Code
2. 70-11 National Electrical Code

E. Petroleum Equipment Institute (PEI)
1. PR100 Recommended Practices for Installation of Underground Liquid Storage Systems

F. Underwriters Laboratories Inc. (UL)
1. 971-06 Non-Metallic Underground Piping for Flammable Liquids
2. 1316-06 Glass-Fiber-Reinforced Plastic Underground Storage Tanks for Petroleum Products
3. UL-971 Nonmetallic Underground Piping For Flammable Liquids

G. American Petroleum Institute (API)
1. 1631-01 Interior Lining and Periodic Inspection of Underground Storage Tanks

1.7 PERMITS

A. Contractor shall obtain and complete all tank permit and registration forms required by governmental authorities.

B. Specifically, the Contractor shall obtain a Underground Storage Tank (UST) permit through Butte County Department of Resource Management

C. Contractor shall file all applications for permit for Underground Storage Tank (UST) systems for diesel and gasoline.

D. Application requirements include submittal of detailed plans showing tanks, piping, sumps, tank equipment, anchorage, monitoring equipment and overfill/leak detection and details of Vacuum/Pressure/Hydrostatic (VPH) system.

E. Obtain permits from both Butte County Air Quality Management Distrcit and Butte County Environmental Health Contractor to determine if additional permitting is required prior to excavation for underground storage tanks. See Addendum A at end of this specification section.

PART 2 - PRODUCTS

2.1 UNDERGROUND FUEL SYSTEM

A. A complete functional system which conforms to local, state and federal codes requirements and guidelines.

2.2 UNDERGROUND FIBERGLASS REINFORCED PLASTIC TANKS

A. Type: Factory-fabricated, double-wall, fiberglass reinforced polyester (FRP), horizontal cylindrical configuration, atmospheric pressure, for underground installation as shown.

B. Construction
1. UL 1316. Provide label of conformance.
2. Conform to NFPA 30 or 31 as applicable.
3. Design for surcharge loads due to backfill and paving as shown. In addition, in paved areas, design for H-20 32,000 pound axle loading.
4. Leaks and abrasions are not permitted. Maximum out-of-roundness is one percent of the diameter.
5. Outer wall shall provide leak-tight secondary containment that covers entire tank. Provide annular space between the walls arranged with flow channels to allow tank leakage at any point to flow to be monitored by a leak detector. Provide connection point to outer wall and plastic pipe from tank connection to grade designed to accommodate leak detection device.

C. Factory Cleaning: Clean interior and exterior. Remove all dirt, debris, and coatings and material incompatible with fuel being stored.

D. Fiberglass Manhole Enclosures
1. Cylindrical enclosures , designed to contain fuel spills from tank piping. Locate all tank manholes and all tank piping connections within the enclosures.
2. Same material type and thickness as tank. Reinforce to prevent deflection. Provide leak-tight connection to tank designed to allow removal of tank man-way cover without disturbing connection between enclosure and tank. Coat all exposed steel surfaces, such as bolting, with two coats of urethane.
3. Provide enclosures and tank with flexible isolation system to prevent differential movement of cover and tank or vehicle and/or external loads from being transmitted to the tank.
4. Access to Manhole Enclosure: Fed. Spec. A-A-60005 cast iron manhole frames and covers rated for H-20 32,000 pound axle loading minimum with opening size as shown in Plans.

5. Provided by tank manufacturer, installed by tank manufacturer approved installer.

E. Pipe Connections to Tanks
1. Conform to UL 1316.
2. Pipe sizes 4 inches and smaller, threaded. Pipe sizes 5 inches and larger 150 pound ASME flanged.
3. Welded joints required on HDPE piping located inside tanks.
4. Provide and coordinate tank connection quantities, sizes and types with requirements of level gage unit; tank leak detector; sounding rod; vent, fill, supply pipes; and other pipes as shown. Vapor recovery piping connection required on gasoline storage tank only
5. All tank piping connections shall be within the tank manhole enclosures and sump/risers.

F. Tank Manholes: Provide quantity indicated on Plans. Bolted cover type, gasketed, zinc-plated bolts, nuts and washers.

G. Wear (Striker) Plates: Provide 12 inch square, 0.25 inch thick steel plates attached to bottom of tank directly under the sounding opening, the fuel return discharge, and the fill discharge.

H. Lifting Lugs: Provide for rigging tanks.

I. Hold-Down Straps: Provide quantity and design of FRP straps as recommended by tank manufacturer to anchor tank to concrete ballast. Straps shall have tension load capability equal to hold-down capability of ballast slab, with a minimum safety factor of two. Provide complete anchorage devices, including turnbuckles, for adjusting tension.

J. Concrete Ballast “Dead Man”: Designed to accept hold down straps in locations indicated by manufacturer. Weight of Ballast per manufacturer recommendations.

2.3 SOIL SEPARATOR MAT

A. Material: Porous, non-woven polypropylene geotextile, Weight: 4 ounces per square yard, resistant to all alkalies and weak acids.

2.4 TANK AND PIPING ACCESSORIES

A. Vent Caps: Galvanized cast iron or cast aluminum with brass or bronze screens, arranged to permit full venting and to prevent entry of foreign material into the vent line. Same pipe size as vent pipe.

B. Zero Emission Pressure/Vacuum Vent Valve: Franklin Fueling.

C. Fill Manhole
1. Spill-container type enclosing a fill cap assembly with cam-lock hose connector with closure coordinated with fittings used by fuel supplier.
2. Watertight assembly, cylindrical body, quick-opening corrosion-resistant watertight sealable cover, polyethylene spill containment compartment with minimum 5 gallon capacity. Integral drain valve with discharge to fill pipe.
3. Fill cap shall be lockable, tight-fill design with provision for padlock on the top of the cap. Fill cap shall screw onto threaded adapter that can be removed without removing fill box. Entire assembly shall seal tight with no leakage during filling and when cap is in place.

4. Provide special tools necessary for opening fill boxes and fill caps.
5. Protect spill container from traffic by ramped, drain-slotted cast iron body ring and cover. Design shall prevent transmission of traffic loads to the underground tank. Spill-container type not required at locations designated only for sounding tanks.
6. Slope grade away from manhole.

D. Support horizontal portion of pipes located inside tank every 7 feet maximum.

E. Furnish gauging chart gallons versus inches depth.

F. Furnish sounding rod for each tank size. Mark rods in increments representing five percent of tank capacity. Provide length of rod suitable for tank burial depth (if applicable). Rods shall be graduated in gallons.

G. Fill Point Identification:
1. Fill Boxes at Grade Level: Aluminum, brass or bronze plate, anchored to concrete fill box pad with stamped or engraved letters 0.75 inch high.
2. Legend: "DIESEL FUEL FILL" "GASOLINE FUEL FILL", "LEAK MONITORING" or "SOUNDING" as appropriate.

H. Provide clean air separator. Tank and Associated Piping per executive order VR-201.

2.5 PIPING, VALVES, FITTINGS

A. Fuel supply, tank fill, vents, sounding, pump out.

B. High Density Polyethylene (HDPE) Pipe and Fittings
1. Conform to UL 971 and ULC/ORD-C971-2005 for Nonmetallic Underground Piping for Flammable Liquids and approved for use for Normal Vent, Vapor Recovery and Product Piping.
2. Design pipe, fittings and joining system for required fuel service, Primary pipe -22 to 122 °F, and 90 psi pressure, secondary pipe -22 to 122 °F, and 50 psi pressure.
3. Secondary containment is integral part of primary piping
4. Joining pipe does not required transition sump

C. Check Valves - Fuel Pump Suction
1. Pipe Sizes 2 inches and under: Rated for 200 psi water-oil-gas, swing-type, threaded ends, ASTM B62 bronze body. Provide union adjacent to valve.
2. Pipe Sizes 2 1/2 inches and above: Rated for 200 psi water-oil-gas, swing-type, 125 pounds ASME flanged ends, ASTM A126 class B cast iron body.

D. Fill Pipe and Riser: Provide a schedule 40 riser sized to accommodate the fill pipe. Provide electrical/static charge grounding for this riser and fill pipe if metallic. Provide a tight-fill swivel adaptor on fill pipes.

E. Extractor Fittings: Arranged to permit overfill prevention valves, and other devices that are located below grade. Access point shall be through a cast iron fill box-type manhole located at grade. Provide extractor wrench.

F. Overfill Prevention Valve: Aluminum automatic valve designed for underground tanks. Removable through the extractor fitting on underground tanks. Locate valve near the top of the tank in the fill pipe. On tanks with gravity fill, provide two stage automatic float-operated valve. First stage operation at 92 percent tank capacity shall reduce flow to 5 gallons per minute or less. Second stage operation shall stop flow completely when tank is no more than 95 percent full. Valve shall include method for draining fuel trapped above the valve into the tank.

G. Double Poppet Shear Valve: Provide a shear valve at each fuel dispenser. Install such that location of valve does not impede function

H. Pipe Supports: Provide supports within conduit for fuel carrier pipes spaced 7 feet apart except 10 feet apart for carrier pipe size 2 inches through 4 inches. Support design shall permit differential movement of pipes, allow drainage of leakage to sumps, and maintain alignment of carrier pipes.

I. Conduit End Seals: Same material and coating as conduit; leak tight.

2.6 LEAK DETECTION SYSTEMS

A. Automatic digital continuous monitoring systems responsive to alarms in hydrostatic, vacuum and contact leak detection systems located in the tank, fuel and vent pipe annular areas, tank, dispenser and vent transition sump annular areas, dispenser and vent transition sumps and, in the tank manhole access enclosures. System shall distinguish between type of alarm and identify location of the alarm as to individual tank, sump and piping system. System shall be combined with tank fluid level monitor and continuous and alarm system specified in Article, TANK FLUID LEVEL MONITOR AND ALARM SYSTEM.

B. Functions and Arrangement
1. Single control station to monitor all sensing probes.
2. Visual indicator to monitor and identify leaks.
3. Indicators showing system status including faults and alarms.
4. On board printer that provides complete reports of all system functions upon command.
5. Panel circuit test button.
6. 95 dB audible alarm with silencing control to sound when leak is detected.
7. Minimum eight hour memory backup system with battery.
8. NEMA cabinet rated for location installed.
9. UL or other accredited testing laboratory listing.
10. RS232 Modbus communications with engineering control system to indicate system in service and alarm conditions.

C. Sensors
1. Designed for required locations including: Insertion in sumps in double-wall, sump interstitial space, piping interstitial space and in tank manhole enclosures. Sensing points shall be at lowest point of each tank or sump. Provide intrinsically safe design.
2. Sensors shall be arranged to allow replacement of individual sensors without disturbing other portions of leak detection system or fuel storage and piping system. Underground sensors shall be accessed through caps as grade.
3. Materials of construction shall be non-corroding.
4. Transmit status signal to control unit.

D. Components
1. Provide manholes at grade for each sensor cap similar in construction to fill boxes. Manholes shall be cast iron, quick-opening cover, water-tight, minimum size necessary to accommodate sensor caps. Provide identification plates, similar to those specified for fill points, labeled “LEAK DETECTION MONITORING WELL-DO NOT FILL”. Provide special tools if necessary for opening covers.
2. Sensor housings from tank and piping to grade shall be Schedule 40 PVC, or stainless steel.
3. Underground wiring between probes and control unit: Place in water-tight corrosion-resistant conduit system conforming to Section 26 05 33, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.

E. Vacuum Leak Detection System: Provide a leak detection system to monitor fuel and vent piping annular area by placing annular area under a vacuum and monitoring pressure change in system with leak detection system.

2.7 TANK FLUID LEVEL MONITOR AND ALARM SYSTEMS

A. Digital systems for central monitoring of fuel and water levels in all fuel storage tanks in the project. High and low level visual and audible alarms. Complete with all transducing, transmitting, and receiving devices. On board printer to provide complete report of all system functions upon command. System may be combined with leak detection system specified in Article, LEAK DETECTION SYSTEMS.

B. Fluid Level Monitor
1. Digital continuous readout, showing tank levels in gallons, smallest reading one gallon. Provide identification of product measured, measuring units, and the tank number.
2. Tank and fuel characteristics contained in preprogrammed non-volatile field-replaceable databases. Protected power supply.

C. High and Low Fluid Level Alarm System
1. Automatic continuous on-line monitoring of all tanks and sumps.
2. Visual and audible indicators combined with fluid level monitor. Identify the tank that is in alarm condition.
3. Manual alarm test and silencing controls.
4. Low level alarm actuation adjustable 0-25 percent of tank capacity. High level alarm actuation adjustable 75-100 percent of tank capacity.

D. Locate all indicators, selector switches, alarms on face of wall-mounted NEMA panel.

E. Remote Alarm Annunciator
1. Visual and audible high level alarms adjacent to tank fill box locations. Locate in NEMA 250 Type 4X weatherproof exterior wall or pole-mounted panels.
2. Alarm shall include flashing red light with 180 degree visibility for each tank and 95 dB horn or 4 inch diameter bell. Provide alarm silence control.
3. Provide identification sign: "WHEN ALARM SOUNDS - FUEL TANK FILLED TO CAPACITY - DO NOT OVERFILL".

F. Modbus communication to indicate tank fluid level and alarm conditions. Telephone modem communication capability with built in ethernet.

G. System Performance: Accuracy plus or minus 0.01 inch of fluid height in inventory mode and 0.001 inch in leak detection mode. Automatic compensation for fluid temperature changes.

H. Sensors
1. Provide sensor types such as magnetostrictive, capacitance, float, hydrostatic and other types as necessary for the applications.
2. Apply in accordance with manufacturer's instructions with provisions for easy future replacement without need for excavation.
3.
4. Float-type units shall be designed for installation and removal through a 4 inch diameter vertical pipe mounted in the top of the tank.

I. Underground Wiring and Piping: Enclose in water-tight corrosion-resistant conduit system sized and arranged as recommended by system manufacturer and conforming to Section 26 05 33, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.

J. Code Conformance: NFPA-70.

K. Tie into fuel/liquid management system such that bulk tank level integration is available.

2.8 CONCRETE FOUNDATIONS

A. Ballast foundations shall be sized for buoyancy of entire tank when empty and soil is water saturated. Credit for overburden is allowed.

2.9 BURIED UTILITY WARNING TAPE

A. Tape shall be 0.004 inch thick, 6 inches wide, yellow polyethylene with a ferrous metallic core, acid and alkali-resistant and shall have a minimum strength of 1750 psi lengthwise and

B. 1500 psi crosswise with an elongation factor of 350 percent. Provide bold black letters on the tape identifying the type of system. Tape color and lettering shall be unaffected by moisture and other substances contained in the backfill material.

PART 3 - EXECUTION

3.1 PREINSTALLATION, UNDERGROUND FIBERGLASS REINFORCED PLASTIC TANKS

A. Conform to PEI – RP100-11 as applicable.

B. Clean tank, equipment, and piping of dust and foreign material.

C. Visually inspect tanks, equipment, and piping for adherence to specifications and damage. Report any detected damage and determine if repairs can be made or if equipment requires replacement. Repairs to be performed in manner approved by manufacturer.

3.2 INSTALLATION AND TESTING, UNDERGROUND FIBERGLASS REINFORCED PLASTIC TANKS

A. Conform to NFPA 30 or 31 as applicable.

B. Place Concrete Ballast “Deadmen” in bottom of excavated area. Prepare strapping and turnbuckles for tank installation.

C. Place tanks on 12 inch thick beds of pea gravel (naturally rounded aggregate, clean and free flowing, conforming to the written requirements of the tank manufacturer).

D. Secure tanks to foundations with fiberglass reinforced plastic straps. Slope tanks at ¼ inch per foot. Completed tank installation shall successfully resist buoyant forces of flooding to top of tank when tank is empty.

E. Double-wall tanks: After tanks are set in place, test internal tank space applying internal air pressure at a maximum of 5 psi. Monitor pressure for 1 hour. Using air from the inner tank, pressurize the interstitial space to a maximum 5 psi. Soap test exterior of tank for leaks and monitor pressure gauges for a drop in pressure. Release interstitial pressure prior releasing air in inner tank. Repair leaks in accordance with the instructions of the manufacturer under the on-site supervision of a representative of the manufacturer. Retest until all leaks are repaired. Tests shall be witnessed by the Owner Representative. Test manhole enclosures by filling with water and proving no leaks for 24 hours.

F. Tanks shipped with liquid-filled or pressurized interstitial spaces are to be inspected and tested per manufacturer’s recommendations. Inspect and test tank openings, man-ways and risers as with single and double walled tanks above.

G. Prior to backfilling, clean and coat all metal parts that will be below grade (including straps, turnbuckles, bolts, piping) with protective coats of urethane, using quantities and methods recommended by the manufacturer of the coating for underground service.

H. Backfill around the tanks as recommended by the tank manufacturer. Backfill material shall be gravel identical to the bed material. If earth is to be placed above gravel, provide soil separator mat on top of gravel. Lap 12 inches at joints. Minimum depth of cover shall be in accordance with recommendations of tank manufacturer but not less than 18 inch. Earth backfilling shall conform to Section 31 00 00, EARTHWORK. Where soil conditions are unsuitable for tank installation, unsuitable soil shall be removed and replaced with suitable material. After completion of backfilling, measure tanks internally for out-of-roundness.

I. Support manholes, piping and other components during backfill.

J. Do not place fluid in tanks until backfilling and piping connections to tanks are complete, and tanks have been inspected internally by Owner Representative. Keep tank excavation dewatered.

3.3 INSTALLATION AND TESTING, UNDERGROUND PIPING SYSTEMS

A. Leak Detection System: Arrange fuel and carrier piping, enclosed in secondary containment piping, to accommodate leak detection system. Slope piping down toward tanks and leak detectors at 1 inch in 40 feet.

B. High Density Polyethylene (HDPE) Piping: All joints butt or socket welding. Piping ends shall be accurately cut, true, and beveled for welding.

C. Secondary Containment Piping
1. Provide pea gravel bedding and backfill material for PE piping.
2. Top of system 18 inches minimum below grade.
3. Seal all building and manhole wall penetrations with a modular, watertight flexible penetration seal system. The modular penetration seal shall have a nitrile rubber seal.
4. After placing system, prior to backfill, repair all damage, including coatings, as recommended in printed instructions of system manufacturer.

D. Leak Test
1. Prior to backfill, isolate piping system from tanks and test carrier pipes with air pressure at 50 psi, and test the containment piping with air pressure at 8 psi or as recommended by the manufacturer. Systems shall hold the pressure for 60 minutes. Repair all leaks and retest. Use an inert gas if any flammable, hazardous or combustible materials have been in pipes. Utilize soap on outside of containment piping to determine leaks.

E. Construction Pipe Monitoring
1. Maintain and monitor a pressure of 10 psi in carrier piping and 5 psi in containment piping during backfill and surrounding construction. Use an inert gas if any flammable, hazardous or combustible materials have been in pipes. Pressures shall not exceed those recommended by manufacturer.

F. Buried Utility Warning Tape
1. Install tape 12 inches below grade above the piping system.

3.4 INSTALLATION, FILL PORTS AND ACCESS MANHOLES AT GRADE

A. Provide for tank fill, tank sounding, leak detector sensors, and extractor fittings. Set at grade in concrete pads. Refer to fill box detail. Provide identification plate set into the concrete pad that identifies the purpose of the device and type of fuel in the tank.

3.5 INSTALLATION AND TESTING, LEAK DETECTOR SYSTEMS FOR SUMPS

A. Wiring shall conform to NFPA-70.

B. Locate control monitor panels as indicated on Plans.

C. Test operation of each probe, and monitoring system with fuel and water. If type of probe utilized is damaged by exposure to fuel, provide temporary probe for testing monitoring system.

3.6 INSTALLATION, TANK FLUID LEVEL INDICATOR AND ALARM SYSTEM

A. Wiring shall conform to NFPA-70.

B. Locate level indicator and alarm panel as indicated on Plans.

C. Locate remote high level alarm on exterior wall or pole in view of tank fill point, 8 feet above grade as indicated on Plans.

3.7 TANK MANHOLE ENCLOSURES

A. All pipe penetrations shall be leak tight permitting no groundwater into enclosure.

ADDENDUM A - REFERENCE COMMUNICATION FROM BUTTE COUNTY PUBLIC HEALTH

DATE: June 19, 2014

FROM: Danelle Leen

RE: Butte Regional Transit Operations Center

It is my understanding the City of Chico Building department is looking for confirmation that Butte County Environmental Health is aware of the Butte Regional Transit Operations Project. Per §2711 of Title 23 in the CCR, this project requires an Application to Install an Underground Storage Tank with supporting documents and fees. Prior to construction of any tank installation, Butte Regional Transit Operations must apply for and receive a Permit to Install from Butte County Environmental Health.

END OF SECTION 23 10 00

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SECTION 23 11 00 - COMMISSIONING OF FACILITY FUEL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY/APPLICABILITY

A. This specification defines the requirements and procedures for startup and commissioning of fuel facility systems. It covers requirements for safety, Owner scheduling and coordination, device testing, and system flushing demonstration of indicated and specified system performance and final acceptance and reporting.

1.2 RELATED WORK

A. Section 23 10 00, FACILITY FUEL SYSTEMS.

B. Section 23 12 13, FACILITY FUEL PUMPS AND DISPENSERS.

1.3 SUBMITTALS

A. The following shall be submitted in accordance with Division 1 - General Submittal Procedures:
   1. Preconstruction Submittals
      a. Commissioning Plan
   2. Test Reports
      a. Piping Flushing Checklist
      b. Commissioning Report
   3. Certificates
      a. Certification of Completion
      b. Disposal of Waste Materials

1.4 SAFETY

A. Prior to any on-site commissioning activities, the following safety procedures shall be accomplished in all fueling areas to be commissioned under this specification section: testing/operation of emergency eyewash facilities, placement of Contractor-provided portable eyewash units within 100 feet or 10 seconds of unobstructed pathway from the fueling point, verification of proper grounding throughout system, coordination with Owner, Fire Marshal, and Safety Authorities, placement of Owner-provided spill pads and containment booms, placement of Contractor-provided fire extinguishers capable of extinguishing a fuel fire. Ensure that all radios/devices at all Class I, Division 1 hazardous location areas are intrinsically safe.

1.5 SYSTEM SUPPLIER INVOLVEMENT

A. The Contractor and the System Supplier shall work together to prepare the work plan, commissioning plan, test reports and final reports. They shall both be present during all commissioning activities and shall coordinate and schedule the work during construction, testing, calibration and acceptance of the system, and operator training. The System Supplier shall be responsible to the Contractor for scheduling all Contractor, sub-Contractor, and manufacturer's service personnel during system startup and final commissioning.

1.6 COMMISSIONING PLAN

A. The Contractor shall submit a detailed written plan for implementation of system commissioning. The commissioning plan shall specify a detailed plan incorporating in a sequenced manner all work specified in PART 3 EXECUTION of this specification section. The plan shall be submitted for Owner approval 90 calendar days prior to commencement of fuel system commissioning. The plan shall include:

1. Personnel. List of Contractor's personnel by trade, list of key personnel, list of safety equipment, list of miscellaneous equipment such as two-way radios, and personnel transportation vehicles.
2. Performance Testing. Detailed equipment startup procedures and schedules to perform all system tests under each operating scenario in accordance with paragraph entitled "Performance Tests".
3. Test forms. Develop all test forms required for documenting the fuel system commissioning work. The format of the test forms shall follow the sequencing and terminology of the commissioning plan and shall furnish data grids and ample areas for test data recording.
4. Schedule. Schedules shall generated listing dates and durations of all commissioning activities as well as regular coordination and safety meetings and dates of key events for Owner participation.
5. Fuel. Quantities of fuel needed for all commissioning activities and fuel delivery schedules. Plan shall include requirements and schedules for Owner-provided materials and equipment.
6. Contingency plans. Information on spill and fire contingencies, along with the required involvement and approvals of the Owner, Fire, and Safety Agencies.

1.7 CERTIFICATION OF COMPLETION

A. As a prerequisite to fuel system commissioning, the Contractor shall submit a Certificate of Completion that certifies all work provided on the fuel system, except for field painting, has been inspected and approved by the specified approving authorities. Further, the Contractor shall certify on this certificate that all specified checks and inspections have been successfully completed prior to commissioning. The Contractor shall give the Owner’s Representative at least 45 calendar days notice prior to commencement of fuel system commissioning. The Contractor shall submit the Certificate of Completion to the Owner’s Representative at least 7 calendar days prior to commencement of system commissioning. The Owner’s Representative shall then be responsible for scheduling the designers for participation in the inspection, performance testing, and final approval activities. Any contractual deficiencies observed shall be corrected by the Contractor without cost to the Owner.

1.8 COMMISSIONING REPORT

A. Contractor shall prepare a commissioning report that documents the execution of the approved commissioning plan. All items of work specified in the commissioning plan shall be carried out and reported in this report unless otherwise approved by the Owner’s Representative. Include as a part of this report verification letters of approved fuel storage tank leak tests and the piping hydrostatic tests, as generated under other specification sections. The commissioning report shall include confirmation of all input and output functions of the Tank Fluid Level Monitoring System.

1.9 DISPOSAL OF WASTE MATERIALS

A. The Contractor shall be responsible for properly disposing of any sludge, debris, filtration elements, and waste fuel resulting from piping and tank cleaning and flushing activities as specified in Section 23 10 00, FACILITY FUEL SYSTEMS. Comply with all applicable local, State, and Federal Regulations for hazardous waste disposal.

PART 2 - PRODUCTS

2.1 DESIGN CONDITIONS

A. Temporary flushing lines and equipment shall be equal in strength, stability, and materials to the associated permanent components; however, temporary spools may be carbon steel.

2.2 CONTRACTOR PROVIDED MATERIALS AND EQUIPMENT

A. The Contractor shall provide all material, equipment and labor required for proper start-up of the systems, except for that specified to be Owner furnished. Equipment shall include but not be limited to the following:
   1. Pipe spools to include spool pieces with a Single Point Receptacle on each end to allow defueling to a portable storage vessel.
   2. Flow meters.
   3. Pressure Gages.

2.3 OWNER FURNISHED MATERIALS AND EQUIPMENT

A. The Owner will furnish the following materials, equipment and services used during the execution of the commissioning plan. Any damage caused by the Contractor's operations shall be repaired at no additional cost to the Owner.

B. Fuel
   1. The Owner will provide the fuel necessary for system testing. The Contractor shall notify the Owner a minimum of sixty (60) days in advance of the requirements. Additional fuel will be provided by the Owner as required for satisfactory flushing of the system. Upon satisfactory completion of the flushing and cleaning operations, the Owner will supply the additional quantities of fuel required to complete the other work under this specification section.
   2. Fuel will not be delivered to the system until the Contractor has satisfactorily completed all work and, in particular, the cleaning and coating of the interior surfaces of the storage tanks and the removal of preservatives and foreign matter from those portions coming in contact with the fuel valves, pumps, filter/separators and other such equipment. Fuel delivered to the system shall remain the property of the Owner and the Contractor shall reimburse the Owner for shortages not attributable to normal handling losses. The Owner shall be reimbursed for fuel lost as a result of defective materials or workmanship.

C. Utilities
   1. Electric power required for the performance of the work under this specification section will be furnished by Owner. The Contractor shall notify the Owner a minimum of sixty (60) days in advance of the requirements.

D. Trucks

1. A small vehicle and driver to transport a 55-gallon drum will be furnished by the Owner.

PART 3 - EXECUTION

3.1 PRELIMINARY REQUIREMENTS

A. All activities listed in paragraph "PART 3 EXECUTION" shall be performed sequentially in the order they are presented. Prior to any on-site commissioning activities, the Contractor shall ensure that all requirements of the paragraph entitled "Safety" are satisfied. Project shall be substantially complete and Contractor's work area shall be free of debris, trash and obstacles. Perform the following activities prior to receipt of fuel:

B. Electrical Preparations
1. Prior to energizing the electrical equipment, verify that short-circuit links have been removed from current transformer and that secondary circuits have been connected. Confirm that all tests required for fire detection and suppression systems have been performed and accepted. Verify correct rotation of all motors prior to testing.

C. Emergency Fuel Shutoff (EFSO) System Testing
1. Prior to initial fuel receipt, verify that each switch will trip the circuit breaker of the fuel pumps and de-energize the EFSO relay and close the main emergency fuel shut-off valve.

D. Storage Tanks
1. Ensure approved performance of storage tank integrity testing, and inspection per the applicable specifications. Include verification letter of approved test results for information in commissioning report. Ensure that tank interior is clean and free of any fuel-contaminating debris. Verify operation of tank level alarms by closing tank connection valves and filling housings with fuel to confirm action.

E. Piping System
1. Ensure that all piping weld integrity and inspections have been performed per the applicable specifications. Include verification of approved test results for information in the commissioning report. Evacuate all accumulated water from piping low point drains, valve cavities, and equipment drains. Verify all bolted connections are tightness tested to required torque using a calibrated torque wrench. Verify that all pressure gauges are properly located and installed. Ensure that pipe marking and identification is provided as specified. Verify the correct installation of piping supports.

3.2 PREPARATIONS FOR FLUSHING

A. Upon completion of the construction to the satisfaction of the Owner, the Contractor shall make the following preparations for system flushing.

B. Protection of Equipment
1. The following components shall be removed from the system prior to start of flushing operations and, where applicable, replaced with pipe spools of internal diameter equal to the item removed.
   a. Control valves.
   b. Flow and pressure sensors which are exposed to the system flush.
   c. Fuel meters.

C. Strainers
1. Temporary 40 mesh cone type strainers shall be used on any contaminated fuel from the flushing operation that is reintroduced into the system.

D. Water Draw-Off:
1. Remove any accumulated water from storage tanks' sumps and bottoms. Drain water and return fuel via filtration to storage tank. Repeat process until all water is removed.

3.3 INITIAL FUEL AND ENGINE FLUIDS RECEIPT

A. General
1. Initial receipt of fuels, oils, coolants and diesel exhaust fluid (DEF) shall be done by gravity if possible. All equipment will be periodically inspected for leaks during filling procedures.

B. Storage Tanks
1. Receipt flow velocity into an empty storage tank shall not exceed 3 feet per second (FPS), as measured in the main receipt piping, until outlet of tank fill tube is submerged and pan/roof legs are lifted.

C. Components
1. Ensure that filter/separators and other vessels are filled slowly by closing outlet valves and venting through air eliminators. Downstream valves shall be throttled to maintain a packed condition in vessels throughout initial fill of piping system. Differential pressure across strainers shall be continuously monitored. Any time a strainer DP reaches 20 psig, it shall be cleaned.

D. Fuel and Engine Fluid Quality
1. Fuel and other fluids used during flushing shall be considered contaminated and shall be positively isolated, with blind flanges or closed, padlocked manual valves, from any active fueling operations. Fuel and fluid isolation shall continue until all flushing is completed.

E. Fuel and Engine Fluids Receipt
1. Receipt by Commercial Truck
a. Coordinate with Owner’s personnel to schedule quantity of fuel required. Contractor's personnel shall be positioned at each unloading point and at the receipt tank, all in radio contact. Contractor shall provide a written summary of truck receipt procedures to the Owner’s Representative. If truck unloading system is newly constructed, perform initial receipt, flushing, and testing prior to performance testing.

F. Initial Low Point Flush
1. Remove any accumulated water from storage tank sumps and bottoms. Perform an initial low point flush operation by flushing each low point drain through a portable basket strainer for 10 seconds at a system pressure of 30 psig. Repeat flush until basket strainer collects no additional debris.

3.4 FLUSHING

A. The intent of the flushing operation is to remove bulk solids and water from the system. Flushing procedures shall precede cleaning procedures. All new fuel piping, including the transfer line, receipt system piping and supply and return lines to the storage tanks, shall be flushed with fuel.

B. Flushing Requirements
1. Begin flushing of fuel system pipelines at low flow rates using one delivery pump. Slowly increase flushing flow rate with additional pumps until a fuel velocity of 3 FPS +/- is achieved for a minimum of 20 seconds. If 3 FPS cannot be achieved using system pumps, the Contractor shall provide additional temporary pumping capacity. For gravity, suction, or other non-pumped piping segments, minimum flushing volume shall be four times the pipe volume. Flushing shall continue until the fuel being delivered is free of construction debris to the satisfaction of the Owner's Representative. Fuel shall be free of gross contamination and visible free water.

C. Fueling and Engine Fluid System Piping
1. The flushing of system pipelines shall be accomplished by pumping fuel from one storage tank through the fueling system piping through each fuel dispensing station to a portable storage vessel such as a 55-gallon drum. After flushing of main system piping, all piping laterals shall be flushed with fuel or appropriate fluid. All air shall be bled from system high points. The procedure shall be continued until the fuel or fluid being delivered is acceptable to the Owner's Representative.

D. Piping Flushing Checklist
1. The Contractor shall generate a comprehensive matrix of all new piping sections in the system. Matrix shall serve as an Owner's piping inventory and a checklist for all Contractor-provided flushing operations. Column entries shall include pipe section name, location, diameter, approximate length and acceptable results of sampling.

3.5 EQUIPMENT TESTS

A. After completion of flushing, the equipment tests and performance tests specified hereinafter shall be performed. Tests will be witnessed by the Owner's Representative and other Owner representatives.

B. Emergency Fuel Shutoff System
1. With one fueling pump operating, test each "Emergency Stop" pushbutton station to verify that the pump stops and the main emergency shutoff valve closes. Repeat this procedure for each fueling pump and "Emergency Stop" pushbutton station. Conduct tests for both the automatic and manual modes. With duplex fueling pumps circulating fuel through the system, push an "Emergency Stop" pushbutton station, ensure both pumps stop, and emergency fuel shutoff valve closes.

3.6 PERFORMANCE TESTS

A. During performance testing, the Contractor shall demonstrate that all portions of the fuel system are operating as designed and specified. Tests shall be performed under all operating scenarios. Additional tests may be required by the Owner's Representative to fully demonstrate system performance. These tests shall be accomplished by the Contractor at no additional cost to the Owner. The Contractor shall notify the Owner's Representative 15 calendar days in advance of the test to permit arrangement for the use of Owner furnished items. Record required data necessary to prepare reports specified in paragraph entitled "Commissioning Report".

B. Storage Tank Systems
   1. Demonstrate the following features:
      a. Tank overfill valve closure upon tank high level condition.
      b. Level alarm actuation.
      c. Pump shutdown on tank low level condition.
      d. Tank leak detection system performance.
   2. Demonstrate all other tank features and functions per the applicable specifications.

C. Transfer/Delivery Systems
   1. Demonstrate the following features:
      a. Manual start/stop pushbutton control.
      b. Pump shutdown upon no-flow condition.
      c. Pump shutdown upon signal from remote EFSO switch.

D. Dispensing Systems
   1. Demonstrate fuel management keypad function for both gasoline and diesel. Demonstrate engine coolant, engine oil and diesel exhaust fluid (DEF) dispensing allowed and disallowed depending on vehicle requirements.
   2. Verify fluid measurement is operational and accurate.
   3. Pump shut down on low tank level.
   4. Verify data from fuel management system is routed to appropriate computer system.

E. Satisfactory Performance
   1. In the event a portion of the system or any piece of equipment fails to meet the test, the Contractor shall make the necessary repairs or adjustments and repeat the Performance Test until satisfactory performance is obtained. Measured flow rates should be within 10 percent of design. Tank level gauging and alarm measurements should be within 1% of design. Any component found not to be working as specified shall be repaired/replaced by the Contractor at no additional cost to the Owner. The determination of satisfactory performance shall be made by the Owner's Representative. The system shall be filled with fuel and shall be operable and leak-free prior to acceptance. The Contractor shall be responsible for any leaks in the new or modified portions of the system.

3.7 TRAINING / INSTRUCTION FOR OWNER'S PERSONNEL

A. The Owner will provide at minimum one or two key personnel from their staff to participate in all phases of system commissioning. The Contractor and System Supplier will be responsible for coordinating the involvement and training of these individuals during the startup process, including hands-on familiarization and adjustment of devices, valves, and components.

B. In addition, the Contractor and System Supplier shall conduct two 8-hour formal training sessions at the conclusion of system performance testing. These sessions shall include initial classroom system presentations as well as a complete system walk-through. The function, operation and maintenance procedures for all system devices and components will be explained. Training shall be videotaped and submitted in CD ROM and DVD format.

3.8 PROJECT CLOSEOUT

A. Ensure that As-Built drawings, equipment warranty documentation, and other project closeout activities are completed and assembled per the requirements of the applicable specifications.

END OF SECTION 23 20 00

SECTION 23 11 23 – NATURAL-GAS PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pipe hangers and supports.
   2. Pipe and pipe fittings.
   3. Valves.

1.2 SUBMITTALS

A. Product Data:
   1. Pipe Hangers and Supports: Submit manufacturers catalog data including load carrying capacity.
   2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.

B. Pipe Hangers and Supports: Design data, indicate pipe sizes, load carrying capacity of trapeze, multiple pipe, and riser support hangers.

C. Manufacturer’s Installation Instructions: Submit installation instructions for material and equipment.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit spare parts lists and maintenance procedures.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 30.

B. List and label flexible connectors in accordance with UL 536.

PART 2 PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Conform to ASME B31.9.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

C. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

E. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

F. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

G. Vertical Support: Steel riser clamp.

H. Floor Support for Pipe Sizes to 4 inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

I. Floor Support for Pipe Sizes 6 inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

2.2 PIPES AND TUBES

A. Natural Gas Piping, Buried:
1. Steel Pipe: ASTM A53/A53M, Grade B, Schedule 40 black with polyethylene jacket and welded joints.
2. Polyethylene Pipe: ASTM D2513, SDR 11.5, with socket type fittings and fusion welded joints.

B. Natural Gas Piping, above Grade:
1. Steel Pipe: ASTM A53/A53M, Grade B, Schedule 40 black, with malleable iron or forged steel fittings, screwed or welded.

2.3 VALVES

A. Gate Valves:
1. Up to 2 inches: Bronze body, bronze trim, non-rising stem, hand wheel, inside screw, double wedge disc, soldered or threaded.
2. Over 2 inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, solid wedge, flanged or grooved ends.

B. Ball Valves:
1. Up to 2 inches: Bronze or stainless steel one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends.
2. Over 2 inches: Cast steel flanged body, chrome plated steel ball, Teflon seat and stuffing box seals and lever handle.

C. Plug Valves:
1. Up to 2 inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends.
2. Over 2 inches: Cast iron body and plug, pressure lubricated, Teflon packing, flanged ends.

2.4 PIPING SPECIALTIES

A. Flanges, Unions, and Couplings:
1. Pipe Size 2 inches and Under: Malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.

2. Pipe Size Over 2 inches: Forged steel flanges for ferrous piping; bronze flanges for copper piping; preformed neoprene gaskets.
3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Flexible Connectors:
1. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure 300 psig.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify excavations are to required grade, dry, and not over-excavate.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside piping before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION - INSERTS

A. Install inserts for placement in concrete forms.

B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

3.4 INSTALLATION - PIPING SYSTEMS

A. Install dielectric connections wherever jointing dissimilar metals.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Route piping parallel to building structure and maintain gradient.

D. Install piping to maintain headroom. Group piping to conserve space. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Sleeve pipe passing through partitions, walls and floors.

H. Install piping system allowing clearance for installation of insulation and access to valves and fittings.

I. Install identification on piping systems including underground piping. Refer to Section 23 05 00.

J. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

3.5 INSTALLATION - VALVES

A. Install valves with stems upright or horizontal, not inverted.

B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install ball valves for throttling or manual flow control services.

3.6 INSTALLATION - FUEL PIPING

A. Install natural gas piping in accordance with ASME B31.2 and NFPA 31.

B. Provide clearance for access to valves and fittings.

C. Establish elevations of buried piping outside building to provide not less than 2 ft of cover.

D. Provide support for utility meters in accordance with requirements of utility company.

E. Pipe vents from gas pressure reducing valves to outdoors and terminate in weatherproof hood.

F. Test natural gas piping in accordance with NFPA 31.

3.7 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

F. Support riser piping independently of connected horizontal piping.

G. Design hangers for pipe movement without disengagement of supported pipe.

H. Prime coat exposed steel hangers and supports. Refer to Section 09900. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.8 SCHEDULES

PIPE HANGER SPACING		
PIPE SIZE Inches	STEEL PIPE MAXIMUM HANGER SPACING Feet	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	7	3/8
3/4	7	3/8
1	7	3/8
1-1/4	7	3/8
1-1/2	9	3/8
2	10	3/8
2-1/2 (Note 2)	11	1/2
3	12	1/2
4	14	5/8

Note 1: Refer to manufacturer's recommendations for grooved end piping systems.

END OF SECTION 23 11 23

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SECTION 23 12 13 – FACILITY FUEL PUMPS AND DISPENSERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. Fuel supply pumps.

B. Related Sections
   1. Section 23 10 00, FACILITY FUEL SYSTEMS.
   2. Section 23 20 00, COMMISSIONING OF FACILITY FUEL SYSTEMS: Equipment Tests.

1.2 REFERENCES

A. National Electrical Manufacturers Association
   1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

B. National Fire Protection Association
   1. NFPA 30 - Flammable and Combustible Liquids Code.

1.3 SUBMITTALS

A. Division 1 – General Submittal Procedures: Submittal procedures.

B. Product Data
   1. Pumps - Fueling, Fuel Transfer
      a. Manufacturer's descriptive literature, general.
      b. Parts manual and recommended spare parts list.
      c. Maintenance, service and repair instructions.
      d. Manufacturer's name, model number.
      e. Performance data at specified flow rates. Performance shall include:
         1) Head developed, horsepower required and efficiency.
         2) Pump curves, flow and power requirements, efficiency, head and operating speed. Curves to show operating points at full range of operating conditions.
      f. Control wiring diagrams showing all terminations of conductors (and all control devices) labeled to permit identification in the field; part numbers of all control devices; normally open or normally closed; voltage of all control components and operational description.
      g. Plan and elevation views of equipment showing clearance required for maintenance and/or replacement.
      h. Name, address and telephone number of the nearest manufacturer's representative.
      i. Shipping and operating weights.
      j. Operating instructions.
      k. Factory run test curves indicating flow, head rpm, vibration amplitude and BHP.
   2. Fuel Dispensers
      a. Manufacturer's descriptive literature, general.
      b. Maintenance service and repair instructions.
      c. Manufacturer's name, model number, serial number.

d. Name, address and telephone number of the nearest manufacturer's representative.

3. Pressure Gages
   a. Manufacturer's descriptive literature, general.
   b. Parts manuals and recommended spare parts list.
   c. Maintenance, service and repair instructions.
   d. Manufacturer's name, model number, serial number.
4. Manual Valves
   a. Manufacturer's descriptive literature, general.
   b. Parts manual and recommended spare parts list.
   c. Maintenance, service and repair instructions.
   d. Operating Instructions.
   e. Manufacturer's name, model number, serial number.
   f. Performance data at specified conditions.
   g. Where specified to have limit switches, control wiring diagrams showing all terminations of conductors (and all control devices) labeled to permit identification in the field; part numbers of all control devices; normally open or normally closed; voltage of all control components.
   h. Name, address and telephone number of the nearest manufacturer's representative.
5. Meters
   a. Manufacturer's descriptive literature, general.
   b. Parts manual and recommended spare parts list.
   c. Maintenance, service, calibration instructions, and repair instructions.
   d. Operating Instructions.
   e. Manufacturer's name, model number, serial number.
   f. Performance data at specified conditions.
   g. Name, address and telephone number of the nearest manufacturer's representative.
6. Strainers
   a. Manufacturer's descriptive literature, general.
   b. Parts manual and recommended spare parts list.
   c. Maintenance, service and repair instructions.
   d. Manufacturer's name, model number, serial number.
   e. Name, address and telephone number of the nearest manufacturer's representative.

C. Manufacturer's Installation Instructions: Submit data for each type of pump.

D. Manufacturer’s operation and maintenance data in accordance with Division 1 Operation and Maintenance Data.

E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

F. Manufacturer's Field Reports: Submit report of each visit of manufacturer’s representative to provide technical assistance during installation.

1.4 CLOSEOUT SUBMITTALS

A. Division 1 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of pumps.

C. Operation and Maintenance Data: Submit spare parts lists for pumps.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 30.

B. List and label pumps in accordance with UL 343.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years experience approved by manufacturer.

1.7 PRE-INSTALLATION MEETINGS

A. Division 1 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Division 1- Product Requirements: Product storage and handling requirements.

B. Accept pumps on site in shipping containers with labeling in place. Inspect for damage.

1.9 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 WARRANTY

A. Division 1 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish two year manufacturer warranty for pumps.

PART 2 - PRODUCTS

2.1 DISPENSING, FUEL MANAGEMENT AND SERCURITY SYSTEMS

A. A complete, functional system which conforms to local, state and federal codes requirements and guidelines. Provide a system that integrates fluid monitoring between separate systems and allows usable data to be delivered to a designated server or personal computer

2.2 DIESEL SUPPLY PUMPS

A. Manufacturers
1. Franklin Fueling Systems.

2. Substitutions: Division 1- Product Requirements.

B. Product Description: Consisting of submersible turbine pump, interconnecting piping, pressure relief, check valve, variable speed, electric control components and accessories.

C. Pumps: Submersible turbine pump/motor assembly.
1. Variable speed, 2-stage centrifugal type pump motor with integral, automatic thermal overload protection.
2. Pump Accessories: Check valve, pressure relief valve, siphon, air eliminator, and electrical disconnect.

D. Performance
1. Flow: Minimum of 35 gallons per minute simultaneously at two dispensers.

2.3 GASOLINE SUPPLY PUMP

A. Manufacturers
1. Franklin Fueling Systems
2. Substitutions: Division 1 - Product Requirements.

B. Product Description: Consisting of submersible turbine pumps, interconnecting piping, pressure relief, check valve, electric control components and accessories.

C. Pumps: Submersible turbine pump/motor assembly
1. Two-stage centrifugal type pump motor with integral, automatic thermal overload protection
2. Pump Accessories: Check valve, pressure relief valve, siphon, air eliminator, and electrical disconnect.

2.4 FUEL DISPENSERS, HOSES AND NOZZLES

A. Gasoline/Diesel Dispenser
1. Dispenser configuration: Remote
2. Cabinet construction: Powder coated, heavy gauge, galvanized steel
3. Display: One inch high, six digit backlit LCD for volume display and ½ inch four digit character display
4. Totalizer: 7 digit electromechanical non-resettable totalizer per hose.
5. Interface with Fuel Control Systems
6. Meter: two piston positive displacement with integral pulser.
7. Electrical requirements: 120 volt, single phase
8. Approvals: UL for diesel and gasoline; US Weights and Measures approval for diesel and gasoline.
9. Gasoline Dispenser Only: Vapor recovery vacuum pump (Stage II) in dispenser housing; CARB Certified in conjunction with hose and nozzle

B. Fueling Hoses
1. Diesel Hose: Nitrile synthetic rubber with spiral synthetic yarn and static wire reinforcement, Chemivic synthetic rubber cover, green color, swivel breakaway, UL listed;

2. Gasoline Hose: Nitrile synthetic rubber coaxial hose with spiral synthetic yarn and static wire reinforcement for Stage II vapor recovery, Chemivic synthetic rubber cover, black color, swivel breakaway, UL listed; CARB Certified in conjunction with dispenser and nozzle

C. C.Nozzles
1. Diesel Nozzle: Bootless design; hold open clip; green scuff-guard; Automatic shut-off; Hose retractor; UL listed
2. Gasoline Nozzle: Vapor recovery nozzle; designed for dispenser mounted vacuum source; bootless design; hold open clip, black scuff-guard; Automatic shut-off; Hose retractor; UL listed; CARB Certified in conjunction with dispenser and hose

2.5 FUEL MANAGEMENT SYSTEM

A. Manufacturers
1. Fuel Master
2. Fuel Force
3. GasBoy
4. Substitutions: Division 1 - Product Requirements.

B. General Requirements
1. System manufacturer must have a minimum of ten years' experience in the design and manufacture of fuel management equipment. The proposed system must conform to ISO 9001:2000 standards for quality management systems. System shall be UL approved. The system must be expandable for future expansions in the number of: fuel sites, vehicles, drivers, dispensers and nozzles.

C. Fueling Procedure
1. The system shall allow manual fueling. A keypad shall be available as a method for initiating a fueling transaction. A two stage authorization process shall be provided by identifying both the vehicle and the driver prior to refueling. Both driver and vehicles IDs should be stored in the transaction. The two stage authorization process should be flexible enough to link the vehicle device either to a specific driver or to a list of drivers. The vehicle identification will initiate access to correct type of fuel, engine oil and coolant. Diesel vehicles will be allowed to utilize diesel exhaust fluid (DEF). The vehicle identification will block use of incorrect fluids for that vehicle.

D. System Description
1. System Configuration
   a. The system shall consist of two keypad site controller on the fuel island. The site controller shall be a stand-alone unit comprising all required peripherals including the central processing unit, display panel, pump control module, fluid control module, and communication modules. The site controller shall be web enabled to allow independent real-time control, monitoring and reporting via the web using user ID with password and SSL protected link. Connection to be Cat 5 cabling. The site controller shall communicate with a central high performance server or dedicated host PC computer for the purpose of centralized control and monitoring of multiple sites.
   b. Refueling shall take place regardless of the connectivity to the host computer. Refueling limits and restrictions shall be 'pushed' from the host computer to all fuel site

controllers enabling off-line refueling with limits and restrictions also when communication is not available.

2. System Operation
   a. Upon keypad entry the dispenser will be authorized to dispense the fuel and fluids related to the vehicle. The vehicle designation will exclude type fuel, engine oil, coolant and DEF not utilized by the particular vehicle. System will monitor quantities of all fluids dispensed. At the end of the refueling process, the nozzle is reinserted into the dispenser cradle and the transaction data is sent from the site controller to the host computer.

E. Site Controller
   1. General
      a. The site controller shall be capable of controlling up to 4 hoses at a single site and through one single terminal. The site controller shall store up to 25,000 transactions and 50,000 vehicles/devices with the ability to set limitations and restrictions. Site controller shall work in online and off-line modes, in case of communication failures with the FHO software. When communication is established again, the system shall synchronize data automatically. The site controller shall have an embedded hardware platform designed to survive the harsh fueling depot environment.
      b. The site controller shall use a solid state Flash disk and RTC (Real Time Clock) with back up, along with surge suppressors for transient and noise immunity. The system shall include a power fail recovery mechanism.
      c. The site controller shall have a high level data protection through a minimum of two separate isolated TCP/IP Ethernet network ports to be used for site peripherals interface and external communication to the network (Remote access, host computer and 3rd party systems) protected by SSL security. The outside link could use a local modem connection through PPP protocol for TCP/IP communication, cellular, or dial-in type modems.
      d. The site controller shall have the following additional capabilities:
         1) Secured remote capabilities for monitoring, management and maintenance activities
         2) Flexible communication including TCP/IP, wireless Ethernet bridge modems, satellite communications, and dial-up analog modem.
         3) Web enabled reporting and alarms for Tank Level Sensing (TLS) systems (Veeder Root-350 and VR-450 protocols)
         4) Fuel management software for reconciliation reports
         5) Accessible via Internet browser to control and monitor the system. No requirement to install dedicated software.
         6) Real time web-based dynamic graphical monitoring and control of dispensers
         7) Remotely open a pump and limit the quantity to a specific transaction
         8) Remote maintenance, remote troubleshoot and remote software upgrades of the various components of the system
      e. The following physical, electrical and environmental specifications shall be provided:
         1) Supply voltage: 100 – 240 VAC
         2) Power consumption: 2A max.
         3) Operating temperature range: -22 F to +158 F
         4) Communication interface: RS-485–9600 bps, Half-Duplex, RS-232, Ethernet RJ-45-10 Mbps, EIA 802.15.4
   2. Tank Level Sensing (TLS) Interface

a. The site controller shall support protocols required by tank fluid level monitoring system.
b. The TLS will be connected to the site controller via TCP/IP communication port or the RS-232 port to allow fuel management capabilities.
c. The site controller shall have the possibility to define the following communication parameters; Baud rate, Parity, Data bit, Stop bit, Flow control.
d. The site controller shall collect the following data from TLS equipment:
    1) 12:00 midnight shift inventory volume for tanks.
    2) Tank inventory level; Leak Detection status – Pass/Fail.
    3) Fuel delivery information; Water Level.
    4) Water levels, Temperature, Alarms (Leak, Overfill, Sump, Sensor, etc)
    5) Alarms shall flash continuously on the main screen. Alarm shall be available to be sent via email

3. The Pedestal
    a. The pedestal shall be a powder coated metal designed for easy installation and service. Coating shall be tested to sustain Oil, Fuel, Sun, Water and Salt. Provide front door access for maintenance and wiring.
    b. The pedestal display panel shall consist of:
        1) High intensity LED illumination
        2) LCD Display window visible in all lightening conditions
        3) 4 lines, 20 characters (1/4” height) each
        4) 16 durable, metal function keys.
        5) Keyboard entry authorization
4. Site Controller Software
    a. Provide web server technology with secured (SSL) remote access through the network using a standard PC with an internet browser, without the need for any other software application. Browser interface shall allow control and monitoring, maintenance activities, report generation with advanced filters and templates, graphical monitoring of fuel levels, and on-line pump monitoring. Provide a site controller which can support all types of dispensers The site controller shall allow the possibility to work offline with all limits and restrictions.
    b. The system shall store transaction data as well as driver and vehicle records and fueling limits and restrictions into its database and provide data searching capabilities.
    c. Authorization by keyboard entry authorization will be: PIN code and vehicle ID, with optional odometer reading and engine hours prior to refueling vehicle. System shall have the option to approve or decline refueling according to pre-defined limits and restrictions for the specific unit. Such limitations shall include:
        1) Limit of daily, weekly and monthly refueling volume or sales amount.
        2) Enable or disable vehicle refueling on specific days (weekdays for example) and/or specific time slots within a day (night time for example).
        3) Limit the maximum refueling sessions for a specific vehicle per day, week or month.
        4) Block specific stations for a specific vehicle (if vehicle is restricted for operation in a specific zone).
    d. Restriction of specific fuel types for refueling of a specific vehicle.
5. Fuel Management System Software
    a. The host computer shall collect the transactions and TLS information from all fuel sites for centralized fuel management activities including required deliveries, forecasting, reconciliation and more for optimal usage of fuel.

b. The system shall provide the following capabilities:
   1) Reports regarding fuel consumption with filters of sites, dates, volumes and more.
   2) Customized templates for specific reports.
   3) History of fuel consumption from every product with graphical representation.
   4) Forecasting consumption for every product based on the consumption history with graphical representation.
   5) Reconciliation.
   6) Manual entry or editing of fueling transactions.
   7) Provide unified view of ALL stations with regards to fuel level status.
   8) Provide consolidated view of each specific fuel tank, per station.
   9) Provide a centralized system for maintenance reporting and reporting of different system alarms, per station.
   10) Provide an interface for managing of manual stations (without Fuel Controllers).
c. Tanks status screen from TLS system per site with graphical representation of the tanks.
d. Alarms (High/Low Tanks Level, Leak Detection, No Communication, etc.).
e. Export capabilities to other systems (ERP).
f. Provide system back-up mechanisms for data protection. Transmit database to a remote server hourly.
g. Provide a one year warranty for parts and labor for entire system

PART 3 - EXECUTION

3.1 INSTALLATION – PUMPS

A. Provide pumps to operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation.

B. Support piping adjacent to pump so no weight is carried on pump casings.

C. Install flexible connectors at or near pumps where piping configuration does not absorb vibration.

D. Install piping accessories furnished loose with pump package.

E. Provide line sized pressure switch and pressure gauge on pump discharge, as indicated on Drawings.

F. Lubricate pumps before start-up.

3.2 INSTALLATION – DISPENSERS

A. Provide dispensers in locations indicated.

B. Install dispenser above dispenser sump per manufacturer recommendations. Ensure sump is sealed from any foreign intrusion from outside dispenser.

C. Ensure bollards located to protect dispenser.

D. Install emergency shut-off valve at base of dispenser

E. Dispenser, hose and nozzles assembly to meet code requirements. Verify assembly is functional

F. Ensure fuel management system is connected to dispenser and operational

3.3 FIELD QUALITY CONTROL

A. Division 1 - Quality Requirements, Division 1 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect for alignment of pumps.

C. Demonstration of Pumps:
   1. Conduct a training session for Owner Representative in the operation and maintenance procedures related to the equipment and systems specified herein. Include pertinent safety operational procedures in the session as well as physical demonstrations of the routine maintenance operations.
   2. Furnish instructors who are familiar with the installation of the equipment and systems, both operational and practical theories, and associated routine maintenance procedures.
   3. The training session shall consist of a total of two hours during normal working hours and shall start after the systems are functionally completed, but prior to final system acceptance.
   4. Submit a letter at least fourteen working days prior to the proposed training date, scheduling a proposed date for conducting the on-site training.

END OF SECTION 23 12 13

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SECTION 23 20 00 - HVAC PIPING AND PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe hangers and supports.
2. Pipe and pipe fittings.
3. Valves.
4. Piping specialties.
5. HVAC piping specialties.
6. HVAC pumps.
7. Chemical treatment.

1.2 SUBMITTALS

A. Shop Drawings: Indicate schematic layout of HVAC piping system, including equipment, radiant tubing layout, critical dimensions, and sizes.
1. The Shop Drawings shall indicate the proposed zoning, the water heating system, and the location of the manifolds. The installation shall be a complete hydronic heating system composed of, but not limited to, hot water circulating pumps, insulated copper supply and return piping to each zone manifold, zone manifolds and balancing valves, tubing embedded in a thermal mass slab floor on grade, controllers, and other accessories required to produce the desired performance of the system as specified. The Contractor shall secure the services of the manufacturer's representative to review the design, supervise, and install and adjust the entire radiant heating system. Components of the radiant heating tubing system shall be provided by one manufacturer, including: tube, fittings, manifolds, and other ancillary items required for a complete installation.

B. Product Data:
1. Pipe Hangers and Supports: Submit manufacturer’s catalog data including load carrying capacity.
2. Valves: Submit Manufacturer’s catalog information with valve data and ratings for each service.
3. Piping Specialties: Submit product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each specialty.
4. Pipe Expansion Products: Indicate maximum temperature and pressure rating, and maximum expansion compensation.
5. Pumps: Submit pump type, capacity, certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements. Include manufacturer’s catalogue information.
6. Chemical Treatment: Submit chemical treatment materials, chemicals, and equipment.

C. Manufacturer’s Installation Instructions: Submit installation instructions for boilers and equipment, pumps, valves and accessories.

D. Operation and Maintenance Data:
   1. Provide operating and maintenance instructions. Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts description.
   2. Follow the manufacturer's recommendations for system water and temperature balancing, record balance settings at each manifold locations, and deliver to the Owner a complete record of these settings for inclusion in the operation and maintenance manuals.

E. Manufacturer’s Certificate: Certify products meet or exceed specified requirements.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit spare parts lists and maintenance procedures.

1.4 WARRANTY

A. Furnish three year manufacturer warranty for pumps.

1.5 MAINTENANCE SERVICE

A. Furnish maintenance services of chemical water treatment for one year from Date of Substantial Completion.

B. Furnish chemicals for treatment and testing during warranty period.

C. Furnish one extra set of mechanical seals for pumps.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Conform to ASME B31.1.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

C. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.

D. Multiple or Trapeze Hangers for Pipe Sizes to 4 inches: Steel channels with welded spacers and hanger rods.

E. Wall Support for Pipe Sizes to 3 inches: Cast iron hooks.

F. Vertical Support: Steel riser clamp.

G. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

H. Copper Pipe Support: Copper-plated, carbon steel ring.

2.2 PIPES AND TUBES

A. Heating Water Piping:
1. Copper Tubing: ASTM B88, Type L hard drawn, cast brass, wrought copper, or mechanically extracted fittings, lead free solder joints. Mechanically compressed joints acceptable for sizes 1 ½ inch and larger only.

B. Radiant Heating Piping:
1. Polyethylene Pipe: ASTM F876 AND ASTM F877, IAPMO Approved, Cross-linked polyethylene, 100 psig at 180 degrees F, brass and copper fittings, and mechanical compression joints.
2. Hose: Composite hose with nitrile liner, braided fiber reinforcing, neoprene cover, 150 psig operating pressure at 205 degrees F, copper fittings, stainless steel clamps.

C. Radiant Heating Manifold:
1. Stainless steel supply manifolds with built in balancing valves; brass return manifolds; support brackets, tube bend supports, temperature gauges, isolation ball valves, drain ports, and electric control heads (if required). Components supplied by manufacturer.

D. Equipment Drains and Overflows:
1. Copper Tubing: ASTM B88, Type L, hard drawn, cast brass, wrought copper or mechanically extracted fittings, lead free solder joints.

E. Flue and Combustion Air Piping:
1. PVC Pipe: ASTM D1785, Schedule 80, polyvinyl chloride (PVC) material.
a. Fittings: ASTM D2467, Schedule 80, PVC.
b. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement. Prime joints with a contrasting color.

2.3 VALVES

A. Gate Valves:
1. Up to 2 inches: Bronze body, bronze trim, non-rising stem, hand wheel, inside screw, double wedge disc, soldered or threaded.

B. Globe Valves:
1. Up to 2 Inches: Bronze body, bronze trim, rising stem and hand wheel, inside screw, renewable composition disc, solder or threaded ends, with back seating capacity.

C. Ball Valves:
1. Up to 2 inches: Bronze or stainless steel one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends.

D. Butterfly Valves:
1. Up To 2 inches: Bronze body, stainless steel disc, resilient replaceable seat, threaded ends, extended neck, infinite position lever handle with memory stop.
2. Over 2 inches: Iron body, chrome plated iron disc, resilient replaceable seat, wafer or lug ends, extended neck, 10 position lever handle.

E. Swing Check Valves:
1. Up to 2 inches: Bronze body and swing disc, solder or threaded ends.

F. Relief Valves:
1. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.

2.4 PIPING SPECIALTIES

A. Flanges, Unions, and Couplings:
1. Pipe Size 2 inches and Under: Bronze unions for copper pipe, soldered joints.
2. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Strainers:
1. Size 2 inches and Under: Threaded brass for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

C. Flexible Connectors:
1. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure 300 psig.

D. Air Vents:
1. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.
2. Float Type: Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

E. Pipe Expansion Compensation Devices:
1. Two-ply Bronze Bellows Type:
a. Construction: Bronze with anti-torque device, limit stops, internal guides.
b. Pressure Rating: 125 psig WSP and 400 degrees F.
c. Maximum Compression: 1-3/4 inch.
d. Maximum Extension: 1/4 inch.
e. Joint: As specified for pipe joints.
f. Size: Use pipe sized units.
g. Application: Copper piping.
2. Low Pressure Compensators with two-ply Bronze Bellows:
a. Working Pressure: 75 psig.
b. Maximum Temperatures: 250 degrees F.
c. Maximum Compression: 1/2 inch.
d. Maximum Extension: 5/32 inch.
e. Joint: Soldered.
f. Size: Use pipe sized units.
g. Application: Copper or steel piping 2 inch and under.

F. Pressure Gages:

1. Gage: ASME B40.1, UL 393 with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
    a. Case: Steel.
    b. Bourdon Tube: Brass.
    c. Dial Size: 2-1/2 inch diameter.
    d. Mid-Scale Accuracy: One percent.
    e. Scale: Both psi and kPa.

G. Thermometers:
1. Stem Type Thermometer: ASTM E1, adjustable angle, red appearing mercury, lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device.
    a. Size: 7 inch scale.
    b. Window: Clear glass.
    c. Stem: Brass, 3/4 inch NPT.
    d. Accuracy: ASTM E77 2 percent.
    e. Calibration: Both degrees F and degrees C.
2. Dial Type Thermometer: ASTM E1, stainless steel case, bimetallic helix actuated with silicone fluid damping, white with black markings and black pointer hermetically sealed lens, stainless steel stem.
    a. Size: 2-1/2 inch diameter dial.
    b. Lens: Clear glass.
    c. Accuracy: 1 percent.
    d. Calibration: Both degrees F and degrees C.

2.5 HVAC PIPING SPECIALTIES

A. Expansion Tanks:
1. Construction: Replaceable diaphragm type, welded steel, ASME tested and labeled, 125 psig rating; cleaned, prime coated, and supplied with steel support legs or saddles; with taps for installation of accessories.
2. Accessories: Pressure gage and air-changing fitting, tank drain; pre-charge to 12 psig.
3. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure double check back flow preventer, test cocks, strainer, vacuum breaker, and by-pass with valves.
4. Hot Water Heating System: Select pressure relief valve at 25 psi. Set pressure reducing valve at 15 psi.

B. Air Eliminators and Dirt Separators:
1. In-Line Air Separators: Steel for sizes 2 inch and larger; ASME tested and stamped; for 150 psig operating pressure. Full flow coalescing type, with copper core tube element, separate venting and settling chambers, with venting mechanism on top and bleeding mechanism on bottom, basis of design is Spirotherm VDT or VHT.

2.6 HVAC PUMPS

A. In-Line System Pumps:
1. Type: Close coupled, in-line, direct drive, single stage, with variable frequency speed control and integral disconnect direct-connected. Radially or horizontally split casing, with flanged connections, for 175 psig maximum working pressure.

2. Construction: Cast iron casing, bronze fitted, with suction and discharge gage ports, renewable bronze casing wearing rings, seal flush connection, flanged suction and discharge, fully enclosed dynamically balanced bronze impeller keyed to shaft, oil lubricated roller or ball bearings, silicon-carbide seal.

2.7 CHEMICAL TREATMENT

A. System Cleaner: Liquid alkaline compound with emulsifying agents and detergents.

B. Closed System Treatment (Water):
1. Sequestering agent to reduce deposits and adjust pH.
2. Corrosion inhibitors.
3. Conductivity enhancers.

C. By-pass (Pot) Feeder: 5 gallon with quick opening cap.

D. Start-up Report: Provide laboratory chemical report following start-up.

2.8 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Electrical Characteristics: In accordance with Division 26 and schedules on drawings.

B. Disconnect Switch: Factory mount in control panel or on equipment.

2.9 MOTORS

A. Motor Type: NEMA 56 C Frame.

B. Controls: In accordance with 23 09 00 HVAC Instrumentation and Controls.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify excavations are to required grade, dry, and not over-excavate.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside piping before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION - INSERTS

A. Install inserts for placement in concrete forms.

3.4 INSTALLATION – RADIANT FLOOR HEATING SYSTEM

A. Install a new complete and operating hydronic radiant floor heating system as indicated on the Drawings and in these specifications including all pumps, piping, valves, manifolds, tubing and supervisory devices.

B. Individual radiant tube circuit length shall not exceed 350 feet or manufacturer's recommendation.

C. Hydronic radiant heat tubing loops shall be installed in accordance with the manufacturer's recommendations and the details as shown on the Contract Drawings.

D. All fittings should be accessible for maintenance. Tubing loops shall be installed without splices, as a minimum, from the point at which the tubing enters the slab to the point at which it exits the slab.

E. Installation shall follow the Shop Drawings for tubing layout, tube spacing, manifold configuration, manifold location, and controls. All notes on the Drawing shall be followed.

F. Extreme care must be used in installing radiant heat tubing loops. Any kinks, butts or splices are unacceptable and will result in the entire loop being replaced with new tubing in perfect condition.

G. Bend supports shall be used for 90° rigid bends.

H. Tubing shall have a minimum of 1-3/4" concrete cover above the top of the tubing. Tubing shall be firmly attached to slab reinforcing steel. Tubing shall not cross over each other.

I. Manifold must be securely fastened at wall a minimum of 16" above the floor where shown on the Drawings. Do not fasten manifold and/or mounting to gypsum board.

3.5 INSTALLATION - PIPING SYSTEMS

A. Install dielectric connections wherever jointing dissimilar metals, unless otherwise noted. Install brass unions on boilers per manufacturer’s installation instructions.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Route piping parallel to building structure and maintain gradient.

D. Install piping to maintain headroom. Group piping to conserve space. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Sleeve pipe passing through partitions, walls and floors.

H. Install piping system allowing clearance for installation of insulation and access to valves and fittings.

I. Install identification on piping systems including underground piping. Refer to Section 23 05 00, COMMON WORK RESULTS FOR HVAC.

J. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

3.6 INSTALLATION - VALVES

A. Install valves with stems upright or horizontal, not inverted.

B. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install ball or butterfly valves for throttling, bypass, or manual flow control services.

D. Provide lug end butterfly valves adjacent to equipment when functioning to isolate equipment.

E. Install spring loaded check valves on discharge of pumps.

F. Install globe or ball valves for throttling service. Install non-lubricated plug valves only when shut-off or isolating valves are also installed.

G. Install butterfly valves in heating water systems, interchangeably with gate and globe valves.

H. Install 3/4 inch ball drain valves at low points of piping, and at equipment. Pipe to nearest drain.

3.7 INSTALLATION - PIPING SPECIALTIES

A. Install one pressure gage for each pump, locate taps before strainers and on suction and discharge of pump; pipe to gage.

B. Install pressure gages with pulsation dampers. Provide needle valve or ball valve to isolate each gage. Extend nipples to allow clearance from insulation.

C. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Allow clearance from insulation.

D. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

E. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

F. Install manual air vents at system high points.

G. For automatic air vents in ceiling spaces or other concealed locations, install vent tubing to nearest drain with accessible cock.

H. Install air separator on suction side of system circulation pumps and connect to expansion tank.

I. Provide drain and hose connection with valve on strainer blow down connection.

J. Pipe relief valve outlet to nearest floor drain.

3.8 INSTALLATION - HEATING PIPING AND RADIANT CEILING PANEL HEATING SYSTEM

A. Install heating water piping in accordance with ASME B31.1.

B. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

C. Support tanks inside building from building structure.

D. Install relief valves on pressure tanks, low-pressure side of reducing valves, and expansion tanks.

E. Select system relief valve capacity greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment. Install piping from relief valve outlet to nearest floor drain.

F. Support piping adjacent to pump so no weight is carried on pump casings. For close coupled or base mounted pumps, install supports under elbows on pump suction and discharge line sizes 4 inches and over.

G. Install line size shut-off valve and strainer on pump suction. Install line size check valve, balancing valve, and shut-off valve on pump discharge.

H. Lubricate pumps before start-up.

I. Install chemical treatment bypass feeder for heating water systems. Install across pump with flow from pump discharge to pump suction from pump taps.

J. Cleaning:
1. After completion, fill, start, and vent prior to cleaning. Use water meter to record capacity in each system. Place terminal control valves in open position during cleaning.
2. Add cleaner to closed systems at concentration as recommended by manufacturer.
3. Hot Water Heating Systems: Apply heat and circulate for 12 hours minimum. Remove heat and cool; drain systems and refill with clean water. Circulate for 6 hours at design temperatures, then drain. Refill with clean water. Repeat until system cleaner is removed.
4. Flush open systems with clean water for one-hour minimum. Drain completely and refill.
5. Remove, clean, and replace strainer screens. Disassemble system components to inspect and remove sludge. Flush low points with clean water after cleaning process is completed.

3.9 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every other floor. Support vertical cast iron pipe at each floor at hub.

G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping.

J. Design hangers for pipe movement without disengagement of supported pipe.

K. Prime coat exposed steel hangers and supports.. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.10 SCHEDULES

A. Copper and Steel Pipe Hanger Spacing:

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	STEEL PIPE MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	5	7	3/8	3/8
3/4	5	7	3/8	3/8
1	6	7	3/8	3/8
1-1/4	7	7	3/8	3/8
1-1/2	8	9	3/8	3/8
2	8	10	3/8	3/8
2-1/2 (Note 1)	9	11	1/2	1/2
3	10	12	1/2	1/2

B. Plastic and Ductile Iron Pipe Hanger Spacing:

PIPE HANGER SPACING		
PIPE MATERIAL	MAXIMUM HANGER SPACING Feet	HANGER ROD DIAMETER Inches
PVC (All Sizes)	4	3/8

C. Note 1: Provide hanger at each change of direction and each branch connection. For pipe sizes 6 inches and smaller subjected to loadings other than weight of pipe and contents, limit span to maximum spacing for 2 pipe sizes smaller.

END OF SECTION 23 20 00

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SECTION 23 30 00 - HVAC AIR DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Ductwork.
2. Ductwork accessories.
3. Fans.
4. Duct Silencers.
5. Air Outlets.
6. Filters.

1.2 SUBMITTALS

A. Shop Drawings: Submit duct fabrication drawings, drawn to scale not smaller than 1/8 inch equals 1 foot, on drawing sheets same size as Contract Documents, indicating:
1. Fabrication, assembly, and installation details, including plans, elevations, sections, details of components, and attachments to other work.
2. Duct layout, indicating pressure classifications and sizes in plan view. For exhaust duct systems, indicate classification of materials handled as defined in this section.
3. Fittings.
4. Reinforcing details and spacing.
5. Seam and joint construction details.
6. Penetrations through roof and other walls.
7. Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.

B. Product Data:
1. Submit sizes, capacities, materials, controls and connections to other work.
2. Submit catalog performance ratings, construction, electric and duct connections, flashing and dimensions for fans and exhausters.

C. Operation and Maintenance Data: Submit instructions for lubrication, motor and drive replacement, spare parts lists, and wiring diagrams.

D. Manufacturer’s Installation Instructions: Submit relevant instructions.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit instructions for filter replacement, spare parts lists, and wiring diagrams.

PART 2 - PRODUCTS

2.1 DUCTWORK

A. Duct Materials:

1. Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having G60 zinc coating of in conformance with ASTM A90/A90M.
2. Fasteners: Rivets, bolts, or sheet metal screws.
3. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

B. Ductwork Fabrication:
1. Fabricate and support rectangular ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated. Administration/Operations and Maintenance: supply duct - 3-inch, return/exhaust – 2-inch.
2. Fabricate and support round ducts with longitudinal seams in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible (Round Duct Construction Standards). Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
3. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide airfoil turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.
4. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
5. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
6. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.

C. Flexible Ducts:
1. Product Description: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helical-wound spring steel wire.
   a) Pressure Rating: 10 inches wg positive and 1.0 inches wg negative.
   b) Maximum Velocity: 4000 fpm.
   c) Temperature Range: -20 degrees F to 210 degrees F.

D. Insulated Flexible Ducts:
1. Product Description: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helical wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.
   a) Pressure Rating: 10 inches wg positive and 1.0 inches wg negative.
   b) Maximum Velocity: 4000 fpm.
   c) Temperature Range: -20 degrees F to 210 degrees F.
   d) Thermal Resistance: 4.2 square feet-hour-degree F per BTU.

E. Single Wall Rigid Spiral Round Duct
1. Product Description: UL 181, Class 1, round spiral lock seam duct constructed of galvanized steel.

2. Construct duct with the following minimum gages:

DIAMETER	GAUGE
3 inches to 14 inches	26
15 inches to 26 inches	24

3. Construct fittings with the following minimum gages:

DIAMETER	GAUGE
3 inches to 14 inches	24
15 inches to 26 inches	22

F. Transverse Duct Connection System:
1. Product Description: SMACNA "E" rated, SMACNA "F" rated or SMACNA "J" rated rigidity class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.

2.2 DUCT ACCESSORIES

A. VAV Terminal Units
1. Manufacturers:
a) Basis of design as scheduled on Drawings.
b) Substitutions: Permitted.
2. Ceiling mounted variable air volume supply air control terminals for connection to single duct, central air systems.
3. Identification: Each marked with label and air flow indicator, including unit nominal air flow, maximum factory set airflow, minimum factory set air flow.
4. Basic Assembly:
a) Casings: Minimum 22 gage galvanized steel.
b) Lining: Minimum ¾ inch thick neoprene or vinyl coated fiberglass insulation, faced with Mylar film.
c) Plenum Air Inlets: Round stub connections for duct attachment.
d) Plenum Air Outlets: S-slip and drive connections.
e) Configuration: Air volume damper assembly inside unit casing. Locate control components inside protective metal shroud.
f) Volume Damper: Construct of galvanized steel with peripheral gasket and self-lubricating bearings, positioned normally open.
g) Accessories: Round Outlet.
5. Automatic Damper Operator:
a) Electric Actuator: 24 volt with high limit and remote temperature read and reset capability.
b) Reset Controller and Probe:
1. Resets the volume of conditioned air delivery to the space in response to the thermostat.
2. Calibration pressure taps for pressure independent control to compensate for varying inlet static pressure.

3. Minimum and maximum limits set at reset device.
4. Maintain airflow to within 5 percent of set point with inlet static pressure variations.

6. Thermostat: Wall-mounted electric type with appropriate mounting hardware.

B. Volume Control Dampers:
1. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.
2. Fabricate splitter dampers of material matching duct gage to 24 inches size in each direction, and two gages heavier for larger sizes. Secure with continuous hinge or rod. Operate with minimum 1/4 inch diameter rod.
3. Fabricate single blade dampers for duct sizes to 12 x 30 inch.
4. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
5. Except in round ductwork 12 inches and smaller, furnish end bearings.
6. Furnish locking, indicating quadrant regulators on single and multi-blade dampers. Where width exceeds 30 inches, furnish regulator at both ends.

C. Turning Devices and Extractors:
1. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.
2. Multi-blade device with radius blades attached to pivoting frame and bracket, steel or aluminum construction, with push-pull operator strap.

D. Flexible Duct Connections:
1. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, approximately 3 inches wide, crimped into metal edging strip.

E. Duct Access Doors:
1. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
2. Access doors smaller than 12 inches square secured with sash locks. Access doors with sheet metal screw fasteners are not acceptable.

F. Back-draft Dampers:
1. Gravity back-draft dampers size 18 x 18 inches or smaller, furnished with air moving equipment, furnish of air moving equipment manufacturers standard construction.
2. Fabricate multi-blade, parallel action gravity balanced back-draft dampers of galvanized steel, or extruded aluminum, with center pivoted blades, with sealed edges, linked together, steel ball bearings, and plated steel pivot pin.

2.3 FANS

A. Upblast Centrifugal Roof Fans:
1. Manufacturers: Basis of design as scheduled on Drawings.
2. Fan Unit: Upblast type. V-belt direct drive, with spun aluminum housing; resilient mounted motor; aluminum wire bird screen; square base to suit roof curb with continuous curb gaskets.

3. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.
4. Motor: Open drip proof.
5. Roof Curb: Height to accommodate roof slope, thickness of roof insulation, roofing system, and flashing. Galvanized steel construction with continuously welded seams, 1 inch insulation and curb bottom, and factory installed nailer strip. LM Curbs or equal.
6. Disconnect Switch: Factory wired, non-fusible, in fan housing for thermal overload protected motor, NEMA 250 Type 1 enclosure.
7. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades.

B. Ceiling Fans:
1. Manufacturers: Basis of design as scheduled on Drawings.
2. Centrifugal Fan Unit: Direct driven with galvanized steel housing lined with 1/2 inch acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge opening, integral outlet duct collar. Discharge position convertible by moving interchangeable panels.
3. Disconnect Switch: Cord and plug in housing for thermal overload protected motor.
4. Grille: Molded white plastic.
5. Wheel: Centrifugal forward curved type constructed of injection molded or polypropylene resin.
6. Motor: Open drip proof type with permanently lubricated sealed bearings and thermal overload protection.
7. Accessories:
   a) Rubber-in-shear vibration isolator.

C. Centrifugal Square Inline Fans
1. Manufacturers: Basis of design as scheduled on Drawings.
2. Product Description: Direct drive with galvanized steel housing lined with 1 inch acoustic glass fiber insulation, integral inlet cone, removable access doors on 3 sides, inlet and outlet duct collar, gravity backdraft damper in discharge, horizontal hanging brackets.
3. Fan Wheel: Backward inclined centrifugal type, aluminum construction.
4. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.
5. Motor and Drive Mounting: Out of air stream.
6. Motor: Open drip proof.
7. Bearings: ABMA 9 life at 200,000 hours.
8. Accessories:
9. Motor cover.
10. Flexible duct connector.
11. Flanged inlet and outlet.
12. Disconnect Switch: NEMA 250 Type 1enclosure.
13. Fan speed controller.

2.4 DUCT SILENCERS

a) Basis-of-Design Manufacturer: Silencers manufactured by Vibro-Acoustics.
1. Alternate manufacturers must request and obtain written approval by the Engineer to bid the project at least 10 days prior to the bid due-date. As a condition of pre-approval, alternate

manufacturers must submit to the Engineer HVAC silencer test reports. Each report shall be for a silencer tested in full accordance with the ASTM E-477-06a silencer test standard in an aero-acoustic test facility which is NVLAP accredited for the ASTM E-477-06a standard. Each test shall have been conducted within the last 12 month period. A copy of the laboratory's NVLAP accreditation certificate must be included with the submitted reports. Any changes to the specifications must be submitted and approved in writing by the Engineer at least 10 days prior to the bid due-date.

b) General Requirements:
   1. Silencers shall be of the size, configuration, capacity and acoustic performance as scheduled on the drawings. All silencers shall be factory fabricated and supplied by the same manufacturer.
   2. Silencer inlet and outlet connection dimensions must be equal to the duct sizes shown on the drawings. Duct transitions at silencers are not permitted unless shown on the contract drawings.
   3. Silencers shall be constructed in accordance with ASHRAE and SMACNA standards for the pressure and velocity classification specified for the air distribution system in which it is installed. Material gauges noted in other sections are minimums. Material gauges shall be increased as required for the system pressure and velocity classification. The silencers shall not fail structurally when subjected to a differential air pressure of 8 inches water gauge.
   4. All casing seams and joints shall be lock-formed and sealed or stitch welded and sealed to provide leakage-resistant construction. Airtight construction shall be achieved by use of a duct-sealing compound supplied and installed by the contractor at the jobsite.
   5. All perforated steel shall be adequately stiffened to insure flatness and form. All spot welds shall be painted.
   6. Fire-Performance Characteristics: Silencer assemblies, including acoustic media fill and sealants, shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84, NFPA 255 or UL 723.
   7. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007.

c) Rectangular Silencers including model RD: Outer casing shall be ASTM A 653/A 653M, G90 galvanized sheet steel, 22 gauge.

d) Rectangular Elbow Silencers including model RED: Outer casing shall be ASTM A 653/A 653M, G90 galvanized sheet steel, 18 gauge. All acoustical splitters shall be internally radiused and aerodynamically designed for efficient turning of the air. Half and full splitters are required as necessary to achieve the scheduled insertion loss. All elbow silencers with a turning cross-section dimension greater than 48" shall have at least two half splitters and one full splitter.

e) Inner perforated metal liner: ASTM A 653/A 653M, G90 galvanized sheet steel.
   1. Rectangular Silencers: 26 gauge.
   2. Rectangular Elbow Silencers: 22 gauge.

a) Principal Sound-Absorbing Mechanism:

   1. Dissipative silencers:
      a) Models RD and RED type with acoustic media. Media shall be of acoustic quality, shot-free glass fiber insulation with long, resilient fibers bonded with a thermosetting resin. Glass fiber density and compression shall be as required to insure conformance with laboratory test data. Glass fiber shall be packed with a minimum of 15% compression during silencer assembly. Media shall be resilient such that it will not crumble or break, and conform to irregular surfaces. Media shall not cause or

accelerate corrosion of aluminum or steel. Mineral wool will not be permitted as a substitute for glass fiber.

b) Performance Data:
1. See duct silencer performance schedule on mechanical drawings.
2. Silencer manufacturer to provide submittal drawings detailing all duct silencer data specified in the mechanical drawing schedule.
3. Alternate manufacturer shall provide, for approval, acoustical system calculations for all duct systems with silencers to demonstrate that the submitted silencers will reduce mechanical fan noise to NC 30-40 in the occupied space.

2.5 AIR OUTLETS AND INLETS

A. See schedule of air terminals on mechanical drawings for basis of design manufacturers and models.

B. General
1. Manufacturer shall be responsible for examining applications of each type of unit to assure that each will operate properly in the intended application.
2. Unit sizes are shown as selected in accordance with the principles set forth in the ASHRAE Guide and Manufacturer's literature.
3. All items of a given type shall be the products of the same manufacturer.

C. Supply Grilles – Steel.
1. Steel supply grilles shall be (double deflection) of the sizes and mounting types shown on the plans and outlet schedule. The deflection blades shall be available parallel to the long dimension of the grille. Construction shall be of steel with a 1 ¼-inch wide border on all sides. Corners shall be welded with full penetration resistance welds.
2. Deflection blades shall be contoured to a specifically designed and tested cross-section to meet published test performance data. Blades shall be spaced on ¾-inch centers. Blades shall have steel friction pivots on both ends to allow individual blade adjustment without loosening or rattling. Plastic blade pivots are not acceptable.
3. Optional opposed-blade volume damper shall be constructed of heavy gauge-steel. Damper must be operable from the face of the grille.
4. The grille finish shall be #26 white. The finish shall be an anodic acrylic paint, baked at 315°F for 30 minutes. The pencil hardness must be HB to H. The paint must pass a 100-hour ASTM B117 corrosive Environments Salt Spray Test without creepage, blistering or deterioration of film.
5. The paint must pass a 250-hour ASTM D870 Water Immersion Test. The paint must also pass the ASTM D2794 Reverse Impact Cracking Test with a 50-inch pound force applied.
6. The manufacturer shall provide published performance data for the grille. The grille shall be tested in accordance with ANSI/ASHRAE Standard 70-2006.

D. Return Grilles – Steel.
1. Steel return grilles shall be (3/4-inch blade spacing) of the sizes and mounting types shown on the plans and outlet schedule. The fixed deflection blades shall be available parallel to the long or short dimension of the grille. Construction shall be of steel with a 1 ¼-inch wide border on all sides. Screw holes shall be countersunk for a neat appearance. Corners shall be welded with full penetration resistance welds.

2. Deflection blades shall be contoured to a specifically designed and tested cross-section to meet published test performance data. Blades shall be firmly held in place by mulliions from behind the grille and ficed to the grille by welding in place. Blade deflection angle shall be at 35°.
3. Optional opposed-blade volume damper shall be constructed of heavy gauge steel. Damper must be operable from the face of grille.
4. The grille finish shall be #26 white. The finish shall be an anodic acrylic paint, baked at 315°F for 30 minutes. The pencil hardness must be HB to H. The paint must pass a 100-hour ASTM B117 Corrosive Environments Salt Spray Test without creepage, blistering or deterioration of film.
5. The paint must pass a 250-hour ASTM D870 Water Immersion Test. The paint must also pass the ASTM D2794 Reverse Impact Cracking Test with a 50-inch pound force applied.
6. The manufacturer shall provide published performance data for the grille. The grille shall be tested in accordance with ANSI/ASHRAE Standard 70-2006.

E. Wall Displacement Diffusers.
1. Description: Furnish and install (WxH) with the sizes and capacities indicated on the plans and air outlet schedule.
2. Performance: Air shall be delivered to the space at low noise levels and low velocities that are even across the diffuser face, in all ducting configurations and without the use of nozzles. Diffuser Manufacturer shall provide sound and pressure drop data derived from tests in accordance with ASHRAE Standard 70-2006. Performance data for Draft Rate (%DR) shall be provided based on tests in accordance with ASHRAE Standard 55-2004. A manufacturer software program that allows room comfort evaluation for specific operating conditions and diffuser locations shall be available to aid in performance assessment lf such a computer program is not available from the manufacturer, the manufacturer shall supply, free of charge, a CFD model of the representatives paces completed by a modeling contractor who has demonstrable qualifications to model such spaces. These shall include no less than 10 years of experience in the modeling of displacement ventilation systems, thorough validation of the code through comparison to empirical data as well as a list of references.
3. Construction: The 1 way flat faced in-wall displacement diffuser, shall be constructed with an equalization baffle behind the operative diffuser face for uniform, low velocity, distribution of supply air. Both the equalization baffle and face shall be securely retained in the diffuser frames. Plastic nozzle arrays or any plastic components are unacceptable. The diffuser frames shall be constructed of 20 gauge steel for rigidity and protection of the operative face. The operative face shall be constructed of painted 18 gauge perforated steel, and the frame shall be provided in painted 20 gauge steel. The plenum shall be 24 gauge steel. The internal baffling elements shall be constructed of aluminum. The diffuser shall be available for duct connection at the top. The paint shall be powder coat polyester. Epoxies and their derivatives are unacceptable. Visible non-metallic components are unacceptable.
4. Mounting/Fastening: The diffuser front panel shall be bolted to the plenum through the wall with factory provided fasteners

F. Perforated Return/Exhaust
1. Steel or aluminum perforated face return diffusers as described on plans and air distribution schedules. Diffuser shall consist of a perforated air distribution face of no less than 51% free area, a heavy gauge steel backpan with round/square inlet collars as noted on plans. The perforated face shall be removable from the diffuser face and shall be fitted with hinges to facilitate the removal of face screen for cleaning purposes. The perforated face screen shall be

steel or aluminum as scheduled on Drawings. The finish of the diffuser shall be B12 White Powder Coat. Paint finish shall pass 500 hours of salt spray exposure with no measurable creep in accordance with ASTM D1656 and 1000 hours with no rusting or blistering as per ASTM D610 and ASTM D714.

a) Volume adjustment for balancing.

G. Corner Displacement Diffusers

1. Description: Furnish and install (WxH) with the sizes and capacities indicated on the plans and air outlet schedule.
2. Performance: Air shall be delivered to the space at low noise levels and low velocities that are even across the diffuser face, in all ducting configurations and without the use of nozzles. Diffuser Manufacturer shall provide sound and pressure drop data derived from tests in accordance with ASHRAE Standard 70-2006. Performance data for Draft Rate (%DR) shall be provided based on tests in accordance with ASHRAE Standard 55-2004. A software program that allows room comfort evaluation for specific operating conditions and diffuser locations shall be available to aid in performance assessment. If such a computer program is not available from the manufacturer, the manufacturer shall supply, free of charge, a CFD model of the representative spaces completed by a modeling contractor who has demonstrable qualifications to model such spaces. These shall include no less than 10 years of experience in the modeling of displacement ventilation systems, thorough validation of the code through comparison to empirical data as well as a list of references.
3. Construction: The 1 Way Flat Faced Corner Displacement diffuser, shall be constructed with an equalization baffle behind the operative diffuser face for uniform, low velocity, distribution of supply air. Both the equalization baffle and face shall be securely retained in the diffuser frames. Plastic nozzle arrays or any plastic components are unacceptable. The diffuser frames shall be constructed of high strength aluminum extrusion for rigidity and protection of the operative face and side panels. There shall be no visible fasteners on the front or side panels. The operative face shall be constructed of painted 16 gauge perforated steel, side and end panels shall be provided in painted 20 gauge steel. The frame and internal baffling elements shall be constructed of Aluminum. The diffuser shall be available for duct connection at the top, bottom, or rear of the diffuser with a factory or field cut inlet. The paint shall be powder coat polyester. Epoxies and their derivatives are unacceptable Visible non-metallic components are unacceptable. The diffuser shall be supplied with concealed mounting brackets that do not require puncturing the diffuser to install.
4. Mounting/Fastening: The diffuser shall be supplied with concealed mounting bracket that do not require puncturing the diffuser to install.
5. Accessories: Provide same manufacturer duct cover and base cover with mounting hardware.

H. Washable Permanent Panel Filters: Media: 14 mesh aluminum, rod reinforced; enclosed in galvanized steel frame.

1. Nominal Size and Thickness: per Section 23 73 00, INDOOR CENTRAL-STATION AIR-HANDLING UNITS.

I. Disposable Panel Filters: Fiber blanket, factory sprayed with flameproof, non-drip, non-volatile adhesive.

1. Nominal Size, Thickness and Performance Rating: Per Section 23 73 00, INDOOR CENTRAL-STATION AIR-HANDLING UNITS.

J. Filter Gages:

1. Direct Reading Dial: 3-1/2 inch diameter diaphragm actuated dial in metal case, vent valves, black figures on white background, range 0-2.0 inch wg, 3 percent of full scale accuracy.

2.6 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Requirements for electrical characteristics.
1. 60Hz and phase as indicated on Drawings.

B. Disconnect Switch: Factory mount on equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify sizes of equipment connections before fabricating transitions.

B. Verify rated walls are ready for fire damper installation.

C. Verify ducts and equipment installed are ready for accessories.

D. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, furniture layout, symmetry, and lighting arrangement.

3.2 INSTALLATION

A. Metal Ducts: Install in accordance with SMACNA Duct Construction Standards - Metal and Flexible.

B. Connect flexible ducts to metal ducts with draw bands.

C. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of airflow.

D. Install flexible connections immediately adjacent to fans and motorized equipment. Install flexible connections specified between fan inlet and discharge ductwork. Prevent flexible connectors being in tension while running.

E. Secure wall fans with cadmium plated steel bolts to structure.

F. Support duct silencers individually from structure per structural drawings, and secure to structure with cadmium plated steel bolts.

G. Install back-draft dampers on discharge of exhaust fans.

H. Prevent passage of unfiltered air around filters by installing felt, rubber, or neoprene gaskets.

I. Install filter gage static pressure tips upstream and downstream of filters. Mount filter gages on outside of filter housing or filter plenum, in accessible position. Adjust and level.

J. Cut openings in ductwork to accommodate thermometers and controllers. Cut pitot tube openings for testing of systems, complete with metal can with spring device or screw to eliminate against air leakage.

K. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities. Apply duct insulation specified in Section 23 07 00, INDOOR CENTRAL-STATION AIR-HANDLING UNITS.

L. Slope underground ducts to plenums or low pump out points at 1:500. Allow access for inspection and cleaning. Coat buried ductwork seams and joints with manufacturer's recommended protective coating.

M. Connect diffusers to low pressure ducts with 5 feet maximum length of flexible duct. Hold in place with strap or clamp.

N. During construction install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

O. Access Doors: Install access doors at the following locations:
1. Spaced every 50 feet of straight duct.
2. Upstream of each rectangular elbow.

P. Access Door Sizes: Install minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access.

Q. Support terminal units individually from structure. Do not support from adjacent ductwork. Install with minimum of 3 ft of 1 inch thick lined ductwork downstream of units.

R. Install balancing dampers on duct take-off to diffusers and grilles and registers, regardless of whether dampers are specified as part of diffuser, or grille and register assembly.

S. Paint ductwork visible behind air outlets and inlets matte black in accordance with

T. Do not operate fans until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

U. Install fans with resilient mountings and flexible electrical leads.

V. Install sheaves required for final air balance.

W. Install safety screen where fan inlet or outlet is exposed.

X. Install displacement diffusers level and plumb. Maintain sufficient clearance for normal services, maintenance, or in accordance with construction drawings.

Y. Complete installation and startup checks according to manufacturer's instructions and perform the following.
1. Verify that inlet duct connections are as recommended by manufacture to achieve proper performance.

2. Verify that any identification tags are visible.
3. Verify locations of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation.

END OF SECTION 23 30 00

SECTION 23 30 10 – FIBER GLASS REINFORCED PLASTIC DUCT

PART 1 GENERAL

1.1 SUMMARY

A. The Contractor shall furnish and install fiberglass reinforced plastic (FRP) duct and all appurtenances, complete and in place, all in accordance with the requirements of the Drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. 23 30 00 HVAC Air Distribution

B. 23 05 00 Sleeves and Mechanical Sleeve seals

1.3 REFERENCED SPECIFICATIONS, CODES, AND STANDARDS

A. Codes: All codes, as referenced herein, are specified in Section entitled “Reference Standards.”

B. Commercial Standards

1.	ASTM D 3567	Practice for Determining Dimensions of “Fiberglass” (Glass-Fiber Reinforced-Thermosetting-Resin) Pipe and Fittings.
2.	ASTM C 582	Standard Specification for Contact-Molded Reinforced Thermosetting Plastic (RTP) Laminates for Corrosion-Resistant Equipment.
3.	AWWA M-45	American Water Works Manual of Water Supply Practices “Fiberglass Pipe Design.”
4.	ASTM D 3982	“Standard Specification for Contact-Molded “Fiberglass” Duct and Hoods” or NBS PS 15-69 “Custom Contact-Molded Reinforced Polyester Chemical-Resistant Process Equipment.”
5.	ASTM D 2992	“Standard Practice for Obtaining Hydrostatic Design Basis for Fiberglass Pipe and Fittings.”
6.	ASTM D 2310	“Standard Classification for Machine-Made ‘Fiberglass’ Pipe.”

1.4 SUBMITTALS

A. Shop Drawings
1. The Contractor shall submit Shop Drawings of duct and fittings in accordance with the requirements in the Sections titled “HVAC Air Distribution” and “Submittals.”
2. Fabrication drawings shall have details on Laminate Sequence used.

B. Additional Submittal Information
1. The Contractor shall submit a copy of this specification with check marks by each line to show full compliance or a note with attached supporting information noting any deviation for Engineer review.
2. A letter from the resin supplier stating that the material used for this project will comply with the specification and meet all corrosion requirements.
3. Design calculations performed by the manufacturer and stamped by a Professional Engineer for record purposes.

4. Duct manufacturer shall submit certified test results in accordance with ASTM 2992.
5. Samples shall be a representative of the ductwork (construction method and material used) to be supplied on this project.

PART 2 PRODUCTS

2.1 GENERAL

A. Manufacturer: Basis of design manufacturer is Monoxivent.

B. Substitutions: Provide FRP duct as manufactured by one of the following. All Equipment (Duct and fittings) shall be the product of a single manufacturer. Out-sourcing of fabrication or parts of the system will not be accepted.
   1. Belco Manufacturing
   2. Bondstrand
   3. Ershigs

C. Service Conditions:
   1. All equipment shall be designed for a minimum working pressure of 2" WC Positive and 3" WC Negative pressure. Buried duct shall be designed per AWWA M-45 Standards and be rated for H-20 Loading. The minimum wall thickness for all FRP duct shall conform to the following:
      a. Wall thickness for internal positive pressure should be determined by ASTM 2310 using duct manufacturers Certified ASTM 2992 HDB test results. A full copy of the HDB testing should be submitted with the wall thickness calculations.

      b.

Duct Inside Diameter (Inches)	Wall Thickness (inches)
3-20	0.125
22-36-	0.1875

   2. Resin:
      a. Resin shall be premium corrosion resistant and fire retardant brominated bisphenol-A vinyl ester. Resin shall not contain pigments, dyes, colorants or fillers. Product should have a class 1 flame spread rating (25 or less).
      b. Thixotropic agents can be added to control resin viscosity per resin manufacturer's recommendation.
      c. Acceptable resins with 3 percent antimony trioxide shall be:
         1) AOC Vipel K022
         2) Ashland Chemical Hetron FR992
         3) Interplastics CoRezyn 8442
         4) Or approved equal.
   3. Insulation:
      a. Double-wall insulated duct: Inner and outer duct complying with requirements for "round duct" description. Closed cell polyurethane foam insulation with maximum thermal conductivity of 0.14 Btu-in/hr-sq ft-deg F at 75 deg F mean temperature (R-Value of 6).

4. Reinforcement:
   a. Surfacing veil shall be C glass veil with a silane finish and a styrene soluble binder.
   b. Chopped strand mat shall be Type E glass minimum 1-1/2 ounces per square foot with silane finish and styrene soluble binder.
   c. Continuous roving for shopper gun spray up shall be Type E glass.
   d. Woven roving shall be Type E glass minimum 24 ounces per square yard with a five by four weave.
   e. Continuous roving for filament winding shall be Type E glass with a silane finish.

5. Construction:
   1. All FRP ductwork shall be of filament would construction for sizes >10" diameter and hand lay-up or filament wound construction for 10" and smaller. Cast pipe with no reinforced internal corrosion barrier or press molded fittings will not be accepted.
   2. Maximum allowable deflection for any size ductwork shall be 1/2 inch between supports and for any size of duct under worse case operating conditions.
   3. FRP ductwork shall be designed using a safety factor of 10 to 1 for pressure and 5 to 1 for vacuum without exception.
   4. Out-of-roundness of duct shall be limited 1% of the diameter.
   5. Length of all flanged duct sections shall not vary more than ± 1/2 inch at 70°F.
   6. All un-flanged ducts shall be square on the ends in relation to the center axis within ± 1/8 inch up to and including 24-inch diameter.
   7. Laminates:
      a. All ductwork shall have a resin-rich inner surface, an interior corrosion barrier, an interior structural layer and an exterior corrosion layer and UV resistant coating.
      b. Inner surface: Nominal 10 mils thick composed of a single ply of the C glass surfacing veil embedded in a resin-rich surface. Resin content shall be 90%.
      c. Interior layer: Nominal 90 mils thick composed of at least two layers of chopped strand mat. Resin content shall be 75%.
      d. Structural layer: Type E glass to meet minimum wall thickness as specified. The total wall thickness includes the inner surface.
         1) Contact molded structural layer shall include alternate layers of chopped strand mat and woven roving.
         2) A layer of chopped strand mat or spray chop shall precede filament wound structural layer. The structural layer shall consist of a minimum of two complete cross hatched layers of continuous filaments applied in a helix angle of 55 to 65 degrees for above-ground ductwork and 75 degrees for any buried ductwork.
      e. Exterior corrosion layer: Single A or C Veil shall be applied to all cut exterior.
   8. Fittings:
      a. All fittings shall be hand lay-up construction fabricated from the same resin and have the same strength as the FRP ductwork.
      b. The internal diameter of all fittings shall be equal to the adjacent duct.
      c. The tolerance on angles of all fittings shall be ± 1 degree up to and including 24-inch diameter.
   9. Elbows:

a. The centerline radius of all elbows shall be 1-1/2 times the diameter.

b. Elbows 24-inch diameter and smaller shall be smooth radius. Elbows 30-inch and larger shall be mitered. Provide a minimum of two mitered joints (3-piece) for all elbows above 45 degrees.

10. Flanges:

a. Provide flanged connections to flexible connectors, expansion joints, vessels, demisters, fans, silencers and other locations as shown on the Drawings.

b. Flanges shall be hand lay-up construction. Dimensions shall be in accordance with NBS PS 15-69 and the Duct Dimension Schedule.

c. Flanges shall be drilled in accordance with NBS PS 15-69 – Table 2. Backs of flange face shall be flat so that washer seats fully on bolt face and flange backing.

d. Flange faces shall be perpendicular to the axis of the duct with 1/2 degree.

e. Flange faces shall be flat to within ± 1/32 inch up to and including 18-inch diameter.

f. Gaskets shall be EPDM, full face and minimum 1/8-inch thickness.

g. All bolts, nuts and washers shall be Type 316 stainless steel.

11. Joints:

a. Provide all butt and strap joints in accordance with NBS PS 15-69.

b. The duct manufacturer shall supply Field weld kits. All necessary fiberglass and reinforcing material shall be supplied pre-cut and individually packaged for each joint. Bulk Glass rolls will not be acceptable.

c. All resin, catalyst and putty shall be supplied in bulk to complete all field joints plus 10% extra for waste.

2.2 DUCT HANGERS AND SUPPORTS

A. All duct supports, interior and exterior, shall meet the requirements of the Section titled “Pipe Supports,” except that hangers and supports for fiberglass duct shall be located as follows:

Duct Inside Diameter (inches)	Maximum Span (feet)
3 – 18	10

B. The Contractor shall note that not all duct support locations are shown on the Drawings, and the Contractor shall follow the Specifications herein in locating additional supports as required. The Contractor shall be responsible for the design of additional supports and for the overall stability of the entire support system. Support and hanger details and a detailed layout showing the location of all duct supports and hangers shall be submitted in the shop Drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A. General: All FRP pipes shall be installed in a neat and workmanlike manner, properly aligned, and cut from measurements taken at the site to avoid interferences with structural members, architectural features, openings and equipment. Exposed pipes shall afford maximum headroom and access to equipment, and where necessary, all piping shall be installed with sufficient slopes for venting or drainage of liquids and condensate to low points. All installations shall be acceptable to the Engineer. Contractor shall obtain training by the pipe manufacturer’s field representative in the correct installation and support of all FRP piping. Instruction shall be a minimum of one 8-hour day.

B. Supports and Anchors: All ducting shall be firmly supported with fabricated or commercial hangers or supports in accordance with the requirement in the Section titled "Pipe Supports." Where necessary to avoid stress on equipment or structural members, the pipes shall be anchored or harnessed. Expansion joints and guides shall compensate for duct expansion due to temperature differences.

3.2 PIPE PREPARATION

A. Prior to installation, each duct length and all fittings shall be carefully inspected, flushed clean of any debris or dust, and straightened, if not true. All duct and fittings shall be equally cleaned before assembly.

3.3 PIPE JOINTS

A. Butt and Wrap Joints: Prior to joining, ends shall be ground smooth. All dust and debris must be fully removed. Ends shall be resin-coated to prevent corrosion. The joint should be of equal strength as the pipe. A butt and wrap sequence and thickness chart should be shown on the fabrication drawings. The laminate sequence for each size duct should be supported by a separate section in the design calculations.

B. Supports and Anchors: All piping shall be firmly supported with fabricated or commercial hangers or supports in accordance with the requirements in the Section titled "Pipe Supports." Where necessary to avoid stress on equipment or structural members, the pipes shall be anchored or harnessed. Expansion joints and guides shall compensate for pipe expansion due to temperature differences.

3.4 INSPECTION AND FIELD TESTING

A. Inspection: All finished installations shall be carefully inspected for proper joints and sufficient supports, anchoring, interference, and damage to pipe, fittings, and coating. Damage shall be repaired to the satisfaction of the Engineer.

B. Field Testing: Prior to enclosure or buying, all piping systems shall be pressure tested at 1-1/2 times the maximum working pressure. The Contractor shall furnish all test equipment, labor, materials and devices at no extra cost to the Owner.
   1. Leakage may be determined by loss of pressure, soap solution, chemical indicator, or other positive and accurate method. All fixtures, devices, or other accessories which are to be connected to the lines and which would be damaged if subjected to the test pressure shall be disconnected and ends of the branch lines plugged or capped as required during the testing procedures.
   2. Leaks shall be repaired to the satisfaction of the Engineer and the system shall be retested until no leaks are found.

END OF SECTION

SECTION 23 52 00 - HEATING BOILERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Condensing boilers.
   2. Expansion tank.

1.2 SUBMITTALS

A. Product Data: Submit capacities, general layout, dimensions, and size and location of water, fuel, electric and vent connections, electrical characteristics, weight and mounting loads.

B. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

1.4 QUALITY ASSURANCE

A. Construction: ASME Section I. Register boiler with National Board of Boiler and Pressure Vessel Inspectors.

B. Boiler Performance Requirements: Conform to minimum efficiency prescribed by ASHRAE 90.1 when tested in accordance with H.I. Heating Boiler Standard.

C. Conform to applicable code for internal wiring of factory wired equipment.

D. Products Requiring Electrical Connection: Listed and classified by testing firm acceptable to authority having jurisdiction.

1.5 WARRANTY

A. Furnish one year manufacturer warranty for boilers, three year warranty on boiler blowers, and a twelve year limited warranty on heat exchangers.

PART 2 - PRODUCTS

2.1 CONDENSING BOILERS

A. Basis of design Manufacturer:
   1. As scheduled on Drawings.

B. Product Description: Hot Water boilers with fire tube, single pass, dual temperature design, with forced draft, insulated jacket, stainless steel heat exchanger, gas burning system, refractory and, controls. Boiler trim including circulator and fill system consisting of diaphragm type expansion tank, fill and check valve and automatic air vent.

C. Boiler Fabrication:
1. Assembly: Stainless steel construction, in accordance with ANSI Standard for Gas Fired Low-Pressure Steam and Hot Water boilers.
2. Furnish access for cleaning heat exchangers.
3. The boiler shall be UL listed and exceed the minimum efficiency requirements of ASHRAE 103/933.

D. Hot Water Boiler Trim:
1. ASME rated pressure relief valve, 30 psig.
2. Combination water pressure and temperature gage. Furnish graduated pressure gage scale from 1-1/2 to 3 times pressure relief valve pressure setting.
3. Low water cut-off to prevent burner operation when boiler water falls below safe level, with manual reset.
4. Operating temperature controller with outdoor reset to maintain boiler water temperature.
5. High limit temperature controller with manual reset for burner to prevent boiler water temperature from exceeding safe system temperature.
6. Combustion, blower, fan.
7. Modulating boiler control.
8. Drain valve.
9. Dirt-air separator.
10. Combination high limit and low limit control.
11. Integral multiple boiler staging control.
12. Condensate neutralization assembly.

E. Boiler Fuel Burning System:
1. Burner Operation: Modulating with low fire position for ignition.
2. Gas Burner: Forced draft type for atmospheric gas adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark ignition, flame sensing device, and automatic 100 percent shut-off.
3. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after air flow proven and slight delay, allow gas valve to open.
4. Exhaust Gas: Non-metallic or stainless steel vent pipe and air intake.
5. Controls: Multiple boilers. Factory wired, factory assembled electronic digital controls in control cabinet with flame scanner or detector, programming control, relays, and switches. Furnish pre-purge and post-purge ignition and shut down of burner in event of ignition pilot and main flame failure with manual reset.

2.2 DIAPHRAGM TYPE EXPANSION TANK

A. Construction: See 23 20 00, HVAC PIPING AND PUMPS.

B. Accessories: Pressure gage and air-charging fitting, tank drain; pre-charge to 12 psig.

2.3 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Requirements for electrical characteristics.
1. 120 volts, single phase, 60 Hz.

B. Disconnect Switch: Factory mount in control panel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install boilers plumb and level, to plus or minus 1/16 inch over boiler base.

B. Maintain manufacturer's recommended clearances around and over boilers.

C. Install boiler on concrete housekeeping pad in accordance with Section 03 30 00, CAST-IN-PLACE CONCRETE.

D. Connect natural gas piping in accordance with NFPA 54. Refer to Section 23 11 23, NATURAL GAS-PIPING.

E. Connect natural gas piping to boiler, full size of boiler gas train inlet. Arrange piping with clearances for burner removal and service.

F. Connect hot water piping to supply and return boiler connections. Refer to Section 23 20 00, HVAC PIPING AND PUMPS.

G. Install piping from relief valves to nearest floor drain.

H. Install diaphragm expansion tank on boiler.

I. Install intake and exhaust piping with positive slope, minimum ¼ inch per foot, back to appliance.

J. Install boiler trim and accessories furnished loose for field mounting.

K. Install electrical devices furnished loose for field mounting.

L. Install control wiring between boiler control panel and field mounted control devices.

M. Connect intake and exhaust to boiler, full size of connections.

N. Install intake and exhaust pipes with rain caps. Provide flue condensate drains, with acid neutralization traps in flue condensate drains for each boiler, and trap depth to meet manufacturer’s requirements or six inches deep.

O. Furnish manufacturer’s field representative for starting unit and training operator.

P. Adjust burner for proper firing.

END OF SECTION 23 52 00

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SECTION 23 73 00 - INDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes modular factory fabricated air-handling units and accessories.

1.2 SUBMITTALS

A. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.

B. Product Data, Submit the following:
1. Published Literature: Indicate capacities, ratings, gages and finishes of materials, and electrical characteristics and connection requirements.
2. Filters: Data for filter media, filter performance data, filter assembly, and filter frames.
3. Fans: Performance and fan curves with specified operating point plotted, power, RPM.
4. Sound Power Level Data: Fan outlet and casing radiation at rated capacity.
5. Dampers: Include leakage, pressure drop, and sample calibration curves. Indicate materials, construction, dimensions, and installation details.
6. Electrical Requirements: Power supply wiring including wiring diagrams for interlock and control wiring. Indicate factory installed and field installed wiring.

C. Manufacturer's Installation Instructions: Submit.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

1.4 QUALITY ASSURANCE

A. Damper Leakage: Test in accordance with AMCA 500.

B. Wiring internal to the unit shall be wired to a numbered terminal strip for simplified identification and ease of trouble shooting. Units shall be ETL listed and labeled, classified in accordance with UL 1995/CAN/CSA/ No. 236-M90.

C. The manufacturer must have a quality management system in place, equal to the quality assurance standard ISO 9001-2000, for the design, manufacture, and service of heat exchangers and packaged ventilation/air conditioning equipment.

D. Standard catalog units requiring modification to meet these specifications shall not be considered or accepted.

E. To ensure manufacturer credibility, the manufacturer must have a net worth greater than five times the value of the equipment being bid. The manufacturer must also be able to demonstrate prior experience manufacturing direct spray type indirect evaporative cooling, heat recovery and DX cooling air handling systems by providing to the consulting engineer, prior to bid, a reference list of at least five similar jobs manufactured over the prior five years.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept units and components on site in factory protective containers, with factory shipping skids and lifting lugs. Inspect for damage.

B. Protect units from weather and construction traffic by storing in dry, roofed location.

1.6 WARRANTY

A. Manufacturer shall warrant products to be free of defects in workmanship and material under normal usage for a period of 12 months from factory documented start-up or 18 months from date of original shipment, whichever occurs first. Manufacturer shall maintain a Service Department, sufficiently staffed to handle all warranty claims in a timely manner.

PART 2 - PRODUCTS

2.1 INDIRECT/DIRECT EVAPORATIVE COOLING AIR HANDLING UNIT WITH DX COOLING (ECU-1)

A. Basis of design Manufacturer:
   1. Scheduled on Drawings.
   2. Substitutions: Permitted
   3. Provide Indirect/Direct evaporative / DX cooling Air Handling Unit with hot water heating in accordance with this specification, plans, and the corresponding Schedule. Units shall be sized to deliver the scheduled ACFM values at jobsite elevation.
   4. All units shall be factory assembled, internally wired, and 100% run tested to check operation, fan and blower rotation, and control sequence before leaving the factory. After system checkout, units that ship in sections shall be disassembled and prepared for shipment and field assembly by contractor.
   5. Units. shall be bid in accordance with the following direction:
      a. Other Approved Manufacturers: Other Manufacturers shall be listed as an alternate add or deduct to the Base Bid, and contractors must include as part of the pricing for such adds or deducts the engineering costs associated with redesign, as required by deviations in dimensions, weight, electrical, thermal performance, etc. In order to gain approval, alternate manufacture must:
         1) Provide factory drawings detailing the overall dimensions and weights of proposed equipment.
         2) Submit equipment performance, including psychrometric charts with all state points clearly indicated, detailing the performance at the ASHRAE summer ambient design dry bulb, dew-point, and wet bulb conditions, along with the winter ambient design condition. Manufacturer must provide a line-by-line comparison of proposed equipment specification versus the specification

provided here, with highlights of how the proposed equipment meets or exceeds this specification.

3) Provide control sequence of proposed equipment, including all sensor locations and wiring diagrams.

B. Configuration: Furnish and install where indicated, 100% outdoor air heat recovery air handling units with indirect evaporative, including the following:
   1. Polymer tube heat exchangers, with direct water spray on exhaust side for indirect evaporative cooling
   2. Polymer tube heat recovery
   3. Direct evaporative cooler
   4. Supply and exhaust fans
   5. Supply and exhaust fan motors
   6. Control air dampers
   7. Supply and return air filters
   8. Hot water coil
   9. Mist eliminators
   10. Complete standalone control system, factory provided, field installed, wired, and programmed.

C. Performance Base: Sea level pressure or altitude.

D. Fabrication: Conform to AMCA 99

E. Mounting Curb:
   1. A seismic mounting curb shall be provided constructed of 18-gauge galvanized steel with bolting brackets and stiffeners of 12-gauge. Curb shall be insulated with 1-1/2 inches of rigid fiberglass. Stiffeners shall be provided at not more than 10 feet on center. Field assembly required by contractor includes welding curb to steel embedment plates in structure. Curb shall be minimum height to allow for p-traps and slope of drain pipes from sump drains to floor sinks, and structural support.

F. Casing:
   1. Base Frame: The base of the package shall consist of an all-welded structural "C" channel steel frame with tubular and angular cross-members as required to maintain floor rigidity and frame stiffness. The base shall be painted with one coat of a lead-free, rust-inhibiting, alkyd metal primer, followed by two coats corrosion and weather resistant 100% acrylic latex paint. Four or more lifting lugs designed to work with clevises shall be an integral part of the structural frame and shall be welded on, or shipped loose for bolt on in the field where required to reduce shipping width.
   2. Unit Casing: 2" double wall casing. Exterior walls and roof shall be constructed of 18 gauge G90 galvanized steel, pre-painted with a primer coat on both sides, and two coats of beige polyester paint that passes a documented 2000-hr salt spray test in accordance with ASTM B117. Inner liner shall be 2” perforated acoustical liner in dry sections, and 0.063" aluminum in wet sections. 2", 1.5# insulation shall be secured between inner and outer walls. The insulation shall be secured between the inner and outer walls and shall not be exposed to any air streams. All roof and sidewall seams shall be positively sealed to prevent water and air leakage. Air leakage shall be less than 1% of design airflow at the maximum unit operating pressure. All fastening hardware between wall panels shall be concealed within the wall for a

clean exterior appearance with minimal penetrations. Roofs shall be pitched to each side, with gutters on the low sides. Units shall be constructed to limit frame and panel deflection to 1/200th of its span in any direction. Tubular frame or aluminum post type construction shall not be accepted due to excessive thermal bridging at panel joints, and poor weather seal characteristics.

3. The casing shall house the fans, motors, coils, heat exchangers, compressors and condensers, and all factory-supplied optional equipment.
4. Access Doors: Hinged access doors shall be provided for inspection and maintenance of fans, coils, filters, evaporative cooling sumps, and other areas requiring routine inspection/maintenance. Access doors shall be gasketed around the perimeter with weather-resistant closed-cell neoprene gasket. The door shall be insulated the same as the unit casing, and double-wall constructed with full-length stainless steel piano-type hinges for rigidity and airtight enclosure. A minimum of two adjustable glass reinforced nylon door latches shall be furnished for each hinged door. Each door handle shall be provided with large nylon roller cam for ease of operation and superior gasket compression. Each hinged door shall include a locking mechanism that requires the use of a tool to open for safety and security purposes prior to unit startup. Handles shall be operable from either side of the door. Doorframes shall be a minimum 16 gauge aluminized steel or 304L stainless steel, welded at the corners. Doors shall have adhesive-backed stickers applied to their exterior surfaces which indicate the compartment contents and any safety/hazards within the enclosure. All exterior doors shall be equipped with rain gutters.
5. Floors: Floor shall be constructed of 16 gauge aluminized steel, with all seams fully welded. Underside of floor shall be totally insulated with R-8 closed cell foam insulation. Cavity formed between bottom of unit and mezzanine shall be filled with closed cell acoustical foam insulation. Floor of unit shall be coated with Heresite throughout. Floors shall have an upturned flange around the entire perimeter and around all interior chases to contain moisture within the unit. The entire floor and upturn flanges must be factory water tested and certified leak proof for a period of five years from the date of shipment. Multiple drains shall be provided to route moisture to either side, or bottom of unit (see plans for specific drain locations. Unit drains shall be sized to remove any condensate that is created within the casing as a natural part of the recovery, dehumidification, or evaporative cooling blow-down/overflow process. Each drain must be trapped separately by the contractor and piped to a floor sink or drain. Drains shall be flush with the unit floor so as not to create a trip hazard. Each floor penetration/ drain hole shall be circumferentially fillet welded to prevent water leakage under the unit floor. The use of sealants for this purpose shall not be acceptable. All drains and associated piping are to be fully welded and tested. Expanded aluminized steel gratings shall be installed over supply and return air openings.

G. Fans:
   1. Supply Fans:
      a. The supply air fan shall be an AMCA certified, Class II, heavy duty, centrifugal plenum type with non-overloading wheel, of the scheduled size.
      b. Fan shall be model EPQ (12 blade) centrifugal plenum type, as manufactured by Twin City Fan &Blower. Fans shall have a sharply rising pressure characteristic extending through the operating range and continuing to rise beyond the peak efficiency to ensure quiet and stable operation. Fans shall have a non-overloading design with self-limiting horsepower characteristics and shall reach a peak in the normal selection area. All fans shall be capable of operating over the minimum pressure class limits as specified in AMCA's Standard 2408-69.

c. Performance – Fans shall be tested in accordance with AMCA 210 and AMCA 300 test standards for air moving devices and shall be guaranteed by the manufacturer to deliver rated published performance levels. Fans shall be licensed to bear the AMCA certified ratings seal for fan inlet sound, fan outlet sound, and air performance. Arrangement 3 fans shall be tested and rated with shaft, bearings, and bearing bar in the inlet and shall be licensed to bear the AMCA certified ratings seal for both sound and air.

d. Construction – Fans shall be designed without a scroll type housing and shall incorporate a non-overloading type backward inclined airfoil blade wheel, heavy-gauge reinforced steel inlet plate, structural steel frame, and shaft and bearings.

e. Frame and Inlet Plate – Inlet plates shall be of heavy-gauge reinforced steel construction. The inlet plate incorporates a removable spun inlet cone designed for smooth airflow into the accompanying inlet retaining ring of the fan wheel. A square, formed lip suitable for attachment of a boot connector shall surround the unit, or an option-al round inlet collar can be provided.

f. Wheel – Wheels shall have a spun non-tapered style blade-retaining ring on the inlet side to allow higher efficiencies over the performance range of the fan. Fan shall have airfoil-shaped extruded aluminum blades. All hollow blade wheels shall be continuously welded around all edges. All wheels shall be statically and dynamically balanced on precision electronic balancers to a Balance Quality Grade G6.3 per ANSI/AMCA 204 or better.

g. Shaft – Shafts shall be AISI 1040 or 1045 hot rolled steel, accurately turned, ground, polished, and ring gauged for accuracy. Shafts shall be sized for the first critical speed of at least 1.43 times the maximum speed. All shafts must be dial indicated for straightness after the keyways are cut and straightened as required.

h. Bearings – Bearings shall be heavy duty, grease lubricated, anti-friction ball or roller, self-aligning, pillow block type and selected for a minimum bearing life (AFBMA L-10) in excess of 40,000 hours at the maximum fan RPM. All bearings shall be equipped with zerk grease fittings and, where necessary, extended lube lines for easy access for lubrication.

i. Finish and Coating: The entire fan assembly, excluding the shaft, shall be thoroughly degreased and deburred before application of a rust-preventative primer. After the fan is completely assembled, a finish coat of paint shall be applied to the entire assembly. The fan shaft shall be coated with a petroleum-based rust protectant. Aluminum components shall be painted.

j. Factory Run Tests: All fans prior to shipment shall be completely assembled and test run as a unit at the specified operating speed or maximum RPM allowed for the particular construction type. Maximum vibration shall be within the limits of ANSI/AMCA 204 Fan Application Category BV-3. Balance readings shall be taken by electronic type equipment in the axial, vertical, and horizontal directions on each of the bearings. Records shall be maintained and a written copy shall be available upon request.

k. Vibration Isolation – Fans chassis' shall be mounted on Kinetics 2" seismic vibration isolators.

l. Fan access doors shall have safety switches that shut down fans upon opening door. No fan cage or belt guards shall be provided.

2. Exhaust Fans: See Section 23 30 00, HVAC AIR DISTRIBUTION.

3. Factory Run Tests. All fans prior to shipment shall be completely assembled and test run as a unit at operating speed or maximum RPM allowed for the particular construction type. Each wheel shall be statically and dynamically balanced in accordance with ANSI/AMCA 204-96

"Balance Quality and Vibration Levels for Fans" to Fan Application Category BV-3, Balance Quality Grade G6.3. Balance readings shall be taken by electronic type equipment in the axial, vertical, and horizontal directions on each of the bearings. Records shall be maintained and a written copy shall be available upon request.

H. Motors and Drives:
1. Fan motors shall be furnished with VFDs (no bypasses) with NEMA 1 enclosures. TEFC, premium efficiency type motors of the scheduled HP shall be furnished for fans as indicated on drawing schedules.

I. Heating Coil Section:
1. Certification: Acceptable coils are to have ARI Standard 410 certification and bear the ARI symbol. Coils exceeding the scope of the manufacturer's certification and/or the range of ARI's standard rating conditions will be considered provided the coil manufacturer is a current member of the ARI Air-Cooling and Air-Heating Coils certification program and the coils have been rated in accordance to ARI Standard 410. Manufacturer must be ISO 9002 certified.
2. Fluid Coil Design Pressures and Temperatures: Coils shall be designed to withstand 250 psi maximum operating pressures and a maximum fluid temperature of 300°F for standard duty copper tube coils.
3. Factory Testing Requirements: Coils shall be submerged in water and tested with a minimum of 315 psi air pressure. Coils must display a tag with the inspector's identification as proof of testing.
4. Fins: Coils shall be of plate fin type construction providing uniform support for all coil tubes. Coils are to be manufactured with die-formed aluminum fins with self-spacing collars which completely cover the entire tube surface. The fin thickness shall be 0.0075 +/- 5% unless otherwise specified.
5. Tubing: Tubing and return bends shall be constructed from UNS 12200 seamless copper conforming to ASTM B75 and ASTM B251. Copper tube temper shall be light annealed with a maximum grain size of 0.040 mm and a maximum hardness of Rockwell 65 on the 15T scale. Design permits in-tube water velocities up to 6 ft/s for the standard seamless copper tubing. Tubes are to be mechanically expanded to form an interference fit with the fin collars. Coil tube size and wall thickness' are 5/8"x0.020
6. Headers: Headers shall be constructed from UNS 12200 seamless copper conforming to ASTM B75 and ASTM B251. Coil return headers are to be equipped with factory-installed 1/2" ftp air vent connection placed at the highest point available on face of the header. Tube-to-header holes are to be intruded inward such that the landed surface area is three times the core tube thickness to provide enhanced header to tube joint integrity. All core tubes shall evenly extend within the inside diameter of the header no more than 0.12 inch. End caps shall be die-formed and installed on the inside diameter of the header such that the landed surface area is three times the header wall thickness.
7. Connections: Standard construction fluid connections are male pipe thread (MPT) and constructed from red brass conforming to ASTM B43 or Schedule 40 steel pipe.
8. Cleaning: All residual manufacturing oils and solid contaminants are removed internally and externally by completely submersing the coil in an environmentally and safety approved type degreasing solution, which is also chemically compatible with the coil material.
9. Brazing: Oxyfuel gas brazing, using fillet rod material of minimum 5% silver, is used for all non-ferrous tube joints to headers and connections. Depending on the application, ferrous to non-ferrous brazing material may contain upwards of 35% silver, or may be Tobin bronze.

10. Casing: Casings and endplates shall be made from 16 gauge galvanized steel, meeting ASTM A527. Double-flanged casings on top and bottom of finned height are to be provided to allow stacking of the coils. All sheet metal brakes shall be bent to 90 degrees +/- 2 degrees unless specified otherwise. Coils shall be constructed with intermediate tube/support sheets fabricated from a heavy gauge sheet stock of the same material as the case. One intermediate/tube support shall be provided for each 48” of finned length. Coils over 144" in finned length shall have 4 intermediate/tube supports.
11. Certification: Performance certified coils that are ARI Standard 410 listed bear the ARI symbol. Coils exceeding the scope of the certification and/or the range of standard rating conditions are also rated to the extent possible by the ARI Std. 410 method.
12. Installation: Coils to be installed in accordance with manufacturer’s instructions and any applicable piping codes.
13. Control Valves and Piping: All hydronic piping shall be performed by the installing contractor. Control valves shall be furnished by the Automatic Temperature Control Contractor, installed by the mechanical contractor, and wired by the Automatic Temperature Control Contractor to unit mounted control panel.
14. Pipe Chase: Air handling unit manufacturer shall provide an 18" x 18" pipe chase, in the floor of the air handler. Pipe chase shall have a 1.5" upturned collar, completely welded to floor. Pipe chase shall be capped upon shipment, for penetration by contractor. All pipe penetrations must be sealed by the installing contractor to prevent air leakage.

J. DX Cooling Coil:
1. Performance Ratings: Tested and according to ARI 410 and ASHRAE 33.
2. Pressure rating in first paragraph below is common. Some manufacturers may vary rating.
3. Minimum Working-Pressure Rating: 300 psig.
4. Source Quality Control: Factory tested to 325 psig.
5. Tubes: ASTM B 75 copper, minimum 0.020 inch thick.
6. Fins: Copper, minimum 0.0075 inch thick.
7. Suction and Distributor Piping: ASTM B 88, Type L copper tube with brazed joints.
8. Frames: Galvanized steel, minimum 0.0625 inch thick.
9. Capacities and Characteristics:
    a. Minimum Fin Spacing: 12 fins per inch
    b. Tube Diameter: 0.625 inch
    c. Minimum Number of Rows: 4
    d. Coil Split: Interlaced
    e. Coating: None
    f. Air Side:
        1) Flow Rate: as scheduled
        2) Minimum Finned Area Face Velocity: as scheduled
        3) Maximum Static Pressure Drop: as schedule.

K. Refrigeration Cooling Section:
1. The packaged heat recovery system manufacturer shall provide a complete integral factory piped and wired mechanical refrigeration system consisting of hermetic scroll compressors and air cooled condenser. The refrigeration shall use R-407C as the working fluid.
2. Compressors shall be direct drive, hermetic, scroll type with centrifugal gear type oil pump providing positive lubrication to moving parts. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent unit nameplate voltage. Internal

temperature and current sensitive motor overloads shall be included for maximum protection. Compressors shall have vibration isolation to minimize vibration transmission and noise.

3. Each refrigerant circuit shall have independent externally compensated thermal expansion valve, solenoid valve, service pressure ports and refrigerant line filter-drier factory installed as standard.
4. Condenser coils shall be of internally finned 1/2-inch copper tubes mechanically bonded to configured aluminum plate fins. Coils shall be leak tested at the factory to insure pressure integrity. The coils shall be rated at 450 PSIG.

L. Polymer Tube Cross Flow Air-to-air Heat Exchanger/Indirect Evaporative Cooler:

1. Heat recovery section shall be an updraft air-to-air heat exchanger with the thermal performance characteristics and pressure drops as scheduled. Heat exchanger shall be sized to handle the scheduled supply and exhaust CFM.
2. Horizontal tubes shall be used as the primary heat exchanger surface. Tubes shall be constructed of a corrosion resistant polymer with internally extruded ribbing for enhanced heat transfer. The polymer material shall be fire and smoke retardant, meeting UL94 V-O standards. The heat exchanger shall be tested and approved to UL 900 Class II. When sprayed for indirect evaporative cooling, water leakage from exhaust/scavenger side to supply side shall be less than 0.001 gallons per hour per 10,000 CFM of primary air.
3. Tubes shall be elastic in design, flexing slightly as exhaust/scavenger fans start/stop to facilitate shedding of dissolved solids buildup (applies to indirect cooling applications). Tube design must have a proven performance record for more than five years operating in hard water, arid conditions.
4. All heat exchanger surfaces shall be non-metallic, suitable for continuous operation in temperatures up to 160°F. Polymer plate type heat exchangers shall not be approved due to their inability to flex and shed solids build-up. Aluminum or stainless steel plate-type or heat pipe heat exchangers will not be considered or approved as a substitute for the specified tubular heat exchanger.
5. Heat exchanger shall have an integral spray manifold for indirect evaporative cooling and wash down, such that exhaust filters are not required. Spray manifold shall consist of PVC water distribution header and cooling tower clip-on type spray nozzles (easily removable for cleaning and maintenance). The water distribution system shall supply water equally to all tubes in the system. An all welded 16 gauge stainless steel drain pan shall be installed beneath heat exchanger to collect and route water to the common sump. Piping shall be in accordance with the detailed piping diagram shown on the plans.
6. Indirect spray pumps shall be submersible type, with epoxy coated cast iron motor housing, oil filled for lifetime lubrication and rapid heat dissipation. Pump shall have stainless steel screws, bolts, and handle, integral thermal overload protection, and mechanical shaft seal with stainless steel spring, nitrile parts, carbon and ceramic faces.
7. Heat exchangers shall be tested in accordance with ASHRAE Standard 84-1991, "Method of Testing Air-to-Air Heat Exchangers," ARI Standard 1060, "Rating Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment," and ANSI/ASHRAE Standard 143-2000, "Method of Test for Rating Indirect Evaporative Coolers." Independent laboratory test data must be supplied by the manufacturer, when requested by the consulting engineer, documenting the thermal effectiveness of the heat exchanger when operating in the heat recovery mode, and the wet bulb depression effectiveness when operating as an indirect evaporative cooler.
8. Pilot activated float control valve for sump level controls. [Cleveland Valve.]

M. Direct Evaporative Cooler:
   1. Direct evaporative cooling: 12” Glasdek media meeting UL 900–Class 2 requirements, with all welded, 16 gauge 304L stainless steel sump, PVC water piping and distribution header, recirculation water pump, manual bleed valve, overflow pipe, level controls, and float valve shall be part of factory furnished and installed components. A potable water feed shall be provided by the installing contractor. Direct evaporative thermal performance and pressure drop shall be as scheduled.
   2. 3/4" make-up and 1-1/2" drain solenoid valves (shipped loose for field piping and wiring by contractor), shall be factory furnished. Sump freeze protection, media drying cycle every 24 hours, and automatic sump dump every 24 hours shall be part of factory control system included. Distribution header shall per Munters Corporation design guidelines, and shall be easily removed for inspection and cleaning.
   3. Direct evaporative pumps shall be submersible type, with epoxy coated cast iron motor housing, oil filled for lifetime lubrication and rapid heat dissipation. Pump shall have stainless steel screws, bolts, and handle, integral thermal overload protection, and mechanical shaft seal with stainless steel spring, nitrile parts, carbon and ceramic faces. Piping shall be in accordance with the detailed piping diagram shown on the plans.
   4. Pilot activated float control valve for sump level controls. [Cleveland Valve).]

N. Filters:
   1. Outdoors air filters: 2" MERV 7 pleated pre-filters and 4” MERV 11 pleated final filters.
   2. Magnetic filter gauge with integral switch shall be included for each filter bank, and shall be factory installed and wired to unit-mounted terminal strip.

O. Dampers:
   1. All dampers shall be of the low leakage airfoil blade type with blade edge and side seals. Dampers shall be constructed of extruded aluminum frames (6063T5) of not less than 2.03 mm thickness. Blades shall be of extruded aluminum profiles with blade gaskets of extruded EPDM. Frame seals shall be of extruded type. Gaskets shall be secured in an integral slot within aluminum extrusions.
   2. Bearings to be comprised of a celcon inner bearing fixed to an 11.11 mm aluminum hexagon blade pin rotating within a polycarbonate outer bearing inserted in frame. Linkage hardware shall be installed in frame side and be constructed of aluminum and corrosion resistant zinc & nickel-plated steel complete with cup-point trunnion screws for slip-proof grip.
   3. Air leakage through a 48" x 48" damper shall not exceed 10.3 CFM/sq. ft against 4" W.G. differential static pressure with standard air. Standard air leakage data to be certified under the AMCA certified ratings program. Pressure drop through a fully open 48" x 48" damper shall not exceed 0.02" W.G. at 1000 FPM.
   4. The following damper functions shall be provided:
      a. O/A heat exchanger face & bypass, with factory installed and wired modulating actuator. Face and bypass shall provide modulation of winter heat reclaim and summer indirect evaporative cooling.
      b. Fan isolation dampers.
      c. Exhaust air, backdraft damper.
      d. Direct Evaporative Cooler face and bypass, with factory installed and wired modulating actuator. Face and bypass shall provide modulation of supply air temperature.

P. Controls:
1. An electronic programmable microprocessor-based logic controller (PLC. with key pad input and LCD display shall be furnished to control the unit. Temperature and humidity set points and 365-day clock functions including daylight savings, holiday programming and user overrides, shall be easily input by the operator. All temperature, humidity, and pressure sensors, as required to accomplish the specified sequence of control, shall be provided and factory wired to the extent possible. All external sensors, including duct static pressure and building static pressure, shall be manufacturer supplied and shall be installed by the contractor.
2. Furnish BACnet open protocol interface with Direct Digital Control system for monitoring, control, and graphics. See Section 23 09 00, HVAC INSTRUMENTATION AND CONTROLS for details of graphics package to be provided by Controls Contractor with DDC system. Interface shall include all necessary inputs and outputs for graphics and trending provided by DDC system. DDC integration devices shall be provided by the manufacturer, and installed and wired by the contractor.
3. Control sequences shall be established and coordinated with the consulting engineer. List of control points included:
    a. Air filter status
    b. Exhaust fan status
    c. Exhaust plenum (fan. low pressure cutout)
    d. Outdoor air temperature and humidity
    e. Outdoor air pre-filter status
    f. Supply fan flow (piezometer ring at fan inlet).
    g. Supply fan status
    h. Supply plenum (fan. high pressure cutout)
    i. Supply air temperature
    j. Return air temperature
    k. Sump Water Conductivity
    l. IEC Pump Start/Stop
    m. IEC Pump Status
    n. DEC Pump Start/Stop
    o. DEC Pump Status
    p. DEC face and bypass damper status
    q. DEC entering air temperature and humidity
    r. Supply duct pressure

Q. Electrical Characteristics and components:
1. Units shall require one 460/3/60 power connection for fan, pump motors and lights.
    a. Provide transformer for 120/1/60 feed for lights, duplex GFCI receptacle, and controls.
    b. An integral NEMA 4 electrical control panel shall be provided that has a hinged access door and an approved locking device. All components shall be fully wired and tested prior to shipment and all major electrical components shall be UL listed. Electrical system shall be ETL listed and labeled, in accordance with UL 1995. A non-fused disconnect switch shall be furnished and installed on the unit. All internal power and control wiring shall be connected to a numbered terminal strip for easy troubleshooting. Any conduit used shall not be run across or come into contact with the floor. All wiring penetrations between air handler sections, and into electrical panel, shall be completely sealed to eliminate air and moisture transfer.

c. Vapor-tight light fixtures with compact fluorescent lights and wire guards shall be installed in all areas of unit requiring routine inspection or maintenance. All lights shall be controlled by one external mounted weatherproof switch. Lights are powered by a dedicated 120V power feed wired from unit-mounted junction box.
d. GFCI receptacle shall be installed beside light switch and shall be factory wired.

R. Water Treatment:
1. 2" Dolphin model G3020-PVC pulsed power water treatment system, piped and factory wired to the discharge side of the indirect evaporative cooling pump. Conductivity controller with flow switch and motorized bleed valve, factory installed and wired. One-year of on site service by local Dolphin rep (total of up to 9 visits included). There shall be one manual bleed, initially set for 1 GPM, in addition to the controlled bleed based on water conductivity.

2.2 INDIRECT/DIRECT EVAPORATIVE COOLING AIR HANDLING UNIT (ECU-2)

A. Basis of design Manufacturer:
1. Basis of design scheduled on Drawings.
2. Substitutions: Permitted
3. Provide Indirect/Direct evaporative Air Handling Unit with hot water heating in accordance with this specification, plans, and the corresponding Schedule. Units shall be sized to deliver the scheduled ACFM values at jobsite elevation.
4. All units shall be factory assembled, internally wired, and 100% run tested to check operation, fan and blower rotation, and control sequence before leaving the factory. After system checkout, units that ship in sections shall be disassembled and prepared for shipment and field assembly by contractor.
5. Units. shall be bid in accordance with the following direction:
a. Other Approved Manufacturers: Other Manufacturers shall be listed as an alternate add or deduct to the Base Bid, and contractors must include as part of the pricing for such adds or deducts the engineering costs associated with redesign, as required by deviations in dimensions, weight, electrical, thermal performance, etc. In order to gain approval, alternate manufacture must:
1) Provide factory drawings detailing the overall dimensions and weights of proposed equipment.
2) Submit equipment performance, including psychrometric charts with all state points clearly indicated, detailing the performance at the ASHRAE summer ambient design dry bulb, dew-point, and wet bulb conditions, along with the winter ambient design condition. Manufacturer must provide a line-by-line comparison of proposed equipment specification versus the specification provided here, with highlights of how the proposed equipment meets or exceeds this specification.
3) Provide control sequence of proposed equipment, including all sensor locations and wiring diagrams.

B. Configuration: Furnish and install where indicated, 100% outdoor air heat recovery air handling units with indirect evaporative, including the following:
1. Polymer tube heat exchangers, with direct water spray on exhaust side for indirect evaporative cooling
2. Polymer tube heat recovery
3. Direct evaporative cooler

4. Supply and exhaust fans
5. Supply and exhaust fan motors
6. Control air dampers
7. Supply and return air filters
8. Hot water coil
9. Mist eliminators
10. Complete standalone control system, factory provided, field installed, wired, and programmed.

C. Performance Base: Sea level pressure or altitude.

D. Fabrication: Conform to AMCA 99

E. Mounting Curb:
1. A seismic mounting curb shall be provided constructed of 18-gauge galvanized steel with bolting brackets and stiffeners of 12-gauge. Curb shall be insulated with 1-1/2 inches of rigid fiberglass. Stiffeners shall be provided at not more than 10 feet on center. Field assembly required by contractor includes welding curb to steel embedment plates in structure. Curb shall be minimum height to allow for p-traps and slope of drain pipes from sump drains to floor sinks, and structural support.

F. Casing:
1. Base Frame: The base of the package shall consist of an all-welded structural "C" channel steel frame with tubular and angular cross-members as required to maintain floor rigidity and frame stiffness. The base shall be painted with one coat of a lead-free, rust-inhibiting, alkyd metal primer, followed by two coats corrosion and weather resistant 100% acrylic latex paint. Four or more lifting lugs designed to work with clevises shall be an integral part of the structural frame and shall be welded on, or shipped loose for bolt on in the field where required to reduce shipping width.
2. Unit Casing: 2" double wall casing. Exterior walls and roof shall be constructed of 18 gauge G90 galvanized steel, pre-painted with a primer coat on both sides, and two coats of beige polyester paint that passes a documented 2000-hr salt spray test in accordance with ASTM B117. Inner liner shall be 2” perforated acoustical liner in dry sections, and 0.063" aluminum in wet sections. 2", 1.5# insulation shall be secured between inner and outer walls. The insulation shall be secured between the inner and outer walls and shall not be exposed to any air streams. All roof and sidewall seams shall be positively sealed to prevent water and air leakage. Air leakage shall be less than 1% of design airflow at the maximum unit operating pressure. All fastening hardware between wall panels shall be concealed within the wall for a clean exterior appearance with minimal penetrations. Roofs shall be pitched to each side, with gutters on the low sides. Units shall be constructed to limit frame and panel deflection to 1/200th of its span in any direction. Tubular frame or aluminum post type construction shall not be accepted due to excessive thermal bridging at panel joints, and poor weather seal characteristics.
3. The casing shall house the fans, motors, coils, heat exchangers, and all factory-supplied optional equipment.
4. Access Doors: Hinged access doors shall be provided for inspection and maintenance of fans, coils, filters, evaporative cooling sumps, and other areas requiring routine inspection/maintenance. Access doors shall be gasketed around the perimeter with weather-resistant closed-cell neoprene gasket. The door shall be insulated the same as the unit casing,

and double-wall constructed with full-length stainless steel piano-type hinges for rigidity and airtight enclosure. A minimum of two adjustable glass reinforced nylon door latches shall be furnished for each hinged door. Each door handle shall be provided with large nylon roller cam for ease of operation and superior gasket compression. Each hinged door shall include a locking mechanism that requires the use of a tool to open for safety and security purposes prior to unit startup. Handles shall be operable from either side of the door. Doorframes shall be a minimum 16 gauge aluminized steel or 304L stainless steel, welded at the corners. Doors shall have adhesive-backed stickers applied to their exterior surfaces which indicate the compartment contents and any safety/hazards within the enclosure. All exterior doors shall be equipped with rain gutters.

5. Floors: Floor shall be constructed of 16 gauge aluminized steel, with all seams fully welded. Underside of floor shall be totally insulated with R-8 closed cell foam insulation. Cavity formed between bottom of unit and mezzanine shall be filled with closed cell acoustical foam insulation. Floor of unit shall be coated with Heresite throughout. Floors shall have an upturned flange around the entire perimeter and around all interior chases to contain moisture within the unit. The entire floor and upturn flanges must be factory water tested and certified leak proof for a period of five years from the date of shipment. Multiple drains shall be provided to route moisture to either side, or bottom of unit (see plans for specific drain locations. Unit drains shall be sized to remove any condensate that is created within the casing as a natural part of the recovery, dehumidification, or evaporative cooling blow-down/overflow process. Each drain must be trapped separately by the contractor and piped to a floor sink or drain. Drains shall be flush with the unit floor so as not to create a trip hazard. Each floor penetration/ drain hole shall be circumferentially fillet welded to prevent water leakage under the unit floor. The use of sealants for this purpose shall not be acceptable. All drains and associated piping are to be fully welded and tested. Expanded aluminized steel gratings shall be installed over supply and return air openings.

G. Fans:
   1. Supply Fans:
      a. The supply air fan shall be an AMCA certified, Class II, heavy duty, centrifugal plenum type with non-overloading wheel, of the scheduled size.
      b. Fan shall be model EPQ (12 blade) centrifugal plenum type, as manufactured by Twin City Fan &Blower. Fans shall have a sharply rising pressure characteristic extending through the operating range and continuing to rise beyond the peak efficiency to ensure quiet and stable operation. Fans shall have a non-overloading design with self-limiting horsepower characteristics and shall reach a peak in the normal selection area. All fans shall be capable of operating over the minimum pressure class limits as specified in AMCA's Standard 2408-69.
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      d. Construction – Fans shall be designed without a scroll type housing and shall incorporate a non-overloading type backward inclined airfoil blade wheel, heavy-gauge reinforced steel inlet plate, structural steel frame, and shaft and bearings.
      e. Frame and Inlet Plate – Inlet plates shall be of heavy-gauge reinforced steel construction. The inlet plate incorporates a removable spun inlet cone designed for

smooth airflow into the accompanying inlet retaining ring of the fan wheel. A square, formed lip suitable for attachment of a boot connector shall surround the unit, or an option-al round inlet collar can be provided.

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k. Vibration Isolation – Fans chassis' shall be mounted on Kinetics 2" seismic vibration isolators.

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4. Fins: Coils shall be of plate fin type construction providing uniform support for all coil tubes. Coils are to be manufactured with die-formed aluminum fins with self-spacing collars which completely cover the entire tube surface. The fin thickness shall be 0.0075 +/- 5% unless otherwise specified.
5. Tubing: Tubing and return bends shall be constructed from UNS 12200 seamless copper conforming to ASTM B75 and ASTM B251. Copper tube temper shall be light annealed with a maximum grain size of 0.040 mm and a maximum hardness of Rockwell 65 on the 15T scale. Design permits in-tube water velocities up to 6 ft/s for the standard seamless copper tubing. Tubes are to be mechanically expanded to form an interference fit with the fin collars. Coil tube size and wall thickness' are 5/8"x0.020
6. Headers: Headers shall be constructed from UNS 12200 seamless copper conforming to ASTM B75 and ASTM B251. Coil return headers are to be equipped with factory-installed 1/2" ftp air vent connection placed at the highest point available on face of the header. Tube-to-header holes are to be intruded inward such that the landed surface area is three times the core tube thickness to provide enhanced header to tube joint integrity. All core tubes shall evenly extend within the inside diameter of the header no more than 0.12 inch. End caps shall be die-formed and installed on the inside diameter of the header such that the landed surface area is three times the header wall thickness.
7. Connections: Standard construction fluid connections are male pipe thread (MPT) and constructed from red brass conforming to ASTM B43 or Schedule 40 steel pipe.
8. Cleaning: All residual manufacturing oils and solid contaminants are removed internally and externally by completely submersing the coil in an environmentally and safety approved type degreasing solution, which is also chemically compatible with the coil material.
9. Brazing: Oxyfuel gas brazing, using fillet rod material of minimum 5% silver, is used for all non-ferrous tube joints to headers and connections. Depending on the application, ferrous to non-ferrous brazing material may contain upwards of 35% silver, or may be Tobin bronze.
10. Casing: Casings and endplates shall be made from 16 gauge galvanized steel, meeting ASTM A527. Double-flanged casings on top and bottom of finned height are to be provided to allow stacking of the coils. All sheet metal brakes shall be bent to 90 degrees +/- 2 degrees unless specified otherwise. Coils shall be constructed with intermediate tube/support sheets fabricated from a heavy gauge sheet stock of the same material as the case. One

intermediate/tube support shall be provided for each 48” of finned length. Coils over 144" in finned length shall have 4 intermediate/tube supports.

11. Certification: Performance certified coils that are ARI Standard 410 listed bear the ARI symbol. Coils exceeding the scope of the certification and/or the range of standard rating conditions are also rated to the extent possible by the ARI Std. 410 method.
12. Installation: Coils to be installed in accordance with manufacturer’s instructions and any applicable piping codes.
13. Control Valves and Piping: All hydronic piping shall be performed by the installing contractor. Control valves shall be furnished by the Automatic Temperature Control Contractor, installed by the mechanical contractor, and wired by the Automatic Temperature Control Contractor to unit mounted control panel.
14. Pipe Chase: Air handling unit manufacturer shall provide an 18" x 18" pipe chase, in the floor of the air handler. Pipe chase shall have a 1.5" upturned collar, completely welded to floor. Pipe chase shall be capped upon shipment, for penetration by contractor. All pipe penetrations must be sealed by the installing contractor to prevent air leakage.

K. Polymer Tube Cross Flow Air-to-air Heat Exchanger/Indirect Evaporative Cooler:

1. Heat recovery section shall be an updraft air-to-air heat exchanger with the thermal performance characteristics and pressure drops as scheduled. Heat exchanger shall be sized to handle the scheduled supply and exhaust CFM.
2. Horizontal tubes shall be used as the primary heat exchanger surface. Tubes shall be constructed of a corrosion resistant polymer with internally extruded ribbing for enhanced heat transfer. The polymer material shall be fire and smoke retardant, meeting UL94 V-O standards. The heat exchanger shall be tested and approved to UL 900 Class II. When sprayed for indirect evaporative cooling, water leakage from exhaust/scavenger side to supply side shall be less than 0.001 gallons per hour per 10,000 CFM of primary air.
3. Tubes shall be elastic in design, flexing slightly as exhaust/scavenger fans start/stop to facilitate shedding of dissolved solids buildup (applies to indirect cooling applications). Tube design must have a proven performance record for more than five years operating in hard water, arid conditions.
4. All heat exchanger surfaces shall be non-metallic, suitable for continuous operation in temperatures up to 160°F. Polymer plate type heat exchangers shall not be approved due to their inability to flex and shed solids build-up. Aluminum or stainless steel plate-type or heat pipe heat exchangers will not be considered or approved as a substitute for the specified tubular heat exchanger.
5. Heat exchanger shall have an integral spray manifold for indirect evaporative cooling and wash down, such that exhaust filters are not required. Spray manifold shall consist of PVC water distribution header and cooling tower clip-on type spray nozzles (easily removable for cleaning and maintenance). The water distribution system shall supply water equally to all tubes in the system. An all welded 16 gauge stainless steel drain pan shall be installed beneath heat exchanger to collect and route water to the common sump. Piping shall be in accordance with the detailed piping diagram shown on the plans.
6. Indirect spray pumps shall be submersible type, with epoxy coated cast iron motor housing, oil filled for lifetime lubrication and rapid heat dissipation. Pump shall have stainless steel screws, bolts, and handle, integral thermal overload protection, and mechanical shaft seal with stainless steel spring, nitrile parts, carbon and ceramic faces.
7. Heat exchangers shall be tested in accordance with ASHRAE Standard 84-1991, "Method of Testing Air-to-Air Heat Exchangers," ARI Standard 1060, "Rating Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment," and ANSI/ASHRAE Standard

143-2000, "Method of Test for Rating Indirect Evaporative Coolers." Independent laboratory test data must be supplied by the manufacturer, when requested by the consulting engineer, documenting the thermal effectiveness of the heat exchanger when operating in the heat recovery mode, and the wet bulb depression effectiveness when operating as an indirect evaporative cooler.

8. Pilot activated float control valve for sump level controls. [Cleveland Valve.]

L. Direct Evaporative Cooler:
   1. Direct evaporative cooling: 12” Glasdek media meeting UL 900–Class 2 requirements, with all welded, 16 gauge 304L stainless steel sump, PVC water piping and distribution header, recirculation water pump, manual bleed valve, overflow pipe, level controls, and float valve shall be part of factory furnished and installed components. A potable water feed shall be provided by the installing contractor. Direct evaporative thermal performance and pressure drop shall be as scheduled.
   2. 3/4" make-up and 1-1/2" drain solenoid valves (shipped loose for field piping and wiring by contractor), shall be factory furnished. Sump freeze protection, media drying cycle every 24 hours, and automatic sump dump every 24 hours shall be part of factory control system included. Distribution header shall per Munters Corporation design guidelines, and shall be easily removed for inspection and cleaning.
   3. Direct evaporative pumps shall be submersible type, with epoxy coated cast iron motor housing, oil filled for lifetime lubrication and rapid heat dissipation. Pump shall have stainless steel screws, bolts, and handle, integral thermal overload protection, and mechanical shaft seal with stainless steel spring, nitrile parts, carbon and ceramic faces. Piping shall be in accordance with the detailed piping diagram shown on the plans.
   4. Pilot activated float control valve for sump level controls. [Cleveland Valve).]

M. Filters:
   1. Outdoors air filters: 2" MERV 7 pleated pre-filters and 4” MERV 8 pleated final filters.
   2. Magnetic filter gauge with integral switch shall be included for each filter bank, and shall be factory installed and wired to unit-mounted terminal strip.

N. Dampers:
   1. All dampers shall be of the low leakage airfoil blade type with blade edge and side seals. Dampers shall be constructed of extruded aluminum frames (6063T5) of not less than 2.03 mm thickness. Blades shall be of extruded aluminum profiles with blade gaskets of extruded EPDM. Frame seals shall be of extruded type. Gaskets shall be secured in an integral slot within aluminum extrusions.
   2. Bearings to be comprised of a celcon inner bearing fixed to an 11.11 mm aluminum hexagon blade pin rotating within a polycarbonate outer bearing inserted in frame. Linkage hardware shall be installed in frame side and be constructed of aluminum and corrosion resistant zinc & nickel-plated steel complete with cup-point trunnion screws for slip-proof grip.
   3. Air leakage through a 48" x 48" damper shall not exceed 10.3 CFM/sq. ft against 4" W.G. differential static pressure with standard air. Standard air leakage data to be certified under the AMCA certified ratings program. Pressure drop through a fully open 48" x 48" damper shall not exceed 0.02" W.G. at 1000 FPM.
   4. The following damper functions shall be provided:
      a. O/A heat exchanger face & bypass, with factory installed and wired modulating actuator. Face and bypass shall provide modulation of winter heat reclaim and summer indirect evaporative cooling.

b. Fan isolation dampers.
c. Exhaust air, backdraft damper.
d. Direct Evaporative Cooler face and bypass, with factory installed and wired modulating actuator. Face and bypass shall provide modulation of supply air temperature.

O. Controls:
1. An electronic programmable microprocessor-based logic controller (PLC. with key pad input and LCD display shall be furnished to control the unit. Temperature and humidity set points and 365-day clock functions including daylight savings, holiday programming and user overrides, shall be easily input by the operator. All temperature, humidity, and pressure sensors, as required to accomplish the specified sequence of control, shall be provided and factory wired to the extent possible. All external sensors, including duct static pressure and building static pressure, shall be manufacturer supplied and shall be installed by the contractor.
2. Furnish BACnet open protocol interface with Direct Digital Control system for monitoring, control, and graphics. See Section 23 09 00, HVAC INSTRUMENTATION AND CONTROLS for details of graphics package to be provided by Controls Contractor with DDC system. Interface shall include all necessary inputs and outputs for graphics and trending provided by DDC system. DDC integration devices shall be provided by the manufacturer, and installed and wired by the contractor.
3. DDC controls shall be open BACnet protocol ALC or equal, and shall be fully factory programmed and tested. Control sequences shall be established and coordinated with the consulting engineer. List of control points included:
a. Air filter status
b. Exhaust fan status
c. Exhaust plenum (fan. low pressure cutout)
d. Outdoor air temperature and humidity
e. Outdoor air pre-filter status
f. Supply fan flow (piezometer ring at fan inlet).
g. Supply fan status
h. Supply plenum (fan. high pressure cutout)
i. Supply air temperature and humidity
j. Return air temperature and humidity
k. Exhaust fan speed (control on building pressure of 0.05” w.c. adjustable)
l. Supply fan speed (control on duct pressure of 0.1” w.c., adjustable)
m. Sump Water Conductivity
n. IEC Pump Start/Stop
o. IEC Pump Status
p. DEC Pump Start/Stop
q. DEC Pump Status
r. DEC face and bypass damper status
s. DEC entering air temperature and humidity
t. Supply duct pressure
u. Building static pressure – north
v. Building static pressure - south

P. Electrical Characteristics and components:
1. Units shall require one 460/3/60 power connection for fan, pump motors and lights.
a. Provide transformer for 120/1/60 feed for lights, duplex GFCI receptacle, and controls.

b. An integral NEMA 4 electrical control panel shall be provided that has a hinged access door and an approved locking device. All components shall be fully wired and tested prior to shipment and all major electrical components shall be UL listed. Electrical system shall be ETL listed and labeled, in accordance with UL 1995. A non-fused disconnect switch shall be furnished and installed on the unit. All internal power and control wiring shall be connected to a numbered terminal strip for easy troubleshooting. Any conduit used shall not be run across or come into contact with the floor. All wiring penetrations between air handler sections, and into electrical panel, shall be completely sealed to eliminate air and moisture transfer.

c. Vapor-tight light fixtures with compact fluorescent lights and wire guards shall be installed in all areas of unit requiring routine inspection or maintenance. All lights shall be controlled by one external mounted weatherproof switch. Lights are powered by a dedicated 120V power feed wired from unit-mounted junction box.

d. GFCI receptacle shall be installed beside light switch and shall be factory wired.

Q. Water Treatment:

1. 2" Dolphin model G3020-PVC pulsed power water treatment system, piped and factory wired to the discharge side of the indirect evaporative cooling pump. Conductivity controller with flow switch and motorized bleed valve, factory installed and wired. One-year of on site service by local Dolphin rep (total of up to 9 visits included). There shall be one manual bleed, initially set for 1 GPM, in addition to the controlled bleed based on water conductivity.

PART 3 - EXECUTION

3.1 GENERAL

A. Units that ship in separate pieces shall be field assembled by installing contractor. Contractor shall perform interconnecting wiring and piping connections between sections in the field. All hardware required for assembly of units shall be furnished by air handling unit manufacturer. Installing contractor shall furnish all gasketing and sealant required in the assembly process.

3.2 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before air-handling unit installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for hydronic make-up water, heating hot water, and condensate drainage piping systems and electrical services to verify actual locations of connections before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected

E. Verify base frame and mounting curb are installed and dimensions are as shown on shop drawings.

3.3 INSTALLATION

A. Install in accordance with ARI 430.

B. Mounting curb:
   1. Coordinate curb installation and anchorage with concrete work and structural steel work.
   2. Assemble curb.
   3. Install curb level.
   4. Anchor curb.

C. Install assembled units with vibration isolators. Install isolated fans with resilient mountings and flexible electrical leads. Install restraining snubbers as required. Adjust snubbers to prevent tension in flexible connectors when fan is operating. Refer to Section 23 05 00, COMMON WORK RESULTS FOR HVAC.

D. Install condensate piping with traps and route from drain pan to receptor to sanitary sewer. Refer to Section 23 20 00, HVAC PIPING AND PUMPS.

E. Insulate coil headers located outside airflow as specified for piping. Refer to Section 23 07 00, HVAC INSULATION.

F. Arrange installation of units to provide access space around air-handling units for service and maintenance.

G. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with new, clean filters.

3.4 CONNECTIONS

A. Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced.

B. Comply with requirements for piping specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

C. Install piping adjacent to air-handling unit to allow service and maintenance.

D. Connect piping to air-handling units mounted on vibration isolators with flexible connectors.

E. Connect condensate drain pans using ASTM B 88, Type M copper tubing. Extend to nearest receptor or floor drain. Construct deep traps at connections to all drain pans and install cleanouts at changes in direction. Provide sump fill and drain valves per manufacturer's recommendations for all rooftop air handling units.

F. Hot Water Piping: Comply with applicable requirements in Section 23 20 00, HVAC PIPING AND PUMPS. Install shutoff valve and union or flange at each coil supply connection. Install balancing valve and union or flange at each coil return connection.

G. Coordinate duct installations and specialty arrangements with schematics on Drawings and with requirements specified in Section 23 30 00, HVAC AIR DISTRIBUTION.

H. Connect make-up to water supply. Install gate valve on water supply piping. Insulate all water piping subject to ambient temperatures. Install 3/4-inch hose bibb accessible from interior. Pipe drain and overflow to nearest receptor drain.

3.5 INSTALLATION HOT WATER HEATING COIL

A. Make connections to coils with unions or flanges.

B. Connect water supply to leaving airside of coil (counter flow arrangement).

C. Locate water supply at bottom of supply header and return water connection at top.

D. Install water coils to allow draining and install drain connection at low points.

E. Install the following piping accessories on hot water piping connections. Refer to Section 23 20 00 HVAC PIPING AND PUMPS.
   1. On supply:
      a. Thermometer well and thermometer.
      b. Well for control system temperature sensor.
      c. Shutoff valve.
      d. Strainer.
      e. Control valve.
      f. Pressure gage.
   2. On return:
      a. Thermometer well and thermometer.
      b. Well for control system.
      c. Pressure gage.
      d. Shutoff valve.
      e. Balancing valve/Flow control valve.

F. Install manual air vents at high points complete with shutoff valve. Refer to Section 23 20 00, HVAC PIPING AND PUMPS.

3.6 FIELD QUALITY CONTROL

A. Retain first paragraph below to require a factory-authorized service representative to perform inspections, tests, and adjustments.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

D. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

E. Tests and Inspections:
   1. Leak Test: After installation, fill water and steam coils with water, and test coils and connections for leaks.

2. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
4. Air-handling unit or components will be considered defective if unit or components do not pass tests and inspections.
5. Prepare test and inspection reports.

3.7 STARTUP SERVICE

A. Perform startup service. Provide a factory technician for startup service on site for minimum of four days for start up and one day of training for central air handling units.

B. Complete installation and startup checks according to manufacturer's written instructions.

C. Verify that shipping, blocking, and bracing are removed.

D. Verify that unit is secure on mountings and supporting devices, and that connections to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers, and switches.

E. Verify that proper freeze protection is installed and fully functional.

F. Verify proper motor rotation direction, free fan wheel rotation, and smooth bearing operations. Reconnect fan drive system, align belts, and install belt guards.

G. Verify that bearings, pulleys, belts, and other moving parts are lubricated with factory-recommended lubricants.

H. Verify that face-and-bypass dampers provide full face flow.

I. Verify that outdoor- and return-air mixing dampers open and close, and maintain minimum outdoor-air setting.

J. Comb coil fins for parallel orientation.

K. Verify that proper thermal-overload protection is installed for electric coils.

L. Install new, clean filters.

M. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.

N. Starting procedures for air-handling units include the following:

O. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm.

P. Measure and record motor electrical values for voltage and amperage.

Q. Manually operate dampers from fully closed to fully open position and record fan performance.

3.8 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Division 23, Section 23 05 93, TESTING, ADJUSTING, AND BALANCING for air-handling system testing, adjusting, and balancing.

3.9 CLEANING

A. After completing system installation and testing, adjusting, and balancing air-handling unit and air-distribution systems and after completing startup service, clean air-handling units internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.10 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain air-handling units. Comply with requirements of 23 08 00 – HVAC Commissioning.

END OF SECTION 23 73 00

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SECTION 23 81 19 - SELF-CONTAINED AIR-CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes packaged, air-cooled air-conditioning units with refrigerant compressors and controls intended for indoor installations.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories.

B. LEED Submittals:
   1. Product Data for Credit EA 4: Documentation indicating that equipment and refrigerants comply.
   2. Product Data for Prerequisite IEQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.

D. Samples for Initial Selection: For units with factory-applied color finishes.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For self-contained air conditioners to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Filters: One set of filters for each unit.
   2. Fan Belts: One set of belts for each unit.
   3. Gaskets: One set for each access door.
   4. Fuses: One set for each air-handling unit.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ARI Compliance:
1. Applicable requirements in ARI 210/240.

C. ASHRAE Compliance:
1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and Startup."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.8 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of self-contained air conditioners that fail in materials or workmanship within specified warranty period.
1. Warranty Period:
a. For Compressor: One year from date of Substantial Completion.
b. For Parts: One year from date of Substantial Completion.
c. For Labor: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Data Aire Inc.
2. Carrier Corporation; Home Comfort and HVAC Building & Industrial Systems.
3. Engineered Air.
4. Marshall Engineered Products Co. (MEPCO).
5. McQuay International.
6. Trane Inc.
7. USA Coil & Air.
8. Whalen Company (The).

2.2 PACKAGED UNITS

A. Description: Factory assembled, wired, and tested; and fully charged with refrigerant and oil.

B. Configuration: Horizontal, ceiling mounted.

C. Disconnect Switch: Factory mounted in control panel

2.3 CABINET

A. Frame and Panels: Structural-steel frame with galvanized-steel panels and access doors or panels.
   1. Interior-Surface Finish: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

B. Insulation: 1-inch thick, glass-fiber duct liner complying with ASTM C 1091 and having a microbial coating on cabinet interior and control panel. 1/2-inch thick liner is acceptable for units smaller than 15 tons.

C. Return-Air Opening: Side duct connection.

2.4 SUPPLY-AIR FAN

A. Fan Material: Galvanized steel.

B. Configuration: Double-width, double-inlet, forward-curved centrifugal fan; statically and dynamically balanced. Horizontal discharge with flexible discharge collar.

C. Fan Sheaves: Variable pitch, dynamically balanced, bored to fit shafts, and keyed for initial startup.

D. Motor Sheave: Variable and adjustable pitch, dynamically balanced, and selected to achieve specified rpm when set at mid-position.

E. Belt Rating: As recommended by manufacturer or a minimum of one and one-half times nameplate rating of motor.

F. Bearings: Grease lubricated with grease lines extended to exterior of unit with L-50 life at 200,000 hours.

G. Comply with NEMA designation, temperature rating, service factor, enclosure type, and premium efficiency requirements for motors specified in Section 23 05 00, COMMON WORK RESULTS FOR HVAC.

2.5 REFRIGERATION SYSTEM

A. Compressor: Scroll type, hermetically sealed, 3600 rpm maximum, and resiliently mounted with positive lubrication and internal motor protection.

B. Refrigerant Coils (For Air-Cooled Units): Seamless copper tubes expanded into aluminum fins.
   1. Mount coil assembly over stainless-steel drain pan complying with ASHRAE 62.1 and having a condensate pump unit with integral float switch, pump-motor assembly, and condensate reservoir.
   2. Refrigerant: R-410A.

2.6 CONTROLS

A. Control equipment and sequence of operation are specified in Section 23 09 00, HVAC INSTRUMENTATION AND CONTROLS.

B. Control Package: Factory wired, including contactor, high- and low-pressure cutouts, internal-winding thermostat for compressor, control-circuit transformer, and noncycling reset relay.

C. Time-Delay Relay: Five-minute delay to prevent compressor cycling.

D. Adjustable Thermostat: Remote, to control the following:
1. Supply fan.
2. Compressor.
3. Condenser.

E. Fan Control Switch: Auto-on.

F. Microprocessor Control Panel: Controls unit functions as standalone or network operation, including refrigeration and safety controls, with unit-mounted display, and the following:
1. Supply fan.
2. Supply-fan motor speed.
3. Compressors.
4. Air-cooled condenser.
5. Panel-mounted control switch to operate unit in remote or local control mode or to stop or reset.
6. Panel-mounted indication of the following:
   a. Operating status.
   b. System diagnostics and safety alarms.
   c. Monitor constant and variable motor loads.

2.7 CAPACITIES AND CHARACTERISTICS

A. Cooling Capacity:
1. Total: As scheduled on Drawings, Btu/h.
2. Sensible: As scheduled on Drawings Btu/h.
3. Energy Efficiency Ratio: As scheduled on Drawings

B. Single-Point Electrical Characteristics:
1. Volts: 277 V
2. Phase: Single
3. Hertz: 60.
4. Full-Load Amperes: As scheduled on Drawings
5. Minimum Circuit Ampacity: As scheduled on Drawings
6. Maximum Overcurrent Protection: As scheduled on Drawings

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Anchor units to structure.

C. Install seismic restraints.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

C. Duct Connections: Duct installation requirements are specified in Division 23 Section "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to self-contained air conditioners with flexible duct connectors. Flexible duct connectors are specified in Section 23 30 00, HVAC AIR DISTRIBUTION.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:
   1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation, and inspect for refrigerant leaks.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Units will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 23 81 19

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SECTION 23 81 26 - SPLIT-SYSTEM AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fan coil unit.
   2. Condensing unit.

1.2 REFERENCES

A. Air-Conditioning and Refrigeration Institute:
   1. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
   2. ARI 270 - Sound Rating of Outdoor Unitary Equipment.
   3. ARI 340/360 - Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment.
   4. ARI 365 - Commercial and Industrial Unitary Air-Conditioning Condensing Units.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
   1. ASHRAE 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
   2. ASHRAE 90.1 - Energy Standard for Buildings except Low-Rise Residential Buildings.

C. ASTM International:
   1. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

D. National Electrical Manufacturers Association:
   1. NEMA MG 1 - Motors and Generators.

E. National Fire Protection Association:
   1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

1.3 SUBMITTALS

A. Section 01 33 00, SUBMITTAL PROCEDURES: Submittal procedures.

B. Product Data: Submit data indicating:
   1. Cooling and heating capacities.
   2. Dimensions.
   3. Weights.
   4. Rough-in connections and connection requirements.
   5. Electrical requirements with electrical characteristics and connection requirements.
   6. Controls.
   7. Accessories.

C. Manufacturer’s Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

E. Manufacturer’s Field Reports: Submit start-up report for each unit.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 73 00, EXECUTION: Closeout procedures.

B. Project Record Documents: Record actual locations of controls installed remotely from units.

C. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, installation instructions, and maintenance and repair data.

1.5 QUALITY ASSURANCE

A. Performance Requirements: Energy Efficiency Rating (EER) not less than prescribed by ASHRAE 90.1 or California Energy Code when used in combination with compressors and evaporator coils when tested in accordance with ARI 210/240.

B. Cooling Capacity: Rate in accordance with ARI 210/240.

C. Sound Rating: Measure in accordance with ARI 270.

D. Insulation and adhesives: Meet requirements of NFPA 90A.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years experience approved by manufacturer.

1.7 PRE-INSTALLATION MEETINGS

A. Section 01 31 00, PROJECT MANAGEMENT AND COORDINATION: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00, PRODUCT REQUIREMENTS: Requirements for transporting, handling, storing, and protecting products.

B. Accept units and components on site in factory protective containers, with factory shipping skids and lifting lugs. Inspect for damage.

C. Comply with manufacturer’s installation instruction for rigging, unloading and transporting units.

D. Protect units from weather and construction traffic by storing in dry, roofed location.

1.9 COORDINATION

A. Section 01 31 00, PROJECT MANAGEMENT AND COORDINATION: Requirements for coordination.

B. Coordinate installation of condensing unit with building structure.

C. Coordinate installation of fan coil unit with building structure.

1.10 WARRANTY

A. Section 01 73 00, EXECUTION: Requirements for warranties.

B. Furnish five year manufacturer’s warranty for compressors.

1.11 MAINTENANCE SERVICE

A. Section 01 73 00, EXECUTION: Requirements for maintenance service.

B. Furnish service and maintenance of equipment for one year from Date of Substantial Completion. Include maintenance items as shown in manufacturer's operating and maintenance data, including filter replacements, fan belt replacement, and controls checkout and adjustments.

C. Furnish 24-hour emergency service on breakdowns and malfunctions for this maintenance period. Furnish capability of response time within 4 hours.

1.12 MAINTENANCE MATERIALS

A. Section 01 73 00, EXECUTION: Requirements for maintenance materials.

B. Furnish one set for each unit of fan belts.

PART 2 - PRODUCTS

2.1 SPLIT SYSTEM AIR CONDITIONING UNITS

A. Manufacturers:
1. Basis of design: as scheduled on Drawings
2. Substitutions: Section 01 60 00, PRODUCT REQUIREMENTS.

B. Product Description: Split system consisting of ductless fan coil and condensing unit including cabinet, evaporator fan, refrigerant cooling coil, compressor, refrigeration circuit, condenser, air filters, controls, fan coil unit accessories, condensing unit accessories, and refrigeration specialties.

2.2 FAN COIL UNIT

A. Configuration: High-wall fan coil.

B. Cabinet:
   1. Panels: Constructed of galvanized steel with baked enamel finish. Access Panels: Located on both sides of unit. Furnish with duct collars on inlets and outlets.
   2. Insulation: Factory applied to each surface to insulate entire cabinet. 1/2 inch thick neoprene coated glass fiber with edges protected from erosion.

C. Evaporator Fan: Forward curved centrifugal type, resiliently mounted with adjustable belt drive and high efficiency motor complying with NEMA MG1, Type 1. Motor permanently lubricated with built-in thermal overload protection.

D. Evaporator Coil: Constructed of copper tubes expanded onto copper fins. Factory leak tested under water. Removable, PVC construction, double-sloped drain pan with piping connections on both sides.

E. Refrigeration System: Single R-410A refrigeration circuit controlled by factory installed thermal expansion valve.

F. Air Filters: 1 inch thick glass fiber disposable media 25 to 30 percent efficiency based on ASHRAE 52.1.

G. Fan Coil Unit Accessories:
   1. Discharge: with construction and finish matching unit casing. Integral grille of aluminum construction and adjustable louvers.
   2. Return Air Grille: mounted in return air opening of aluminum construction and fixed louvers.
   3. Mounting Subbase with construction and finish matching unit casing.
   4. Local disconnect.

2.3 CONDENSING UNIT

A. General: Factory assembled and tested air cooled condensing units, consisting of casing, compressors, condensers, coils, condenser fans and motors, and unit controls.

B. Unit Casings: Exposed casing surfaces constructed of galvanized steel with manufacturer's standard baked enamel finish. Designed for outdoor installation and complete with weather protection for components and controls, and complete with removable panels for required access to compressors, controls, condenser fans, motors, and drives.

C. Compressor: Single refrigeration circuit with rotary or semi-hermetic reciprocating type compressors, resiliently mounted, with positive lubrication, and internal motor overload protection.

D. Condenser Coil: Constructed of copper tubing mechanically bonded to copper fins, factory leak and pressure tested.

E. Controls: Furnish operating and safety controls including high and low pressure cutouts. Control transformer. Furnish magnetic contactors for compressor and condenser fan motors.

F. Condenser Fans and Drives: Direct drive propeller fans statically and dynamically balanced. Wired to operate with compressor. Permanently lubricated ball bearing type motors with built-in thermal overload protection. Furnish high efficiency fan motors.

G. Condensing Unit Accessories: Furnish the following accessories:

1. Controls to provide low ambient cooling to 0 degrees F.
2. Time delay relay.
3. Anti-short cycle timer.
4. Disconnect switch.
5. Vibration isolators.
6. Condenser Coil Guard: Condenser fan openings furnished with steel wire safety guards.
7. Suction and discharge pressure gauges.

H. Refrigeration specialties: Furnish the following:
1. Charge of compressor oil.
2. Holding charge of refrigerant.
3. Replaceable core type filter drier.
4. Liquid line sight glass and moisture indicator.
5. Shut-off valves on suction and liquid piping.
6. Liquid line solenoid valve.
7. Charging valve.
8. Oil level sight glass.
9. Crankcase heater.
10. Pressure relief device.

I. Refrigerant: Furnish charge of refrigerant R-410A.

2.4 CONTROLS

A. Thermostat: Remote space thermostat with single stage heating and single stage cooling with automatic changeover. Furnish system selector switch off-heat-auto-cool and fan control switch auto-on.

2.5 CAPACITY

A. Supply Air: Corrected to sea level altitude.

B. Unit Sound Rating: Maximum dBA measured 3 feet from casing. Shall not exceed manufacturer's published sound level data.

C. Supply Fan:
1. Supply air flow: As scheduled on Drawings.
2. Fan motor: As scheduled on Drawings.

D. Cooling Capacity:
1. Total cooling capacity: As scheduled on Drawings.
2. Sensible cooling capacity: As scheduled on Drawings.
3. Energy efficiency ratio: Minimum 11.4.

E. Nominal Capacity: As scheduled on Drawings.

2.6 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Electrical Characteristics: In accordance with Section 23 05 00, COMMON WORK RESULTS FOR HVAC and the following:
   1. As scheduled on Drawings.
   2. Maximum overcurrent protection as scheduled on Drawings.
   3. Minimum circuit ampacity as scheduled on Drawings.

B. Disconnect Switch: Factory mounted, non-fused type, interlocked with access door, accessible from outside unit, with power lockout capability.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 31 00, PROJECT MANAGEMENT AND COORDINATION: Verification of existing conditions before starting work.

3.2 INSTALLATION – FAN COIL UNIT

A. Install fan coil unit on vibration isolators.

B. Install condensate piping with trap and route from drain pan to approved location as indicated on Drawings. Refer to Section 22 10 00, PLUMBING PIPING AND PUMPS.

C. Install components furnished loose for field mounting.

D. Install connection to electrical power wiring in accordance with Section 23 05 00, COMMON WORK RESULTS FOR HVAC.

3.3 INSTALLATION - CONDENSING UNIT

A. Install condensing units on vibration isolators.

B. Install units on concrete foundations. Refer to Section 03 30 00, CAST-IN-PLACE CONCRETE.

C. Install refrigerant piping from unit to condensing unit. Install refrigerant specialties furnished with unit.

D. Evacuate refrigerant piping and install initial charge of refrigerant.

E. Install electrical devices furnished loose for field mounting.

F. Install control wiring between fan coil unit, condensing unit, and field installed accessories.

G. Install connection to electrical power wiring in accordance with Section 26 05 00, COMMON WORK RESULTS FOR ELECTRICAL.

3.4 MANUFACTURER’S FIELD SERVICES

A. Section 01 40 00, QUALITY REQUIREMENTS: Requirements for manufacturer’s field services.

B. Furnish initial start-up and shutdown during first year of operation, including routine servicing and checkout.

3.5 CLEANING

A. Section 01 73 00, EXECUTION: Requirements for cleaning.

B. Vacuum clean coils and inside of unit cabinet.

C. Install new throwaway filters in units at Substantial Completion.

3.6 DEMONSTRATION

A. Section 01 73 00, EXECUTION: Requirements for demonstration and training.

B. Demonstrate fan coil unit operation and maintenance.

C. Demonstrate starting, maintenance, and operation of condensing unit including low ambient temperature operation.

D. Furnish services of manufacturer's technical representative for one 8-hour day to instruct Owner's personnel in operation and maintenance of units. Schedule training with Owner, provide at least 7 days notice to Architect/Engineer of training date.

3.7 PROTECTION OF FINISHED WORK

A. Section 01 73 00, EXECUTION: Requirements for protecting finished Work.

B. Do not operate air fan coil until, filters are in place, bearings lubricated, and fan has been test run under observation.

END OF SECTION 23 81 26

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SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 WORK NOT INCLUDED

A. Cooperate with the other trades who may or may not be party to this Contract for the purpose of coordinating the electrical requirements and installation of equipment, materials, and furnishings provided by those other trades, including the Owner.

1.2 CODES AND STANDARDS

A. Provide equipment and materials which conform to, and perform the installation thereof in accordance with the following codes and industry standards:
   1. California Electrical Code (CEC).
   2. National Electrical Code (NEC).
   3. Titles 8, 19 and 24 of the California Code of Regulations (CCR).
   4. National Fire Protection Association (NFPA)
   5. American National Standards Institute (ANSI).
   6. California State Fire Marshal (CSFM).
   7. California Fire Code (CFC)
   8. Underwriters' Laboratories (UL).
   9. Electrical Testing Laboratories Inc (ETL)
   10. National Electrical Contractors' Association (NECA).
   11. National Electrical Manufacturers' Association (NEMA).
   12. International Electrical Testing Association (NETA)
   13. Institute of Electrical and Electronics Engineers (IEEE).
   14. International Electrotechnical Commission (IEC)
   15. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
   16. International Energy Conservation Code (IECC)
   17. National Electrical Safety Code (NESC) - Electrical Safety Orders
   18. Other applicable local codes and ordinances.

B. Where the authority-having-jurisdiction makes an interpretation or decision, as is their prerogative in accordance with the Code, such direction shall be considered a part of these Contract Documents as if contained herein. With respect to completing the intent of the Contract Documents, comply with any and all requirements of the authority-having-jurisdiction and utility company field inspectors, at no additional cost.

C. The above referenced codes and standards are considered to be absolute minimum requirements. Nothing in these Drawings or Specifications shall be construed to allow Work not conforming to the applicable codes and standards.

1.3 UTILITY FEES

A. Pay utility company charges for normal or after hours shutdowns, service calls, repairs, and cable locating that are directly related to the installation of the Electrical Work.

1.4 WORKING SPACE

A. Maintain adequate work space around, and access to, electrical and mechanical equipment in strict accordance with the applicable Codes. Verify during the course of construction that sufficient space will be available for the installation and maintenance of equipment, fixtures, etc.

1.5 MATERIALS AND SUBSTITUTIONS

A. Specific trade names are used in the Drawings and Specifications in order to establish the standard grade and characteristics of said items. This does not imply the right upon the part of the Contractor to use other materials or methods without the approval of the Owner.

B. Electrical materials and equipment shall bear the label of, or be listed by, the UL wherever standards have been established and label service is regularly furnished by that agency. Comply with the installation and application requirements of UL as documented in their published directories.

C. Maintain uniformity throughout the Project by making use of only one make or brand of material for each material used.

1.6 SUBMITTALS

A. Shop Drawings for equipment and materials as noted in each Division 16 specification section. Bind the submittals as complete volumes according to classification of equipment such as power, lighting, fire alarm, etc. When possible, make all electrical submittals at the same time.

B. Arrange panelboard submittals to show bussing, circuit numbering, and branch circuit protective devices similar the schedules as indicated. Show elevations of switchboards, motor control centers, and distribution centers indicating the layout of devices, meters, handles, etc. Provide device ratings, circuit numbers, and nameplate descriptions in table form. Include terminal strip mounting arrangements on elevations for terminal cabinets.

1.7 DRAWINGS AND SPECIFICATIONS

A. The data and information contained on the Drawings is as accurate as was reasonably possible at the time they were produced, but absolute accuracy is not guaranteed. Exact locations, distances, elevations, etc., will be dictated by the actual building and the conditions at the Site.

B. The layout of electrical equipment, wiring, and accessories is shown in a diagrammatic fashion (not pictorially) in order to achieve clarity and legibility. Although the size and location of electrical equipment is drawn to scale wherever possible, refer to all data in the Contract Documents and field verify this information as the project progresses. Examine architectural, structural, mechanical, and other drawings to determine the exact location of conduits, outlets, fixtures, and equipment and to note any conditions which may affect the electrical Work.

C. Because the Electrical Drawings may be distorted for clarity of representation, it may be necessary to field verify the exact location of electrical outlets, lights, switches, etc. in order to conform to the architectural elements. The Owner reserves the right to make minor changes to the locations of equipment, devices, and wiring shown, at no additional cost, providing the changes are ordered before the rough-in of conduit, boxes, or related items is completed, and no extra material are required.

D. Conduit quantities, sizes, termination points, and wiring are indicated. However, not all conduit bends or routing details are indicated. Route conduit so as to conform to the structural conditions, avoid obstructing other trades, maintain space restrictions and keep circulation areas and access openings clear.

1.8 WORKMANSHIP

A. Constantly supervise the work personally or through an authorized and competent representative. Keep the same foreman or supervisor on the project from commencement through completion.

B. Perform the Electrical work using the highest caliber craftsman available. Workmanship shall be first class and of the best quality available to insure a long and trouble free service life. Allow only experienced and competent workmen on the job.

1.9 MANUFACTURER'S DIRECTIONS

A. Adhere to the manufacturer's directions regarding the proper installation and configuration of electrical equipment where those directions cover points not included in these Drawings and Specifications.

1.10 PROTECTION AND STORAGE

A. Deliver electrical materials to the Site new, and in unbroken packages. Protect electrical equipment and materials during transit, storage and handling to prevent damage, soiling and deterioration.

B. During shipping storage and handling protect electrical materials from damage of any type including dust, water, over-spray, and temperature. Avoid damage during construction to the Work and materials of other trades as well as the electrical Work and material. Repair or replace, at the Contractor's expense, defective or damaged items such that the entire Work is completed in a condition satisfactory to the Owner.

1.11 EXCAVATION, CUTTING, PATCHING, AND REPAIR

A. Perform excavation and backfill required for the installation of electrical sub-structures. Restore grounds, walkways, roadways, curbs, walls, and other existing underground facilities to their original condition.

B. Cut, core-drill, and demolish existing walls, floors, ceilings and other building surfaces as required for the installation of Electrical Work. Obtain the approval of the Owner prior to performing any operation which may affect any structural elements of the building.

C. Patch and repair wood, plaster, tile, or concrete surfaces which have been damaged by the installation of the Electrical Work so that the finished surface matches the surrounding conditions.

1.12 FLASHING, WATERPROOFING AND SEALING

A. In general, install in an approved watertight manner, Electrical Work which pierces exterior walls or waterproofing membranes. Flash and counter-flash roof and wall penetrations in a manner described in other applicable sections of this Specification and as approved by the Owner.

B. Fit conduits passing through finished walls with steel escutcheon plates of brass, chrome, or painted finish as directed by the Owner. Grout penetrations of floor slabs, concrete or masonry walls with an approved grout or silicone elastomeric caulk.

1.13 CLEANING, ADJUSTING, AND TOUCH-UP

A. Remove on a daily basis electrical debris, scraps, packaging material and other rubbish. Dispose of such items off-site in an approved manner and debris. Maintain the site free from physical hazards at all times in accordance with OSHA regulations.

B. After installation, completely clean electrical equipment, fixtures, and materials of excess paint, over-spray, plaster, cement, insulating products, and other foreign matter. Leave the Electrical Work in a clean, finished, dry, level, like new condition.

C. Touch-up paint scratches and scuffs on electrical equipment and lighting fixtures with paint recommended by the manufacturer and matching the original item finish.

D. Make setting, adjustments, and programming in accordance with the manufactures' operating and installation instructions. Settings and program variables will be issued by the Owner prior to commissioning of the electrical system.

1.14 INSPECTIONS AND TESTING

A. Arrange for the inspection of the Work at various stages of completion by the authority having jurisdiction, utility company representatives, and the Owner. Comply with all directions and remedial measures issued thereby. Any objections to these orders on the part of the Contractor must be presented to the Owner in writing within forty eight (48) hours of the inspection report.

B. Coordinate the installation of the Work so that observation of all rough-in, concealed, or underground Work can take place by the Owner.

C. Perform tests of the electrical system during the course of the project and at project completion to ensure safe and proper function in accordance with the Contract

Documents, manufacturers' recommendations, and applicable codes. Testing shall include, but not necessarily be limited to, the following:

1. Test for short circuits, open circuits, neutral leakage, and improper grounds on feeders and branch circuits. Perform this test with mains in disconnect from feeders, branch circuits closed, fixtures and devices permanently connected, lamps removed from sockets and wall switches closed.
2. Provide insulation resistance tests of all phase and neutral circuit conductors using a 500 Volt Megger for circuits of 240 Volt rating and below, and a 1000 Volt Megger for circuits of 277 volts and above. Minimum acceptable insulation resistance is one (1) megohm.
3. Perform a ground resistance test of each main grounding electrode system, ground rod, and supplemental grounding electrode. Utilize a calibrated, direct reading, earth ground test set and make the tests using the "Three-terminal, Fall-of-Potential" method. The maximum allowable earth ground resistance is 25 ohms.
4. Test for proper phase-to-phase and phase-to-neutral operating voltage on the main service and on each separately derived system. Perform this test at full load and at no load. With all circuits at full operating conditions, test the phase and neutral load currents using a clamp-on ammeter.
5. Tests as required by other sections of these Specifications.
6. Tests as prescribed by individual equipment manufacturers whether or not described in these Specifications.

D. Demonstrate to the Owner that the entire installation is complete, in proper operation condition. Activate all circuits, lights, devices, and controls under full load and normal operating conditions. Identify faulty items and immediately replace or repair defective equipment, workmanship, and materials to like new condition and retest in the presence of the Owner.

E. Demonstrate to the Owner that the entire electrical system is free from short circuits and improper grounds, or upon request of the Owner anytime, make necessary tests under the observation of the Owner which will ensure that electrical equipment, materials and installation methods are as specified.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 26 05 00

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SECTION 26 05 19 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes building wire and cable, service entrance cable, control cables, wiring connectors and connections.

B. All circuit wiring and cables shall be installed in conduit. This includes power, lighting, fire alarm, Tel/Data and security cables.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. ASTM B 3 Soft or Annealed Copper Wire

B. ASTM B 496 Compact Round Concentric-Lay-Stranded Copper Conductors

C. ASTM B 8 Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

D. ANSI C 2 National Electrical Safety Code – latest edition

E. IEEE 242 Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.

F. IEEE 399 Recommend Practice for Industrial and Commercial Power System Analysis.

G. NECA (National Electrical Contractors Association) - Standard of Installation.

H. NEMA WC-26 Wire and Cable Packaging

I. NETA ATS National Electrical Testing Association Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

J. NFPA 70 NEC.

K. UL 83 Thermoplastic-Insulated Wires and Cables.

L. UL 486A Wire Connectors and Soldering Lugs for Use with Copper Conductors.

M. UL 510 Polyvinyl Chloride, Polyethylene and Rubber Insulating Tapes.

1.3 SYSTEM DESCRIPTION

A. The applications for required cable, wire, and connectors include, but are not limited to:
   1. Power distribution circuitry.
   2. Lighting circuitry.
   3. Appliance and equipment circuitry.
   4. Wiring for motors of mechanical equipment

5. Wiring from the motor(s) of mechanical equipment to the disconnect switches or junction boxes, including wiring for pushbuttons, pilot lights, interlocks and similar devices as directed, shown, or specified.
6. Wiring from the motors of mechanical equipment to motor starters, including other auxiliary wiring as may be required, directed, or shown.
7. Line voltage wiring as required by other Divisions 2 thru 15, and interlocking to motor starters.
8. Control wiring for motors, mechanical equipment, relays and switches, and similar mechanical-electrical devices.
9. Line voltage wiring to thermostats, alarm system components, security system components and other miscellaneous equipment.

1.4 PROJECT CONDITIONS

A. All wire and cables shall be minimum No. 12 AWG copper conductor unless otherwise indicated.

B. All conductor sizes are based on copper.

C. Wire and cable routing indicated is diagrammatic unless dimensioned.

D. Route wire and cable as required to complement project conditions.

E. The Contractor shall be responsible for any and all raceways and raceway/cable supports in accordance with all other sections of these Specifications.

1.5 REGULATORY REQUIREMENTS

A. Furnish products listed and classified by UL, ETL, or other recognized, acceptable testing and listing agencies as suitable for the purpose specified and shown.

1.6 CONTRACTOR SUBMITTALS

A. Product Data:
1. Submit manufacturer’s catalog cuts and technical data for building wire and cables.

B. Field Test Report:
1. Measure overall insulation resistance to ground. Provide certified test report.

1.7 CLOSEOUT SUBMITTALS

A. Submit final certified test reports of all insulation resistance tests.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Accept cable and accessories on site in manufacturer's packaging. Inspect for damage.

B. Store and protect cable and accessories from the environment in accordance with manufacturer's published instructions. Provide adequate heating and ventilation to prevent condensation.

C. Damaged items shall be replaced at no additional cost to Owner.

1.9 COORDINATION

A. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

B. Wire and cable routing indicated is approximate unless dimensioned. Include wire and cable lengths within 10 feet of length shown.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Building Wire and Cable
1. American Wire and Cable.
2. Cerro Wire and Cable Co.
3. General Cable Corp.
4. Okonite Co.
5. Or Approved Equal.

2.2 BUILDING WIRE AND CABLE

A. Building wire and cable shall be UL83 compliant, insulated, single conductor, copper, solid or stranded, rated for 600-volts AC. The insulation shall be thermoplastic material rated for 90 degrees Celsius, THW, THHN/THWN, RHW or XHHW, per ANSI/NFPA 70.

B. For Interior Dry Location: Use only building wire, THHN/THWN insulation rated 90 degree Celsius, in raceway.

C. For Exterior Wet or Dry Locations: Use only XHHW insulation rated for 90 degree Celsius, in raceway.

D. For Underground Dry or Wet Locations: Use only XHHW insulation rated 90 degree Celsius, in raceway.

E. For connections to electrical equipment, coordinate wire type with equipment manufacturer.

2.3 SERVICE ENTRANCE CABLES

A. Service entrance cables shall be insulated, single conductor, copper, stranded, rated for 600-volts AC, type XHHW insulation.

B. Overhead Service entrance cables shall be insulated, single conductor, copper, stranded, rated for 600-volts AC, type SE insulation.

2.4 WIRING CONNECTORS

A. Split Bolt Connectors:
1. FCI Burndy Corp.
2. Cooper Crouse Hinds.
3. O.Z./Gedney Co.
4. Thomas & Betts Co.
5. 3-M Co.
6. Or Approved Equal.

B. Solderless Pressure Connectors:
1. FCI Burndy Corp.
2. Ideal Industries Co.
3. Thomas & Betts Co.
4. 3-M Co.
5. Or Approved Equal.

C. Spring Wire Connectors:
1. Ideal Industries Co.
2. 3-M Co.
3. Or Approved Equal.

D. Compression Connectors:
1. FCI Burndy Corp.
2. Thomas & Betts Co.
3. 3-M Co.
4. Or Approved Equal.

2.5 WIRE COLOR CODE

A. Color-code all conductors:
1. Wire sizes No. 10 AWG and smaller shall have integral color-coded insulation.
2. Wire sizes No. 8 AWG and larger may have black insulation but shall be identified by color-coded electrical tape at all junction, splice, pull, or termination points.
3. Color tape shall be applied to at least 3 inches of the conductor at the termination ends and in junction or pull boxes or where readily accessible.
4. Conductors for all systems shall not change color at splice points.
5. Where there are two or more neutrals in one conduit, each shall be individually identified with the proper circuit.
6. For No. 4 AWG and larger ground conductors, identify with green tape at both ends and all visible points, included in all junction boxes.

B. Each phase wire shall be uniquely color-coded as indicated below:
1. 120/240-Volts
a. Phase A – Black
b. Phase B – Red

c. Neutral - White
d. Ground - Green

2. 120/208-Volts
   a. Phase A – Black
   b. Phase B – Red
   c. Phase C – Blue
   d. Neutral – White
   e. Ground – Green
3. 277/480-Volts
   a. Phase A - Brown
   b. Phase B - Orange
   c. Phase C – Yellow
   d. Neutral - White or Natural Gray
   e. Ground – Green
4. Isolated Grounds: Green with Yellow Stripes

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

C. Verify that raceway installation is complete and supported as required by the specifications.

3.2 PREPARATION

A. Test raceway with a mandrel and thoroughly swab out to remove foreign material before pulling cables.

B. For conduits sizes less than 3 inches, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel.

C. For conduits sizes 3 inches and larger, draw a flexible testing mandrel approximately 12 inches long with a diameter less than the inside diameter of the conduit through the conduit. Then draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel.

3.3 EXISTING WORK

A. Disconnect and remove exposed and/or abandoned wire and cable. Patch surfaces where removed cable pass through building finishes.

B. Disconnect abandoned circuits and remove wire and cable. Remove abandoned boxes if wire and cable servicing them is abandoned and/or removed. Provide blank cover for abandoned boxes that are not removed.

C. Ensure access to existing wiring connections which remain active and which require access. Modify installation or provide access panel as appropriate.

D. Extend existing circuits using materials and methods and compatible with existing electrical installations, or as otherwise specified.

E. Tag and repair existing wire and cable that remain or are being reused.

3.4 INSTALLATION

A. General:
1. Install wire and cable in accordance with manufacturer's instructions and NECA “Standard of Installation.”
2. Route wire and cable as required to meet project conditions.
3. Identify and color code wire and cable. Identify each conductor with its circuit number or other designation indicated.
4. Protect exposed cable from damage.
5. Pull all conductors into raceway at same time.
6. Use suitable wire pulling lubricant for building wire No. 4 AWG and larger. Lubricant shall not be deleterious to the cable sheath, jacket or outer covering.
7. Do not exceed cable manufacturer’s recommended pulling tension limits when installing wire or cable.
8. Support cables above accessible ceiling using standard support methods to support cables from structure. Do not rest cable on ceiling panels.
9. Neatly train and lace wiring inside boxes, equipment, and panelboards

B. Cable and Wire Size:
1. Conductor sizes are based on copper unless specifically indicated as aluminum or “AL”.
2. Use conductor no smaller than No. 12 AWG for power and lighting circuits.
3. Use conductor no smaller than No. 14 AWG for control circuits.
4. Use No. 10 AWG conductors for 20 ampere, 120-volt branch circuits longer than 75 feet.
5. Use No. 10 AWG conductors for 20 ampere, 277-volt branch circuits longer than 200 feet.
6. Use stranded conductor for all feeders, branch and control circuits.

C. Cable Identification
1. Identify all wires and cables as specified in other Sections of these Specifications.

D. Special Techniques - Wiring Connections:
1. Clean conductor surfaces before installing lugs and connectors. Where an anti-oxidation lubricant is used, apply liberally, coating all exposed conductor surfaces.
2. Use suitable cable fittings and connectors.
3. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
4. Use split bolt connectors for copper conductor splices and taps, No. 8 AWG and larger.

5. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, No. 8 AWG and smaller.
6. Tape un-insulated conductors and connector with two layers of half-lapped rubber insulating compound tape and two layers of half-lapped, 7-mil electrical tape, Scotch 33+, or approved equal.
7. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, No. 10 AWG and smaller.
8. Stranded conductors for control circuits shall have ring terminals crimped on for all device terminations. Bare stranded conductors shall not be placed directly under the screws.

3.5 FIELD QUALITY CONTROL

A. Field inspection and test shall be performed under provisions of NETA ATS section 7.3 (2) - Low Voltage Cables, 600-Volt Maximum as follows.
   1. Visual and Mechanical Inspection:
      a. Compare cable data with drawings and specifications.
      b. Inspect exposed sections of cable for physical damage and correct connection in accordance with single-line diagram.
      c. Inspect all bolted electrical connections for high resistance using one of the following methods:
         1) Use of low-resistance ohm-meter in accordance with NETA section 7.3.2.2 (Electrical Tests).
         2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data from NETA ATS Table 10.12.
      d. Inspect compression-applied connectors for correct cable match and indentation.
      e. Verify cable color coding with applicable specifications and National Electrical Code.
   2. Electrical Tests
      a. Perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable. Test duration shall be one minute.
      b. Perform resistance measurements through all bolted connections with low-resistance ohmmeter, if applicable, in accordance with Section 7.3.2.1 (Visual and Mechanical Inspection).
      c. Perform continuity test to insure correct cable connection.
      d. Correct malfunctions and/or deficiencies immediately as detected at no additional cost to the Owner, including additional verification testing.
      e. Subsequent to final wire and cable terminations, energize all circuitry and demonstrate functional adequacy in accordance with system requirements.
   3. Test Values
      a. Compare bolted connection resistance to values of similar connections.
      b. Bolt-torque levels should be in accordance with NETA ATS Table 10.12 unless otherwise specified by the manufacturer.

c. Micro-ohm or milli-volt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from similar connections by more than 50 percent of the lowest value.
d. Minimum insulation-resistance values should not be less than 50 meg-ohms.
e. Investigate deviations between adjacent phases.

END OF SECTION 26 05 19

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SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes:
   1. Furnishing of grounding electrodes and conductors; equipment grounding conductors; bonding methods and materials; conduit and equipment supports; anchors and fasteners; sealing and fireproofing of sleeves and openings between conduits and wall.
   2. Inspection and testing of the Grounding and Bonding System; and Ground-Fault Protection Systems.

1.2 RELATED SECTIONS

1. Section 16123 - 600-Volt Power Conductors and Cables

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. The standards referenced herein, except as modified in the Contract Documents, shall have full force and effect as though included in these Specifications.
   1. ASTM B 187 - Specifications for Copper Bus, Rod, and Shapes.
   2. ASTM A 653 - Standard Specifications for Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated(Galvannealed) by Hot Dip Process
   3. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
   4. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.
   5. NECA - Standard of Installation.
   6. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
   7. NFPA 70 - NEC.
   8. UL 467 - Electrical Grounding and Bonding Equipment.

1.4 SYSTEM DESCRIPTION

A. Grounding electrode system consist of the following elements:
   1. Metal underground water pipe
   2. Metal frame of the building
   3. Concrete encased electrode
   4. Rod electrodes
   5. Service equipment
   6. Enclosures
   7. Separately derived systems.

B. Anchor and fasten electrical products to building elements and finishes as follows:
   1. Concrete Structural Elements: Provide preset inserts.
   2. Concrete Surfaces: Provide epoxy or expansion anchors.
   3. Interior Structural Steel: Provide appropriate size beam clamps.

4. Solid Masonry Walls: Use expansion anchors and preset inserts.
5. Sheet Metal: Provide sheet metal screws.

1.5 DESIGN REQUIREMENTS

A. Furnish products listed and classified by UL, ETL, or other recognized, acceptable testing and listing agencies as suitable for purpose specified and shown.

B. Grounding shall be in accordance with the NEC. Where size, type, rating and quantities indicated or specified are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

C. Select materials, sizes, and types of anchors, fasteners, and supports to carry at least twice the loads of equipment and raceway, including weight of wire and cable in raceway.

1.6 SUBMITTALS

A. Product Data:
1. Grounding electrodes and connections for fastening components; fire stopping material; and fireproofing sealants.

B. Test Report:
1. Grounding & Bonding: certified test.
2. Ground-Fault Protection System: certified test report.

1.7 CLOSEOUT SUBMITTALS

A. Record actual locations of components and grounding electrodes.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

B. Field testing shall be performed by a third party testing firm with certification from a recognized testing agency, with a minimum of five (5) years of testing experience.

PART 2 - PRODUCTS

2.1 GROUNDING SYSTEM

A. Except as indicated elsewhere, provide materials for electrical grounding system, including, but not limited to, cables, wires, connectors, terminals (solderless lugs) and exothermic welds, grounding rods and electrodes, bonding jumper and braided straps, and other items and accessories required for a complete installation. Where more than one type of material or equipment meets indicated requirements, selection shall be at Contractor's option. Where materials or components are not otherwise indicated, provide products as recommended by the accessories manufacturers and in compliance with the NEC and established industry standards.

B. All grounding materials required shall be furnished new and undamaged in accordance with the requirements of these specifications:

2.2 WIRE

A. Service Equipment Grounding Electrode Conductor: Bare, soft-drawn copper, Class AA stranding, ASTM B 8. Size per NEC Table 250-66, unless otherwise noted.

B. Electrical Equipment Grounding Conductor: Insulated, soft-drawn copper, Class B stranding or solid, with green colored polyvinyl chloride insulation per Section 16123. Size per NEC Article 250-122, unless otherwise noted.

2.3 BUS AND BARS

A. Silver plated, soft copper with cross section not less than 1 square inch per 1,000 ampere rating, but in no case less than 1/4-inch thick by 1-inch wide, ASTM B 187. Rating shall be per the NEC, unless otherwise noted.

2.4 EXOTHERMIC WELD CONNECTIONS

A. Exothermic materials, accessories and tools for preparing and making permanent field connections between grounding system components. Molds, cartridges, materials, and accessories as recommended by the manufacturer of the molds for the items to be welded.

B. Manufacturer:
1. Cadweld (Erico Products) "Exolon" Low Emission. Molds and powder shall be furnished by the same manufacturer.
2. Or Approved Equal.

2.5 MECHANICAL CONNECTORS

A. Mechanical connectors shall be permitted only when exothermic weld connections are not suitable or recommended by the manufacturer.

B. Bolt-on bronze connectors, suitable for grounding and bonding applications in configurations required for the particular installation.

C. Manufacturer
1. Burndy Corp.
2. Anderson
3. Thomas & Betts
4. 3-M Co.
5. Or Approved Equal

2.6 FLUSH GROUND PLATES

A. Cadweld B-162 series, B-164 series, or Approved Equal.

2.7 FLEXIBLE JUMPER STRAP

A. Flexible flat conductor, 480 strands of 30-gauge, bare copper wire; ¾-inch width, 9-1/2-inch-long; 48.25 kcMil, minimum. Protect braid with copper bolt-hole ends with holes sized for 3/8-inch diameter bolts.

2.8 BONDING PLATES, CONNECTIONS, TERMINALS AND CLAMPS

A. Provide electrical bonding plates, connectors, terminals and clamps, and accessories as recommended by the manufacturer for the specific applications. Components shall be high-strength, high-conductivity copper alloy.

2.9 UFER GROUND

A. In accordance with the NEC.

2.10 ROD ELECTRODES

A. Copper-clad steel, 5/8-inch (16 mm) minimum diameter, 10 feet (3,000 mm) long, coupling type unless otherwise noted.

2.11 GROUNDING WELL COMPONENTS

A. Well Pipe: 8 inches NPS (DN200) by maximum 12 inches (300-mm) long, precast concrete or fiberglass pipe with belled end.

B. Well Cover: Cast iron, high impact traffic rated cover with legend "GROUND" embossed on outer face.

2.12 ANCHORS AND FASTENERS

A. Indoor Locations: Epoxy type anchors and heavy-duty, galvanized steel screws and bolts.

B. Outdoor Locations: Epoxy type or Red Head anchor bolts and stainless steel screws and bolts.

2.13 SUPPORT CHANNEL

A. All conduit and electrical equipment support channels for interior, exterior, wet and corrosive areas shall be galvanized steel.

B. Support channels for free standing electrical equipment such as switchgear, switchboard antennas, and motor control centers, shall be:
   1. Indoors: galvanized steel channel and hardware, minimum 12 gauge, ASTM A653 Grade 33 sheet steel, zinc coated by hot dip process.
   2. Outdoors: 316 Stainless steel

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that abandoned wiring and equipment serve only abandoned facilities.

3.2 EXISTING WORK

A. Modify existing grounding system to maintain continuity to accommodate renovations.

B. Extend existing grounding system using materials and methods as specified.

C. Install temporary wiring and connections to maintain existing grounding systems in service during construction.

D. Perform work on energized equipment or circuits with experienced and trained personnel following all safety rules and procedures.

E. Remove, relocate, and extend existing installations to accommodate new construction.

F. Repair adjacent construction and finishes that are damaged during demolition and extension work.

G. Remove exposed and/or abandoned grounding and bonding components, fasteners, supports and electrical identification labels. Cut embedded support elements below surface of walls and floors. Patch surfaces damaged by removal of existing components to match surrounding finishes.

3.3 GROUNDING AND BONDING INSTALLATION:

A. Verify that final backfill and compaction has been completed before driving rod electrodes.

B. Install grounding well with cover at rod locations as indicated. Install well top flush with finished grade.

C. Installation:
1. Remove paint, rust, mill-oils, and surface contaminants at connection points.
2. Install grounding electrode conductor and connect to reinforcing steel in slab or foundation.
3. Bond together metal siding not attached to grounded structure; bond to ground.
4. Bond together reinforcing steel and metal accessories.
5. Connect to site grounding system.
6. Install continuous grounding using underground cold water system and building steel as grounding electrode. Where water piping is not available, provide an artificial station ground by means of driven rods or buried electrodes.
7. Permanently ground entire light and power system in accordance with NEC, including service equipment, distribution panels, lighting panel boards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.

8. Install branch circuits feeding isolated ground receptacles with separate insulated grounding conductor, connected only at isolated ground receptacle, ground terminals, and at ground bus of serving panel in accordance with IEEE 1100.
9. Accomplish grounding of electrical system by installing insulated grounding conductor with each feeder and branch circuit conductor in conduit. Install separate insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing. Size grounding conductor in accordance with the NEC.
10. Install grounding conductor from ground bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes, and metal enclosures of service equipment.
11. Bond all metallic conduits to grounding bus at service panel by means of grounding bushings using minimum No. 12 AWG conductor.
12. Ground electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC. Bond together each metallic raceway, pipe, duct and other metal object entering enclosures and exiting slabs.
13. Permanently bond all equipment, grounding conductors, lightning protection system and grounding system prior to energizing equipment.

3.4 GROUND CONDUCTORS

A. Grounding conductors shall be located and connected as indicated or as required by Code.

B. Ground conductors under buildings or structures shall be buried with at least 6 inches of earth cover. Buried grounding conductors extending beyond the foundations of buildings or structures shall have at least 18 inches of earth cover.

C. Exposed conductors shall be installed inconspicuously in vertical or horizontal positions on supporting structures. When located on irregular supporting surfaces or equipment, the conductors shall run parallel to or normal to dominant surfaces.

D. Conductors routed over concrete, steel, or equipment surfaces shall be kept in close contact with those surfaces by using fasteners located at intervals not to exceed 3 feet.

E. Conductors passing through floor slabs shall be installed in conduit sleeves that extend above the floor slab, a minimum of 1-1/2 inches to provide protection. Sleeves shall be sealed to maintain fireproof integrity.

F. Provide isolated grounding conductor for circuits supplying equipment and systems as indicated.

G. Provide a separate equipment-grounding conductor for low voltage distribution systems, single or three phase feeder circuit and each branch circuit with single or three phase protective devices. Install a grounding conductor in conduit with phase and neutral conductors. Single-phase branch circuits for 120 and 277 volt lighting, receptacles, and motors shall have a phase, neutral, and ground conductors installed in the common conduit. Provide suitable bonding jumpers and approved grounding type bushings for flexible conduits used for equipment connection utilized in conjunction with the above

branch circuits. Single-phase circuits for equipment and all branch circuits installed in non-metallic or flexible conduits shall be provided with a separate grounding conductor.

H. Ground the neutral of separately derived systems with a bare copper conductor, installed in conduit, from the neutral directly to the building interior cold water pipe or nearest solidly grounded structural reinforcing steel, in accordance with the provisions of NEC Article 250-24. Use bolted accessible connections to the ground system so that the neutral ground can be disconnected for test. Ground the system ground conduit as detailed on drawing. Size the grounding electrode conductors in accordance with the NEC, Table 250-66, or as indicated.

3.5 CONNECTIONS

A. All connections shall be made by the exothermic welding process, except where otherwise indicated. The manufacturer's instructions on the use of exothermic welding materials shall be followed in all details. Powder and molds shall be kept dry and warm until use. Worn or damaged molds shall not be used.

B. All surfaces to be joined by the welds shall be thoroughly cleaned. Paint, scale, and other deleterious substances shall be removed from surfaces of ungalvanized structural steel members by grinding. Galvanized steel surfaces shall be cleaned with emery paper.

C. All exothermic welded connections shall successfully resist moderate hammer blows. Any connection which fails such test or which, upon inspection, indicates a porous or deformed weld, shall be remade.

D. All exothermic welds shall encompass 100 percent of the ends of the materials being welded. Welds, which do not meet this requirement, shall be remade.

E. Worn, damaged, incorrectly sized, or improperly shaped molds which, in the opinion of the Owner and/or Engineer, do not make satisfactory welds, shall be removed from the jobsite after being physically rendered inoperable.

F. All contact surfaces of bolted and screwed connections shall be thoroughly cleaned and coated with oxide inhibitor before being securely tightened.

3.6 CONDUIT GROUNDING

A. All grounding bushings within all enclosures, including equipment enclosures, shall be wired together and connected internally to the enclosure grounding lug or grounding bus with a bare copper conductor. Grounding bushings shall be grounded with conductors sized in accordance with NEC, but not smaller than No. 8 AWG.

3.7 EQUIPMENT GROUNDING

A. Comply with NEC 250, except where larger sizes or more conductors are indicated.
   1. All electrical equipment shall be connected to the grounding system with an insulated, green, stranded or solid copper equipment-grounding conductor.

2. Terminate each end on suitable lug, bus, or bushing. The term "electrical equipment", as used in this article, shall include, but not be limited to, all enclosures containing electrical connections or bare conductors, except that individual devices, such as solenoids, pressure switches, and limit switches, shall be exempt from this requirement, unless the device requires grounding for proper operation.
3. Large equipment, such as metal-clad or metal-enclosed switchgear, will be furnished with a grounding bus that shall be connected to the grounding system.
4. Most other equipment will be furnished with grounding pads and/or grounding lugs which shall be connected to the grounding system. All ground connection surfaces shall be cleaned immediately prior to connection.
5. Contractor shall furnish all grounding material required, if not furnished with the equipment.

B. Install equipment grounding system such that all metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment and other conductive items in close proximity with electrical circuits will operate continuously at ground potential and provide a low impedance path for possible ground fault currents.

C. Where grounding system extension stingers are indicated to be provided for connection to electrical equipment, the Contractor shall connect the bare grounding conductor to the equipment ground bus, pad, or lug. Except where otherwise indicated, all equipment ground conductors that are not an integral part of a cable assembly, shall be sized in accordance with the requirements of NEC. All ground conductors installed in conduit shall be insulated.

D. Suitable grounding facilities, acceptable to the Owner, shall be furnished on electrical equipment not so equipped. The grounding facilities shall consist of compression type terminal connectors bolted to the equipment frame or enclosure and providing a minimum of joint resistance.

E. The conduit system is not considered to be a grounding conductor, except for lighting fixtures. No grounding conductor shall be smaller in size than No. 12 AWG, unless it is a part of an acceptable cable assembly.

3.8 GROUND SYSTEM RESISTANCE

A. Ground resistance of the system shall be no greater than five (5) ohms.

3.9 ANCHORS, FASTENERS AND SUPPORT

A. Installation:
1. Locate and install anchors, fasteners, and supports in accordance with NECA “Standard of Installation”.
2. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
3. Do not use spring steel clips and clamps.
4. Do not use powder-actuated anchors.
5. Do not drill or cut structural members.

B. Supports:

1. Fabricate supports from structural steel or formed steel members. Rigidly weld members or install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
2. Install surface-mounted cabinets and panel board with minimum of four (4) anchors.
3. Use steel channel supports to stand cabinets and panel boards one (1) inch off wall.
4. Use sheet metal channel to bridge studs above and below cabinets and panel boards recessed in hollow partitions.

3.10 ACCEPTANCE TESTING

A. Grounding and Bonding: Perform inspections and tests as outlined below (NETA ATS, Section 7.13 – Grounding Systems).
   1. Visual and Mechanical Inspection
      a. Verify ground system is in compliance with drawings and specifications.
      b. Electrical Tests
      c. Perform fall-of-potential test or alternative in accordance with IEEE Standard 81 “IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potential of a Ground System.” on the main grounding electrode or system. Instrumentation utilized shall be as defined in Section 12 of the above guide and shall be specifically designed for ground impedance testing. Provide sufficient spacing so that the plotted curves flatten in the 62% area of the distance between the item under test and the current electrode.
      d. Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.
      e. When sufficient spacing of electrodes per Electrical Tests is impractical, perform ground impedance measurements utilizing either the intersecting curves method or the slope method. (Ref. Nos. 40 and 41 in IEEE Std. 81).
      f. Utilize two-point method of IEEE Std. 81. Measure between equipment ground being tested and known low-impedance grounding electrode or system.
      g. Test shall be performed after a minimum of ten (10) calendar days of dry weather so that the ground is not wet.
   2. Test Values
      a. The resistance between the main grounding electrode and ground shall be greater than five (5) ohms for commercial or industrial systems and one (1) ohm or less for generating or transmission station grounds unless otherwise specified by the Owner. (Reference: ANSI/IEEE Standard 142.) Equipment grounds, depending on size and length of grounding conductor, should be only fractionally higher than system ground.
      b. Investigate point-to-point resistance values which exceed 0.5 ohm.

END OF SECTION 26 05 26

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SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes conduit and tubing, surface and buried raceways, wireways, outlet boxes, pull boxes, junction boxes, hand holes and concrete manholes.

1.2 RELATED SECTIONS

A. Section 16060 - Grounding and Bonding for Electrical Systems

1.3 REFERENCES - CODES AND STANDARDS

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit.

D. ASTM A 48 - Standard Specification for Grey Iron Castings.

E. NECA - Standard of Installation.

F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

G. NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

H. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.

I. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

J. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit.

K. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

L. NEMA TC 6 - Non-Metallic Conduit.

M. NEMA 250 - Enclosures for Electrical Equipment (1,000 Volts Maximum).

N. NFPA 70 - NEC.

O. UL 1 - Flexible Metal Conduit

P. UL 6 - Rigid Metal Conduit

Q. UL 514B - Conduit, Tubing and Cable Fittings.

R. UL 651 - Rigid Non-Metallic Conduit

S. UL 797 - Electrical Metallic Tubing

T. UL 1242 - Intermediate Metal Conduit

1.4 CONDUIT APPLICATION

A. Acceptable raceway systems and their limitations of use are summarized in the following table:

Location	RSC	RNC	EMT	FMC	LFMC
Exterior locations: Wet or subject to physical damage.	Yes	No	No	No	No (note 3)
Exterior locations: Damp and not subject to physical damage.	Yes	No	No	No	Yes
Interior locations: Wet or subject to physical damage.	Yes	No	No	No	No (note 3)
Interior locations: Exposed and not subject to physical damage.	Yes	No	Yes	Yes (note 5)	Yes
Interior locations: Totally concealed.	Yes	No (note 4)	Yes	Yes (note 5)	Yes
Underground:	Yes	Yes	No	No	No

B. Notes for Conduit Application Table:
1. RSC = rigid steel conduit, RNC = rigid nonmetallic conduit, EMT = electrical metallic tubing, FMC = flexible metal conduit, LFMC = liquidtight flexible metal conduit.
2. For the purposes of these specifications, locations subject to physical damage include, but are not limited to, those areas less than 6 feet above the finished floor or grade.
3. Liquidtight flexible metal conduit may also be use in wet or damp, exterior or interior locations not subject to physical damage, where used for flexible equipment connections in lengths not exceeding 3 feet.
4. Rigid nonmetallic conduit may also be used above grade, where totally concealed in walls, for transitions from underground up to a height of 24 inches above the concrete sill.
5. The use of flexible metal conduit is limited to lengths not exceeding 6 feet for flexible connections to equipment and lighting fixtures, or where necessitated by structural obstacles and explicitly approved by the Owner.

1.5 BOX APPLICATION

A. Provide raceway, boxes and manholes located as indicated and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements and for a complete wiring system.

1.6 CONDUIT SIZE

A. Minimum acceptable conduit sizes are summarized in the following table:

	Minimum Size
Underground, site wiring	1”
Underground • Building wiring Aboveground • Equipment or panel feeders • Telecommunications	3/4”
Aboveground • Lighting or branch circuit wiring • Fire alarm • Security	1/2”
Other	3/4”

1.7 SUBMITTALS

A. Detailed conduit routing plan as follows:
1. Exposed and/or concealed in building walls for conduits larger than 2-inch outside diameter.
2. All underground conduits (3/4-inch and larger) in duct bank; concealed in floor slabs, equipment pads and concrete slabs.

B. Product Data:
1. Rigid Steel Conduit.
2. PVC Coated galvanized rigid steel conduit.
3. Intermediate steel conduit.
4. Electrical Metallic Tubing (EMT).
5. Flexible metal conduit.
6. Liquid tight flexible metal conduit.
7. Nonmetallic conduit.
8. Raceway fittings.
9. Conduit bodies.
10. Surface raceway.
11. Pull boxes, junction boxes and manholes.

C. Manufacturer's Installation Instructions:
   1. Submit application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.
   2. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.8 CLOSEOUT SUBMITTALS

A. Project Record Documents:
   1. Record actual routing of conduits.
   2. Record actual locations and mounting heights of outlet, pull boxes, junction boxes and manholes.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

B. Protect PVC and PVC-coated metallic conduit from sunlight.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Galvanized Rigid Steel Conduit (GRSC or RGS), couplings and elbows shall be hot-dip galvanized, rigid mild steel in accordance with ANSI C80.1 and UL 6. The conduit interior and exterior surfaces shall have a continuous zinc coating with a transparent overcoat of enamel, lacquer, or zinc chromate. Conduit shall be formed with continuous welded seams with a uniform wall thickness, in minimum 10-foot lengths, with threaded ends.

B. Intermediate Metal Conduit (IMC). Raceway shall be hot-dip galvanized mild steel in accordance with ANSI C80.6 and UL 1242 and shall bear the UL label. Conduit shall have same characteristics of rigid steel except for thinner wall.

C. Polyvinyl Chloride (PVC) coated galvanized rigid steel conduit and intermediate metal conduit shall be in accordance with NEMA RN 1. Coating shall be applied under controlled factory conditions. Prior to coating, conduit shall meet requirements of ANSI C80.1 and UL 6 or ANSI C80.6 and UL 1242 as appropriate. PVC coated conduits shall have ultra-violet (UV) inhibitor in the coating material.

D. Electrical Metallic Tubing (EMT). Electrical metallic tubing, including elbows and bends, shall be zinc coated, mild steel in accordance with the requirements of ANSI C80.3 and UL 797. The interior and exterior surfaces of the tubing shall have a continuous zinc coating. Conduit shall be formed with a continuous welded seam, with a uniform wall thickness, in minimum 10-foot lengths.

E. Flexible Metal Conduit shall be galvanized steel meeting the requirements of UL 1. Flexible aluminum conduit is not permitted.

F. Liquid-Tight Flexible Metal Conduit shall be plastic-jacketed, galvanized steel, "Sealtite" Type EF for general service areas or Type HC for high-temperature when used under raised floor or in air plenums. Conduit shall be UL listed.

G. Non-Metallic Conduit shall be as follows:
   1. Schedule 40: Conduit shall be 90 degree Celsius, polyvinyl chloride in conformance with NEMA TC-2 and UL 651 requirements.
   2. Spacers used in duct bank installations shall be high impact plastic, interlocking bases, and intermediate type spacers. Place spacers between 6 and 10 feet apart.

H. Rigid aluminum, flexible aluminum, or flexible non-metallic conduits shall not be used on this project.

2.2 RACEWAY FITTINGS

A. Couplings and Thread Protectors. Each length of threaded conduit shall be provided complete from the manufacturer with a coupling on one end and a thread protector on the other. The thread protector shall have sufficient mechanical strength to protect the threads during normal handling and storage.

B. Metal Conduit Fittings shall conform to the requirements of UL 514B where this standard applies. Galvanized iron or galvanized steel fittings shall be used with steel conduit. Threaded fittings shall engage a minimum of five threads made up wrench-tight and be compatible with conduit. EMT fittings shall be compression type, UL approved for rain tight applications and setscrew type with insulated throat for indoor applications.

C. Liquid-Tight Flexible Conduit Fittings shall be galvanized steel, T&B 53XX series insulated throat, and shall bear the UL label. Die-cast malleable fittings are not acceptable.

D. Liquid-Tight Flexible Metal Conduit Fittings shall be galvanized steel similar to T&B “Tite-Bite.”

E. Non-Metallic Conduit Fittings shall be of same material and strength characteristics as the conduit and shall be solvent welded as recommended by manufacturer. End bells shall be plastic, high impact, tapered to fit. Where conduit transition from non-metallic to metallic is required, provide non-metallic female “terminal” adapter. Non-metallic “male” adapters are not acceptable.

F. Special Fittings. Conduit sealing, explosion proof, dust proof, and other types of special fittings shall be provided as required and shall be consistent with the area and equipment with which they are associated. Fittings installed outdoors or in damp locations shall be sealed and gasketed. Outdoor fittings shall be of heavy cast construction. Hazardous area fittings and conduit sealing shall conform to NEC requirements for the area classification.

G. Bushings shall be provided for the termination of all conduits not terminated in hubs, couplings or insulated throat connectors. Grounding type insulated bushings with insulating inserts in metal housings shall be provided for conduit 1-1/4 inches and larger. Standard bushings shall be galvanized steel or malleable iron in all sizes.

H. Locknuts. One interior and one exterior locknut shall be provided for all conduit terminations not provided with threaded hubs and couplings. Locknuts shall be designed to securely bond with the conduit to the box when tightened. Locknuts shall be so constructed that they will not be loosened by vibration.

I. Unions. Watertight conduit unions shall be Appleton or Crouse-Hinds Type UNF or UNY, or Approved Equal.

J. Raintight Conduit terminating hubs, where indicated on the drawings or required by these specifications, shall be Meyer's rigid conduit hubs, or Approved Equal.

2.3 CONDUIT BODIES

A. Malleable iron conduit bodies shall be cast malleable iron with tensile strength meeting ASTM A 48, Class 30A requirements. Malleable conduit bodies shall be finished with an epoxy powder coating. Cover shall be malleable iron with captive screws.

B. All conduit bodies' entrances shall be machined NPT threads with a smooth, rounded, internal conduit stop bushing.

C. All conduit bodies shall be equipped with a sealed and gasketed cover. Cover shall be secured using stainless steel machine screws.

2.4 CONDUIT SUPPORTS

A. Conduit supports shall be furnished and installed in accordance with other section of these specifications. Conduits shall be supported so that fittings are accessible. Support systems shall be limited to electrical conduits only.

B. Hanger rods shall be 3/8-inch diameter galvanized threaded steel rods, minimum. Conduit racks over 18-inch wide, over one level, or supporting 2-inch RSC or larger, shall be 1/2-inch diameter rod minimum.

C. Conduit Clamps. Conduits in single runs or groups of two shall be supported by steel clamps and clamp backs. They shall be galvanized malleable iron or Approved Equal cast ferrous metal for steel conduit or tubing.

D. Support Channels. Supports for banks of three of more conduits shall be constructed of formed steel support channels (Unistrut, Kindorf, Superstrut, B-Line or Approved Equal) with associated conduit or tubing clips. Support channels shall be steel, hot-dip galvanized after fabrication with galvanized steel clips for steel conduit or tubing.

2.5 OUTLET BOXES AND SWITCH BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized flat rolled sheet steel outlet wiring boxes of types, shapes and sizes, including box depths, to suit each respective location and installation; construct with stamped knockouts in back and sides, and with threaded screw holes with corrosion-resistant screws for securing box covers and wiring devices.

B. Outlet boxes used in wet outdoor locations, surface mounted shall be cast metal (FS or FD type) with mounting lugs and gasketed covers.

C. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported, per NEC requirements.

D. Outlet Box Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and meeting requirements of individual wiring situations.

2.6 PULL BOXES, JUNCTION BOXES, HANDHOLES AND MANHOLES

A. Sheet Metal Boxes shall be NEMA OS 1, NEMA rating as indicated. Minimum 16 gauge galvanized steel construction with stainless steel hinged cover and neoprene gasket. Cover shall be secured to the body with a continuous, full length, piano type hinge and stainless steel pin on one side and captive screw on the other side. Door shall be equipped with padlock hasp with sealing hole provisions.
1. Provide #10-32 tapped hole provisions for optional ground lug kit.
2. Provide 0.375-16 collar studs for mounting optional panel.
3. Provide external mounting feet for secure wall mounting.
4. Finish: Wash and phosphate undercoat with ANSI 61 gray polyester power finish.

B. Surface-Mounted Cast Metal Box: NEMA 250, NEMA Type 3R or 4 as indicated, flat-flanged, surface- mounted junction box:
1. Material: Cast Iron.
2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

C. Concrete pull boxes, vaults and hand holes for power, lighting, controls and telecommunications shall be pre-cast concrete boxes, sized as indicated. Pull boxes shall be equipped with a concrete cover for non traffic rated locations, or cast-in frame, galvanized steel, adjustable, high impact traffic cover (H-20 load rated), sump, lifting lugs, and conduit knock-outs as indicated. Knockout location and sizes shall be coordinated with the duct bank for each location. Cover shall be engraved with the words - – “POWER,” “LIGHTING,” “CONTROLS,” COMM/DATA,” “TELEPHONE” or similar as applicable.

D. Concrete manholes and/or pull boxes for buried power (MH-P-xx) and control (MH-C-xx) conduits shall be either cast-in-place or pre-cast concrete vault.
1. Size shall be indicated.
2. Pull boxes, Vaults and Manholes shall be equipped with:
    a. Galvanized steel covers for non-traffic rated locations and cast-in frame, galvanized steel, adjustable, high impact traffic cover (H-20 load rated) for traffic rated locations.
    b. Sump, lifting lugs, conduit knock-outs, pick holes, bolt down holes in cover plate, and pull irons. Knockout location and sizes shall be coordinated with the duct bank for each location. Hot-dip galvanized cable racks shall be provided as required to support the cables in the pull box. Cover shall be engraved with the words “POWER,” “LIGHTING,” or “CONTROLS” as applicable.

2.7 CLOSURE FOAM

A. All conduit, raceways, cables and sleeves penetrations through fire rated and hazardous location walls, shafts, floor, ceilings, etc., shall be sealed by closure foam as in Dow Corning #3-6548 silicone RTV, GE RTV 850 silicone foam, or Approved Equal.

2.8 SEALING AND FIREPROOFING

A. Penetrations. All conduits, raceways, cables and sleeve penetrations through fire rated and hazardous location walls, shafts, floor, ceilings, etc., shall be sealed with a UL-approved fire stopping system.

B. Furnish UL listed products or products tested by a nationally recognized independent testing laboratory. Select products with rating not less than the rating of the wall, ceiling or floor being penetrated.

C. Manufacturers:
1. 3M CP 25WB + Caulk
2. 3M FS 195 wrap or strip with restricting collar
3. 3M CS 195 composite sheets
4. Proset Systems fire rated floor and wall penetrations
5. Dow Corning Fire Stop System

D. Use stamped steel, chrome plated, hinged, split ring escutcheons or floor/ceiling plates for covering openings in occupied areas where conduit is exposed.

E. In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the conduit and the cored opening or a water-stop type wall sleeve.

F. At non-rated interior wall or floor openings use Tremco Fyre-Sil, Sika Corp. Sikaflex Ia, Sonneborn Sonolastic NPT, or Mameco Vulkem 116 urethane caulk or Approved Equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify outlet locations and routing and termination locations of raceway prior to rough in.

3.2 EXISTING WORK

A. Extend existing raceway and box installations using materials and methods compatible with existing electrical installations, or as specified.

B. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.3 INSTALLATION OF RACEWAYS

A. Routing

1. Install raceway and boxes in accordance with NECA “Standard of Installation.”
2. Conduit routing is diagrammatic only. Contractor shall field route conduit and raceways between equipment and devices as required to obtain a complete wiring system.
3. All exposed conduits shall be installed parallel or perpendicular to dominant surfaces with right-angle turns made of symmetrical bends or fittings.
4. Conduit shall not be installed on the outside face of exposed columns, but shall be routed on the web or on the inside of a flange of the column.
5. Except where prevented by the location of other work, a single conduit or a conduit group shall be centered on structural members.
6. Conduit shall be located at least 6 inches from hot water or steam pipes and from other hot surfaces

B. Moisture Pockets
1. Moisture pockets shall be eliminated from conduits. If water cannot drain to the natural opening in the conduit system, a hole shall be drilled in the bottom of a pull box or a "C-type" conduit fitting provided in the low point of the conduit run.

C. Couplings and Unions
1. Metal conduit shall be joined by threaded conduit couplings, with the conduit ends butted.
2. The use of running threads, Erickson type couplings, split couplings or similar unions are not permitted.

D. Conduit Bodies
1. Conduit bends shall meet the requirements of NEC, minimum bend radius of the cable installed or as indicated, whichever is greater.
2. Conduits or tubing deformed or crushed in any way shall be removed from the Site.

E. Bends and Offsets
1. Changes in direction of conduits shall be made with fittings or bends.
2. Conduit bends shall meet the requirements of NEC, minimum bend radius of the cable installed or as indicated, whichever is greater.
3. Bends shall be made using appropriate tools or mechanical equipment. The use of a pipe tee or vise for bending conduit or tubing will not be permitted.
4. For non-metallic conduit or plastic coated steel, approved factory bends and offsets shall be used.
5. Conduits or tubing deformed or crushed in any way shall be removed from the Site.
6. Install no more than the equivalent of three 90 degree bends between boxes or outlets

F. Cutting and Threading
1. The plane of all conduit ends shall be square with the centerline.
2. Where threads are required, they shall be cut and cleaned prior to conduit reaming.
3. The ends of all conduit and tubing shall be reamed to remove all rough edges and burrs.
4. Cutting oil shall be used in threading operations; the dies shall be kept sharp, and provisions shall be made for chip clearance.

5. Threads on conduits and fittings shall be lubricated with conducting and sealing compound.
6. All steel conduits shall be coated after threading with cold-galvanized zinc coating. The Contractor shall furnish this protective material and shall apply it in the field prior to installing conduit or fittings.

G. All steel conduit, exposed to weather or in contact with earth, shall be re-galvanized after threading with "Galvanizing Powder M-321" as manufactured by the American Solder and Flux Company of Philadelphia, Pennsylvania; "Zincilate 810" as manufactured by Industrial Metal Protectives, Inc., of Dayton, Ohio; "Zinc Rich" coating as manufactured by ZRC Chemical Products Company, Quincy, Massachusetts; or Approved Equal. The Contractor shall furnish this protective material and shall apply it in the field.

H. Connections to Boxes and Cabinets
1. Conduit shall be securely fastened to all boxes and cabinets.
2. Threads on metallic conduit shall project through the wall of the box to allow the bushing to butt against the end of the conduit.
3. The locknuts, both inside and outside, shall then be tightened sufficiently to bond the conduit securely to the box.
4. Locknuts on connectors shall be tightened securely to bond the connectors.

I. All conduits entering enclosures outdoors or in wet areas shall enter through Meyer's hubs, or Approved Equal, or threaded openings.

J. Cleaning
1. Precautions shall be taken to prevent the accumulation of water, dirt, or concrete in the conduit.
2. Conduit in which water or other foreign materials have been permitted to accumulate shall be thoroughly cleaned or, where such accumulation cannot be removed by methods acceptable to the Owner, the conduit shall be replaced.
3. For conduits sizes 3 inches and larger, draw a flexible testing mandrel approximately 12 inches long with a diameter less than the inside diameter of the conduit through the conduit. After which, draw a stiff bristle brush through until conduit is clear of particles of foreign materials. For conduits less than 3 inches, draw a stiff bristle brush through until conduit is clear of particles and foreign material.

K. Empty Conduit
1. All conduits installed for future use shall have a polypropylene pull line with a minimum tensile strength of 200 lbs., Jet Line, Cat. No. 232, polyolefin, or Approved Equal. Pull line shall be secures at both ends to ensure future accessibility.

L. Rooftop Conduits
1. Provide redwood sleepers on waterproof mastic base for all conduit runs exposed on roofs.

M. Identification
1. All conduits shall be identified in accordance with other section of these specifications.

N. Grounding
   1. All conduits shall be grounded in accordance with specification Section 16060.
   2. A solid or stranded bare copper or green insulated copper solid or stranded ground wire shall be provided in all conduits and raceways.

O. Galvanized Rigid Steel Conduit
   1. Galvanized rigid steel conduit shall be installed in areas exposed to weather, vehicle traffic, in hazardous classified areas, for penetrations through foundations, and 10 feet before transition from below grade to 8 feet above grade, unless otherwise indicated.
   2. Steel conduit in contact with earth shall be protected by "Scotchwrap" 10 mil tape applied in double thickness using 50 percent lap turns to 6 inches above grade and 6 inches beyond transition.
   3. Expansion joints shall be used where required.

P. Intermediate Steel Conduit
   1. Intermediate steel conduit may be installed in lieu of galvanized rigid steel conduit in all above ground areas where rigid steel conduit is permitted, except for wires over 600- volts, unless otherwise specified.

Q. Polyvinyl Chloride (PVC) Coated Galvanized Rigid Steel Conduits and Intermediate Steel Conduit
   1. PVC -coated, steel conduit and fittings shall be installed where highly corrosive conditions exist, indoors or outdoors.
   2. The Contractor shall patch any damaged coating according to the manufacturer's instructions.

R. Electrical Metallic Tubing
   1. Electrical metallic tubing shall be installed for all circuits, indoors above concrete slab, where not subject to conditions outlined for rigid galvanized steel conduits.

S. Rigid Aluminum Conduit
   1. Not acceptable.

T. Flexible Metal Conduit, Steel
   1. Flexible conduit inserts not greater than 30 inches in length, shall be installed in all conduit runs, which are supported by both building steel and by structures subject to vibration or thermal expansion. This shall include locations where conduit supported by building steel enters or becomes supported by isolated structures on separate foundations.
   2. Flexible conduit shall be installed in conduit runs, which cross expansion joints.
   3. Special areas, such as plant office control rooms in which external noise is to be minimized, shall have flexible conduit in conduit runs where the runs cross from the main building framing to the control room or office framing.
   4. Flexible conduit shall be installed adjacent to all equipment and devices, which move in relation to the supply conduit due to vibration, normal operation of the mechanism, or thermal expansion.

5. Conduit shall be connected to pressure switches, thermocouples, solenoids, and similar devices with flexible conduit. Flexible conduit shall be installed adjacent to the motor terminal housing for motors requiring 4-inch and smaller conduit.
6. Flexible metal conduit inserts not greater than 6 feet in length shall be installed for light fixture tap conductors.

U. Liquid-Tight Flexible Metal Conduit
1. Liquid-tight flexible metal conduit shall be used in place of regular flexible conduit for connections to motors and transformers, in areas exposed to weather, moisture or oil, and under raised floors.
2. Liquid-tight flexible metal conduit may be used in place of flexible metal conduit where not otherwise required.

V. Non-Metallic Conduit
1. Schedule 80 shall be used for all power, signal feeders and branch circuits, in earth under roadways. Conduits must be buried in earth in accordance with the NEC.
2. Schedule 40 shall be used for all other power, signal feeders and branch circuits, in earth or enclosed in concrete, unless otherwise noted on the drawings. Conduits must be buried in earth in accordance with the NEC.

W. Conduit Support
1. Fasten conduit supports to building structures and surfaces in accordance with these specifications.
2. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
3. Do not use wire, ceiling support wires or perforated pipe straps to support conduit. Remove any temporary installation support wire.

X. Spacing of Supports
1. All conduit runs shall be rigidly supported, except where buried in concrete,.
2. Each conduit shall be supported within one (1) foot of junction boxes and fittings.
3. Spacers used in duct bank installations shall be placed no more than 6 to 10 feet apart.
4. Support spacing along conduit runs shall be as follows.

Conduit Size	Maximum Distance Between Supports
½ inch through 1-1/4 inch	5 feet
1-1/2 inch and larger	8 feet

Y. Ground and bond raceway and boxes in accordance with Section 16060.

3.4 CABINET AND BOX INSTALLATION

A. Install electrical boxes as indicated, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

B. Locate boxes and conduit bodies so as to ensure ready accessibility of electrical wiring, maintain headroom and to present neat mechanical appearance.

C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only. In inaccessible ceiling areas, install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices with each other.

E. Use flush mounting outlet boxes in finished areas.
   1. Do not install flush mounting boxes back-to-back in walls.
   2. Provide minimum 6-inch separation between adjacent boxes.
   3. Provide minimum 24-inch separation in acoustic rated walls.
   4. Use stamped steel bridges to fasten flush mounting outlet box between studs.
   5. Secure flush mounting box to interior wall and partition studs.
   6. Accurately position to allow for surface finish thickness.
   7. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
   8. Use adjustable steel channel fasteners for hung ceiling outlet box.

F. Support boxes independently of conduits.

G. Use code sized gang box where more than one device is mounted together. Do not use sectional box. Use code sized gang box with plaster ring for single device outlets.

H. Use cast outlet box in exterior locations where exposed to the weather and wet locations (interior or exterior).

I. Coordinate installation of electrical boxes and fittings with cable and raceway installation work. Provide knockout closures to cap unused knockout holes where blanks have been removed.

J. Avoid using round boxes where conduit must enter box through side of box, which would result in difficult and insecure connections where fastened with a locknut or bushing on rounded surface.

K. Fasten boxes rigidly to substrate or structural surfaces to which they are being mounted, or solidly embed electrical boxes in concrete or masonry as appropriate.

L. Except as prevented by the location of other work, all junction boxes and outlet boxes shall be centered on structures.

M. Conduit openings in boxes shall be made with a hole saw or shall be punched.

N. Cabinets and boxes shall be rigidly mounted.
   1. Mounting on concrete shall be secured by self-drilling anchors.
   2. Mounting on steel shall be by drilled and tapped screw holes, or by special support channels welded to the steel, or by both.
   3. Cabinets shall be leveled and fastened to the mounting surface with not less than ¼-inch air space between the enclosure and mounting surface.
   4. All mounting holes in the enclosure shall be used.

O. Large Pull Boxes - Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.
   1. Interior Dry Locations - Use hinged enclosure.
   2. Other Locations - Use surface mounted box of appropriate location classification.

3.5 ANCHORS

A. Where supports for raceways, boxes, and cabinets are mounted on concrete surfaces, they shall be fastened with self-drilling tubular expansion shell anchors with externally split expansion shells, single-cone expanders, and annular break-off grooved chucking cones. Anchors shall be Phillips "Red Head" or Approved Equal.

3.6 SEALING AND FIREPROOFING

A. Fire-Rated Surface:
   1. Where conduit penetrates fire rated surface, install fire-stopping product in accordance with manufacturer's published instructions.
   2. All openings through fire rated wall, floor, ceiling or roof must be sealed.
   3. Install galvanized sheet metal sleeves (minimum 12-gage) through opening and extending beyond minimum of one (1) inch on each side of building element.
   4. Pack void between sleeve and building element with backing material.
   5. Seal ends of sleeve with UL listed fire-resistive silicone compound to meet fire rating of structure penetrated.

B. Non-Rated Surfaces:
   1. Opening through a non-fire rated wall, floor, ceiling or roof must be sealed using an approved type of material.
   2. Use galvanized sheet metal sleeves in hollow wall penetrations to provide a backing for the sealant. Grout area around sleeve in masonry construction.
   3. Install escutcheons or floor/ceiling plates where raceway, penetrates non-fire rated surfaces in occupied spaces.
   4. Install rubber links of mechanical seal tightened in place and sized for the pipe, in exterior wall openings below grade, in accordance with the manufacturer's instructions.
   5. All pipe penetrations at interior partitions and/or walls, laboratory spaces, telephone, data and communication rooms and similar spaces where the room pressure or odor transmission must be controlled, shall be sealed. Sealant shall be applied to both sides of the penetration in such a manner that the annular space between the pipe sleeve and the pipe is completely filled.

3.7 PULL BOX AND VAULT INSTALLATION

A. Openings or "knockouts" in precast concrete vaults shall be located as indicated and shall be sized sufficiently to permit passage of the largest dimension of pipe and/or flange.

B. After the structure and all appurtenances are in place and approved, backfill shall be placed to the original ground line or to the limits indicated.

C. All joints between precast concrete vault sections shall be made watertight. The plastic joint sealing compound shall be installed according to the manufacturer's recommendations to provide a watertight joint which remains impermeable throughout the design life of the structure. The outside of the entire structure shall be coated with an approved water proofing material.

D. Access doors shall be built up such that the hatch is flush with the surrounding surface unless otherwise indicated or directed by the Owner. The Contractor is responsible for placing the cover at the proper elevation where paving is to be installed and shall make all necessary adjustments so that the cover meets these requirements.

E. Ladders shall be installed using Type 316 stainless steel capsule anchors.

F. Ladders shall be attached a minimum of 3 places to the vault wall.

G. Ladder shall be centered under access door opening.

3.8 ADJUSTING

A. Install knockout closures in unused openings in boxes.

3.9 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

B. Clean exposed surfaces and restore manufacturer’s finish.

END OF SECTION 26 05 33

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SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. The extent of the electrical systems and equipment requiring identification is indicated, and the extent of identification required is specified herein and in individual sections of Work requiring identification. The types of electrical identification specified in this section include the following:
   1. Exposed conduit color banding.
   2. Buried cable warnings.
   3. Cable/conductor identification.
   4. Operational instructions and warnings.
   5. Danger signs.
   6. Equipment/system identification signs.

1.2 REFERENCES - CODES AND STANDARDS

A. ANSI Z535.1 - Safety Color Code

B. APWA ULCC - Uniform Color Code for Buried Utilities

C. NFPA 70 - NEC

1.3 SYSTEM DESCRIPTION

A. Label the following electrical equipment with nameplates which clearly identify each item, the function or use of the item, and the circuit identification of the feed to the item:
   1. All transformers shall be identified by 1-inch high block letters cut in stencil and applied with yellow paint on a flat-black background. The transformer number, primary and secondary voltages, and the kVA shall be shown. The nameplate shall be located on the front of the transformer.
   2. All Metal-Clad Switchgear, Metal-Enclosed Switchgear, Switchboards, Distribution Panelboards, Power and Lighting Panels, Motor Control Centers, Local Control Panels, Terminal Cabinets and all electrical equipment enclosure shall be identified using laminated plastic nameplates. Show the equipment number, voltage rating, current rating, number of phases, connection type, short circuit interrupting rating, and circuit number
   3. Identify all receptacles and lighting switches, by the circuit number indicated using ¼-inch high white characters on ½-inch wide black stick-on tape placed on the wall directly above the device if the device is wall mounted. Place the tape on the device enclosure if the device is not wall mounted.
   4. All motors, starters, disconnect switches, Time Switches, Special Function Pushbuttons and Switches, and miscellaneous control devices shall be identified by function and circuit number, with ¼-inch high white characters on a ½-inch wide black stick-on tape where installed indoors and engraved plastic nameplates where installed outdoors.

5. All underground raceway or cable shall be marked with buried warning tape along its entire length.
6. All exposed raceway longer than 10 feet in length shall be identified.
7. Panelboard Directories: Furnish all panelboards with a complete 8-1/2-inch by 11-inch typewritten directory mounted in the inner door under a clear plastic cover set in a metal frame.

B. Branch circuits and devices:
1. Label all individual receptacle outlets at the outlet faceplate to indicate the panelboard of origin and branch circuit number. Label modular furniture feeds at the power pole drop in a visible and consistent location. Labels shall be self adhesive, thermal machine printed type such as Brothers, Panduit, T&B, or Approved Equal and shall be clear plastic with black lettering.
2. All branch circuits in outlet boxes shall be identified with circuit number using wrap-around labels (T&B, BRADY, 3M, or Approved Equal).
3. As an alternative to separate nameplates, device plates may be engraved directly with lettering filled with black enamel.

1.4 SUBMITTALS

A. Product Data: nameplates, labels, and markers.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70 – NEC.

B. Furnish products listed and classified by UL, ETL, or other recognized, approved testing and listing agencies as suitable for the purpose specified and shown.

PART 2 - PRODUCTS

2.1 NAMEPLATES AND LABELS

A. Nameplates
1. Engraved, three layer laminated plastic, white letters on black background for normal power and white letters on red background for emergency power. Communications and control cabinets shall be labeled with white letters on green background.
2. Locations
   a. Each electrical distribution and control equipment enclosure.
   b. Communication cabinets.
   c. Motor control centers, including each combination module.
3. Letter Size
   a. Use 1/2-inch letters for identifying individual equipment and loads.
   b. Use ¼-inch letters for identifying grouped equipment, loads, panelboards, and transfer switch.

c. Use ½-inch letters for identifying the main switchboard, motor control centers, and large distribution switchboards.

B. Labels
1. Embossed adhesive tape, with 3/16-inch white letters on colored background to match color scheme of plastic laminate labels in 2.1.A. Use only for identification of individual wall switches and receptacles, control device stations, and multi-outlet devices.
2. Thickness
a. 1/16-inch for units up to 20 square inches or 8-inch length; 1/8-inch for larger units.

2.2 WIRE MARKERS

A. Manufacturers
1. Brady
2. Thomas & Betts
3. 3-M Co.
4. Or Approved Equal

B. Description: Tape, split sleeve, or tubing type wire markers, self-adhesive.

C. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, control panels, motor controllers and starters, and each load connection.

D. Legend
1. Power and Lighting Circuits: Branch circuit or feeder number indicated.
2. Control Circuits: Control wire number indicated on shop drawings.
3. Neutral Conductors: Clearly indicate the branch circuit or feeder number the neutral serves. In multi-wire circuits where the neutral is shared, mark the neutral with the circuit number of the “A” phase.

2.3 CONDUIT MARKERS

A. Provide manufacturer's standard preprinted, flexible or semi-rigid, permanent, plastic-sheet conduit markers, minimum of 3 mils thick and 1-1/2-inch wide extending 360 degrees around conduits; designed for self-adhesive attachment to conduit. Except as otherwise indicated, provide lettering that indicates the voltage of the conductor(s) in the conduit. Provide 8-inch minimum length for 2-inch and smaller conduit, 12-inch minimum length for larger conduit.

B. Identify conduits containing conductors above 600-volts with the following alternating markers
1. DANGER - HIGH VOLTAGE
2. The voltage, as applicable (i.e. – 12-kV, 4.16-kV, etc.)

C. Identify conduits containing conductors below 600-volts with the following markers
1. The voltage, as applicable (i.e. 480-Volts, 240-Volts, etc.)

D. Location: Furnish markers for each conduit longer than 10 feet.

E. Spacing: 20 feet on center.

F. Color: Unless otherwise indicated or required by governing regulation, provide conduit tags in the following colors.
   1. Normal and Emergency Power Systems: Orange w/black letters.
   2. Fire Alarm System: Red w/black letters.
   3. Telephone System: Green w/yellow letters.
   4. Data/Communication. System: White w/black letters.

G. Legend:
   1. 480 Volt System: Normal 480Y/277-volts.
   2. 208 Volt System: Normal 208Y/120-volts.
   3. Fire Alarm System: Fire alarm.
   4. Telephone System: Telephone.
   5. Data/Communication System: Data/Communications.

2.4 FASTENERS

A. Secure all labels and nameplates with self-tapping stainless steel screws. Use contact type permanent adhesive where screws cannot or should not penetrate the substrate.

2.5 BAKED ENAMEL DANGER SIGNS

A. Provide manufacturer's standard "DANGER" signs of baked enamel finish on 20 gage steel; of standard red, black and white graphics; 14-inch by 10-inch size except where 10-inch by 7-inch is the largest size which can be applied where needed, and except where larger size is needed for adequate vision; with recognized standard explanation wording (e.g. HIGH VOLTAGE, KEEP AWAY, BURIED CABLE, DO NOT TOUCH SWITCH).
   1. At each entry doors of Electrical Rooms: “DANGER HIGH VOLTAGE – KEEP OUT, AUTHORIZED PERSONNEL ONLY”

2.6 LETTERING AND GRAPHICS

A. Coordinate names, abbreviations and other designations used in the electrical identification Work, with the corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of the electrical systems and equipment.

2.7 UNDERGROUND WARNING TAPE

A. Three-inch minimum width, 5 mil thickness, foil bonded polyethylene tape, detectable type, with suitable continuous warning legend describing buried electrical lines. Tape color shall conform to APWA uniform color code using ANSI Z535.1 safety colors. Text shall be black, 2-inch minimum letters.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

B. Coordination: Where identification is to be applied to surfaces that require finish, install identification after completion of painting.

C. Regulations: Comply with governing regulations and the requests of governing authorities for the identification of electrical Work.

3.2 APPLICATION

A. Install nameplate and label parallel to equipment lines.

B. Secure nameplate to equipment front using screws, rivets, or adhesive.

C. Secure nameplate to outside moveable surface of door on panelboard.

D. Conduit Identification:
   1. Where electrical conduit is exposed in spaces with exposed mechanical piping, which is identified by a color-coded method, apply color-coded identification on the electrical conduit in a manner similar to the piping identification. Except as otherwise indicated, use orange as the coded color for conduit.
   2. Paint red band or provide red tape on each fire alarm conduit longer than 10 feet, minimum 20 feet on center.

E. Cable/Conductor Identification:
   1. Apply cable/conductor identification on each cable and conductor in each box/enclosure/cabinet where the wires of more than one circuit or communication/signal system are present, except where another form of identification (such as color-coded conductors) is provided.
   2. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project electrical Work.

F. Operational Identification and Warnings
   1. Wherever reasonably required to ensure safe and efficient operation and maintenance of the electrical systems, and electrically connected mechanical systems and general systems and equipment, including the prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices and covers of electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for the intended purposes.

G. Danger Signs

1. In addition to the installation of danger signs required by governing regulations and authorities, install appropriate danger signs at the locations indicated and at locations subsequently identified by the Installer of electrical Work as constituting similar dangers for persons in or about the project.
2. High Voltage
   a. Install danger signs wherever it is possible, under any circumstances, for persons to come into contact with electrical power of voltages higher than 110-120 volts.
   b. Critical Switches/Controls
   c. Install danger signs on switches and similar controls, regardless of whether concealed or locked up, where untimely or inadvertent operation (by anyone) could result in significant danger to persons, or damage to or loss of property.

H. Equipment/System Identification Signs
1. Install an engraved plastic-laminate sign on each major unit of electrical equipment in the building; including the central or master unit of each electrical system and the communication/signal systems, unless the unit is specified with its own self-explanatory identification or signal system.
2. Except as otherwise indicated or specified, provide single line of test, ½-inch high lettering on 1-1/2-inch high sign (2-inch high where two lines are required), white lettering in black field.
3. Provide text matching terminology and numbering of the shop drawings.
4. Provide signs for each unit of the following categories of electrical Work
   a. Major electrical switchboard
   b. Electrical substation
   c. Motor control center
   d. Fire alarm control panel and annunciators.
   e. Data / communications

I. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrata with fasteners, except use adhesive where fasteners should not or cannot penetrate the substrata.

J. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches below finished grade.

END OF SECTION 26 05 53

SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Remote control lighting relays.
2. Lighting contactors.
3. Switches.
4. Switch plates.
5. Occupancy sensors.
6. Photo control module.
7. Wireless control devices
8. Lighting control network devices

B. Lighting control scheme:
1. Office Spaces:
   a. Vacancy sensing control (manual on / auto off) with daylight sensing and continuous dimming in response to daylight conditions.
2. Conference Rooms:
   a. General fixtures: Vacancy sensing control (manual on / auto off) with daylight sensing and continuous dimming in response to daylight conditions.
   b. Specialty fixtures: Local On/Off Control with timeclock override of decorative and/or specialty fixtures. Dimming control for specialty fixtures with incandescent, fluorescent, or LED lamping.
3. Lobby and other Public spaces:
   a. General fixtures: Vacancy sensing control (manual on / auto off) with daylight sensing and continuous dimming in response to daylight conditions.
   b. Specialty fixtures: Local On/Off Control with timeclock override of decorative and/or specialty fixtures. Dimming control for specialty fixtures with incandescent, fluorescent, or LED lamping.
4. Garage Space:
   a. Manual on, timeclock off with 1 hour afterhours override.
   b. Continuous dimming of general high bay lighting in response to daylight conditions.
5. Other Spaces:
   a. Wall and /or ceiling occupancy sensors connected for bi-level control with appropriate power packs and wiring.
   b. In rooms with exterior windows: Daylight sensing to override lighting levels when outside light is present, including continuous dimming of all LED and fluorescent fixtures
6. Exterior Lighting:
   a. Timeclock control with photocell override
   b. Initial settings will allow for exterior lighting to turn on at Dusk, off at 10:00 PM, on at 5:00 AM and off at Dawn.

1.2 RELATED SECTIONS

A. Section 16050 - Common Work Results for Electrical

B. Section 16500 - Lighting

1.3 REFERENCES

A. ASHRAE 90.1 2007 - Energy Standard for Buildings Except Low-Rise Residential Buildings

B. IECC 2003

C. Federal Communications Commission:
1. Standard for Radio Frequency Equipment.

D. Government Electronics and Information Technology Association:
1. EIA 709.1 - Control Network Protocol Specification.

E. National Electrical Manufacturers Association:
1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
2. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
3. NEMA FU 1 - Low Voltage Cartridge Fuses.
4. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contractors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
5. NEMA ICS 4 - Industrial Control and Systems: Terminal Blocks.
6. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
7. NEMA ICS 6 - Industrial Control and Systems: Enclosures.
8. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

F. National Fire Protection Association:
1. NFPA 70 - National Electrical Code.
2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

G. Underwriters Laboratories Inc.:
1. UL 50 - Enclosures for Electrical Equipment.
2. UL 67 - Panelboards.
3. UL 508 - Industrial Control Equipment.
4. UL 916 - Energy Management Equipment.

1.4 SYSTEM DESCRIPTION

A. Centralized control and switching control using digitally programmable panel mounted lighting relay controls for exterior lighting control.

B. Occupancy sensors for lighting and area exhaust fan control applications.

C. Distributed controls for local dimming and day-lighting control using a programmable digital network interface for office and other areas as noted on the drawings.

1.5 SUBMITTALS

A. Provide submittals for the following:
   1. Lighting control panels including:
      a. Cabinets, enclosures, covers, & trim.
      b. Contactors & relays.
      c. Transformers, and power supplies.
      d. Automation, intelligence, communication, and building EMS interface cards.
      e. Photo-control package.
      f. Dataline and low-voltage switches.
      g. Network interface modules.
      h. Control & programming software.
      i. Low-voltage, dataline, and network cabling.
   2. Occupancy sensors and power packs
   3. Classroom digital dimming/day-lighting control system

B. Provide three copies of manufacturer's system documentation including:
   1. Reflected ceiling plans showing each occupancy and daylighting sensor location.
   2. System one-line showing all panels, number and type of switches and sensors, dataline, telephone override modules, and central PC.
   3. Drawings for each panel showing hardware configuration and numbering.
   4. Panel wiring schedules, relay grouping, and channel assignments.
   5. Typical wiring diagrams and mounting details for each component.

C. Certify that the products meet the product specifications and local energy codes. If any additional equipment is required to meet the coverage patterns or local energy codes, the provide the additional equipment at no cost to the Owner.

1.6 QUALITY ASSURANCE

A. Comply with NEC, NEMA, and FCC Emission requirements for Class A applications.

B. UL Approvals: Relay panels and accessory devices are to be UL listed under UL 916 Energy Management Equipment. Configured to order or custom relay panels shall be UL Listed under UL 508, Industrial Control Panels.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept components on Site in manufacturer's packaging. Inspect for damage.

B. Protect components by storing in manufacturer's containers indoor protected from weather.

1.8 EXTENDED WARRANTY

A. Provide a four year extended warranty for all system components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Typical Devices - Watt Stopper, Lutron, or Approved Equal:
   1. Low voltage Dataline Switch: Wattstopper HLDS2SS
   2. Wall sensor switch, 1-circuit, line voltage, passive IR: Watt-Stopper # DW-100.
   3. Wall sensor switch, 2-circuit, line voltage, passive IR: Watt-Stopper # DW-200.
   4. Ceiling sensor, line voltage, 360° coverage, dual-technology: Watt-Stopper #DT-355.
   5. Ceiling sensor, low voltage, 360° coverage, dual-technology, for use with power-pack: Watt Stopper #DT-300.
   6. Wall sensor, low voltage, 2000 SF coverage, dual-technology, for use with power-pack: Watt Stopper #DT-200 with mud ring adapter.
   7. Power pack, 2-circuit: Watt-Stopper #LC-100.
   8. Wireless Low voltage Dimmer (120V required at each switch location): Lutron Pico PJ-3BRL-GWH-T01
   9. Wireless Ceiling Sensor: Lutron Radio Powr Savr LRF2-OCR2B-P-WH
   10. Wireless Daylight Sensor: Lutron Radio Powr Savr LRF2-DCRB-WH
   11. Wireless Receiver / Room Controller: Lutron PowPak with Ecosystem RMJ-ECO32-DV-B

B. Lighting Relay Control Panel (For Common and Exterior Lighting Control):
   1. Watt Stopper Lighting Integrator or Approved Equal

2.2 MATERIALS

A. Wall Sensors: Provide products as follows:
   1. Capable of detection of occupancy at desktop level up to 300 sq. ft. and gross motion up to 1000 sq. ft.
   2. Accommodate loads from 0 to 800 watts at 120 volts and 0 to 1200 watts at 277 volts and have 180 degree coverage capability.
   3. Utilize Zero Crossing Circuitry which increases relay life of sensor and increases sensor's longevity.
   4. No leakage current to load, in manual or in Auto/Off mode, for safety purposes.
   5. Have voltage drop protection.

B. Passive Infrared Sensors: Provide products as follows:
   1. Utilize custom ASIC specifically designed for PIR sensors which provides high immunity to false triggering from RFI (walkie talkies) and EMI (electrical noise on the line), superior performance, and greater reliability.
   2. Have a multiple segmented Fresnel lens, in a multiple-tier configuration, with grooves-in to eliminate dust and residue buildup.
   3. Where specified, passive infrared and dual technology sensors shall offer daylighting foot-candle adjustment control and be able to accommodate dual level lighting.

C. Dual Technology Sensors: Provide products as follows:
   1. Corner-mounted to avoid detection outside the controlled area when doors are left open.
   2. Consisting of passive infrared and ultrasonic technologies for occupancy detection.

D. Sensors: Provide products as follows:
   1. Capable of operating normally with electronic ballasts, PL lamp systems, and rated motor loads.
   2. Coverage: Remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.
   3. Readily accessible, user adjustable controls for time delay and sensitivity. Controls shall be recessed to limit tampering.
   4. Provide a bypass manual override on each sensor in the event of failure. When bypass is utilized, lighting shall remain on constantly until sensor is replaced. Control shall be recessed to prevent tampering.
   5. Ultrasonic Operating Frequency: Crystal controlled to within plus or minus 0.005 percent tolerance to assure reliable performance and eliminate sensor cross-talk.
      a. Sensors using multiple frequencies are not acceptable.
   6. Provide a method of indication to verify that motion is being detected during testing and that the unit is working.
   7. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed, and Common outputs for use with HVAC control, Data Logging, and other control options.
      a. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.

2.3 CIRCUIT CONTROL HARDWARE

A. Control Units:
   1. Externally mount control unit through a 1/2-inch knockout on a standard electrical enclosure for ease of mounting, installation, and future service.
   2. Provide an integrated, self-contained unit consisting internally of an isolated load switching control relay and a transformer to provide low-voltage power.
   3. Provide power to a minimum of 2 sensors from each control unit.

B. Relay Contacts: Provide ratings as follows:
   1. 13A - 120 VAC Tungsten.
   2. 20A - 120 VAC Ballast.
   3. 20A - 277 VAC Ballast.

2.4 CONTROL WIRING

A. Control Wiring Between room controller and ecosystem ballasts / drivers: Class II, 18-24 AWG, stranded UL Classified, PVC insulated or TEFLON jacketed cable installed in conduit.

2.5 ENCLOSURES

A. Sensors: UL rated, 94V-0 plastic enclosures.

2.6 LIGHTING RELAY CONTROL PANEL (FOR COMMON AND EXTERIOR LIGHTING CONTROL):

A. Lighting Relay System: Watt Stopper Lighting Integrator, Control panel with quantity of relays as indicated on the drawings,(4) four pole contactors and all devices and programming necessary for a fully functional system and as indicated elsewhere, including:
   1. Photo Control Module
   2. Automation Card for interface of connected devices
   3. Network Clock Programmer for programming
   4. Universal Switch Interface module (1 per lighting control panel)
   5. Building Management System BMS interface module

B. Provide an automated lighting control system, consisting of relay panel assemblies; programmable intelligence cards; power supplies; networked time-switch; low voltage switches; photocell; and all associated data and low voltage control cabling as depicted on the Drawings and as specified herein.

C. Lighting Control Panels shall be UL listed and consist of the following:
   1. Enclosure/Tub: NEMA 1, NEMA 3R, or NEMA 4 as indicated on the drawings, sized to accept an interior with 1-8 relays, 1-24 relays and six (6) four pole contactors, or 1-48 relays with six (6) four pole contactors.
   2. Cover: Surface or Flush as required, hinged, and lockable and with restricted access to line voltage section.
   3. Interior: Barrier included for separation of high voltage (class 1) and low voltage (class 2) wiring. The interior shall include intelligence boards, power supply, mechanically latched control relays and multi-pole contactors. The interiors will include the following features:
      a. Screwless, removable, plug-in connections for all low voltage terminations.
      b. Each relay shall be capable of individual ON/OFF control by a low voltage switch and/or occupancy sensor input.
      c. The system shall monitor true relay status; the relay status will be displayed at the onboard pilot LED and monitored by the system electronics.
      d. Stagger the ON and OFF sequence of the relays.
      e. Heavy Duty Relays – Mechanically latching contacts with single moving part design for improved reliability. Relays to have the following characteristics:
      f. 30 amp NEMA 410 electronic ballast rated and 20 amp tungsten, rated for 50,000 ON/OFF cycles at full load, Support #12 - #14 AWG solid or stranded wire and rated for 120, and 277 volts; 20 amp NEMA 410 electronic ballast rated and 20 amp tungsten 347 volts.
      g. 30 VAC isolated contacts for status feedback and pilot light indication.
      h. 14,000 amp short circuit current rating.
      i. Contactors shall be DIN rail mounted, four pole standard, normally open or normally closed, electrically held with 120 or 277 volt coil voltage to match panel control power voltage. Contactors shall be compatible with all lighting, ballast and HID loads and be rated for 277 volt 20 amp tungsten and 600 volt 30 amp ballast loads.
   4. Power Supply: Multi-voltage transformer assembly with enough power to supply all electronics, occupancy sensors, dataline switches, pilot lights, and photocells as

necessary to meet the project requirements. Power supply to have internal over-current protection with automatic reset and metal oxide varistor protection.

5. Only one of either the Networked Timeclock or Building Management Interface module will actually be installed and configured in the panel. Provide both items and convey the uninstalled module back to the Owner in the original packaging.

D. RELAY PANEL - Group, Channel and Pattern Control
   1. Provide a Group Switching card (GS) that allows simple group and pattern configuration at the panel without requiring handheld devices or special programming tools. The GS shall allow any group of relays within the panel to be associated (smartwired) to a channel button using the following procedure:
      a. Press and hold the group pushbutton for several seconds. The group LED and the LEDs for relays currently controlled by that input will begin to flash.
      b. Select the relays to be controlled. The LED for each relay smartwired to the channel selected will be flashing ON/OFF. Press the associated relay control button to add/delete that relay to/from the group.
      c. Press the group pushbutton again. The LEDs will stop flashing and the group pushbutton and associated switch inputs will now control the relays selected.
   2. Group Status: Each group pushbutton shall include an LED status indication. The LED will be ON whenever all of the relays within the group are ON; and shall go OFF when all of the relays within the group go OFF. The LED will be green when in a “mixed” state. Each channel shall also have an associated dry contact closure and pilot contact which tracks the LED operation described above.
   3. Hardware Features
      a. Each GS card will support up to eight groups (channels). The 8-relay and 24-relay panels shall support one GS card; the 48 relay panels will support two cards.
      b. Individual relays may be assigned to more than one channel, and the channel status will be annunciated appropriately.
      c. Each channel shall also have an input for connecting switch or dry contacts for controlling a channel. Inputs shall accept 2 or 3-wire, maintained or momentary inputs, or a 24 VDC signal from occupancy sensor or other voltage signaling device. Groups may be controlled by: an on-board group pushbutton switch, low voltage switch, dataline switch, occupancy sensor, photocell, or time of day.
      d. Screwless, removable, plug-in terminals will be provided for all low voltage wiring connections.

E. RELAY PANEL - AUTOMATION PANEL NETWORKING AND DATALINE SWITCH SUPPORT
   1. An automation control card provides a non-proprietary network for communications between the intelligent field devices, panels, BMS Module, and Photocontrol Module.
      a. The modules in multiple panels shall be linked over a single dataline that uses a digital network protocol for communications.
      b. The dataline shall extend from the lighting control panel and provide a single communications bus to allow dataline switches and other intelligent field devices to communicate with the panels.
      c. Dataline communications wire shall be 18 AWG, 4 unshielded copper conductors (two independent twisted pairs) meeting Class 2P NEC code requirements. The dataline can be run in a loop, serial, or star configuration.

F. BUILDING MANAGEMENT SYSTEM INTERFACE
1. The BMS module shall provide an occupied/unoccupied signal to all networked relay panels by using dry contact closures from any automation system. The module will also provide the blink warning signal, time delay feature and all necessary requirements for ASHRAE 90.1, IECC 2003 as well as state and local energy codes required for this project.
2. The BMS module accepts timing signals from another system, and does not provide its own scheduling; it shall include a unique egress delay option for each group to allow time for occupants to clear the area before lighting is turned OFF.
3. Features
   a. 2 line LCD display with simple data entry for each of eight channels.
   b. User-selectable intelligent scenarios to handle standard lighting control functions for each channel independently, including:
      1) Schedule ON / Schedule OFF
      2) Manual ON / Schedule OFF
   c. Automatically detects the presence of the eight channel Photocontrol Module on the dataline and adds the Dark scenarios to the menus, accepting actual light level readings for the following scenarios:
      1) Dark ON / Dark OFF
      2) Dark ON / Schedule OFF
   d. User-selectable egress delay up to 240 minutes (4 hours) to allow safe exit after channel status changes to Unoccupied.
   e. Isolated, single-pole input contact for each channel, user-definable with choice of Occupied = Open or Occupied = Closed.
   f. 24 VAC, 1 amp status output contacts, user-definable with choice of closed contact = Any ON, All ON, All OFF, Any OFF.

2.7 DIGITAL NETWORK CLOCK

A. The lighting control system shall include a digital clock module capable of system wide automation of the lighting control on a scheduled basis. The clock shall provide capability for independent schedules for each of the eight system wide channel groups.

B. The clock shall support all of the energy saving features required of ASHRAE 90.1, IECC 2003, as well as all state and local energy codes.

C. The clock module shall provide astronomic capabilities, time delays, blink warning, daylight savings, and holiday functions and will include a battery back up for the clock function and EEPROM for program retention. Clocks that require multiple events to meet local code lighting shut off requirements shall not be allowed.

D. The clock shall operate on a basis of unique pre-configured control scenarios. Scenarios shall include:
1. Scheduled ON / OFF
2. Manual ON / Scheduled OFF
3. Manual ON / Auto Sweep OFF (for AS-100 Switches)
4. Astro ON / OFF (or Photo ON / OFF)
5. Astro and Schedule ON / OFF (or Photo and Schedule ON / OFF)

E. The clock shall include system diagnostic functions to identify and verify communication with intelligent field devices anywhere on the network dataline,

F. The clock module shall function as a dataline switch programming tool and allow the assignment of relays and channel groups to dataline switch buttons.

G. The user interface shall incorporate an 8-line, 22-character per line LCD display and a simple pushbutton interface with on line help feature

H. The clock module shall employ non volatile memory and shall retains user programming and time for a minimum of 10 years.

I. Provide DIN rail mounting for the clock programmer in the Class 2 section of the lighting control panels

2.8 PHOTO CONTROL MODULE

A. Provide a weatherproof Class 2 photocell for measuring exterior light levels. The photocell shall be mounted facing north as indicated on the plans. The photocell shall be connected to a photocontrol module mounted on the DIN rail inside the low voltage section of a lighting control panel and connected to the dataline communications wire.

B. The photocontrol Module shall integrate seamlessly with either the Network Clock, Automation Appliance, or the BMS Interface Module. The control module shall measure the actual exterior light and display this level in foot candles (fc) on the unit LCD display.

C. The controller shall have eight individual set point adjustments that are available to the lighting control network over the dataline communications wire.

D. Features
1. Real time, 2 line LCD display of actual exterior light level up to 200 fc.
2. Channel set points and parameters programmed via the Network Clock or BMS Interface Module.
3. Choice of OPERATE or TEST modes, with simulated light level for testing.
4. Automatic dead band and 5 minute time delay to avoid cycling

2.9 DATALINE

A. The Dataline wire will be supplied by the equipment manufacturer and will include the manufacturers name, catalog number and length of wire printed on the wire jacket. The contractor, at their own expense will, replace an improper dataline wire.

2.10 EMERGENCY LIGHTING RELAY

A. The Emergency Lighting Relay shall be a Wattstopper ELCU-100 or Approved Equal. The relay shall be connected to sense the on/off status and control emergency fixtures similar to fixtures in the vicinity. Additional emergency lighting relays shall be provided as necessary to accommodate additional zones of control.

PART 3 - EXECUTION

3.1 GENERAL

A. Install all lighting control system and device wiring in conduit. Install the lighting control system conduit, wiring, and accessories in accordance with the requirements of Sections 16050 and 16500.

B. Installation
   1. Softwired Switches and/or photocells shall be mounted in the spaces as indicated on the Reflected Ceiling Plans. Each low voltage wire shall be labeled clearly indicating which relay panel it connects to. Use only properly color coded, stranded #18 AWG (or larger) wire as indicated on the drawings or as recommended by the manufacturer. All relays and switches shall be tested after installation to confirm proper operation and the loads recorded on the directory card in each panel.
   2. The relay panels shall be mounted in electrical closets as indicated on the drawings. The numbered relays in the panel shall be wired to control the power to each load as indicated on the Panel Wiring Schedules included in the drawings. All power wiring will be identified with the circuit breaker number controlling the load. If multiple circuit breaker panels are feeding into a relay panel, wires shall clearly indicate the originating panel's designation.

C. Refer to the Drawings, particularly the architectural elevations and reflected ceiling plans, in determining the exact mounting location and height for switches, sensors, cabinets, and accessories.

3.2 SUPPORTS AND BLOCKING

A. Provide supports and blocking for cabinets that will provide support independent of suspended ceilings, ceiling or wall surfaces.

B. Provide blocking and back-boxes for wall switches and ceiling sensors.

3.3 AUTOMATIC LIGHTING CONTROLS SYSTEM STARTUP

A. Manufacturer shall provide a factory authorized technician to confirm proper installation and operation the system components including testing of all system components and operation and initial programming

B. The startup requirement is intended to verify:
   1. That all sensors are located, installed, and adjusted as intended by the factory and the contract documents.
   2. The occupancy sensors and daylighting sensors are operating within the manufacturers specifications.
   3. The sensors and relay panels interact as a complete and operational system to meet the design intent.

C. Manufacturer to provide a written statement verifying that the system meets the above requirements.

3.4 TRAINING

A. Provide factory authorized technician to train owner personnel in the operation, programming and maintenance of the lighting control system including all occupancy sensors and daylighting controls.

B. User training shall consist of four hours of on-site training of Owner designated personnel.

3.5 PROGRAMMING

A. Provide system programming by manufacturer including:
   1. Wiring documentation.
   2. Switch operation.
   3. Operating schedules.

B. These shall be provided on CD-ROM compatible with the central PC's Lighting Control Program.

END OF SECTION 26 09 23

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SECTION 26 22 00 – LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Two-winding transformers.
2. Shielded transformers.
3. Autotransformers.
4. Buck-and-boost transformers.

B. Related Requirements:
1. Section 03 30 00 - Cast-In-Place Concrete: Housekeeping pads.
2. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
3. Section 26 05 29 - Hangers and Supports for Electrical Systems.
4. Section 26 05 33 - Raceway and Boxes for Electrical Systems.
5. Section 26 05 53 - Identification for Electrical Systems.
6. Section 26 22 03 - Low-Voltage Transformers For Nonlinear Loads.
7. Section 26 22 06 - Low-Voltage Transformer Load Centers.

1.2 REFERENCE STANDARDS

A. National Electrical Manufacturers Association:
1. NEMA ST 1 - Specialty Transformers (Except General Purpose Type).
2. NEMA ST 20 - Dry Type Transformers for General Applications.

B. International Electrical Testing Association:
1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.

C. Test and Evaluation Reports: Indicate loss data, efficiency at 25, 50, 75 and 100 percent rated load, and sound level.

D. Source Quality Control Submittals: Indicate results of [shop] [factory] tests and inspections.

E. Field Quality Control Submittals: Indicate results of Contractor furnished tests and inspections.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Record Documentation: Record actual locations of transformers.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years [documented] experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

PART 2 - PRODUCTS

2.1 TWO-WINDING TRANSFORMERS

A. Manufacturers:
1. <Click here to find, evaluate, and insert list of manufacturers from SpecAgent>.
2. Substitutions: [Section 01 60 00 - Product Requirements {01600 - Product Requirements}] [Not Permitted].

****** [OR] ******

3. No substitutions permitted.

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Description: NEMA ST 20, factory-assembled, air-cooled, dry type transformers [, ratings as indicated on Drawings].

D. Operation:
1. Primary Voltage: [480 volts, 3 phase] <_____>.
2. Secondary Voltage: [208Y/120 volts, 3 phase] <_____>.
3. Insulation system and average winding temperature rise for rated kVA as follows:
4. 1-15 kVA: Class 185 with [80] [115] degrees C rise.
5. 16-500 kVA: Class 220 with [80] [115] [150] degrees C rise.

6. Case temperature: Do not exceed [35] <_____> degrees C rise above ambient at warmest point at full load.
7. Winding Taps:
   a. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.
   b. Transformers 15 kVA and Larger: NEMA ST 20.
8. Sound Levels: [NEMA ST 20.] [Maximum sound levels are as follows:]
   c. 1-5 kVA: <_____> dB.
   d. 6-25 kVA: <_____> dB.
   e. 26-150 kVA: <_____> dB.
   f. 151-225 kVA: <_____> dB.
   g. 226-300 kVA: <_____> dB.
   h. 301-500 kVA: <_____> dB.
9. Basic Impulse Level: [10 kV] [10 kV for transformers less than 300 kVA, 30 kV for transformers 300 kVA and larger].
10. Mounting:
    i. 1-15 kVA: Suitable for wall mounting.
    j. 16-75 kVA: Suitable for [**wall**] [**, floor**] [**, or**] [**trapeze**] mounting.
    k. Larger than 75 kVA: Suitable for [**floor**] [**or**] [**trapeze**] mounting.

E. Materials:
   1. Ground core and coil assembly to enclosure by means of visible flexible copper grounding strap.
   2. Coil Conductors: Continuous [copper] [aluminum] windings with terminations brazed or welded.
   3. Enclosure: NEMA ST 20, [Type 1] [Type 3R [ventilated] [non-ventilated]]. Furnish lifting eyes or brackets.

F. Fabrication:
   1. Isolate core and coil from enclosure using vibration-absorbing mounts.
   2. Nameplate: Include transformer connection data [and overload capacity based on rated allowable temperature rise].

1.2 SHIELDED TRANSFORMERS

G. Manufacturers:
   1. <Click here to find, evaluate, and insert list of manufacturers from SpecAgent>.
   2. Substitutions: [Section 01 60 00 - Product Requirements {01600 - Product Requirements}] [Not Permitted].
   3. No substitutions permitted.

****** [OR] ******

H. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

I. Description: NEMA ST 20, factory-assembled, air-cooled, dry type shielded isolation transformers [, ratings as indicated on Drawings].

J. Operation:
1. Primary Voltage: [480 volts, 3 phase] <_____>.
2. Secondary Voltage: [208Y/120 volts, 3 phase] <_____>.
3. Insulation system and average winding temperature rise for rated kVA as follows:
   a. 10-15 kVA: Class 185 with 115 degrees C rise.
   b. 16-500 kVA: Class 220 with 150 degrees C rise.
4. Case temperature: Do not exceed [50] <_____> degrees C rise above ambient at warmest point at full load.
5. Winding Taps:
   a. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.
   b. Transformers 15 kVA and Larger: NEMA ST 20.
6. Sound Levels: [NEMA ST 20.] [Maximum sound levels are as follows:]
   a. 1-5 kVA: <_____> dB.
   b. 6-25 kVA: <_____> dB.
   c. 26-150 kVA: <_____> dB.
   d. 151-225 kVA: <_____> dB.
   e. 226-300 kVA: <_____> dB.
   f. 301-500 kVA: <_____> dB.
7. Basic Impulse Level: [10 kV] [10 kV for transformers less than 300 kVA, 30 kV for transformers 300 kVA and larger].
8. Winding Shield: Electrostatic, with separate insulated grounding connection.
9. Mounting:
   a. 1-15 kVA: Suitable for wall mounting.
   b. 16-75 kVA: Suitable for [wall] [, floor] [, or] [trapeze] mounting.
   c. Larger than 75 kVA: Suitable for [floor] [or] [trapeze] mounting.

K. Materials:
1. Ground core and coil assembly to enclosure with visible flexible copper grounding strap.
2. Coil Conductors: Continuous [copper] [aluminum] windings with terminations brazed or welded.
3. Enclosure: NEMA ST 20, [Type 1] [Type 3R [ventilated] [non-ventilated]]. Furnish lifting eyes or brackets.

L. Fabrication:
1. Isolate core and coil from enclosure using vibration-absorbing mounts.
2. Nameplate: Include transformer connection data.

2.2 AUTOTRANSFORMERS

A. Manufacturers:
1. <Click here to find, evaluate, and insert list of manufacturers from SpecAgent>.
2. Substitutions: [Section 01 60 00 - Product Requirements {01600 - Product Requirements}] [Not Permitted].
3. No substitutions permitted.

****** [OR] ******

4. No substitutions permitted.

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Description: NEMA ST 20, factory-assembled, air-cooled, dry type autotransformers [, ratings as indicated on Drawings].

D. Operation:
1. Primary Voltage: [480 volts, 3 phase] <_____>.
2. Secondary Voltage: [208Y/120 volts, 3 phase] <_____>.
3. Insulation system and average winding temperature rise for rated kVA as follows:
   a. 10-15 kVA: Class 185 with 115 degrees C rise.
   b. 16-500 kVA: Class 220 with 150 degrees C rise.
4. Case temperature: Do not exceed [35] <_____> degrees C rise above ambient at warmest point at full load.
5. Winding Taps:
   a. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.
   b. Transformers 15 kVA and Larger: NEMA ST 20.
6. Sound Levels: [NEMA ST 20.] [Maximum sound levels are as follows:]
   a. 1-5 kVA: <_____> dB.
   b. 6-25 kVA: <_____> dB.
   c. 26-150 kVA: <_____> dB.
   d. 151-225 kVA: <_____> dB.
   e. 226-300 kVA: <_____> dB.
   f. 301-500 kVA: <_____> dB.
7. Use three-legged core construction.
8. Mounting:
   a. 1-15 kVA: Suitable for wall mounting.
   b. 16-75 kVA: Suitable for [wall] [, floor] [, or] [trapeze] mounting.
   c. Larger than 75 kVA: Suitable for [floor] [or] [trapeze] mounting.

E. Materials:
1. Ground core and coil assembly to enclosure by means of visible flexible copper grounding strap.
2. Coil Conductors: Continuous [copper] [aluminum] windings with terminations brazed or welded.
3. Enclosure: NEMA ST 20, [Type 1] [Type 3R [ventilated] [non-ventilated]]. Furnish lifting eyes or brackets.

F. Fabrication:
1. Isolate core and coil from enclosure using vibration-absorbing mounts.
2. Nameplate: Include transformer connection data.

1.3 BUCK-AND-BOOST TRANSFORMERS

A. Manufacturers:

1. <Click here to find, evaluate, and insert list of manufacturers from SpecAgent>.
2. Substitutions: [**Section 01 60 00 - Product Requirements {01600 - Product Requirements}**] [**Not Permitted**].

3. No substitutions permitted.

****** [OR] ******

4. No substitutions permitted.

****** [OR] ******

G. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

H. Description: NEMA ST 1, factory-assembled, dry type two winding buck and boost transformers [, ratings as indicated on Drawings].

I. Operation:
1. Insulation system and average winding temperature rise for rated kVA as follows:
   a. 0.25-2 kVA: Class 185 with 80 degrees C rise.
   b. 3-7.5 kVA: Class 220 with [80] [115] degrees C rise.
2. Primary Voltage: 120 x 240 volts, single phase.
3. Secondary Voltage: [12/24] [16/32] volts.

J. Materials:
1. Coil Conductors: [copper] [aluminum] Continuous windings.
2. Lugs: Suitable for terminating conductors sized for full load ampacity of transformer unit when operating in buck-and-boost configuration shown.
3. Enclosure: NEMA ST 1, Type 1.

K. Fabrication:
   a. Isolate core and coil from enclosure using vibration-absorbing mounts.
   b. Nameplate: Include transformer connection data.

2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Production test each unit according to NEMA ST20.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify mounting supports are properly sized and located including concealed bracing in walls.

3.2 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Provide concrete pads under provisions of Section 03 30 00.

3.3 DEMOLITION

A. Disconnect and remove abandoned transformers.

B. Maintain access and adequate ventilation to existing transformers and other installations remaining active and requiring access and ventilation. Modify installation or provide access panel or ventilation grilles.

3.4 INSTALLATION

A. Set transformer plumb and level.

B. Use flexible conduit, in accordance with Section 26 05 33, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

C. Support transformers in accordance with Section 26 05 29.
   1. Mount wall-mounted transformers using integral flanges or accessory brackets furnished by manufacturer.
   2. Mount floor-mounted transformers on vibration isolating pads suitable for isolating transformer noise from building structure.
   3. Mount trapeze-mounted transformers as indicated on Drawings.

D. Provide seismic restraints.

E. Install grounding and bonding in accordance with Section 26 05 26.

3.5 [REPAIR] [RESTORATION]

A. Repair existing transformers to remain or to be reinstalled.

3.6 FIELD QUALITY CONTROL

A. Section [01 40 00 - Quality Requirements] Requirements for inspecting and testing.

****** [OR] ******

B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Inspect and test in accordance with NETA ATS, except Section 4.

D. Perform inspections and tests listed in NETA ATS, Section 7.2.1.

3.7 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Measure primary and secondary voltages and make appropriate tap adjustments.

3.8 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. Clean existing transformers to remain or to be reinstalled.

END OF SECTION 26 22 00

SECTION 26 24 13 - SWITCHBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes main distribution switchboard.

1.2 REFERENCES - CODES AND STANDARDS

A. ANSI C12.1 - Code for Electricity Metering.

B. ANSI C39.1 - Electrical Analog Indicating Instruments.

C. ANSI C57.13 - Instrument Transformers.

D. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

E. NEMA ICS 6 - Enclosures

F. NEMA AB 1 - Molded Case Circuit Breakers.

G. NEMA PB 2 - Dead Front Distribution Switchboards.

H. NEMA PB 2.1 - Proper Handling, Installation, Operation and Maintenance of Dead front Switchboards Rated 600 Volts or less.

I. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

J. NFPA 70 - National Electrical Code, latest edition

1.3 CONTRACTOR SUBMITTALS

A. Shop Drawings:
   1. Provide front and side views of enclosures, with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars for each phase, neutral, and ground; and switchboard instrument details.
   2. Provide detailed drawings of the Utility Cable Entrance Compartment, Main Circuit Breaker Compartment, Instrument transformer and Revenue Metering compartment per EUSERC standards that meet Utility Company requirements.
   3. Submit Utility Cable Entrance, Instrument Transformer and Metering Compartment drawings to Utility Company for review and approval prior to release for fabrication and construction.
   4. Submit calculations and enclosure pad-mount anchoring method (anchor bolt size, embedment, and assembly details) to meet California Seismic Zone 4 requirements.

B. Product Data: Submit electrical characteristics, including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of equipment and components.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations, configurations, and ratings of switchboards and their components on single line diagrams and plan layouts.

B. Operation and Maintenance Data: Submit spare parts data listing, source and current prices of replacement parts and supplies, and recommended maintenance procedures and intervals.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five (5) years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver in convenient shipping splits, individually wrapped for protection and mounted on shipping skids.

B. Accept switchboard on site. Inspect for damage.

C. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic. Keep equipment warm with temporary electric heaters to prevent condensation during storage.

D. Handle in accordance with NEMA PB 2.1. Lift only with lugs provided. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Conform to NEMA PB 2 service conditions during and after installation of switchboards.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.1 DISTRIBUTION OR SERVICE ENTRANCE SWITCHBOARD

A. MANUFACTURERS
1. Cutler-Hammer.
2. General Electric Co.
3. Siemens
4. Square D Co.
5. Or Approved equal

B. Product Description: NEMA 3R enclosed switchboard with electrical ratings and configurations as indicated on Drawings. Switchboard shall be designed and appropriate for use in a heavy-duty industrial area.

C. Construction
   1. Enclosure: The switchboard enclosure shall be NEMA 3R construction as follows:
      a. Steel support frame with body stiffeners for added strength and minimum 12 gauge steel panels all around.
      b. Steel panels shall have seams that are continuously welded and ground smooth with no holes or knockouts.
      c. Provide continuous external support channels for floor mounting, leveling and anchoring the assembly.
      d. Provide heavy duty removable lifting angles and/or lugs.
      e. Provide suitable grounding stud on door and body.
      f. Provide adequate cable entry space and conduit fittings approved for top or bottom conduit entry as indicated on the drawings}
   2. The switchboard shall be constructed in compartmented vertical sections fabricated of steel and assembled to provide a rigid self-supporting structure.

D. Main Bus:
   1. Voltage and current rating shall be as indicated on the drawings.
   2. Material: Insulated Copper with tin plating, standard size. Provide minimum 1,000 ampere per square inch copper bus density.
   3. Connections: Bolted, accessible from front only for maintenance.

E. Neutral Bus: Extend length of switchboard. Current rating shall be minimum 50 percent of the man bus rating.

F. Ground Bus: Extend length of switchboard. Current rating shall be minimum 50 percent of the main bus rating.

G. Pull Section (if required by Utility): Top or Bottom feed, integral with metering section, as indicated on Drawings, and in accordance with Utility requirements.

H. Line and Load Terminations: Accessible from front only of switchboard, suitable for conductor materials and sizes as indicated on Drawings.

I. Utility Metering Compartment: Furnish metering transformer compartment for Utility Company’s use, in accordance with EUSERC requirements. Provide 7 or 13 jaw meter sockets as required by the Utility Co.

J. Future Provisions: Fully equipped spaces for future devices with bussing and bus connections insulated and braced for short circuit currents.

K. Align sections at front and rear.

L. Finish for NEMA 1 Construction: Manufacturer’s standard light gray enamel over external surfaces. Coat internal surfaces with a minimum of one coat of corrosion-resistant paint, or plate with cadmium or zinc.

2.2 MOLDED CASE CIRCUIT BREAKER

A. Description: Molded-case circuit breaker rated for 100% of its listed current. Circuit breaker shall be rated for use as service equipment as described in NFPA 70.

B. Provide Handle Lock and provisions for padlocking the circuit breaker in open position.

2.3 SOURCE QUALITY CONTROL

A. Furnish shop inspection and testing in accordance with NEMA PB 2.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surface is suitable for switchboard installation.

3.2 INSTALLATION

A. Install in accordance with NEMA PB 2.1.

B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

C. Install engraved plastic nameplates in accordance with Section 16050.

D. Install breaker circuit directory.

E. Ground and bond switchboards in accordance with Section 16050.

3.3 FIELD QUALITY CONTROL

A. In accordance with Division 1 Requirements.

B. Perform inspections and tests listed in NETA ATS Section 7.1 for Switchgear and Switchboard Assemblies, as follows:
   1. Visual and mechanical inspection
      a. Compare equipment nameplate data with drawings and specifications.
      b. Inspect physical, electrical, and mechanical condition.
      c. Confirm correct application of manufacturer’s recommended lubricants.
      d. Verify appropriate anchorage, required area clearances, physical damage, and correct alignment.
      e. Inspect all door panels, and sections for paint, dents, scratches, fit, and missing hardware.
      f. Verify that fuses and/or circuit breaker sizes and types correspond to drawings.
      g. Verify that current and voltage (potential) transformer ratios correspond to drawings.
      h. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer’s published data or NETA ATS Table 10.12.

i. Confirm correct operation and sequencing of electrical and mechanical interlock systems.
   1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
j. Clean Switchgear.
k. Inspect insulators for evidence of physical damage or contaminated surfaces.
l. Exercise all active components.
m. Verify that filters are in place and /or vents are clear

2. Electrical Tests
   a. Perform ground-resistance testing accordance with NETA ATS Section 7-13.
   b. Perform resistance tests through all bus joints with a low-resistance ohmmeter. Any joints that cannot be directly measured due to permanently installed insulation wrap shall be indirectly measured from closest accessible connection.
3. Test Values
   a. Compare bus connection resistance to values of similar connections.
   b. Bolt-torque levels shall be in accordance with NETA ATS Table 10.12 unless otherwise specified by manufacturer.

C. Check phase rotation of all connected loads prior to removal of existing equipment and after new equipment is installed.

3.4 ADJUSTING

A. Tighten bolted bus connections.

3.5 CLEANING

A. Touch up scratched or marred surfaces to match original finish.

END OF SECTION 26 24 13

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SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes distribution and branch circuit panelboards and circuit breakers.

1.2 REFERENCES - CODES AND STANDARDS

A. ANSI C2 - National Electrical Safety Code.

B. NECA - Standard of Installation

C. NEMA AB 1 - Molded Case Circuit Breakers.

D. NEMA ICS 6 - Enclosures

E. NEMA PB 1 - Panelboards.

F. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

G. NETA ATS - (National Electrical Testing Association) - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems

H. NFPA 70 - NEC

1.3 SUBMITTALS

A. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

B. Product Data: Submit catalog data showing specified features of standard products.

C. Test Report:
   1. Factory Tests:
      a. Certified factory test reports shall be submitted for manufacturer performed routine factory tests, including tests required by standards listed in Section 1.2. Results of factory tests performed shall be certified by the manufacturer, or an approved testing laboratory, and submitted within 7 days following successful completion of the tests. The manufacturer’s pass-fail criteria for tests specified in Section 3.3 shall be included.

D. Installation, Operation, and Maintenance Manuals: Submit spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.4 EXTRA MATERIALS

A. Furnish two (2) of each panel board key. Panelboards keyed alike to Owner's current keying system.

PART 2 - PRODUCTS

2.1 DISTRIBUTION AND BRANCH CIRCUIT PANELBOARDS

A. Manufacturers:
1. Allen Bradley
2. Cutler Hammer
3. General Electric Co.
4. Siemens.
5. Square D Co.
6. Or Approved Equal.

B. Product Description
1. NEMA PB 1, circuit breaker type distribution, lighting and appliance branch circuit panelboard.

C. Service Conditions:
1. Temperature: 104 degrees F (40 degrees C) ambient
2. Altitude: 100 feet (35 m) above sea level.

D. Panelboard Bus
1. Silver plated copper current carrying components, ratings as indicated on drawings.
2. Main bus ampacity shall be equal to the main circuit breaker frame size rating.
3. Furnish copper ground bus in each panelboard.

E. Minimum integrated short circuit rating
1. Panelboards rated 240-Volts - 10,000 amperes RMS symmetrical
2. Panelboards rated 480-Volts - 42,000 amperes RMS symmetrical
3. Circuit Breaker rating shall match or exceed the panel interrupting rating
4. Series rated circuit breakers are not acceptable

F. Enclosure:
1. Indoor Installation:
   a. NEMA PB 1, Type 1, gasketed, steel construction, minimum 6 inches deep, 20 inches wide suitable for flush or surface mounting as indicated on drawings.
   b. Flush or surface cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike. Finish in manufacturer's standard gray enamel.
   c. Fully hinged door with flush lock and metal directory frame.
   d. Finished in manufacturer's standard gray enamel (ANSI 61).
2. Outdoor Installation:
   a. Panel shall be housed inside an outer weatherproof, corrosion resistant, NEMA 4X, 316 stainless steel enclosure constructed as follows:

b. Steel support frame with body stiffeners for added strength and minimum 12 gauge 316 stainless steel panels all around.
c. Steel panels shall have seams that are continuously welded and ground smooth with no holes or knockouts.
d. The outer door shall provide two-door protection, isolation of electrical equipment and easy access to the interior section doors and devices.
e. Provide rolled lip around three sides of each outer door and along the top of enclosure opening to channel away liquids and contaminants.
f. Provide oil-resistant door gasket attached with oil resistant adhesive and held in place with steel retaining strips.
g. Provide heavy gauge steel continuous piano hinged, 3-point latch, hasp and staple for pad-locking.
h. Provide continuous external support channels for floor mounting, leveling and anchoring the assembly.
i. Provide heavy duty removable lifting angles and/or lugs.
j. Provide suitable grounding stud on door and body.
k. Provide adequate cable entry space and conduit fittings approved for NEMA Type 4X enclosure for top or bottom conduit entry as indicated on the drawings.
l. Provide space heaters with thermostat control in each section to prevent condensation.

2.2 MOLDED CASE CIRCUIT BREAKERS

A. NEMA AB 1, bolt-on type thermal magnetic and instantaneous magnetic trip circuit breaker. Circuit breaker thermal elements shall be of the bimetallic type and shall be capable of withstanding sustained overload and short-circuit currents without injury and without affecting the calibration of the bimetallic element. The thermal element shall have inverse time characteristics. The instantaneous elements shall trip the circuit breaker at the minimum standard trip setting.

B. Provide common trip handle for multiple pole circuit breakers.

C. Provide type SWD for lighting circuits and type HACR circuit breakers for air conditioning equipment circuits.

D. Provide Class A ground fault interrupter circuit breakers as indicated on drawings.

E. Trip rating shall be as indicated on drawings.

F. Minimum integrated short circuit rating
1. Circuit Breakers rated 240-Volts - 10,000 amperes RMS symmetrical
2. Circuit Breakers rated 480-Volts - 42,000 amperes RMS symmetrical
3. Circuit Breaker rating shall match or exceed the panel interrupting rating
4. Series rated breakers are not acceptable

PART 3 - EXECUTION

3.1 EXISTING WORK

A. Disconnect and remove abandoned panelboards. Verify all branch circuits are no longer in use before disconnecting.

B. Maintain access to existing panelboard that remain active and require access. Modify installation or provide access panel.

C. Clean and repair existing panelboards to remain or to be reinstalled.

3.2 INSTALLATION

A. Install panelboards in accordance with NEMA PB 1.1 and NECA "Standard of Installation", NFPA 70 and IEEE C2.

B. Install panelboards plumb.

C. Install recessed panelboards flush with wall finishes.

D. Mounting height: 6 feet to top of panelboard. Install panelboards taller than 6 feet with bottom no more than 4 inches above floor.

E. Install filler plates for unused spaces in panelboards.

F. Provide typed circuit directory for each panelboard. Revise directory to reflect circuiting changes to balance phase loads.

G. Install engraved plastic nameplates in accordance with Section 16075.

H. Ground and bond panelboard enclosure according to Section 16060. Connect equipment ground bars of panels in accordance with NEC.

3.3 FIELD QUALITY CONTROL

A. Field Inspect and testing shall be in performer under the provisions of NETA ATS 7.6 (1) (1) – Circuit Breaker, Low Voltage, Insulated Case/Molded Case, as outlined below:
   1. Visual and Mechanical Inspection:

      a. Compare equipment nameplate data with drawings and specifications.
      b. Inspect physical and mechanical condition.
      c. Inspect circuit breaker for correct mounting.
      d. Operate circuit breaker to insure smooth operation.
      e. Inspect case for cracks or other defects.
      f. Verify appropriate anchorage, required area clearances, physical damage, and correct alignment.
      g. Inspect all doors, panels, and sections for corrosion, dents, scratches, fit, and missing hardware.

h. Verify that fuse and/or circuit breaker sizes and types correspond to drawings.
i. Perform circuit breaker inspections and operation test.

3.4 ADJUSTING

A. Rearrange circuits in panelboard to balance phase loads to within 20 percent of each other.

B. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION 26 24 16

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SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wiring devices are defined as single discrete units of electrical distribution systems that are intended to carry but not utilize electric energy. The types of general purpose wiring devices required for the project include, but are not limited to the following line voltage devices:
   1. Connectors
   2. Plugs
   3. Receptacles
   4. Switches
   5. Wall plates

1.2 RELATED SECTIONS

1. Section 16050 - Common Work Results for Electrical
2. Section 16075 - Identification for Electrical Systems

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. IEC 529 - Degrees of Protection provided by Enclosures.

B. NEMA WD 1 - General Purpose Wiring Devices

C. NEMA WD 6 - Wiring Device Configurations.

1.4 CONTRACTOR SUBMITTALS

A. Product Data:
   1. Catalog cut of each device showing Manufacturer name, catalog number, voltage and current rating and dimensions.

1.5 REGULATORY REQUIREMENTS

A. Furnish products listed and classified by UL, ETL, or other recognized, acceptable testing and listing agencies as suitable for the purpose specified and shown.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide factory fabricated wiring devices in the type, color, electrical rating for service indicated, and/or as shown on the drawings.

2.2 MANUFACTURERS

A. Provide products produced by one of the following for each type of wiring device:

1. Appleton
2. Arrow-Hart, Inc.
3. Bryant Electric Co.
4. Crouse-Hinds Co.
5. General Electric Co.
6. Hubbell Wiring Device Division
7. Pass & Seymour
8. Pyle National
9. Russell & Stoll
10. Slater
11. Wiremold (multi-outlet assemblies)
12. Or Approved Equal

2.3 WALL SWITCHES

A. Provide specification grade, quiet type, flush, 1-pole, 2-pole, three and four-way toggle switches, 20 ampere, 120/277-volts AC, with mounting yoke insulated from mechanism equipped with plaster ears and side wired screw terminals, ivory plastic body with toggle handle, NEMA WD-1.
   1. Device Number: #1221, #1222, #1223, #1224
   2. Manufacturers: Hubbell, Pass & Seymour, Bryant, Or Approved Equal

2.4 RECEPTACLES

A. Provide specification grade, grounding type, heavy-duty receptacles with ivory plastic body, green hexagonal equipment ground screw terminal and grounding poles internally connected to mounting yoke; metal plaster ears; side wiring NEMA WD-6 as follows:
   1. Duplex Receptacle: Two pole, 3 wire, 20-ampere, 125-volt duplex receptacle, NEMA configuration 5-20R unless otherwise indicated.
   2. GFCI Receptacle: Two pole, 3 wire, 20-ampere, 125-volt duplex receptacle with integral ground fault circuit interrupter to meet regulatory requirements.
   3. Special Purpose: Two pole, 3 wire, 20-ampere, 125-volt single receptacle, twist-lock, NEMA configuration L5-20R as indicated.
   4. Two pole, 3 wire, 20-ampere, 250-volt single receptacle, twist-lock, NEMA configuration L6-20R as indicated.
   5. Two pole, 3 wire, 20-ampere, 277-volt single receptacle, twist-lock, NEMA configuration L7-20R as indicated.
   6. Two pole, 3 wire, 30-ampere, 125-volt single receptacle, twist-lock, NEMA configuration L5-30R as indicated.
   7. Two pole, 3 wire, 30-ampere, 250-volt single receptacle, twist-lock, NEMA configuration L6-30R as indicated.
   8. Two pole, 3 wire, 30-ampere, 277-volt single receptacle, twist-lock, NEMA configuration L7-30R as indicated.
   9. Three phase, 4 wire, 20-ampere, 125/250-volt single receptacle, twist-lock, NEMA configuration L14-20R as indicated.
   10. Three phase, 4 wire, 20-ampere, 250-volt single receptacle, twist-lock, NEMA configuration L15-20R as indicated.
   11. Three phase, 4 wire, 20-ampere, 480-volt single receptacle, twist-lock, NEMA configuration L16-20R as indicated.

12. Three pole, 4 wire, 30-ampere, 125/250-volt single receptacle, twist-lock, NEMA configuration L14-30R as indicated.
13. Three pole, 4 wire, 30-ampere, 250-volt single receptacle, twist-lock, NEMA configuration L15-30R as indicated.
14. Special Purpose Receptacle: Type as required meeting the requirements of this Section and the equipment shown on the drawings and elsewhere specified.

2.5 PLUGS AND CONNECTORS

A. Comply with NEMA Standards Publication No. WD-1. Provide 20 ampere, 125-volts, bakelite body connectors, 3-wire grounding, parallel blades, double wipe contact, with cord clamp.

B. Matching Insulgrip, corrosion resistant nylon plugs, IP20, shall be provided for each twist-lock type receptacles unless indicated otherwise.

C. Manufacturers: Hubbell, Pass & Seymour, Bryant, or Approved Equal.

2.6 WALL PLATES

A. Decorative Cover Plate: High impact, smooth nylon and smooth satin in finished areas. Color of nylon cover plate shall be ivory unless noted otherwise. Stainless steel cover plate in unfinished areas or where device is embedded in concrete.

B. For areas where two separate power sources are provided, each power source receptacle shall have a different color cover plate such as black, gray, or brown. Emergency power source receptacles shall have a red cover plate.

C. Weatherproof Cover Plate: Gasketed cast metal with hinged gasketed device cover. Cover for duplex devices shall be designed such that each device is independently covered.

2.7 MULTI-OUTLET ASSEMBLIES

A. Provide fixed multi-outlet assemblies consisting of #5362 grounding type, 20 ampere, 125-volt, two poles, three wire receptacles as an integral part, on 12-inch centers, unless otherwise noted.

B. Where more than one circuit is indicated, do not connect adjacent receptacles to the same circuit. Include raceway snap-on covers with punched holes to accurately align receptacles.

2.8 HAZARDOUS RATED AREAS

A. Switches, receptacles and other devices installed in hazardous areas shall be explosion-proof type in accordance with NFPA 70 and as shown on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify outlet boxes are installed at proper height.

B. Verify wall openings are neatly cut and will be completely covered by wall plates.

C. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

D. Inspect each item of materials or equipment immediately prior to installation, and reject damaged and defective items.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface, if necessary.

B. Clean debris from all boxes.

3.3 INSTALLATION

A. Install wiring devices where indicated, in accordance with the manufacturer's written instructions, the applicable requirements of the NEC and the NECA "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve the intended function.

B. Comply with the manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in the contract documents.
   1. Install devices plumb and level. Install switches with OFF position down
   2. Install vertically oriented grounded receptacles with grounding pole on top
   3. Connect wiring device grounding terminal to equipment grounding conductor as specified in Section 16050.
   4. Connect isolated ground (IG) receptacle equipment (yoke) grounding terminal only at metallic box with bonding jumper
   5. Install decorative plates on switch, receptacle, and blank outlets in finished areas
   6. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets in utility areas. (Does not include multi-outlet assemblies, other similar locations.).
   7. Identify wiring devices as specified in Section 16075..

3.4 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes to obtain mounting heights compliant with ADA.

B. Install wall switches at 42 inches to top of the maximum reach above finished floor for forward reach applications, 48 inches to top of reach for side reach applications to comply

with the ADA. The lower reach shall be at or above 18 inches for forward reach and for side reach to comply with the ADA, unless otherwise noted.

C. Install convenience receptacle 18 inches to center above finished floor, unless otherwise noted.

D. Install convenience receptacle 6 inches to center above backsplash of counter, unless otherwise noted.

E. Install dimmer 42 inches to center above finished floor, unless otherwise noted.

F. Install telephone and/or data jacks 18 inches to center above finished floor, unless otherwise noted.

G. Install telephone jack for wall telephone 42 inches to top of reach above finished floor for forward reach applications, and 48 inches to top of reach above finished floor for side reach applications to comply with the ADA. Receiver hook shall not be above 54 inches to its highest point above finished floor.

3.5 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

F. Verify that each telephone and data jack is properly connected and circuit is operational.

3.6 ADJUSTING

A. Adjust devices and wall plates to be flush, plumb and level.

END OF SECTION 26 27 26

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SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fusible and non fusible switches.

1.2 RELATED SECTIONS

1. Section 16050 - Common Work Results for Electrical
2. Section 16075 - Identification for Electrical Systems

1.3 REFERENCES

A. NEMA FU 1 - Low Voltage Cartridge Fuses.

B. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

C. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.4 SUBMITTALS

A. Product Data: Submit switch ratings and enclosure dimensions.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCH ASSEMBLIES

A. Manufacturer: Square D Company or Approved Equal.

B. Fusible Switch Assemblies: Horsepower rated, heavy-duty type; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
   1. Fuse Clips: Designed to accommodate Class R fuses only and reject all others.

C. Nonfusible Switch Assemblies: Horsepower rated, heavy-duty type; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

D. Product Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position.

E. Fuse clips: Designed to accommodate NEMA FU 1, Class J fuses.

F. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
   1. Interior Dry Locations: Type 1.
   2. Exterior Locations: Type 3R.

G. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

H. Furnish switches with entirely copper current carrying parts.

2.2 NONFUSIBLE SWITCH ASSEMBLIES

A. Manufacturer: Square D Company or Approved Equal.

B. Nonfusible Switch Assemblies: Horsepower rated, heavy-duty type; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

C. Product Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position enclosed load interrupter knife switch. Handle lockable in OFF position.

D. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
   1. Interior Dry Locations: Type 1.
   2. Exterior Locations: Type 3R.

E. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

F. Furnish switches with entirely copper current carrying parts.

2.3 FUSES

A. Manufacturers:
   1. Bussmann.
   2. Gould Shawmut.
   3. Littelfuse.
   4. Or Approved Equal.

B. Fuses 600 Amperes and Less: UL 198E, Class RK5, sized as indicated on Drawings.

C. Interrupting Rating: 200,000 RMS amperes.

2.4 SWITCH RATINGS

A. Switch Rating: Horsepower rated for AC or DC as indicated on Drawings.

B. Short Circuit Current Rating: UL listed for 10,000 rms symmetrical amperes when used with or protected by Class H or K fuses (30-600 ampere) 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses (30-600 ampere switches employing appropriate fuse rejection schemes). 200,000 rms symmetrical amperes when used with or protected by Class L fuses (800-1200 ampere).

PART 3 - EXECUTION

3.1 EXISTING WORK

A. Disconnect and remove abandoned enclosed switches.

B. Maintain access to existing enclosed switches and other installations remaining active and requiring access. Modify installation or provide access panel.

C. Clean and repair existing enclosed switches to remain or to be reinstalled.

3.2 INSTALLATION

A. Install enclosed switches plumb. Provide supports in accordance with Section 16050.

B. Height: 4 feet (1500 mm) to operating handle.

C. Install fuses for fusible disconnect switches.

D. Install engraved plastic nameplates in accordance with Section 16075.

E. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.5.

END OF SECTION 26 28 16

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SECTION 26 32 13 – ENGINE GENERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes equipment and services necessary for the design, manufacture, factory testing, installation, and site testing of a complete and operable on-site emergency generator unit including radiator, exhaust silencer, double-contained fuel piping, sub-base fuel tank, leak-detection system, control panel, battery and charger enclosed in an outdoor weatherproof, sound attenuated, rodent resistant enclosure with a marine-grade finish.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. The standards referenced herein, except as modified in the Contract Documents, shall have full force and effect as though included in these Specifications. These standards are not furnished to by the Engineer since manufacturers and trades involved are assumed to be familiar with these requirements. The Contractor and/or Installer shall obtain copies of reference standards direct from publication sources as needed for proper performance and completion of the work. General codes, such as the National and State Electric Codes, Building Codes, and Fire Codes are to be followed without specific reference in these specifications.

1. IEC 8528 Control Systems for Generator Sets - Part 4.
2. IEC Standards 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.
3. IEEE 446 Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
4. IEEE 587 Voltage surge resistance.
5. NEMA AB 1 Molded Case Circuit Breakers.
6. NEMA ICS 10 AC Generator sets, Industrial Control and Systems: AC Transfer Switch Equipment.
7. NEMA MG 1 Motors and Generators.
8. NEMA 250 Enclosures for Electrical Equipment (1,000 Volts Maximum.)
9. NETA ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
10. NFPA 30 Flammable and Combustible Liquids Code.
11. NFPA70 National Electrical Code, 2005 Edition (2007 California Electrical Code).
12. NFPA 110 Emergency and Standby Power Systems.
13. CFC California Fire Code, 2010 Edition
14. SFFC San Francisco Fire Code, 2010 Edition
15. UL 142 Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids.
16. UL508 Standard for Industrial Control Equipment
17. UL 2200 Standards for Stationary Engine Generator Assemblies

1.3 SUBMITTALS

A. Shop Drawings:
1. Electrical characteristics and connection requirements.
2. Plan and elevation views of unit including overall dimensions.
3. Electrical and Fuel Oil piping interconnection point with dimensions.
4. Fuel consumption rate curves at various loads.
5. Ventilation and combustion air requirements.
6. Electrical schematic and interconnection diagrams.
7. Sub-base fuel tank details and dimensions.
8. Overall unit dimensions and seismic anchoring points with dimensions.
9. Enclosure sound rating.
10. Emissions report.

B. Product Data:
1. Submit data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine-, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, sub-base fuel tank, and radiator.
2. Submit two (2) sets of product data, certification, test reports and other necessary information, for engine-generator unit and sub-base fuel tank, to the local city Fire Marshall for approval and permit. Contractor and/or Installer shall be responsible for obtaining fire marshal approval for the sub-base fuel tank assembly.
3. Submit calculations and enclosure pad-mount anchoring method (anchor bolt size, embedment and assembly details) to meet 2007 California Building Code seismic requirements, site class D.

C. Certification and Test Reports:
1. Provide Certification for the Protected Sub-Base fuel tank.
2. Provide results of manufacturer's certification of performance testing. Certification and Test Reports (Includes inspections, findings, and recommendations).
3. Certification that the Engine-Generator unit is designed to meet emission limits and operate correctly for the application.

D. Installer to complete Permit Application Checklist for Diesel Generators, Diesel Fire Pumps, and Fuel Tanks Serving Generators and Fire Pumps, located on Drawings E-701 and E-702. Application is partially completed with information available during design. Contractor and/or Installer to review, update, and correct as necessary for building department

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Shop Drawings and Product Data as described under Submittals.

B. Operation and Maintenance Manuals (3 complete sets):
1. Instructions and service manuals for normal operation, routine maintenance, oil sampling and analysis for engine wear and engine- maintenance procedures.
2. Manufacturer's standard manuals for EG Unit.

3. "As Built" elementary and schematic drawings; wiring diagrams; and panel drawings, in conformance with construction record.
4. Troubleshooting procedures, with a cross-reference between symptoms and corrective recommendations.
5. Connection data to permit removal and installation of recommended smallest field-replaceable parts.
6. Information on testing of electronic circuit boards and an explanation of the EG unit diagnostics.
7. List special tools, maintenance materials, and replacement parts. Include complete information for tightening of all electrical connections secured with bolts or studs.

1.5 QUALIFICATIONS

A. Manufacturer: Company specialized in manufacturing the products specified in this section with recent minimum five (5) years experience and with service facilities within 50 miles of project site.

B. Supplier: Authorized distributor of specified manufacturer with recent minimum five (5) years experience.

C. Prepare anchor bolt calculations under direct supervision of a professional civil or structural engineer experienced in the design of this work and licensed in the State of California.

1.6 WARRANTY

A. Furnish two (2) year manufacturer's warranty from date of substantial completion for defective parts and labor.

1.7 MAINTENANCE SERVICE

A. Coordinate addition of the new generator into the existing SF Fire Department generator maintenance contract. Maintenance contract is currently provided by ER Bacon Co, INC. Maintenance contract contact is Harry How, (408) 288-9500. Fire Department will assume cost of maintenance contract.

1.8 MAINTENANCE MATERIALS

A. Furnish one (1) set of tools required for preventive maintenance of engine-generator system. Package tools in adequately sized metal toolbox.

B. Furnish two (2) of each: fuel, oil and air filter elements.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver mounted on shipping skids.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and

traffic. Provide space heaters if required, to prevent condensation and keep the equipment dry.

1.10 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication

PART 2 - PRODUCTS

2.1 ENGINE

A. Manufacturers:
1. Generac

B. EPA Tier 3 emissions compliant

C. BAAQMD Emissions Permit: Coordinate Permit application filing by generator manufacturer. Permit fees to be paid as a part of generator quote.

D. Product Description: Diesel, 4-cycle, radiator- and fan-cooled, compression- ignition internal combustion engine.

E. Fuel System: No. 2 diesel oil.

F. Engine speed: 1,800 rpm.

G. Safety Devices: Engine shutdown on high water temperature, high oil temperature, low oil pressure, over speed, and engine over crank. Limits as selected by manufacturer.

H. Engine Starting: DC starting system with positive engagement, voltage of starter motors in accordance with manufacturer's instructions. Furnish remote starting control circuit with MANUAL-OFF-REMOTE selector switch or pushbuttons on engine-generator control panel.

I. Engine Jacket Heater: Thermal circulation-type water heater with integral thermostatic control, sized to maintain engine jacket water at 90 degrees F (32 degrees C), and suitable for operation on 120-Volt, single-phase power supply. Provide 20-amp 120-volt power circuit, including conduit and wire, from nearest available panelboard.

J. Radiator: Radiator using glycol coolant, with blower type fan, sized to maintain safe engine temperature in ambient temperature of 105 degrees F (40 degrees C). Radiator airflow restriction 0.5 inches of water (1.25 Pa) maximum.

K. Engine Accessories: Fuel filter, lube oil filter, intake air filter, lube oil cooler, fuel transfer pump, fuel priming pump, engine-driven water pump. Furnish fuel pressure gauge, water temperature gauge, and lube oil pressure gauge on engine-generator control panel.

L. Mounting: Heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails. Furnish unit with

suitable spring-type vibration isolators. Provide mounting bolts sized for 2007 California Building Code seismic requirements, site class D.

2.2 GENERATOR

A. Product Description: NEMA MG1, single-phase, re-connectable, brushless synchronous generator with brushless exciter.

B. Rating: 80-kW, 240/120 volt 3-phase, 4-wire, 60 Hz at 1,800 rpm.

C. Insulation Class: H.

D. Temperature Rise: 125 degrees C standby.

E. The generator shall be rated for delivering output KVA at rated frequency and power factor, at any voltage not more than 5% above or below rated voltage.

F. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to the single phase or three-phase fault at approximately 300% of rated current for not more than 10 seconds.

G. The generator set shall meet all requirements for NFPA 110 Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit; component level type tests will not substitute for this requirement.

H. The engine generator unit shall be listed to meet UL 2200 or submit to an independent third party certification process to verify compliance as installed.

2.3 VOLTAGE REGULATION

A. Furnish generator-mounted volts per hertz exciter-regulator to match engine and generator characteristics, with voltage regulation plus or minus 1 percent from no load to full load. Furnish manual controls to adjust voltage droop, voltage level (plus or minus 5 percent) and voltage gain.

2.4 GOVERNOR

A. Product Description: Electronic Isochronous governor to maintain engine speed within 0.5 percent, steady state, and 5 percent, no load to full load, with recovery to steady state within 2 seconds following sudden load changes. Equip governor with means for manual operation and adjustment.

2.5 ENGINE GENERATOR SET CONTROL

A. Product Description: Microprocessor-based digital control system, designed to provide governing, voltage regulation, metering, protective relaying, automatic starting, monitoring, and control functions for the generator unit.

B. Control System shall be designed to allow local monitoring and control of the generator unit and remote monitoring and control as described in these specifications.

C. Control system shall be mounted on the generator unit. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration condition encountered. The controls shall be UL508 labeled, CSA282-M1989 certified, and meet IEC8528 part 4. The control, including all control, monitoring and protective functions, shall meet or exceed the requirements of Mil-Std 461C part 9, and IEC Std. 801.2, 801.3 and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions. The entire control shall be tested and meet the requirements of IEEE 587 for voltage surge resistance. Manufacturers utilizing components that have not been tested as a system, as installed, (as demonstrated by a statement of performance on standard published literature) shall conduct RFI/EMI testing on the equipment in the manufacturer's facility prior to shipping the equipment to the project job site. Voltage surge testing shall be performed on an identical prototype unit.

D. Control voltage shall be 12 or 24 volts DC. Control system shall withstand DC surge voltage produced by the battery-charging alternator operating at full load when the battery bank is disconnected. Generator set governing, voltage regulation, protection, and control equipment shall be capable of proper operation within the typical battery voltage levels.

E. All switches, lamps and meters shall be oil-tight and dust-tight, and the enclosure door shall be gasketed.

F. All switches shall be provided with fully illuminated backlit labels, and all metering shall be individually lighted to allow for easy reading of functions in a completely dark room.

G. All adjustments to the control system shall be made from the front of the generator set control panel, with the aid of a digital readout display integral to the equipment. No rotary pots shall be acceptable for any function of the control system provided for the generator set.

H. Control equipment shall contain a system of diagnostic LEDs to assist in analyzing proper system function.

I. The entire generator set control system as supplied shall be capable of being directly monitored and controlled by a personal computer connected to the control for monitoring, diagnosis, service, and adjustment of the system via an RS232 port on the control.

J. The generator set mounted control shall include the following features and functions:
   1. Three- (3) position selector switch or independent pushbuttons labeled RUN/OFF/AUTO. In the RUN position the generator shall automatically start, and accelerate to rated speed and voltage. In the OFF position the generator shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
   2. Red "mushroom-head" push-button EMERGENCY STOP switch. Depressing the emergency stop switch shall cause the generator set to immediately shut down and

be locked out from automatic restarting. Reset of the control shall require reset of the emergency stop switch and the control system.

3. Pushbutton RESET switch. The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
4. Push-button PANEL LAMP switch. Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off several minutes after the switch is depressed or after the switch is depressed a second time. Lamps shall be LED type.
5. Push-button LAMP TEST switch. Depressing the lamp test switch shall cause all the alarm and status lamps on the panel to be lighted, and cause the digital display panel to sequentially display all the alarm and status messages in the control system.

K. Emergency Generator Control Panel shall be NEMA 250, Type 1 generator-mounted control panel enclosure with engine and generator controls and indicators. Furnish provision for padlock and the following equipment features:

1. Frequency Meter: 45-65 Hz range, digital display preferred (or 3.5-inch dial).
2. AC Output Voltmeter: digital display preferred (or 3.5-inch dial), 2 percent accuracy, with phase selector switch.
3. AC Output Ammeter: digital display preferred (or 3.5-inch dial), 2 percent accuracy, with phase selector switch.
4. Output voltage adjustment.
5. Push-to-test indicator lamps, one each for low oil pressure, high water temperature, over speed, and over crank.
6. Engine Start/Stop selector switch or pushbuttons.
7. Engine running time meter.
8. Oil pressure gauge.
9. Water temperature gauge.
10. Auxiliary Relay: Three Pole Double Throw (3-PDT) operates when engine runs with contact terminals pre-wired to terminal strip.
11. Additional visual indicators and alarms in accordance with by NFPA 110.
12. Remote Alarm Contacts: Factory-wired SPDT contacts to terminal strip for extending each alarm function to a Control Panel or PLC for remote indication, in accordance with NFPA 110.
13. High Battery voltage alarm.
14. Low Battery voltage alarm.
15. Low Fuel alarm.
16. System ready.
17. Anticipatory high water temperature.
18. Anticipatory low oil pressure.
19. Low coolant temperature.
20. Switch in Off Position alarm.
21. Over crank alarm.
22. Emergency Stop alarm.
23. High Water temperature alarm.
24. Over speed alarm.
25. Low Oil Pressure alarm.
26. Line power available.
27. Generator power available.

28. Lamp test and horn silence switch.

L. Alarms: Provide wiring and conduit between ATS and engine-generator alarm points for a complete operating system. Provide display windows with 3/8-inch engraved black letters on white background for each annunciated alarm. Provide at least one spare blank window for future use.
1. Engine Run
2. Engine Trouble
3. High Fuel Alarm
4. Low Fuel Alarm
5. Engine Over speed shutdown
6. Fuel Leak in secondary containment tank
7. All other critical shut down function as recommended by the EG unit manufacturer
8. Spares

M. Power Source: 120-VAC. Provide 20 amp, single pole, circuit breaker in nearest available switchboard or panelboard. Provide conduit and wire from power source.

2.6 GENERATOR SET REMOTE ANNUNCIATOR PANEL

A. The Generator Set shall be connected to a manufacturer recommended or supplied remote annunciator panel with the following features at a minimum:
1. Control:
   a. Manual Start / Stop
2. Monitoring:
   a. Running / Ready
   b. General Failure
   c. Low Fuel
   d. High Fuel
   e. High Temp
3. Alarm:
   a. High Temp
   b. Low Fuel
   c. General Failure
   d. High Fuel (visual and audible)

B. Power Source: 120-VAC. Provide 20 amp, single pole, circuit breaker in nearest available switchboard or panelboard. Provide conduit and wire from power source.

2.7 GENERATOR SET AND ENGINE CONTROL FUNCTIONS

A. The control system provided shall include cycle cranking system, which allows for user selected crank time, rest time, and number of cycles. Initial setting shall be 3 cranking periods of 15 seconds each, with 15 second rest period between cranking periods.

B. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled and the engine protection parameters for engine oil pressure and engine temperature shall be reduced to proper levels to reflect the lower engine operating speed.

C. The control system shall include the engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification.

D. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit the exhaust smoke while the unit is starting. The control system shall automatically adjust governor gain and stability settings to compensate for engine performance variation related to engine temperature.

E. The control system shall include time delay start (adjustable 0-100 seconds) and time delay stop (adjustable 0-30 minutes) functions. Indicators shall be provided to reflect that the time delays are in operation, and the time remaining for completion of the time delay period.

F. The starting control logic shall check for engine rotation at each signal for the engine starter to run. If the engine rotation is not present when the starter is operating, a "fail to crank" alarm and shutdown shall be indicated on the generator set control panel.

G. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature that is capable of discriminating between failed sender or wiring components, and an actual engine failure conditions.

H. Generator set start contacts shall be rated 10 amps at 32 VDC.

I. A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is outside manufacturer specified tolerances. During engine starting, the low voltage limit shall be disabled, and the system shall conduct a battery capacity test. A 'weak battery" alarm shall be initiated if the starting/control battery does not pass this test.

2.8 OUTDOOR SOUND-ATTENUATING ENCLOSURE

A. The outdoor weather-protective, sound attenuating, rodent proof, enclosure shall be designed to allow full-load operation of the generator set, and all of its accessories shall be sized for the exact unit being furnished. Adequate metal screening shall be installed at all engine-generator unit openings to prevent rodents from entering the enclosure.

B. Reinforced steel housing shall allow access to control panels and service points, with lockable doors and panels.

C. Roof shall have a positive camber for moisture runoff. The exhaust outlet(s) shall be supplied with rain guard(s) 1 inch above enclosure to prevent moisture from entering the enclosure.

D. Walls shall be a minimum of 1½" deep and of 14-gauge steel.

E. Air openings shall include fixed louvers sized to allow proper airflow.

F. Exhaust silencer shall be installed inside the enclosure. Maximum noise level allowable for the installed unit is 75 dB at 23 feet.

G. Enclosure shall be provided with Manufacturer's standard marine-grade finish.

2.9 PROTECTED SUB-BASE FUEL TANK

A. Product Description: factory-fabricated, protected, secondary contained, sub-base fuel tank with dual integral float-controlled valve and pump with capacity for 72-hours of continuous operation at 100% load.

B. Tank Construction:
1. Dual wall, corrosion resistant steel tank.
2. Internal tank shall be rectangular in shape, listed and constructed in accordance with UL 142 Standard for Generator-Base Tanks.
3. Inner and outer steel tank shall be constructed of a minimum 3/16-inch thick A-36 Hot Rolled Steel.
4. Tank and associated anchorage shall meet 2007 California Building Code seismic requirements, site class D.
5. The internal tank shall be pressure tested and pass a test of 5 psi at the factory.
6. The tank shall be designed with an over spill containment.
7. The tank shall include atmospheric and engine- venting nozzles sized to UL requirements.
8. The tank shall have labels to meet applicable codes, Flammable, No Smoking, product content, and tank capacity, etc.
9. Each nozzle on the tank shall be identified for its intended use.
10. The tank shall be designed to meet weight loads of the engine-generator set.
11. The tank shall be designed with earthquake, hurricane, and flood tie down points.

C. Tank Painting:
1. Tank shall have manufacturer's standard marine grade coating system.
2. Bottom of tank shall be coated with coal-tar epoxy.

D. Certification: Based on the Manufacturer's published literature, the proposed generator based fuel tank shall have the following certifications:
1. The internal and external tank shall be constructed in accordance with UL 142.
2. The tank shall have an identifying UL Nameplate attached with the following:
3. "Special Purpose Flammable Liquid Tank Protected Secondary Containment Generator Base Tank UL 142"
4. "This tank is Intended for Installation In Accordance With NFPA 30, NFPA 30A, Or NFPA 31, NFPA 37, NFPA 110"
5. Tank Serial number, Manufacturer's name, location and telephone number, Date of Manufacture, Model number of Tank, and Maximum Generator Weight.
6. Primary Tank Capacity in gallons, Containment Percentage.
7. "Tank Requires Emergency Relief Venting, Capacity Not Less Than (To be provided by fuel tank vendor) Cubic Feet per Hour, PRIMARY TANK AND (To be provided by vendor) Feet per Hour ANNULAR SPACE."
8. "Tank is intended for stationary Installation Only. Tank shall be inspected to determine suitability after fire exposure."
9. "For Diesel Fuel Only."
10. "Pressurized Primary Tank When Pressure Testing Annular Space. Follow Installation Instructions."

E. Furnish flexible fuel line connections, fuel gauge, check valve, high fuel level alarm contact, and indicating light.

F. Provide fuel fill valve to be accessible from outside the emergency generator enclosure. The fill valve shall be at or below the overfill vent level. Provide a five (5) gallon fuel spill containment enclosure with lockable cover as required by the local agency.

G. Conform to NFPA 30.

H. Controls:
1. Monitoring: Low-level control and alarm, high level control and alarm, leak- detection monitoring and alarm system.
2. Low Level Alarm Sensor: Separate device to operate alarm contacts at 25 percent of normal fuel level.
3. High Level Alarm Sensor: Separate device to operate alarm and redundant fuel shutoff contacts at 98 percent of normal fuel level.
4. Piping connections: Include fuel suction and return lines, local fuel fill, vent line, overflow line, and tank drain line complete with shutoff valve.
5. Redundant High-Level Fuel Shutoff: Actuated by the high-level alarm sensor in primary tank. Shutoff action shall initiate an alarm signal to control panel but shall not shut down engine-generator unit.

I. Leak Detection System:
1. Calibrated leak detection and monitoring system complying with UL1238 with probes, sensors, switches and remote alarm panel located in the engine-generator unit enclosure.
2. Locate leak detection switch in rupture basin and connect to provide audible and visual alarm in the event of sub-base tank leak.
3. Locate leak detection switch in double-contained fuel line (at lowest point) to provide audible and visual alarm in the event of a leak in the fuel line.
4. Provide alarm contacts for remote indication and alarm of a fuel leak.

J. Fuel Oil:
1. Provide No. 2 diesel fuel oil for commissioning and testing of the engine-generator unit.
2. Provide No. 2 diesel fuel oil to fill tank once acceptance testing has been completed.

2.10 ACCESSORIES

A. Exhaust Silencer: Critical-type silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, sized in accordance with engine manufacturer's instructions. Maximum noise level allowed is 75 dBA at 23 feet.

B. Metal Roof Thimble: Where unit is installed indoors, provide ventilated metal roof thimble for all high temperature (greater than 100 degrees C) wall, ceiling and roof penetrations.

C. Batteries: Heavy-duty, diesel-starting deep cycle gel pack/absorption glass-mat (AGM) type storage batteries, 12 or 24 volts, sized as recommended by the engine-generator manufacturer. Match battery voltage to starting system. Furnish cables and clamps.

D. Battery Tray: Treated for electrolyte resistance; constructed to contain spillage.

E. Battery Charger: Solid state to operate with type of batteries furnished. Current limiting type designed to float at 2.17 volts for each cell and equalize at 2.33 volts for each cell. Furnish overload protection, full wave rectifier, DC voltmeter and ammeter, and fused input. Furnish enclosure to meet NEMA 250, Type 1 requirements, or furnish as an internal component of the ATS. Provide 20-amp 120-volt power circuit, including conduit and wire, from nearest available panelboard.

F. Line Circuit Breaker: NEMA AB 1, molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole. Furnish battery voltage operated shunt trip, connected to open circuit breaker on engine failure. Unit mount in enclosure to meet NEMA 250, Type 1 requirements.

G. Load Bank Circuit Breaker: NEMA AB 1, molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole. Furnish battery voltage operated shunt trip, connected to open circuit breaker on engine failure. Unit mount in enclosure to meet NEMA 250, Type 1 requirements.

2.11 SOURCE QUALITY CONTROL

A. Provide shop inspection and testing of completed assembly.

B. Make completed engine-generator assembly available for inspection at manufacturer's factory prior to packaging for shipment. Notify Engineer at least seven (7) days before inspection is allowed.

C. Allow witnessing of factory inspections and tests at manufacturer's test facility. Notify Engineer at least seven (7) days before inspections and tests are scheduled.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install engraved plastic nameplates in accordance with these Specifications.

B. Ground and bond generator and other electrical system components in accordance with these Specifications.

C. Provide Emergency Shutdown procedure and post in a conspicuous location near the engine. Procedure shall indicate location(s) of fuel shutoff valve(s).

3.2 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, Section 7.22 as follows:
   1. Visual and Mechanical Inspection
   2. Compare equipment nameplate data with drawings and specifications.
   3. Inspect physical and mechanical condition.
   4. Inspect correct anchorage and grounding.

B. Electrical and Mechanical Tests
   a. Perform an insulation-resistance test on generator winding with respect to ground in accordance with ANSI/IEEE Standard 43.
   b. Calculate polarization index.
   c. Test protective relay devices in accordance with Section 7.9.
   d. Perform phase-rotation test to determine compatibility with load requirements.
   e. Functionally test engine shutdown for low oil pressure, over-temperature, over-speed, and other features as applicable.
   f. Perform vibration baseline test. Plot amplitude versus frequency for each main bearing cap.
   g. Conduct performance test in accordance with ANSI/NFPA Standard 110, Section 5-13 (Installation Acceptance).
   h. Verify correct functioning of governor and regulator.
   i. Inspect and test fuel oil piping according to NFPA 30 "Testing" Paragraph and NFPA 31 "Tests of Piping" Paragraph.
   j. Repair leaks and defects with new materials, and retest system until satisfactory results are obtained.
   k. Test and adjust controls and safeties
   l. Provide fuel tank hydrostatic testing in the presence of the Fire Inspector per CBC 3403.6.3.
2. Test Values
   a. Polarization index values shall be in accordance with ANSI/IEEE Standard 43.
   b. Vibration levels shall be in accordance with manufacturer's published data.
   c. Performance tests shall conform to manufacturer's published data and ANSI/NFPA Standard 110.

3.3 MANUFACTURER'S FIELD SERVICES

A. Engage the services of a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections, and to assist in testing. Report results in writing.

B. Testing:
1. Perform field quality control testing under the supervision of the manufacturer's factory-authorized service representative.
2. Installer shall provide No. 2 diesel fuel and lubricating oil for all testing as noted above.
3. Installer shall provide a full tank of No. 2 diesel fuel at the completion and acceptance of testing.

C. Tests: Include the following:
1. Tests recommended by manufacturer.
2. Adjust generator output voltage and engine speed to meet specified ratings.
3. International Electrical Testing Association Tests: Perform each visual and mechanical inspection, and electrical and mechanical test stated in NETA ATS for engine-generator sets, except omit vibration baseline test. Certify compliance with test parameters for tests performed.
4. NFPA 110 Acceptance Tests: Perform Single-step full-load pickup test.

5. Exhaust-System Backpressure Test: Use a manometer with a scale exceeding 40 inches water gauge (120 kPa). Connect to exhaust line close to engine exhaust manifold. Verify that backpressure at full-rated load is within manufacturer's written allowable limits for the engine.
6. Exhaust Emissions Test: Comply with applicable government test criteria.

D. Coordinate tests for engine-generator with tests for automatic transfer switch, and run them concurrently. Run complete electrical test, including, but not limited to, automatic transfer switch and generator control panel to ensure proper automatic Start-Stop operation. Coordinate testing with Automatic Transfer Switch field service representative.

E. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.

F. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests. Provide certified copies of field tests approved and signed by the authorized service representative.

3.4 DEMONSTRATION AND TRAINING

A. Provide four (4) hours of training and instruction for at least four persons, to be conducted at project site with manufacturer's certified field service representative. Instruction shall include handouts to all trainees, procedures for the proper operation, adjustments and maintenance of the engine-generator system.

B. Simulate operation of the engine-generator in manual mode, test mode and causing a power outage by interrupting normal source, and demonstrate that system operates to provide engine- power.

3.5 CLEANING

A. Clean engine and generator surfaces. Replace oil and fuel filters with new filters after unit testing and prior to acceptance of the project.

B. On completion of installation, inspect system components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish. Clean components internally using methods and materials recommended by manufacturer.

END OF SECTION 26 32 13

SECTION 26 36 00 – TRANSFER SWITCHES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes automatic transfer switches in individual enclosures.

B. Transfer switch shall be provided by the generator manufacturer. OEM products certified and labeled by the manufacturer are acceptable.

1.2 REFERENCES - CODES AND STANDARDS

A. NEMA ICS 6 Enclosures.

B. NEMA ICS 10 AC Transfer Switch Equipment.

C. NFPA 110 Emergency Standby Power Systems.

D. NFPA 70 National Electrical Code.

E. NETA ATS (International Electrical Testing Association) – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

F. UL 1008 Automatic Transfer Switches.

1.3 SUBMITTALS

A. Product Data: Submit catalog sheets showing voltage, switch size, ratings and size of switching and overcurrent protective devices, operating logic, short- circuit ratings, dimensions, and enclosure details.

B. Test Reports: Provide five (5) copies of results of manufacturer’s certification of performance testing.

C. Manufacturer’s Field Report: Indicate inspections, findings, and recommendations.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit instructions and service manuals for normal operation and routine maintenance. List special tools, maintenance materials, and replacement parts.

B. Manufacturer’s Field Report: Indicate inspections, findings, performance and recommendations.

1.5 QUALIFICATIONS

A. Manufacturer: Company shall specialize in manufacturing the products specified in this section with minimum five (5) years' experience and with service facilities within 50 miles of project site.

B. Supplier: Authorized distributor of specified manufacturer with minimum five (5) experience.

1.6 MAINTENANCE SERVICE

A. Provide service and maintenance (parts and labor) for a period of two (2) year from Date of Substantial Completion.

1.7 WARRANTY

A. Furnish two (2) year manufacturer's warranty from date of substantial completion for defective parts and labor to install the part.

PART 2 PRODUCTS

2.1 AUTOMATIC TRANSFER SWITCH

A. Product Description: NEMA ICS 10, automatic transfer switch suitable for use in standby systems as described in NFPA 70 and shall conform to NFPA 110. Manual operator conforming to UL 1008 shall be provided and switch shall be designed for safe operations under full load conditions.

B. Configuration: Electrically operated, mechanically held in both operating positions.

C. Rating: Voltage and current rating shall be as indicated on drawings, continuous duty, three (3) poles with solid neutral. Neutral continuous current rating shall not be less than twice the rating of the phase contacts.

D. Interrupting Capacity: 100 percent of continuous rating.

E. Withstand Current Rating: 30,000 RMS symmetrical amperes when used with molded case circuit breaker. Contacts shall be non-welding when used with upstream feeder overcurrent device of available fault current specified.

F. Service Conditions: NEMA ICS 10
1. Temperature: -40 to +50 degrees C
2. Relative Humidity: up to 95 percent
3. Altitude: 50 feet (15 meters) above sea level

G. Product Features:

1. Indicating Lights: Mount on front panel of switchboard to indicate NORMAL SOURCE AVAILABLE, ALTERNATE SOURCE AVAILABLE and switch position.
2. Test Switch: Mount on front panel of switchboard to simulate failure of normal source.
3. Return to Normal Switch Mount on front panel of switchboard to initiate manual transfer from alternate source to normal source.
4. Auxiliary Contacts: Provide the following discrete output signals, rated at no less than 10 amps at 120 volts, 60 Hz.
   a. Loss of utility power
   b. Preferred source active
   c. Alternate source active
   d. Any additional control signals as required to control a standby engine generator and as indicated on drawings.
5. Preferred Source Monitor: Monitor normal source voltage and frequency; initiate transfer when voltage drops below 85 percent or frequency varies more than 3 percent from rated nominal value.
6. Alternate Source Monitor: Monitor alternate source voltage and frequency. Inhibit transfer when voltage is below 85 percent or frequency varies more than 3 percent from rated nominal value.
7. In-Phase Monitor: Inhibit transfer until source and load are within 10 electrical degrees.

H. Automatic Sequence of Operation:
1. Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor.
2. Time Delay to Start Alternate Source Engine Generator: 0 to 30 seconds, adjustable and factory set at 1 second.
3. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.
4. Time Delay before Transfer to Alternate Power Source: 0 to 300 seconds, adjustable, and factory set at 3 seconds.
5. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.
6. Time Delay before Transfer to Normal Power: 0 to 30 minutes, adjustable; and factory set at 5 minutes. Time delay shall be automatically defeated in the event of alternate source failure, provide normal source is available.
7. Time Delay before Engine Shutdown: 0 to 30 minutes, adjustable, of unloaded operation factory set at 10 minutes.
8. Engine Exerciser: Provide a generator exerciser timer. Run times shall be user programmable. The exerciser shall be selectable between load transfer and engine run only and shall have a fail-safe feature that will retransfer the switch to preferred source during exercise period. Bypass exerciser control when normal source fails during exercising.
9. Alternate System Exerciser: Transfer load to alternate source during engine exercising period.

I. Enclosure:

1. Indoor wall mount enclosure shall be NEMA 1, minimum 16 gauge steel panels, with front door to provide easy access to the internal panel door and devices. The enclosure shall be suitable for wall mounting as indicated on the drawings.
2. Complete switch assembly shall be suitable for indoor installation
3. Provide inner-hinged door panel for mounting ATS control devices, selector switches and cluster type LED indicating lights etc. Door shall swing open to provide access to the ATS switch. Inner door panel shall separate the wiring compartment from operator controls.
4. Provide adequate space for conduit entry from the top, termination of control cable, device wiring and raceway.
5. Protective barrier shall be provides to prevent accidental contact with current carrying components (120-volt).

J. Finish:
1. Manufacturer's standard light gray enamel (ANSI 61) over external surfaces. Coat internal surfaces with a minimum of one coat of corrosion-resistant paint, or plate with cadmium or zinc.

PART 3 EXECUTION

3.1 INSTALLATION

A. Switch shall be installed in accordance with approved manufacturer's instructions.

3.2 MANUFACTURER'S FIELD SERVICES

A. Engage the services of a qualified factory-authorized service representative to inspect field-assembled components and equipment installation, including commissioning, start-up demonstration and training, and to assist in Field Quality Control inspection and testing.
1. Check out transfer switch connections and operations, and place in service.
2. Adjust control and sensing devices to achieve specified sequence of operation.

B. Following completion of switch installation and after making proper adjustments and settings, site tests shall be performed to demonstrate that the switch function as specified.

3.3 FIELD QUALITY CONTROL

A. Field inspection and testing shall be performed under provisions of NETA ATS section 7.22 (3) – Automatic Transfer Switches, Emergency Systems, as follows:
1. Visual and Mechanical Inspection
a. Compare equipment nameplate data with drawings and specifications.
b. Inspect physical and mechanical condition.

c. Confirm correct application of manufacturer's recommended lubricants.
d. Verify that manual transfer warnings are attached and visible.
e. Verify tightness of all control connections.
f. Inspect all bolted electrical connections for high resistance using one of the following methods:
    1) Use of low-resistance ohmmeter in accordance with Section 7.22.3.2 (Electrical Tests).
    2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 10.12.
g. Perform manual transfer operation.
h. Verify positive mechanical interlocking between normal and alternate sources.

2. Electrical Tests
a. Perform a contact-resistance test.
b. Perform resistance measurements through all bolted connections with low-resistance ohmmeter, if applicable, in accordance with NETA ATS Section 7.22.3.1 (Visual and Mechanical Inspection).
c. Perform insulation-resistance on each pole, phase-to-phase and phase-to-ground with switch closed and across each open pole for one minute. Perform tests in both source positions. Test voltage shall be in accordance with manufacturer's published data or NETA ATS Table 10.1.
d. Calculate polarization index.
e. Verify settings and operation of control devices.
f. Calibrate and set all relays and timers in accordance with NETA ATS Section 7.9.
g. Perform automatic transfer tests:
    1) Simulate loss of normal power.
    2) Return to normal power.
    3) Simulate loss of emergency power.
    4) Simulate all forms of single-phase conditions.
h. Verify correct operation and timing of the following functions:
    1) Normal source voltage-sensing relays.
    2) Engine start sequence.
    3) Time delay upon transfer.
    4) Alternate source voltage-sensing relays.
    5) Automatic transfer operation.
    6) Interlocks and limit switch function.
    7) Time delay and retransfer upon normal power restoration.
    8) Engine cool down and shutdown feature.

3. Test Values
a. Compare bolted connection resistance to values of similar connections.
b. Bolt-torque levels should be in accordance with Table 10.12 unless otherwise specified by manufacturer.
c. Minimum insulation-resistance shall be in accordance with manufacturer's published data or Table 10.1.

d. Micro-ohm or milli-volt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from similar connections by more than 50 percent of the lowest value.

3.4 DEMONSTRATION AND TRAINING

A. Furnish four (4) hours of instruction for eight (8) persons, to be conducted at project site with manufacturer's field service representative. Instruction shall include handouts to all trainees describing the procedures for the proper operation, adjustment and maintenance of the automatic transfer switch. Use approved O&M manuals.

B. Demonstrate operation of transfer switch in normal and emergency modes.

C. Simulate power outage by interrupting the normal source, and demonstrate that system operates to provide emergency power. Coordinate testing and training to coincide with the engine-generator unit testing and training.

END OF SECTION 26 36 00

SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Interior lighting fixtures, lamps, ballasts, hangars, trim and diffusers.

B. Supports, suspension systems, and blocking.

1.2 SUBMITTALS

A. Product Data:
   1. Light fixtures.
   2. Lamps.
   3. Ballasts.

1.3 WARRANTEE

A. Fixtures and ballasts shall have a minimum five year warrantee.

PART 2 - PRODUCTS

2.1 LIGHTING FIXTURES

A. Provide lighting fixtures, lamps, ballasts and accessories complete and ready for operation. Furnish the fixtures as indicated on the Drawings and as listed in the fixture schedule. Verify in all cases, the lengths and quantity of fixtures necessary to achieve the indicated results.

B. Provide lighting fixtures in the finishes and colors as noted on the Drawings.

C. Provide the UL and IBEW labels on all lighting fixtures.

D. Equip fluorescent fixtures with CBM-ETL labeled ballasts provided with internally mounted automatic reset thermal protectors and silver plated sockets.

E. All lighting fixtures shall have published photometric tests conducted by Electrical Testing Laboratories. Make available the test results upon request. Testing shall include candlepower distribution curves, total fixture efficiency, brightness and shielding angles in longitudinal and transverse directions.

F. Observe the requirements of the CBC Section 2606 regarding plastic lighting diffusers. Fixtures and auxiliary equipment mounted against combustible material shall be approved for such installation.

G. Make-up fixtures with Type AF or equal fixture wire. Provide an identified, approved landing lug for equipment ground wires.

2.2 LENSES, REFLECTORS, AND TRIM

A. Provide specialty lenses and frames such as Holophane type low glare lenses as indicated on the lighting fixture schedule. Verify that the fixture frames and trims are designed to function with the selected lens and the particular mounting conditions.

B. Provide substantial light sealing and separation between individual lamp rows in the louver assemblies of 3-lamp recessed parabolic fluorescent fixtures. This shall be accomplished by the provisioning of ballast compartment covers between cells even if no ballasts are contained therein.

2.3 LAMPS

A. Fluorescent lamps:
1. All fluorescent lamps shall be low mercury, Federal EPA TCLP compliant, extended life lamps.
2. T-8 fluorescent lamps shall be extended performance, 4100 Kelvin, 86 CRI color rendering, long-life 36,000 hrs @ 3 hrs/start, GE Ecolux XL SPX lamps.
3. T-5 fluorescent lamps shall be extended performance, 4100 Kelvin, 85 CRI color rendering, long-life 30,000 hrs @ 3 hrs/start, GE Starcoat Ecolux High output lamps
4. Compact fluorescent lamps shall be low mercury, 3500 Kelvin, 82 CRI color rendering, 10,000 hrs @ 3 hrs/start, Philips “ALTO PL-T,” or Sylvania “DULUX ECOLOGIC.”
5. Provide 4100 Kelvin, tri-phosphor, energy saving, slim-line or high output fluorescent lamps where lamps longer than four feet long are specified.
6. Furnish all fluorescent lamps of the same type, throughout the Project, from the same manufacturer.

B. High intensity discharge (HID) lamps:
1. All HID lamps shall be mercury and lead free, Federal EPA TCLP compliant, ECO lamps.
2. Provide clear high pressure sodium lamps, Sylvania “LUMALUX Mercury Free /ECO.”
3. Exterior metal halide lamps shall be clear, unless otherwise noted.
4. Interior metal halide lamps shall be coated, unless otherwise noted.
5. Furnish all HID lamps of a particular type throughout the Project from the same manufacturer.

C. Incandescent lamps:
1. Provide 130 volt rated, long service life lamps.
2. Lamps shall be A-21, frosted type, in wattage as indicated.

2.4 BALLASTS

A. Electronic Ballasts (non-dimming):
1. Provide fully electronic or hybrid style ballasts.
2. Power factor shall be greater than .85.
3. Ballast factor shall be greater than .87.
4. Total harmonic distortion (THD) shall not exceed:

a. 20% for a four foot fluorescent ballast
b. 32% for an eight foot fluorescent ballast.

5. Provide UL listed ballasts that meet applicable California Energy Commission requirements.
6. Ballasts must be of the rapid start type; instant start is not acceptable.
7. Acceptable manufacturer: Magnetek, Motorola, or Approved Equal.

B. Dimming Ballasts:
1. Provide Lutron EcoSystem “intelligent” dimming ballast or Approved Equal.

C. Rapid Start Fluorescent Ballasts:
1. Energy saving type, class P, CBM certified,
2. Ballasts shall have an "A" sound rating.
3. Acceptable manufacturers: Universal, Advance, Valmont, or Approved Equal.
4. Provide zero degree ballasts where used in exterior fixtures.

D. HID Ballasts:
1. Provide constant wattage, high power factor type ballasts.

PART 3 - EXECUTION

3.1 GENERAL

A. Install fixtures in straight, true lines and without visible gaps between fixtures and building surfaces and between fixtures in continuous rows. For linear wall mounted fixtures, ensure that the wall surface is finished flat, straight, and free of imperfections prior to mounting the fixtures. Replace or repair lighting fixture installations that are out of plumb or that have obvious gaps or misalignment.

B. Provide fixtures with the appropriate trim frames, flanges, canopies, and finish accessories to accommodate the ceiling conditions. Prior to ordering fixtures, and throughout the Project, verify the exact ceiling types, finishes, and thicknesses and coordinate the fixture installation therewith.

C. Refer to the Drawings, particularly the architectural elevations and reflected ceiling plans, in determining the exact mounting location and height of lighting fixtures. For wall mounted or suspended fixtures that do not have the mounting heights clearly indicated, contact the Owner for clarification prior to ordering pendants and installing the fixtures.

D. Following installation of HID and fluorescent lighting fixtures, and prior to completion of the Project, perform a burn in test of the lights. The burn in test shall consist of operating the fixtures continuously for a minimum of forty-eight (48) hours. Replace lamps that are inoperative or that show signs of flicker or color wander. If building power is not available for the burn in test, then provide a portable generator, fuel, and temporary connections for the stipulated period.

E. Provide final touchup painting to repair fixture finishes which are nicked or marred during installation. Obtain the paint from the fixture manufacturer.

3.2 AUDIBILITY

A. Fixtures shall be free from any undesirable hum, vibration, or noise. Provide lighting equipment suitable for the intended ambient sound levels. Where necessary to meet this criteria, provide additional means of sound deadening, whether or not specifically indicated. Fixtures that are found to be unsatisfactory in the opinion of the Owner shall be removed and replaced at the Contractor's expense.

3.3 SUPPORTS AND BLOCKING

A. Provide hangers, suspension cables, and blocking for lighting fixtures that will provide support independent of suspended ceilings, ceiling or wall surfaces, and electrical outlet boxes. Exception: Fixtures less than 12 inches in all dimensions and weighing less than six pounds may be permitted to be supported from the electrical outlet box if the box itself is independently supported by blocking or hangars.

B. Refer to the Drawings for specific blocking details and seismic mounting details for lighting fixtures.

3.4 OBSTRUCTIONS

A. Verify throughout the Project that mounting locations and suspension systems remain free of obstructions. Suspended or pendant mounted fixtures must be free to swing 45 degrees in all directions without hitting obstructions or other fixtures. Provide seismic rated swivel ball hangars for pendant mounted lighting fixtures to achieve the proper swing.

END OF SECTION 26 51 00

SECTION 26 56 00 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Exterior lighting fixtures, lamps, ballasts, and poles.

1.2 SUBMITTALS

A. Product Data:
   1. Light fixtures.
   2. Lamps.
   3. Ballasts.

1.3 WARRANTEE

A. Fixtures and ballasts shall have a minimum five year warrantee.

PART 2 - PRODUCTS

2.1 LIGHTING FIXTURES

A. Provide lighting fixtures, lamps, ballasts and accessories complete and ready for operation. Furnish the fixtures as indicated on the Drawings and as listed in the fixture schedule. Verify in all cases, the lengths and quantity of fixtures necessary to achieve the indicated results.

B. Provide lighting fixtures in the finishes and colors as noted on the Drawings.

C. Provide the UL and IBEW labels on all lighting fixtures.

D. Equip fluorescent fixtures with CBM-ETL labeled ballasts provided with internally mounted automatic reset thermal protectors and silver plated sockets.

E. All lighting fixtures shall have published photometric tests conducted by Electrical Testing Laboratories. Make available the test results upon request. Testing shall include candlepower distribution curves, total fixture efficiency, brightness and shielding angles in longitudinal and transverse directions.

F. Observe the requirements of the CBC Section 2606 regarding plastic lighting diffusers. Fixtures and auxiliary equipment mounted against combustible material shall be approved for such installation.

G. Make-up fixtures with Type AF or equal fixture wire. Provide an identified, approved landing lug for equipment ground wires.

2.2 LENSES, REFLECTORS, AND TRIM

A. Provide specialty lenses and frames such as Holophane type low glare lenses as indicated on the lighting fixture schedule. Verify that the fixture frames and trims are designed to function with the selected lens and the particular mounting conditions.

2.3 LAMPS

A. High intensity discharge (HID) lamps:
   1. All HID lamps shall be mercury and lead free, Federal EPA TCLP compliant, ECO lamps.
   2. Provide clear high pressure sodium lamps, Sylvania “LUMALUX Mercury Free /ECO.”
   3. Exterior metal halide lamps shall be clear, unless otherwise noted.
   4. Interior metal halide lamps shall be coated, unless otherwise noted.
   5. Furnish all HID lamps of a particular type throughout the Project from the same manufacturer.

2.4 BALLASTS

A. Electronic Ballasts (non-dimming):
   1. Provide fully electronic or hybrid style ballasts.
   2. Power factor shall be greater than .85.
   3. Ballast factor shall be greater than .87.
   4. Total harmonic distortion (THD) shall not exceed:
      a. 20% for a four foot fluorescent ballast
      b. 32% for an eight foot fluorescent ballast.
   5. Provide UL listed ballasts that meet applicable California Energy Commission requirements.
   6. Ballasts must be of the rapid start type; instant start is not acceptable.
   7. Acceptable manufacturer: Magnetek, Motorola, or Approved Equal.

B. HID Ballasts:
   1. Provide constant wattage, high power factor type ballasts.

PART 3 - EXECUTION

3.1 GENERAL

A. Install fixtures in straight, true lines and without visible gaps between fixtures and building surfaces and between fixtures in continuous rows. For linear wall mounted fixtures, ensure that the wall surface is finished flat, straight, and free of imperfections prior to mounting the fixtures. Replace or repair lighting fixture installations that are out of plumb or that have obvious gaps or misalignment.

B. Provide fixtures with the appropriate trim frames, flanges, canopies, and finish accessories to accommodate the ceiling conditions. Prior to ordering fixtures, and throughout the Project, verify the exact ceiling types, finishes, and thicknesses and coordinate the fixture installation therewith.

C. Refer to the Drawings, particularly the architectural elevations and reflected ceiling plans, in determining the exact mounting location and height of lighting fixtures. For wall mounted or suspended fixtures that do not have the mounting heights clearly indicated, contact the Owner for clarification prior to ordering pendants and installing the fixtures.

D. Following installation of HID and fluorescent lighting fixtures, and prior to completion of the Project, perform a burn in test of the lights. The burn in test shall consist of operating the fixtures continuously for a minimum of forty-eight (48) hours. Replace lamps that are inoperative or that show signs of flicker or color wander. If building power is not available for the burn in test, then provide a portable generator, fuel, and temporary connections for the stipulated period.

E. Provide final touchup painting to repair fixture finishes which are nicked or marred during installation. Obtain the paint from the fixture manufacturer.

3.2 AUDIBILITY

A. Fixtures shall be free from any undesirable hum, vibration, or noise. Provide lighting equipment suitable for the intended ambient sound levels. Where necessary to meet this criteria, provide additional means of sound deadening, whether or not specifically indicated. Fixtures that are found to be unsatisfactory in the opinion of the Owner shall be removed and replaced at the Contractor's expense.

3.3 SUPPORTS AND BLOCKING

A. Provide hangers, suspension cables, and blocking for lighting fixtures that will provide support independent of suspended ceilings, ceiling or wall surfaces, and electrical outlet boxes. Exception: Fixtures less than 12 inches in all dimensions and weighing less than six pounds may be permitted to be supported from the electrical outlet box if the box itself is independently supported by blocking or hangars.

B. Refer to the Drawings for specific blocking details and seismic mounting details for lighting fixtures.

3.4 EXTERIOR POLE MOUNTED FIXTURES AND BOLLARDS

A. Provide pole base footings in accordance with the Drawings. Footings shall be reinforced concrete with anchor bolts sized and located in accordance with the manufacturer's recommendations for the geographic locality. Provide reinforced concrete in accordance with the requirements as stipulated elsewhere in these Specifications. Forms for pole bases shall be placed using resin-lined Sonotube concrete forms or Approved Equal to give a smooth finished appearance. Patch and sack cracks and voids in the bases to match the surrounding surface.

B. Verify the exact location of underground facilities in the vicinity of pole bases prior to boring holes and bring potential conflicts to the attention of Owner. Use an anchor bolt template as provided by the manufacturer for the placement of anchor bolts and substantially brace the forms to ensure that the base remains straight and plumb. Refer to

the Drawings for fixture orientation and alignment, and utilize a transit site or snap line to verify same.

C. Exposed surfaces of concrete bases or footing shall be finished smooth without cracks, voids, or jagged edges. Chamfer and float the base after pouring concrete to achieve a finished appearance. In order to allow leveling of the pole, install the pole base-plate one inch above the top of the concrete footing. Level the pole plumb and pack the space under the base-plate with Embeco dry pack grout.

D. For fixtures with adjustable aiming or reflectors, arrange to perform a final adjustment of aiming at night under the direction of Owner.

3.5 OBSTRUCTIONS

A. Verify throughout the Project that mounting locations and suspension systems remain free of obstructions. Suspended or pendant mounted fixtures must be free to swing 45 degrees in all directions without hitting obstructions or other fixtures. Provide seismic rated swivel ball hangars for pendant mounted lighting fixtures to achieve the proper swing.

END OF SECTION 26 56 00

SECTION 27 00 00 - TELECOMMUNICATIONS INFRASTRUCTURE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Materials, labor, equipment, testing, and documentation for a complete local area network (LAN) structured cabling system in accordance with the following published standards, hereinafter referred to as the "Standards":

B. ANSI/TIA/EIA 568A "Commercial Building Telecommunications Cabling Standard."
   1. ANSI/TIA/EIA 569 "Commercial Building Standard for Telecommunications Pathways and Spaces."
   2. EIA/TIA TSB-67 "Transmission Performance Specifications for Field Testing of UTP Cabling Systems."
   3. ANSI/TIA/EIA 606 "Administration Standard for the Telecommunications Infrastructure of Commercial Buildings."
   4. TIA/EIA 607 "Commercial Building Grounding and Bonding Requirements for Telecommunications."
   5. ANSI/TIA/EIA-A-5.
   6. EIA/TIA TSB-95.

C. The scope of the LAN infrastructure includes the following:
   1. Provisioning of telecommunications equipment rooms and closets including:
      a. Main distribution facilities (MDF).
      b. Intermediate distribution facilities (IDF).
   2. Pathways including conduits, junction boxes, cable trays, ducts, wire-ways, cable supports, and cabling management systems.
   3. Freestanding (floor) and wall mounted equipment racks.
   4. Backbone cabling.
   5. Horizontal cabling.
   6. Telecommunication outlets and data jacks.
   7. Cross-connect fields, patch-panels, and cable terminations at the IDFs in telecommunications rooms and closets.
   8. Documentation and labeling.
   9. Cable testing and reports.

1.2 WORK NOT INCLUDED

A. Hubs, switches, routers, transceivers, and other active network equipment.

B. Servers and workstation equipment.

C. Patch cables, baluns, and adapters.

1.3 SUBMITTALS

A. Backbone and horizontal cabling including but not limited to the following:
   1. Fiber-optic (FO) cables.

2. Unshielded twisted pair (UTP) cables.

B. Connectors, splices, and terminations used for FO and UTP cabling.

C. Wall mount and floor mounted distribution equipment racks, frames, bracing, and anchors.

D. Surface raceway, cable tray, and cable management systems.

E. Cross-connect punch-down blocks, UTP modular patch-panels, FO management panels, and components.

F. Telecommunication outlet jacks, boxes, bezels, modules, and cover-plates.

PART 2 - MATERIALS

2.1 RACEWAYS, PATHWAYS, AND BOXES

A. All telecommunication cabling shall be installed in raceways. Provide conduit, wireway, cable-trays, junction boxes, and outlet boxes as indicated on the Drawings. Where sizes are not indicated on the Drawings provide raceways sized in accordance with EIA/TIA and BICSI standards. Materials shall be in accordance with Specification Section 16128 in addition to specific requirements of the Standards.

B. Provide pull-lines in both empty and partially occupied data and telecomm raceways. Partially occupied raceways are considered to be those that are filled to less than 40 percent of the cross sectional area of the raceway. Pull-line sizes and types are as follows:
1. Conduits 1¼” and smaller: 3/16” polyester pre-measured printed tape, Greenlee Textron #434.
2. Conduits 1½” and larger: 1/4” Kevlar pre-measured printed tape, Greenlee Textron #39243.
3. Cable trays longer than ten feet in length: Rig continuous traveling pull-lines of 1/4” polypropylene between access points so as to allow multiple sequential cable installations over the life of the Project.

C. Provide rough-in outlet boxes for data and telecomm outlets in size 4-11/16” square by 2-1/8” deep with single gang plaster rings. Select special knockout provisions to match the conduit entries indicated on the Drawings.

2.2 TERMINAL BACKBOARDS

A. 3/4" exterior grade plywood, finished on one side. Furnish in 4’ x 8’ sheets and cut to fit the available space. Finish with two coats of white fire retardant paint.

2.3 EQUIPMENT RACKS

A. Server Cabinet: provide (1) freestanding, 4-post, enclosed server cabinet, APC NetShelter (no substitutions). Coordinate exact model number and accessories with Owner’s IT consultant. Provide seismic mounting brackets and mount in MDF room,

B. IDF / MDF Rack (Freestanding floor mounted): Standard EIA 19”, 72” high, 3” x 1.265” x ¼” EIA channel, extruded aluminum rack, with base angles and top angles. Chatsworth, ADC, or Panduit.

For each two sections of rack, provide an adjustable steel channel mounting brace or lateral ladder rack section for anchorage to the wall or ceiling. Provide an adjustable steel channel mounting brace or lateral ladder rack section for anchorage to the wall or ceiling.

1. For each rack provide full vertical cable management on each end and between rack sections. Chatsworth MCS, 4.4" wide, double-sided, with hinged covers, or equal.
2. For each rack provide one (1) horizontal cable manager for each 12 RMU spaces or fraction thereof. Chatsworth "Universal Horizontal Cable Manager", or equal.
3. For each rack provide two (2) 48-inch high, 16 outlet strip with 15-ft. cord, with rack mounting hardware Tripp Lite # PS4816, or equal.
4. For each rack provide the manufacturer recommended seismic mounting kit for use on a raised floor

C. Fixed wall-mount rack for IDF: APC Netshelter WX 13U with threaded hole vertical mounting rail and glass front door.

2.4 CABLE TRAY AND RACK SYSTEMS

A. Wall mounted half-rack: Extruded aluminum construction, 3" loading depth, 9" rungs on 6" spacing, flush mounted without spacers or brackets, B-Line "HALF-RACK" #C3A1H06-09-length as shown. Provide #B594 clevis U-brackets at 32" maximum on center.

2.5 PATCH PANELS AND CROSS-CONNECTS

A. All UTP components shall be rated to CAT-6 including cable, outlets, terminations, and patch panels.

B. Fiber optic (FO) components:
1. Fiber Optic termination panels, wall mounted: Panduit #FWME24.
2. Fiber Optic interconnect drawer, rack mounted: Panduit #FMD24.
3. Fiber Optic adapter panel for duplex SC connectors: Panduit #FAP3WDSC. (Two required per twelve fiber cable).
4. Blank Adapter panels: Panduit #FAPB.

C. Unshielded twisted pair (UTP) components:
1. Cat 6 UTP termination panels, 48 port, rack-mounted: Panduit #CP48BL.
2. Cat 6 UTP termination modules, T568B (RJ45 type): Panduit #CJ688T3-X (color per scheme).

D. Cable management components:
1. Vertical cable management, 4"x5" plastic wiring duct, front and rear: Panduit #WMPVS20 (on sides of racks) and #WMPVC20 (between adjacent racks).
2. Horizontal cable management, 3"x3" plastic wiring duct on front, 2"x4" plastic wiring duct on rear, 2 rack space unit: Panduit #WMP1 (required between patch panels and at top and bottom).
3. Cable ties: Velcro type, Panduit HLT or HLS series (color at Contractor's discretion).

2.6 FIBER OPTIC (FO) CABLE

A. Indoor Fiber Optic backbone cable: 12 strand, 50/125 μm, multi-mode, tight-buffered, riser type, NEC rated OFNR/FT4, color coded, ripcord, 900 μm TBII buffer coating, 600m Serial 10 Gigabit Ethernet Distance, Siecor MIC #012T81-33191-24.

B. Outdoor Fiber Optic backbone cable: 12 strand, 50/125 μm, multi-mode, tight-buffered, indoor/outdoor type, NEC rated OFNR/FT4, color coded, ripcord, 900 μm buffer coating, UV-resistant flame retardant sheath, water-blocking tape, 600m Serial 10 Gigabit Ethernet Distance, Siecor FREEDM #012T8F-31191-29.

C. Buffer Tube Fan-Out Assemblies: Siecor BTF.

D. Other Fiber Optic cable: As indicated on the Drawings.

2.7 UNSHIELDED TWISTED PAIR (UTP) CABLE

A. Category 6 UTP cable: Unshielded, 4 twisted-pair, 24 AWG copper, Category 6, NEC Article 800 type CMR rated, non-plenum type, tested to 550MHz, Superior Essex DataGain Category 6, #66-246-xA, color per established scheme.

B. Category 6 UTP cable: Unshielded, 4 twisted-pair, 24 AWG copper, Category 6, NEC Article 800 type CMP rated, plenum type, tested to 550MHz, Superior Essex DataGain Category 6, #66-246-xB, color per established scheme.

C. Copper Backbone cable: flooded / gel filled #19 AWG 25-pair OSP copper, Superior Essex 09-031-02

D. Outdoor Category 5e cable: water blocked #24 AWG 4-pair OSP copper, Superior Essex 04-001-58

E. Other UTP cable: As indicated on the Drawings.

2.8 TELECOMMUNICATIONS OUTLETS & DATA JACKS

A. Where individual wall data outlets are indicated, provide 4-port, single-gang outlets with bezels, adapters, faceplates, and Category 6, RJ45 modules. The actual quantity and configuration of activations shall be as scheduled on the Drawings.
   1. Faceplate bezel: Panduit #CBEIW.
   2. Sloped inserts: Panduit #CHS2IW-X.
   3. Blank inserts: Panduit #CHB2IW-X.
   4. Modular jacks, T568B (RJ45 type): Panduit #CJ688T3-X (color per scheme).

B. Where data outlets in modular furniture are indicated provide surface mounted boxes for outlets, and Category 6, RJ45 modules. The actual quantity and configuration of activations shall be as scheduled on the Drawings.
   1. Boxes shall be Panduit CBXC4X-A.
   2. Modular jacks, T568B (RJ45 type): Panduit #CJ688T3-X (color per scheme).

C. Where data outlets in Wiremold 5400 surface raceway are indicated, provide 4-port, single-gang outlets with brackets, adapters, faceplates, and Category 6, RJ45 modules. The actual quantity and configuration of activations shall be as scheduled on the Drawings.
   1. "Decora" style frame for twin style wireway covers: Panduit #CFG4IW.
   2. Modular jacks, T568B (RJ45 type): Panduit #CJ688T3-X (color per scheme).
   3. Provide matching, coordinated, Wiremold faceplate.

D. Provide surface mounted boxes for outlets installed using surface mounted conduit or wireway. Size the box for the largest required conduit or wireway entry. Single gang outlets with accessories and faceplates with a similar appearance to flush mounted telecommunications outlets.

E. Single data outlets that must be concealed in under-floor duct or attached inconspicuously to furniture or casework shall be fastened with low profile, two module, surface mount boxes. In no case shall cable data or telecom cabling be directly terminated without physical protection and support.
   1. Outlets box: Panduit #CBXJ2IW-A.
   2. Modular jacks, T568B (RJ45 type): Panduit #CJ688T3-X (color per scheme).

F. Verify the color selection of data and telecommunications devices in the finished environment with the Engineer prior to installation.

PART 3 - EXECUTION

3.1 RACEWAYS, PATHWAYS, AND BOXES

A. Install conduit, wireway, cable-trays, junction boxes, and outlet boxes as indicated on the Drawings. Installation methods shall be in accordance with Section 26 05 33, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS in addition to the specific requirements of the Standards.

3.2 TERMINATIONS AND SPLICES

A. Perform terminations and splices of backbone and horizontal cabling at each the IDF and station outlets. Splices and terminations shall be performed only by competent technicians proficient in latest standardized procedures.

B. Fiber Optic splices shall be performed by means of the thermal fusion splicing method. Maximum allowable average splice loss shall be 0.05 dB. Maximum allowable absolute splice loss shall be 0.15 dB. Maximum allowable reflectance shall be –65dB.

C. Fiber Optic terminations shall be performed by means of the UV-cure, Epoxy and Polish, or other comparable methods. Maximum allowable average insertion loss shall be 0.15 dB. Maximum allowable absolute splice loss shall be 0.30 dB. Maximum allowable reflection shall be –55 dB.

D. Category 6 UTP cabling terminations shall be performed using the insulation displacement contact (IDC) method. Take special care to observe jacket cut-back and pair twist requirements to preserve the performance of data cabling.

E. Route, lace, and support both FO and UTP cabling in accordance with the Standards. Observe published bending radius and pulling tension limitations during installation.

F. The entire UTP channel shall be installed, terminated, and tested to meet or exceed CAT-6 standards.

G. Provide a minimum of 3’ slack for UTP cable at each MDF/IDF, 10’ slack at ceiling panels, and 1’ slack at data outlets to allow for adds/moves/changes.

H. Provide a service loop for FO cable at each MDF/IDF consisting of a minimum of 15’ of cable at or above the ceiling in the vicinity of the termination rack. In addition, at the FO termination tray, provide a minimum of 36” extra strip length for the buffer tube & fan-out assembly to allow each termination to be removed from the tray for inspection and assembly without disturbing adjacent terminations.

3.3 TERMINAL BACKBOARDS AND EQUIPMENT RACKS

A. Fasten backboards securely to the structural wall framing. Provide blocking between wall studs or metal framing prior to application of wall finishes where substantial support cannot be obtained for the wall framing alone. Install the board with the finished side out and secure with #12 x 3” all-purpose screws spaced at not more than two feet apart.

B. Anchor freestanding equipment racks to the building floor with 3/8” x 3” lag screws or concrete expansion wedge anchors fastened through the base plate. Provide a minimum of four (4) anchors per rack. In addition racks over 47” high shall be tied back to the building structure at the top using cable tray for additional seismic support.

C. Unless otherwise indicated, wire Category 5e, UTP data jacks to the TIA 568B wiring configuration.

3.4 TELECOMMUNICATIONS OUTLETS & DATA JACKS

A. Provide flush, large, double gang, back-boxes with single gang plaster rings for mounting of telecommunications outlets in finished walls.

B. Where station outlets are indicated with voice and data services combined, use a different color jack for each service. The jack color assignments shall be consistent throughout the entire Project.

C. Unless otherwise indicated, wire Category 6, UTP data jacks to the TIA 568B wiring configuration.

3.5 TESTING AND DOCUMENTATION

A. Fiber Optic (FO) cable: Conduct performance testing of fiber optic cable in accordance with EIA/TIA standardized procedures. Use Optical Time Domain Reflectometer (OTDR) and Optical Loss Test Sets (OLTS) that have been calibrated against National Institute of Standards & Technology (NIST) standards during the previous twelve months. Operate and adjust the test equipment in accordance with the manufacturer’s directions. The test set operating instructions, as published by the manufacturer, shall be made available for inspection by the Project Inspector or Engineer at the time of the test.

B. Testing for Fiber Optic (FO) cable shall be in accordance with ANSI/TIA/EIA-526-7 and ANSI/TIA/EIA-526-14 and TSB-72

C. Fiber Optic cable shall meet the performance criteria as stipulated in the table below and as amended by the latest applicable Standards. Replace, re-splice, or re-terminate cables that do not meet the specified performance criteria. Retest and document the replacement cables.

D. Tests on FO cables shall be conducted on individual fibers from origination point to termination point; Duplex "Loop-back" testing is not acceptable.

OPTICAL FIBER TRANSMISSION PERFORMANCE TABLE		
WAVELENGTH λ (NM)	ATTENUATION (DB/KM)	BANDWIDTH (MHZ-KM)
850	2.8	3500
1300	1.0	500

E. Provide copies of the Cable Manufacturer's test results for each reel of FO cable as follows
1. Bandwidth/Dispersion test data.
2. Index of Refraction.
3. Cable length and reel data.

F. Prepare a type written or hardcopy printout of report of the results, including OTDR traces, for each cable tested and furnish three copies to the Engineer.

G. Testing for UTP cable shall follow TSB-95 and shall include the following: Return Loss, PS-ELFEXT, Far-end crosstalk, Power sum far-end crosstalk, Power sum near-end crosstalk, ACR, Delay, and Delay Skew. Testing shall include both Basic Link and Level II tests. Horizontal UTP cable shall meet the performance criteria as stipulated in the table below and as amended by the latest applicable Standards. Replace, re-splice, or re-terminate cables that do not meet the specified performance criteria. Retest and document the replacement cables.
1. Characteristic impedance: 100 ohms ±15% from 1 MHz to 100 MHz, ±22% from 100 MHz to 200 MHz, ±25% from 200 MHz to 250 MHz, ±32% from 250 MHz to 350 MHz.
2. Minimum ACR: 26dB at 100 MHz and 7dB at 250 MHz.
3. Attenuation is given as the maximum allowable attenuation in dB per 100m for the worst pair in the cable.
4. NEXT (near end cross talk) is given as the minimum allowable NEXT loss in dB for the worst pair in the cable.

H. Horizontal UTP cable connections shall meet the performance criteria as stipulated in the latest applicable Standards. Replace, re-splice, or re-terminate cables that do not meet the specified performance criteria. Retest and document the replacement connectors.

3.6 IDENTIFICATION AND CABLING MANAGEMENT

A. Permanently and clearly identify individual cables, fibers, and grounding conductors at outlets, terminations, and cross connects in accordance with TIA/EIA 606 standards.

B. Prepare a report that cross references the linkages between the various components and equipment.

C. Establish a record keeping system for the Project that tracks the location, use, and status of telecommunications and LAN Infrastructure components and equipment. Prepare a computer or

paper based report that documents the above elements. Provide three copies of the system to the Engineer.

END OF SECTION 27 00 00

SECTION 27 41 00 - AUDIO-VIDEO SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all materials and labor required for the installation and start-up of complete and operational audio-video systems, as outlined herein and as indicated on the drawings.

B. The Contractor is responsible for providing complete systems, including detailed design drawings and diagrams, documentation, startup configuration, testing, and documentation. The Contractor shall provide all labor, materials, equipment, interconnections, and configuration as specified on the drawings and/or as indicated herein. The Work includes but is not necessarily limited to the following:
   1. Provision of (2) wall mount ultra-short throw projection systems in the Administration/Operations building
   2. Provision of (1) Flat panel display in the Maintenance Building
   3. Provision of (3) independent assisted listening systems – 2 in the Administration/Operations building, 1 in the Maintenance Building

C. The following is a general summary of the Audio-Visual system work:
   1. Administration / Operations Building Equipment
      a. Large Conference Room
         1) (1) Wall Mount Projector
         2) (1) Assisted Listening System
      b. Small Conference Room
         1) (1) Wall Mount Projector
         2) (1) Assisted Listening System
   2. Maintenance Building Equipment
      a. Break / Training Room
         1) (1) Flat panel Display, 80” Diag
         2) (1) Assisted Listening System
   3. Sound reinforcement for each of the Training Rooms consisting of speakers, and interconnections with the projector / display.
   4. Input receptacle plates for device connections shall reside in a 2 gang wall box with faceplate and jacks for HDMI, Ethernet, VGA, and Stereo Mini.
   5. Hearing Assistance: An induction loop hearing assistance system will be provided and connected to an output of the new DSP audio processor.
   6. All audio, video, network, and power cabling as required for a complete and functioning system.

1.2 SUBMITTALS

A. Within twenty (20) working days of notice to proceed submit four sets of submittals. Include any proposed component or system design changes.

B. Complete list of equipment, devices, cable, and connectors including the following:
   1. Manufacturer
   2. Model number

3. Type, style, and color
4. Selected options, accessories, and functional components

C. Manufacturer's product data sheets for all of the above.

D. Shop drawings consisting of the following:
1. Point-to-point functional wiring diagrams.
2. A/V connection and outlet plates, panels, and receptacles including engraving and faceplate labels.
3. A/V system floor plan showing equipment, devices, and outlets.

1.3 ACCEPTANCE TEST SUBMITTALS

A. Submit copies of the preliminary test reports prior to requesting completion of the acceptance tests.

1.4 PROJECT SITE CONDITIONS

A. Prior to submitting a proposal the Contractor shall inspect the existing project site conditions, and shall become fully informed as to the laws, ordinances, and regulations affecting the Work. The Contractor shall immediately bring to the Owner's attention in writing any existing condition that contradicts or is in conflict with the Contract Documents. Failure of the Contractor to visit the site, and become fully informed as to all the above-mentioned items shall in no way relieve the Contractor from any obligations with respect to their bid.

1.5 QUALITY ASSURANCE

A. Contractors Qualifications
1. Must specialize in the design & installation of professional audio-video systems with a minimum of 5 years documented experience and be an approved vendor for the components to be installed.
2. Must maintain a local service center within fifty (50) miles of the installation location. The service center shall be staffed and adequately equipped to provide emergency service during normal business hours within 4 hours after being called.
3. Hold all legally required California State Contractor's licenses necessary to accomplish the installation and activation of the described system.

B. Material and Equipment
1. Equipment and materials shall be new, current production models and shall meet all applicable codes and the applicable standards as listed below.
a. American National Standards Institute (ANSI).
b. Electronic Industries Association (EIA).
c. Institute of Electrical and Electronic Engineers (IEEE).

PART 2 - PRODUCTS

2.1 AUDIO/VISUAL EQUIPMENT AND SYSTEMS

A. See the drawings for a list of all intended A/V equipment and components. The items listed therein represent minimum levels of performance and function and are based upon values as published by

the listed manufacturers. Equipment or materials that are proposed as substitutes shall meet or exceed the performance and functional characteristics of the listed material in order to be considered.

B. Wall Mount Ultra Short Throw Projector
   1. Mitsubishi WD385U-EST or Equal
   2. Mitsubishi PROJ-SWM wall mount with 4" extension adapter

C. Wall mount Flat Panel Display
   1. Vizio M801I-A3 80" LED TV or Equal
   2. MW Mounts XL Tilt Wall mount MW175T74 or Equal

D. Assisted Listening System:
   1. Provide an assisted listening system. The system shall accept sound signal input from the display device audio output. The signals will be received by user-carried receiver/amplifiers with self-contained rechargeable batteries. The system shall be furnished with a self-contained recharging system for the user receiver/amplifier units.
   2. Provide equipment equal to that manufactured by Listen Technologies Corp.
      a. Administration / Operations Building Equipment:
         1) Large Conference Room:
            a) Listen Technologies Basic Listen RF system, LS-02-072
         2) Small Conference Room
            a) Listen Technologies Basic Listen RF system, LS-02-072
      b. Maintenance Building Equipment:
         1) Break / Training Room:
            a) Listen Technologies Try Listen RF system, LS-01-072

2.2 WIRE AND CABLE

A. System Description
   1. Provide all wire and cable as required for complete and operational systems.
   2. All wire and cable shall meet equipment manufacturer's requirements, national, state and local code requirements and shall be UL listed for their application.
   3. Provide local CATV feeds for RG-6 broadband coaxial (television) and Category 6 UTP (data) as shown on the Drawings. Provide 'F' style or RJ45 connectors, respectively, at each end. Label these feed cables as specified in the respective specification section.
   4. Cables shall be individually marked with a customized numbering scheme using typewritten printed tagging system. Hand-written labels are not acceptable. Cable identification shall be included in the record drawings.
   5. Provide interconnecting cabling and connectors within each room as indicated on the Drawings.

B. Acceptable Manufacturers
   1. Belden, West Penn, Canare or approved equal.
   2. Cable installed in below floor or above ceiling spaces used for environmental air shall be plenum rated as required by Code.

2.3 CONNECTORS

A. Neutrik, Canare, Switchcraft, or approved equal.

B. Style and type as required for the intended connections as indicated on the Drawings.

2.4 MISCELLANEOUS HARDWARE

A. Equipment Locks: Provide equipment locks on each item as noted below.
   1. One lock is required at the projector support mounting plate connection and one of the LCD projector mounting screws.

B. Connectors: Provide compatible plugs and connectors as indicated on the drawings and as required for a complete and functional system. Cable connectors subject to physical damage or loading shall be metal and shall have black anodized finish where available.

C. Patch Cables: For each wall, floor, or panel receptacle that is not to be used by immediately installed equipment, provide one patch cable with compatible connector for connection of future portable devices to the system.

D. A/V Outlet Plates: Provide stainless steel or aluminum plates with etched and ink-filled labels. Submit samples for approval prior to fabrication.

E. Miscellaneous: Provide miscellaneous hardware such as screws, nuts, fasteners, power supplies, plug strips, cable ties, etc. that are not necessarily shown on the drawings but are required to provide a complete and functioning A/V system in accordance with the industry standard of care.

F. Surge protection: Provide surge protective devices as noted below
   1. Projector Receptacle – Tripp Lite Isoblok2-0

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment
   1. Install all equipment and software in accordance with the manufacturer’s requirements and instructions.
   2. Verify the exact mounting locations of all equipment with the Owner prior to installation.

B. Conduit and Boxes
   1. Contractor shall provide and install all conduit and boxes. Coordinate with other trades the location of all conduits, back-boxes, junction boxes and raceway that are indicated on the drawings or that are required to provide a quality installation. Contractor shall be responsible for ensuring that all conduit, back-boxes and raceways meet equipment and wiring requirements for the system.

C. Wiring
   1. All wire and cable shall be installed in accordance with the equipment manufacturer’s requirements and instructions, national, state and local code requirements.

2. All wiring shall be in conduit or shall be run concealed within walls or above accessible ceilings. All cables run exposed above accessible ceilings shall be neatly run and fastened to the structure at least every 10 feet.
3. Code compliant fireproofing techniques shall be utilized by the Contractor for all penetrations of fire rated partitions and slabs, where the penetrations are made by or used by the Contractor.
4. All cable must be run continuous from device location to the final point of termination. No mid-run cable splices will be allowed.
5. Make all wiring connections with solderless devices, mechanically and electrically secure in accordance with manufacturer's requirements.
6. A single "system ground" point shall be established for the system. This system ground shall consist of a single grounding point to which all grounds in the system are connected. Under no conditions shall the AC neutral either in a power panel or in receptacle outlets be used for a reference ground. The Contractor shall be responsible for establishing the ground point and insuring that no ground loops are created.
7. Cables shall be labeled with a commercially available cable labeling system delivering type-written labels. Handwritten labels shall not be used. Labels shall indicate cable origination and termination points.

D. Power Requirements
1. The Contractor shall use the designated 120VAC power outlets and/or circuits for the audio-visual system that maybe available at required locations. Field verify the exact locations. Provide other 120 VAC power circuits as required for proper operation of the system. These additional circuits shall be noted and designated on the shop drawing submittals.
2. Provide a listing of all breakers and outlets and their locations that are associated with the audio-visual system.

3.2 AUDIO/VISUAL EQUIPMENT AND SYSTEMS

A. General: Where unneeded remote control devices or other loose accessories or appurtenances are shipped with a Contractor-provided item of equipment, pack these items in a carton and deliver them to the Owner.

B. Projector Support
1. Set support and mounting plate plumb and level. Supports that are set out of plumb will not perform adequately and will require remounting.
2. Verify in each room the required dimensions so that the top of the projector is level with the top of the projector screen viewing area. The projector "throw" distance is critical. Adjust the mounting arm height and length for the projector to completely fill the width of the screen given the mounting location.

3.3 AUDIO/VISUAL CABLING AND CONNECTORS

A. Label cables according to function and attach these labels in a permanent and durable manner. Example: A cable attached to a VCR output connector = "VCR Out".

B. Cabling jacket color shall be coordinated to maintain consistent identification.

C. Where a multiple conductor cable is terminated in multiple connectors, provide colored boots at each connector that match the insulation color of the cable or conductor being terminated.

D. Connections to screw clamp or binding post terminals require flanged or snap spade type lugs appropriately color coded. Binding post connections are not acceptable. Loudspeaker connections shall be soldered with rosin core solder or with connectors approved by the Owner.

E. Grounding: Equipment racks and the "safety" ground conductor of the equipment rack should be tied to the building's service ground. Cable shields shall only be used for shielding (not signal) and connected to ground at the rack. All equipment shall be checked for ground continuity.

3.4 INVENTORY SPREADSHEET

A. The Owner will furnish the Contractor with adhesive numbered inventory tags. Contractor shall affix these tags to Contractor-provided equipment and shall provide Owner with an Excel spreadsheet containing the following fields (provide hardcopy and electronic file):
1. Owner Tag number
2. Equipment description
3. Equipment location (room number)
4. Equipment manufacturer
5. Equipment model number
6. Equipment serial number
7. Equipment Cost

B. Provide inventory data for the following items:
1. LCD Projectors
2. Flat Panel Displays
3. Assisted Listening Equipment

3.5 RECORD DOCUMENTATION

A. Prior to final acceptance of the Work, the Contractor shall submit three (3) sets of Record Documentation to the Owner within 30 days from the date of final acceptance and prior to project close out requirements set forth under General Conditions. Record Documentation shall include the following:
1. Product Data
    a. Equipment schedules listing all system components, the manufacturer, model number and quantity of each.
    b. Manufacturer's literature sheets for all system components, including any warranty information.
2. General functional description of the system and the software.
3. Cable and wiring types.
4. A listing of all 120VAC breakers and their locations associated with the audio-visual equipment.
5. Original software media.
6. Wiring diagrams for the systems defining the interconnection of all inputs and outputs for all equipment.
7. Provide touch panel and control system source code, and DSP system configuration files to the Owner. Store files on site in the system documentation binders in disk sleeves.

8. System Operation Instructions: Step-by-step operating instructions for the normal day-to-day use of the system including power activation, connection of microphones and other source devices, adjustment of volume levels, selection of sources and loudspeaker zones, etc. Include illustrations and references to individual equipment manuals as necessary.

3.6 TRAINING

A. Provide 4 hours of system training to operator(s) designated by the Owner.

3.7 SYSTEM ACCEPTANCE

A. Prior to the final acceptance test the Contractor shall have conducted the complete preliminary testing and adjustments for the entire system as outlined above and shall provide the Owner with a written report on the results of that test.

B. The Contractor shall conduct the final acceptance testing of the audio-visual system in the presence of the Owner.

C. Acceptance Test
1. Each major component shall be demonstrated to function, as specified.
2. Measurements: Further electrical and acoustical measurements may be performed at the discretion of the Owner. Such measurements may include sound pressure levels, uniformity of coverage, distortion, or other pertinent characteristics. Provide equipment for performing any necessary electrical tests.

D. Such tests shall be performed on each piece of equipment or system. If any test shows the equipment or system is defective or does not comply with this section, the Contractor shall perform any remedies at his expense and pay the subsequent expenses of any retesting required.

E. The Owner retains the right to suspend, terminate or reschedule testing at any time when the system is found to be incomplete or fails to perform as specified. In the event it becomes necessary to suspend, terminate or reschedule the test, the Contractor shall work diligently to complete/repair all outstanding items as required by the Contract Documents. The Contractor shall supply the Owner with a detailed completion schedule outlining task-by-task completion dates and a tentative date for a subsequent retest. During the final acceptance test, no adjustments, repairs or modifications to the system shall be conducted without the permission of the Owner.

F. Upon successful completion of the final acceptance test (or subsequent punch list retest), the Owner will issue a letter of final acceptance. The warranty period shall commence upon issuance of the letter of final acceptance.

END OF SECTION 27 41 00

SECTION 27 51 23 - INTERCOMMUNICATIONS AND PROGRAM SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes materials, labor, equipment, testing, and documentation for the installation of a new Bogen Quantum Multicom IP public address (PA) and intercom system.

B. The contractor shall furnish all equipment, accessories and material required for the installation of a comprehensive communication system in strict compliance with these specifications and applicable contract drawings. Any material and/or equipment necessary for the proper operation of the system, which is not specified or described herein, shall be deemed part of this specification.

1.2 SYSTEM DESCRIPTION

A. Provision of a new public address system for two-way voice communication, general paging, clock program tone generation, and music.

B. Features
1. Interface to telephone system.
2. One-way paging by zone.
3. Emergency paging override.
4. Distribution of background music.
5. Selective speaker talkback.

C. Includes
1. Provision of new Quantum Multicom rack mount equipment, including Multicom IP rack mount PA system controllers, amplifiers, cable management, and accessories in the following locations:
   a. Maintenance Building IDF Room
2. Configuration of the Quantum Multicom Commander Software loaded onto desk top servers
3. Room speakers.
4. Exterior speakers.
5. Call-in switches.
6. Cabling, terminations, and connections.
7. Network switches and connections to (E) data network as indicated in the drawings

1.3 SUBMITTALS

A. Provide Shop Drawing submittals for the following:
1. Submit catalog data on all passive equipment and materials with complete description of components; including speakers, cabling, racks, cable management, and all related equipment. Submittal information shall include manufacturer's descriptive and technical literature for devices and equipment, and installation instructions
2. Submit catalog data on all active equipment and materials with complete description of components; including PA system controllers, amplifiers, switches, uninterruptable power

supplies, and all related equipment. Submittal information shall include manufacturer's descriptive and technical literature for devices and equipment, and installation instructions

3. Submit a complete system block and riser / connection diagrams, including all equipment and interconnection cabling.
4. Submit a complete bill of materials with all equipment quantities

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of speakers, control equipment, and outlets for input/output connectors.

B. Operation and Maintenance Data: Submit instructions for adjusting, operating, and extending system, and repair procedures and spare parts documentation.

C. Test Reports: Indicate procedures and results for specified field testing and inspection.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

E. Manufacturer's Field Reports: Indicate activities on site, adverse findings, and recommendations.

1.5 QUALIFICATIONS

A. Equipment Manufacturer: PA & Intercom system equipment shall be manufactured by Bogen Communications, Inc.

B. The manufacturer shall be a United States manufacturer, who has been regularly engaged in the manufacture of communication systems for at least thirty (30) years.

C. **Note: The Owner shall not be charged a yearly software fee or for future software changes. Systems which require yearly software fee's or fee's for software upgrades will not be acceptable.** The equipment described herein, and furnished per these specifications shall be the product of one manufacturer. All reference to model numbers and other detailed descriptive data is intended to establish standards of design, performance and quality, as required.

D. The communications system shall bear the label of a Nationally Recognized Testing Laboratory (NRTL) such as E.T.L., D.S. & G., or UL and be listed by their re-examination service. All work must be completed in strict accordance with all applicable electrical codes, including NEC Section 800-51 (i), under direction of a qualified and factory approved distributor, to the approval of the owner.

E. The system is to be designed and configured for maximum ease of service and repair. All major components of the system shall be designed as a standard component of one type of card cage. All internal connections of the system shall be with factory keyed plugs designed for fault-free connection. The printed circuit card of the card cage shall be silk screened to indicate the location of each connection.

F. All work described herein to be done by the manufacturer's authorized representative shall be provided by a documented factory authorized representative of the basic line of equipment to be utilized.

G. As further qualification for bidding and participating in the work under this specification the manufacturer's representative shall hold a valid B or C-10 Contractor's License issued by the Contractor's State License Board of California. The manufacturer's representative shall have completed at least ten (30) projects of equal scope, giving satisfactory performance and have been in the business of furnishing and installing sound systems of this type for at least ten (10) years. The manufacturer's representative shall be capable of being bonded to assure the owner of performance and satisfactory service during the guarantee period.

1.6 MAINTENANCE SERVICE

A. The contractor shall provide a five year equipment warranty of the installed system against defects in material and workmanship. All materials shall be provided at no expense to the owner during normal working hours. The warranty period shall begin on the date of acceptance by the owner/engineer.

B. The contractor shall, at the owner's request, make available a service contract offering continuing factory authorized service of this system after the initial warranty period.

C. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

PART 2 - MATERIALS

2.1 RACEWAYS, PATHWAYS, AND BOXES

A. Provide conduit, wire way, cable-trays, junction boxes, and outlet boxes as indicated on the Drawings. Materials shall be in accordance with these Specifications in addition to specific requirements of the Standards.

2.2 PA / INTERCOM SYSTEM

A. The equipment described herein, and furnished per these specifications shall be supplied by one communications contractor. All reference to model numbers and other detailed descriptive data is intended to establish standards of design, performance, and quality as required.

B. Provide a complete and comprehensive, computer based, integrated telephone/public address/intercom system. The system shall incorporate integrated Speaker Intercom and a fully non-blocking Digital Telecommunication system, capable of integrated connection to outside telephone lines as specified. All system functions shall be enabled by DTMF/microprocessor control. The communications system shall be provided by one supplier to assure smooth coordination of all communications needs. The system shall have the capabilities of processing voice/data transmission at the standard

C. Master and Sub Controllers: Bogen Quantum Multicom IP QCR 24, including amplifiers, accessories, and connections as required.

D. Input modules: As required to serve the new paging/speaker zones as depicted on the Drawings.

2.3 PA/INTERCOM EQUIPMENT

A. To fulfill the requirements, the following control equipment shall be provided:
   1. Bogen QCR24 including the following components:
      a. Quantum Processor Card QSPC1
      b. Analog Card
      c. Station Card
      d. Telephone Interface Card
      e. Power supply and integral ventilation fan
   2. Bogen HTA-200 series amplifier.

2.4 CALL STATIONS

A. Call in switches shall be Bogen Model SC-1 Call Assurance Call in switch with call pending LED, and shall be capable of Normal/Urgent/Emergency Calls

B. Normal/Urgent Call involves pressing the Call Switch once. The Call is then switched to the Administrative Display Phone.

C. Emergency Call involves pressing the emergency call switch a minimum of 4 times in rapid succession. The Call is then switched to the Administrative Display Phone, where a distinct ring tone is issued. Emergency calls will be automatically raised to the top of the call queue.

D. Emergency Link Transfer - If the emergency call is unanswered by the Administrative Display Phone and the emergency link transfer is provisioned and programmed; the emergency call will be forwarded to the loudspeaker associated with that station. Any station/admin phone with speaker can be programmed for the Emergency Link Transfer except the Administrative VoIP Phone.

2.5 SPEAKERS

A. Outdoor Speakers shall be Bogen FMH15T mounted in BBSM6 surface-mounted vandal-resistant enclosure with BBFM6 flush-mounted vandal-resistant enclosure, FMHAR8 adapter ring and SGHD8 heavy duty grille

B. Interior speakers shall be Bogen MB8TSQ Metal Grille and Back Box.

2.6 ADMINISTRATIVE DISPLAY PHONES

A. Administrative Display Phones shall be Bogen Model MCDS4. The administrative telephone display panel shows the time of day and day of week, the current time signaling schedule, and the station numbers and call-in priority of staff stations that have called that particular station. A 3-key response is used to scroll the display, and answer or erase normal, urgent, and security calls. Depending upon the system programming, an administrative station can use display menus to activate zone pages, alarm signals and external functions, as well as select program sources and distribute or cancel a program to any or all speakers or zones.

B. Administrative Display Phones shall have the ability to dial and have the option of dialing the loudspeaker at each station location.

2.7 SYSTEM CABLING

A. PA/Intercom/clock cabling: Cabling for speakers and call-switches shall consist of 2 twisted pairs #22 solid copper under jacket with overall PVC jacket and water blocking, with (1) shielded and (1) unshielded pair, West-Penn #AQ357

B. No splices are permitted except in approved junction boxes. All terminations shall be made on telephone type punch blocks or at specified devices. Display, speaker, and specialty cables shall be as required for best operation under manufacturer recommendations.

2.8 SYSTEM TERMINATIONS AND ORGANIZATION

A. Jacks: All station device terminations (except speakers) shall be terminated on USOC standard modular jacks. Jacks for wall mounted telephones shall have lugs for securely attaching the instrument to the wall.

B. Where instruments are to be wall-mounted, provide mounting studs on the faceplate. Faceplates are to be stainless steel AT&T #630B.

C. Backboards: Provide 4' x 4' plywood backboards for mounting of system cross connect field. mount as shown on the plans. Provide Modular Termination backboards with 110 type terminal blocks as required to terminate all cables. Provide Distribution and cross connect backboards equal to 66M1-50 Harris Series for all cross connect wiring.

D. Terminal Cabinets: A terminal cabinet with a sufficient number of bushed openings shall be installed in the wall behind the Intercom Control Console equipment rack. Cabling between the equipment rack and the main junction box shall be provided with telephone type 50 pin connectors to allow ease in console connections, disconnection’s and service. Satellite terminal junction boxes shall be provided as needed to allow for station termination’s in each building.

2.9 SYSTEM ACCESSORIES

A. The communications contractor shall furnish all equipment, accessories and material required for the installation of a comprehensive Intercom /Call Processing / Clock / Communications System in strict compliance with these specifications and applicable contract drawings. Any material and/or equipment not specified or described herein necessary for the proper operation of the system shall be deemed part of this specification.

2.10 QUANTUM COMMANDER SOFTWARE

A. The processor utilizes a web-based programming tool. The Quantum Commander is built into the QSPC1 processor card, and upon boot up, user can login to the Quantum Commander Web Server.

B. The Quantum Commander shall be broken into three access levels depending on user access credentials. Systems that do not provide at least three (3) Levels of access are not equivalent. The three levels are:

1. User
2. Administrator
3. Technician

C. Only the Administrator and Technician shall have access to add/delete/modify the database objects.

D. Users shall have display only access to see the data objects that include configuration, alarms, and performance data and perform certain operations based on the user's CoS (Class of Service).
   1. The following Menu Items must be available on the Multicom IP Quantum Commander: File - Open Database, New System, Save, Delete, Report and Exit, Upload Database, Download Database, Download Software, Diagnostics, Tones and Announcements, Relay Configuration, Program Distribution, Media Assignment, List Passwords, Add Password, and Change Password.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment in Maintenance building IDF rack.

B. Install engraved plastic nameplates in accordance with these Specifications.

C. Ground and bond public address and music equipment in accordance with these Specifications.

D. Plug disconnect: All major equipment components shall be fully pluggable by means of multi-pin receptacles and matching plugs to provide for ease of maintenance and service.

E. Protection of cables: Cables within terminal cabinets, equipment racks, etc., shall be grouped and bundled (harnessed) as to type and laced with No. 12 cord waxed linen lacing twine or T & B "Ty-Rap" cable. Edge protection material ("cat-track") shall be installed on edges of holes, lips of ducts or any other point where cables or harnesses cross metallic edge.

F. Cable identification: Cable conductors shall be color-coded and individual cables shall be individually identified. Provide labels at all termination points. Each cable identification shall be a unique number located approximately 1-1/2" from cable connection at both ends of cable. Numbers shall be approximately 1/4" in height. These unique numbers shall appear on the As-Built Drawings.

G. Shielding: Cable shielding shall be connected to common ground at point of lowest audio level and shall be free from ground at any other point. Cable shields shall be terminated in same manner as conductors.

H. Provide complete "in service" instructions of system operation to school personnel. Assist in programming of telephone system.

3.2 WIRING

A. Obtain the services of a California-licensed Sound Contractor to install the system, make connections, provide tuning and adjustments and make final tests.

B. Speaker and telephone lines run above ceiling shall be in conduit secured to structure with a maximum spacing of 8' between supports. No wires shall be laid on top of ceiling tile.

C. Connect field cable to each speaker transformer using UL butt splices for 22 AWG wire.

D. All systems herein specified shall be provided and installed by a Factory Authorized Dealer for the equipment. All systems shall be supplied and installed by one Systems Contractor, who shall be the sole source, responsible party with complete authority over all aspects of the project. Certificates of authorization showing that the submitting contractor is qualified to install and maintain all the types of equipment shall be part of the submission process.

E. A comprehensive, documented communications wiring system is to be installed. Wiring is to be identified by room number, segregated, neatly laced, and terminated on telephone type punch blocks. Back boards and cross connect fields shall be neatly organized as to function. (i.e.: intercom, telephone stations, data network etc.) All termination points are to be labeled with function. Data cables shall be certified as usable and checked using the cable certification sheet. Data cables shall be labeled as per the data identification scheme.

F. Terminate field wiring on wall adjacent to rack using Telco 66 type blocks. Provide neat cross connect system for wiring. Wiring to be labeled to indicate final architectural room number that it services on the Telco block.

G. Make splices at punch-down blocks to be provided and mounted on backboards at the MDF and IDF's. Splices are not permitted in underground pullboxes.

3.3 FIELD QUALITY CONTROL

A. Measure and record sound power levels at designated locations.

3.4 MANUFACTURER'S FIELD SERVICES

A. Include services of technician employed by manufacturer to supervise installation, adjustments, final connections, system testing, and Owner training.

B. Verify installation is complete and performs according to specified requirements.

C. On the first school day following installation of Multicom System, the Contractor shall provide a technician to standby and assist in system operation.

3.5 ADJUSTING

A. Adjust transformer taps for appropriate sound level.

B. Adjust devices and wall plates to be flush and level.

3.6 TESTING, DEMONSTRATION AND TRAINING

A. Prior to connection of any terminal equipment all cables shall be tested as per REA bulletin 345-63. Cables shall be tested for Opens, Splits, Crossed Pairs, Shorts to Ground and Shield Continuity. All defective cabling is to be replaced prior to device hook-up.

B. Upon completion of the installation the contractor shall test each room station speaker and call switch for proper operation. All telephones, programming and functions are to be tested for proper operation. All emergency and program functions are to be tested. Any malfunction shall be corrected prior to final acceptance.

C. The contractor shall provide a minimum of 12 hours of training to instruct personnel designated by the owner in the proper use, basic care, and maintenance of the equipment. Such training shall be provided as an integral component of the system. These training sessions will be on both the general operation and basic programming of these systems. The contractor will also provide the owner with limited programming access to the system. This programming will be executed utilizing plain English menus, from any authorized administrative phone, to assist the owner with all necessary changes. The main programming for the system shall be PC/Windows based for ease of operation. Systems that do not use plain English menus and Windows based PC programming and are only programmable from a laptop PC will not be accepted as equal.

3.7 WARRANTIES, OPERATING MANUALS, AND RECORD DRAWINGS

A. The contractor shall furnish a letter from the manufacturer of the equipment, which certifies that the equipment has been installed according to factory intended practices, that all the components used in the system are compatible and that all new portions of the systems are operating satisfactorily. Further, the contractor shall furnish a written unconditional guarantee, guaranteeing all parts and all labor for a period of two (2) years after final acceptance of the project by the owner.

B. Prepare complete drawings of the entire PA & Intercom system. The record drawings shall include a functional block diagram and a point-by-point diagram components, devices, and interconnections. Identify devices according to name, function, and manufacturer's catalog numbers, and indicate their locations on the drawings. Show routing from the main system out to all individual speakers and stations. Provide four (4) complete sets of operating instructions, service manuals, product brochures and specification sheets, installation and maintenance instructions, and internal wiring diagrams to the Architect.

C. The contractor shall make available, and maintain a radio dispatched mobile service department capable of furnishing equipment inspection and timely service at the owner’s location. The contractor shall be prepared to offer a service contract for the maintenance of the system beyond the warranty period.

END OF SECTION 27 51 23

SECTION 28 1300 - ACCESS CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes access control door hardware for the following:

1. Swinging doors.
2. Sliding doors.
3. Other doors to the extent indicated.

B. Section includes, but is not necessarily limited to, the following for the integrated access control security and site management system:

1. Integrated Wiegand access control door hardware.
2. System network control processors.
3. Reader controller interfaces and modules.
4. Power sourcing equipment, network switches and wireless access points.
5. Access control cards and credentials.
6. Access control system application software.
7. Access control system power supplies, back-ups and surge protection.

C. Related Sections:

1. Division 08 Section – “Operations and Maintenance”.
2. Division 08 Section – “Door Schedule”.
3. Division 08 Section – “Hollow Metal Doors and Frames”.
4. Division 08 Section – “Flush Wood Doors”.
5. Division 08 Section – “Aluminum-Framed Entrances and Storefronts”.
6. Division 08 Section – “Automatic Door Operators”.
7. Division 08 Section – “Access Control Hardware”.
8. Division 26 Sections for connections to electrical power system and for low-voltage wiring work.
9. Division 28 Section - "Intrusion Detection" for detection devices installed at door openings and provided as part of an intrusion detection system.
10. Division 28 Section - "Video Surveillance" for motion detection and video camera devices and equipment installed at door openings and provided as part of a security and site management system.

11. Division 28 Section - "Fire Detection and Alarm" for connections to building fire alarm system.

D. Codes and References: Comply with the current version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. System Operational Descriptions: Complete system operational narratives for the integrated access controlled openings defining the owner's prescribed requirements for the opening functionality. Narratives include, but are not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions, and interfaces with other building control systems.

C. Shop Drawings: Details of electrified integrated locking hardware and access control firmware, indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication and control of the access control system electrified hardware and firmware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
b. Complete (risers, point-to-point) access control system block wiring diagrams.

2. Electrical Coordination: Coordinate with related Division 26 Electrical Sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Proof of Certification: Provide copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider of the primary access control components.

E. Keying Schedule: Reference Division 08 Section "Door Hardware".

F. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

G. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete access control and site management installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and telephone number of the supplier/integrator providing the installation and the nearest service representatives for each item of equipment included in the system. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

1. As-Built Drawings: During system installation, the Contractor to maintain a separate hard copy set of drawings, elevation diagrams, and wiring diagrams of the access control system to be used for record drawings. This set to be kept up to date by the Contractor with all changes and additions to the access control system accurately recorded.

H. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum **[5]** years of documented experience in providing access control and security systems equipment and software similar to that indicated for this Project and that have a proven record of successful in-service performance.

1. Software and access control systems components to have been previously and thoroughly tested together with proven installations similar in size and functionality to the design requirements indicated for this Project.

B. Integrator Qualifications: Systems Integrators, verifiably factory trained and certified by the primary product manufacturers, with a minimum 3 years documented experience installing complete integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance. Qualifications include, but are not necessarily limited, to the following:

1. References: Provide a list of references for similar projects including contact name, phone number, name and type of project.
2. Professional Staffing: Firms to have a dedicated access control systems integration department with full time, experienced professionals on staff experienced in providing on site consulting services for both electrified door hardware and integrated access control systems installations.

3. Factory Training: Installation and service technicians are to be competent factory trained and certified personnel capable of maintaining the system.
4. Service Center: Firms to have a service center capable of providing training, in-stock parts, and emergency maintenance and repairs at the Project site with 24-hour/7-days a week maximum response time.

C. Supplier/Dealer Qualifications: Supplier/Dealers, verifiably authorized and in good standing with the primary product manufacturers, with a minimum **[3]** years experience supplying integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance.

D. Integrated Wiegand Output, Wireless, and IP-Enabled access control products are required to be supplied and installed only through designated ASSA ABLOY "Authorized Channel Partner" (ACP) and “Certified Integrator” (CI) accounts.

E. Source Limitations: Obtain the access control door hardware, system firmware and application software specified in this Section from a single source, qualified supplier/integrator unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide integrated access control door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:

1. Comply with NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:

    a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
    b. Door Closers: Comply with the following maximum opening-force requirements indicated:

        1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
        2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Comply with NFPA 101 "Life Safety Code" for doors in a means of egress.

a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.

4. Comply with NFPA 80 "Fire Doors and Windows" for fire labeled opening assemblies.
5. The installed access control system shall conform to all local jurisdiction requirements.

G. Keying Conference: Reference Division 08 Section "Door Hardware".

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), Systems Integrator(s), and Contractor(s) to review proper methods and procedures for receiving, handling, and installing door and access control hardware to manufacturer's recommendations and according to specifications.

1. Prior to installation of door hardware, arrange for manufacturers' representatives to hold a project specific training meeting on the proper installation and adjustment of their respective products. Product training to be attended by the installers of access control hardware for the aluminum, hollow metal and wood door sections. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

1. Access control firmware and software: Where approved and directed, inventory upon receipt and store electronic access control equipment in a secure, temperature and humidity controlled environment in original manufacturer's sealed containers.

B. Tag each item or package separately with identification related to the final Access Control Door Schedule, and include basic installation instructions with each item or package.

C. Deliver permanent keys, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner established at the “Pre-Submittal Conference".

1.6 COORDINATION

A. Coordinate quantity and arrangement of assemblies with ceiling space configuration and with components occupying ceiling space, including structural members, pipes, air-distribution components, raceways, cable trays, recessed lighting fixtures, and other items.

B. Integrated Access Control Door Hardware and Electrical Coordination: Coordinate the layout and installation of scheduled integrated access control door hardware, and related access control equipment, with required connections to source power junction boxes, power supplies, detection and monitoring hardware and fire alarm system.

1. Door Hardware Interface: The access control system to interface and be connected to electrified and integrated access control door hardware as described under Division 08 Sections "Door Hardware" or "Access Control Door Hardware". Coordinate the installation and configuration of electrified door hardware being monitored or controlled with the controls, software and access control hardware specified in this Section.

C. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing electrified door hardware and access control system components. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing access control system hardware to comply with indicated requirements.

D. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article will not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and are in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of the installed access control system hardware and software that fails in materials or workmanship, including all related parts and labor, within specified warranty period after final testing and acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Two years for Integrated Access Control Door Hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of standard and access control door hardware.

B. Maintenance Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance including repair and replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

C. Maintenance Support and Extended Service Agreement: Submit for Owner’s consideration an optional extended Service Agreement for the installed access control system, including support for software related issues. The extended Service Agreement is considered elective and is without manufacturer's requirement stipulating mandatory coverage for owner and/or vendor system support.

1. A published copy of this agreement to be included with the submittal package
2. Support for the installed access control system components is provided through the vendor under a 24 hour technical assistance program.
3. Access control and management system components are to be available on a one-day turn-around time frame from the manufacturer.
4. Primary systems manufacturer to offer and provide remote modem or internet access for direct factory support to the vendor. The factory level support to include diagnostics and troubleshooting support on systems related issues at no additional cost to the owner.

D. Access Control Software Upgrades: Version upgrades and "fix" releases to the access control system software are available at no extra charge as long as the version of software provided in this specification remains the current manufacturer’s version or for up to (2) years after a new version release.

1. Major access control software revisions that provide new functionality to the product provided free of charge for up to one (1) year from the date of substantial completion.

2. Access control system software is to be upgradeable as may be required or as necessary, to expand and manage the owner's site or sites. Upgrades are to be offered at a published flat fee for the primary system software, with single license modules included in the primary fee structure. System upgrades offered at a costing structure based upon the original number of licensed modules issued, or on those to be purchased at a future date, are not allowed.
3. As part of the submittal package, provide a list of available software upgrades and/or expansions modules. List to identify related costs for upgrades, or expansions to the original system, up to the next qualifying operational level.

1.9 SCOPE OF WORK

A. Access Control Site Management System: Furnish and install at the indicated locations the specified integrated access control door hardware and access control system firmware and software for a completely operational access control and security site management system. System includes, but is not necessarily limited, to the following:

1. Electrified integrated access control locks and exit hardware, network control processors, reader controller panels, I/O monitor/control interfaces, door position switches, remote card readers, keypads, and display terminals, access cards and credentials, system application software, special tools, operating manuals, and required cabling and accessories as detailed below and listed in the Access Control Hardware Sets at the end of Part 3.

    a. Provide the appropriate number of reader controller panels and I/O monitoring/control expansion interfaces as needed to handle the number of card readers, locking devices, door status devices, and identified alarm inputs specified in this section, and as shown on the security drawings.
    b. Provide manufacturer approved integrated access control locks, exit hardware, and remote mounted card readers, keypads, and display terminals that are functionally compatible with the specified access control equipment interfaces.

2. Access control system equipment to be installed in an enclosure box compatible with the specified components. This enclosure to include, but is not necessarily limited to, the network control processor, I/O monitor/control interface panels, power supplies, terminal strips, wire ducts, keyed lock cylinder, integrated outlet for A/C power, and standoffs.

    a. Enclosure box to be located in the designated IT/Telecom room(s) with connection to the owner designated local area network for communication back to the central server host.

3. Owner to provide the following:

    a. Computer hardware and peripherals to be from an approved, major line computer manufacturer. The following manufacturers will be considered "pre-approved", however, specific information detailing compliance with the

manufacturer's requirements must be included within the project submittal package as specified.

1) Compaq
2) Dell
3) Hewlett-Packard
4) IBM

b. Central Server Host Computer:

1) System Server to include the following minimal requirements: Windows Server 2003 (Service Pack 1 or higher) or later Operating System, Intel Pentium IV 1 GHz (equivalent or greater), SQL Server 2005 Express Edition or SQL 2005, 1GB Ram or larger, 120GB hard disk space available or more as needed, CRT or LCD minimum 15" display Monitor, CD/RW Drive. Single serial port, or multiple USB ports, and one parallel port, keyboard and mouse.

c. Client Workstations:

1) Client Workstation to include the following minimal requirements: Windows XP Professional (Service Pack 2 or higher) or Windows Vista Business, Intel Pentium III 500 MHz (equivalent or greater), SQL Server 2000 Client Access License, 1GB Ram or larger, 30GB hard disk space available or more as needed, CRT or LCD minimum 15" display Monitor, CD/RW Drive. Single serial port, or multiple USB ports, and one parallel port, keyboard and mouse.

d. Owner will be responsible for ensuring that each computer hardware component includes the required interfaces, expansion boards, and peripherals that will be necessary to allow the system to operate as described within this specification and as indicated on the drawings.

e. Power Sourcing, Network Switches and Wireless Access Points: Quantity as required to accommodate installed access control (and video surveillance) devices.

f. Network Control Processor Connections:

1) LAN/Ethernet communication ports (jacks) and network interface cards as needed, CAT5e (CAT6) cabling from network router/switch to network control processor, outlet and cover plates and/or patch cables required for network connection within each designated IT/Telecom room.
2) Required static IP addresses.

4. Power Supplies, including battery or uninterrupted backup powers supply (UPS) and separately fused surge protection, required for the electrified door hardware, access control equipment, and PoE switches or wireless routers driving the integrated card reader locking devices.

5. Installation, final configuration and commissioning of electrified door and access control system hardware, communication firmware, power supplies and related accessories.

6. System application software including installation, programming, and end user training of the access control system demonstrating operating, repair, and maintenance procedures. Include on-site central server training for designated personnel (facilities maintenance, security, IT, administration) by a factory certified representative.

   a. Include Client Software Application (client workstation) training at each of the remote installed facilities for local administrative staff.

7. Provide manufacturer required power controllers, interface boards, and programming that may be required for approved electric latch retraction exit devices supplied under Division 08 Section "Door Hardware."

8. Electrical contractor, Division 26, to provide the following:

   a. Source power wiring (120VAC) as required for the integrated locking and access control hardware, equipment, accessories and power supplies. This includes quad outlets as required on a dedicated circuit in the designated IT/Telecom room(s) and the related conduit, stub-in, junction boxes and connectors required for the source power delivery and connections.
   b. Provide required conduit, stub-in, junction and back boxes for both the electrified locking hardware and access control equipment at each of the access controlled or monitored openings per plan drawings and specs. Supply and install conduit between each of the aforementioned devices and between the electrical junction boxes, power supplies and access control equipment located on or above the door opening.

      1) At wall mounted remote readers, provide conduit on the secured side of the door, 36" from the finish floor and 6" from the edge of the frame, to the related power supplies and access control equipment.
      2) At electrical hardware power transfers provide conduit on the secured side of the opening from the power transfer, thru-wire hinge, or serviceable panel location on the frame jamb to the related power supplies and access control equipment.

   c. Electrical Contractor to provide all 120VAC cabling connections and terminations from the electrical junction boxes to these electrical devices.

9. Access Control System Integrator to provide the following:

   a. Low voltage wiring (12/24VDC) and communication cabling (RS-232/RS-485) from network control processors to reader controllers, I/O monitor/control interface panels, electrified and integrated locking hardware, remote card readers, keypads, or display terminals, monitoring and signaling switches, and power supplies. Work includes related connectors, final terminations, and hook-ups required for a complete and

functional access controlled opening in accordance with applicable codes and specified system operational narratives.

10. Full and seamless integration of the analog, digital or IP-enabled CCTV video surveillance system (Division 28) if applicable, with the installed site access control system software.

11. Full and seamless integration of the site intrusion alarm service and motion detector systems, (Division 28) if applicable, with the installed site access control system software.

12. Final connections to fire alarm system, if required, by electrical and fire alarm system contractors.

13. Provide permits, submittals and approvals required by the authority having jurisdiction, prior to commencing with work.

PART 2 - PRODUCTS

2.1 SYSTEM ARCHITECTURE - ACCESS CONTROL SITE MANAGEMENT SYSTEM (ACSMS)

A. General: The ACSMS is a modular and networked based system providing physical access control security to a Wide Area district, campus or educational enterprise. The system to be capable of controlling and integrating multiple security functions including the configuration, management and monitoring of cardholder access, locking hardware units, events, alarms, visitors, and real-time tracking and reporting. The ACSMS is to be alterable at any time depending on the facility requirements and will allow for easy upgradeability or modification of network processors, controller, interface modules, card data, inputs, outputs, and remote work stations. The ACSMS to include, but is not be limited to, the following features and functions:

1. An "Enterprise" class access control software application.
2. Client/Server model operating central server host software modules and client workstation software applications in a multi-user and a multi-tasking environment.

    a. The ACSMS to permit multiple instances of client software applications to run simultaneously on the network. The base system to include **[ ]** software application licenses with an unlimited number of licenses available subject to connection fees.

3. Partitioning: The system to support security partitioning enabling system administrator to segment the configuration database and group multiple entities within the security partition.

    a. Security partitions limit what users can view in the configuration database. Administrators, who have all rights and privileges, can segment a database into multiple security partitions. A user who is given access to a specific

partition will only be able to view entities (components) within the partition they have been assigned.

4. Encryption: The system to support encrypted communication between the central server software and client software applications (sever-to-server and client-to-server) using a 128-bit AES encryption algorithm (at a minimum).

    a. Communication between the central server host software module and system controllers to be encrypted if supported by the controllers.
    b. The ACSMS client software applications to be password protected with passwords stored in the central server database in an encrypted manner.

5. Distributed Processing: The system is a fully distributed processing application allowing information, including time, date, zones, valid codes, tasks, access levels, and similar data, to be downloaded from the central host station to controller interface devices allowing access-control decisions with or without central host station communication. If communications to a central host station are lost, the controllers will automatically buffer event transactions until communications are restored and events are automatically uploaded to the central host station.

    a. Provide for a higher level of distributed database management at defined perimeter access points such that no single point of failure will allow more than two access points to fail, or affect more than two access points at perimeter points system wide.

6. Single Data Base: The system to support a single database for access control site setup, credential and identity file creation, alarm and control setup, and system user operation and command functions.
7. System Access Management: The system to allow operators through password authentication the ability to make access granted or denied decisions, define access levels, time zones, holidays, assign cardholders, access groups, develop tasks, and generally manage access control, alarm monitoring and response activities system wide from a single login. Operator and user privileges are managed by a system administrator allowing for different levels of system access and system control. Authorization management is fully Owner definable.
8. Cardholder Management: The system to include a cardholder management system integrated within the access control system. This cardholder management functionality allows the enrollment of cardholders into the database, and import/export of employee data.
9. Access Groups and Access Levels: The system to provide adequate access groups and access level assignment capability to meet Owner requirements for the specified project. If required, software application can be expandable to support unlimited access groups and access levels.
10. Alarm Monitoring: The system is able to monitor, report, and provide information about the time and location of alarms, along with their priority.
11. Event Monitoring: The system is able to monitor, report, and archive network access control activity.

12. Transaction Logs: The system to support an unlimited number of logs and historical transactions (events and alarms) with the maximum allowed being limited by the amount of hard disk space available.
13. System Monitoring: The system to have ability to report on the integrity of all network assigned devices, circuits and communications and provide a diagnostics screen showing field level communications system wide
14. Lock/Unlock Commands: The system to allow an operator to manually lock and unlock doors overriding scheduled access control restrictions and configurations if necessary.
15. Hardware Interface: The system to integrate with and control specified electrified hardware, signaling and monitoring devices.
16. Report Generator: The system to have the ability to generate and output reports with any and all combinations of system fields and data including, but not limited to: by cardholder, by door, by site, by time, by groups of doors and by cardholder field. Any and all combinations of fields must be available for reporting. The report feature to allow exporting of generated reports over a network connection or by remote printing.
17. Multi-User/Web Based Network Capabilities: The system to support multiple operator workstations via local area network/wide area network (LAN/WAN), the Internet, or VPN. The system to be capable of supporting minimum of **[ ]** concurrent users/clients with software expansions to an unlimited number of workstations based on the Owners network requirements.
18. Systems Integration: The system to have the ability to be fully and seamlessly integrated with existing or specified intrusion detection alarm and video surveillance (CCTV) systems.

B. Open Architecture: The access control system infrastructure will be based on an open architecture design capable of supporting multiple access control hardware manufacturers and integrate with multiple non-proprietary network processors, controllers, interface modules, integrated locking hardware, remote card readers, keypads and display terminals, and other third party applications.

C. Network Support: Communication network connecting the central server host software modules, client workstation software applications, and hardware controllers to be designed to support all of the following:

1. LAN/Ethernet enterprise ring topology and localized star topology based on TCP/IP.
2. Direct-connected RS-232 and RS-485 communication cabling.
3. Dial-up modem connection using a standard dial-up telephone line.

2.2 MANUFACTURERS

A. General: Provide integrated access control door hardware and access control system equipment and accessories for each designated opening to comply with requirements in this Section and with the Access Control Hardware Sets listed at the end of Part 3.

1. Access Control Hardware Sets: Requirements for quantity, item, model, design, grade, finish, size, and other distinctive qualities of each type of integrated door

and access control hardware are indicated in the Access Control Hardware Sets at the end of Part 3.

2. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

B. System Design: The equipment and materials supplied are to be standardized components regularly manufactured and utilized within the source manufacturer's access control systems.

1. System components to be non-proprietary in design and implementations, providing for an open protocol platform with multiple manufacturers having functional software capable of integrating with the hardware specified. The installed integrated product is to be part of a single, cohesive management and access control system.

C. Substitutions: Requests for substitution and product approval for inclusive integrated access control door and access control systems hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

1. The access control system described in this specification represents a complete engineered system. If alternate products are submitted, it is the responsibility of the Supplier/Dealer/Integrator to provide an acceptable complete and working system layout, including re-engineering of elevation and wiring diagrams, as applicable. Complete systems to include at a minimum required power supplies, power transfers, and integrated access control locking hardware and accessories.

D. Approved Access Control and Site Management System Manufacturers:

1. Corbin Russwin (Integrated Access Control Locking Devices and Accessories).
2. HID Global (Access Cards and Credentials, Remote Readers).
3. Sargent Manufacturing (Integrated Access Control Locking Devices and Accessories).
4. Securitron Corporation (Power Supplies).

2.3 ACCESS CONTROL AND SITE MANAGEMENT SYSTEM HARDWARE

A. General: Provide all necessary access control field hardware devices required to receive alarms and administer all access granted/denied decisions. Field hardware devices must be designed and installed in accordance with applicable electrical codes.

B. Central Computer Host Server (Owner Provided): The central host server is interconnected to all system components, including client workstations and field installed controllers, providing operator interface, interaction, display, control, and real-time monitoring.

2.4 INTEGRATED WIEGAND OUTPUT ACCESS CONTROL LOCKS

A. Integrated Wiegand Output Mortise Locks: Wiegand output ANSI A156.13, Grade 1, mortise lockset with integrated card reader, request-to-exit signaling, door position status switch, and latchbolt monitoring in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle trim, 3/4" deadlocking anti-friction latch, and 1" case-hardened steel deadbolt. Lock is U.L listed and labeled for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.

1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand compatible access control systems. Latchbolt monitoring and door position switch act in conjunction to report door-in-frame (DPS) and door latched (door closed and latched) conditions.
2. Reader supports either HID 125 kHz proximity (up to 39 bits, including Corporate 1000).
3. 12VDC external power supply required for reader and lock, with optional 24VDC operation available with iClass® reader (125 kHz reader is always 12VDC). Fail safe or fail secure options.
4. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
5. Installation requires only one cable run from the lock to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
6. Installation to include manufacturer's access control panel interface board or module where required for Wiegand output protocol.

7. Acceptable Manufacturers:

    a. Corbin Russwin Hardware (RU) - Access 600 - ML20600 RNE1 Series.
    b. Sargent Manufacturing (SA) - Harmony - H1/H2 8200 Series.
    c. Yale Security (YA) - Symphony - S8800 SYM Series.

B. Wiegand Output Integrated Card Reader Exit Hardware: Wiegand output ANSI 156.3 Grade 1 rim, mortise, and vertical rod exit device hardware with integrated card reader, latchbolt and touchbar monitoring, and request-to-exit signaling, in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle exit trim with 3/4" throw latch bolt. U.L listed and labeled for either panic or "fire exit hardware" for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.

1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand compatible access control systems. Inside push bar (request-to-exit) signaling and door position (open/closed status) monitoring (via separately connected DPS).
2. Reader supports either HID 125 kHz proximity (up to 39 bits, including Corporate 1000).
3. 12VDC external power supply required for reader, with optional 24VDC operation available with iClass® reader (125 kHz reader is always 12VDC). 24VDC

required for solenoid operated exit trim (12VDC if applicable). Fail safe or fail secure options.

4. Installation requires only one cable run from the exit hardware to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
5. Competitor Alternates Allowed Option>Installation to include manufacturer's access control panel interface board or module where required for Wiegand output protocol.

6. Acceptable Manufacturers:

   a. Corbin Russwin Hardware (RU) - Access 600 - ED5000 RNE1 Series.
   b. Sargent Manufacturing (SA) - Harmony - H1/H2 80 Series.
   c. Yale Security (YA) - Symphony -7100 SYM Series.

2.5 ELECTRONIC ACCESSORIES

A. Proximity Access Cards and Credentials: RF programmable, 125 kHz access control/identification cards utilizing a passive, no battery design allowing for infinite number of reads. Cards are programmable in any HID proximity format up to 85 bits and compatible with all HID proximity readers.

1. Acceptable Manufacturers:

   a. HID Global (HD) – RP40 Series

B. Switching Power Supplies: Provide UL listed or recognized filtered and regulated power supplies. Provide single, dual, or multi-voltage units as shown in the hardware sets. Units must be expandable up to eight Class 2 power limited outputs. Units must include the capability to incorporate a battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Acceptable Manufacturers:

   a. Securitron (SU) - AQ Series.

2.6 CABLES AND WIRING

A. Comply with Division 27 Section "Conductors and Cables for Electronic Safety and Security."

B. Data Line Supervision: System to include alarm initiation capability in response to opening, closing, shorting, or grounding of data transmission lines.

C. Install appropriate number of conductor pairs, in the wire gage (AWG) recommended by manufacturer, corresponding to the electronic locking functions specified, amperage drawn and distances covered between the power supplies, power transfer devices, electrified hardware and access control equipment.

2.7 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.8 ACCESS CONTROL HARDWARE FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Protect mechanical finishes on exposed surfaces from damage by applying temporary protective coverings before shipping.

C. Where specified, finishes on integrated card key locksets or exit hardware to incorporate an FDA recognized antimicrobial coating (i.e., MicroShield™) listed for use on equipment as a suppressant to the growth and spread of a broad range of bacteria, algae, fungus, mold and mildew.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance of the installed access control system.

B. Examine roughing-in for electrical source power to verify actual locations of wiring connections before electrified and integrated access control door hardware installation.

C. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

D. Notify architect of any discrepancies or conflicts between the specifications, drawings and scheduled access controlled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Doors and frames at scheduled access controlled openings to be properly prepared to receive specified electrified and access control hardware and connections without additional in-field modifications.

3.3 INSTALLATION

A. Install each item of integrated access control door hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

B. Mounting Heights: Mount integrated access control door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."

C. Boxed Power Supplies: Verify locations.

1. Configuration: Provide the least number of power supplies required to adequately serve doors with access control hardware and equipment.

D. Integrated Wiegand access control products, campus locks, and IP enabled products are required to be installed through current members of the ASSA ABLOY "Certified Integrator" (CI) program.

E. Final connect the system control switches (integrated access control door hardware, remote readers, keypads, display terminals, biometrics), and monitoring, and signaling equipment to the related Controller devices at each opening to properly operate the electrified door and access control hardware according to system operational narratives.

F. Retrofitting: Install each door hardware and access control item to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

G. Networked System Application Software: Install, and test application(s) software and databases for the complete and proper operation of systems involved. Assign software license(s) to Owner.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Perform a final inspection of the installed integrated access control door hardware and access control system and state in report whether installed work complies with or deviates from requirements, including whether each component representing the opening assembly is properly installed, adjusted, operating and performing to system operational narratives.

B. Commissioning and Testing Schedule: Prior to final acceptance of the access control system installation, the following testing and documentation to be performed and provided to the Owner.

1. Inspection: Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.
2. Pre-testing: Program and adjust the system and pretest all components, wiring, and functions to verify they conform to specified requirements. Provide testing reports indicating devices tested, pass/fail status, and actions taken to resolve problem(s) on failed tests.
3. Acceptance Test Schedule: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
4. Provide “as designed” drawings showing each device and wiring connection and electronic enclosure legends indicating cabling in and out.
5. Provide a complete set of operating instructions for access control hardware devices and a complete software user manual. The documentation includes module reference guides for each electronic enclosure.

3.5 ADJUSTING

A. Adjust and check each operating item of integrated access control door hardware, and each door opening to ensure proper secured operation and function of every unit. Replace units that cannot be adjusted to operate as intended.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all integrated access control door hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by access control system installation.

C. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure access control door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain electronic integrated door hardware and the access control system.

END OF SECTION

SECTION 28 31 11 - FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provision of a new fully addressable fire alarm system including a control panel, programming unit, and addressable initiation and notification devices.

B. Fire alarm initiation and signal devices.

C. Conduit and wiring for fire alarm system.

D. 1-year Central Station monitoring service.

1.2 SUBMITTALS

A. Provide submittals for the following items:
   1. Fire alarm control panel
   2. Fire alarm annunciator.
   3. Fire alarm initiation devices.
   4. Fire alarm notification appliances.
   5. Interface devices and accessory components.

B. Provide a complete deferred approval fire alarm system submittal package to the County of Butte, Department of Emergency Services, Fire Division. The package shall include, but not be limited to, layout plan drawings, riser diagram, wiring diagrams, battery calculations, voltage drop calculations, sound level calculations, bill of materials, device and equipment catalog cut sheets, and California State Fire Marshall (CSFM) listing sheets.

C. Prepare complete drawings of the entire fire alarm system. The design drawings shall include a point-by-point wiring diagram identifying initiation and notification signal zones conductor colors. Identify devices according to the manufacturer's catalog numbers and indicate their locations on the drawings.

D. In addition to an approved copy of the fire alarm system submittal, provide a set of comprehensive operating instructions; programming documentation; and system maintenance, testing and alarm documentation to the Owner.

E. At project completion the factory authorized technician shall provide all on-site software modifications and provide a written report attesting to the proper operations of the completed system.

PART 2 - PRODUCTS

2.1 FIRE DETECTION AND ALARM SYSTEM

A. Manufacturer
   1. Notifier – NFS-320 FACP with appropriate accessories.

2. Approved Equal.

2.2 SYSTEM DESIGN

A. The fire alarm and detection system modifications shall maintain a complete, supervised system. The system shall be activated into the alarm mode by actuation of any alarm-initiating device. The system shall remain in the alarm mode until initiating device is reset and the fire alarm control panel is reset and restored to normal. Alarm initiating devices shall be connected to initiating device circuits, Style D, or to signal line circuits in accordance with NFPA 72. Alarm indicating appliances shall be connected to indicating appliance circuits, in accordance with NFPA 72. All textual, audible, and visual appliances and systems shall comply with NFPA 72.

B. The system shall be a complete, electrically supervised fire detection system, microprocessor based operating system having the following; capabilities, features and capacities:
1. Single addressable loop
2. 252 addressable initiation device capability as a minimum.
3. Addressable devices shall be polarity insensitive.
4. Addressable devices shall operate on “standard wire” no special twist or shield shall be required
5. 4 notification circuits capable of Style Y (Class B), or 2 notification circuits capable of Style Z (Class A).
6. LED drivers for graphic annunciation.
7. Remote annunciator/control panel.
8. DACT capable of sending point information to a Central Station depending on protocol required by the Central Station.
9. Be programmable from system keypad or Laptop computer.

C. System Operation
1. Activation of any manual pull station, smoke detector, heat detector or sprinkler waterflow switch shall activate the building notification appliances.
2. Activation of any alarm causing devices shall signal the Central Station to an alarm condition.
3. Activation of a supervisory device shall sound an audible and light LED at the control panel to signal a supervisory condition.
4. Activation of a supervisory causing device shall signal the Central Station to a supervisory condition.
5. Activation of a trouble shall sound an audible and light an LED at the control panel to signal a trouble condition.
6. Activation of a trouble shall signal the Central Station to a trouble condition.
7. Activation of an alarm shall signal.

2.3 FIRE ALARM CONTROL PANEL

A. The control panel shall have digital communications, addressable devices, control points and relays. The system shall have the following:
1. Application specific fire detection
2. Auto configuration, which, reads all addressed devices on the loop and automatically creates a basic general alarm configuration
3. Manual changes by the Owner or Notifier distributor without special tools.
4. Windows type software to make configurations easier.

5. Eighty- (80) character backlit LCD display with full system control and up to forty (40) character available for custom message on display.
6. Fully field programmable from the local display or by a PC configuration tool.
7. 800-event history log, minimum.
8. Alarm verification
9. Cross zoning
10. Positive Alarm Sequence
11. Walk test by a single individual in either a silent or audible mode.
12. Maintenance and Technician level with Password protection.
13. Standard with 159 addressable detection and 159 addressable monitoring devices.
14. Optional Peer-to-Peer networking with at least 100 other comparable panels.

B. The system shall support off site reporting modules within the enclosure shall include one of the following modules in accordance with the requirements of this specific project site:
   1. A system DACT shall be supplied with the following:
      a. Support two (2) lines and up to four (4) accounts
      b. Can transmit serial information by point to the Central or Remote Station.
      c. Be capable of transmitting information in the following protocols as a minimum; SIA DCS 8,SIA DCS 20, Ademco Contact ID, 3/1 1400 Hz, 3/1 2300 Hz, 4/2 1400 Hz and 4/2 2300Hz.
   2. A Municipal Tie/Lease Line module shall provide local energy output for municipal call box connection or a reverse polarity output for lease line connection.

C. Power Supply
   1. The power supply shall be capable of 6 amps. A maximum of 3.0 amps available for the NAC circuits. This can be expanded to 6 amps by adding an additional transformer. The power supply/battery charger shall support at least 18 AH battery sets.
   2. Provide self-contained, automatically recharging batteries. Upon failure of incoming line power, the batteries shall provide a minimum of 24 hours of standby power followed by 5 minutes of alarm operation. Provide batteries that are rated at 125% minimum, of the above determined capacity.

D. Enclosure
   1. The system enclosure shall be sized to carry all the modules required to meet the specification requirements.

E. Printer Interface
   1. An interface for a printer shall be provided to allow system events to be printed.

2.4 FIELD PROGRAMMING UNIT

A. The programming tool shall program the intelligent devices addresses. The unit shall test the loop wiring for grounds, opens and shorts. Systems not having this ability shall test all the above items and provide a written report documenting the testing procedure as required in the submittal section.

B. The system programmer shall print labels for all addressable devices and contain the complete SLC circuit and device numbers.

2.5 ADDRESSABLE INITIATION DEVICES

A. Smoke detectors shall be intelligent photoelectric detectors with thermal element that provides digital communications to the FACP. Detectors shall be listed for use as open area protective coverage, in duct installation and duct sampling assembly installation and shall be insensitive to air velocity changes. Detectors shall be programmable as application specific, selected in software for a minimum of eleven environmental fire profiles unique to the installed location. These fire profiles shall eliminate the possibility of false indications caused by dust, moisture, RFI/EMI, chemical fumes and air movement while factoring in conditions of ambient temperature rise, obscuration rate changes and hot/cold smoke phenomenon into the alarm decision to give the earliest possible real alarm condition report. The detector shall be designed to eliminate calibration errors associated with field cleaning of the chamber. The detector shall support the use of a relay, or LED remote indicator. The detector shall not exceed 2.5 inches of extension below the finish ceiling. Detector wiring shall not require any special cable.
   1. The intelligent smoke detector shall be Notifier FSP-851 or Approved Equal.

B. Addressable thermal detectors shall be a rate of rise detectors rated at 135°F.
   1. The detector shall be a Notifier FST-851 or Approved Equal.

C. Detector bases shall be low profile twist lock type with screw clamp terminals and self-wiping contacts. Bases shall be installed on an industry standard, 4" square or octagonal electrical outlet box. Detectors located in concealed locations (above ceiling, etc.) shall have a remote visible indicator lamps. Bases shall be supplied with the following features as required for performance to this specification. Select the bases based on manufacturer’s requirements for the devices specified

D. Intelligent interface modules shall be supplied for the monitoring of contact type initiation devices and for the control of electrical devices as required by project conditions. Modules shall be intelligent analog signaling circuit interface modules as follows:
   1. A single circuit intelligent signaling circuit interface module for monitoring alarm, trouble, supervisory or status contact type devices.
   2. The single circuit interface shall also be available as a freestanding shrink-wrapped unit with pigtail wire leads for direct mounting with contact devices.
   3. A single circuit intelligent signaling circuit interface module for monitoring alarm, trouble, supervisory security or status contact type devices with form C software programmable control contacts for the management of specified electrical loads as required by this specification.
   4. Dual circuit intelligent signaling circuit interface module for monitoring alarm, trouble, supervisory security or status contact type devices.

2.6 NOTIFICATION APPLIANCES

A. The horn or horn/strobe appliance as indicated on the drawings shall be a synchronized temporal horn with a synchronized strobe light with multiple candela taps to meet the intended application. The appliance shall be red or white as indicated on the drawings. The strobe light taps shall be adjustable for 15/75, 30/75, 75, and 110 candela. The appliance shall be red for wall mounted and white for ceiling mounted. Ceiling mounted appliances shall be rated for that application.
   1. Provide Notifier P4R series devices or Approved Equal.

B. The strobe only appliance as indicated on the drawings shall be a synchronized strobe light with multiple candela taps to meet the intended application. The strobe light taps shall be adjustable for 15/75, 30/75, 75, and 110 candela. The appliance shall be red for wall mounting and white for ceiling mounted. Ceiling mounted appliances shall be rated for that application. The model number shall be
   1. Notifier SR series or Approved Equal.

2.7 CONDUIT, WIRE, & CABLE

A. Conduit: Conduit and fittings shall comply with UL 6, UL 1242 and UL 797.

B. Wiring: Wiring for 120-volt ac power shall be No. 12 AWG minimum. Wiring for low voltage dc circuits shall be No. 14 AWG minimum. Power wiring (over 28 volts) and control wiring shall be isolated. All wiring shall conform to NFPA 70. System field wiring shall be solid copper and installed in metallic conduit or electrical metallic tubing, except rigid plastic conduit may be used under slab-on-grade. All conductors shall be color-coded. Conductors used for the same functions shall be similarly color-coded. Wiring code color shall remain uniform throughout the circuit. Pigtail or T-connections to alarm initiating, supervisory circuits, and alarm indicating circuits are prohibited. T-tapping using screw terminal blocks are allowed for addressable systems.

C. Special Tools and Spare Parts: Special tools necessary for the maintenance of the equipment shall be furnished. Two spare fuses of each type and size required and five spare lamps and LED's of each type shall be furnished. Two percent of the total number of each different type of detector, but no less than two each, shall be furnished. Fuses and lamps shall be mounted in the fire alarm panel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All work shall be installed as shown and in accordance with the manufacturer's diagrams and recommendations, unless otherwise specified. Upon initial installation, all wiring outlets, junction, pull and outlet boxes shall have dust covers installed. Dust covers shall not be removed until wiring installation when permanent dust covers or devices are installed. Smoke detectors shall not be installed until the building has been thoroughly cleaned.

B. Boxes: All devices and appliances shall be mounted to or in an approved electrical box. Boxes shall be installed plumb and firmly in position. Extension rings with blank covers shall be installed on junction boxes where required. Junction boxes served by concealed conduit shall be flush mounted.

C. Wiring: All system wiring shall be installed in conduit. Conduit size for wiring shall be in accordance with NFPA 70. Wiring for the fire alarm system shall not be installed in conduits, junction boxes, or outlet boxes with conductors of lighting and power systems. No more than one conductor shall be installed under any screw terminal. All circuit conductors entering or leaving any mounting box, outlet box enclosure or cabinet shall be connected to screw terminals with each terminal marked in accordance with the wiring diagram. Connections and splices shall be made using screw terminal blocks. Do not splice fire alarm conductors in underground or exterior pull-boxes. Crimp-on type spade lugs shall be used for terminations of stranded conductors to binder screw or stud type terminals. Spade lugs shall have upset legs and insulation sleeves sized for the conductors. The use of wire nut type connectors are prohibited in the system. Wiring within any

control equipment shall be readily accessible without removing any component parts. The equipment manufacturer's representative shall be present for the connection of wiring to the control panel.

D. Marking: Each conductor shall be identified as shown on the drawings with wire markers at terminal points. Attach permanent wire markers within 2 inches of the wire termination. Marker legends shall be visible. A consistent color code for fire alarm system conductors throughout the installation. "Fire alarm system" decal or indicator shall be applied to all junction box covers and visible conduits in each room or space.

E. Auxiliary Equipment: Relays and other devices to be mounted in auxiliary panels are to be securely fastened to avoid false indications and failures due to shock or vibration.

3.2 FIELD QUALITY CONTROL AND PRELIMNARY TESTING

A. Complete testing and certification shall be performed by a certified Notifier technician or manufacturer representative.

B. Preliminary Tests: Upon completion of the installation, the system shall be subjected to functional and operational performance tests including tests of each installed initiating and notification appliance. Tests shall include the meggering of all system conductors to determine that the system is free from grounded, shorted, or open circuits. The megger test shall be conducted prior to the installation of fire alarm equipment. If deficiencies are found, corrections shall be made and the system shall be retested to assure that it is functional.

C. The Contractor shall notify the Owner's Representative 30 days before the preliminary and acceptance tests are to be conducted. The tests shall be performed in accordance with the approved test procedures in the presence of the Contracting Officer. The control panel manufacturer's representative shall be present to supervise all tests. The Contractor shall furnish all instruments and personnel required for the tests.

D. Preliminary Testing Procedure
1. All Alarm Initiating Devices shall be observed and logged for correct zone and sensitivity. These devices and their bases shall be tagged with adhesive tags located in an area not visible when installed, showing the initials of the installing technician and date.
2. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Resistance, current and voltage readings shall be made as work progresses.
3. The acceptance inspector shall be notified before the start of the required tests. All items found at variance with the drawings or this specification during testing or inspection by the acceptance inspector shall be corrected.
4. All test equipment, the installing contractor shall make instruments, tools and labor required to conduct the system tests available. The following equipment shall be a minimum for conducting the preliminary and acceptance tests:
    a. Ladders and scaffolds as required to access all installed equipment.
    b. Multi-meter for reading voltage, current and resistance.
    c. Two way radios, and flashlights.
    d. A manufacturer recommended device for measuring airflow through air duct smoke detector sampling assemblies.
    e. Decibel meter.

f. In addition to the testing specified to be performed by the installing contractor, the installation shall be subject to test by the acceptance inspector.

3.3 ACCEPTANCE TESTING

A. Acceptance testing shall be in accordance with NFPA 72 and this specification. The recommended tests in NFPA 72 shall be considered mandatory and shall verify that all previous deficiencies have been corrected. The contractor shall be responsible for the performance of the acceptance testing, demonstrating the function of the system and verifying the correct operation of all system components, circuits, and programming.

B. Conduct the acceptance testing procedure (ATP) in the presence of the Owner's Representative, the local Fire Marshal and/or the local Fire Department.

C. The acceptance inspector shall use the system record drawings in combination with the documents specified in this specification during the testing procedure to verify operation as programmed. In conducting the ATP, the acceptance inspector shall request demonstration of any or all input and output functions. The items tested shall include but not be limited to the following:
   1. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:
      a. Open, shorted and grounded signal line circuits.
      b. Open, shorted and grounded notification circuits.
      c. Primary power or battery disconnected.
   2. System notification appliances shall be demonstrated as follows:
      a. All alarm notification appliances actuate as programmed
      b. Audibility and visibility at required levels.
   3. System indications shall be demonstrated as follows:
      a. Correct message display for each alarm input at the control display.
      b. Correct annunciator light for each alarm input at each annunciator and graphic display as shown on the drawings.
      c. Correct history logging for all system activity.
   4. System off-site reporting functions shall be demonstrated as follows:
      a. Correct point transmitted for each alarm input
      b. Trouble signals received for disconnect
   5. Secondary power capabilities shall be demonstrated as follows:
      a. System primary power shall be disconnected for a period of time as specified herein. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period as specified.
      b. System primary power shall be restored for forty-eight hours and system-charging current shall be normal trickle charge for a fully charged battery bank.
      c. System battery voltages and charging currents shall be checked at the fire alarm control panel.

D. Complete and submit to the Owner’s Representative the signed “Certificate of Completion” as per NFPA 72 Section 1-7.21 following the successful completion of the witnessed acceptance testing procedure.

3.4 DOCUMENTATION

A. System documentation shall be furnished to the owner and shall include but not be limited to the following:
   1. System record drawings and wiring details including one set of reproducible masters and drawings on a CD ROM in a DXF format suitable for use in a CAD drafting program. Original drawings must be provided by the systems engineering firm.
   2. System operation, installation and maintenance manuals.
   3. System matrix showing interaction of all input signals with output commands.
   4. Documentation of system voltage, current and resistance readings taken during the installation, testing and ATP phases of the system installation.
   5. System program showing system functions, controls and labeling of equipment and devices.

3.5 SERVICES

A. The contractor shall warrant the entire system against mechanical and electrical defects for a period described in the contract general conditions. This period, shall begin upon completed certification and test of the system or upon first beneficial use of the system, determined by the Engineer, whichever is earlier.

B. The contractor performing the contract services shall be qualified and listed to maintain ongoing certification of the completed system to the UL for specific installed system listing.

C. The installation contractor shall furnish training as follows for a minimum of two employees of the system user:
   1. Training in the receipt, handling and acknowledgment of alarms.
   2. The total training requirement shall be a minimum of 2 hours, but shall be sufficient to cover all items specified.

END OF SECTION 28 31 11

SECTION 31 00 00 - EARTHWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. Earthwork shall consist of performing all operations necessary for excavation, subgrade preparation and grading where applicable.

B. Excavation and grading within the City of Chico shall conform to the applicable provisions of City of Chico Grading Ordinance.

C. All work shall conform to the lines, grades and cross-sections or elevations shown on the Drawings. Prior to placing fill, the area shall be cleared and grubbed in conformance with Section 31 11 00, SITE CLEARING AND GRUBBING. The exposed area shall then be disked, plowed, benched and/or compacted as directed by the Engineer or specified herein, to insure proper bonding and compaction.

D. Prior to bid, Contractor shall verify existing topography and notify Engineer of any discrepancy between existing topographic information indicated on the plans and actual field topographic data. Failure to notify Engineer of any discrepancy prior to bid indicates Contractor acceptance of existing conditions in conformance with those shown on the Plans.

E. The following Soils Report has been prepared for the project:
   1. "Geotechnical Engineering Investigation Report for the Butte Regional Transit Operations Center, 326 Huss Drive, Chico, California" by Holdrege & Kull, dated May 17, 2012.
   2. “Design Memorandum: Recommendations for Subgrade Soil Stabilization Using Lime Treatment,” Date: August 27, 2013, Author: Holdrege & Kull
   3. “Supplemental Recommendations to the Geotechnical Engineering Investigation Report dated May 17, 2012,” by Holdrege & Kull, dated July 1, 2014.

F. The near surface soil conditions at the project site generally consist of approximately 0 – 9 feet of dark brown, stiff to very stiff, damp, sandy clay, underlain by up to 5 feet of dark brown, medium dense, damp silty sand, underlain by brown, medium dense to very dense, moist to wet, silty gravel. Bedrock was not encountered during geotechnical explorations and is assumed to be present at a depth of approximately 68 feet below existing ground surface.

G. Groundwater was not encountered in the exploratory borings, but may be present at varying depths. Seasonal fluctuations in the local groundwater table at the project site and vicinity are generally highest at the end of the winter rainy season and lowest at the end of the summer dry season. The Contractor should expect groundwater and soil moisture conditions within the project area to vary depending on seasonal rainfall and runoff conditions. Groundwater may be present close to the ground surface during prolonged wet winter weather. Groundwater will drop during dry summer and fall weather.

H. Existing power and telephone lines, trees, fences, pipelines or other conduits, embankments, and structures in the vicinity of the work that are to remain shall be supported and protected from injury by the Contractor during the construction and until the completion of the Work. The Contractor shall be liable for all damages to such structures, as herein provided, and shall save and keep the

Owner and Engineer harmless from any liability or expense for injuries, damages, or repairs to same.

I. Excess material from the excavation shall become the property of the Contractor and shall be disposed of by him at his expense.

J. Related items described elsewhere:
1. Section 02 01 00, SITE CONDITIONS
2. Section 02 01 10, EXISTING UTILITIES AND UNDERGROUND STRUCTURES
3. Section 31 23 19, DEWATERING
4. Section 31 11 00, SITE CLEARING AND GRUBBING
5. Section 31 01 40, SHORING AND TRENCH SAFETY
6. Section 31 23 00, TRENCH EXCAVATION AND BACKFILL
7. Section 31 23 19, DEWATERING
8. Section 31 23 23.43, TIRE DERIVED AGGREGATE FILL
9. Section 32 12 00, PAVING SYSTEMS

1.2 QUALITY ASSURANCE

A. Qualifications of workmen: Provide sufficient skilled workmen and supervisors who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of construction involved and the materials and techniques specified.

B. Codes and Standards:
1. Wherever a test method is referenced in this Section it shall be made in accordance with the most current test methods in use by the California Department of Transportation (Caltrans) as listed in the State Standard Specifications, latest edition, or ASTM method as listed below at the Owner's option:

TEST	TEST METHOD
Particle-Size Analysis of Soils	ASTM D422
Density of Soil in Place by Sand Cone Method	ASTM D1556
Moisture-Density Relations of Soil & Soil Aggregates	ASTM D1557
Unconfined Compressive Strength of Cohesive Soil	ASTM D2166
Laboratory Determination of Water Content of Soil & Rock	ASTM D2216
Classification of Soils for Engineering Purposes	ASTM D2487
Resistance R-Value and Expansion Pressure of Compacted Soils	ASTM D2844
Density of Soil in Place by the Drive-Cylinder Method	ASTM D2937
Direct Shear Test of Soils Under Consolidated Drained Conditions	ASTM D3080
Liquid Limit, Plastic Limit, & Plasticity Index of Soils	ASTM D4318
Expansion Index of Soils	ASTM D4829
Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods	ASTM D6938

2. Where reference is made to the State Standard Specifications, reference shall mean the State of California, Department of Transportation (Caltrans), Standard Specifications, 2010, excluding measurement and payment Sections.

1.3 TESTING

A. Relative compaction, moisture, and permeability tests will be made at locations determined by the Engineer. When tests indicate that the specified compaction has net been achieved, that portion of the Work shall be reworked until the required density, moisture, and permeability has been attained.

B. The Contractor shall be responsible for the sampling and testing costs associated with any failed test.

C. The Geotechnical Engineer will perform all testing for trenches and in paved and graveled areas.

D. The Geotechnical Engineer will perform all testing in building areas for standard backfill and in other areas designated by the Engineer.

E. A minimum of 72 hours' notice shall be given to the Engineer by the Contractor prior to commencing or recommencing any grading operation.

1.4 SUBMITTALS

A. Samples: In accordance with the provisions of Section 01 33 00, "Submittal Procedures," of the specifications, submit samples of all materials 15 days prior to construction or planned use. Periodic testing of the material will also be made during construction.

B. Submit all product data, laboratory test results, material source information, and certificates of compliance listed in this Section under a single submittal cover for review. Incomplete submittals will not be reviewed.

C. Product Data:
   1. Submit data for geotextile fabric indicating fabric properties, test methods, and manufacturer's installation instructions.
   2. Submit soil and aggregate material laboratory gradations and quality properties as specified and required by the State Standard Specifications.

D. Material Source: Submit name of imported fill materials supplied.

E. Manufacturer's Certificate: Submit Certifications that products meet or exceed specified requirements.

PART 2 - PRODUCTS

2.1 TOPSOIL AND UNDOCUMENTED FILL

A. Topsoil is classified as the top two to four inches of excavated material including buried organics, shallow vegetation roots and other deleterious materials and excluding cleared and grubbed materials. Undocumented fill pertains to soils previously imported and placed at the project site.

2.2 GENERAL FILL MATERIAL

A. Shall be non-expansive and free of organic material, with a plasticity index less than or equal to 15 percent as determined by ASTM D4318, shall not contain clumps/rock larger than 3 inches, and should consist predominantly of materials less than 1/2 inch in greatest dimension.

B. Existing material excavated on site from building foundations and trenchs may be used as fill provided it meets the requirements of subparagraph 2.3.A, after vegetative matter, rocks larger than 3 inches, and other debris is removed and after approval by the Geotechnical Engineer.

C. All on-site and off-site sources of fill shall be approved by the Geotechnical Engineer a minimum of 48 hours prior to placement or importation to the site.

2.3 ENGINEERED FILL

A. Material specified in paragraph 2.3, except that potentially expansive soils shall not be used as engineered fill within the top 60 inches of subgrade beneath buildings or lightly loaded structures, concrete slabs and paving.

B. Standard Specifications, Section 26, Class 2, 3/4-inch maximum.

2.4 STRUCTURAL AGGREGATE

A. Structural aggregate material shall consist of washed aggregate with the following ASTM D422 test particle side distribution:

SIEVE SIZE	PERCENT PASSING
3/4 Inch	100%
No. 4	0-5%
No. 200	0-3%

2.5 PIPE BEDDING MATERIAL

A. Pipe bedding material shall consist of 3/4-inch minus, washed and crushed rock material. The rock particle size gradation shall beet the following requirements:

SIEVE SIZE	PERCENT PASSING
1.0 Inch	100%
3/4 Inch	80-100%
3/8 Inch	60-100%
No. 4	0-30%
No. 8	0-10%
No. 200	0-3%

2.6 TRENCH BACKFILL MATERIAL

A. The following materials may be used as Trench Backfill Material:
   1. General Fill Material
   2. Aggregate Base
   3. Aggregate Subbase.
   4. Section 31 23 23.43, TIRE DERIVED AGGREGATE FILL.

2.7 PERMEABLE MATERIAL

A. State Standard Specification Section 68.2.02F(3), Class 2.

2.8 AGGREGATE SUBBASE

A. Standard Specifications, Section 25, Class 2.

2.9 AGGREGATE BASE

A. Standard Specifications, Section 26, Class 2, 3/4-inch maximum.

2.10 SAND

A. Standard Specifications, Section 19-3.02E(2), Salt Free.

2.11 COBBLE

A. Standard Specifications, Section 72-4.02, Cobble.

2.12 ROCK SLOPE PROTECTION

A. Standard Specifications, Section 72-3, Facing Class.

2.13 SLURRY CEMENT BACKFILL

A. Standard Specifications, Section 19-3.02D.

B. Materials for controlled low strength material shall be thoroughly machine-mixed in a pug mill, rotary drum, or other approved mixer. Mixing shall continue until the cementitious material and water are thoroughly dispersed throughout the material.

C. CLSM shall be used as backfill only where shown on the Drawings or as directed by the Engineer.

D. When used as bedding around new electrical conduits the mix shall contain 1 sack of red dye per cubic yard.

2.14 SUBGRADE STABILIZATION FABRIC

A. Standard Specifications, Section 88-1.02O, Class B1.

2.15 FILTER FABRIC

A. Standard Specifications, Section 88-1.02B, Polypropylene, Class B.

PART 3 - EXECUTION

3.1 GENERAL

A. All active portions of the construction site, earthen access roads and material excavations shall be sufficiently watered to prevent excessive amounts of dust. Watering shall occur at least twice a day with complete coverage, preferably in the late morning and after work for the day.

B. All grading, earthmoving and excavation shall cease during periods of winds greater than 20 miles per hour average over a one hour period.

C. All material transported offsite shall be either sufficiently watered or securely covered to prevent excessive amounts of dust.

D. Areas disturbed by earthmoving or excavation activities shall be minimized at all times.

3.2 CLEARING AND GRUBBING

A. Clearing and grubbing shall conform to Section 31 11 00, SITE CLEARING AND GRUBBING.

3.3 TOPSOIL EXCAVATION

A. Remove all topsoil and organics.

B. Material specified in Paragraph 2.2 shall be removed before commencement of any excavation. Do not use this material for fill or backfill, except as approved by the Geotechnical Engineer. Topsoil shall be removed from the site at the Contractor’s expense or amended and reused as fill in landscaped areas.

3.4 DISPOSAL OF WASTE MATERIAL

A. Burning is prohibited. Remove unsuitable material from the site in accordance with all local laws, codes and ordinances.

B. Existing clean suitable fill material may be stockpiled at a designated location on site after approval by the Engineer.

3.5 COMPACTION EQUIPMENT

A. Compaction Equipment: All compaction shall be by mechanical means. Compaction equipment shall be of suitable type and adequate to obtain the densities specified and approved.

3.6 SITE EXCAVATION

A. Perform all excavation of every description, regardless of the type, nature, or condition of material encountered, as specified, shown, or required to accomplish the Work.

B. The Contractor shall control excavations and stockpiling in a manner to prevent water from entering the excavations. Material for fill, backfill, or for protection of excavations from surface drainage shall be neatly placed and kept shaped and covered so as to cause no dust or interference with other work.

C. The Geotechnical Engineer shall observe all excavated bottoms, including foundations and utility structures and trenches, following removal of material. Unsuitable materials observed by the Geotechnical Engineer in the excavated bottom shall be removed by the Contractor and stabilized using engineered fill material.

3.7 STRUCTURAL EXCAVATION

A. Excavation is unclassified. Excavate for structures to the lines and grades shown or as required to accomplish the Work. Perform all excavation regardless of the type, nature, or condition of the material encountered. Bench or shore excavations as required. Remove all debris and sort material to be reused as engineered fill. The method of excavation used is optional; however, no heavy equipment shall be operated within 5 feet of existing structures or newly completed construction, except as approved. Excavation that cannot be accomplished without endangering existing or new structures shall be performed with hand tools. All benching, shoring and sloping of excavations shall be at the Contractor's expense.

3.8 REMOVAL OF WATER

A. See Section 31 23 19, DEWATERING.

B. Water disposal shall meet Federal, State, and local requirements and as specified.

3.9 SUBGRADE STABILIZATION

A. Any base or soft areas shall be brought to the attention of the Geotechnical Engineer for evaluation of over-excavated depth and stabilized. If unsuitable materials are observed within the excavation bottom by the Geotechnical Engineer over-excavation will be required.

B. Areas receiving fill shall be prepared according to the following:
   1. Scarified to a depth of at least 8-inches.
   2. Moisture conditioned to within 3 percent of optimum moisture content.
   3. Compacted to at least 95 percent relative compaction.

3.10 OVEREXCAVATION

A. If groundwater or excessive soil moisture prevents operations described in 3.9.B, the bottom of the excavation may require overexcavation and a layer of aggregate base placed on the excavation bottom to provide a firm base on which to place and compact subsequent fill. The thickness of the aggregate base layer and/or need for subgrade stabilization fabric shall be evaluated by the Geotechnical Engineer at the time of excavation.

B. If the bottom of an excavation is found to consist of soft or unstable material that is incapable of properly supporting the pipe or structure, the Engineer shall be advised immediately.

C. The Contractor shall obtain the Engineer's approval prior to performing any overexcavation. Any overexcavating and resultant backfill and compaction without such approval shall be at the Contractor's expense. The quantity of approved unsuitable material excavated and its replacement shall be paid for as extra work only with the authorization of the Engineer and in accordance with the Contract Documents.

3.11 ROCK EXCAVATION

A. Rock excavation shall include removal and disposal of the following: (1) all boulders measuring 1/3 of a cubic yard or more in volume; (2) all rock material in ledges, bedding deposits, and unstratified masses; (3) concrete or masonry structures which have been abandoned; and (4) conglomerate deposits which are so firmly cemented that they possess the characteristics of solid rock.

B. Rock excavation is not anticipated for this project. If the Contractor encounters rocks during earthwork activities, the Engineer shall be advised immediately.

C. The Contractor shall obtain the Engineer's approval prior to performing any rock excavation. Any rock excavation and resultant backfill and compaction without such approval shall be at the Contractor's expense. The quantity of approved rock excavated and its replacement with suitable fill material shall be paid for as extra work only with the authorization of the Engineer and in accordance with the Contract Documents.

D. Explosives and Blasting: Use of Explosives and Blasting will not be permitted.

3.12 MOISTURE CONDITIONING

A. The term "moisture conditioning" as used in these Specifications, is defined to refer to any approved method of obtaining a required moisture content for materials to be compacted. Included under moisture conditioning requirements shall be the furnishing of all required water and the furnishing of all other necessary labor, materials and equipment required to provide the approved or required percent of moisture content. Moisture conditioning, as required, shall be performed for all materials specified to be compacted regardless of whether or not such requirement is specifically stated. No separate payment will be made for any or all operations of the Contractor pertaining to moisture conditioning or from delays occasioned thereby.

B. Prior to and during compaction, all earthwork materials specified to be compacted, including but not limited to backfill, refill and foundation subgrade, shall have an approved moisture content which shall be uniform in each layer of material compacted. If the moisture content is less than the approved requirement, compaction operations shall not proceed until the Contractor has added the necessary amount of water. If the moisture content is greater than the approved requirement, compaction operations shall not proceed until such time as the materials have dried sufficiently or have been otherwise mechanically dewatered or replaced with materials having the approved moisture content. The soil should be mixed after water is added to distribute the water evenly throughout the lift. Sufficient time should be allowed between water application and compaction to allow the water to penetrate the soil clods and reach a uniform value in the lift. If the soil is too moist, aeration will be required to lower moisture content to the desired level.

C. Contractor shall be responsible to demonstrate throughout the duration of all earthwork operations, that required moisture conditioning limits are being obtained. Care must be exercised to ensure that

the moisture content is not above moisture requirements. This is to ensure that the structural stability of the material is not affected.

D. For general engineered fill construction, the following compaction requirements apply:
   1. Maximum 8-inch lifts of uncompacted thickness.
   2. Compact to a minimum 90% relative compaction at, or within, 3 percent of the ASTM D1557 optimum moisture content.

3.13 SITE GRADING

A. Perform all earthwork to the lines and grades as shown and/or established by the Engineer. Shape, trim, and finish slopes to conform to the lines, grades, and cross sections as shown or approved. Make slopes free of all exposed roots and stones exceeding 2 inches in diameter which are loose and liable to fall. Round tops of banks to circular curves, in general, not less than a 6-foot radius. Rounded surfaces shall be neatly and smoothly trimmed.

B. Work that has been suspended by weather, scheduling or for any other reason, shall be protected against the effects of such weather or other conditions. Grading which has been considered acceptable, but which has been subsequently damaged shall be re-worked to meet the requirements of the Specifications.

C. Slopes shall be re-dressed as required to mitigate any erosion that may occur prior to establishment of the erosion control mitigation measures.

D. All grades shown on the Plans are expressed as finished elevations.

3.14 CUT SLOPES AND FILL SLOPES

A. Permanent cut and fill slopes shall be constructed no steeper than 3H:1V. Fill slopes shall be constructed beyond planned grades and trimmed back to expose form compacted soil.

B. Where fills are placed on existing slopes that exceed 5H:1V, the fills shall be keyed and beveled into the existing slope.

3.15 CONCRETE SLABS ON GRADE

A. Excavate to subgrade, scarify 12-inches and compact to at least 95% of the ASTM D1557 maximum dry density with a moisture content within three percent of the ASTM D1557 optimum moisture content.

B. Install structural aggregate layer to the thicknesses shown on the Drawings and compact to a minimum of 95 percent of the ASTM D1557 maximum dry density with a moisture content within three percent of the ASTM D1557 optimum moisture content.

C. Prior to placing concrete and the moisture barrier membrane, but after placing the overlaying structural aggregate layer, the subgrade soil shall be moisture conditioned to a uniform moisture content of between 2 and 6 percent greater than the ASTM D1557 optimum moisture content. Moisture conditioning shall be performed for a minimum of 24 hours prior to concrete placement.

3.16 HOT MIX ASPHALT PAVEMENT

A. Excavate to subgrade, scarify 12-inches and compact to at least 95% of the ASTM D1557 maximum dry density with a moisture content within three percent of the ASTM D1557 optimum moisture content.

B. Evaluate the stability of the compacted subgrade soil by wheel rolling prior to placing the overlaying aggregate base rock layer. Wheel rolling should be performed with a fully loaded water truck with tire pressures between 60 and 95 psi. The subgrade soil should exhibit only minor deflections as the wheel load passes by. Any unstable areas should be reworked and then retested foer relative compaction and moisture content and then proof rolled again.

C. Place aggregate base in 7-inch loose lifts and compact each lift to at least 95% of the ASTM D1557 maximum dry density with a moisture content within three percent of the ASTM D1557 optimum moisture content.

3.17 ROCK SLOPE PROTECTION

A. Place rock in accordance with Section 72-5.03, Method B placement.

3.18 CONTAMINATED SOILS HANDLING

A. Contractor to maintain separate stockpiles for potentially contaminated soil such that potentially contaminated soil is not commingled with non-contaminated soil.

B. Contractor to prepare a 10-mil, polyethylene plastic sheeting lined containment area for stockpiling and covering of potentially contaminated soils. Overlap the plastic sheeting a minimum of two feet to prevent run off underneath the plastic sheeting.

C. Collect soil samples to fully characterize excavated soil for disposal and manage accordingly. Sample, according to protocols set forth in ASTM E1903-97, Standard Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process, any soils generated as a result of excavations in these areas, as well as the bottoms and side walls of any such excavations.

D. Contractor to hire a California-certified laboratory to sample and test the potentially contaminated soil in accordance with sampling requirements of the nearest Class II or III landfill that accepts contaminated soils, or other type of disposal means preapproved by the Owner, as laboratory results indicate. In general, for gasoline and diesel contaminated soils, this includes the collection of one 4-point composite for every 100 cubic yards of excavated contaminated soil, and analysis for TPH-gas and TPH-diesel by EPA 8015, and for volatile organic compounds by EPA 8260.

E. Should the laboratory testing confirm the presence of contaminated soil, submit test results and any additional reporting requirements to the Class II or III landfill at least three working days prior to the planned disposal date.

F. Upon review of the test results, the Class II or III landfill will determine if the contaminated soil may be disposed of at the facility.

G. If the test results exceed the acceptance limits of the Class III landfill, Contractor shall submit test results and any additional reporting requirements to the nearest Class II landfill.

H. Upon review of the test results, the Class II landfill will determine if the contaminated soil may be disposed at the facility or if additional testing is required.

I. If additional testing is necessary, Contractor shall hire a California-certified laboratory to sample and test the contaminated soil in accordance with the additional sampling requirements.

J. If characterization determines that wastes are hazardous under RCRA or CalEPA Hazardous Waste guidelines, treat and/or dispose of all contaminated soils at properly permitted facilities approved by the Owner and all other controlling regulatory agencies for such purposes.

K. Complete disposal facility applications as necessary to obtain preapproval for disposal of all contaminated soil.

3.19 ADDITIONAL EXCAVATION IF CONTAMINATION IS DISCOVERED

A. If contaminated soil is discovered during construction activities, notify the Architect or Owner, and upon approval from the Owner, notify the Chico Fire Department.

B. Call upon an OSHA-certified, trained personnel, experienced in identifying unknown contaminants (such as a Professional Geologist or Registered Civil Engineer) to collect confirmation samples. Identify possible contaminated areas, and notify the Engineer or Owner. If warranted or directed by the Chico Fire Department, Engineer, or Owner, perform additional remedial excavation of soil and collect confirmation soil samples.

C. In areas where additional remedial excavation is required, complete excavation and backfilling as requested by the Engineer, Owner, or trained personnel prior to continuing with project.

D. If additional soils are excavated, follow the same protocol for stockpiling, characterizing, reloading, and disposal as described in other sections of this specification.

E. This work will be completed as an extra scope, once total contaminated soil exceeds estimations for the project.

3.20 DISCOVERED CONTAMINATION NOT PREVIOUSLY KNOWN TO EXIST

A. If contaminated soil is discovered where not expected and contaminants cannot be identified, call upon an OSHA-certified, trained personnel experienced in identifying unknown contaminants (such as a Professional Geologist/Engineer to collect samples and field identify possible contaminated areas.

3.21 WASTE MINIMIZATION

A. Minimize the generation of contaminated waste. Take all necessary precautions to avoid mixing clean and contaminated wastes.

3.22 CONTAMINATED MATERIAL STORAGE AREA MAINTENANCE

A. When contaminated materials are present and require stockpiling, complete the following tasks:

B. Stockpile Site Locations

C. Liner Maintenance: Maintain a stockpile area bottom to prevent tears or holes in the plastic. Any tears shall be patched or the area relined with 10-mil plastic within 24 hours. Sweep clean roadways leading to stockpile areas and repair all surface damage caused by the stockpile traffic.

D. Dust Control: Control all dust that may arise during stockpiling activities by keeping roads swept or wet, as necessary.

E. Conduct: All activities will be conducted in a manner that minimizes litter, nuisances, dust, noise impacts, and mud.

F. Access: Unauthorized access will be prevented within potentially contaminated soil areas.

G. Traffic Control: Traffic will be controlled in a safe manner.

H. Emergency Communications: The Contractor using the stockpile area shall provide telephone or radio communication capacity for emergency purposes.

I. Record Keeping: Maintain a log book in which storage dates, quantity of material accepted and leaving, and concentrations of constituents are tracked and any special occurrences such as written public complaints will be recorded.

J. Length of Use/Site Closure: When Contractor completes the use of the stockpile area, he shall ensure the area is clean of any potentially contaminated soils and have approval from Owner prior to leaving the site.

3.23 TRANSPORTATION OF WASTES

A. With preapproval from the Owner and the disposal facility, reload, transport, and dispose of contaminated materials in accordance with all local, state, and federal laws, rules, and regulations for transporting contaminated soil.

B. Contractor shall arrange the hauling and disposal of the contaminated soil at the accepted landfill licensed to accept such soil.

C. Transport all contaminated soil off site only to appropriate permitted Treatment and/or Disposal Facilities, approved by the Owner. The Contractor performing the work of this Section shall be licensed for the transportation and hauling of hazardous wastes. The firm shall provide a route plan, which clearly identifies the routes he proposes to follow while transporting soil to the off-site disposal facility.

D. Compliance with Federal Motor Carrier Safety Regulations: A motor carrier driver or other person must comply with the rules when he/she is transporting hazardous materials by a motor vehicle, which must be marked or placarded in accordance with DOT 177.823.

E. Transport drivers will offload soil only at the approved disposal facilities.

F. Ensure contaminated soil is free of debris, concrete, or asphalt rubble. Ensure no free water is ponding or leaking from trucks.

3.24 REPORT, MANIFESTS, AND RECORDS

A. Provide the Engineer or Owner with a compliance certificate verifying that all waste soils were received by the approved landfill has been properly disposed.

B. Provide copies of all manifests, permits, or other documents currently in effect relating to the specific wastes to be transported, treated, and disposed hereunder except as otherwise stated in this Section.

C. As the waste generator, the Owner shall furnish completed State of California Hazardous Waste Manifests (or the Uniform Manifest - 40 CFR Parts 260, 262, 271 - if effective at time of preparation) for all contaminated soils to be removed from the project area for transportation to an appropriate disposal facility. These manifests shall accompany the waste loads to disposal and be properly completed by the hauler and disposal agent as required by federal and state hazardous waste management law. The final manifest shall then be returned by registered mail to the Owner within the designated time period specified by federal law.

D. The contract work will not be considered complete nor will the Owner make final payment until the Engineer or Owner receives certifications of treatment and/or disposal.

3.25 NON-CONTAMINATED SOIL REUSE

A. Soil containing very low levels of contamination may be considered for reuse as backfill, but must be cleared with the Chico Fire Department and Engineer or Owner for reuse, prior to reuse.

B. Non-contaminated soil may be reused for backfill, if preapproved by the Engineer or Owner, and is permitted in other sections of the specifications.

3.26 DISPOSAL OF UNSUITABLE AND EXCESS EXCAVATED MATERIAL

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off project site.

B. Location of disposal site and length of haul are the Contractor's responsibility.

C. Place excess excavated materials suitable for fill and/or backfill on site where directed by Engineer.

D. Remove from site and dispose of any excess excavated materials after all fill and backfill operations have been completed.

E. Segregate all excavated contaminated soil designated by the Engineer from all other excavated soils, and stockpile on site on two 6 mil polyethylene sheets with a polyethylene cover. A designated area shall be selected for this purpose. Dispose of excavated contaminated material in accordance with State and Local requirements.

3.27 CLEAN UP

A. Upon completion of earthwork operations, clean areas within contract limits, remove tools, and equipment. Provide site clear, clean, free of debris, and suitable for subsequent construction operations. Remove debris, rubbish, and excess material from the Medical Center.

END OF SECTION 31 00 00

SECTION 31 01 40 - SHORING AND TRENCH SAFETY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Shoring required for general safety, worker protection, and protection of adjacent property from the hazards of caving ground.

B. Shoring for trench excavations.

C. Shoring for structural excavations.

D. Contractor’s responsibilities.

E. Contractor’s trench safety plan.

F. Contractor’s supervisor.

G. Related requirements and Work described elsewhere includes:
1. Division 01 – Requirements for temporary facilities, controls, public safety, and convenience.
2. Division 02 – Existing Conditions.
3. Division 31 – Earthwork.
4. Division 33 – Utilities.

1.2 CONTRACTOR'S RESPONSIBILITIES FOR SAFETY

A. The Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons (including employees) and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours.

B. Safety provisions shall conform to U.S. Department of Labor (OSHA), the California Occupational Safety and Health Act, and all other applicable Federal, State, county, and local laws, ordinances, codes, the requirements set forth below, and any regulations that may be detailed in other parts of these Specifications.

C. Contractor is advised that Part 1926 of 29 CFR, subpart P, has been revised. This regulation governs excavations, trenching and protective systems, sloping, benching, wood, and aluminum shoring for various types of soils, and depths of excavations. The Contractor shall follow these regulations (including the latest revisions) for this project.

D. Where any of these are in conflict, the more stringent requirement shall be followed.

1.3 PERMIT

A. For trenches or excavations of depth five (5) feet or deeper, the Contractor shall obtain from the State Division of Industrial Safety a permit for such excavation; submit a copy of the permit to the Engineer, prior to initiating any work requiring said permit.

1.4 CONTRACTOR SUBMITTALS

A. Submit all plans, product data, material source information, and certificates of compliance listed in this Section under a single submittal cover for review. Incomplete submittals will not be reviewed.

B. The Contractor's attention is directed to the provisions for "Shoring and Bracing Drawings" in Section 6705 of the California Labor Code. The Contractor, prior to beginning any trench or structure excavation five (5) feet deep or over, shall submit to the Engineer for review for compliance with Section 6705 the Contractor's detailed plan showing design of all shoring, bracing, sloping of the sides of excavation, or other provisions for worker protection against the hazard of caving ground during the excavation of such trenches or structure excavation. If such plan varies from the shoring system standards established in the Construction Safety Orders of the State of California, such alternative system plans shall be prepared, stamped and signed by a civil or structural engineer licensed in the State of California at the Contractor's expense.

C. Certificates of Compliance: Certificates of Compliance shall be provided for all products and materials proposed to be used under this Section.

D. For all materials that are not pre-approved by the Owner the Contractor shall designate the source and/or submit samples of all materials in advance of their use for required testing and Engineer's approval. All testing costs shall be at the Contractor's expense.

1.5 SAFETY ORDERS

A. The Contractor shall have at the work site, copies or suitable extracts of the Construction Safety Orders of Cal-OSHA, and Part 1926 of 29 CFR, subpart P.

B. All work shall comply with the provisions of these and all other applicable laws, ordinances and regulations.

1.6 TRENCH SAFETY PLAN

A. For trenches and excavations five feet or more in depth, the Contractor shall submit to the Engineer a detailed plan, design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazards of caving ground.

B. If such plan varies from the shoring system standards established by the Construction Safety Orders, or Part 1926 of 29 CFR, Subpart P, the plan shall be prepared, sealed and signed by a civil or structural engineer registered in California. Signed and sealed copies of calculations necessary to quality the system shall also be submitted.

C. Nothing herein shall be deemed to allow the use of shoring, sloping, or protective system less effective than that required by the Construction Safety Orders of the Division of Industrial Safety, or Part 1926 of 29 CFR, subpart P.

D. If Contractor proposes to use trench jacks or speed shores, submittals shall show length and type of shoring vertical and horizontal spacing, vertical or horizontal wales and planks. Shields, when proposed or used, shall show depth allowed in the soils expected to be encountered.

1.7 ENGINEER'S REVIEW

A. The duty of the Engineer to conduct construction review of the Contractor's performance is not intended to include a review or approval of the adequacy of the Contractor's safety supervisor, the safety program, or any safety measures taken in, on, or near the construction site.

B. The Engineer will review the submittal of the Contractor's proposed shoring system to verify the general scope of the Work, to determine that qualified professional engineering services are used and to determine that appropriate construction techniques are proposed for use. This review shall not in any way be construed to relieve the Contractor from sole responsibility for the design and safety of such shoring.

1.8 CONTRACTOR'S SUPERVISOR

A. The Contractor shall appoint a qualified supervisory employee who shall be responsible to determine the sloping or shoring system which shall be used depending on local soil type, water table, stratification, depth, etc.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 31 01 40

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SECTION 31 11 00 - SITE CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the following:
1. Removing surface debris.
2. Removing designated trees, shrubs, and other plant life.
3. Excavating topsoil.

B. Related Sections include, but are not limited to, the following:
1. Section 01 10 00, SUMMARY: Use of premises, Project phasing, and Owner-occupancy requirements.
2. Section 01 33 00, SUBMITTAL PROCEDURES: Requirements for submittals.
3. Section 01 50 00, TEMPORARY FACILITIES AND CONTROLS: Temporary construction and protection of items to remain, and control of noise, erosion, dewatering, site winterization, access, weeds and dust.
4. Section 02 01 10, EXISTING UTILITIES AND UNDERGROUND STRUCTURES: Locating and protecting existing utilities, facilities and underground structures.
5. Section 02 41 10, DEMOLITION, SALVAGE AND ABANDONMENT: Site clearing, tree removal and removal of above and below grade improvements and utilities.
6. California Department of Transportation, Standard Specifications, Section 16.

1.3 SUBMITTALS

A. Submit all product data, laboratory test results, material source information, and certificates of compliance listed in this Section under a single submittal cover for review. Incomplete submittals will not be reviewed.

B. Product Data: Submit data for herbicide in accordance with Section 01 33 00, SUBMITTAL PROCEDURES. Indicate compliance with applicable codes for environmental protection.

1.4 QUALITY ASSURANCE

A. The Contractor shall be responsible for all actions, damage, and effects arising out of any and all herbicide and/or pesticide use. The Contractor shall obtain and pay for all required permits and licenses prior to application.

B. Conform to applicable code for environmental requirements, disposal of debris, and use of herbicides.

1.5 REFERENCES

A. "Guide for Plant Appraisal" 9th Edition, published by International Society of Arboriculture, printed 2000.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 SITE ACCEPTANCE

A. The Contractor shall examine the area and conditions under which work in this Section will be performed. If conditions are detrimental to timely and proper completion of the work as described in the Construction Documents and these Specifications, the Contractor shall notify the Engineer in writing, describing the nature and extent of the issues.

B. Verify existing plant life designated to remain is tagged or identified

C. Identify waste area or salvage area for placing removed materials.

D. Once the Contractor has investigated the site and is satisfied as to the condition, the Contractor shall notify the Landscape Architect in writing.

3.2 PROTECTION

A. The Contractor shall contact Underground Services Alert (USA) (800) 227-2600 in accordance with the requirements of Section 02 01 10, EXISTING UTILITIES AND UNDERGROUND STRUCTURES.

B. The Contractor shall be solely responsible for the protection of adjacent properties, structures, streets, and utilities. Any damage shall be repaired to its original condition, as determined by the Landscape Architect, at the Contractor’s expense.

C. The Contractor shall be financially responsible for the health and well being of all existing plants designated to remain. In case of damage, the Contractor shall forfeit an amount in proportion to the extent of damage, as determined by the Landscape Architect, using the procedures outlined in the Council of Tree and Landscape Appraisers "Guide for Plant Appraisal", 9th Edition.

D. The Contractor shall protect benchmarks, survey control points, and existing structures not identified for removal from damage or displacement.

E. Western Burrowing Owls: Contractor shall retain a Qualified Biologist to conduct pre-construction surveys for Western Burrowing Owls nests a minimum of 7 days prior to any vegetation removal or ground disturbance between March 1 and August 31 (breeding season). If a potential nest is observed on the site, the area must either be monitored to determine if the nest is active, or that area shall be avoided. If an active nest is observed, a no-disturbance buffer of 50 feet in radius shall be established and no ground disturbance in that area will be allowed until the young have fledged.

F. Swainson's Hawk: Contractor shall retain a Qualified Biologist to conduct pre-construction surveys for raptor nests in accordance with the California Department of Fish and Wildlife (CDFW) publication "Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley" a minimum of 7 days prior to any vegetation removal or ground disturbance between March 1 and September 15 (nesting season). The area to be surveyed should include a ½ mile radius area including and surrounding the project area. If an active nest is observed in the survey area, the area must either be monitored to determine if the nest is active, or that area shall be avoided. If an active nest is observed, mitigation measures consistent with the CDFW publication "Staff Report Regarding Mitigation for Impacts to Swainson's Hawk (Buteo swainsoni) in the Central Valley of California" should be incorporated in the following manner:
   1. No intensive new disturbances, such as heavy equipment operation associated with construction, use of cranes or draglines, and rock crushing activities or other project-related activities that may cause nest abandonment or forced fledging, should be initiated within ¼ mile (buffer zone) of an active nest between March 1 and September 15.
   2. If construction or other project-related activities that may cause nest abandonment or forced fledging are necessary within the buffer zone, monitoring of the nest site by the Qualified Biologist to determine if the nest is abandoned will be required. If it is abandoned as a result of Contractor's disturbances and if the nestlings are still alive, the Contractor shall be responsible for funding the recovery and hacking (controlled release of captive reared young) of the nestling(s).

G. Migratory Birds and Raptors: If vegetation removal or ground disturbance in areas where nests of birds protected by the Migratory Bird Treaty Act (MBTA) (16 USC §703) and the California Fish and Game Code (CFGC) (§3503) occur between March 1 and August 31 (the breeding season) then the Qualified Biologist shall:
   1. Conduct a survey for all birds protected by the MBTA and map all nests located within 500 feet of construction areas;
   2. Develop buffer zones around active nests in coordination with CDFW. Construction activity shall be prohibited within the buffer zones until the young have fledged or the nest fails. Nests shall be monitored at least twice per week and a report submitted to CDFW monthly.

3.3 CLEARED MATERIAL

A. Clearing and grubbing shall consist of removal of all objectionable material within the limits of work shown on the plans and as directed by the Engineer. Objectionable materials shall include but are not limited to all abandoned pipes, conduits, waste concrete, undergrowth and dead wood. All objectionable cleared material shall become the property of the Contractor and shall be removed from the project site and disposed of or recycled properly.

3.4 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. Remove paving and concrete slabs as indicated on the drawings. Neatly saw cut edges at right angle to surface.

C. Remove abandoned utilities in accordance with Section 02 41 10, "Demolition, Salvage and Abandonment," and as indicated on the drawings. Indicate removal termination point for underground utilities on Record Documents.

D. Remove trees and shrubs indicated and as described in Section 02 41 10, DEMOLITION, SALVAGE AND ABANDONMENT.

E. Continuously cleanup and remove waste materials from site. Do not allow materials to accumulate on site.

F. Do not burn or bury materials on site. Leave site in clean condition.

3.5 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated or re-graded without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

A. Topsoil to be removed from the site.

3.6 SITE PREPARATION

A. Prior to beginning any grading, the Contractor shall spray weeds with a non-selective herbicide. Herbicide shall be applied only by qualified personnel and in full accordance with all manufacturer recommendations and instructions. A second spraying may be required if weeds are not killed.

B. Shape slopes and swales with no abrupt change of gradient. All mounds and swales indicated on the plans shall be constructed and approved before soil preparation is started.

C. All areas to be planted shall be cultivated to a minimum depth of six inches (6") and the soil shall be loose and friable.

END OF SECTION 31 11 00

SECTION 31 23 00 - TRENCH EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: The Work covered in this section consists of performing all operations necessary to excavate all earth, regardless of character and subsurface conditions, from the trench or adjacent thereto and to place stabilization, bedding, cover, water removal, backfill, base, and compaction as shown on the Drawings and as specified, or as may be ordered by the Engineer.

B. Such earthwork shall include, but may not necessarily be limited to, the loosening, removing, loading, transporting, depositing, and compacting in its final location of all materials wet and dry, as required for the purposes of completing the Work, which shall include, but not necessarily be limited to, the furnishing, placing, and removing of sheeting, shoring and bracing necessary to safely support the sides of all excavations; all pumping, ditching, draining and other required measures for the removal or exclusion of water from the excavation; the supporting of structures above and below the ground; all backfilling around structures and all backfilling of trenches and pits; the disposal of excess excavated materials; borrow of materials to make up deficiencies for fills; and all other incidental earthwork.

C. General intent:
1. It is the general intent of these specifications to specify conduct of the Work in such manner as to cause no exposure to unsafe conditions during construction and to provide a trench that will properly support and protect the pipe and only minor settlement in areas where such settlement will not be noticed, or compensation made for any expected settlement. The degree of compaction and type of material will vary in accordance with type of pipe, and soil and surface conditions.
2. The Contractor shall obtain compaction and install base and temporary paving. He shall keep access roads clean and free of dust, mud or debris by providing cleanup as necessary.
3. If the Contractor does not properly clean up, (to preconstruction conditions) the Owner shall have the option of using outside equipment and labor to perform the Work and such costs will be deducted from the contract.
4. Stabilization material will be required only where soil conditions warrant and as directed by the Engineer.
5. No backfilling shall be done until the installation to be covered has been inspected and approved for covering. Compaction of backfill shall proceed immediately after backfilling, in appropriate layers.
6. During construction, heavy rains may be encountered causing wet backfill and other unsuitable working conditions. During these periods the Owner will have authority to shut down the Work to avoid poor working conditions, wet unsuitable backfill, damage to base and paving, unsafe conditions, etc.

D. Hazardous materials shall be handled in accordance with Section 31 00 00, EARTHWORK and all regulatory agency requirements.

E. Related Work:
1. Section 02 01 10, EXISTING UTILITIES AND UNDERGROUND STRUCTURES
2. Section 26 00 00, COMMON WORK RESULTS FOR ELECTRICAL

3. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
4. Section 31 00 00, EARTHWORK
5. Section 31 01 40, SHORING AND TRENCH SAFETY
6. Section 31 23 19, DEWATERING
7. Section 31 23 23.43, TIRE DERIVED AGGREGATE
8. Section 33 11 00, WATER DISTRIBUTION
9. Section 33 31 00, SANITARY SEWER
10. Section 33 41 00, STORM DRAIN

1.2 QUALITY ASSURANCE

A. Qualifications of workmen: Provide sufficient skilled workmen and supervisors who shall be present at all times during execution of this portion of the Work and who shall be thoroughly familiar with the type of construction involved and the materials and techniques specified.

B. Codes and standards:
1. Wherever a test method is referenced in this section it shall be made in accordance with the most current test methods in use by the California Department of Transportation (Caltrans). Where reference is made to the State Standard Specifications, reference shall mean: State of California, Business and Transportation Agency, Department of Transportation (Caltrans), Standard Specifications, 2010, excluding measurement and payment Sections.

1.3 GUARANTEES

A. The Contractor shall guarantee his Work against settlement for a period of one year after the Notice of Completion has been filed and shall repair all damage caused by settlement within that time. For the purpose of this specification, settlement will be deemed to have occurred if the following conditions exist:
1. Along unpaved portions, a depression of 1 inch below the average of the sides of the uncut portion shall be deemed a settlement.
2. In paved areas, the depression of 1/4 inch below the average of the sides of the uncut portion will be deemed a settlement.

1.4 CONTRACTOR SUBMITTALS

A. Submit all product data, laboratory test results, material source information, and certificates of compliance listed in this Section under a single submittal cover for review. Incomplete submittals will not be reviewed.

B. The Contractor’s attention is directed to the provisions for "Shoring and Bracing Drawings" in Section 6705 of the California Labor Code. The Contractor, prior to beginning any trench or structure excavation five (5) feet deep or over, shall submit to the Engineer for review for compliance with Section 6705 the Contractor’s detailed plan showing design of all shoring, bracing, sloping of the sides of excavation, or other provisions for worker protection against the hazard of caving ground during the excavation of such trenches or structure excavation. If such plan varies from the shoring system standards established in the Construction Safety Orders of the State of California, such alternative system plans shall be prepared, stamped and signed by a civil or structural engineer licensed in the State of California at the Contractor’s expense.

C. Certificates of Compliance: Certificates of Compliance shall be provided for all products and materials proposed to be used under this Section.

D. For all materials, the Contractor shall designate the source and/or submit samples of all materials in advance of their use for required testing and Engineer's approval, if requested. All testing costs shall be at the Owner's expense.

1.5 QUALITY ASSURANCE

A. General: All soils testing will be performed by the Owner.

B. Where soil material is required to be compacted to a percentage of maximum density the maximum density at optimum moisture content will be determined in accordance with the standards outlined ASTM D1557. Field density in-place tests will be performed by the Owner.

C. The Contractor shall notify the Engineer at least 48 hours prior to performing any utility excavation.

PART 2 - PRODUCTS

2.1 EXCAVATION

A. The Contractor shall complete all excavation regardless of type, nature, or condition of the material encountered. The Contractor shall make his own estimate of the kind and extent of the various materials to be excavated in order to accomplish the Work. The Contractor should refer to the available geotechnical report (soils report) for anticipated excavation conditions. Native backfill shall not be used for any utility trench backfill.

2.2 BEDDING AND COVER MATERIAL

A. Pipe Bedding Material: Section 31 00 00, EARTHWORK.

2.3 TRENCH BACKFILL

A. Trench Backfill Material: Section 31 00 00, EARTHWORK.

2.4 PERMEABLE MATERIAL

A. Permeable Material: Section 31 00 00, EARTHWORK.

B. Permeable material shall be used in overexcavated areas of trenches, including where the bottom of excavations is unstable, disturbed or wet.

2.5 TIRE DERIVED AGGREGATE

A. Tire Derived Aggregate Fill: Section 31 23 23.43, TIRE DERIVED AGGREGATE FILL.

2.6 GEOTEXTILE FABRICS

A. Filter Fabric: Section 31 00 00, EARTHWORK.

B. Subgrade Stabilization Fabric: Section 31 00 00, EARTHWORK.

2.7 SLURRY CEMENT BACKFILL

A. Slurry Cement Backfill: Section 31 00 00, EARTHWORK.

2.8 STEEL PLATE

A. When steel plate bridging is provided in lieu of backfill and temporary asphalt, it shall conform to Section 602.1 of the Caltrans Encroachment Permit Manual, with the following minimum thicknesses:

TRENCH WIDTH	MINIMUM PLATE THICKNESS
(10”) 0.25 m	(1/2”) 13 mm
(1’ – 11”) 0.58 m	(3/4”) 19 mm
(2’ – 7”) 0.80 m	(7/8”) 22 mm
(3’ – 5”) 1.04 m	(1”) 25 mm
(5’ – 3”) 1.60 m	(1 ¼”) 32 mm

B. For spans greater than 5 feet-3 inches, a structural design shall be prepared by a California registered civil engineer. Plates to be coated with a “no slip” surface.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall perform all excavation of whatever substance is encountered to the lines and grades shown on the plans. All excavated materials shall become the property of the Contractor and disposed of in accordance with local and state requirements.

B. Not more than 300 feet of excavation trench will remain unbackfilled at the end of each days Work. The maximum amount of open trench permitted in any one location shall be the length necessary to accommodate the amount of pipe installed and backfilled in a single day. All trenches shall be fully backfilled at the end of each day or, in lieu thereof, shall be covered by heavy steel plates adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each day. The above requirements for backfilling or use of steel plate may be waived in cases where the trench is located further than 100 feet from any traveled roadway or occupied structure. In such cases, however, barricades and warning lights meeting safety requirements shall be provided and maintained. All operations shall be carried out in an orderly fashion. Backfilling, compacting, base, and cleanup will be accomplished as sections of the pipe are installed.

C. Where abandoned underground structures are encountered, remove to sufficient depth to allow underground lines to cross, backfill and compact during rough grading. The Engineer may require further work to be done if visual inspection indicates during construction.

3.2 WIDTH OF TRENCH

A. Except where otherwise specifically noted or directed, excavation for pipelines and utilities shall be open-cut trenches, sides of trenches shall be vertical, shored as required, and shall be uniform width from top to bottom. Trenches shall be of a width as shown on the Drawings.

B. If trench widths exceed those shown on the Drawings, install all additional stabilization material, special bedding and cover, backfill, base and paving or higher strength pipe in conformance with these specifications and as directed by the Engineer at no additional cost to the Owner.

C. Subgrade: The surface of the subgrade after compaction shall be hard, uniform, smooth, self draining, and true to grade and cross section.

D. Trench Bottom: The pipe bedding shall be given a final trim establishing grade such that each pipe section when first laid will be continually in contact with the bedding along the extreme bottom of the pipe. Rounding out the trench bottom or bedding to form a cradle for the pipe will not be allowed. The Contractor shall hand excavate for bell holes and fittings.

3.3 PAVING REMOVAL

A. Pavement removed for trenching shall be recycled at an approved facility.

3.4 REMOVAL OF WATER

A. Dewatering: Section 31 23 19, DEWATERING.

B. Water disposal shall meet federal, state, and local requirements and as specified.

3.5 SHORING, SHEETING AND BRACING

A. See Section 31 01 40, SHORING AND TRENCH SAFETY. The Contractor shall furnish and install all shoring, sheeting and bracing required to support adjacent earth banks and structures for the protection and safety of all personnel working in the trench. All shoring, sheeting and bracing shall conform to the requirements of the State or local agents having jurisdiction over such matters. Remove shoring, sheeting and bracing in a manner that will protect the workman and prevent caving of banks and damage to the pipe, grade, sidewall support, bedding compaction, excavation, backfill or adjacent property.

3.6 OVEREXCAVATION

A. If the bottom of an excavation is found to consist of soft or unstable material that is incapable of properly supporting the pipe or structure, the Engineer shall be advised immediately.

B. The Contractor shall obtain the Engineer’s approval prior to performing any overexcavation. Any overexcavating and resultant backfill and compaction without such approval shall be at the Contractor’s expense. The quantity of approved unsuitable material excavated and its replacement shall be paid for as extra work only with the authorization of the Engineer and in accordance with the Contract Documents.

3.7 ROCK EXCAVATION

A. Rock excavation shall include removal and disposal of the following: (1) all boulders measuring 1/3 of a cubic yard or more in volume; (2) all rock material in ledges, bedding deposits, and unstratified masses; (3) concrete or masonry structures which have been abandoned; and (4) conglomerate deposits which are so firmly cemented that they possess the characteristics of solid rock.

B. The Contractor shall obtain the Engineer's approval prior to performing any rock excavation. Any rock excavation and resultant backfill and compaction without such approval shall be at the Contractor's expense. The quantity of approved rock excavated and its replacement with suitable fill material shall be paid for as extra work only with the authorization of the Engineer and in accordance with the Contract Documents.

C. Rock excavation is not anticipated for this project. If the Contractor encounters rocks during earthwork activities, the Engineer shall be advised immediately.

D. Explosives and Blasting: Use of Explosives and Blasting will not be permitted.

3.8 TRENCH BACKFILL IN THE PIPE ZONE

A. The Contractor shall backfill the pipe zone with the bedding and cover materials specified to the dimensions shown on the Drawings. The trench shall be final-graded by hand to provide a secure bedding full length with hand excavation made for bells or collars.

B. Trench backfill in the pipe bedding zone shall be moisture conditioned to within three percent of the ASTM D1557 optimum moisture content and compacted to achieve a minimum relative compaction of 95 percent of the ASTM D1557 maximum dry density.

C. Trench backfill in the pipe shading and cover zone shall be moisture conditioned to within three percent of the ASTM D1557 optimum moisture content and compacted to achieve a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density.

D. Additional backfill shall then be installed and the sides of the pipes moisture conditioned to within three percent of the ASTM D1557 optimum moisture content. Backfill on the sides of the pipe and above the pipe in the pipe shading and cover zone shall be shovel sliced to remove voids and tamped to not less than 90 percent of the ASTM D1557 maximum dry density to secure full-length bedding and proper pipe wall support. After this, cover material in the lower trench zone shall be added and mechanically compacted to a relative compaction not less than 90 percent.

3.9 TRENCH BACKFILL IN THE TRENCH ZONE

A. The Contractor shall backfill the lower and upper trench zone with the trench cover materials specified to the dimensions shown on the Drawings. The trench shall be final-graded by hand to provide a secure bedding full length with hand excavation made for bells or collars.

B. Trench backfill in the trench zone shall be moisture conditioned to within zero to four percent of the ASTM D1557 optimum moisture content, placed in maximum 8 inch thick loose lifts prior to compacting, and compacted to achieve a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density.

C. Trench backfill within 12 inches of subgrade in non-vehicular areas shall be moisture conditioned to within zero to four percent of the ASTM D1557 optimum moisture content, placed in maximum 6 inch thick loose lifts prior to compacting, and compacted to achieve a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density.

D. Trench backfill within 12 inches of subgrade in vehicular areas shall be moisture conditioned to within zero to four percent of the ASTM D1557 optimum moisture content, placed in maximum 6 inch thick loose lifts prior to compacting, and compacted to achieve a minimum relative compaction of 95 percent of the ASTM D1557 maximum dry density.

3.10 PLACING AND SPREADING OF BACKFILL MATERIALS

A. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around nor upon any structure for a minimum of 72 hours or until the concrete has attained sufficient design strength to withstand the loads imposed, whichever is greater.

B. Backfill materials shall be placed and spread evenly in horizontal layers.

C. During spreading each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer and uniformity of moisture throughout backfill materials. Pipe Zone backfill materials shall be manually spread around the pipe so that when compacted, the Pipe Zone backfill will provide uniform bearing and side support.

D. Where the backfill material moisture content is below the optimum moisture content water shall be added before or during spreading until the proper moisture content is achieved.

E. Where the backfill material moisture content is too high to permit the specified degree of compaction, the material shall be dried or replaced until the moisture content is satisfactory.

F. Backfill shall be mechanically compacted by means of tamping rollers, sheepsfoot rollers, pneumatic tire roller, vibrating rollers, or other mechanical tampers. All such equipment shall be of a size and type subject to review by the Engineer. Impact-type pavement breakers (stompers) will not be permitted. Permission to use specific compaction equipment shall not be construed as guaranteeing or implying that the use of such equipment will not result in damage to adjacent ground, existing improvements, or new improvements. The Contractor shall make its own determination in this regard.

G. Material for mechanically compacted backfill shall be placed in lifts which, prior to compaction, shall not exceed the thickness specified below for various types of equipment:
   1. Vibratory equipment, including vibratory plates, vibratory smooth-wheel rollers, and vibratory pneumatic-tired rollers - maximum lift thickness of 1 foot.
   2. Rolling equipment, including sheepsfoot (both vibratory and non-vibratory), grid, smooth-wheel (non-vibratory), pneumatic-tired (non-vibratory), and segmented wheels - maximum lift thickness of 1 foot.
   3. Hand-directed mechanical tampers-maximum lift thickness of 4 inches.

H. Mechanically compacted landfill shall be placed in horizontal layers of thickness not exceeding those specified above, compatible to the material being placed and the type of equipment being

used. Each layer shall be evenly spread, moistened or dried, if necessary, and then tamped or rolled until the specified relative compaction has been attained.

3.11 COMPACTION OF BACKFILL MATERIALS

A. Specification Section 31 00 00, EARTHWORK. Each layer of backfill material as defined herein, shall be mechanically compacted to the specified percentage of maximum density. Equipment that is consistently capable of achieving the required degree of compaction shall be used and each layer shall be compacted over its entire area while the material is at the required moisture content range.

B. Flooding, ponding, or jetting shall not be used.

C. Equipment weighing more than 10,000 pounds shall not be used closer to structure walls than a horizontal distance equal to the depth of the fill against the structure wall at that time or 5-feet, whichever is greater. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations.

D. Trench Backfill Requirements: The pipe class has been structurally designed based upon the trench configuration specified herein.
   1. The Contractor shall maintain the specified trench width up to a horizontal plane lying 12 inches above the top of the pipe.
   2. If, at any location under said horizontal plane, the Contractor slopes the trench walls or exceeds the maximum trench widths indicated the Pipe Zone backfill shall be "improved" or the pipe class improved at no additional cost to the Owner. "Improved" backfill shall mean Slurry Cement Backfill or other equivalent materials acceptable to the Engineer.
   3. All trenches shall have a minimum of 2 inches of temporary asphalt placed daily and maintained unless final paving can be completed in the same day. Temporary asphalt shall be placed flush with adjacent pavement grade.
   4. Steel plates may be used to cover open trenches in-lieu of backfill and temporary asphalt pavement.

3.12 COMMUNICATIONS/ELECTRICAL

A. Bed and backfill in accordance with the Drawings.

3.13 STEEL PLATE

A. General: When backfilling operations of an excavation in the traveled way, whether transverse or longitudinal, cannot be properly completed within a work day, steel plate bridging with a non-skid surface and shoring may be required to preserve unobstructed traffic flow.

B. Steel plate bridging and shoring shall be installed using either Method (1) or (2):
   1. Method 1 for speeds more than 45 mph:
   2. The pavement shall be cold planed to a depth equal of the thickness of the plate and to a width and length equal to the dimensions of the plate.
   3. Method 2 for speeds 45 mph or less:
      a. Approaching plate(s) and ending plate (if longitudinal placement) shall be attached to the roadway by a minimum of 2 dowels pre-drilled into the corners of the plate and drilled 2 inches into the pavement. Subsequent plates are butted to each other. Fine

graded asphalt concrete shall be compacted to form ramps, maximum slope 8.5 percent with a minimum 12 inch taper to cover all edges of the steel plates. When steel plates are removed, the dowel holes in the pavement shall be backfilled with either graded fines of asphalt concrete mix, concrete slurry or an equivalent slurry.

C. When steel plate bridging is required, the following conditions shall apply:
   1. Steel plates used for bridging must extend a minimum of 12 inches beyond the edges of the trench.
   2. Steel plate bridging shall be installed to operate with minimum noise.
   3. The trench shall be adequately shored to support the bridging and traffic loads.
   4. Temporary paving with cold asphalt concrete shall be used to feather the edges of the plates, if plate installation by Method (2) is used.
   5. Bridging shall be secured against displacement by using adjustable cleats, shims or other devices.

D. Steel plate bridging and shoring shall be installed using either Method (1) or (2):
   1. Method 1 for speeds more than 45 mph:
      a. The pavement shall be cold planed to a depth equal of the thickness of the plate and to a width and length equal to the dimensions of the plate.
   2. Method 2 for speeds 45 mph or less:
      a. Approaching plate(s) and ending plate (if longitudinal placement) shall be attached to the roadway by a minimum of 2 dowels pre-drilled into the corners of the plate and drilled 2 inches into the pavement. Subsequent plates are butted to each other. Fine graded asphalt concrete shall be compacted to form ramps, maximum slope 8.5 percent with a minimum 12 inch taper to cover all edges of the steel plates. When steel plates are removed, the dowel holes in the pavement shall be backfilled with either graded fines of asphalt concrete mix, concrete slurry or an equivalent slurry.

E. Steel plate bridging should not exceed 4 consecutive working days in any given week.

3.14 TESTING

A. Relative compaction shall be to the densities specified and referenced herein. All testing will be performed by the Owner.

END OF SECTION 31 23 00

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SECTION 31 23 19 - DEWATERING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Groundwater is not anticipated in this project. However, the Contractor is advised that groundwater may be present in some of the proposed excavations, depending on site location, soil conditions and time of year. As necessary, the Contractor shall keep excavations free from water during construction.

B. The Contractor shall provide all labor, materials, and equipment necessary to dewater trench and structure excavations, in accordance with the requirements of the Contract Documents, to enable the pipes and structures to be installed in excavations that are free from standing or flowing water that may be due to groundwater, surface water, stormwater, precipitation, or wastewater.

C. The preferred disposal method for water removed from trenches and other excavations is through infiltration and evaporation from on-site ponding. The location shall be approved by the Engineer and Owner.

D. If required, the Contractor shall obtain a waste discharge permit from the City of Chico for the discharge of dewatered groundwater to the sanitary sewer system.

E. The Contractor shall be responsible for all permits and fees associated with such discharges.

F. The preferred discharge location for dewatered groundwater is the City of Chico’s wastewater collection system, as described in paragraph 1.4 of this Section.

G. The Contractor shall develop an excavation dewatering plan in accordance with paragraph 1.5.A of this Section.

H. The Contractor shall qualitatively monitor for odor or visual discrepancies indicative of hydrocarbon contamination in groundwater during dewatering operations. The Contractor shall notify the Owner immediately if potential contamination is encountered.

I. The Contractor’s dewatering operations shall not interfere with vehicle or pedestrian traffic. Under no circumstances shall dewatering water be allowed to flood streets and cause hazardous conditions for vehicular or pedestrian traffic. Dewatering pump noise shall be mitigated, especially at night. Any mitigating measures taken to conform to these requirements shall be at no extra expense to the Owner.

J. The Contractor shall obtain any and all permits required in conjunction with dewatering operations, including permits for construction of dewatering wells.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02 01 00, SITE CONDITIONS

B. Section 31 01 40, SHORING AND TRENCH SAFETY

C. Section 31 23 00, TRENCH EXCAVATION AND BACKFILL

1.3 DEFINITIONS

A. Dewatering: Practices that manage the discharge of groundwater and accumulated precipitation from a work location so that construction work may be accomplished.

1.4 DISCHARGE TO COLLECTION SYSTEM

A. No water shall be discharged into sanitary sewers without the prior written consent of the Engineer and 24 hours advance notice to the City of Chico.

B. Groundwater turbidity may not exceed 10 NTU for discharging into the City's wastewater collection system.

C. If the turbidity requirements above are not met by tank settling alone, a filter must be employed to remove soil particles from the groundwater prior to discharge.

D. Testing of water samples for turbidity shall be performed and documented daily for the first week, then at weekly intervals during the remaining period of discharge. Water shall only be discharged if the sample test results meet the specified turbidity requirements. A log of the monitoring and sampling results shall be maintained.

E. The Contractor shall coordinate groundwater discharge into the collection system with the Owner, including verifying water quality requirements, discharge flow limitations into the collection system, and location of discharges into the collection system. Discharged flows into the collection system shall be limited to 500 gpm.

F. In no case shall the Contractor's groundwater disposal operation surcharge the collection system (i.e., full pipe flow).

1.5 SUBMITTALS

A. Submit all plans, product data, laboratory test results, material source information, and certificates of compliance listed in this Section under a single submittal cover for review. Incomplete submittals will not be reviewed.

B. Dewatering Plan

1. Dewatering systems shall be designed and maintained by the Contractor and shall be coordinated with the design of shoring specified in Section 31 01 40, SHORING AND TRENCH SAFETY. The plans should contain at a minimum the sizes of pumps, tanks, filtration devices, and the points of disposal. The plan should also include alternate

(contingent) systems, and the Contractor should be prepared to alter the initial dewatering or shoring systems to meet the specified requirements.

2. The plan shall also include the water quality requirements specified herein.

C. Section 01 33 00, SUBMITTAL PROCEDURES

D. Product Data: Submit data for each of the following:
   1. Dewatering Pumps: Indicate sizes, capacities, priming methods, and engine or motor characteristics.
   2. Pumping equipment for control of discharge.
   3. Size of tank(s) used for storage.
   4. Specifications and size and type of filters and any other materials used for filtration.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 33 00, SUBMITTAL PROCEDURES

B. Once the storage tank(s) are no longer needed, clean and remove from the site and return the area to original condition.

1.7 PRE-INSTALLATION MEETINGS

A. Section 01 31 00, PROJECT MANAGEMENT AND COORDINATION: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this Section.

1.8 SEQUENCING

A. Section 01 10 00, SUMMARY: Requirements for sequencing.

1.9 COORDINATION

A. Coordinate work to permit the following construction operations to be completed on stable substrate.
   1. Excavation for structures and pipelines as specified in Section 31 23 00, TRENCH EXCAVATION AND BACKFILL.

B. Coordinate with the Engineer prior to the commencement of any soil excavation and groundwater discharge.

C. All dewatering operations shall be adequate to assure the integrity of the finished project.

PART 2 - PRODUCTS

2.1 DEWATERING EQUIPMENT

A. Select dewatering equipment to meet specified performance requirements.

PART 3 - EXECUTION

3.1 DEWATERING OPERATIONS

A. Install dewatering system in accordance with the approved Dewatering Plan.
   1. Secure City approved areas for siting of groundwater storage tanks and treatment systems. Located system components to allow continuous dewatering operations without interfering with the excavation work.
   2. Install the dewatering system in accordance with State, local and Unified Building Code standards.

B. Remove water from the excavation in accordance with the approved Dewatering Plan.
   1. Keep excavations free from water during construction.
   2. Treat all water from the dewatering operations as required for removal of sediment prior to discharge. Water discharged to the City's collection system shall be within acceptable limits.
   3. Draw down the static water level a minimum of 2 feet below the bottom of excavations to maintain the undisturbed state of natural soils and allow the placement of any fill to the specified density.
   4. Operate dewatering systems continuously until backfill has been completed to 1-foot above the normal static groundwater level.
   5. Control the release of groundwater to its static level to prevent disturbance of the natural foundation soils or compacted fill and to prevent floatation or movement of structures and pipelines.
   6. Control groundwater to prevent softening of the bottom of excavations, or formation of "quick" conditions. Dewatering systems shall not remove natural soils.
   7. At all times, site grading shall promote drainage away from excavations. Surface runoff shall be diverted from excavations.
   8. Dewatering in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
   9. Control surface runoff to prevent entry or collection of water in excavations.

C. Notify the Engineer and stop excavation work should the dewatering system not adequately control water within the excavation.
   1. Supplement or modify dewatering system and provide other remedial measures to control water within excavation.
   2. Demonstrate dewatering system operation complies with performance requirements before resuming excavation operations.

D. Notify the Engineer and stop excavation work if potentially contaminated groundwater is encountered.
   1. Upon notification from the Contractor regarding potential groundwater contamination, the City will sample and analyze to verify the existence and extent of contamination.

E. Notify the Engineer and stop excavation work if settlement or ground movement is detected.
   1. Contractor shall control the rate and effect of the dewatering in such a manner as to avoid all settlement and subsidence.
   2. Where critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at daily intervals to detect any settlement or ground movement that may develop. The Contractor shall conduct the

dewatering operation in a manner that protects adjacent structures and facilities. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the Contractor.

F. Maintain all equipment in an operable state.
   1. Inspect equipment daily and repair or replace as needed.
   2. Clean accumulated sediment from tanks as needed.

G. Remove dewatering systems after dewatering operations are discontinued.
   1. The Contractor shall be responsible for sampling and disposal of sediments collected in storage tanks, as well as other waste materials related to groundwater discharge.
   2. Repair damage caused by dewatering systems or resulting from failure of systems to protect property.

END OF SECTION 31 23 19

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SECTION 31 23 23.43 – TIRE DERIVED AGGREGATE FILL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Lightweight fill shall consist of furnishing and placing tire derived aggregate (TDA) and filter fabric, and shall be constructed in conformance with the requirements of this section, the details shown on the Drawings and as directed by the Engineer.

B. TDA and select material shall conform to the requirements of Section 19, EARTHWORK of the Standard Specifications and this specification.

C. Filter fabric shall be as specified in Section 31 00 00, EARTHWORK.

D. Perforated and non-perforated plastic pipe be as specified in Section 33 41 00, STORM UTILITY DRAINAGE.

E. Excess fill material shall become the property of the Contractor and shall be disposed of by him at his expense.

F. Related items described elsewhere:
1. Section 02 01 00, SITE CONDITIONS
2. Section 02 01 10, EXISTING UTILITIES AND UNDERGROUND STRUCTURES
3. Section 31 00 00, EARTHWORK
4. Section 31 23 19, DEWATERING
5. Section 31 01 40, SHORING AND TRENCH SAFETY
6. Section 31 23 00, TRENCH EXCAVATION AND BACKFILL

1.2 QUALITY ASSURANCE

A. Qualifications of workmen: Provide sufficient skilled workmen and supervisors who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of construction involved and the materials and techniques specified.

B. Codes and Standards:
1. Wherever a test method is referenced in this Section it shall be made in accordance with the most current test methods in use as listed below:
   a. AASHTO-27 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates;
2. Where reference is made to the State Standard Specifications, reference shall mean the State of California, Department of Transportation (Caltrans), Standard Specifications, 2010, excluding measurement and payment Sections.

1.3 QUALITY ASSURANCE TESTING

A. Prior to placement of TDA material the Contractor shall:

1. Facilitate the Construction Quality Assurance (CQA) sampling of the TDA and provide a minimum of one (1) 30 pound sample at a frequency of one sample per 250 tons and facilitate the CQA visual inspection of all TDA deliveries.
2. Sample facilitation includes 48 hour notification to Engineer prior to date of first scheduled delivery.
3. Sample facilitation includes 48 hour notification to Engineer prior to date of reaching the complete delivery amount.

B. The Engineer shall be responsible for the sampling and testing costs associated with each test.

C. The Contractor shall be responsible for the sampling and testing costs associated with any failed test.

D. The Geotechnical Engineer will perform all testing for trenches.

1.4 SUBMITTALS

A. Submit all plans, product data, laboratory test results, material source information, and certificates of compliance listed in this Section under a single submittal cover for review. Incomplete submittals will not be reviewed.

B. Samples: In accordance with the provisions of Section 01 33 00, SUBMITTAL PROCEDURES of the specifications, submit samples of all materials 15 days prior to construction. Periodic testing of the material will also be made during construction.

C. A minimum of 15 days prior to the start of TDA delivery, the Contractor shall provide the name, address, and phone number of the TDA supplier and a Certificate of Compliance conforming to the requirements of Section 6-3.05E, “Certificates of Compliance,” of the Standard Specifications, for TDA gradation, free wire, and exposed wire testing, for review by the Engineer. Indicate process used to produce TDA.

D. A minimum of 15 days prior to the start of TDA delivery, the Contractor shall provide a written stockpiling plan conforming to the requirements of “Stockpiling” of this specification for review by the Engineer.

E. The Engineer will have 15 days to review the submittals and provide written approval the TDA supplier and stockpiling plan.

F. If the Engineer does not approve the TDA supplier, the Contractor shall not start hauling TDA material from that supplier, and shall submit the required documentation for another TDA supplier. The Engineer will have an additional 15 days to review and approve subsequent submittals.

G. If the Engineer does not approve the stockpiling plan, the Contractor shall not start hauling TDA material from that supplier, and shall submit a revised stockpiling plan. The Engineer will have an additional 15 days to review and approve subsequent submittals.

H. TDA material shall be tested a minimum of once every 250 tons of production. A Certificate of Compliance conforming to the requirements of Sections 6-3.05E, “Certificates of Compliance,” of

the Standard Specifications shall be furnished to the Engineer as every 250 tons of TDA material is received on the project.

I. Material Source: Submit name of TDA fill materials supplied. Available suppliers listed in order of distance from project site:
   1. Tri-C Manufacturing Inc.
      520 Harbor Blvd.
      West Sacramento, CA 95691
      Website: www.tri-cshredders.com
   2. Waste Recovery West, Inc.
      4554 S El Dorado St,
      Stockton, CA 95206
      Phone: (916) 395-5541
      Website: http://www.tiredisposal-recycling.com

J. Manufacturer's Certificate: Submit Certifications that products meet or exceed specified requirements.

1.5 MANUFACTURING SOURCE QUALITY CONTROL

A. Manufactured by a company with at least three years documented experience producing TDA materials meeting the quality standards of this section.

B. Perform gradation tests (AASHTO-27) at a frequency of one test per 500 cubic yards of material manufactured for this project.

PART 2 - PRODUCTS

2.1 TIRE DERIVED AGGREGATE

A. Type A TDA material shall consist of whole used tires shredded into pieces conforming to the gradation specified in this section.

B. Tire buffing or tire fines will not be allowed.

C. Tire shreds shall be produced by a shearing process. Tire shreds produced by a hammer mill will not be allowed.

D. Tire shreds shall not contain any contaminates such as oil, grease, diesel fuel or other chemical substances, shall not contain fragments of wood, wood chips, or any other fibrous organic matter, and shall not contain loose wire or metal fragments.

E. The TDA shall have less than 1% (by weight) of metal fragments that are not at least partially encased in rubber.

F. At least one sidewall shall be severed from the tread of each tire.

G. Tire shreds shall not contain the remains of tires that have been previously burned.

H. Metal fragments that are partially encased in rubber shall protrude no more than 1 inch from the cut edge of the TDA on 75% of the pieces (by weight) and no more than 2 inches on 90% of the pieces (by weight).

I. The gradation shall be measured in accordance with AASHTO T-27, "Standard Method for Sieve Analysis of Fine and Coarse Aggregate", except that the minimum sample size shall be 30 pounds.

J. A list of TDA suppliers is included in this section. The Contractor is not required to use a supplier from this list. The Contractor may request an updated TDA supplier list from the Engineer a minimum of 30 days prior to the beginning TDA compliance testing.

K. TDA shall be Type A, 300-mm sizing, and shall conform to the following grading and quality requirements:
   1. Type A TDA shall have a maximum dimension, measured in any direction, of 8 inches. In addition, Type A TDA shall have 100% passing the 4 inch square mesh sieve, a minimum of 95% passing (by weight) 3 inch square mesh sieve, a minimum of 50% passing (by weight) the 1.5 inch square mesh sieve, and a maximum of 5% passing (by weight) the No. 4 sieve.

2.2 FILTER FABRIC

A. Specification Section 31 00 00, EARTHWORK.

PART 3 - EXECUTION

3.1 PREPARATION

A. The Contractor shall provide safe access to all work and any inspections that may be required as determined by the Engineer or onsite CQA personnel during work activities.

B. Verify that surveying has been completed to define the as-built subgrade configuration upon which the TDA will be placed.

C. Verify that the geotextile filter fabric separator has been installed and that all Material Quality Control (MCQ) and CQA documentation has been received and approved by the Engineer.

D. Verify that the drain system has been installed and a survey has been performed to document its as-built location.

E. Verify that the water quality sample wells have been installed and a survey has been performed to document the as-built location.

F. Verify surveys have been performed to define the TDA fill configuration, slopes and finished grade.

G. Prepare subgrade of bioretention areas by scarifying subgrade soil to a depth of 8 inches.

H. Provide for dust control as required.

3.2 STOCKPILING

A. The Contractor's written plan for stockpiling TDA material shall include the following:
   1. Locations and maximum sizes of TDA stockpiles.
   2. Stockpile platform size and methods of preparation.
   3. Dimensions and locations of fire access roads and fire breaks.
   4. Fire and security emergency telephone numbers

B. TDA stockpiling plan shall be submitted to the Engineer for approval as detailed in "Submittals" of this section.

C. The Contractor shall prepare stockpile platforms within the areas approved by the Engineer in the TDA stockpiling plan.

D. Stockpile platforms shall be the minimum size and number necessary to allow delivery of TDA and construction of lightweight fill.

E. Approved areas for stockpile platforms shall be cleared and grubbed. All topsoil shall be removed. Stockpile platforms shall consist of either:
   1. a minimum 6-inch thick layer of permeable material. The maximum allowable stockpile platform grade shall be 10 percent.
   2. Paved areas.

F. Individual TDA stockpiles on stockpile platforms shall cover a maximum of 25,000 square feet, and shall not exceed 12 feet in height.

G. A mineral strip firebreak with a minimum width of 35 feet shall separate adjacent stockpile platforms. Mineral strip firebreaks shall consist of exposed mineral soils or rock that has been cleared of vegetation, topsoil, and all other combustible materials.

H. The Contractor shall provide access roads to TDA stockpiles wide enough to accommodate fire trucks. All access roads and firebreaks shall be free and clear of obstructions at all times.

I. TDA materials may be stockpiled for a maximum of 90 days.

J. If unforeseen circumstances require TDA materials to remain stockpiled longer than 90 days, the Contractor shall obtain written approval from the Engineer, and written approval from the Chico Fire Marshal and all project permitting agencies prior to the end of the 90 day limit.

K. Stockpile platforms shall be completely removed and disposed of by the Contractor when no longer required.

3.3 TDA INSTALLATION

A. TDA fill shall be constructed as shown on the Drawings.

B. TDA shall not be placed on soil containing organic matter.

C. Immediately prior to spreading, the subgrade to receive TDA material shall be scarified to a minimum depth of 6 inches and then compacted to 80 percent relative compaction.

D. Compaction for topsoil fill and embankment material above the lightweight fill shall be 80 percent relative compaction.

E. TDA material shall be placed initially by dumping from trucks.

F. TDA material shall be spread using track-mounted equipment.

G. TDA material shall be placed in lifts no greater than 12 inches.

H. TDA lifts shall be compacted using a minimum of six complete coverage passes by a vibratory smooth drum steel roller imposing a minimum static weight of 11 tons.

I. In narrow trenches, walk behind trench compactor with minimum centrifugal force of 15,000 LBF and travel speed of 1.5 MPH is acceptable.

J. Placement on a grade acceptable, provided the compaction equipment can make 6 passes.

K. TDA material shall be encapsulated in filter fabric as shown on the Drawings. Filter fabric shall be overlapped a minimum of 18 inches in the direction of the spread.

L. A tolerance of 2 inches above the required grade and cross section will be allowed for TDA fill.

M. If the top of any layer of TDA becomes contaminated by any foreign material, including but not limited to soil, organic matter, oil, grease, gasoline, or diesel fuel, the contaminated material shall be removed and replaced with the specified material at the expense of the Contractor.

N. The top of the encapsulated TDA layer shall be covered by topsoil as shown on the Drawings. Topsoil shall be placed and compacted to 80 percent relative compaction.

O. The maximum tolerance of compacted lightweight fill (TDA) shall be 3 inches from the finished grades for TDA shown on the plans.

3.4 UTILITY INSTALLATION IN TDA

A. Install utility pipes and structures in TDA fill as shown on the Drawings.

B. Thoroughly level compact TDA fill prior to placement of utility pipes, drop inlets, and other structures.

C. TDA is compressible. Place and compact additional TDA fill under utility pipes and structures as required to achieve design grades and invert elevations.

D. Set utility pipes and structures on level TDA. Place and compact additional TDA bedding and backfill around pipes and structures so they are firmly installed and stable. Support pipes and structures during TDA placement and compaction.

E. Overlap filter fabric around drop inlets and structures a minimum of 18 inches such that the TDA is fully encapsulated in filter fabric. Use additional filter fabric to ensure TDA is completely separated from subsequent placement of topsoil.

3.5 FIELD QUALITY ASSURANCE

A. The CQA Monitor will determine optimum moisture content and maximum density for mineral aggregate and soil fill materials in accordance with ASTM D1557.

B. In place density and moisture content of mineral and soil will be determined by one or more of the following methods: ASTM D2216, ASTM D2922, ASTM D2937, or ASTM D3017.

C. Cooperate fully with the CQA Monitor in their performance of in-place density and moisture testing.

3.6 COMPACTION EQUIPMENT

A. Compaction Equipment: All compaction shall be by mechanical means.
   1. Vibratory smooth drum steel roller imposing a minimum static weight of 11 tons.
   2. Walk behind trench compactor with minimum centrifugal force of 15,000 LBF and travel speed of 1.5 MPH.

3.7 AS-BUILT SURVEY

A. Perform an as-built survey of the completed TDA fill surface configuration prior to placing cover topsoil.

B. Document as-built elevations at a minimum 50-foot grid and at grade breaks. Provide survey points (x,y,z) in electronic format on same horizontal and vertical datum as project survey to Engineer.

C. Review survey data to confirm grading criteria and tolerances have been met prior to covering with topsoil.

D. Submit final survey data to the Engineer within 3 days of confirming grading criteria is met.

3.8 DISPOSAL OF UNSUITABLE AND EXCESS EXCAVATED MATERIAL

A. Disposal: Remove surplus TDA and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off project site.

3.9 CLEAN UP

A. Upon completion of earthwork operations, clean areas within contract limits, remove tools, and equipment. Provide site clear, clean, free of debris, and suitable for subsequent construction operations. Remove debris, rubbish, and excess material from the site.

END OF SECTION 31 23 23.43

SECTION 31 25 00 - EROSION CONTROL

PART 1 - GENERAL

1.1 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
   1. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
      a. ASTM D 4439-14 Standard Terminology for Geosynthetics
      b. ASTM D 4491-14 Water Permeability of Geotextiles by Permittivity
      c. ASTM D 4533-11 Trapezoid Tearing Strength of Geotextiles
      d. ASTM D 4632-13 Grab Breaking Load and Elongation of Geotextiles
      e. ASTM D 4751-12 Determining Apparent Opening Size of a Geotextile
      f. ASTM D 4873-09 Identification, Storage, and Handling of Geosynthetic Rolls

B. California Department of Transportation, Standard Specifications, Section 13 Water Pollution Control

C. A Storm Water Pollution Prevention Plan (SWPPP) document has been prepared for this project based on all available project data and is included as part of the Contract Documents. Contractor and LRP to coordinate with QSD to finalized SWPPP upon award or contractor selection.

1.2 GENERAL

A. The Contractor shall implement the storm water pollution prevention measures specified in the SWPPP, in this section, in Standard Specification Section 13, and the requirements of the National Pollution Discharge Elimination System (NPDES).

B. The Contractor shall provide information to the LRP and/or QSD and/or QSP as required to complete the SWPPP document for electronic filing at the State Water Board. Items to be completed include:
   1. Name and contact information for QSP and Contractor,
   2. Construction SWPPP schedule including erosion control related milestones,
   3. Update construction materials, housekeeping practices, etc. in areas highlighted in SWPPP,
   4. Update/include information where highlighted in the SWPPP document,
   5. Name and contact information for laboratory for non-visible pollutant sample analysis,
   6. Name and contact information for subcontractors responsible for erosion control work.

C. Earthwork construction activities that occur outside of the summer months from May 15 through October 15 or during periods of measurable precipitation shall incorporate implementation and monitoring of temporary water quality BMPs and storm water pollution prevention measures specified in the SWPPP, in this section, in Standard Specification Section 13, and as required by the NPDES.

D. The Contractor shall minimize the size of the work area in any drainage channels.

E. Heavy equipment shall be placed outside of drainage channels except when necessary to perform the Work.

F. Upon completion of construction activities, drainage channels shall be restored and re-contoured as nearly as practicable to pre-project conditions, and shall match adjacent natural channel contours.

1.3 EROSION AND SEDIMENT CONTROLS

A. The controls and measures required by the Contractor include but are not limited to the items below.
   1. Structural Practices: Structural practices shall be implemented to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Structural practices shall be implemented in a timely manner during the construction process to minimize erosion and sediment runoff. Structural practices shall include the following devices.
      a. Silt Fences. The Contractor shall provide silt fences as a temporary structural practice to minimize erosion and sediment runoff. Silt fences shall be properly placed and installed to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (e.g. clearing and grubbing, excavation, embankment, and grading). Silt fences shall be installed in the locations indicated on the drawings. Final removal of silt fence barriers shall be upon approval by the Owner.
      b. Fiber Rolls (sediment logs or wattles): Contractor shall provide fiber rolls as temporary structural practice to minimize erosion and sediment runoff. Fiber rolls shall be properly placed and installed to effectively retain sediment immediately after completing each phase of work (e.g., clearing and grubbing, excavation, embankment, and grading) in each independent runoff area (e.g., after clearing and grubbing in a area between a ridge and drain, fiber rolls shall be placed as work progresses; fiber rolls shall be removed/replaced/relocated as needed for work to progress in the drainage area). Areas where fiber rolls are to be used are shown on the drawings. Final removal of fiber roll barriers shall be upon approval by the Owner. Fiber Rolls shall be provided as follows:
         1) Along the downhill perimeter edge of all areas disturbed.
         2) Along the top of the slope or top bank of drainage ditches, channels, swales, etc. that traverse disturbed areas.
         3) Along the toe of all cut slopes and fill slopes of the construction areas.
         4) Perpendicular to the flow in the bottom of existing drainage ditches, channels, swales, etc. that traverse disturbed areas or carry runoff from disturbed areas. Rows shall be spaced a maximum of 100 feet apart.
         5) Perpendicular to the flow in the bottom of new drainage ditches, channels, and swales. Rows shall be spaced a maximum of 100 feet apart.
         6) At the entrance to culverts that receive runoff from disturbed areas.
      c. Diversion Dikes. Diversion dikes shall have a maximum channel slope of 2 percent and shall be adequately compacted to prevent failure. The minimum height measured from the top of the dike to the bottom of the channel shall be 18 inches. The minimum base width shall be 6 feet and the minimum top width shall be 2 feet. The Contractor shall ensure that the diversion dikes are not damaged by construction operations or traffic. Diversion dikes shall be located as shown on the drawings.

1.4 SUBMITTALS

A. Submit all product data, laboratory test results, material source information, and certificates of compliance listed in this Section under a single submittal cover for review. Incomplete submittals will not be reviewed.

B. Product Data:
   1. Submit data for erosion control materials listed in this section indicating properties, test methods, and manufacturer's installation instructions.

C. Material Source: Submit name of imported fill materials supplied.

D. Manufacturer's Certificate: Submit Certifications that products meet or exceed specified requirements.

PART 2 - PRODUCTS

2.1 TEMPORARY SILT FENCES

A. The filter fabric shall meet the requirements of Section 88-1.02E of the State Standard Specifications.
   1. Type: Woven.

B. Mill Certificate or Affidavit. A mill certificate or affidavit shall be provided attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above.

C. The Contractor may use either wooden stakes or steel posts for silt fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 inches by 2 inches when oak is used and 4 inches by 4 inches when pine is used. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum weight of 1.33 pounds per linear foot.

2.2 TEMPORARY FIBER ROLLS (sediment logs or wattles)

A. Standard Specifications, Section 21-1.02P Fiber Rolls.
   1. Type A or Type B
   2. 8 – 10 inches in diameter, 10 – 20 feet long.

B. Standard Specifications, Section 13-6.03E Temporary Fiber Rolls.

C. The Contractor shall use wooden stakes for fiber roll installation. Wooden stakes utilized for fiber roll installation, shall have a minimum cross section of 1 inch by 2 inches, or as suggested by the fiber roll manufacturer.

2.3 EROSION CONTROL BLANKETS

A. Standard Specifications, Section 21-1.02O Jute Mesh or Netting.

2.4 TEMPORARY COVERS

A. Standard Specifications, Section 13-5.02F Temporary Covers.

B. Standard Specifications, Section 88-1.02H Temporary Covers.

2.5 GRAVEL-FILLED BAGS

A. Standard Specifications, Section 13-5.02G Gravel-Filled Bags.

B. Standard Specifications, Section 88-1.02F Gravel-Filled Bags.

2.6 SEDIMENT FILTER BAGS

A. Standard Specifications, Section 88-1.02G Sediment Filter Bag.

2.7 TEMPORARY HYDRAULIC MULCH

A. Standard Specifications, Section 13-5.03E Temporary Hydraulic Mulch (Bonded Fiber Matrix).

B. Standard Specifications, Section 13-5.03F Temporary Hydraulic Mulch (Polymer-Stabilized Fiber Matrix).

2.8 TEMPORARY TACKED STRAW

A. Standard Specifications, Section 13-5.03H Temporary Tacked Straw.

2.9 TEMPORARY HYDROSEED

A. Standard Specifications, Section 13-5.03I Temporary Hydroseed.

PART 3 - EXECUTION

3.1 INSTALLATION OF SILT FENCES

A. Silt fences shall extend a minimum of 16 inches above the ground surface and shall not exceed 34 inches above the ground surface. Filter fabric shall be from a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter fabric shall be spliced together at a support post, with a minimum 6 inch overlap, and securely sealed. A trench shall be excavated approximately 4 inches wide and 4 inches deep on the upslope side of the location of the silt fence. The 4-inch by 4-inch trench shall be backfilled and the soil compacted over the filter fabric. Silt fences shall be removed upon approval by the Owner

B. Maximum spacing for post supports shall be 6 feet on center. Posts shall be buried 12 inches minimum and shall not exceed 36-inches above the ground surface.

3.2 INSTALLATION OF FIBER ROLLS (sediment logs or wattles)

A. Fine grade the subgrade by hand dressing where necessary to remove local deviations and to remove larger stones or debris that will inhibit intimate contact of the fiber roll with the subgrade. Prior to roll installation, contour a concave key trench 2 to 4 inches deep along the proposed installation route. Soil excavated in trenching should be placed on the uphill or flow side of the roll to prevent water from undercutting the roll.

B. Place fiber rolls into the key trench and stake on both sides of the roll within 6 feet of each end. Spacing for stakes shall be 3 to 5 feet. Stakes are typically driven in on alternating sides of the roll. Stakes shall be buried 12 inches minimum.

C. When more than one fiber roll is placed in a row, the rows should be abutted securely to one another to provide a tight joint, not overlapped. Fiber rolls shall be placed in a single row, lengthwise on the contour, with ends of adjacent rolls tightly abutting one another.

3.3 INSTALLATION OF OTHER SEDIMENT AND EROSION CONTROLS

A. Install other sediment and erosion controls in accordance with project SWPPP and Standard Specification Section 13.

3.4 MAINTENANCE

A. The Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures. The following procedures shall be followed to maintain the protective measures.

1. Silt Fence Maintenance. Silt fences shall be inspected in accordance with paragraph INSPECTIONS. Any required repairs shall be made promptly. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, the fabric shall be replaced promptly. Sediment deposits shall be removed when deposits reach one-third of the height of the barrier. When a silt fence is no longer required, it shall be removed. The immediate area occupied by the fence and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be re-vegetated.
2. Fiber Roll Maintenance. Fiber roll barriers shall be inspected in accordance with paragraph INSPECTIONS. Close attention shall be paid to the repair of damaged rolls, end runs and undercutting beneath rolls. Necessary repairs to barriers or replacement of rolls shall be accomplished promptly. Sediment deposits shall be removed when deposits reach one-half of the height of the barrier. Roll rows used to retain sediment shall be turned uphill at each end of each row. When a fiber roll barrier is no longer required, it shall be removed. The immediate area occupied by the roll and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be re-vegetated.

3.5 INSPECTIONS

A. General. The Contractor shall inspect disturbed areas of the construction site, areas used for storage of materials that are exposed to precipitation that have not been finally stabilized, stabilization practices, structural practices, other controls, and area where vehicles exit the site at least once every seven (7) calendar days, within two (2) calendar days of forecasted rains, and within 24 hours of the end of any storm that produces 0.5 inches or more rainfall at the site. Where sites have been finally stabilized, such inspection shall be conducted at least once every month and in accordance with the SWPPP and State of California Water Resources Control Board Construction General Permit requirements.

B. Inspections Details. Disturbed areas and areas used for material storage that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the Storm Water Pollution Prevention Plan shall be observed to ensure that they are operating correctly. Discharge locations or points shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles exit the site shall be inspected for evidence of offsite sediment tracking.

C. Inspection Reports. For each inspection conducted, the Contractor shall prepare a report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the Storm Water Pollution Prevention Plan, maintenance performed, and actions taken. The report shall be furnished to the Engineer within 24 hours of the inspection as a part of the Contractor's work. A copy of the inspection report shall be maintained on the job site.

END OF SECTION 31 25 00

SECTION 31 32 15 - LIME SOIL STABILIZATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating and treating soil.
2. Placing soil lime mix.

B. Related Sections:
1. Section 03 30 00, CAST-IN-PLACE CONCRETE: Concrete materials.
2. Section 31 00 00, EARTHWORK.
3. Section 31 23 00, TRENCH EXCAVATION AND BACKFILL.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO M216 - Standard Specification for Lime for Soil Stabilization.

B. ASTM International:
1. ASTM C25 - Standard Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime.
2. ASTM C977 - Standard Specification for Quicklime and Hydrated Lime for Soil Stabilization.
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3).

C. National Lime Association:
1. NLA - Lime Stabilization Construction Manual.

D. California Department of Transportation, Standard Specifications 2010.

E. Geotechnical Investigation Report:
1. Title: Geotechnical Engineering Investigation Report for the Butte Regional Transit Operations Center, 326 Huss Drive, Chico, California.
Date: May 17, 2012.
Author: Holdrege & Kull
2. Title: Design Memorandum: Recommendations for Subgrade Soil Stabilization Using Lime Treatment.
Date: August 27, 2013
Author: Holdrege & Kull
3. Title: Supplemental Recommendations to the Geotechnical Engineering Investigation Report dated May 17, 2012.
Date: July 1, 2014
Author: Holdrege & Kull

1.3 SUBMITTALS

A. Submit all product data, laboratory test results, material source information, and certificates of compliance listed in this Section under a single submittal cover for review. Incomplete submittals will not be reviewed.

B. Section 01 33 00, SUBMITTAL PROCEDURES: Requirements for submittals.

C. Product Data:
1. Submit mix design and materials mix ratio to achieve specified requirements.
2. At least 30 days before applying lime, submit samples, MSDS, certificate of compliance, and slurry's lime content in accordance with Section 24-2.01C of the Standard Specifications.

D. Manufacturer's Certificate: Certify Lime Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with NLA - Lime Stabilization Construction Manual.

B. Perform Work in accordance with State of California Department of Transportation Standard Specifications.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00, PRODUCT REQUIREMENTS: Environmental conditions affecting site.

B. Section 31 11 00, SITE CLEARING AND GRUBBING: Environmental conditions affecting site.

C. Do not install mixed materials in wind in excess of 10 mph or when temperature is below 35 degrees F.

PART 2 - PRODUCTS

2.1 MIX MATERIALS

A. Subsoil: Existing reused.

B. High Calcium Quicklime: Lime must comply with ASTM C25, ASTM C977 and requirements for high calcium qucklime listed in Section 24-2.02B of the State Standard Specifications.

C. Portland cement: Section 03 30 00, CAST-IN-PLACE CONCRETE.

D. Water: State Standard Specifications Section 24-2.02C.

2.2 EQUIPMENT

A. Equipment: Capable of excavating subsoil, mixing and placing materials, wetting, consolidation, and compaction of material in accordance with the State Standard Specifications.

2.3 SOIL-CEMENT-LIME MIX

A. Mix materials in accordance with State Standard Specifications Section 24-2 and these specifications.

B. Add water to mix to achieve homogeneous damp mixture without lumping, yet not creating wet plastic consistency.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 31 00, PROJECT MANAGEMENT AND COORDINATION: Verification of existing conditions before starting work.

B. Do not place fill over spongy subgrade surfaces.

3.2 PREPARATION

A. Coordinate requirements with foundation, paving and landscaping operations.

3.3 EXCAVATION

A. Excavate subsoil to subgrade depth indicated on Drawings.

B. Proofroll subgrade to identify soft areas; excavate those areas and replace with approved fill material.

C. Remove lumped subsoil, boulders, and rock larger than 3 inches in diameter. Remove larger material as specified in Section 31 00 00, EARTHWORK.

D. Notify Engineer of unexpected subsurface conditions. Discontinue affected Work in area until notified to resume Work.

E. Correct areas over-excavated in accordance with Section 31 00 00, EARTHWORK.

F. Stockpile excavated material in area designated on site; remove excess material not being reused from site.

3.4 SOIL TREATMENT AND BACKFILLING

A. Mix 70% high calcium quicklime and 30% Portland cement (dry weight) with site subsoil to depths shown on the Drawings. Blend treated subsoil mix to achieve mix formulation and required stabilization.

B. Application Rate: 3 percent by dry weight of soil or 3.3 pounds of lime-cement per square foot of soil based on an untreated soil dry unit weight of 110 pounds per cubic foot.

C. Maintain the in-place moisture of the soil to be stabilized approximately 3 percent above the optimum moisture determined under ASTM D1557.

D. Mix lime, cement and soil on the same day lime and cement is applied in accordance with State Standard Specification Section 24-2.03D and wait 18 hours minimum and no more than 36 hours maximum to allow a mellowing period before remixing.

E. Mixing equipment shall be equipped with a visible depth indicator showing the mixing depth, and odometer or foot meter to indicate travel speed and a controllable water additive system to regulate moisture condition and rehydrating.

F. Remix after 18 hour cure period until the mixture is uniform with no streaks or pockets of lime, cement or native soil.

G. Do not allow traffic other than the mixing equipment or other related construction equipment to pass over the spread lime and cement until after completion of mixing.

H. Compact mix to a minimum relative compaction of 93 percent of the ASTM D1557 maximum dry density with a moisture content within three percent of the ASTM D1557 optimum moisture content. Compact using a kneading foot compactor and finish using a steel tire or pneumatic tired roller.

I. Proofroll compacted subgrade soil using wheel rolling prior to placing the overlying aggregate base rock. Wheel rolling shall be performed with a fully loaded water truck with tire pressures between 60 and 95 pounds per square inch. The subgrade soil surface should exhibit only minor deflections as the wheel load passes by. Any unstable areas should be scarified and recompacted and then retested for relative compaction and moisture content and then proofrolled again until the area is firm and unyielding.

J. Shape to required line, grade, and cross section.

K. Finish grade in accordance with State Standard Specification Section 24-2.03F.

L. Make grade changes gradual. Blend slope into level areas.

M. At end of day, terminate completed Work by forming straight and vertical construction joint.

N. Replace damaged fill with new mix to full depth of original mix.

O. Remove surplus mix materials from site.

3.5 CURING

A. Immediately following compaction of mix, seal top surface with curing seal.

B. Do not permit traffic for 72 hours after sealing top surface.

3.6 TOLERANCES

A. Section 01 40 00, QUALITY REQUIREMENTS: Tolerances.

B. Top Surface of Fill: Plus or minus 0.08 feet from required subgrade elevations.

3.7 FIELD QUALITY CONTROL

A. State Standard Specification Section 24-2.01D Quality Control and Assurance.

B. Testing: Compression test and analysis of hardened fill material in accordance with ASTM D1557.

C. Verify each application of lime by measuring the weight of lime applied to a pan that is placed in line with the direction of the applicator truck.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Tests: drop pan method once every 40,000 square feet stabilized, or twice per day, whichever is greater.

END OF SECTION 31 32 15

SECTION 32 12 16 – HOT MIX ASPHALT PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Work covered in this section consists of performing all work and operations necessary for producing and placing hot mix asphalt (HMA) by mixing aggregate and asphalt binder at a mixing plant and spreading and compacting the HMA mixture. The section also includes requirements for pavement striping, markings and markers.

B. General intent: All roadway surfaces shall be replaced in a manner which will result in a surface equal to or better than that existing prior to the trenching operations. HMA shall be replaced with a thickness equal to the existing plus 1 inch, or 4 inches total, whichever is greater. See details on the Drawings.

C. Section Includes:
1. Quality Control Plan.
2. Quality Control Testing.
3. Acceptance Testing.
4. Asphalt Binder and Tack Coat.
5. Aggregate Materials.
6. Hot Mix Asphalt.

D. HMA shall be provided in accordance with the Standard HMA construction process and conform to the latest Caltrans Section 39 of the Standard Specifications and as detailed in this specification.

E. Related Work described elsewhere:
1. Section 31 00 00 - Earthwork
2. Section 31 23 00 - Trench Excavation and Backfill

F. References
1. AMERICAL ASSOCIATION OF STATE HIGHWAY TRANSPORTATION OFFICIALS (AASHTO)
   a. T-304 (2008) Uncompacted Void Content of Fine Aggregate.
2. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
   a. ASTM B 117 (2009) Standard Practice for Operating Salt Spray (Fog) Apparatus.
   b. ASTM D 150 (2004) Standard Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation.
   c. ASTM D 412 (2006ae2) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
   d. ASTM D 822 (2010) Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
   e. ASTM D 2041 (2011) Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.
   f. ASTM D 2240 (2010) Standard Test Method for Rubber Property—Durometer Hardness
   g. ASTM D 4791 (2010) Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

3. CALIFORNIA TEST METHODS (CT)
   a. CT 125 (2010) Sampling Highway Materials and Products Used in the Roadway Structural Sections.
   b. CT 202 (2010) Method of Test for Sieve Analysis of Fine and Coarse Aggregates.
   c. CT 205 (2010) Method of Test for Percentage of Crushed Particles.
   d. CT 211 (2010) Method of Test for Abrasion of Coarse Aggregate by use of the Los Angeles Abrasion Testing Machine.
   e. CT 217 (2008) Method of Test for Sand Equivalent.
   f. CT 226 (2010) Method of Test for Moisture Content of Soils and Aggregates by Oven Drying.
   g. CT 308 (2010) Determining Bulk Specific Gravity and Density of Compacted Hot Mix Asphalt.
   h. CT 309 (2010) Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.
   i. CT 366 (2000) Stabilometer Value.
   j. CT 367 (1999) Recommending Optimum Bitumen Content (OBC).
   k. CT 370 (2002) Determining Moisture Content of Asphalt Mixtures or Mineral Aggregate Using Microwave Ovens.
   l. CT 371 (2003) Resistance of Compacted Bituminous Mixture to Moisture Induced Damage.
   m. CT 375 (2004) Determining the In-Place Density and Relative Compaction of AC Pavement.
   n. CT 379 (2000) Determining Asphalt Content of Bituminous Mixtures (Troxler Nuclear Gauge Model 3241).
4. E. CALTRANS LABORATORY PROCEDURE (LP)
   a. LP-2 (2004) Determination of the Voids in Mineral Aggregate.
   b. LP-3 (2004) Determination of the Voids Filled with Asphalt.
   c. LP-4 (2004) Determination of Dust Proportion
   d. LP-9 (2006) Hot Mix Asphalt (HMA) using up to 15% Reclaimed Asphalt Pavement.
5. State of California, Business and Transportation Agency, Department of Transportation (Caltrans), Standard Specifications, latest edition excluding measurement and payment items.

1.2 QUALITY CONTROL PLAN

A. Establish, implement and maintain a Quality Control Plan (QCP) to ensure materials and work comply with the specifications and the corrective actions required to control the quality of work. The QCP shall comply with these specifications and Section 39-2 “Standard” of the Caltrans Standard Specifications.

B. Attend a pre-paving conference with the Engineer to discuss methods of performing the production and paving work and how quality control will be performed throughout.

C. The Contractor must identify the HMA sampling locations in their QCP. During production, take samples under California Test Method (CT) 125 except if requested in writing with Engineer approval, you may sample HMA from:
   1. The plant
   2. The truck

3. The paver hopper
4. The mat behind the paver

D. A minimum of one sample for Rice Specific Gravity shall be taken each day at the plant during placement of HMA. The Rice Specific Gravity test shall be in accordance with ASTM D 2041. The results shall be submitted to the Engineer within one working day of receiving them from the testing laboratory. Any change shall be noted and the Contractor shall take necessary measures to correct JMF or resubmit a new JMF for approval prior to continuing work.

E. In place density tests per CT 375 Nuclear Gage field test shall be performed during HMA operations to meet compaction requirements per Standard Specifications. The frequency of testing shall be in accordance with CT 375.

F. Qualifications of workers: Provide sufficient skilled workers and supervisors who shall be present at all times during execution of this portion of the Work and who shall be thoroughly familiar with the type of construction involved and the materials and techniques specified.

G. Codes and standards:
1. Wherever a test method is referenced in this section, it shall be made in accordance with the most current test method in use by the California Department of Transportation (Caltrans) in the State Standard Specifications, latest edition.
2. For references made to the Standard Specifications, reference shall mean State of California, Business and Transportation Agency, Department of Transportation (Caltrans), Standard Specifications, latest edition, excluding measurement and payment items.

1.3 SUBMITTALS

A. Submit all product data, laboratory test results, material source information, and certificates of compliance listed in this Section under a single submittal cover for review. Incomplete submittals will not be reviewed.

B. The Contractor shall provide the Engineer with the following information a minimum of 10 days prior to commencing the Work:
1. Hot mix asphalt job mix formula (JMF) in accordance with Caltrans Standard Specifications.
   a. Proposed JMF on Form CEM-3511.
      1) Include percentage of reclaimed asphalt pavement (RAP)
   b. Mix design documentation, data and aggregate quality on Form CEM-3512 dated within 12 months of submittal.
   c. JMF verification on Form CEM-3513, if applicable
   d. JMF renewal on Form CEM-3514, if applicable
   e. Materials Safety Data Sheets (MSDS) for:
      1) Asphalt binder
      2) Supplemental fine aggregate except fines from dust collectors
      3) Antistrip additives
2. Written confirmation from the supplier that the JMF to be supplied meets all specified requirements.

C. Tack Coat
1. Submit asphalt binder tack coat and asphaltic emulsion tack coat.

D. The Contractor shall develop and submit a Quality Control Plan for the project. This shall, at a minimum, cover the areas or subjects contained in Appendix A of this section and Section 39-2 of the Standard Specifications. The Contractor shall not begin hot mix asphalt production or placement without written approval from the Engineer of the QCP and an approved JMF. Approval of the QCP and JMF by the Engineer does not relieve the contractor of responsibility for quality control or work methods.
   1. Test Reports:
      a. Submit reports of tentative paving material design and testing.
      b. Submit reports of testing and inspection during the course of the Project.
         1) Submit all laboratory test reports for daily Rice Specific Gravity and Nuclear Gage field tests immediately upon receipt from the testing laboratory.
         2) Submit daily field summary reports for all testing activities.
         3) Submit all laboratory test reports at the end of the Project.
         4) Submit current certificates from all laboratories immediately upon receipt from the testing laboratory. Certificates shall not be expired or more than 1 year old.
         5) Submit current certificates for mixes, materials and products immediately upon receipt from the testing laboratory or product supplier. Certificates shall not be expired for more than 1 year, and must reflect materials actually used on the project. JMF shall have no changes in aggregate, asphalt, or other materials from what was provided in current certificates.

1.4 ENGINEER'S ACCETANCE

A. In addition to the Quality Control Plan, the Contractor shall provide an independent quality control to perform independent sampling and acceptance testing in accordance with Section 39-1.05 and Section 39-2.03 of the Standard Specifications. Sampling shall be performed under California Test 125. Testing shall be performed as specified in this Section.

B. Start-up evaluation will be performed in accordance with Section 39-1.07 of the Standard Specifications. Sampling and testing shall occur at a minimum for the following:
   1. Aggregate
   2. Asphalt binder
   3. RAP
   4. HMA

C. Quality control sampling and acceptance testing shall be performed by the Contractor's Independent Assurance Tester in accordance with the following schedule:

QUALITY CHARACTERISTIC	TEST METHOD	MINIMUM SAMPLING AND TESTING FREQUENCY	LOCATION OF SAMPLING	MAXIMUM REPORTING TIME ALLOWANCE
Aggregate Gradation	CT 202	1 per 750 tons	Plant	24 hours
Reclaimed Asphalt Pavement Gradation	LP-9	Daily	RAP System	24 hours
Asphalt Binder Content	CT 379 or CT 382	1 per 750 tons	Loose Mix Behind Paver	24 hours
Percent of Maximum Theoretical Density	CT 308	1 per 750 tons	Loose Mix Behind Paver	24 hours

QUALITY CHARACTERISTIC	TEST METHOD	MINIMUM SAMPLING AND TESTING FREQUENCY	LOCATION OF SAMPLING	MAXIMUM REPORTING TIME ALLOWANCE
Maximum Theoretical Density	CT 309	Per CT 375	Loose Mix Behind Paver	24 hours
Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants	CT 226 or CT 370	2 per day during production	Stock-piles or Cold Feed Belts	24 hours
Sand Equivalent (minimum)	CT 217	1 per 750 tons	Plant	24 hours
HMA Moisture Content (maximum)	CT 370	1 per 2,500 tons but not less than 1 per paving day	Loose Mix Behind Paver	24 hours
Stabilometer Value (minimum) No. 4 and 3/8” gradings 1/2” and 3/4” gradings	CT 366	1 per 4,000 tons or 2 per five business days, whichever is greater	Loose Mix Behind Paver	48 hours
Air Voids Content (%)	CT 367	1 per 4,000 tons or 2 per five business days, whichever is greater	Loose Mix Behind Paver	48 hours
Percent of crushed particles coarse aggregate (% minimum) One fractured face Two fractured faces Fine aggregate (% minimum) (Passing No. 4 sieve and retained on No. 8 sieve)	CT 205	1 every 6,000 tons	Plant	48 hours
Los Angeles Rattler (% maximum) Loss at 100 revolutions Loss at 500 revolutions	CT 211	1 every 6,000 tons	Plant	48 hours
Fine aggregate angularity (% minimum)	AASHTO T-304, Method A	1 every 6,000 tons	Plant	48 hours
Flat and elongated particle (% maximum at 5:1)	ASTM D 4791	1 every 6,000 tons	Plant	48 hours
Voids in mineral aggregate (% minimum)	LP-2	1 every 6,000 tons	Loose Mix Behind Paver	48 hours
Voids filled with asphalt (%)	LP-3	1 every 6,000 tons	None Calculation	48 hours
Dust proportion	LP-4	1 every 6,000 tons	None Calculation	48 hours
Moisture Sensitivity	CT-371	1 every 5,000 tons	Loose Mix Behind Paver	NA

D. A minimum of one sample for Rice Specific Gravity shall be taken by Independent Assurance Tester each day at the plant during placement of HMA. The Rice Specific Gravity test shall be in accordance with ASTM D 2041. The results shall be submitted to the Engineer within one working day of receiving them from the testing laboratory. Any change shall be noted and the Contractor shall take necessary measures to correct JMF or resubmit a new JMF for approval prior to continuing work.

E. In place density tests per CT 375 Nuclear Gage field test shall be performed during HMA operations by Independent Assurance Tester to meet compaction requirements per Standard Specifications. The frequency of testing shall be in accordance with CT 375.

F. Should any test specified in Paragraph 1.4 of this Section fail to meet density requirements, Independent Assurance Tester shall take density core samples every 500 feet of paved roadway per Section 39-2.03 of Standard Specifications to verify density results.

1.5 PRODUCT HANDLING

A. All products described herein shall be handled in conformance to the applicable provisions of the Standard Specifications.

1.6 PROJECT CONDITIONS

A. Weather Limitations:
1. No HMA shall be placed when weather conditions prevent the proper handling, finishing, or compaction of the mixtures.
2. Do not apply when underlying surface is muddy, frozen or wet.
3. Do not place tack coat when temperature is below 45º F.
4. Do not place hot mix asphalt when air temperature is below 45º F and surface temperature is below 50º F.

B. Traffic Striping and Pavement Markers
1. Do not apply pavement marking paint within 8 hours of fog or rain or when below 40 Degrees F.
2. Contractor shall guarantee that all traffic lane pavement markers be in place and adhered to the pavement for a period of not less than 90 days from the date of acceptance of the work by the Owner.
3. All new traffic striping and pavement markings shall be thermoplastic, unless otherwise shown on the Drawings.
4. No pavement markings shall be applied to any roadway surface until new hot mix asphalt surface has cured for a minimum of seven (7) days when hot melt bituminous adhesive is used, and not less than 14 days when epoxy adhesive us used.

PART 2 - PRODUCTS

2.1 TACK COAT

A. Tack Coat, Grade PG 64-16, conforming to the provisions of Sections 39 and 92 of the Standard Specifications shall be used between layers of each lift of HMA, and on curbs, gutters and construction joints.

2.2 ASPHALT BINDER

A. Asphalt binder, Grade PG 64-16, conforming to the provisions of Sections 39 and 92 of the Standard Specifications.

2.3 AGGREGATE

A. Aggregate shall be clean and free from deleterious substances and shall meet the gradation and quality for 1/2-inch HMA Type A in the Caltrans Standard Specifications.

2.4 HOT MIX ASPHALT

A. Hot Mix Asphalt shall be 1/2-inch HMA Type A and conform to the latest provisions of Section 39 of the Standard Specifications.

B. HMA batch plant shall be Department-qualified under the Department's Materials Plant Quality Program of the Standard Specifications.

C. Reclaimed asphalt pavement shall be acceptable in accordance with the Standard Specifications not exceeding 15.0 percent of the aggregate blend.

2.5 TRAFFIC PAINT

A. Traffic paint shall be waterborne in accordance with the Section 84-3 of the Standard Specifications.

2.6 THERMOPLASTIC MATERIAL

A. Thermoplastic material and glass beads shall conform to the requirements of Caltrans Standard Specifications Section 84-2.

B. Thermoplastic material shall be free of lead and chromium, and shall conform to the requirements in State Specification PTH 02ALKYD.

C. Retroreflectivity of the thermoplastic traffic stripes and pavement markings shall conform to the requirements in ASTM Designation: D 6359 99. White thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of 250 mcd m 2 lx 1. Yellow thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of 150 mcd m 2 lx 1.

D. Thermoplastic material shall be white, unless otherwise shown on the Drawings.

2.7 GLASS BEADS

A. Glass beads to be applied to surface of the paint and thermoplastic shall conform to the requirements of State Specification 8010-11E-22 (Type II).

2.8 PAVEMENT MARKERS AND ADHESIVES

A. Reflective Markers:

1. Reflective markers shall be Type B or Type D reflective markers as defined in Standard Specifications Section 85. Materials shall conform to material standards referenced in Standard Specifications Section 85.

B. Non-Reflective Markers
1. Non-reflective markers shall be Type A or Type AY non-reflective markers as defined in Standard Specifications Section 85. Materials shall conform to material standards referenced in Standard Specifications Section 85.Reflective and non-reflective raised pavement markers shall be ceramic conforming to the requirements of Section 85, "Pavement Markers," of the State Standard Specifications and these specifications.

C. Retroreflective pavement markers shall be marked as abrasion resistant on the body of the markers.

D. The Contractor shall furnish the Engineer certificates of compliance for the pavement markers in conformance with the provisions in Section 6-3.05E, "Certificates of Compliance," of the Standard Specifications.

E. Adhesive for pavement markers shall be Rapid Set Type epoxy conforming to Section 95-2.04 of the Caltrans Standard Specifications or hot melt bituminous adhesive conforming to Section 85-1.055 of the Caltrans Standard Specifications..

PART 3 - EXECUTION

3.1 PROTECTION OF EXISTING STREET SURFACE

A. During the entire construction period, the Contractor shall take care to protect existing pavement or sealed surfaces. Backhoes and trenchers must have street pads. Grossers or metal tipped pads will not be allowed. Surfaces scarred by cleanup or excavation equipment shall be repaired in a manner satisfactory to the Engineer. Any and all damage caused by the Contractor’s operations to existing roads and streets shall be repaired by the Contractor to at least the original condition and to the satisfaction of the Engineer, at no additional cost to the Owner.

B. If pavement is damaged (excessive loading, grouser marking, scarring/scraping of pavement, etc.) in adjacent lanes, a full lane width grinding and overlay will be required as directed by the Owner. If pavement is damaged due to excessive loading near the trench wall causing openings in the pavement, full depth structural section replacement will be required as directed by the Owner. If pavement restoration comes to within 4 feet from the edge of the pavement or lip of gutter/curb, pavement shall be replaced to the lip of gutter/curb.

3.2 PAVING REMOVAL

A. Sawcutting shall be required for all roads. See Section 31 23 00 “Trench Excavation and Backfill” for paving removal requirements.

B. Subgrade shall be compacted to a firm and unyielding condition prior to placement of HMA

C. Clean and dry subgrade area prior to commencing with placement of HMA

3.3 AGGREGATE BASE

A. Aggregate base shall be spread and compacted according to Specification Section 31 00 00 and Section 26 of the Standard Specifications. Compact to 95 percent relative compaction.

3.4 TACK COAT

A. Ensure the area is clean and dry. All material accumulations which would interfere with the adhesion of the tack coat or with the placing and performance of the HMA shall be removed, including dust, loose aggregate, soil, leaves, and pieces or lumps of other foreign material deposited on the surface.

B. A tack coat shall be applied to existing pavement including planed surfaces, between HMA layers, and to vertical surfaces of curbs, gutters and construction joints at the minimum residual rates specified in Section 39-1.09C “Tack Coat” of the Standard Specifications.

C. Before placing HMA, a tack coat shall be furnished and applied uniformly to contact surfaces of all cold pavement joints, curbs, gutters, pavement reinforcing fabric and all existing pavement to be surfaced in conformance with Section 39 of the Standard Specifications.

D. Tack coat shall be applied to any course in advance of spreading the next course unless the surface temperature is at least 140 °F.

E. Hot mix asphalt shall not be placed until tack coat has cured.

F. Immediately in advance of placing HMA, apply additional tack coat to damaged areas or where loose or extraneous material is removed.

G. Close areas receiving tack coat to traffic. Do not track tack coat onto pavement surfaces beyond the job site.

H. The cost of applying tack coat will be considered included in the Contract Price and no additional compensation will be allowed therefore.

3.5 TRANSPORTING HOT MIX ASPHALT

A. From mixing site in trucks having tight, clean compartments.

B. Coat hauling compartments with lime-water mixture to prevent sticking.

C. Elevate and drain compartment of excess solution before loading mix.

D. Provide covers over asphalt concrete mixture to protect from weather and to prevent loss of heat.

E. During periods of cold weather or for long distance deliveries, pre-insulation around entire truck bed surfaces.

F. Do not use petroleum products such as kerosene or diesel fuel to release HMA from trucks, spreaders, or compactors..

3.6 HOT MIX ASPHALT

A. HMA surfacing shall conform to the provisions of Section 39 of the Standard Specifications. Placing HMA shall be done under suitable weather conditions for such operations. Rain, snow or other inclement weather will be cause for discontinuing paving Work. The Engineer shall have the authority for determining whether weather conditions are sufficient cause to postpone work.

3.7 SPREADING AND COMPACTING

A. Spreading and compacting shall be performed in accordance with Section 39-1.10 and Section 39-1.11 of the Standard Specifications.

B. HMA shall be transferred from the trucks into the hopper of the paving machine by means of a shoulder machine equipped with a conveyor belt. Any equipment used to transfer asphalt concrete to the paving machine shall not exceed the load capacity of any surface it is driven over and, therefore, shall not produce rutting or pumping of the existing roadway surface or newly placed HMA at any time. No trucks or other rubber tired construction equipment are allowed on the subgrade at any time except when proofrolling in the presence of the Engineer or during the placement of HMA. No trucks or other rubber tired construction equipment are allowed on newly placed HMA until the day after the HMA is placed.

C. Longitudinal joints in the top layer must match specified lane edges shown on the striping plans. Longitudinal joints in lower HMA layers shall be offset at least 0.5 feet from each side of the specified lane edges.

D. Place final lift of HMA after vehicle detector loops have been cut and installed.

E. Finish rolling shall be completed before pavement surface temperature is below 150 degrees F.

F. Traffic shall not be allowed on HMA until mid-depth temperature is below 160 degrees F and the pavement surface temperature is below 140 degrees F.

3.8 SMOOTHNESS AND DRAINAGE

A. Verify smoothness and drainage using a water truck. Spray sufficient quantity of water in the presence of the Engineer to cause surface runoff from the entire newly paved surface. Any puddles and birdbaths deeper than 1/4 inch shall be corrected by sawcutting, removing and replacing HMA a sufficient distance from puddles and birdbaths to correct them, or by grinding. All smoothness and drainage corrections to HMA shall be at the Contractor’s expense and to the satisfaction of the Engineer.

3.9 TRENCH PATCHING

A. All trench patches on Owner property and within the employee/staff and visitor parking area shall be limited to the width of the trench. In these areas, the structural section shall match the plan.

3.10 TRAFFIC STRIPING LAYOUT

A. The Contractor shall furnish the necessary control points for all striping, painting and markings and shall be responsible for the completeness and accuracy thereof to the satisfaction of the Engineer.

B. The Contractor shall perform all layout, alignment, and spotting for traffic stripes and markings. Traffic striping shall match the striping prior to the hot mix asphalt overlay except as shown on the plans or directed by the engineer. When indicated on the plans, striping and marking shall not vary by more than 2 inches in 50 feet from the alignment shown on the plans. Where markings will match existing markings, striping and marking shall not vary by more than 2 inches in 50 feet from the existing markings. The dimensional details of the stripes and markings shall conform to the provisions set forth in the Traffic Manual and Maintenance Manual available for Caltrans.

C. Cat tracks shall consist of spots of paint not more than 3 inches in width and not more than 5 feet apart along the alignment of the stripe. Paint for the cat tracks shall be the same as that for the intended stripe. Paint for the dribble lines shall be neutral color obtained by mixing approximately two parts white paint with one part black paint.

D. Existing stripes and markings shall be removed prior to painting new ones, but in no case shall any section of street be left without the proper striping for more than 24 hours, or over weekends or holidays.

E. NO STRIPING SHALL BE PAINTED UNTIL THE LAYOUT AND SPOTTING HAVE BEEN SPECIFICALLY APPROVED BY THE ENGINEER.

3.11 THERMOPLASTIC, TRAFFIC PAINT AND GLASS BEADS

A. All lines to be painted on pavement surfaces shall be thermoplastic material. Pavement markings of test symbols and arrows shall be formed per Caltrans Standards and shall be thermoplastic material.

B. Thermoplastic traffic stripes and pavement markings and painted traffic stripes for curbs shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

C. Application and installation of thermoplastic traffic stripes and pavement markings shall conform to the provisions in Section 84-1, “General”, and 84-2 “Thermoplastic Traffic Striper and Pavement Markings,” of the State Standard Specifications” and these Special Provisions.

D. Extruded thermoplastic material for traffic stripes shall be applied at a minimum rate of 0.20-lb/ft. The minimum application rate is based on a solid stripe of 4 inches in width.

E. All new surfaces shall have the traffic paint applied in two applications in accordance with Section 84-3, “Painted Traffic Stripes and Pavement Markings” of the Caltrans Standard Specifications. The first or priming coat shall be in light applications without glass beads to seal the pavement. The first coat shall be dry before application of the second coat.

F. All striping and marking shall be laid out by the Contractor and field reviewed by the Engineer prior to final placement of the Thermoplastic material. Failure to obtain this field review shall be basis for rejection of the work by the Engineer. Any work rejected shall be completely removed, the surface of the pavement restored to the satisfaction of the Owner, and new striping and marking placed at the Contractor’s expense.

G. Restriping except where indicated on the drawings, shall coincide with the original painting and shall be applied in one application in accordance with Section 84-3 of the Caltrans Standard Specifications.

H. The pavement markings of the legend (text) and symbols (arrows) shall be furnished and installed, and shall coincide with the original painting except where indicated otherwise on the plans and shall be installed using Thermoplastic material.

I. Where striping joins existing striping, as shown on the Drawings, the Contractor shall begin and end the transition from the existing striping pattern or from the new striping pattern a sufficient distance to ensure continuity of the striping pattern.

J. All surfaces to be painted shall be clean and dry prior to painting. Ample time shall be allowed between placement of the asphalt pavement and the initial painting application. There shall be a minimum drying time between paint applications of approximately 20 minutes.

K. Glass beads shall be placed on all traffic stripes and pavement markings except for the first or priming coat on new asphalt surfaces. All glass beads shall be applied directly to the wet traffic paint with a method that provides uniform distribution.

L. Striping shall not be applied at temperatures below 50° F or if pavement surfaces are wet.

M. Thermoplastic traffic stripes and pavement markings shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

N. All painted pavement markings shall be clean and sharp as to dimensions. Ragged ends of segment or fogginess along the sides shall not be permitted.

O. The alignment of all striping shall be accurately laid out. Lines which have a wavy appearance shall be removed and replaced by the Contractor at its expense.

3.12 THERMOPLASTIC MATERIAL AND GLASS BEADS

A. Thermoplastic material and glass beads shall be applied in accordance with Caltrans Standard Specifications Section 84-2.04. Minimum application thickness shall be 0.1-inch for traffic stripes and 0.15-inch for pavement markings.

3.13 REMOVAL OF STRIPING, MARKINGS AND MARKERS

A. All stripes and pavement markings not in conformance with the proposed striping plan shall be removed by grinding or sandblasting. Black paint will not be allowed unless specifically indicated on the drawings. All thermoplastic material and raised pavement markers shall be removed prior preparation of the pavement reinforcing fabric.

3.14 PAVEMENT MARKERS

A. Pavement markers shall be replaced in kind and number where removed for completion of the Work with new, unused material as specified herein. Application shall be in accordance with Section 85 of the Standard Specifications.

B. Placement shall be to the alignment established by the Contractor and approved by the Engineer. Reflective face of marker should be perpendicular to roadway centerline.

C. Markers shall be cemented to the pavement with adhesive conforming to Section 95.2.04 of the Standard Specifications.

D. Markers shall not be placed under following conditions:
   1. When either the pavement or the air temperature is 40 degrees F or less.
   2. If the relative humidity of the air is greater than 80 percent.
   3. If pavement is not surface dry.
   4. On new asphalt concrete surfacing until the surfacing has been opened to public traffic for a period of not less than 14 days.

3.15 TEMPORARY MARKING

A. Temporary pavement delineation shall be furnished, placed, maintained, and removed in conformance with the provisions in Section 12 3.01, "General," of the State Standard Specifications and these special provisions. Nothing in these special provisions shall be construed as reducing the minimum standards specified in the California MUTCD or as relieving the Contractor from the responsibilities specified in Section 7 1.04, "Public Safety," of the State Standard Specifications.

B. Whenever the work causes obliteration of pavement delineation, temporary or permanent pavement delineation shall be in place prior to opening the traveled way to public traffic. Laneline or centerline pavement delineation shall be provided at all times for traveled ways open to public traffic.

C. All work necessary, including any required lines or marks, to establish the alignment of temporary pavement delineation shall be performed by the Contractor. Surfaces to receive temporary pavement delineation shall be dry and free of dirt and loose material. Temporary pavement delineation shall not be applied over existing pavement delineation or other temporary pavement delineation. Temporary pavement delineation shall be maintained until superseded or replaced with a new pattern of temporary pavement delineation or permanent pavement delineation.

D. Temporary pavement markers and removable traffic type tape which conflicts with a new traffic pattern or which is applied to the final layer of surfacing or existing pavement to remain in place shall be removed when no longer required for the direction of public traffic, as determined by the Engineer.

E. Whenever lanelines and centerlines are obliterated, the minimum laneline and centerline delineation to be provided shall be temporary reflective raised pavement markers placed at longitudinal intervals of not more than 15 feet. The temporary reflective raised pavement markers shall be the same color as the laneline or centerline the markers replace.

F. Temporary reflective raised pavement markers shall be placed in accordance with the manufacturer's instructions and shall be cemented to the surfacing with the adhesive recommended by the manufacturer, except epoxy adhesive shall not be used to place pavement markers in areas where removal of the markers will be required.

G. Temporary laneline or centerline delineation consisting entirely of temporary reflective raised pavement markers placed on longitudinal intervals of not more than 24 feet shall be used on lanes opened to public traffic for a maximum of 14 days. Prior to the end of the 14 days the permanent pavement delineation shall be placed. If the permanent pavement delineation is not placed within the 14 days, the Contractor shall provide, at his expense, additional temporary pavement delineation. The additional temporary pavement delineation to be provided shall be equivalent to the pattern specified for the permanent pavement delineation for the area, as determined by the Engineer.

3.16 CURB PAINTING

A. The Contractor shall paint curbs with two coats of paint as shown on the Drawings in conformance with Section 84 of the Standard Specifications.

3.17 STREET MAINTENANCE

A. Until the permanent pavement is placed, the base rock or temporary asphaltic plant mix at the surface of the trench shall be maintained at all times at a grade level with the adjacent street. Continuous inspection and maintenance of the trench area will be required. Lights and barriers shall be maintained on all Work that is not safe for travel until such time as is made safe.

3.18 CONTRACTOR'S RESPONSIBILITY

A. Settlement of replaced pavement over trenches within the warranty period shall be considered the result of improper or inadequate compaction of the subbase or base materials. The Contractor shall promptly repair all pavement deficiencies noted during the warranty period.

END OF SECTION 32 12 16

SECTION 32 13 13 RIGID CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete paving for:
      a. Concrete sidewalks and ramps.
      b. Concrete equipment pads
      c. Concrete curbs and gutters.
      d. Precast Concrete Parking Bumpers
      e. Jointed Plain Concrete Pavement (JPCP)

B. Related Requirements:
   1. Section 31 00 00 - Grading: Preparation of site for paving and base.
   2. Section 31 32 15 - Lime Soil Stabilization: subgrade treatment for JPCP.
   3. Section 32 12 16 - Hot Mix Asphalt Paving.

1.2 REFERENCE STANDARDS

A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

B. ASTM International:
   1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
   2. ASTM A184 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
   3. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
   4. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
   5. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   6. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
   7. ASTM A767 - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
   8. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
   9. ASTM C33 - Standard Specification for Concrete Aggregates.
   10. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   11. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
   12. ASTM C150 - Standard Specification for Portland Cement.
   13. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.

14. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
15. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
16. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
17. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
18. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
19. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
20. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
21. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
22. ASTM E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
23. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
24. ASTM E1918 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
25. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

C. California Department of Transportation, 2010 Standard Specifications.

1.3 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:
1. Submit data on concrete materials, joint filler, admixtures, reinforcing steel, curing compounds.

C. Design Data:
1. Submit concrete mix design for each concrete strength per Section 40-1.01C(9) and Section 40-1.01D(5) of the State Standard Specifications.
2. Identify mix ingredients and proportions, including admixtures.

D. Quality Control Submittals:
1. Submit concrete pavement QC plan per Section 40-1.01C(10) of the State Standard Specifications. Establish, implement and maintain the QC plan for JPCP per Section 40-1.01D(4) of the State Standard Specifications.

2. Submit concrete field qualification data and test reports per Section 40-1.01C(11) of the State Standard Specifications.
3. Submit updated quality control charts each paving day per Section 40-1.01C(12) of the State Standard Specifications. Maintain quality control charts per Section 40-1.01D(8) of the State Standard Specifications.

E. JPCP Submittals:
1. Provide submittals as stated in Section 40-1.01C of the State Standard Specifications.
2. Certificates of Compliance: Submit certificates of compliance for the materials listed in Section 40-1.01C(2) of the State Standard Specifications.
3. Drilled Corings: Submit drilled corings per Section 40-1.01C(3) of the State Standard Specifications.
4. Air Content Testing Laboratory: Submit the name of the laboratory that will detst drilled core specimens for air content per Section 40-1.01C(4) of the State Standard Specifications.
5. Manufacturer's Recommendations and Instructions: Submit manufacturer's recommendations and instructions for the storage and installation of the materials listed in Section 40-1.01C(6) of the State Standard Specifications.
6. Preformed Compression Seal: Submit performed compression seal per Section 40-1.01C(3) of the State Standard Specifications.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the requirements of Section 03 30 00.

B. Obtain cementitious materials from same source throughout.

C. Perform Work in accordance with State of California Department of Transportation Standards and these Specifications.

D. Prepaving Conference: Schedule a prepaving conference per Section 40-1.01D(3) of the State Standard Specifications.

PART 2 PRODUCTS

2.1 SUSTAINABILITY CHARACTERISTICS

A. Section 01 81 13 - Sustainable Design Requirements: Requirements for sustainable design compliance.

B. Sustainable Sites Characteristics:
1. Paving Surfaces: Minimum solar reflectance index (SRI) of 29, calculated in accordance with ASTM E1980.
   a. Reflectance: Measured in accordance with ASTM E903, ASTM E1918, or ASTM C1549.
   b. Emittance: Measured in accordance with ASTM E408 or ASTM C1371.

2.2 AGGREGATE BASE COURSE

A. Aggregate Base Course: As specified in Section 31 00 00.

2.3 CONCRETE PAVING

A. Form Materials:
   1. Form Materials: Form materials shall conform to the provisions of Section 51-1.03C(2) of the Standard Specifications.
   2. Joint Filler: Premolded expansion joint filler shall conform to the provisions of Section 51-2 of the Standard Specifications.

B. Reinforcement:
   1. Reinforcing Steel: Reinforcing steel shall conform to the provisions of Section 52-1.02B of the Standard Specifications.
      a. Reinforcing steel shall conform to ASTM A706.
      b. Reinforcing steel shall be Grade 60 yield strength.
   2. Welded Plain Wire Fabric: Welded Plain Wire Fabric shall conform to the provisions of Section 52-1.02B of the Standard Specifications.
      a. Welded Plain Wire Fabric shall conform to ASTM A185 or ASTM A497.
   3. Dowel Bars: Dowel bars shall conform to the provisions of Section 52-1.02B of the Standard Specifications.
      a. Dowels shall conform to ASTM A615.
      b. Dowels shall be Grade 60 yield strength.
      c. Dowels shall be:
         1) Plain steel bars.
         2) Cut to length indicated on Drawings
         3) Square ends with burrs removed
         4) Unfinished.
   4. Tie Wire: Tie wire shall conform to the provisions of Section 52-1.02D of the Standard Specifications.
      a. Tie wire shall conform to ASTM A82.

C. Concrete Materials:
   1. Portland Cement Concrete: Section 40-1.02B of the Standard Specifications
      a. Cementitious Material:
         1) 675 pounds cementitious material per cubic yard (minimum).
         2) 4,000 psi at 28 days (minimum).
      b. Aggregate: Section 40-1.02B(2)(c) of the Standard Specifications.
         1) Combined aggregate grading: 1.0 inch maximum.
      c. Admixtures: Section 90-1.02E of the Standard Specifications.
      d. Water: Section 90-1.02D of the Standard Specifications.

2.4 MIXES

A. Mix, proportion and transport concrete in accordance with Section 90 of the Standard Specifications

2.5 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing and Inspection Services: Provide mix design for sidewalks, curbs, gutters, equipment pads and JPCP.

B. Submit proposed mix design of each class of concrete to Engineer for review prior to commencement of Work.

C. Tests on cement, aggregates, and mixes will be performed by the Owner's testing laboratory to ensure conformance with specified requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify compacted stabilized subgrade soil is dry and ready to support paving and imposed loads.
   1. Proof roll subgrade and base in accordance with Section 31 00 00.
   2. Remove soft subbase and base and replace with compacted fill as specified in Section 31 00 00.

C. Verify gradients and elevations of subgrade are correct.

3.2 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Moisten base to minimize absorption of water from fresh concrete.

C. Coat surfaces of utility frames with oil to prevent bond with concrete paving.

D. Notify Architect/Engineer minimum 24 hours prior to commencement of concreting operations.

3.3 INSTALLATION

A. Subgrade:
   1. Lime Stabilization: Stabilize subgrade soils as specified in Section 31 32 15.

B. Base Course:
   1. Aggregate Base Course: Install as specified in Section 31 00 00.

C. Forms:
   1. Place and secure forms and screeds to correct location, dimension, profile, and gradient.
   2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

D. Reinforcement:

1. Place reinforcing as indicated on Drawings.
2. Place dowel bars per Section 40-1.03J.
3. Interrupt reinforcing at contraction and expansion joints.
4. Place dowels to achieve paving and curb alignment as detailed.
5. Provide doweled joints as indicated on Drawings.

E. Placing Concrete:
1. Place concrete in accordance with Section 40-1.03H of the Standard Specifications.
2. Ensure reinforcing, inserts, embedded parts and formed joints are not disturbed during concrete placement.
3. Place concrete continuously over the full width of the slab and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
4. Place concrete to pattern indicated on Drawings.

F. Joints
1. Place joints as shown on Drawings and in accordance with Section 40-1.03E of the Standard Specifications. Align curb, gutter, and sidewalk joints.
2. Place joint filler between paving components and building or other appurtenances.
3. Provide scored joints as indicated on Drawings
4. Provide keyed joints as indicated on Drawings.
5. Seal joints as indicated on Drawings and in accordance with State Standards.

G. Finishing:
1. Finish JPCP in accordance with Section 40-1.03M of the Standard Specifications.
2. Area Paving: Light broom.
3. Sidewalk Paving: Light broom.
4. Curbs and Gutters: Light broom.
5. Direction of Texturing: Parallel to paving direction.
6. Place curing compound on exposed concrete surfaces immediately after finishing.

H. Curing and Protection
1. Cure JPCP in accordance with Section 40-1.03N of the Standard Specifications.
2. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury in accordance with Section 40-1.03P of the Standard Specifications.
3. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

I. Repair:
1. Repair and replace new JPCP in accordance with Section 40-1.03Q of the Standard Specifications.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation of Surface Flatness: 1/4 inch 10 ft.

C. Maximum Variation from True Position: 1/2 inch.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting, testing.

B. Perform quality control and quality assurance in accordance with Section 40-1.01D of the Standard Specifications.

C. Inspect reinforcing placement for size, spacing, location, support.

D. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with State Standards.

E. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.6 PROTECTION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.

C. Do not permit vehicular traffic over paving until 75 percent design strength of concrete has been achieved.

3.7 SCHEDULES

A. Concrete Sidewalks and Walkways: 3,000 psi 28 day concrete, 4 inches thick, buff color Portland cement, broom finish.

B. JPCP Area Paving: 4,000 psi 28 day concrete, 9 inches thick, dowel bar reinforcing, wood float finish.

END OF SECTION 32 13 13

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SECTION 32 1316 - SITE CONCRETE

PART 1 - GENERAL

1.1 WORK INCLUDED

Furnish all labor, materials and equipment required for the reinforcement, formwork and the construction of cast-in-place concrete sidewalks, seatwalls, stairs and mow curbs, including all other work required to produce a finished project in accordance with the Drawings and as specified herein.

1.2 SUMMARY

A. Section includes colored and antiqued concrete paving.

B. Related Sections:

1. Division 03 Section Cast-in-Place Concrete and Miscellaneous Cast-in-Place Concrete for general building applications of concrete.
2. Division 03 Section "Architectural Concrete" for general building applications of specialty finished formed concrete.
3. Division 32 Section "Concrete Paving" for cast-in-place concrete paving with other finishes, curbs and gutters, stamped detectable warnings, pavement markings, and wheel stops.
4. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within decorative concrete paving and in joints between decorative concrete paving and asphalt paving or adjacent construction.

1.3 QUALITY ASSURANCE

A. Comply with ASTM A-615 "Standard Specifications for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement," and "Manual of Standard Practice for Detailing Reinforced Concrete Structures," publication ACI 315-65 of the American Concrete Institute.

B. Comply with all pertinent recommendations contained in American Concrete Institute (ACI), "Recommended Practice of Concrete Formwork, ACI-347."

C. Construct forms to sizes, shapes, lines and dimensions indicated on Drawings, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finish. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

D. Provide complete forms of such strength and construction as to prevent any spread, shifting, or settling when concrete is deposited, and tight enough to avoid any leakage or washing out of cement mortar.

1.4 JOB CONDITIONS

A. Temperature: All concrete design mixes and methods of protecting concrete shall be resubmitted to the Landscape Architect for review when the following temperatures are anticipated:
   1. The temperature is below 40° F, or when conditions indicate that the temperature will fall below 40° F within seventy-two (72) hours.
   2. The placing temperature of the concrete is, or anticipated to be, above 80° F.

1.5 COORDINATION

A. Secure all pipe sleeves, anchors and bolts, including those for angle frames, inserts, ties and other materials in connection with concrete construction, in position before concrete is placed.

B. Obtain information and instructions from other Trades and suppliers in ample time to schedule and coordinate the installation of items furnished by them to be embedded in concrete so provisions for their work can be made without delaying the project.

C. Make cutting and/or patching made necessary by failure or delay in complying with these requirements at no cost to the Owner.

1.6 FORM CONSTRUCTION TOLERANCES

A. Set form to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of work so that forms can remain in place at least twenty-four (24) hours after concrete placement.

B. Check completed formwork for grade and alignment to following tolerances:
   1. Top of forms not more than one-eighth (1/8) inch in ten (10) feet vertical elevation.
   2. Vertical face on longitudinal axis not more than one-fourth (1/4) inch in ten (10) feet horizontal width.

1.7 SMOOTHNESS TOLERANCE

A. Cement finish surfaces shall be of such smoothness and evenness that they shall contact the entire length of a 10-foot straight edge laid in any direction, with an allowable tolerance of 1/8 inch. Any operations necessary to achieve this result should be performed by the Contractor, at no additional cost to the City.

B. No patching will be permitted to correct defective work; defective sections shall be removed and replaced. No extensions of time will be allowed for correcting defective work.

1.8 INSPECTIONS

A. Inspections will be required. Contractor shall call for inspection a minimum of 48 hours (two working days) prior to need.

B. The contractor shall-call for inspection during specific phases of construction. They shall include the following, each prior to pour:
   1. All Form Work
   2. All Footings
   3. Subgrade
   4. Steel Reinforcing

C. Contractor shall notify the Landscape Architect 48 hours prior to each concrete pour.

D. Any work covered prior to inspection shall be opened to view by the Contractor at his expense.

1.9 TESTING

All testing shall be as required by the Standard Specifications and these Contract Documents.

1.10 MOCK-UPS

A. Prior to construction, provide (1) 4-foot x 4-foot x 4-inch sample of each paving type specified on Drawings.

B. Create Test Pour or Cast of concrete walls and column finished as specified on Drawings.

C. Ensure that each mock-up contains joint types specified on project, i.e. construction, contraction, and isolation.

D. Locate mock-ups in a conveniently accessible and protected place. At contractor's cost, additional mock-ups shall be provided as needed until approved. Approved mock-ups will be standard for future installation review.

E. Remove mock-ups from site upon completion of Work and approval by Owner's Authorized Representative.

1.11 SUBMITTALS

A. See Section 01300 – Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's data on manufactured products for approval.

C. Shop drawings: Indicate formwork, dimensions, reinforcement, accessories and control and expansion joint layout.

D. Mix design: Submit each class of concrete to approved inspection and testing firm and the City for review prior to commencement of concrete operations.

E. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

PART 2 - PRODUCTS

2.1 CONCRETE REINFORCEMENT

A. Reinforcing Bars: Deformed Billet Steel Bars, ASTM A-615, Grade 40 or Grade 60.

B. Welded Wire Mesh: ASTM A-186 plain type and uncoated finish.

C. Tie Wires: Black annealed, ASTM A-82, minimum 16 gauge.

D. Chains, Bolsters, Bar supports, Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete.

E. Stirrup Steel: ASTM A-82.

F. Smooth dowel steel bars for construction joints: ASTM A-29, Grade 60.
   1. Where indicated, provide dowel sleeve at one end of greased dowel to permit longitudinal movement of dowel within concrete section.
   2. Provide for movement which equals joint width plus one-half (1/2) inch.

2.2 CONCRETE FORM MATERIALS

A. Slabs, Walks, Walls, Columns and Concrete edges: Steel, wood or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.
   1. Use flexible spring steel forms or laminated boards to form radius bends and foam templates for detailed edges as required.
   2. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

B. Forms for Exposed Finish Concrete: Unless otherwise shown, construct formwork for exposed concrete surfaces with plywood, to provide continuous, straight, smooth, exposed surfaces. Provide plywood in largest practicable sizes to minimize number of joints. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection. Provide solid backing and form supports to insure stability of forms. On any length of wall the difference in form piece size shall not be greater than 25% plus or minus the dimension of the smallest piece and in no case smaller than two (2) inches in width.
   1. Use five (5) ply exterior plywood complying with U.S. Product Standard PS 1-66, "B-B (Concrete Form) Plywood," Class 1, Exterior Grade or better, with each piece bearing legible inspection trademark.
   2. Use form material in largest practicable sizes to minimize number of form joints. Arrange form joints orderly and symmetrically with minimum number of joints.

C. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least two (2) edges and on one side for tight fit that is fir or pine, No. 2 common or better.

D. Circular Concrete Footings or Columns: All round concrete footings or columns, size as indicated on Drawings, shall be formed with seamless "SONOTUBE" fiber forms as manufactured by Sonoco Products Company of Hartsville, South Carolina.

E. Forms for Curved Exposed Surfaces: Forms shall be built up with hand sawn two (2) inch stringers, sized and carefully fitted to desired form, with segmental tacking. Exposed face surfaces shall be sheet metal, oil tempered hardboard, or one-quarter (1/4) inch waterproof plywood facing.

F. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties (break back cone ties), designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal. All form ties to be used on unexposed concrete surfaces.

G. Chamfer Exposed Corners and Edges: Chamfer exposed corners and edges as indicated on Drawings using wood chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

H. Radius Exposed Corners: Apply concrete radius tooled edges to exposed concrete corners as dimensioned and sized on Drawings.

I. Rough Hardware: Pipe, conduit, bolts, anchors, etc., as indicated on Drawings or needed shall be furnished and set.

J. Chamfer Horizontal Reveal: Chamfer concrete wall horizontal reveals, as indicated on Drawings, using wood chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

2.3 CONCRETE ACCESSORIES

A. Bonding Agent: ASTM C 1059, Type II acrylic non-redispersable type.

B. Epoxy Bonding System: ASTM C 881, type as required by project conditions.

C. Vapor Retarder: 6 mil (0.5 mm) thick clear polyethylene film, type recommended for below grade application.

D. Chemical Hardener: Fluosilicate solution designed for densification of cured concrete slabs.

E. Non-Shrink Grout ASTM C 1107; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
1. Minimum Compressive Strength at 48 Hours: 2,400 psi (17 MPa).
2. Minimum Compressive Strength at 28 Days: 7,000 psi (48 MPa).

F. Moisture-Retaining Cover: ASTM C 171; white burlap-polyethylene sheet.

G. Liquid Curing Compound: ASTM C 309, Type 1, clear or translucent with guarantee not to leave surface residue.

H. Waterproof Barrier: Thoroseal waterproof cement-based coating, color gray.

2.4 JOINT DEVICES AND MATERIALS

A. Expansion Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard of felt, 1/4 inch thick and full depth of concrete less 1/2 inch.

B. Construction Joint Devices: Integral extruded plastic; 1/4 inch thick, formed to tongue and groove profile, with removable top strip exposing sealant trough, knockout holes spaced at 6 inches, ribbed steel spikes with tongue to fit top screed edge.

C. Joint Cap: Plastic joint size to match expansion joint size by Sealtight or approved equal

D. Elastomeric Sealant: Joint sealer color to match concrete.

E. See Section 02764 Pavement Joint Sealers for additional specifications.

2.5 CONCRETE

A. Concrete Mix:
1. Mix concrete in accordance with ASTM C-94 and with aggregates complying with ASTM C-33 and Portland Cement ASTM C-150, Type II.
2. All concrete mixes shall be designed by a testing laboratory approved by the City's Representative or Landscape Architect. All mixes shall conform to applicable building code requirements listed herein or on the Drawings. All mix designs shall be submitted to the Landscape Architect for approval before being used. Mix design shall show proportions of cement, fine and coarse aggregate, and water and graduation of combined aggregates. Calcium chloride shall not be added at any mix.
3. Alteration of approved concrete mixes is not acceptable. Installation of concrete other than approved mixes shall be replaced at the expense of the contractor
4. Concrete shall be as specified:

Item	Minimum Cement Content	28-Day Minimum Strength	Max. Slump	Max. Aggregate Size	Gal/Bag Water to Cement Ratio Max.
Slabs on Grade, Curbs, Exterior Walkways	540 lb/cu. yd.	3,500 PSI	3 in.	3/4 in.	SIX
Walls	540 lb/cu. yd.	4,000 PSI	2-1/2 in.	3/4 in.	FIVE

2.6 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C 685. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C 94/C 94M.

2.7 ADMIXTURES

A. Chemical admixtures shall conform to the requirements, of Section 90-4.04 through 90-4.07 of the State Standard Specifications.

B. See Site Colored Concrete Section 03330

2.8 SILICON CARBIDE

Silicon Carbide shall be Silicarbid as manufactured by Anti-Hydro, telephone number (800) 777-1773; Sparkle Grain as manufactured by Pacific Palette Concrete Products, telephone number (831) 457-4566; Carborex WSC as manufactured by Washington Mills, contact Mr. Craig Williams, telephone number (508) 839-6511, ext. 214; or an approved equivalent. Silicon carbide crystals shall have a Moh Scale hardness of at least 9 and a grit size of either 16/30 or 16/36.

2.9 PORTLAND CEMENT CONCRETE

Shall conform to the provisions in Standard Specifications Section 90 “Portland Cement”.

2.10 EXPANSION JOINTS

Shall be as shown on plans and details. Submit samples of preformed material and sealant for approval by the Landscape Architect.

2.11 CONCRETE CURING COMPOUND

Plast-A-Cure Heavy Duty Curing Compound or Approved Equal: Concrete curing compound shall be a white-pigmented curing compound conforming to the requirements of Section 90-7.01 B, "Curing Compound Method" of the State Standard Specifications and shall be a product conforming to ASTM C 309, Type 2, Class B.

2.12 SCORE JOINT

Shall be as shown on the drawings and details, or as called for in the City of Oroville, Department of Public Works Standard Drawings.

PART 3 - EXECUTION

3.1 GENERAL

A. All work shall conform to the requirements of City of Oroville, Department of Public Works Standard Drawings unless noted otherwise on the plans.

B. All work shall conform to the foundation investigation report. Slab thicknesses, reinforcement, compaction requirements, and base recommendations shall take precedence over details and plan callouts.

C. All concrete slabs shall slope to drain. Depressions in the slab surface that hold water ("bird baths") will not be acceptable.

D. Install concrete and cement finish work true to lines, dimensions and levels. Finishing to conform to the City of Oroville Standard Drawings unless noted otherwise on plans.

E. Protect all finished concrete from graffiti. Contractor shall be responsible for providing concrete watchmen. A graffiti finish will not be acceptable.

F. Remove and replace defective concrete or cement work with new materials. Permission to patch any defective area shall not be a waiver of the City's right to require complete removal of defective work if patching does not restore quality and appearance of work.

G. Verify lines, levels, and dimensions before proceeding with work of this section.

H. No advertising impression, stamp, or mark of any description will be permitted on surface of concrete or cement finish.

3.2 CONCRETE REINFORCEMENT PLACEMENT

A. Fabricate reinforcement in accordance with ACI-315, providing a minimum concrete cover of two (2) inches.

B. Place all reinforcement in the exact position shown on the Drawings and secure in position during the placing and compacting of concrete. Wire bars together with No.16 gauge wire with ties at all intersections except where spacing is less than twelve (12) inches in each direction, in which case tie alternate intersections.

C. Overlap welded wire mesh one square plus six (6) inches to maintain a uniform strength, and securely fasten at the ends, edges and support to maintain clearances.

D. Place all sleeves, inserts, anchors and embedded items required for adjoining work or for its support prior to concreting. Fill voids in embedded items temporarily with readily removable material to prevent entry of concrete.

E. Give all contractors and subcontractors whose work is related to concrete or supported by it, ample notice and opportunity to introduce and/or furnish embedded items before concrete placement.

3.3 CONCRETE FORMWORK CONSTRUCTION

A. Construct support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete.

B. Contractor assumes full responsibility in the removal of forms. The length of time forms must remain in place depends on the rate of time required for concrete to obtain a proper strength. Remove forms after the concrete is sufficiently hard to prevent damage to concrete.

C. Reuse of Forms:
   1. Do not reuse forms if there is any evidence of surface wear or defect which would impair quality of surface.
   2. Thoroughly clean and properly coat forms before reuse.

D. Earth Forms

   Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete

3.4 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement *of* concrete.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in or passing through concrete work.

B. Locate and secure in place items that will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, inlets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement

3.6 FORM REMOVAL

Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

A. Field Quality Control:
   1. Observe formwork continuously while concrete is being placed to see that there are no deviations from desired elevation, alignment, plumbness or camber.
   2. If during construction any weakness develops and falsework shows undue settlement or discoloration, stop work, remove affected construction if permanently damaged, and strengthen falsework.
   3. Verify that forms are clean and free of rust before applying release agent.

3.7 CONCRETE PLACEMENT AND FINISHES

A. Placing Concrete:

1. Place concrete in accordance with ACI-304 and Section 2605 of the Uniform Building Code. Immediately after depositing, compact concrete thoroughly by mechanical vibration. No vibrating of form is allowed. Mixing shall be continuous, with no interruptions from the time the truck is filled until the time it is emptied. Concrete shall be placed within one hour of the time water is first added.
2. Insure anchors, seats, plates, and other items to be cast into concrete are placed, held securely and will not cause hardship in placing concrete.
3. Insure reinforcement, inserts, embedded parts, etc. are not disturbed during concrete placement.
4. Pour concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur, unless otherwise indicated on the Drawings.
5. Lines and Grades: Elevations requiring accurate placement shall be set by a competent instrument man, using a professional type instrument.
6. For all concrete placed on soil, the subgrade shall be wet and compacted prior to placing.
7. Before placing concrete mixing, conveying and finishing equipment, forms and reinforcing shall be well-cleaned. Wet form before placing concrete, unless oiled forms are used.
8. Notify Landscape Architect at least 48, hours prior to commencement of concrete placement operations.
9. Repair vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches (150 mm) and seal watertight.
10. Install joint devices in accordance with manufacturer's instructions.
11. Install construction joint devices in coordination with concrete slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
12. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
13. Place concrete continuously between predetermined expansion, control, and construction joints.
    a. Do not interrupt successive placement; do not permit cold joints to occur

B. Concrete Finishing
1. Exterior Slabs and Sidewalks:
    a. Concrete Sidewalks and Ramps – Finish per plan.
    b. All exterior slabs, sidewalks and top of walls to have non-slip uniform surface per plan.
    c. After concrete has been placed, consolidate strike off and screed uniformly to the required grades. Float concrete to a uniform surface, then steel trowel lightly to compact surface. Finish exterior slabs and sidewalks as detailed on Drawings. Exterior slabs and sidewalks shall be formed with slopes as indicated, as directed or as necessary to insure proper drainage. Exterior slabs and sidewalks adjacent to buildings shall drain away from buildings.

2. Exterior Walls and Columns:
   a. Finish per plan.
   b. Consolidate by vibration so that concrete is thoroughly worked around reinforcement, embedded items and into corners of forms to eliminate air or stone pockets. As-cast concrete surfaces obtained with form material as detailed on Drawings. Provide uniform concrete finish to walls as detailed on Drawings. Lightly sandblast concrete surfaces where required to eliminate form seams and marks. Fill all snap tie holes to match surrounding finish.
   c. Repair surface defects, including tie holes, immediately after removing formwork.
3. Unexposed Form Finish: Rub down or chip off fins or other raised areas 114 inch (6 mm) or more in height.

3.8 CONCRETE SURFACE WITH SILICON CARBIDE

Where noted on plans, the concrete surface shall have silicon carbide applied at the rate of 20 to 25 lbs./100 S.F., as follows, unless otherwise directed by the manufacturer.

Immediately after substrate surface has been leveled and wood floated, before bleed water has appeared, the silicon carbide shall be applied evenly while there is sufficient moisture in the slab to saturate at least two dust-on coats. Troweling must be started early enough to complete all operations without use of additional water on the surface. Distribute the silicon carbide crystals uniformly (at the rate of 20 – 25 lbs, per 100 sq.ft.) either by hand or mechanical spreader over prepared wet slab. Crystals shall be applied in three separate shake coats. Use one-third (1/3) of the required quantity of crystals for the first application. Apply second application slightly after first application is floated. Do not throw the crystals or broadcast them with a shovel. Use an evenly distributed hand broadcast.

Trowel crystals uniformly into surface after each shake coat. After the second shake coat of crystals have been troweled once, sprinkle the third coat over the surface. The surface must be uniformly coated. Use a steel trowel to leave grains at surface covered with a thin film of cement paste.

The final finish may be lightly troweled to produce a smooth surface free from defects or blemishes. Finish trowelling shall be delayed until surface has set sufficiently to avoid burying the crystals, but must be accomplished before finish has hardened.

Exposure of the silicon carbide crystals shall be accomplished with either of the following methods provided it results in a satisfactory finish:

a) Water and a soft broom, or sponge. Allow concrete surface to set sufficiently so that light scrubbing will not cause pitting; or,
b) A light 5% to 10% Muratic acid washing to expose grains after the concrete is at least 2 weeks old. Acid shall be removed from the finished surface with clean water within 15 minutes after application; or,
c) Other methods, as approved by the Engineer.

3.9 CURING

A. Beginning immediately after placement, protect concrete from premature drying, from excessively hot or cold temperatures, and from mechanical injury. Maintain concrete with minimal moisture loss at relatively constant temperature for a period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than 7 days.
   2. Hairline fissures and cracks developed in first ninety (90) days shall result in replacement of concrete.

B. Comply with requirements of ACI 308 and ASTM C171. Immediately after placement protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury. Cover with white burlays-polyestylene sheet.

C. Initial curing shall be moist curing or moisture cover wring and shall continue for at least 188 emulative hours (not necessarily consecutive), during which the concrete has been exposed to air temperatures above 50 degrees F. Avoid rapid drying at the end of the curing period.

D. Use water that is free of impurities that could etch or discolor concrete surfaces.

E. Do not use liquid membrane curing compounds on surfaces which are to be covered with a coating material applied directly to the concrete or with a covering material bonded to the concrete, such as other concrete, liquid floor hardener, waterproofing, damp-proof flooring, painting, and other coatings and finish materials, unless otherwise acceptable to the Inspector.

F. Formed Surfaces: Cure by moist curing with forms in place for full curing period. Surfaces Not in Contact with Forms:
   1. Start initial curing as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
   2. Begin final curing after initial curing but before surface is dry.
      a. Moisture-retaining cover. Seal in place with waterproof tape or adhesive.
      b. Curing compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.10 WATERPROOF BARRIER

Place, protect and repair waterproof barrier according to manufacturer’s written instructions.

3.11 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01400.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

D. Compressive Strength Tests: ASTM C 39/C 39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd (76 cu m) or less of each class of concrete placed.

E. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C 143/C 143M.

3.12 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to the City and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the City. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Contractor to be responsible for epoxy grouting repair of any cracks occurring in the concrete which exceed 1/8" as directed by Landscape Architect.

E. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of the Landscape Architect for each individual area.

3.13 COORDINATION

Bench posts, bike rack posts, drinking fountain, etc. shall be set in cured footings prior to placing concrete slab. Block outs will not be permitted.

END OF SECTION

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SECTION 32 3119 - DECORATIVE METAL FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Decorative steel fences.
2. Swing gates.
3. Cane Bolt

B. Related Requirements:

1. Section 03 3000 "Cast-in-Place Concrete" for concrete and post concrete fill.

2. Section 07 4213.13 “Formed Metal Wall Panels” for exposed fastener lap-seam metal wall panels.

3. Section 08 7100 “Door Hardware” for levers, cylinders and latches at gates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fence and gates. Include plans, elevations, sections, details, and attachments to other work. Show adjacent building faces and flatwork for coordination.

C. Samples: For each fence material and for each color specified.

1. Provide Samples 12 inches (300 mm) in length for linear materials. Complete with post, angle and panel segments, along with fasteners.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For gate operators to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Include 10-foot (3-m) length of fence complying with requirements.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Lightning-Protection System: Maximum grounding-resistance value of 25 ohms under normal dry conditions.

2.2 DECORATIVE STEEL FENCES

A. Decorative Steel Fences: Fences made from steel tubing and shapes, hot-dip galvanized.

B. Posts: Square steel tubing.

1. Line Posts: 2-1/2 by 2-1/2 inches (64 by 64 mm) with 3/16-inch (4.76-mm) wall thickness.
2. End and Corner Posts: 2-1/2 by 2-1/2 inches (64 by 64 mm) with 3/16-inch (4.76-mm) wall thickness.
3. End Posts at Swing Gate: 3 by 3 inches (76 by 76 mm) with 3/16-inch (4.76-mm) wall thickness.
4. Swing Gate Frame: 2-1/2 by 2-1/2 inches (64 by 64 mm) with 3/16-inch (4.76-mm) wall thickness.

C. Post Caps: Formed from steel sheet and hot-dip galvanized after forming.

D. Hinges: Round Body Barrel Weld-On Hinge
1. Pivot: Ball Bearing
2. Pin: Fixed in one barrel
3. Body Diameter: 1 ½”
4. Hinge Gap: 1 15/16”

5. Pin Diameter: ¾”
6. Size: 7 1/8” x 1 ¾”
7. Weight Rating: 800#/pair min.
8. Finish: Zinc Plated
9. Quantity: 3 per gate panel

E. Cane Bolt: Black Adjustable Cane Bolt, with Mounting Brackets and Hanger.
1. Basis-of-Design Product: Subject to compliance with requirements, provide National Manufacturing “N177-188 ½” x 18” Cane Bolt” or comparable product by one of the following:
a. Approved Equal

F. Fasteners: Stainless-steel, hex head S.T.S.M. Screw, Type A, 316.

G. Fabrication: Assemble fences in sections by welding angles to posts.

1. Fabricate sections with angles welded to posts for field fastening of perforated panels.
2. Drill posts and clips for fasteners before finishing to maximum extent possible.

H. Finish exposed welds to comply with NOMMA Guideline 1, Finish #3 - partially dressed weld with splatter removed.

I. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.

1. Hot-dip galvanize posts and rails.
2. Hot-dip galvanize rail and picket assemblies after fabrication.
3. Hot-dip galvanize bar grating infill after fabrication.
4. Hot-dip galvanize custom-design rail and infill assemblies after fabrication.

J. Finish for Steel Items: High-performance coating.

2.3 STEEL AND IRON

A. Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Bars (Pickets): Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.

C. Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

2.4 COATING MATERIALS

A. Shop Primers for Steel: Provide primers that comply with Section 099113 "Exterior Painting."

B. Shop Primer for Steel: Manufacturer's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For aluminum, provide type and alloy as recommended by producer of metal to be welded and as required for strength and compatibility in fabricated items.

B. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M and specifically recommended by manufacturer for exterior applications.

2.6 GROUNDING MATERIALS

A. Grounding Conductors: Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.

1. Material above Finished Grade: Copper.
2. Material on or below Finished Grade: Copper.
3. Bonding Jumpers: Braided copper tape, 1 inch (25 mm) wide, woven of No. 30 AWG bare copper wire, terminated with copper ferrules.

B. Grounding Connectors and Grounding Rods: Comply with UL 467.

1. Connectors for Below-Grade Use: Exothermic-welded type.
2. Grounding Rods: Copper-clad steel.

a. Size: 5/8 by 96 inches (16 by 2440 mm).

2.7 STEEL FINISHES

A. Surface Preparation: Clean surfaces according to SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."

1. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it.

B. Primer Application: Apply zinc-rich epoxy primer immediately after cleaning, to provide a minimum dry film thickness of 2 mils (0.05 mm) per applied coat, to surfaces that are exposed after assembly and installation, and to concealed surfaces.

C. Shop-Painted Finish: Comply with Section 099113 "Exterior Painting."

D. High-Performance Coating: Apply intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.

1. Match approved Samples for color, texture, and coverage. Remove and refinish, or recoat work that does not comply with specified requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.

B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

1. Construction layout and field engineering are specified in Section 017300 "Execution."

3.3 DECORATIVE FENCE INSTALLATION

A. Install fences according to manufacturer's written instructions.

B. Install fences by setting posts as indicated and fastening rails and infill panels to posts.

C. Post Excavation: Drill or hand-excavate holes for posts in firm, undisturbed soil. Excavate holes to a diameter of not less than 4 times post size and a depth of not less than 24 inches (600 mm) plus 3 inches (75 mm) for each foot (300 mm) or fraction of a foot (300 mm) that fence height exceeds 4 feet (1.2 m).

D. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.

2. Concrete Fill: Place concrete around posts and sleeves and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

    a. Exposed Concrete: Extend 2 inches (51 mm) above grade. Finish and slope top surface to drain water away from post.

3. Posts Set in Concrete: Extend post to within 6 inches (150 mm) of specified excavation depth, but not closer than 3 inches (75 mm) to bottom of concrete.
4. Posts Set into Concrete in Sleeves: Use galvanized-steel pipe sleeves with inside diameter at least 3/4 inch (20 mm) larger than outside diagonal dimension of post, preset and anchored into concrete for installing posts.

    a. Extend posts at least 5 inches (125 mm) into sleeve.
    b. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions; shape and smooth to shed water. Finish and slope top surface of grout to drain water away from post.
5. Space posts: Per Drawings

3.4 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.5 GROUNDING AND BONDING

A. Fence Grounding: Install at maximum intervals of 1500 feet (450 m) except as follows:

1. Fences within 100 Feet (30 m) of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet (225 m).

    a. Gates and Other Fence Openings: Ground fence on each side of opening.

        1) Bond metal gates to gate posts.
        2) Bond across openings, with and without gates, except at openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches (460 mm) below finished grade.

B. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 feet (45 m) on each side of crossing.

C. Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2 unless otherwise indicated.

D. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches (150 mm) below finished grade. Connect rod to fence with

No. 6 AWG conductor. Connect conductor to each fence component at grounding location.

E. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

F. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

G. Bonding to Lightning-Protection System: If fence terminates at lightning-protected building or structure, ground the fence and bond the fence grounding conductor to lightning-protection down conductor or lightning-protection grounding conductor, complying with NFPA 780.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

1. Grounding-Resistance Tests: Subject completed grounding system to a megger test at each grounding location. Measure grounding resistance not less than two full days after last trace of precipitation, without soil having been moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural grounding resistance. Perform tests by two-point method according to IEEE 81.
2. Excessive Grounding Resistance: If resistance to grounding exceeds specified value, notify Architect promptly. Include recommendations for reducing grounding resistance and a proposal to accomplish recommended work.
3. Report: Prepare test reports of grounding resistance at each test location certified by a testing agency. Include observations of weather and other phenomena that may affect test results.

3.7 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

3.8 DEMONSTRATION

A. Train Owner's personnel to adjust, operate, and maintain gates.

END OF SECTION

SECTION 32 31 19.13 – DECORATIVE METAL SECURITY FENCES AND GATES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section covers the Work necessary to furnish, install, test, and complete the welded decorative metal security fencing, gates, operators and appurtenances shown on the Drawings, complete.

B. The Contractor shall provide all labor, materials, equipment and appurtenances necessary for installation of the welded decorative steel fence system. The fence system shall include all components, including panels, posts, gates, operators, loops, hardware, concrete and other materials necessary for a complete installation and shown on the Drawings and specified herein.

C. Related Work described elsewhere:
   1. Section 03 30 00, CAST-IN-PLACE CONCRETE
   2. Section 32 00 00, EARTHWORK

1.2 STANDARDS

A. ASTM International
   1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
   2. ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
   3. ASTM D523 - Test Method for Specular Gloss. 0020
   4. ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.
   5. ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
   6. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
   7. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
   8. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
   9. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.
   10. ASTM F2408 - Ornamental Fences Employing Galvanized Steel Tubular Pickets.

B. American Welding Society AWS D1.1 / D1.1M Structural Welding Code.

C. Underwriters Laboratory Gate Operator Requirements (UL 325).

1.3 QUALITY ASSURANCE

A. Provide sufficient skilled workmen and supervisors who shall be present at all times during execution of this portion of the Work and who shall be thoroughly familiar with the type of construction involved and the materials and techniques specified.

B. Fence, gates, and accessories shall be the product of one manufacturer.

C. Electric gate manufacturer to have a minimum five years of experience in gate operator systems. Gate installer to be approved by supplier.

1.4 SUBMITTALS

A. Submit all product data, shop drawings, laboratory test results, material source information, and certificates of compliance listed in this Section under a single submittal cover for review. Incomplete submittals will not be reviewed.

B. Section 01 33 00, SUBMITTAL PROCEDURES: Requirements for submittals.

C. Shop Drawings:
1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
2. Show the relationship of operating systems with other work. Include details of all major components. Include parts list showing manufacturer's names and part numbers for the complete installation.
3. Include complete details of gate construction, operator location, gate height, post spacing dimensions and unit weights of structural components.
4. Submit manufacturer's literature for fencing, gates and operators.

D. Product Data:
1. Submit data on fencing, posts, accessories, motors, gates, fittings and hardware.
2. Provide manufacturer's catalog cuts with printed specifications and installation instructions.
3. Furnish detailed sequence of operation (description of system).
4. Deliver two (2) copies of operation and maintenance data covering the installed products, including name, address and telephone number of the nearest fully equipped service center.

E. Certifications:
1. Gates in compliance with ASTM F 2200-05, Standard Specification for Automated Vehicular Gate Construction and operators are UL 325 listed.
2. The steel welders and welding process must be certified. Gate manufacturer shall provide independent certification as to the use of a documented Welding Procedure Specification and Procedure Qualification Record to insure conformance to the AWS D1.1 / D1.1M Structural Welding Code – Steel. Upon request, Individual Certificates of Welder Qualification documenting successful completion of the requirements of the AWS D1.1 / D1.1M code shall also be provided.
3. Gate manufacturer shall certify gate is manufactured in compliance with ASTM F 2200-05, Standard Specification for Automated Vehicular Gate Construction and the operators are UL 325 listed.\

1.5 PRODUCT WARRANTY

A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.

B. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufactures warranty shall be guaranteed for five (5) years from date of original purchase. Date of original purchase shall be the official date of project Notice of Completion.

PART 2 - PRODUCTS

2.1 FENCE AND GATE

A. Steel material for fence panels and posts shall conform to the requirements of ASTM A653/A653M, with a minimum yield strength of 45,000 psi and a minimum zinc (hot-dip galvanized) coating weight of 0.60 oz/ft^2, Coating Designation G-60.

B. Material for pickets shall be 3/4" square x 14 Ga. tubing.
   1. Extended picket

C. The rails shall be steel channel, 1.5" x 1.4375" x 14 Ga.
   1. 3-Rail System, with two top rails and single bottom rail treatment.

D. Picket holes in the rail shall be spaced 4.675" O.C. for standard picket space.
   1. Welded and Rackable (ATF – All Terrain Flexibility) Ornamental Steel design.

E. Fence posts and gate posts shall meet the minimum size requirements of Table 1.

F. Gates shall be cantilever type, as shown on Drawings.

G. Materials shall be new products and to these specifications.

H. All materials shall be hot-dip galvanized after fabrication.

I. All ferrous metal for use above or below ground shall be hot-dip galvanized.

J. Manufacturer:
   1. Ameristar Fence Products, Inc.
      a. Model: Montage Commercial Classic.
   2. Substitutions: Not Accepted.

2.2 FABRICATION

A. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.

B. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by manufacturer's fusion welding process, providing a rigid panel assembly.

C. The manufactured panels and posts shall be subjected to an inline electrode position coating process consisting of a multi-stage pretreatment/wash (with zinc phosphate), followed by a duplex application of an epoxy primer and an acrylic topcoat.
   1. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils.
   2. The color shall be Black.
   3. The coated panels and posts shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2.

D. The manufactured fence system shall be capable of meeting the vertical load, horizontal load, and infill performance requirements for Industrial weight fences under ASTM F2408.

E. Gates shall be fabricated using fusion welded ornamental panel material and 1-3/4" sq. x 14ga. gate ends. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding.

2.3 GATE OPERATOR SYSTEM

A. Description: Systems that open and close cantilever gate when properly activated by Knox Key Switch system, owner's security card access system, vehicle detector loops and preemption.

B. Design, supply of equipment and components, installation, and on-call service shall be product of individual company with record of installations meeting requirements specified in this section.

C. Gate Operators:
   1. Heavy-duty, high use, electrical models designed to open and close cantilever gates provided. For gate, supply manufacturer of gate operator with complete details of gate, hardware, track rollers, adjacent fence posts, and fence construction for development and detailing of gate operator.
   2. Provide with following features:
      a. Minimum 2 hp motor, 208V ac, single-phase, 60-Hz electric power, reversible and continuous operation.
      b. AC Drive: The variable frequency drive unit shall allow for programmable speeds and programmable soft-start and soft-stop features with adjustable solid state speed control.
      c. Class III and IV operation.
      d. Compliant with UL 325 and 991.
      e. Gear Box Reducer:
         1) Electric motor driven with chain drive.
      f. Drive – Chain: A #50 roller chain shall be utilized. All chain brackets and required attachment hardware shall be supplied.
      g. Positive limit switches that sense position of gate and provide control to prevent damage to gate operator.
      h. Motor Housing: NEMA 250, Type 12 enclosure for all motor control components. Metal enclosure with finish and design suitable for exterior installation in all-weather environment. Security hinges and screws shall be furnished to secure operator enclosure components. Motor box shall be locked with a detention grade dead bolt. Three (3) keys shall be provided per key code.
      i. Motor Overload Protection: Motor shall be protected against overload by either a thermal or a current sensing overload device. Industrial quality with manual reset.

j. Manual operation crank handle feature or disconnect, without use of tools, for easy operation during power failure, malfunction, or emergency.
k. Heater kit for cold environments.
l. Gate Travel Speed:
1) Minimum 1/2 foot per second, maximum 2.0 feet per second.
2) Fully programmable speed adjusting feature that provides range of appropriate speeds for gate operation.
m. Component parts of operator, including attachments, shall be constructed with materials or plated, coated, or finished as necessary to provide reliable service in exterior all-weather environment.
n. Compatible with gate operator control devices provided.
o. Main Power Disconnect Switch and Wiring Compartment:
1) When this switch is in the OFF position, the main power shall be disconnected from the Variable Speed Drive, Motor Control Board and power transformer(s).Control Circuit: U.L. compliant operator shall have 5vdc controls.
p. Audio Alarm: This alarm shall have a dual function.
1) The first function shall be as a warning prior to gate movement. When the motor control board recognizes a command, this alarm shall be activated three (3) seconds before the motor is energized and the gate begins to move. This shall be continuously activated while the gate is in motion.
2) For UL Class III operation only, the audio alarm shall be an entrapment notification alarm. This alarm shall sound as a result of a second activation of the external primary entrapment prevention device before an end limit (open or close) is reached. The pulsing rate of the alarm in the entrapment notification mode shall be faster than the pulsing rate when in the warning mode prior to gate movement.

3. Manufacturer:
a. Doorking, Model 9200.
b. Substitutions: Not Acceptable.

D. Gate Entry Mounting Posts
1. Dual height post.
2. Architectural Heavy Duty Style.
3. Pad mount.
4. Powder coated, black.
5. Manufacturer:
a. Doorking Model 1200-049
b. Substitutions: Not Acceptable.

E. Knox Key Switch System
1. Section 10 41 16, EMERGENCY KEY CABINETS

F. Vehicle Detector Loops
1. Provide loop detectors on each side of gate in paved areas for safety only, at locations shown on Drawings.
2. Loop wire shall be Type 2 in accordance with Section 86 of the Standard Specifications.
3. Lead-in cable shall be Type B. Lead-in cable shall be continuous from handhole where splice to loop wires is made to gate controller terminals.

4. Detector loop wire sealant shall be one-part elastomeric compound requiring no mixing, measuring or application of heat prior to or during its installation. The elastomeric sealant shall be a polyurethane material of a composition that will, within its stated shelf life, cure only in the presence of moisture. Sealant shall be suitable for use in both HMA and Portland Cement Concrete. The cured sealant shall meet the performance characteristics in Section 86-5.01A(3)(a) of the Standard Specifications.
5. Gate Operation:
    a. Entry: Gate opens when activated by Fire Department key switch. Gate closes after adjustable time period up to 90 seconds.
    b. Exit: Gate opens when activated by detector loop in pavement. Gate closes as for entry.
    c. Override or 7-day timer to allow gate to remain open for up to 12 hours with equipment at rest.
    d. Gate operator to release to allow manual operation of gate in the event of a power failure.

PART 3 - EXECUTION

3.1 PREPARATION

A. All new installation shall be laid out by the Contractor in accordance with the Drawings.

3.2 INSTALLATION OF FENCE

A. Fence post shall be spaced according to Table 3, plus or minus 1/4". For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete footings having a minimum depth shown on the Drawings. The "Earthwork" and "Concrete" sections of this specification shall govern material requirements for the concrete footings. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by Contractor's California Licensed Engineer to be sufficient in strength for the intended application.

B. Fencing shall be erected in straight lines between angle points in accordance with the manufacturer's recommendations, these Specifications, and the Drawings.

C. Rough grade the fence line prior to setting posts, so that fencing material, when installed, will not be over 4-inches above ground at low points or touching ground at high points.

D. Do not install panels until concrete has cured a minimum of seven days.

E. Fencing that is to remain which is destroyed or damaged during the course of construction shall be removed and replaced with new fence.

F. Coordinate with Fire Department during installation of pedestal mounted key switch for installation and operation requirements

3.3 INSTALLATION OF VEHICLE DETECTOR LOOPS

A. New vehicle detectors and lead-in cables shall be installed before final lift of hot mix asphalt. Test each loop circuit for continuity, circuit resistance and insulation resistance at the gate controller cabinet location.

B. The Contractor shall install conductor loop wires and place the required sealant on the same day that saw slots are cut in the road surface for these installations to the nearest detector hand hole. Epoxy sealant shall not be used.

C. The Contractor shall install conductor loop wires using elastomeric sealant in accordance with Section 86-5 of the Standard Specifications, and the Drawings.

D. Contractor shall insure compatibility of each inductive loop sensor and its associated loop lead-ins and loops, and their associated lead-ins and sensing elements, and shall ensure and prove to the satisfaction of the Engineer that the combined system will provide consistent and stable operation and be unaffected by input voltage disturbances, flooding of cable with water, and normal range of temperature, humidity and other weather and climatic conditions. Any deviation from insuring such compatibility shall be approved by the Engineer prior to installation.

3.4 INSTALLATION OF GATE

A. Gate equipment shall be installed in accordance with the manufacturer's printed instructions unless otherwise shown on the Drawings.

B. Gate posts shall be spaced according to the manufacturers' approved gate shop drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.

C. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles.

D. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application.

E. Gate hardware shall be provided by the manufacture of the gate and shall be installed per manufacturer's recommendations.

F. System Validation:
   1. The complete system shall be adjusted to assure it is performing properly.
   2. The system shall be operated for a sufficient period of time to determine that the system is in proper working order.
   3. Test and Explain Safety Features:
      a. Each system feature and device is a separate component of the gate system.
      b. Read and follow all instructions for each component.
      c. Ensure that all instructions for mechanical components, safety devices and the gate operator are available for everyone who will be using the gate system.
      d. The warning signs shipped with the gate operator must be installed in prominent position on both sides of the gate.

4. Ensure the Owner is clear with regard to the safety points concerning the basic operational guidelines of the safety features of the gate operator system. These safety points are listed in the operator manual and must be clearly explained to the Owner prior to system use.

3.2 INSTALLATION OF GATE OPERATOR

A. Install operator on concrete equipment pad as shown on the Drawings and in accordance with manufacturer's written installation instructions.

3.3 CLEANING

A. The Contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

3.4 SCHEDULES

TABLE 1 – MINIMUM SIZES FOR MONTAGE COMMERCIAL POSTS	
Fence Posts	Panel Height
2-1/2" x 14 Ga.	8' Heights
Gate Leaf	Gate Height
	8' Heights
Up to 4'	3" x 12 Ga.
4'-1" to 6'	4" x 12 Ga.
6'-1" to 16'	6" x 12 Ga.

TABLE 2 – COATING PERFORMANCE REQUIREMENTS		
Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117, D714 & D1654	Corrosion Resistance over 1,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822 D2244, D523 (60˚ Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

TABLE 3 – MONTAGE COMMERCIAL – POST SPACING BY BRACKET TYPE						
Span	For CLASSIC, GENESIS, & MAJESTIC 8' Nominal (91.95" Rail)					
Post Size	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"
Bracket Type	Montage Commercial Universal	Montage Commercial Line Blvd.	Montage Commercial Flat Mount		Montage Commercial Swivel (BB113)*	

	(BB112)	(BB114)	(BB111)			
Post Settings ± 1/4" O.C.	95"	95"	95"	95-1/2"	*95"	*95-1/2"
*Note: When using BB304 swivel brackets on either or both ends of a panel installation, care must be taken to ensure the spacing between post and adjoining pickets meets applicable codes. This will require trimming one or both ends of the panel.						

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SECTION 32 8400 - PLANTING IRRIGATION

PART 1 - GENERAL

1.1 CONDITIONS

A. The general provisions of the Contract, including General and Supplementary Conditions and Special Provisions (if any) apply to the work specified in this Section.

1.2 SCOPE OF WORK

A. Furnish all labor, materials, processes, and equipment necessary to complete the irrigation system repair or replacement work as indicated on the Drawings and specified herein.

B. Test the each affected irrigation system to assure proper operation.

C. Furnish all labor, materials, and equipment necessary to restore all disturbed areas resulting from the work as indicated on the Drawings and specified herein.

D. All incidental parts, which are not shown on the plans or specified herein and are necessary to complete or modify the existing system shall be furnished and installed as though such parts were shown on plans or specifications. All systems shall be in satisfactory operation at the time of completion.

1.3 QUALITY ASSURANCE & REQUIREMENTS

A. Permits and Fees: The Contractor shall obtain and pay for all permits and all observations as required.

B. Performance Qualifications:

1. The Landscape Contractor shall have a minimum of three (3) equivalent jobs of similar complexity completed in the last five (5) years.

2. The Landscape Contractor shall furnish qualifications to the General Contractor to be included in the proposal form due at bid opening date. Burden of proof as to qualifications of the Landscape Contractor shall be on the Contractor; the Owner’s decision is final.

C. Manufacturer's Directions: Manufacturer's directions and detailed Drawings shall be followed in all cases where the manufacturers of articles used in this Contract furnish directions covering points not shown in the Drawings and Specifications.

D. Ordinances and Regulations

1. All local, municipal and state laws, rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these Specifications and their provisions shall be carried out by the Contractor. Anything

contained in these Specifications shall not be construed to conflict with any of the above rules and regulations or requirements of the same. However, when these Specifications and Drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of the Specifications and Drawings shall take precedence.

2. The materials and work of this section shall conform to all applicable provisions of the latest editions of the Uniform Plumbing Code, the National Electrical Code, and all codes properly governing the materials and work at the project site.

3. All electrical materials and work shall conform to California Administrative Code, Title 23, Part 3, Basic Electrical Regulations, and Article 18 E 110-16.

D. Explanation of Drawings

1. Not all offsets, fittings, sleeves, main line, lateral, etc., which may be required are shown on plans. Carefully investigate the structural and finish conditions affecting all of the work and plan the work accordingly furnishing such fittings; etc., as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. Due to the scale of the Drawings, it is not possible to indicate all offsets, fittings, sleeves, etc., which may be required to complete the irrigation system.

2. Before proceeding with any work, the Contractor shall check and verify all dimensions, quantities, pressures and flows and shall immediately inform the Owner of any discrepancy between the drawing and/or the Specifications and actual conditions. No work shall be done in any area where there is such a discrepancy until the Owner has given written approval for the same. The Contractor shall assume full responsibility for work installed without approval.

3. The materials and work shall be installed in such a manner as to avoid conflicts between irrigation system and planting, existing or proposed utilities, and all other construction features.

4. Contractor shall verify prior to and during construction, that his contract documents reflect the latest revisions and change orders. Contractor shall be able to produce such documents at the request of the Owner.

5. Pipe sizes indicated on the Drawings are minimum allowable.

E. Proprietary brand names shown are for illustrative purposes only. Equal products will be considered by the Owner and may be used by the contractor upon approval by the Owner.

1.4 EXISTING CONDITIONS

A. The Contractor shall notify members of U.S.A. two (2) working days in advance of performing any excavation work by calling the toll-free number 800-542-2444. The

contractor shall verify the locations of existing utilities identified by U.S.A. with the as-built plans for the project area. The Contractor shall inform the Owner of any discrepancies before construction begins.

B. Information on the Drawings, relative to existing conditions, is approximate only. Deviations found necessary during construction to conform to actual conditions, as approved by the Owner, shall be made without additional cost.

C. Where it is necessary to excavate in areas of existing utilities, the contractor shall pothole to confirm exact locations of existing utilities. Exercise extreme care in excavating and working near existing utilities. The Contractor shall be responsible for all damages to existing utilities that are caused by his operation or neglect**.** In case of interruption of utilities caused by the contractors operations or neglect, the contractor shall be responsible to have the utilities in service as soon as possible and in no case shall the interruption be longer than a twenty-four (24) hour period. In such case that the contractor needs more than a twenty-four (24) hour period, prior approval shall be acquired from the Owner in writing.

D. Excavation in proximity to existing trees shall conform to the Tree Protection Measures per Plan.

1.5 SUBMITTALS

A. Material List
1. Contractor shall furnish the articles, equipment, materials, or processes specified by name in the Drawings and Specifications. Product names are used as standards only; other materials or methods shall not be used unless approved in writing by the Owner. Burden of proof as to equality of proposed material shall be on the Contractor; the Owner's decision is final. Only one request for substitution shall be considered for each item. Equipment capacities specified are minimum acceptable.
2. A complete material list (6 copies) shall be submitted to the Owner for approval prior to performing any work. The materials shall clearly identify on the submittal by a color highlight, the manufacturer, model number and description of materials and equipment to be used, including but not limited to the following:
   a. Quick coupler valves
   b. Backflow preventers
   c. Enclosures
   d. Sub-surface drip tubing
   e. Air relief valves
   f. Flush valves
   g. Isolation Valves
   h. Remote Control Valves
   i. Irrigation Valve Boxes
   j. Swing Joint Assemblies
   k. PVC Main Line
   l. PVC Lateral Pipe
   m. PVC and HDPE Sleeves
   n. PVC Solvent Cement and Primer
   o. Electrical Pull Boxes

p. Remote Control Valve Wire
q. Water Proof Wire Connectors
r. Detectable underground tape
s. Wire Marking System

3. The contractor shall provide additional submittals as required for products not listed above but which are used on site. Approval of submittals is required before installation.
4. Equipment or materials installed or furnished without prior approval of the Owner shall be rejected and the Contractor shall be required to remove such materials from the site at his own expense.
5. Approval of any item, alternate or substitute indicates only that the product or products apparently meet the requirements of the Drawings and Specifications based on the information or samples submitted.

B. Record Drawings

1. Maintain on site, separate from documents used for construction, one complete set of Contract Documents as Record Documents or As Built Drawings. Keep documents current. Do not permanently cover work until information is recorded. These record drawing must be kept for all portions of the project that may be built differently that the plans define.
2. Include all Change Orders.
3. Where reference dimensions are required in the individual specification section, measure reference dimensions from at least two (2) reference points that will be easily identifiable in the finished work.
4. Prior to Contract Closeout, obtain from the Owner's Project Manager a reproducible copy of the drawings. Using technical drafting pen, duplicate information contained on the Record Drawings maintained on site.
5. Label each sheet "Record Drawing". On the first sheet, the Contractor or resident superintendent shall execute the following statement:

   Having reviewed this document and all attachments, I affirm that, to the best of my knowledge, the information presented here is true and accurate.

   Signed _____ Date _____
   Position _____

6. The Contractor shall dimension from two (2) permanent points of reference, sidewalks, or road intersections, etc., the location of the following items:
   a. Controller Assembly
   b. Isolation Valves
   c. Quick Coupler Valves
   d. Remote Control Valves
   e. Routing of irrigation pressure lines; dimension maximum 100' along routing and at turns in direction (Note Depth)
   f. Routing of remote control wires
   g. Main Line, Lateral and Electrical Sleeves at both ends (Note Depth)
   h. Other related equipment as directed by the Owner.
7. On or before the date of the final observation, the Contractor shall deliver the corrected and completed reproducible as-built plan and digital media to the Owner.

Delivery of these shall not relieve the Contractor of the responsibility of furnishing required information that may be omitted from the plans or digital media. Reproducible plans or digital media may be obtained for said use from the Engineer.

C. Controller Charts
   1. Record Drawings shall be approved by the City before controller charts are prepared.
   2. Provide one (1) controller chart for each controller supplied.
   3. The chart shall show or explain the area controlled by the automatic controller and shall be the maximum size that the controller door will allow.
   4. The chart shall be either a reduced drawing or a written description of the actual record drawing system. In the event the controller sequence is not legible, which the drawing is reduced, it shall be enlarged to a size that is readable.
   5. When completed and approved, the chart shall be hermetically sealed between two (2) pieces of plastic, each piece being a minimum ten (10) mils thick.
   6. The controller charts shall be completed and approved prior to final observation of the irrigation system.

D. Operation and Maintenance Manuals
   1. Prepare and deliver two (2) operation manuals as specified and as follows:
   2. Product information sheets, parts sheets, operational and maintenance manuals on every material and equipment installed under this contract including but not limited to:
      a. Central Control Satellite Controllers
      b. Central Control Lighting Relay
      c. Backflow Preventer and Enclosure
      d. Isolation Valves
      e. Quick Coupler Valves
      f. Remote Control Valves
      g. Pop-Up Rotators
      h. Pop-Up Sprinklers
      i. Swing Joint Assemblies
   3. Guarantee Statement for Irrigation System.

E. The above-mentioned material submittals, record drawings, controller charts, operations and maintenance manuals and guarantee statement for irrigation system shall be turned over to the Owner at the conclusion of the project. Before final observation can occur, written evidence that the Landscape Architect has received submittals must be provided by the Owner.

1.6 EQUIPMENT TO BE FURNISHED:

A. Irrigation Products to be Furnished
   1. Supply as a part of this Contract the following tools:
      a. Two (2) sets of special tools required for removing, disassembling, adjusting and locating each type of sprinkler, valve, valve box and splice box supplied on this project.
      b. Two (2) keys for each automatic controller.
      c. Two (2) quick coupler keys and matching hose swivels for each type of quick coupling valve installed.
      d. Two (2) isolation valve opening keys

e. Two (2) hand-held remote transmitter kits
f. One (1) Valve marker locator

2. The above-mentioned equipment shall be turned over to the Owner at the conclusion of the project. Before final observation can occur, written evidence that Owner has received materials must be provided to the Owner.

1.7 OBSERVATION SCHEDULE

A. Normal progress observations shall be requested by the Contractor from the Owner as per observations listed in specifications SECTION 20 – EROSION CONTROL AND HIGHWAY PLANTING.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

Handling of PVC Pipe and Fittings: The Contractor is cautioned to exercise care in handling, loading, unloading, and storing of PVC pipe and fittings. All PVC pipe shall be transported in a vehicle that allows the length of pipe to lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has been dented or damaged will be discarded and if installed replaced with new.

1.9 GUARANTEE

1. The guarantee for the replacement/ repair of existing irrigation systems shall be made in accordance with the form shown on the following page. A copy of the guarantee form shall be provided to the Owner and to each affected, adjacent property owner. The guarantee form shall be re-typed onto the Contractor's letterhead and contain the following information:

GUARANTEE FOR IRRIGATION SYSTEM

We hereby guarantee that the portions of the sites irrigation systems that we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the Drawings and Specifications, ordinary wear and tear and unusual abuse or neglect accepted. We agree to repair or replace any defects in material or workmanship, which may develop during the period of one (1) year from date of final acceptance and also to repair or replace with originally specified materials. Any damage resulting from the repairing or replacing of such defects shall be replaced and repaired by the contractor at no additional cost to the Owner. We shall make such repairs or replacements within a 48-hour period, after receipt of written notice. In the event of our failure to make such repairs or replacements within said period after receipt of written notice from the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT: _____

LOCATION: _____

SIGNED: _____

ADDRESS: _____

PHONE: _____

DATE OF ACCEPTANCE: _____

PART 2 - PRODUCTS

2.1 MATERIALS

General: Use only new materials of brands and types noted on the Drawings specified herein or approved equals.

A. Backfill Material
   1. Existing site material, if approved by the Owner, may be used for backfill material. Backfill material shall be free from organic materials, large clods of earth or rocks larger than one (1) inch diameter, trash, debris, rubbish, broken cement, asphalt material or other objectionable substances.
   2. Imported backfill material, if required and as approved by the Owner, shall be clean Vina Loam soil or other approved material topsoil, with no large clods of earth or rocks larger than one (1) inch diameter.
   3. Sand backfill shall be a fine, granular sand material backfill containing no foreign matter larger than one-half (1/2) inch in size.

B. Drainage Fill Material
   1. Drainage fill material shall be three-quarter (3/4) inch washed, hard and durable, fragments of screened or broken stone or gravel.

C. Irrigation Pipe Sleeving
   1. Irrigation Sleeve shall be PVC Schedule 40 with solvent-weld joints.
   2. Pipe shall be made from NSF approved Type I, Grade I, PVC compound conforming to ASTM resin specification D1785. All pipes shall meet requirements set forth in Federal Specification PS-21-70. (Solvent-weld Pipe)

D. PVC Pressure Main Line Pipe and Fittings.
   1. Pressure main line piping for sizes two and one half (2-1/2) inches and larger shall be PVC Class 315 pipe. Pipe shall be made from an NSF (National Sanitation Foundation) approved Type I, Grade I, PVC compound conforming to ASTM resin specification D2241. All pipes shall meet requirements as set forth in Federal Specification PS-22-70, with an appropriate standard dimension ratio (S.D.R. Pipe).
   2. Pressure main line piping for sizes two (2) inch and smaller shall be PVC Schedule 40 with solvent-weld joints. Pipe shall be made from NSF approved Type I, Grade I, PVC compound conforming to ASTM resin specification D1785. All pipes shall meet requirements set forth in Federal Specification PS-21-70. (Solvent-Weld Pipe).
   3. Main line fittings shall be PVC Schedule 40 solvent-weld fittings, 1-2; II-I NSF approved conforming to ASTM D2466.
   4. All PVC pipe shall be marked continuously and permanently with the following information: Manufacturer's name, nominal pipe size, schedule or class of pipe, pressure rating in P.S.I. extrusion, NSF approval and date of extrusion.
   5. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable I.P.S. schedule and NSF seal of approval.
   6. All offsets shall be a minimum four (4) inches unless contractor receives written approval from the Owner.

E. PVC Non-Pressure Lateral Line Piping
   1. Non-pressure buried lateral line piping shall be PVC Schedule 40 with solvent-weld joints.
      a. Pipe shall be made from NSF approved, Type I, Grade II, PVC compound conforming to ASTM resin specification D1785.
      b. All pipes shall meet requirements set forth in Federal Specification PS-21-70.
   3. PVC solvent-weld fittings shall be Schedule 40, 1-2; II-I NSF approved conforming to ASTM D2466.
   4. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of the type and installed by the method specified by the manufacturers for each type of pipe.
   5. All offsets shall be a minimum four (4) inches unless otherwise noted or contractor receives written approval from the Owner.

F. Concrete
   1. ASTM Class B concrete shall be used for fill concrete and miscellaneous equipment pads.
   2. Concrete shall have a 3,000-PSI compressive strength at 28 days and shall have maximum water to cement and dispersing agent ration of 56%. Concrete shall have a minimum cement content of 470 lbs. (5 bags) per cubic yard concrete. Nominal maximum size of coarse aggregate shall be three-quarter (3/4) inch.

G. PVC Threaded Nipples:
   1. PVC Schedule 80 nipples shall be produced from extruded stock grade PVC compounds. No molded nipples shall be used.
   2. PVC Schedule 80 nipples shall be made from NSF approved PVC compound conforming to ASTM D1784, Cell Classification 12454B

H. Electric Remote Control Valve
   1. Remote control valves shall be of the same type, manufacturer and sizes as indicated on the Drawings and/or as specified herein or approved by the Owner.
   2. Remote control valves shall have a glass-filled nylon construction with a flow control and manual bleed capability
   3. Remote control valves shall be in the normally closed position unless otherwise noted.

I. Identification Products
   1. Remote control valve tags shall be manufactured from polyurethane Behr Desopan, with a reinforced attachment hole and will be 2-1/4” x 2.3/4” in size. Valve identification tags shall be yellow in color with double sided stamped controller and valve designation.
   2. Detection tape shall detectable marking tape consists of a 5.0 mil (0.005") thickness; five-ply composition; ultra-high molecular weight; 100 percent virgin polyethylene; acid, alkaline & corrosion resistant.
      a. The tape tensile strength is in accordance with ASTM D882-80A and will not be less than 7800 PSI.
      b. Elongation properties are in accordance with ASTM D882-80A and are less than 150% at break point.

c. Tape color & legend combination will be in accordance with A.P.W.A. or local requirements. The color is Blue. The legend reads "Caution Irrigation Line Buried Below".
d. The tape will have a 2.0 mil (0.0020") solid aluminum foil core, encapsulated within 2.55 mil (0.00255") polyethylene backing.
e. Tape width shall be four (4) inch in width.

J. Automatic Controllers
1. Automatic controllers shall be of size and type shown on the Drawings.

K. Control Wiring
1. Connections between the automatic controllers and the electric control valves shall be made with direct burial copper wire AWG-U.F. 600-volt. Pilot wires shall be a different color wire for each automatic controller. Common wires shall be white with a different color stripe for each automatic controller. Install in accordance with valve manufacturer's Specifications and wire chart. In no case shall wire size be less than #14.
2. All splices shall be made with TKHP LV-9000, Dri-Splice DS-400, Scotch-Lok No. 3576, or approved equal.
3. No splices between controller and valve less than 500’.
4. All splices shall be placed in a Carson Model 910 valve box with a bolt down gray cover.

L. Control Wire Conduit
1. PVC Schedule 40 electrical conduit ASTM F-512 sizes as required, except as noted per plan.

M. Control Wire Pull Box
1. Control wire pull boxes shall be Carson, Model 910 with bolt down gray cover or approved equal. Extension as per details.

N. Gate Valves
1. Gate valves shall be of the same type, manufacturer and sizes as indicated on the Drawings and as specified herein or approved equal.
2. Gate valves 2-1/2” and larger shall be resilient wedge and conform to AWWA standards. Gate valves shall be flange by flange with a two (2) inch square-operating nut.
3. Gate valves 2" and smaller shall be 125 lb. SWP bronze gate valve with ends. Gate Valves shall be equipped with a cast bronze cross handle.

O. Quick Coupling Valves
1. Quick coupling valves shall have a brass two-piece body designed for working pressure of 150 P.S.I. operable with quick coupler key.
2. Quick coupler valves shall be of the same type, manufacturer and size as indicated on the Drawings and as specified herein or approved equal.

P. Valve Boxes
1. Remote Control Valve Boxes for valve sizes 1-1/2" and 2" shall be green rectangular valve boxes 17-3/8" x 23-7/8" x 12", Carson model 1220 with a green cover and Bolt-Down Loc Kit (with bolt) or approved equal.
2. Remote Control Valves Boxes for valve sizes 1" shall be green rectangular valve boxes 14-1/2" x 19-1/2" x 12-1/4", Carson model 1419 with a green cover and Bolt-Down Loc Kit (with bolt) or approved equal.
3. Remote Control Valve Box Extensions shall be of the same manufacturer of the valve box or approved equal.
4. Quick Coupler Valve Boxes shall be green round valve boxes 11-1/2" (I.D.) diameter by 10-1/4" high, Carson model 910 with a green cover and Bolt-Down Loc Kit (with bolt) or approved equal.
5. Electrical Pull Boxes and Wire Splice Boxes shall be gray round valve box 11-1/2" (I.D.) diameter by 10-1/4" high, Carson model 910 with a gray cover and Bolt-Down Loc Kit (with bolt) or approved equal.
6. All remote control valve boxes, quick coupler valve boxes, electrical pull boxes and wire splice boxes shall be located in shrub planters unless otherwise shown on the Drawing or specified by the Owner.

Q. Backflow Preventer - The backflow preventer shall be the same type and size as shown on plans or specified herein.

R. Subsurface Pressure Compensating Dripperline
1. Subsurface Pressure Compensating Dripperline shall consist of nominal sized one-half inch (½") inch low-density linear polyethylene tubing with internal pressure compensating, continuously self-cleaning, integral drippers at a specified spacing, (12", 18", or 24" centers) or blank tubing without drippers.
2. The tubing shall be brown in color and conform to an outside diameter (O.D.) of 0.67 inches and an inside diameter (I.D.) of 0.57 inches.
3. Individual pressure compensating drippers shall be welded to the inside wall of the tubing as an integral part of the tubing assembly. These drippers shall be constructed of plastic with a hard plastic diaphragm retainer and a self-flushing/cleaning elastomer diaphragm extending the full length of the dripper.
4. The dripper shall have a built-in physical root barrier whereby the water shall exit the dripper from a point different than where it shall exit the tubing. This physical barrier shall create an air gap inside the tubing.
5. The drippers shall have the ability to independently regulate discharge rates, with an inlet pressure of seven to seventy (7-70) pounds per square inch (PSI), at a constant flow and with a manufacturer's coefficient of variability (Cv) of 0.03.
6. Recommended operating pressure shall be between 15-45 PSI.
7. The dripper discharge rate shall be 0.4, 0.6, or 0.9 gallons per hour (GPH) utilizing a combination turbulent flow/reduced pressure compensation cell mechanism and a diaphragm to maintain uniform discharge rates. The drippers shall continuously clean themselves while in operation.

S. Filter
1. The filter shall be a multiple disc filter with trifluralin incorporated into the replaceable disk ring assembly inside the filter housing. The disc filter body shall be molded of black plastic with male pipe threads for both inlet and outlet. The disc filter shall be

capable of periodic servicing and replacement of the chemically treated disk ring set by unscrewing a threaded cap or unlatching the band.
2. The mesh rating is 120, and maximum system pressure is 140 PSI.

T. Line Flushing Valve
1. The Line Flushing Valve shall be constructed of brown molded plastic with ½" MPT end configurations

U. Air/Vacuum Relief Valve
1. Air/Vacuum Relief Valve shall be constructed of black and/or grey plastic with a ½" male pipe thread capable of mating with a threaded PVC reduction bushing or ½" FPT fitting.

V. Subsurface Pressure Compensating Dripperline Fittings
1. All fittings shall be constructed of brown molded plastic having a nominal outside dimension (I.D.) of 17mm (0.57"). Female and male threaded ends shall be capable of mating to standard PVC pipe with tapered threads.

W. Stainless Steel Clamps
1. Clamps shall be constructed of 304 AISI stainless steel. Clamps shall be one "ear" type and formed with a "dimple", allowing for thermal expansion and contraction properties without loosening the clamp
2. Clamps shall have a nominal size of 13/16"
3. Interior clamp wall shall be smooth to prevent crimping or pinching of tubing.
4. Wall thickness of clamps shall be .0236" (0.6 mm) with an overall bandwidth of ¼" (7mm).

PART 3 - EXECUTION

3.1 INSPECTION OF SITE

A. Site Conditions
1. All scaled dimensions are approximate. Prior to the start of work the Contractor shall meet with the Site Contractor to review and approve "turn over conditions" of the project area.
   a. The Contractor shall be responsible to report discrepancies between Contract Documents and "take over conditions" to the Owner prior to start of work.
   b. Discrepancies not reported shall become the Contractor's responsibility.
2. The Contractor shall check and verify all site water and electrical services and notify the Owner if site conditions have changed from those specified in the drawings.
3. The Contractor shall carefully check all grades to satisfy him that he may safely proceed before starting work on the irrigation system.
4. The contractor shall obtain permits and call for inspections as required by local codes and regulation. All installations shall conform to local codes and accepted construction practices.

3.2 PREPARATION

A. Physical Layout
1. Locations on Drawings are diagrammatic and approximate only and shall be changed and adjusted as necessary and as directed by Owner to meet existing conditions and obtain complete water coverage.
2. The Contractor shall install, repair, and/or extend the system as shown on the Drawings, and as necessary to carry out the intent of the Drawings and Specifications.

3.3 WATER AND ELECTRICAL SERVICES

A. Water Supply - Coordinate with the Owner and California Water Service the irrigation and potable water supply points of connection as indicated on the Drawings. Field verify connection points. Contractor is responsible for any changes caused by actual site conditions. Notify the Owner of any discrepancies prior to beginning construction.

B. Electrical Supply
1. Contractor shall provide all materials and connections to supply electrical power to the irrigation controller(s) and other electrical components as needed.
2. Connection shall be made at approximate location(s) as indicated on the Drawings. The Contractor is responsible for minor changes caused by actual site conditions and for the coordination of all electrical service connections to the controllers.
3. All electrical work shall be performed by a licensed Electrical Contractor. Materials and workmanship for electrical service shall conform to local codes, ordinances and governing authorities having jurisdiction.

3.4 INSTALLATION

A. Trenching
1. Dig trenches straight and support pipe continuously on bottom of trench. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on the Drawings and as noted.
2. Provide for a minimum of eighteen (18) inches cover for all pressure lines.
3. Provide for a minimum of twelve (12) inches cover for all non-pressure lines.
4. Provide for a minimum of eighteen (18) inches cover for all control wiring.
5. Provide for a minimum of twenty-four (24) inches of cover for all pressure lines, non-pressure lines and control wiring under auto traffic areas.
6. Trench width shall be as needed to provide a minimum horizontal clearance between pipes and edges of trench.
7. No pipe shall be laid directly over another pipe.
8. See contract documents for vertical and horizontal pipe separation requirements.

B. Backfilling
1. The trenches shall not be backfilled, except for center loading, until all required tests are performed. All debris shall be removed prior to placement of backfill. Trenches shall be carefully backfilled with the materials approved for backfilling. Backfill shall be mechanically compacted in six (6) inch lifts to a dry density equal to adjacent

undisturbed soil in landscaped areas. Backfill shall conform to adjacent grades without dips, sunken areas, humps or other surface irregularities.

2. Backfill main lines with a minimum of 6" of sand below piping and 6" of sand above the piping.
3. Backfill lateral lines with approved backfill material or approved imported soil. Backfill material shall be free from organic materials, large clods of earth or rocks larger than one (1) inch diameter, trash, debris, rubbish, broken cement, asphalt material or other objectionable substances.
4. If settlement occurs and subsequent adjustments in pipe, valves, sprinklers heads, lawn or planting, or other construction are necessary, the Contractor will make all the required adjustments without cost to the Owner.

C. Trenching and Backfilling Under Paving
1. Trenches located under areas where paving, asphaltic concrete or concrete shall be installed, shall be backfilled with sand, a layer six (6) inches below the pipe and six (6) inches above the pipe and compacted in layers to 95% compaction, using manual or mechanical tamping devices. All trenches shall be left flush with the adjoining grade.
2. Generally piping under existing walks is done by jacking, boring or hydraulic driving, but where any cutting or breaking of sidewalks and/or concrete is necessary, it shall be done and replaced by the Contractor as part of the Contract cost. Permission to cut or break sidewalks and/or concrete shall be obtained from the Owner in writing. No hydraulic driving shall be permitted under concrete paving.

D. Sleeving
1. Sleeving shall be installed for irrigation pressure main line pipe, non-pressure lateral pipe and electrical wiring that crosses pavement, walkways, paths, concrete, and other hardscape elements as needed whether shown on drawing or not.
2. Install irrigation and electrical sleeving as needed whether or not indicated on the Drawings. Contractor shall coordinate the installation of sleeving with the work of other trades. Sleeving shall extend a minimum of six (6) inches past hardscape.
3. Sleeves shall be sized to easily accommodate piping and/or control wiring as called for in the drawings leaving a minimum of 25% void space inside sleeve.
   a. The contractor shall be responsible to verify sleeving sizes based on field verification of pipe and wire crossings.
4. Separate sleeves shall be provided for main line and lateral piping, 120V wiring, 24V wiring, telephone cable, communication cable, sensor cable and grounding wire.
5. Sleeves shall have both ends capped during installation to prevent dirt and debris from entering the sleeve.
6. Identify location of sleeve ends from two permanent points of reference and show on as-built plans.

E. PVC Pipe
1. Routing of irrigation pipe as indicated on the Drawings is diagrammatic. Install lines and various assemblies to conform to the details shown on the drawings.
2. Install irrigation main line a minimum of five (5) feet from tree locations to avoid conflict with mature rooting systems.
3. Install no multiple assemblies on plastic lines. Provide each assembly with its own outlet.

4. Install all assemblies specified herein in accordance with respective detail. In absence of detail Drawings or specifications pertaining to specific items required to complete work, perform such work in accordance with best standard practice with prior approval of the Owner.
5. PVC pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before installation. Installation shall be as recommended by the pipe and fitting manufacturer.
6. PVC pipe shall be installed so that there will be a small amount of excess length in the pipe to compensate for contraction and expansion of the pipe. This shall be accomplished by "snaking" the pipe in the trench during installation.
7. Center load pipe with small amounts of backfill to prevent arching and slopping under pressure. Leave joints exposed for inspection during testing.
8. No water shall be permitted in the pipe until inspections have been completed and a period of at least 24 hours has elapsed for solvent weld setting and curing.
9. Plastic to metal connections shall be made with plastic male adapters and female metal adapter, hand tightened, plus one turn with a strap wrench. Teflon tape or approved equal shall be used on all threaded PVC to metal joints.
10. Solvent Weld Joint: Solvent weld pipe ends using solvent recommended by pipe manufacturer only.
11. Threaded joints shall be wrapped with Teflon tape as per manufacturer's instructions.
12. Flush all debris out of pipe prior to installing valves and heads.
13. In changing main line and lateral pipe depth, 45° elbows shall be used.
14. Install a tracer wire twelve (12) inches below finish grade along the entire length of the main line run, including main line branches.
15. Trenching under and around existing trees shall be in accordance with the Tree Protection Measures as outlined on the Plans and Specifications.

F. Line Clearance
1. Irrigation lines shall have a minimum horizontal and vertical clearance of four (4) inches from each other. Parallel lines shall not be installed directly over one another.
2. Horizontal and vertical clearance of irrigation lines from lines from other trades shall be as per local codes and regulations.
3. Line clearances shall be inspected and approved by the Landscape Architect prior to backfilling trenches.

G. Gate Valves
1. Install as per details and manufacturer's specifications.
2. Install where shown on Drawings. Locate in valve boxes as per detailed.
3. Install one gate valve per valve box. Provide extension units as required as per details. Install valve boxes in shrub planting areas whenever possible.
4. Wherever possible, install gate valves, quick coupler valves and remote control valves in groupings not to exceed a maximum of three (3) valves per group.

H. Quick Coupling Valves
1. Install as per details and manufacturer's specifications.
2. All quick coupling valves shall be installed plumb and vertical with the valve accessible and removable with proper tools. Valves shall be located adjacent to paving and in shrub planting areas whenever possible.

3. Install where shown on Drawings. Locate, in valve boxes, twelve (12) inches and perpendicular to walk, curb, header board, etc., for easy access.
4. Install one quick coupling valve per valve box. Provide extension units as required. Install valve boxes in shrub planting areas whenever possible.
5. Wherever possible, install quick coupler valves, gate valves and remote control valves in groupings not to exceed a maximum of three (3) valves per group.

I. Electric Remote Control Valves
1. Install as per details and manufacturer's specifications.
2. Install where shown on Drawings. Locate valve boxes twelve (12) inches from, and perpendicular to walk, curb, header board, etc., for easy access.
3. Install one (1) remote control valve per valve box. Provide extension units as required so as valve is protected by adjacent native soil. Install valve boxes in shrub planting areas whenever possible.
4. Provide eighteen (18) inch expansion loop at all electrical connections within control valve boxes.
5. Install a T.Christy I.D. tag on all valves identifying the Satellite Controller Assembly and station number of the valve. Attach the identification tag to the valve stem using a nylon cable tie.

J. Control Wiring
1. Install control wiring in the same trench and along the same route as the pressure supply line whenever possible.
2. Control wiring shall be installed in PVC Schedule 40 conduit.
3. Provide an eighteen (18) inch expansion curl in valve boxes, pull boxes and splice boxes.
4. Control valve wire and spare wire splices allowed only on runs of more than 500 feet.
5. An expansion curl shall be provided within three (3) feet of each wire connection. Expansion curl shall be of eighteen (18) inches in length at each splice connection and at each remote control valve, so that in case of repair, the valve bonnet or splice may be brought to the surface without disconnection of the control wires.
6. All splices shall be made in either a valve box or a splice box.
7. All control wire splices shall be made with waterproof connectors that use a mechanical clamp.
8. Use one waterproof connector per splice.

K. Conduit
1. Install remote control wire in PVC Schedule 40 conduit.
2. The ends of the conduits, whether shop or field cut, shall be reamed to removed burrs and rough edges. Cuts shall be made square and true.
3. Install conduit couplers on pipe ends when in direct contact with remote control wires.
4. The ends of the conduit shall be capped until the pulling of wiring is started. Conduit shall be free of soil and debris.
5. Conduit bends, except factory bends, shall have a radii of not less than six times the inside diameter of the conduit.
6. Install pull boxes at changes in direction.
7. Install pull boxes where depicted on drawings and no more than every 500’ along the conduit route (unless compelling conditions require additional pull boxes). Remote

control valve boxes, pull boxes used for changes in direction and splice boxes may be used to satisfy this requirement.

8. Install pull tape in conduit.

L. Valve Boxes
   1. Install valve boxes in shrub planter areas as indicated.
   2. Install valve boxes as per details unless otherwise noted on plans.
   3. Do not install more than three (3) valve boxes in any one single group.

M. Electrical Pull Boxes
   1. Install electrical pull boxes at wire splice locations and as per details.
   2. Install pull boxes at changes in direction and depth.
   3. Install pull boxes where depicted on drawings and no more than every 500’ along the conduit route (unless compelling conditions require additional pull boxes). Remote control valve boxes, pull boxes used for changes in direction and splice boxes may be used to satisfy this requirement.

N. Automatic Controller
   1. Install as per manufacturer's specifications
   2. Automatic controllers shall be securely mounted in the location as indicated on the Drawings or approved by the Landscape Architect in such a manner that all normal operations can be conveniently made by the operator.
   3. The Contractor shall properly ground the automatic controllers in accordance with local codes and as per details.
   4. The Contractor shall take all control wires to the automatic controllers and make all required connections for their installation.
   5. All electrical and control wires installed above ground shall be placed in metal conduit or other approved materials and securely mounted. Paint conduit as per Landscape Architect’s directions and/or as indicated on the Drawings.

O. Flushing of System - After new irrigation mainline, valves, laterals and swing joints are in place and connected, all necessary diversion work is complete, and prior to installation of irrigation heads, the control valves shall be opened and a full head of water shall be used to flush out the system.

P. Subsurface Pressure Compensating Dripperline
   1. Install the subsurface pressure compensating dripperline as detailed on drawings. Dripperline to be installed in this work shall be as per approved submittals.

   2. Spacing of dripperline shall not exceed the maximum indicated on the drawings. In no case shall the spacing exceed the maximum recommended by the manufacturer.
   3. Add additional dripperline as required to provide adequate coverage with no additional cost to owner.
   4. Maximum system pressure shall be 45 PSI.
   5. Bending radius shall be 7”.
   6. 6” metal wire staples shall be installed 10’ on center, and two staples shall be installed at every change of direction.

7. Dripperline pipe depth shall be 4” unless otherwise specified.
8. Dripperline pipe shall have a 2” setback from the edge of hardscape.

Q. Filter
1. Install as per details and manufacturer’s specifications.
2. Install where shown on Drawings.

R. Line Flushing Valve
1. Line Flushing Valve shall operate at the beginning of the irrigation cycle as the system begins to pressurize, and flush approximately one gallon of water at 57 PSI maximum, or 1.5 PSI minimum
2. Line Flushing Valves are to be installed below grade, as detailed, in a valve box to allow for periodic inspection and are to be installed either vertically with dome portion facing upward installed on a 90 degree elbow or horizontally with the dome portion facing sideways.
3. One (1) Line Flushing Valve shall be installed for every fifteen (15) GPM of zone flow, and shall be installed at a point as far away from the source (typically on an exhaust header) as possible.

S. Air/Vacuum Relief Valve
1. Air/vacuum relief valves shall be installed at the highest elevation in each zone (some zones may require more than one) in order to expel air and relieve vacuum.
2. In a zone where the highest elevation occurs between the intake and exhaust headers (such as a mound or berm), an air/vacuum relief lateral shall interconnect all the dripperlines to avoid the necessity of installing one air/vacuum relief valve on each dripperline lateral.
3. Air/vacuum relief valves can be installed below grade in valve boxes to allow for periodic inspection.

T. Subsurface Pressure Compensating Dripperline Fittings
1. Subsurface pressure compensating dripperline fittings shall be mated with dripperline by pushing the fitting into the tubing while twisting side to side until the tubing abuts to either adjoining tubing or a fitting stop.

U. Stainless Steel Clamps
1. Stainless steel clamps shall be used to secure dripperline over barbed insert fittings when design-operating pressures exceed 45 PSI.
2. Place the clamp between the first and second ridge of the barbed insert fittings. Crimp the “ear” of the clamp tightly. Crimp twice to ensure proper seating.

3.5 SYSTEM ADJUSTMENT

A. The Contractor shall flush and adjust all irrigation heads for optimum performance and to prevent over-spray onto walks, windows, roadways, and buildings.

B. If it is determined that adjustments in the irrigation equipment shall provide proper and more adequate coverage, the Contractor shall make such adjustments after written approval by the Owner. Adjustments shall include changes in head locations, nozzle size and degrees of arc as required without additional contract costs.

C. If it is determined that any irrigation equipment is improperly installed, the contractor shall reinstall the equipment to conform to contract documents.

D. All irrigation heads shall be set perpendicular to finished grades unless otherwise designated on the Drawings.

3.6 TESTING OF THE IRRIGATION SYSTEM

A. The Contractor shall request the presence of the Landscape Architect at least two (2) working days in advance of observation.

B. Open Trench pipe observation.

C. Emitter Test
1. The initial emitter function test shall be performed prior to plant material installation.
2. Perform an emitter function test in the presence of the Landscape Architect to determine if the water coverage for plant materials is complete and adequate.
3. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from the Drawings or where the system has been willfully installed as indicated on the Drawings, when it is obviously inadequate without bringing this to the attention of the Landscape Architect.

D. Coverage Test
1. Perform a sprinkler coverage test in the presence of the Landscape Architect to determine if the water coverage for landscape areas is complete and adequate.
2. A coverage test shall be performed after the irrigation system is completed, an irrigation water audit has been performed and recommended adjustments to the irrigation system are complete.
3. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from the Drawings or where the system has been willfully installed as indicated on the Drawings, when it is obviously inadequate without bringing this to the attention of the Feather River Recreation and Park District.
4. The sprinkler coverage test shall be completed and approved before landscape material is planted.

3.7 FINAL ACCEPTANCE

A. Upon completion of all project work, including maintenance period and warranty period the Owner will, upon proper request, make an observation to determine final project acceptability.

B. Where observed work does not comply with the Plans and Specifications, replace rejected work and continue specified maintenance period until re-inspected by the Landscape Architect and determined to be acceptable. All replacement materials and

installations shall be in accordance with the Plans and Specifications. Remove rejected work and materials immediately from project.

3.10 TEMPORARY REPAIRS

The Owner reserves the right to make temporary repairs as necessary to keep the irrigation system in operating condition. The exercise of this right shall not relieve the Contractor of his responsibilities under the terms of the guarantee as herein specified.

3.11 MAINTENANCE

Provide maintenance as per “Landscape Maintenance”

3.12 CLEAN-UP

Clean up shall be made as each portion of work progresses. Refuse and excess dirt shall be removed from site. All walks and paving shall be broomed or washed down, and any damage sustained to the work of others shall be repaired to original conditions acceptable to the Owner.

3.13 INSPECTION SCHEDULE

A. The Contractor shall be responsible for notifying the Engineer in advance for the following observations according to the time indicated:
   1. Staking points of connection, location of irrigation main lines, remote control valves– two (2) working days
   2. Open trench observation - two (2) working days
   3. Emitter coverage test (after finish grade approval and prior to planting) - two (2) working days
   4. Substantial Completion - two (2) working days
   5. Final Acceptance - two (2) working days

B. No site visits shall commence without all items noted in previous Observation Reports, either completed or remedied, unless such compliance has been waived. Failure to accomplish punch list tasks or prepare adequately for desired observations shall make the Contractor responsible for reimbursing the Engineer at his current billing rates per hour, plus transportation costs.

C. Normal progress observations shall be requested by the Contractor from the Engineer as per “41-3.12 Observation Schedule” as listed in specifications

D. No final observation shall commence without Record Drawings. In the event the Contractor calls for an observation without Record Drawings, without completing previously noted corrections or without preparing the system for observations, he shall be responsible for reimbursing the Owner or Engineer at the hourly rate in effect at the time of the observation (plus transportation costs) for the inconvenience. No further observations will be scheduled until this charge has been paid.

END OF SECTION

SECTION 32 9115 – SOIL PREPARATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials services and equipment indicated on Drawings and/or herein specified to complete all Landscape Grading Work

B. Landscape grading shall consist of importing topsoil to cap turf areas, importing top soil to create landscape berming, importing top soil for tree hole back fill, ripping, establishing finish grade to conform to the contours, grades, line and shapes of rough grades established on Engineer's plans. Work may also include loosening of compacted soils created during the course of construction.

C. Land alteration of existing topographic conditions to conform to the contours, grades, lines and shapes indicated on Engineer's plans.

D. Contractor shall furnish, place and settle all required backfill material to conform to the contours, grades, lines and shapes as indicated on the Drawings, and engineer's plans

1.2 RELATED WORK

A. SECTION 02905 - LANDSCAPE INSTALLATION

1.3 DEFINITIONS

A. Finish grade: Finish grade shall mean the establishment of grades to .04 feet plus or minus.

B. Grading intent: Spot elevations (grades) and contours are indicated based on the best available data. Architect's Drawings are referenced to provide site grading data. The intent is to maintain constant slopes between spot elevations. If a spot elevation is determined to be in error, or the difference in elevation between points change contact the Landscape Architect immediately for field adjustments of spot elevations.

1.4 JOB CONDITIONS

A. Visit the project site and examine the existing conditions under which the Work is to be performed. Note all conditions, as to character and extent of Work involved. This may include pot holing to determine depth of bedrock

1.5 EXISTING UTILITIES

A. Contractor is responsible to contact U.S.A (800-642-2444) to stake and mark the location of all existing utilities before commencing Work. Pot hole as required to determine and verify location and depth.

B. Retain and protect in operating condition all active utilities traversing the site designated to remain.

1.6 PROTECTION OF EXISTING CONDITIONS and ADJACENT PROPERTIES

A. Use all means necessary to protect existing conditions designated to remain, newly constructed conditions and adjacent properties. Avoid any encroachment on adjacent properties.

B. Prevent damage to existing bench marks, pavement, utility lines. In the event of damage or loss immediately make all repairs and replacements required to the Landscape Architect's approval at no additional cost to the Owner.

1.7 QUALITY ASSURANCE

A. Finish grade shall conform to contours, grades, lines and shapes, as indicated on Architect’s Drawings, with uniform slopes between finish grades or between finish grades and existing grades.

B. Establish finish landscape grades in a continuous, uniform line, resulting in a uniform surface with no ridges, birdbaths or low spots.

C. Finish landscape grade tolerance shall be .04 feet plus or minus of final grades indicated on Drawings.

D. Slope grade away from buildings a minimum of two (2) percent in five (5) feet horizontal distance unless otherwise indicated on Drawings, or Architect’s plans.

1.8 SUBMITTALS

A. Provide one (1) cubic foot sample of import topsoil material for the Landscape Architect's approval prior to delivery to the site, but in any case, prior to placement.

B. Provide horticultural soils report of submitted topsoil and existing site soil (after rough grade) including information on soil texture, filtration rate, nutrient levels and organic matter. Include recommendation for amendment to be added to each soil type to mitigate any deficiencies.

C. Provide horticultural soils report of finish grade to verify correct amendments were added.

PART 2 - PRODUCTS

2.1 ONSITE MATERIAL

A. Existing onsite excavated surplus material may be acceptable fill or top soil material, if approved by the Landscape Architect or Landscape Architect’s representative and upon submittal of a horticultural soils report and possible amending of existing soil to match

criteria specified in this section for import top soil. Excavated surplus material not required for fill material or top soil shall be removed and legally disposed of offsite.

2.2 IMPORTED TOPSOIL MATERIAL

A. Imported topsoil material shall be of friable sandy-loam texture free of refuse, roots, heavy or stiff clays, rocks over 1" in diameter , 15% by volume rock between 1/8" and 1", sticks, other deleterious matter.

B. Imported topsoil acidity range (Ph) shall be between 6.5 to 7.5, containing a minimum of 4% and a maximum of 25% organic matter.

C. Imported topsoil shall be free of all noxious weeds and other seeds.

D. Imported topsoil shall be amended as per soils report (refer to paragraph 1.08 B), at no additional cost to Owner.

E. Topsoil shall be stock piled on site in an area free of rock and other deleterious materials. Landscape Architect reserves the right to reject topsoil once placed in proper location per Part 3 if deleterious materials mixed in to topsoil.

PART 3 - EXECUTION

3.1 GENERAL

A. Conduct work in an orderly manner. Dirt shall not be permitted to accumulate on streets or sidewalks nor to be washed into storm drains.

B. Use all means required to prevent the erosion of freshly graded areas during construction and until such a time as proposed hard surfaces and landscaping have been constructed.

C. Excess on site material after material has been used to bring site to finished grade shall be removed and legally disposed of off site on Owner's maintenance yard, access gate located behind unit 193. Spread soil evenly on maintenance yard grounds. Do not deposit or spread soil within 15 feet of perimeter fence.

D. If there is not enough site material to bring site to grade, contractor shall import topsoil.

3.2 RIPPING

A. If, during the course of construction, landscape areas become compacted to greater than 90% relative density, landscape areas with the exception of areas beneath the canopies of existing trees shall be ripped and cross ripped to a depth of 18".

B. Rip and cross rip to a depth of 12 inches all areas exposed by engineering cut operations. Remove all rock two inches or larger within 6 inches of finish grades in all non-hydro mulch planted areas.

C. Rip and cross rip to a depth of 12 inches all landscape areas prior to the placement of import topsoil.

3.3 TOP SOIL PLACEMENT

A. Place topsoil to contours or spot elevations as indicated on plans.

B. Place topsoil in any way as indicated on plans

C. If insufficient on site soil is available, then contractor shall supply import topsoil.

3.4 FINISH LANDSCAPE GRADING

A. Finish grade shall conform, after settling, to shapes, spot elevations and contours as indicated on Architect's Drawings, with uniform levels or slopes between finish elevations or between finish elevations and existing elevations.

B. Fine grade all planting areas to a smooth, loose and uniform surface. Remove all extraneous matter 1" or larger in size and dispose of off site to create a smooth surface. Finish grades shall slope to drain, without water pockets or irregularities (humps or hollows). Grades shall be or uniform slope between points of fixed elevation establishing vertical curves or roundings at abrupt changes in slope.

C. Shrub/ground cover planting areas shall be graded two and one-half (3-1/2) inches below adjacent paved areas, sidewalks, valve boxes, headers, drains, etc. in order to receive two (3) inch depth of decomposed granite, establishing final grade one-half (1/2) inches below these surfaces.

D. Turf areas shall be graded one and one half (1-1/2) inches below adjacent paved areas, sidewalks, valve boxes, headers, drains, etc. in order to receive sod.

3.5 FINISH LANDSCAPE GRADING OBSERVATION

A. Soil preparation: comply sixth SECTION 02905 - LANDSCAPE INSTALLATION prior to finish grading operations

B. Finish grade shall conform, after compaction, to shapes, spot elevations and contours as indicated on Drawings, with uniform levels or slopes between finish elevations or between finish elevations and existing elevations.

C. The Contractor is responsible to spread excess excavated soil material from plant pits in surrounding planting beds.

D. Fine grade topsoil in all planting areas eliminating rough and low areas to insure positive drainage, to a smooth, loose and uniform surface. Maintain levels, profiles and contours of sub-grades.

E. Remove stones, roots, grass, weeds, debris and other foreign material while spreading, in excess of one inch in diameter.

F. Shrub/ground cover planting areas shall be graded two and one-half (2-1/2) inches below adjacent paved areas, sidewalks, valve boxes, headers, drains, etc. in order to receive two (2) inch depth of mulch, establishing final grade one-half (1/2) inches below these surfaces

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SECTION 32 9300 - LANDSCAPE INSTALLATION

PART I - GENERAL

1.1 WORK INCLUDED

A. Furnish all labor, material, equipment and services necessary to provide all landscape work, complete in place, as indicated on Drawings and specified herein.

Work specified in this Section, but is not limited to the following:
1. Soil preparation
2. Root Barriers
3. Trees
4. Shrubs
5. Groundcover
6. Bulbs
7. Planting container backfill
8. Decomposed Granite
9. Mulches

B. Related Work Specified in Other Sections
1. 32 9115 Soil Preparation
2. 32 8400 Planting Irrigation
3. 32 9500 Landscape Maintenance

1.2 QUALITY ASSURANCE

A. Source Quality Control
1. Submit documentation to the Landscape Architect at least sixty (60) days prior to start of planting that all plant material has been ordered. Arrange procedure for observation of plant material with the Landscape Architect at time of submission.
2. Plants shall be subject to observation and approval of the Landscape Architect upon delivery for conformity to specifications. Such approval shall not impair the right of observation and rejection during progress of the work.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery
1. The Contractor, upon request by the Landscape Architect, shall provide receipts, delivery tickets, load tickets, etc. of all items delivered to the job site to verify products and total quantities.
2. Deliver fertilizer to site in original unopened containers bearing manufacturer's guaranteed chemical analysis, name trademark, and conformance to State Law.
3. Deliver plants with legible identification labels.
   a. Label trees, evergreens, bundles of containers of like shrubs, or ground cover plants.
   b. State correct plant name and size indicated on plant list.
   c. Use durable waterproof labels with water-resistant ink which will remain legible for at least sixty (60) days.

4. Protect plant material during delivery to prevent damage to root ball or desiccation of leaves.
5. The Contractor shall notify the Landscape Architect forty-eight (48) hours in advance of delivery of all plant materials for observation.

B. Storage
1. Store plant material in shade and protect from weather.
2. Maintain and protect plant material.

C. Handling
1. Do not drop plant materials.
2. Do not pick up container plant material by stems or trunks.

1.4 JOB CONDITIONS

A. Planting: Perform actual planting only when weather and soil conditions are suitable in accordance with locally accepted practice.

B. Scheduling: Install trees, shrubs, and ground cover plant material before lawn areas are installed and after irrigation system is operable.

C. Protect work and materials from damage due to construction operations by other contractors and trades and by vandalism. Maintain protection during installation and maintenance period.

1.5 SAMPLES AND TESTS

A. Provide one quarter cubic foot samples of wood chip, decomposed granite and crusher dust mulches to Landscape Architect for approval prior to installation.
B. The Landscape Architect reserves the right to take and analyze samples of materials for conformity to specifications at any time; the Contractor shall furnish samples upon request by Landscape Architect. Rejected materials shall be immediately removed from the site at the Contractor's expense. Cost of testing of materials not meeting specifications shall be paid by the Contractor.

1.6 GUARANTEE AND REPLACEMENT

A. Guarantee: All plant material and other materials installed under the Contract shall be guaranteed against any and all poor, inadequate or inferior materials and/or workmanship for a period of one (1) year. Any plant found to be dead or not in a satisfactory or healthy condition due to faulty materials, workmanship, or improper maintenance as determined by the Landscape Architect, shall be replaced by the Contractor at his expense.

B. Replacement: Any materials found to be dead, missing or not in a satisfactory or healthy condition during the maintenance period shall be replaced immediately. The Landscape Architect shall be the sole judge as to the condition of material. Material to

be replaced within the guarantee period shall be replaced by the Contractor within fifteen (15) days of written notification by the City's Representative. All replacement materials and installation shall comply with the Drawings and the Specifications.

PART 2 - PRODUCTS

2.1 GENERAL

All materials shall be of standard, approved and first-grade quality and shall be in prime condition when installed and accepted. Any commercially processed or packaged material shall be delivered to the site in the original unopened container bearing the manufacturer's guaranteed analysis. The Contractor shall supply the Landscape Architect with a sample of all supplied materials accompanied by analytical data from an approved laboratory source illustrating compliance of bearing the manufacturer's guaranteed analysis.

2.2 PRODUCTS

A. Soil Conditioner
   1. Gro-Power Plus: Humus (bacteria included based fertilizer and soil conditioner with soil penetrant shall consist of the following percents by weight:
      5 % nitrogen
      3 % phosphoric acid
      1 % potash
      50 % humus
      15 % humic acids

B. Soil Amendment and Fir Bark Mulch
   1. Nitrogen Stabilized Fir Bark Shavings: 0.56 to 0.84% N based on dry weight for fir bark mulch, treated with relative form of nitrogen (NH3).
      a. Particle Size: 95% - 100% passing 6.35 mm standard sieve.
         80% - 100% passing 2.33 mm standard sieve.
      b. Salinity: The saturation extract conductivity shall not exceed 3.5 millimeters/centimeter at 25 degrees (25°) centigrade as determined by saturation extract method.
      c. Iron Content: Minimum 0.08% dilute acid soluble Fe on dry weight basis.
      d. Ash: 0 - 6.0% (dry weight)
   2. Agricultural gypsum
      a. As per soils report recommendations

C. Fertilizer
   1. Planting Pit Fertilizer: Shall be Gro-Power Plus (bacteria included) with soil penetrant and shall consist of the following percents by weight:
      5% nitrogen
      3% phosphoric acid
      1% potash
      50% humus
      15% humic acid

2. Planting Tablets: Slow-release 21 gram tablets as manufactured by Agriform or approved equal, containing the following percentages of nutrients by weight:

20%	nitrogen
10%	phosphoric acid
5%	potash

D. Imported Soil
1. Imported soil shall be obtained from a source approved by the Landscape Architect.
2. Imported topsoil shall be of friable sandy-loam texture free of refuse, roots, heavy or stiff clay, rocks, sticks, brush or other deleterious materials. Topsoil acidity range (pH) shall be between 6.5 to 7.5 containing a minimum of 4% and a maximum of 25% organic matter. Topsoil shall be free of all noxious weeds. Topsoil samples and analysis shall be submitted to the Landscape Architect for approval prior to delivery of any soil to the project site. Should the Landscape Architect reject any portion of the delivered soil, for any reason, it shall be removed immediately at no cost to the Owner.
3. Topsoil, if rejected, shall be amended to meet specifications. Submit amended topsoil analysis to the City Urban Forester or the Landscape Architect for verification.
4. See also 32 9115 Soil Preparation.

E. Plant Material
1. The plant material indicated on the Drawings by the listed names shall conform to "Standard Plant Names", second edition, except for names not covered therein, the established customs of the nursery trade is followed. All plants shall be true to name, above one of each bundle or lot shall be tagged with the name and size of the plant, in accordance with the standards of practice recommended by the American Association of Nurserymen. All plant materials shall meet the specifications of Federal, State and County laws, requiring observation for plant diseases and insect infestations. Plants shall be symmetrical, typical for variety and species, sound, healthy, vigorous, free from plant diseases, insect pests or other eggs, and shall have healthy, normal root systems, while filling their containers, but not to the point of being root bound. Use only plant materials that are first class representative of the species and cultivars specifies and that conform to all State and local laws governing the sale, transportation and observation of plant materials. Plants shall have straight, single trunks, unless otherwise specified on the plans. Those specified to be multi-trunk shall have at least three (3) main leaders from the base. Any and all plants that have any encircling roots (not root bound) shall have root balls lightly slashed on a minimum of three (3) sides to stop encircling root growth. The height and spread of all plant materials shall be measured with branches in their normal position. Sizes of plants shall be as stated on the plant list, five and fifteen (5 & 15) gallon can container stock shall have been grown in that container not less than six (6) months, but shall not have been overgrown in the containers so as to have become root bound.
2. The size of the plants will correspond with that normally expected for species and variety of commercially available nursery stock or as specified in the Special Conditions or Drawings. The minimum acceptable size of all plants, measured

before pruning with the branches in normal position, shall conform with the measurements, if any, specified on the Drawings in the list of plants to be furnished. Plants larger in size than specified may be used with the approval of the Landscape Architect, but if the use of larger plants is approved, the ball of earth or spread of roots for each plant will be increased proportionally. Plant material shall conform to the following Specifications for container stock:

SHRUBS

SIZE	TYPE	EXAMPLE	HEIGHT	SPREAD	CALLIPER
1 Gal.	low growing	Agapanthus - etc.	8-10"	6-8"	
5 Gal.	low growing	Salvia gregii - etc.	15-18"	15-18"	
5 Gal.	tall growing	Dietes bicolor. etc,	24-30"	15-18	

TREES

5 Gal.	slow growing	Quercus - etc.	5-6'	12-18"	1/4 - 1/2"
5 Gal.	fast growing	Euc. - Prunus - etc.	6-7'	12-18"	1/2 - 3/4"
15 Gal.	slow growing	Quercus - Pyrus - etc.	7-8'	24-30"	3/4 - 1"
15 Gal.	fast growing	Euc. - Prunus - etc.	8-10'	30-36"	1- 1 1/4"
24" Box	slow growing	Quercus - Pyrus - etc.	8-10'	3-4'	1 1/2-1 3/4"
24" Box	fast growing	Euc. - Prunus - etc.	10-12'	4-5'	1 3/4-2 1/2
30" Box	slow growing	Quercus - Pyrus - etc.	12-14'	6-7'	2 1/2 - 3"
30" Box	fast growing	Euc. - Prunus - etc.	12-14'	6-7'	2 1/2 - 3"
36" Box	slow growing	Quercus - Pyrus - etc.	14-16'	8-10'	2 1/2 - 3"
36" Box	fast growing	Euc. - Prunus - etc.	14-16'	8-10'	2 1/2 - 3"
36" Box	fast growing	Euc.- Prunus - etc.	14-16'	8-10'	2 1/2 - 3"

3. All plants not conforming to the requirements herein specified, shall be considered defective and such plants, whether in place or not, shall be marked as rejected and immediately removed from the site of the work and replaced with new plants at the Contractor's expense. The plants shall be of the species, variety, size and condition specified herein or as shown on the Drawings. Under no conditions will there be any substitution of plants or sizes listed on the plans, except with the expressed written approval of the Landscape Architect.
4. At no time shall trees or plant materials be pruned, trimmed or topped prior to delivery and any alteration of their shape shall be conducted only with the approval and when in the presence of the Landscape Architect and/or as noted on the Planting Specifications.
5. Nursery Grown and Collected Stock
   a. Plant materials shall conform with the best edition of ANSI Z60.1-1986 American Standard for Nursery Stock.
   b. Grown under climatic conditions similar to those in locality of project.
   c. Container-grown stock in vigorous, healthy condition, not root bound or with root system hardened off.
   d. Use only liner stock plant material which is well established in removable containers or formed homogeneous soil sections.

6. Ground Cover: Ground cover plants shall be grown in flats, peat pots, or taken as cuttings, as indicated on the plans. Flat grown plants (rooted cuttings) shall remain in those flats until trans-planting. The flat's soil shall contain sufficient moisture so that it will not fall apart when lifting the plants. If plants from peat pots are used, the pots shall be protected at all times prior to planting to prevent unnecessary drying of the rootball.

F. Mulches
1. Wood chip mulch shall be chipped trees branches and tree trunks, particle range of between ½" to ¾" in diameter by 2" to 4" long, free of chipped diseased trees. Colored or dyed wood products are not acceptable.
2. Decomposed granite mulch shall be 1/8 inch minus, gold brown in color.
3. Crusher dust shall be ¼ chipped rock gray in color, non graded, Stony Creek , Hamilton City or equal.
3. Nitrogen stabilized fir bark mulch per PART 2 PRODUCTS, Section A., Paragraph number 1.

G. Pre-emergent - Pre-emergent, Ronstar or approved equal, prevent weed development in planter areas.

H. Weed Control - Pre-emergent herbicide ronstar or equal.

I. Tree Staking Material
1. Stakes for Tree Suppor
Wood Tree Stakes- Lodge pole pine stakes full-length untreated. Minimum nominal size: two (2) inches in diameter x ten feet (2" x 10') long and pointed at one (1) end (adjust length to fit tree). Stakes shall be free from knots, checks, splits, or disfigurements.
2. Ties
32" length cinch tie as manufactured by V.I.T. Company,
1-714-871-2309 or approved equal.

J. Decomposed Granite
"Californian Gold" decomposed granite, #4 sieve minus, available from Felton Quarry 1-831-335-3445 or approved equal.

K. Root Barrier
By Deep Root Corp. model numbers LB-12-2 and LB-18-3 or approved equal.

L. Miscellaneous Materials
1. Sand: wash river sand or equal.
2. Tree wound paint: as approved. Morrison Tree Seal, Cabot Tree Paint, or approved equal.

PART 3 - EXECUTION

3.1 OBSERVATION

A. Landscape Architect to verify that topsoil has been imported, and final grades have been established prior to beginning planting operations. Landscape Architect to observe, trees and shrub stock plant material for injury, insect infestation and improper pruning. Do not begin planting of trees until deficiencies are corrected or plants replaced.

3.2 LAYOUT OF PLANTING AREAS

A. Stake or mark all locations for plants and outline of planting beds on ground. Do not begin excavation until plant locations and plant beds are acceptable to the Owner, the irrigation system shall be operational and approved prior to planting.

B. If an underground construction or utility line is discovered prior to work, other locations for planting may be selected by the Owner.

3.3 FINISH GRADE

A. Finished grading shall be complete prior to plant installation, conform to **SOIL PREPARATION** specification.

3.4 PLANT INSTALLATION

A. General
1. Actual planting shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted practice, as approved by the Owner.
2. Only as many plants as can be planted and watered on that same day shall be distributed in a planting area.
3. Container shall be opened and plants shall be removed in such a manner that the ball of earth surrounding the roots is not broken and they shall be planted and watered as herein specified immediately after removal from the containers. Containers shall not be opened prior to placing the plants in the planting area.

B. Preparation of planting areas:
1. After approximate finished grades have been established, soil shall be conditioned and fertilized according to the Horticultural Report. See section 32 9115 Soil Preparation for more information.
2. All soil areas shall be compacted and settled by application of heavy irrigation to a minimum depth of twelve (12) inches.
3. At time of planting, the top six (6) inches of all areas to be planted shall be free of stones, stumps, or other deleterious matter one (1) inch in diameter or larger, and shall be free from all wire plaster, or similar objects that would be a hindrance to planting and maintenance. All rock larger than 1 inch to be removed by mechanical means, either by sieve for loose rock and by heavy equipment if solid bedrock.

C. Planting of Trees and Shrubs
   1. Excavation for planting shall include the stripping and stocking of all acceptable topsoil encountered within the areas to be excavated for trenches, tree holes, plant pits and planting beds. Excess soil generated from the planting holes and not used as backfill or in establishing the final grades shall be removed from the site.
   2. Shape
      a. Vertical sides and flat bottom.
      b. Plant pits to be square for box material, circular for canned material.
      c. Scarify sides and bottom of each pit.
   3. Protect all areas from excessive compaction when trucking plants or other materials to planting site.
   4. Can Removal
      a. Cut cans on two (2) sides with an acceptable can cutter.
      b. Do not injure the rootball.
      c. Do not cut cans with spade or ax.
      d. Carefully remove plants without injury or damage to rootball.
      e. After removing plant, superficially cut edge roots with knife on three (3) sides.
   5. Box Removal
      a. Remove bottom of plant boxes before planting.
      b. Remove sides of box without damage to root ball after positioning plant and partially backfilling.
   6. Center plant in pit.
   7. Face plants with fullest growth into prevailing wind.
   8. Set plant plumb and hold rigidly in position until soil has been tamped firmly around ball roots.
   9. Remainder of planting pit shall be backfilled with:
      a. One (1) parts import top soil or approved on-site soil per landscape grading specification.
      b. One (1) parts nitrogen stabilized fir bark shavings.
      c. Eighteen (18) pounds Gro-Power Plus planting pit fertilizer per cubic yard of mix.
      d. Specified type and quantity of planting tablets
   10. All plants which settle shall be raised to the correct level. After the plant has been placed, additional backfill shall be added to the hole to cover approximately one-half (1/2) of the height of the root ball. Water shall be added to the top of the partly filled hole to thoroughly saturate the root ball and adjacent soil.
   11. After the water has completely drained, planting tablets shall be placed adjacent to but not in contact with root ball.
      a. One (1) tablet per 1-gallon container
      b. Two (2) tablets per 5-gallon container
      c. Three (3) tablets per 15-gallon container
   12. After backfilling, an earthen basin shall be constructed around each plant. Each basin shall be of a depth sufficient to hold at least two (2) inches of water. Basin shall be of a size suitable for the individual plant. In no case shall the basin for fifteen (15) gallon plant be less than four (4) feet in diameter; a five (5) gallon plant less than three (3) feet in diameter. The basins shall be constructed of amended backfill materials, and shall not be constructed for trees in turf areas.

13. Pruning - Pruning of trees shall be limited to the minimum necessary to remove injured twigs and branches and to compensate for loss of roots during transplanting, but never to exceed one-third (1/3) of the branching structure. Upon approval of the City, pruning may be done before delivery of plant, but not before plants have been observed and approved. Prune as per specifications Landscape Maintenance Section 30 9500.
14. Staking
    a. Staking of all trees shall conform to tree staking details.
    b. One (1) tree shall be staked and approved by the City prior to continued staking.

D. Planting of Ground Cover
1. Ground cover shall be planted in straight rows and evenly spaced, unless otherwise noted, and at intervals called out in the Drawings. Triangular spacing shall be used unless otherwise noted on the Drawing.
2. Each rooted plant shall be planted with its proportionate amount of flat soil or in a peat pot in a manner that will insure minimum disturbance of the root system, but in no case shall this depth be less than two (2) nodes. To avoid drying out, planting shall be immediately irrigated after planting until the entire area is soaked to the full depth of each hole, unless otherwise noted on the Drawing.
3. Care shall be exercised at all times to protect the plants after planting. Any damage to plants by trampling or other operations of this Contract shall be repaired immediately.

3.5 MULCH COVER

A. All planting areas shall be top dressed with a 2 inch layer of decomposed granite, as measured after settling.

B. Crusher dust mulch and decomposed granite mulch shall be settled by thorough application of water applied from above and not to exceed infiltration rate. Do not compact by mechanical means and do not exceed 85% relative density. Do not compact soil grade beneath mulch by more than 85%relative density.

3.6 WEED CONTROL

A. Apply weed control to all planting and decomposed granite areas with the exception of landscape medians. Do not apply pre-emergent to medians. Apply weed control after completion of all planting and prior to installation of mulches.

B. Hand water to dissolve herbicide per manufacturer’s specifications.

C. Apply as per manufacturer's specifications.

3.7 OBSERVATION SCHEDULE

A. The Contractor shall be responsible for notifying the Landscape Architect in advance for the following observations according to the time indicated:
1. Pre-construction conference - 7 days.
2. Finish grade review - 48 hours.

3. Plant material review - 48 hours.
4. Soil preparation, plant layout, and planting operations. One (1) tree with each type of specified shall be approved prior to planting of trees - 48 hours.
5. End of landscape installation - 48 hours.
6. End of landscape maintenance/Final Acceptance - 48 hours

B. No site visits shall commence without all items noted in previous Observation Reports, either completed or remedied, unless such compliance has been waived. Failure to accomplish punch list tasks or prepare adequately for desired observations shall make the Contractor responsible for reimbursing the City's Representative or Landscape Architect at his current billing rates per hour, plus transportation costs.

3.8 CLEAN UP

After all planting operations have been completed; remove all trash, excess soil, empty plant containers or rubbish from the property. All scars, ruts or other marks in the ground caused by this work shall be repaired and the ground left in a neat and orderly condition throughout the site. The Contractor shall pick-up all trash resulting from this work no less frequently than at the end of each day. All trash shall be removed completely from the site. The Contractor shall leave the site area broom-clean and shall wash down all paved areas within the Contract area, leaving the premises in a clean condition acceptable to the City.

3.9 LANDSCAPE MAINTENANCE

Provide Landscape Maintenance as per
LANDSCAPE MAINTENANCE – SECTION 32 9500

END OF SECTION

SECTION 32 9500 - LANDSCAPE MAINTENANCE

PART 1 - GENERAL

1.01 CONDITIONS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

1.02 SCOPE OF WORK

A. Furnish all labor, material, equipment and services required to maintain landscape in a healthy growing condition and in a neat and attractive appearance throughout the maintenance period.

B. Related Sections:
   1. Planting Irrigation Section 32 8400
   2. Landscape Installation Section 32 9300

1.03 QUALITY ASSURANCE

The Maintenance Contractor shall be experienced in horticulture and landscape maintenance, practices and techniques, and shall provide sufficient number of workers with adequate equipment to perform the work during the maintenance period.

1.04 MAINTENANCE PERIOD

A. Continuously maintain the entire project area during the progress of the work and during the sixty (60) calendar-day, maintenance period or until final acceptance of the project by the Landscape Architect.

B. Sections of the project may begin the maintenance period before others if project schedule is divided into thirds or an alternate schedule that is accepted by the Architect. A prime requirement is that lawn and landscape areas shall be planted and that lawn areas shall show an even, healthy stand of grass seedlings or sod, either of which shall have been mown twice. If such criteria are met to the satisfaction of the Landscape Architect, a written notification shall be issued to establish the effective beginning date of maintenance period for each section of the project.

C. Any day of improper maintenance, as determined by the Landscape Architect, shall not be credited as an acceptable maintenance period day. The maintenance period shall be extended on a daily basis if the work is not in accordance to the Plans and Specifications. Project shall not be segmented into maintenance areas or phases, unless authorization of the Landscape Architect is obtained.

D. Maintenance shall continue beyond the sixty (60) day maintenance period, as required, until final acceptance is given by the Landscape Architect.

1.05 GUARANTEE AND REPLACEMENT

A. Guarantee: All plant material and other materials installed under the Contract shall be guaranteed for one (1) year from time of final acceptance against any and all poor, inadequate or inferior materials and/or workmanship or improper maintenance, as determined by the Landscape Architect, shall be replaced by the Contractor at his expense.

B. Replacement: Any materials found to be dead, missing, or not in a satisfactory or healthy condition during the maintenance period shall be replaced immediately. The Landscape Architect shall be sole judge as to the condition of material. Material to be replaced within the guarantee period shall be replaced by the Contractor within five (5) days of written notification by the Landscape Architect. All replacement materials and installations shall comply to the Plans and Specifications. Any plant missing due to suspected theft shall be replaced by the Contractor. If the Contractor suspects that theft may be a problem, the Contractor shall provide written documentation to the Landscape Architect that security on this site needs to be intensified. The Contractor may relieve himself of theft responsibility if after the security notice, with no result, a written notice to the Landscape Architect shall be given that plant material will not be replaced for theft or vandalism due to lack of site security being maintained. This procedure may take place only during the Landscape Maintenance Period.

1.06 OBSERVATION SCHEDULE

Normal progress observations shall be requested by the Contractor from the Landscape Architect as per observations listed in specifications Plants Section 32 9300

1.07 FINAL ACCEPTANCE OF THE PROJECT

A. Upon completion of all project work, including maintenance period, the Landscape Architect will, upon proper request, make an observation to determine final project acceptability.

B. Where observed work does not comply with the Plans and Specifications, replace rejected work and continue specified maintenance period until re-inspected by the Landscape Architect and determined to be acceptable. All replacement materials and installations shall be in accordance with the Plans and Specifications. Remove rejected work and materials immediately from project. Prior to the date of final observation, Contractor shall provide the Owner with all Record Drawings and written Guarantee Statement in accordance with the Plans and Specifications.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All materials used shall either conform to Specifications in other sections or shall otherwise be acceptable to the Landscape Architect. The Landscape Architect shall be given a monthly record of all herbicides, insecticides and disease control chemicals used.

B. Turf maintenance fertilizer: shall consist of the following percents by weight:
16% nitrogen
6% phosphoric acid
8% potash

PART 3 - EXECUTION

3.01 MAINTENANCE

A. General: Proper maintenance, including watering, weeding, mowing, edging, fertilization, repairing and protection shall be required until entire project is finally accepted, but in any event for a period of not less than the specified maintenance period after planting.

B. Watering: Thoroughly water to insure vigorous and healthy growth until work is accepted. Water in a manner to prevent erosion due to application of excessive quantities of water. When hand watering use a water wand to break the water force.

C. Weeding: Keep plant basins and areas between plants free of weeds. Control weeds with pre-emergent herbicides. If weeds develop, use legally approved herbicides. Avoid frequent soil cultivation that destroys shallow roots. Weeding also shall be included in all paved areas including public or private sidewalks.

D. Pruning
1. Trees: Prune trees to select and develop permanent scaffold branches; to eliminate narrow V-shaped branch forks that lack strength; to reduce toppling and wind damage by thinning out crowns; to maintain a natural appearance and to balance crown with roots. Prune only as directed by the Landscape Architect.
2. Shrubs: Same objectives as for trees. Shrubs shall not be clipped into balled boxed forms unless such is required by the landscape plans. All pruning cuts shall be made to lateral branches, buds or flush with the trunk. "Stubbing" and "heading" shall not be permitted.
3. Only skilled workmen shall perform pruning work in accordance with standard horticultural pruning practices. Remove from the project all pruned branches and material. Remove and replace any plant material excessively pruned or malformed resulting from improper pruning practices at no additional costs to the Owner.

E. Staking and Guying: Stakes and guys shall remain in place through the guarantee period (one year) and shall be inspected and adjusted to prevent rubbing that causes bark wounds.

F. Insect, Animal, Rodent and Disease Control: Maintain proper control with legally approved materials as required as part of the Contract.

G. Protection: The Contractor shall maintain protection of the planted areas. Damaged areas shall be repaired or replaced at the Contractor's expense.

H. Trash: Remove trash weekly in all planted areas, pedestrian walkways and plazas.

I. Replacement: As per Guarantee and Replacement Specifications of this Section.

3.02 IRRIGATION SYSTEM

A. System Observation: The Contractor shall check all systems for proper operation. Lateral lines shall be flushed out after removing the last sprinkler head or two at each end of the lateral. All heads are to be adjusted as necessary for unimpeded coverage.

B. Controllers: Set and program automatic controllers for seasonal water requirements. Give the Town's representative instructions on how to turn off system in case of emergency.

C. Repairs: Repair all damages to irrigation system at the Contractor's expense. Repairs shall be made within twenty-four (24) hours.

END OF SECTION

SECTION 33 11 00 - WATER UTILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section includes: The Contractor shall provide all materials, equipment, and labor necessary to furnish and install all potable and fire water pressure pipe with all necessary fittings and coupling systems and all appurtenant work, complete and operable, including all connections as shown on the Drawings and as specified herein.

B. All fire and water distribution materials, equipment and installation within California Water Service Company easements shall be in accordance with the California Water Service Company Standards and approved construction drawings.
   1. All facilities to be installed under a California Water Service Company subdivider installation agreement must be installed by a contractor approved by California Water Service Company and no part of the work may be sublet without the approval of the California Water Service Company.

C. Section includes:
   1. Water Main Piping
   2. Gate Valves
   3. Underground Warning Tape
   4. Couplings
   5. Bolts and Nuts for Underground Piping and Valves
   6. Bolts and Nuts for Aboveground Piping and Valves
   7. Restrained Joints for PVC Piping
   8. Service Saddles
   9. Tapping Sleeves
   10. Corporation Stops
   11. Angle Meter Ball Valves/Curb Stops
   12. Service Piping and Fittings
   13. Service Elbows
   14. Valve and Water Meter boxes
   15. Pipe Sleeves
   16. Underground Pipe Markers
   17. Tracer Wire
   18. Hydrants, Hydrant Piping and Appurtenances
   19. Water Meters
   20. Back Flow Prevention Assembly
   21. Double-Detector Check Valve

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Division 1 - General Requirements.

B. Section 03 30 00, CAST-IN-PLACE CONCRETE.

C. Section 21 05 00, COMMON WORK RESULTS FOR FIRE SUPPRESSION.

D. Section 22 05 00, COMMON WORK RESULTS FOR PLUMBING.

E. Section 31 01 40, SHORING AND TRENCH SAFETY.

F. Section 31 23 00, TRENCH EXCAVATION AND BACKFILL.

G. Section 31 23 19, DEWATERING.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. American Public Works Association (APWA)
1. Uniform Color Code for Marking of Underground Utility Locations.

B. American Society of Testing and Materials (ASTM)
1. ASTM A193 – Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications
2. ASTM A194 – Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
3. ASTM A536 – Standard Specification for Ductile Iron Castings
4. ASTM D2737 – Standard Specification for Polyethylene (PE) Plastic Tubing
5. ASTM F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

C. American Water Works Association (AWWA)
1. AWWA C104 – Standard for Cement–Mortar Lining for Ductile-Iron Pipe and Fittings
2. AWWA C105 – Polyethylene Encasement for Ductile-Iron Pipe Systems
3. AWWA C110 – AWWA Standard for Ductile-Iron and Gray-Iron Fittings
4. AWWA C111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
5. AWWA C153 – Standard for Ductile-Iron Compact Fittings for Water Service
6. AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service
7. AWWA C550 – Protective Interior Coatings for Valves and Hydrants
8. AWWA C600 – Installation of Ductile Iron Water Mains and their Appurtenances.
9. AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
10. AWWA C900 – AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution
11. AWWA C901 – Standard for Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13 mm) through 3 In. (76 mm), for Water Service – PE material designations PE 2708, PE 3608, and PE 4710.

1.4 QUALITY ASSURANCE

A. Standards: The materials and work performed in this Section shall conform to the applicable standards of:
1. The American National Standards Institute (ANSI).
2. The American Society for Testing and Materials (ASTM).
3. American Water Works Association Inc. (AWWA).
4. The American Society of Mechanical Engineers, Boiler and Pressure Vessel Code (ASME).
5. Plumbing and Drainage Institute (PDI).

6. Underwriters Laboratories Inc. (UL).
7. Uniform Plumbing Code (UPC).
8. National Fire Protection Association (NFPA).
9. Factory Mutual Research Corporation (FMRC).

B. Tests: All materials used in the manufacture of the pipe shall be tested in accordance with the requirements of the California Water Service Company, and the referenced standards, as applicable, in addition to national, local, and state codes.

C. All work between the water main connections in Huss Lane and Aztec Drive up to and including the fire hydrant, water meter and box, and double detector check will be subject to inspection by and approval of the California Water Service Company. The Contractor shall be responsible for all work required for compliance with California Water Service Company requirements and inspections.

D. Contractor shall coordinate with and provide a minimum 48 hour notice to the California Water Service Company for all inspections.

E. All costs of inspection and tests shall be borne by the Contractor.

F. The pipe shall be subjected to the specified hydrostatic strength tests, flexure tests, and crushing tests. The crushing tests shall be made on samples taken from the center of full-length sections of pipe.

G. The Contractor shall verify with the pipe manufacturer all connection details.

H. Qualification of manufacturers:
   1. The material shall be the product of a supplier regularly engaged in the manufacturing of pipe and plumbing products.
   2. All materials shall be new and of current manufacture and shall be guaranteed against defects or workmanship in accordance with the General Conditions.

I. Qualification of installers:
   1. For the actual assembly, installation, and testing of the work in this Section, use only thoroughly trained and experienced personnel who are completely familiar with the requirements for this work and with the installation recommendations of the manufacturers of the specified items.
   2. In acceptance or rejection of installed materials, no allowance will be made for lack of skill on the part of installers.

1.5 CONTRACTOR SUBMITTALS

A. Submit all product data, materials, shop drawings, laboratory test results, material source information, and certificates of compliance listed in this Section under a single submittal cover for review. Incomplete submittals will not be reviewed.

B. Submittals shall be in accordance with Section 01 33 00, SUBMITTAL PROCEDURES. Submit complete shop drawings including layouts, elevations, and details to the Engineer.

C. Material List:
1. In accordance with the provisions of Section 01 33 00, SUBMITTAL PROCEDURES of the Specifications, submit with the shop drawings a complete list of all materials and equipment proposed to be furnished and installed under this portion of the work, giving manufacturer's name, catalog number, and catalog cuts for each item where applicable.

D. Manufacturer's recommendations:
1. Accompanying the materials list and shop drawings, submit four copies of the manufacturer's current recommended method of installation.

E. Certificates of Compliance: Certificates of Compliance shall be provided for all products and materials proposed to be used under this Section.

1.6 COORDINATION

A. Section 01 31 00, PROJECT MANAGEMENT AND COORDINATION: Coordination and project conditions.

B. Coordinate the Work with termination of water connection outside building, trenching, connection to municipal water system, and off-site improvements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Coated pipe shall be shipped on bunks, and secured with nylon belt tied down straps or padded banding located approximately over braces. Coated pipe shall be stored on padded skids, sand or dirt berms, sand bags, old tires or other suitable means so that coating will not be damaged. Coated pipe shall be handled with the wide belt slings, padded forks, or other means that will not damage the pipe or coating. Chains, cables or other equipment likely to cause damage to the pipe or coating shall not be used. Prior to shipment, the pipe shall be visually inspected for damage to the coating. Any damaged areas shall be repaired at the Contractor’s expense in accordance with the standard to which the coating was applied.

B. Deliver and store valves and other appurtenances in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 GENERAL

A. These Specifications are intended to be standard specifications and they may therefore contain specifications for materials not required for this project or allowed on any or various parts of it. Certain materials, which are applicable for only one portion or a small portion, may be shown on the plans and not particularly specified herein.

B. All materials shall conform to sizes, capacity, quality and quantities as shown on the drawings or described in these Specifications. Materials shall be from new stock, delivered in good condition. No damage to stock shall be used.

C. Where no method of tests for materials is specified, the latest applicable test specified by ASTM shall be followed.

D. After delivery to the site, all materials shall be carefully unloaded, protected against breakage, rusting, accumulation of foreign matter, disintegration, and injury. The Contractor shall be responsible for all lost or damaged material supplied and work done under this contract.

2.2 WATER MAIN PIPING

A. Polyvinyl Chloride (PVC) Pipe:
   1. Size: 2-inch to 8-inch.
   2. Pipe: AWWA C900, DR 25, Pressure Class 165.
   3. Fittings: Ductile iron, AWWA C110. Compact fittings AWWA C153.
      a. Coating and Lining:
         1) Bituminous Coating: AWWA C110.
         2) Cement Mortar Lining: AWWA C104, double thickness.
         3) Jackets: AWWA C105 polyethylene jacket.
   4. Joints:
      a. Mechanical and Push-On Joints: AWWA C111.
      b. Flanged Joints: AWWA C115.
      c. Restrained Joints: Boltless, push-on type, joint restraint independent of joint seal.
      d. Jackets: AWWA C105 polyethylene jacket.

B. Ductile Iron Pipe (DIP):
   1. Ductile Iron Pipe shall be used at all locations where minimum required pipe cover is not achieved or achievable.
   2. Provide ductile iron pipe conforming to the requirements of ANSI/AWWA C151/A21.51, Pressure Class 350 for Pipe 4 inches through 12 inches in diameter, with cement mortar lining interior in accordance with ANSI/AWWA C104, exterior asphaltic coating on direct-buried pipe in accordance with ANSI/AWWA C151/A21.51. All ductile iron pipe and fittings shall have mechanical joints.
      a. Manufacturer:
         1) U.S. Pipe
         2) American Cast Iron Pipe Co
         3) Approved equivalent.
   3. Supply pipe in lengths not in excess of a nominal 20 feet with rubber ring type push-on gasketed joints.
   4. Provide a polyethylene encasement around all direct-buried pipe, fittings, and valves. The material, installation and workmanship shall conform to applicable sections of AWWA C105. Make provisions to keep the polyethylene from direct exposure to sunlight prior to installation. Backfill following installation without delay to avoid exposure to sunlight.
   5. Pipe and fittings exposed to view in the finished work, including inside utility vaults and chase are to be painted. Pipe shall not receive the standard tar or asphalt coat on the outside surfaces but shall be shop primed on the outside with one coat of Kop-Coat No. 621 Rust Inhibitive Primer or equal. Paint color shall match the wall color.
   6. All Pipe Fittings: Ductile iron with a minimum pressure rating of 350 psi. All ductile iron pipe fittings shall meet the requirements of ANSI/AWWA C153/A21.53 or ANSI/AWWA C110/A21.10 specifications as applicable. Rubber gasket joints shall conform to AWWA C111.
   7. Provide cement mortar lining on the inside of the pipe and fittings in accordance with ANSI/AWWA C104. Provide standard asphaltic coating on the exterior of the direct buried

pipe, and 10 mil fusion bonded epoxy coating in accordance with AWWA C550 on the exterior of all buried fittings.

8. Provide a factory hydrostatic test of not less than 500 psi for all pipe in accordance with AWWA C151.

2.3 GATE VALVES

A. Size: 2-inch to 8-inch.

B. Manufacturers:
1. Mueller Company
2. Clow Eddy - Iowa
3. American Flow Control
4. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

C. Resilient Wedge Gate Valves: AWWA C509.
1. Body Material: ductile iron.
2. Working Pressure: 250psig.
3. Seat: Resilient.
4. Stem: Non-rising bronze stem.
5. Operating Nut: 2-inch square; open counterclockwise unless otherwise indicated.
6. Ends: Flanged, mechanical joint or bell end connections. Push-on ends suitable with ductile iron, cast iron or C900 PVC
7. Coating: AWWA C550; interior/exterior.
8. Bolting: 316 stainless steel

2.4 COUPLINGS

A. Restrained Coupling
1. Type: AWWA C219, NSF 61 listed.
2. Body: Ductile Iron; ASTM A536
3. Bolts: 316 stainless steel.
4. Coating: AWWA C550; interior/exterior.
5. Pressure rating: meet or exceed adjacent piping system rating.
6. System compatible with connecting pipe; verify connecting pipe O.D.

B. Restrained Flange Adaptor
1. System: restrain plain end of pipe to a flange, conforming to AWWA C110.
2. Body: Ductile Iron; ASTM A536
3. Bolts: 316 stainless steel,
4. Coating: AWWA C550; interior/exterior.
5. Pressure rating: meet or exceed adjacent piping system rating.
6. System compatible with connecting pipe; verify connecting pipe O.D.

2.5 BOLTS FOR UNDERGROUND PIPING AND VALVES

A. Bolts: 316 stainless steel; ASTM A193, Grade 138M hex head with

B. Nuts: 316 stainless steel; ASTM A194, Grade 8M hex nuts.

C. Plastic washers and sleeves for dielectric joints shall be provided.

D. All nuts and bolts shall have a fluoropolymer coating. Fluoropolymer coating for bolts and nuts shall be applied at a nominal thickness of 1 mil. and baked on. Coating shall have a minimum kinetic friction coefficient of 0.08.

E. Manufacturer:
1. Coating shall be Tripac 2000 Blue Coating System, or approved equivalent.

2.6 BOLTS FOR ABOVEGROUND PIPING AND VALVES

A. Bolts for exposed flanged ductile iron pipe joints shall be either silicon bronze bolts and nuts or 304 stainless steel bolting with the heavy duty stainless steel nuts (only).

B. All nuts and bolts shall have a fluoropolymer coating. Fluoropolymer coating for bolts and nuts shall be applied at a nominal thickness of 1 mil. and baked on. Coating shall have a minimum kinetic friction coefficient of 0.08.

C. Manufacutere:
1. Coating shall be Tripac 2000 Blue Coating System, or approved equivalent.

2.7 RESTRAINED JOINTS FOR PVC PIPING

A. Manufacturer:
1. EBAA Iron – Series 1600 or 2000PV.
2. Smith-Blair – Cam-Lok, 120 Series.
3. Romac Industries, Inc. – Romagrip, 600 Series.
4. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

B. Materials: ductile iron, ASTM A536.

C. Coating: MEGA-BOND or approved equivalent.

D. Pressure rating: minimum working pressure rating equivalent to the pipe.

2.8 SERVICE SADDLES

A. Materials: Bronze and stainless steel nylon coated of the double strap type.

B. Saddle shall be stamped for use with ductile iron or PVC pipe.

C. Manufacturer:
1. Mueller BR2B or BR2S.
2. Romac 202N.
3. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

2.9 TAPPING SLEEVES

A. Material: Cast Iron Stainless steel

B. Sleeve must be compatible with pipe type.

C. Manufacturers:
1. Dresser: Style 630.
2. Ford: FTSS
3. JMC: 415, 432
4. Mueler: H-615, H-616 or H-667
5. American Flow Control: MJ Split Tapping Sleeve
6. Smith-Blair: 664-665
7. APAC Tapping Sleeve
8. Clow Corp: MJ, F-5093 or F-5205
9. M&H Valve and Fitting Co.: Catalog 52, Style 974
10. U.S. Pipe: Smith Dual Compression Seal Tapping Sleeve.
11. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

2.10 CORPORATION STOPS

A. Manufacturer:
1. Mueller B-25008.
2. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

2.11 CURB STOPS

A. Manufacturer: Mueller B-24286.

B. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

2.12 ANGLE METER STOP

A. Materials: Bronze conforming to AWWA C800 and ASTM B62.

B. Pressure Rating: 300 psig.

C. Ball: PTFE coated.

D. Accessories: A PE pack joint inlet and a lockwing shall be provided on the top of the fitting to operate the shutoff mechanism.

E. Manufacturers:
1. James Jones J-1527.
2. Ford KV-63342W.
3. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

2.13 SERVICE PIPING AND FITTINGS

A. Piping Material: Polyethylene ANSI/AWWA C901-02 – Pressure Class 160

B. Size: 2-inch CTS.

2.14 SERVICE ELBOW

A. Manufacturer: Mueller H 15533.

B. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

C. Size: 2-inch CTS.

2.15 PIPE EMBEDMENT MATERIAL

A. Unless otherwise specified or shown, all material used for pipe embedment shall be as specified in Section 31 23 00, TRENCH EXCAVATION AND BACKFILL.

2.16 VALVE AND WATER METER BOXES

A. General:
   1. Box: Concrete
   2. Lid:
      a. Reinforced concrete
      b. Composite material containing polyester resin, fiberglass and calcium carbonate.
      c. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

B. Valve boxes:
   1. Manufacturer: Oldcastle Precast Model F08.
   2. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

C. Water meter boxes:
   1. Manufacturer: Oldcastle Precast.
   2. Size: As required to provide 6 inches clear around meter or other appurtenance.
   3. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

2.17 PIPE SLEEVES

A. Ductile iron or zinc coated steel.

2.18 UNDERGROUND PIPE MARKERS

A. Detectable pipe locating tape with magnetic conductor:
   1. Dimensions: minimum 6 inches wide by 4 mils thick
   2. Tape shall have a minimum strength of 1,500 pounds per square inch (psi) lengthwise and 1,250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.
   3. Service: direct burial.
   4. Tape color: APWA Uniform Color Code for Marking of Underground Utility Locations; “Safety Precaution Blue” bright colored.
   5. Lettering: minimum of 2 1-inch high permanent black lettering imprinted continuously with “Caution Water Line Buried Below” over the entire length.

6. Manufacturers:
   a. Reef Industries: Terra “D”
   b. Allen Systems: Detectatape
   c. Substitutions: 01 25 00, SUBSTITUTION PROCEDURES.

2.19 TRACER WIRE

A. Manufacturers:
   1. Pro-Line
   2. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

B. Characteristics:
   1. Type: Insulated Copper, THWN
   2. Gage: No. 10
   3. Materials: Copper conductor, PVC insulation, nylon jacket.

2.20 HYDRANTS, HYDRANT PIPING AND APPURTENANCES

A. Fire Hydrant: Clow 960 with one (1) 4” outlet and two (2) 2.5” outlets.

B. Hydrant Break-Off Check Valve Assembly:
   1. Clow #40
   2. Long Beach LB400
   3. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

C. Coatings:
   1. Benjamin Moore & Co., DTM Acrylic Gloss Enamel, M28.
   2. Kelly Moore, DTM Acrylic Gloss Enamel, 5780.
   3. Sherwin Williams DTM Acrylic Coatings, B66-100.
   4. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

2.21 WATER METER

A. Size: 1 to 2 inch.

B. Material: Cast Bronze.

C. Accessories: Strainer.

D. Gage: Gallons

E. Manufacturer: BadgerMeter, Inc.

F. Model: Recordall Model 25.

G. Substitutions: Require approval of the Engineer.

2.22 BACK FLOW PREVENTION ASSEMBLY

A. Potable and Irrigation Water Service: Reduced Pressure Principle Type AWWA C511, except pressure drop at rated flow shall not exceed 15 psi. Gate valves installed on the assembly shall be resilient seated valve conforming to AWWA C509.

2.23 REDUCED PRESSURE BACKFLOW DEVICE

A. Reduced pressure backflow prevention devices for installation on water service lines for commercial fire sprinkler systems shall be of the reduced pressure principal type approved for potable water applications. Reduced pressure principal devices shall be from the “List Of Approved Back-Flow Prevention Devices” (latest revision) by the University of Southern California Foundation For Cross-Connection Control and Hydraulic Research, and approved by the Engineer.

B. Reduced pressure backflow devices shall be approved by the Foundation for Cross-Connection Control and Hydraulic Research per current edition of the Manual of Cross-Connection Control.

C. Reduced pressure backflow devices shall not be located in any area containing fumes that are toxic, poisonous or corrosive.

D. Direct connections between potable water piping and sewer connected wastes shall not exist under any condition with or without backflow protection.

E. Reduced pressure backflow devices shall be accessed and have clearance for the required testing, maintenance and repair. Access and clearance shall require a minimum of one (1) foot between the lowest portion of the assembly and grade, floor or platform. Installations elevated more than five (5) feet above the floor or grade shall be provided with a permanent platform capable of supporting a tester or maintenance person.

F. Provide lockable screen and insulation jacket.

G. Testing
   1. Valves shall be given a hydrostatic and seat test at the full rated working pressure and a hydrostatic shell test at twice the rated working pressure with the test results being certified. Certified copies of Proof-of-Design test reports shall be furnished as outlined in AWWA C-504-87 Section 5.2.4. In lieu of testing the valves at an independent testing laboratory, proof-of-design testing may be performed at the valve manufacturer's laboratory, but must be witnessed by a representative of a qualified independent testing laboratory, and all test reports must be certified by the laboratory representative and provided as a part of the product submittal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 31 00, PROJECT MANAGEMENT AND COORDINATION: Verification of existing conditions before starting work.

B. Verify existing utility water main size, location, and inverts are as indicated on Drawings.

3.2 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs. Use only equipment specifically designed for pipe cutting. Use of chisels or hand saws will not be permitted. Grind edges smooth with beveled end for push-on connections.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.3 BEDDING AND BACKFILL

A. 2-inch to 8-inch Service Lines
   1. Install bedding per plan.
   2. Install backfill per plan.

3.4 INSTALLATION - PIPE

A. Install PVC pipe in accordance with manufacturer's instructions and AWWA C605.

B. Maintain separation of water main from sewer piping in accordance with State of California Department of Public Health code.

C. Install pipe to indicated elevation to within tolerance of 5/8 inches.

D. Route pipe in straight line.

E. Install pipe with no high points. If unforseen field conditions arise which necessitate high points, install air release valves as directed by Engineer.

F. Install pipe to have bearing along entire length of pipe. Excavate bell holes to permit proper joint installation. Do not lay pipe in wet or frozen trench.

G. Install pipe to allow for expansion and contraction without stressing pipe or joints.

H. Install underground pipe marker above pipe in accordance with manufacturer's instructions.

I. Install tracer wire on pipe and attach at minimum 5 foot intervals using approved tape or other attachment method. The tracer wire shall be installed so that electrical continuity is maintained throughout the pipe system. As few connections as possible shall be made in the tracer wire. Connections will be made by stripping the insulation back one inch and joining the two ends using an approved mechanical connector and a split bolt connector. Twisting of copper wire will not be acceptable. To complete this connection, wrap all exposed wire thoroughly with electrical tape. A minimum 2 foot of additional tracer wire will be coiled, buried and terminate at the ends of the pipeline, inside valve and other boxes. Of the 2 foot tracer wire section at the ends of the pipeline, one foot of insulation will be stripped back, prior to burial.

J. Close pipe openings with watertight plugs during work stoppages.

K. Install access fittings to permit disinfection of water system.

L. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main.

M. Establish elevations of buried piping with not less than 4 feet of cover. Measure depth of cover from final surface grade to top of pipe barrel.

N. Install pipe warning tape continuous over top of pipe buried 6 inches below finish grade, above pipe line.

3.5 INSTALLATION - VALVES

A. Gate Valves: Install valves per Plan.

B. Set valves on solid bearing compacted soil.

C. Center and plumb valve box over valve. Set box cover flush with finished grade.

D. Install tracer wire into valve box providing a 2 foot long coil of wire.

3.6 POLYETHYLENE ENCASEMENT

A. Encase ductile iron pipe fittings in polyethylene to prevent contact with surrounding backfill material.

B. Install in accordance with AWWA C105.

C. Terminate encasement 3 to 6 inches above ground where pipe is exposed.

3.7 PIPE SLEEVES

A. Install where water lines pass through retaining walls, building foundations and floors. Seal with modular mechanical type link seal. Install piping so that no joint occurs within a sleeve. Split sleeves may be installed where existing lines pass through new construction.

3.8 THRUST RESTRAINT

A. Install clamps, set screw retainer glands, or restrained joints. Protect metal restrained joint components against corrosion by applying a bituminous coating, or by concrete mortar encasement of metal area. Do not encase pipe and fitting joints to flanges.

B. Install thrust blocks as shown on the Drawings. Concrete for thrust blocks shall be in accordance with Section 03 30 00, CAST-IN-PLACE CONCRETE.

3.9 BACKFILLING

A. Backfill around sides and to top of pipe per trench detail in the Plan.

B. Maintain optimum moisture content of bedding material to attain required compaction density.

3.10 DISINFECTION OF POTABLE WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 33 13 00, DISINFECTING OF WATER UTILITIES.

3.11 FIELD QUALITY CONTROL

A. Section 01 40 00, QUALITY REQUIREMENTS: Field inspecting, testing, adjusting, and balancing.

B. Compaction Requirements: In accordance with Section 31 23 00, TRENCH EXCAVATION AND BACKFILL.

C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest at the Contractor's expense.

3.12 BACKFLOW PREVENTOR TESTING

A. All backflow preventers shall be factory tested and certified for proper operation prior to being placed in operation.

B. Original copies of the certification shall be submitted to the Engineer.

3.13 PRESSURE TESTING

A. Prior to acceptance of the Work by the City, the Contractor shall perform pressure testing on potable water distribution systems in accordance with
1. AWWA C600 for ductile iron pipe.
2. AWWA C605 for PVC pipe.
3. AWWA C901 for Polyethylene pressure pipe.

B. When tests indicate Work does not meet specified requirements, remove Work, replace and retest at the Contractor's expense.

END OF SECTION 33 11 00

SECTION 33 13 00 - DISINFECTING OF WATER UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes disinfection of potable water systems; and testing and reporting results.

B. All fire and water distribution materials, equipment and installation within California Water Company easements shall be in accordance with the California Water Company Standards and approved construction drawings.

C. Related Sections:
   1. Section 33 11 00, WATER DISTRIBUTION.

1.2 REFERENCES

A. American Water Works Association:
   1. AWWA B301 - Liquid Chlorine.
   2. AWWA C651 - Disinfecting Water Mains.

1.3 SUBMITTALS

A. Submit all product data, materials, shop drawings, laboratory test results, material source information, and certificates of compliance listed in this Section under a single submittal cover for review. Incomplete submittals will not be reviewed.

B. Section 01 33 00, SUBMITTAL PROCEDURES: Requirements for submittals.

C. Product Data: Submit procedures, proposed chemicals, and treatment levels for review.

D. Test Reports: Indicate results comparative to specified requirements.

E. Certificate: Certify cleanliness of water distribution system meets or exceeds specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 73 00, EXECUTION: Requirements for execution, installing, cleaning, starting, adjusting and protecting Work.

B. Section 01 77 00, CLOSEOUT REQUIREMENTS: Requirements for closeout.

C. Disinfection Report:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and time of completion.
   3. Test locations.
   4. Name of person collecting samples.
   5. Initial and 24 hour disinfectant residuals in treated water in ppm for each outlet tested.

6. Date and time of flushing start and completion.
7. Disinfectant residual after flushing in ppm for each outlet tested.

D. Bacteriological Report:
1. Date issued, project name, and testing laboratory name, address, and telephone number.
2. Time and date of water sample collection.
3. Name of person collecting samples.
4. Test locations.
5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for each outlet tested.
7. Certify water conforms, or fails to conform, to bacterial standards of authority having jurisdiction.

E. Water Quality Certificate: Certify water conforms to quality standards of authority having jurisdiction, suitable for human consumption.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with AWWA C651 and California Water Service Company requirements.

1.6 QUALIFICATIONS

A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this section with minimum three years documented experience.

B. Testing Firm: Company specializing in testing potable water systems, certified by State of California.

C. Submit bacteriologist's signature and authority associated with testing.

PART 2 - PRODUCTS

2.1 DISINFECTION CHEMICALS

A. Chemicals: AWWA B301, Liquid Chlorine

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 00, EXECUTION: Verification of existing conditions before starting work.

B. Verify piping system has been cleaned, inspected, and pressure tested.

C. Perform scheduling and disinfecting activity with start-up, water pressure testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.2 INSTALLATION

A. Provide and attach required equipment to perform the Work of this section.

B. Comply with California Department of Public Health Disinfection Requirements.

C. Perform disinfection of water distribution system during installation of system and pressure testing. Refer to Section 33 11 00, WATER UTILITIES.

D. Introduce treatment into piping system.

E. Maintain disinfectant in system for 24 hours.

F. Dechlorinate, flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.

G. Replace permanent system devices removed for disinfection.

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00, QUALITY REQUIREMENTS: Field inspecting, testing, adjusting, and balancing.

B. Disinfection, Flushing, and Sampling:
1. Disinfect pipeline installation in accordance with AWWA C651.
2. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than that generally prevailing in existing system or is acceptable for domestic use.
3. Legally dispose of chlorinated water. When chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water.
4. After final flushing and before pipeline is connected to existing system, or placed in service, employ an approved independent testing laboratory to sample, test and certify water quality suitable for human consumption.

END OF SECTION 33 13 00

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SECTION 33 31 00 - SANITARY SEWER

PART 1 - GENERAL

1.1 SUMMARY

A. The Contractor shall provide all materials, equipment, and labor to furnish and install all sanitary sewer pipe, cleanouts, and prefabricated maintenance holes (also known as manholes) complete with frame, cover, pipe connections, and cast-in-place base, and all other appurtenances complete in place, as shown on the Drawings and as specified herein.

B. Related Sections:
1. Section 03 30 00, CAST-IN-PLACE CONCRETE
2. Section 05 50 00, METAL FABRICATIONS
3. Section 31 01 40, SHORING AND TRENCH SAFETY
4. Section 31 23 19, DEWATERING
5. Section 31 23 00, TRENCH EXCAVATION AND BACKFILL
6. Section 33 32 10, FLOW BYPASS SYSTEMS
7. Section 09 96 00, HIGH-PERFORMANCE COATINGS

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 318 - Building Code Requirements for Structural Concrete.
2. ACI 530/530.1 - Building Code Requirements for Masonry Structures and Specifications for Masonry Structures.

B. ASTM International:
1. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
2. ASTM A536 - Standard Specification for Ductile Iron Castings.
3. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C150 - Standard Specification for Portland Cement
5. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
6. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
7. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures.
8. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
9. ASTM D 2241 - Specification for Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR - Series).
10. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
11. ASTM D 3034 Specification of Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings.

1.3 SUBMITTALS

A. Submit all product data, materials, shop drawings, laboratory test results, material source information, and certificates of compliance listed in this Section under a single submittal cover for review. Incomplete submittals will not be reviewed.

B. Section 01 33 00, SUBMITTAL PROCEDURES: Requirements for submittals.

C. Product Data: Submit cover and frame construction, features, configuration, dimensions and manufacturer.

D. At least seven (7) days before any new facilities are to be connected to existing facilities, the Contractor shall prepare and submit to the Engineer, for review, a description of the procedures it intends to use.

E. Certificates of Compliance: Certificates of Compliance shall be provided for all products and materials proposed to be used under this Section.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the City of Chico Improvement Standards and this Specification.

B. Contractor shall coordinate with and provide a minimum 48 hour notice to the City of Chico for all inspections within the public Right-of-Way.

C. All costs of inspection and tests shall be borne by the Contractor.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 10 years documented experience.

1.6 COORDINATION

A. Section 01 31 00, PROJECT MANAGEMENT AND COORDINATION: Coordination and project conditions.

B. Coordinate the Work with termination of sanitary sewer connection outside building, trenching, connection to municipal sanitary sewer system, and off-site improvements.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with precast concrete manufacturer’s instructions for unloading, storing and moving precast manholes.

B. Store precast concrete manholes to prevent damage to Owner’s property or other public or private property. Repair property damaged from materials storage.

C. Mark each precast structure by waterproof paint indicating manhole number shown on Drawings to indicate its intended use.

PART 2 - PRODUCTS

2.1 PVC “SOLID WALL” GRAVITY SEWER PIPE

A. Type: PVC closed profile gravity sewer pipe.
   1. Meet requirements of ASTM D3034.
   2. Pipe stiffness: minimum 46 psi for SDR 35 and 115 psi for SDR 26

B. Pipe Size: per Drawings.

C. PVC gravity sewer pipe shall have integral bell and spigot joints for the gravity conveyance of raw sewage.

D. Integral bells shall incorporate locked in gaskets meeting the requirements of ASTM D3212 and F477. The bell shall consist of an integral wall section with a solid cross section rubber ring factory assembled, securely locked in place to prevent displacement.

E. All fittings and accessories shall be as manufactured and furnished by the pipe supplier and have bell and/or space configurations identical to that of the pipe.

2.2 FITTINGS FOR PVC “SOLID WALL” GRAVITY SEWER PIPE

A. Size: per Drawings.

B. Material: PVC.

2.3 LATERAL CONNECTIONS TO SANITARY SEWER

A. Size: per Drawings.

B. Material: Only PVC shall be allowed.

C. Service lateral connections to new sewers shall be made with wye fittings, installed as sewer pipe is laid.

2.4 MAINTENANCE HOLES

A. Manholes and vaults shall be constructed of precast reinforced concrete rings or precast reinforced sections.
   1. Precast Reinforced Concrete Rings: Rings or sections shall have an inside diameter as indicated on the drawings, and shall be not less than 48 inches in diameter. Wall thickness shall conform to requirements of ASTM C76, except that lengths of the sections may be shorter as conditions require. Tops shall conform to ASTM C478.
   2. Precast Reinforced Concrete Manhole Risers and Tops: Design, material and installation shall conform to requirements of ASTM C478.

B. The inside of all manholes shall be coated with hand or spray applied high-performance epoxy waterproofing coating or crystalline waterproofing coating.
   1. Manufacturers:
      a. Epoxytec, UME Hybrid Epoxy Composite System.
      b. RS Technik, RS SprayLiner MaxPox WCS epoxy system.
      c. Xypex Cementitious Crystalline Coating.
      d. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

2.5 BEDDING AND COVER MATERIALS

A. Bedding and Cover Material: Section 31 00 00, EARTHWORK.

B. Trench Backfill Material: Section 31 00 00, EARTHWORK.

2.6 CONCRETE AND GROUT

A. Concrete for use in re-channelizing manhole bases is specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.

B. Grout for manhole structures is specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.

2.7 REINFORCING STEEL

A. Reinforcing steel shall be deformed bars, ASTM A615, Grade 60 unless otherwise noted.

2.8 CLEANOUT FRAMES AND COVERS

A. Frames and covers shall be in accordance with the Drawings.

2.9 UNDERGROUND PIPE MARKERS

A. Detectable pipe locating tape with magnetic conductor:
   1. Dimensions: minimum 6 inches wide by 4 mils thick
   2. Tape shall have a minimum strength of 1,500 pounds per square inch (psi) lengthwise and 1,250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.
   3. Service: direct burial.
   4. Tape color: APWA Uniform Color Code for Marking of Underground Utility Locations; “Safety Precaution Green” bright colored.
   5. Lettering: minimum of 2 1-inch high permanent black lettering imprinted continuously with “Caution Sewer Line Buried Below” over the entire length.
   6. Manufacturers:
      a. Reef Industries: Terra “D”
      b. Allen Systems: Detectatape
      c. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

B. Locating wire:

1. Manufacturers:
   a. Pro-Line
   b. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.
2. Characteristics:
   a. Type: Insulated Copper, THWN
   b. Gage: No. 10
   c. Materials: Copper conductor, PVC insulation, nylon jacket.

2.10 FLEXIBLE SEALING COMPOUND

A. Flexible sealing compound shall be packaged in extruded preformed shape, sized to completely fill the joint between precast sections, and form permanently flexible watertight seal. The sealing compound shall be non-shrink and meet AASHTO M198.

B. Manufacturers:
   1. Quick-Seal
   2. Ram-Nek
   3. Substitutions: Approved equal permitted

2.11 EXTERNAL JOINT SEALS:

A. Seals: The Contractor shall provide external joint seals, riser and frame seals for utility vaults, drop inlets and manholes, in addition to the performed plastic sealing gaskets used between each barrel section.

B. Each sanitary sewer manhole frame shall be sealed to the structure with a continuous seamless band made of high quality EPDM (Ethylene Propylene Diene Monomer) rubber with a minimum thickness of 65 mils. There shall be a preformed L shaped corner molded into the top of the seal. The top section and the side section will extend from the L shaped corner at a generally 90-degree angle to each other. There shall be a 2" to 3" wide strip of butyl mastic attached to the underside of the top section of the seal. There shall be a 2" wide strip of butyl mastic attached to the inside of the side section at the bottom of the seal. The mastic shall be non-hardening butyl rubber sealant, with a minimum thickness of 1/8", and shall seal to the cone/top of the manhole section and over the flange of the casting frame. An aerosol primer shall be used to enhance the bond strength of the seal to the structure.
   1. External joint frame seals shall be Infi-Shield Uni-Band manufactured by Sealing Systems, Inc.
   2. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

C. Each sanitary sewer manhole and riser joint shall be sealed with an external rubber sleeve. The seal shall be made of a stretchable, self-shrinking, intra-curing halogenated based rubber with a minimum thickness of 30 mils. The back side of each unit shall be coated with a cross-linked re-enforced butyl adhesive. The butyl adhesive shall be non-hardening sealant, with a minimum thickness of 30 mils. The seal shall be designed to stretch around the substrate then overlapped creating a cross-link and fused bond between the rubber and butyl adhesive. The application shall form a continuous rubber seal that applies inward pressure on the protected area for the life of the application. The butyl adhesive and the inward pressure exerted on the substrate will prevent the intrusion of water and soil through the joint sections of a manhole.
   1. External joint seals shall be Infi-Shield Gator Wrap manufactured by Sealing Systems, Inc.

2. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 02 01 00, SITE CONDITIONS: Verification of existing conditions before starting work.

B. Verify correct size of pipe and manhole.

3.2 PREPARATION

A. Coordinate placement of inlet and outlet pipes as per Drawings.

B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.

C. Inspect precast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.

3.3 BUILDING SERVICE LINE INSTALLATION

A. Install sanitary sewer service lines to point of connection within approximately 5 feet outside of buildings where service is required and make connections. Coordinate the invert and location of the service line with the Contractor installing the building lines.

B. Connections of service line to building piping shall be made after the new sanitary sewer system has been constructed, tested, and accepted for operation by the Engineer. The Contractor shall install all temporary caps or plugs required for testing.

C. When building services have not been installed at the time when the sanitary sewer system is complete, provide temporary plugs or caps at the ends of all service lines. Mark the location and depth of the service lines with continuous warning tape placed 12 inches above service lines.

3.4 ABANDONED MANHOLES, STRUCTURES, AND PIPING

A. Manholes and Structures Outside of Building Areas: Remove frame and cover, cut and remove the top of an elevation of 3 feet below finished grade. Fill the remaining portion with compacted gravel or crushed rock or concrete.

B. Manholes and Structures with Building Areas: Remove frame and cover and remove the entire structure and the base.

C. Piping under and within 5 feet of building areas shall be completely removed.

D. Piping outside of building areas shall have all ends of the piping at the limit of the abandonment and within structures and manholes, plugged with concrete, and abandoned in-place.

E. The Contractor shall comply with all OSHA confined space requirements while working within existing manholes and structures.

F. When the limit of the abandonment terminates in an existing manhole to remain, the flow line in the bench of the manhole to the abandoned line shall be filled with concrete and shaped to maintain the flowline of the lines to remain.

3.5 REGRADING

A. Raise or lower existing manholes and structures frames and covers, cleanout frames and covers and valve boxes in regraded areas to finish grade. Carefully remove, clean and salvage cast iron frames and covers. Adjust the elevation of the top of the manhole or structure as detailed on the drawings. Adjust the elevation of the cleanout pipe riser, and reinstall the cap or plug. Reset cast iron frame and cover, grouting below and around the frame. Install concrete collar around reset frame and cover as specified for new construction.

B. During periods when work is progressing on adjusting manholes or structures cover elevations, the Contractor shall install a temporary cover above the bench of the structure or manhole. The temporary cover shall be installed above the high flow elevation within the structure, and shall prevent debris from entering the wastewater stream.

C. The Contractor shall comply with all OSHA confined space requirements when working within existing structures.

3.6 PIPE SEPARATION

A. Horizontal Separation - Water Mains and Sewers:
   1. Existing and proposed water mains shall be at least 10 feet horizontally from any proposed gravity flow and pressure (force main) sanitary sewer or sewer service connection.
   2. Gravity flow mains and pressure (force) mains may be located closer than 10 feet but not closer than 6 feet to a water main when:
      a. Local conditions prevent a lateral separation of ten feet; and
      b. The water main invert is at least 18 inches above the crown of the gravity sewer or 24 inches above the crown of the pressure (force) main; and
      c. The water main is in a separate trench separated by undisturbed earth.
   3. When it is impossible to meet (1) or (2) above, both the water main and sanitary sewer main shall be constructed of push-on or mechanical joint ductile iron pipe. The pipe for the sanitary sewer main shall comply with the specifications for pressure (force) mains, and the water main material shall comply with Section 33 10 00, WATER DISTRIBUTION. The sewer shall be pressure tested as specified for pressure (force) mains before backfilling.

B. Vertical Separation - Water Mains and Sewers at Crossings:
   1. Water mains shall be separated from sewer mains so that the invert of the water main is a minimum of 24 inches above the crown of gravity flow sewer or 48 inches above the crown of pressure (force) mains. The vertical separation shall be maintained within 10 feet horizontally of the sewer and water crossing. When these vertical separations are met, no additional protection is required.
   2. In no case shall pressure (force) sanitary main cross above, or within 24 inches of water lines.

3. When it is impossible to meet (1) above, the gravity flow sewer may be installed 18 inches above or 12 inches below the water main, provided that both the water main and sewer shall be constructed of push-on or mechanical ductile pipe. Pressure (Force) sewers may be installed 24 inches below the water line provided both the water line and sewer line are constructed of ductile iron pipe. The pipe for the sewer shall conform to the requirements for pressure sewers specified herein. Piping for the water main shall conform to Section 33 10 00, WATER DISTRIBUTION.
4. The required vertical separation between the sewer and the water main shall extend on each side of the crossing until the perpendicular distance from the water main to the sewer line is at least 10 feet.

3.7 GENERAL PIPING INSTALLATION

A. Lay pipes true to line and grade. Gravity flow sewer shall be laid with bells facing upgrade.

B. Do not lay pipe on unstable material, in wet trench or when trench and weather conditions are unsuitable for the work.

C. Support pipe on compacted bedding material. Excavate bell holes only large enough to properly make the joint.

D. Inspect pipes and fittings, for defects before installation. Defective materials shall be plainly marked and removed from the site. Cut pipe shall have smooth regular ends at right angles to axis of pipe.

E. Clean interior of all pipe thoroughly before installation. When work is not in progress, open ends of pipe shall be closed securely to prevent entrance of storm water, dirt or other substances.

F. Lower pipe into trench carefully and bring to proper line, grade, and joint. After jointing, interior of each pipe shall be thoroughly wiped or swabbed to remove any dirt, trash or excess jointing materials.

G. Do not lay sewer pipe in same trench with another pipe or other utility, unless noted otherwise on the Drawings. Sanitary sewers shall cross at least 1 foot below water lines.

H. Do not walk on pipe in trenches until covered by layers of bedding or backfill material to a depth of 12 inches over the crown of the pipe.

I. Warning tape shall be continuously placed 12 inches above sewer pipe

J. Install tracer wire on pipe and attach at minimum 5 foot intervals using approved tape or other attachment method. The tracer wire shall be installed so that electrical continuity is maintained throughout the pipe system. As few connections as possible shall be made in the tracer wire. Connections will be made by stripping the insulation back one inch and joining the two ends using an approved mechanical connector and a split bolt connector. Twisting of copper wire will not be acceptable. To complete this connection, wrap all exposed wire thoroughly with electrical tape. A minimum 2 foot of additional tracer wire will be coiled, buried and terminate at the ends of the pipeline, inside cleanouts and other boxes. Of the 2 foot tracer wire section at the ends of the pipeline, one foot of insulation will be stripped back, prior to burial.

K. Install gravity sewer line in accordance with the provisions of these specifications and the following standards:
   1. Ductile Iron Piping: AWWA C111 and C600.
   2. Polyvinyl Chloride (PVC) Piping: ASTM D2321.

3.8 MANHOLE INSTALLATION

A. All precast concrete maintenance holes shall be installed in conformance with the City of Chico Improvement Standards and manufacturer's printed instructions on a well-compacted foundation as specified in Section 31 23 00, TRENCH EXCAVATION AND BACKFILL.

B. Excavation and Backfill:
   1. Excavate for manholes in accordance with Section 31 23 00, TRENCH EXCAVATION AND BACKFILL in location and to depth shown on Drawings. Provide clearance around sidewalls of structure for construction operations.
   2. When groundwater is encountered, prevent accumulation of water in excavations in accordance with Section 31 23 19, DEWATERING" Place manholes in dry trench.
   3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation.

C. Place and cure concrete in accordance with Section 03 30 00. Place base pad, trowel top surface level.

D. Lift pre-cast components at lifting points designated by manufacturer. Set precast structures bearing firmly and fully on crushed stone bedding, compacted to 95 percent relative compaction.

E. Assemble multi-section structures by lowering each section into excavation. Lower, set plumb and level, and firmly position base section before placing additional sections. Trim to correct elevations, anchor to base pad. Maintenance holes sections shall be set so as to be vertical with sections in true alignment.

F. Remove foreign materials from joint surfaces and verify sealing materials are placed properly. Maintain alignment between sections.

G. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with mortar.

H. Cut pipe to finish flush with interior of structure.

I. Shape inverts through manhole in accordance with Drawings.

J. Backfill excavations for manholes in accordance with Section 31 23 00, TRENCH EXCAVATION AND BACKFILL.

K. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour to form continuous drainage channel.

L. Set cover frames and covers level without tipping, to correct elevations.

M. Coordinate with other sections of Work to provide correct size, shape, and location.

3.9 FRAME AND COVER INSTALLATION

A. Set frames using mortar and grade adjustment rings in accordance with Drawings.

B. Set frame and cover in accordance with Drawings.

3.10 CLEANOUTS

A. 6 inches in diameter and consisting of a ductile iron 45 degree fitting on end of run, or combination Y fitting and l/8 bend in the run with ductile iron pipe extension, water tight plug or cap and cast frame and cover flush with finished grade. Center set cleanouts, located in unpaved areas, in a 12 by 12 by 6 inches thick concrete slab set flush with adjacent finished grade. Where cleanout is in force main, provide a blind flange top connection. The center of the flange shall be equipped with a 2 inches base valve to allow the pressure in the line to be relieved prior to removal of the blind flange. Frames and covers for pressure (force) mains shall be 24 inches in diameter.

B. The top of the cleanout assembly shall be 2 inches below the bottom of the cover to prevent loads being transferred from the frame and cover to the piping.

3.11 TESTING AND INSPECTION

A. Testing of precast concrete maintenance holes and sanitary sewer piping shall conform to the following requirements
   1. All sewer mains and laterals shall be cleaned and free of debris by means of an approved method, such as rubber ball washed through or hydro-cleaner, prior to tests for leakage and deflection.
   2. Pipe Deflection Test: Pipe deflection shall be tested by use of a steel mandrel.
      a. Polyvinyl chloride (PVC) sewers shall be tested for deflection after final backfill and compaction has been completed, but before paving is placed. A rigid mandrel having an outside diameter of 95% of the “average inside diameter” of the pipe, as defined in ASTM D 3034, shall be pulled through the pipeline. The minimum length of the circular portion of the mandrel shall be equal to the nominal diameter of the pipe.
      b. If the mandrel does not pass freely through the pipe, the pipe shall be reexcavated, bedded and backfilled to adequately support the pipe and reduce the deflection to 5% or less of the average inside diameter of the pipe. The pipeline shall then be retested for both leakage and deflection.
      c. Should tests performed by the Owner, within one year of the original testing and acceptance, show deflection in excess of 7.5% of the average inside diameter of the pipe, the contractor shall reexcavate, bed and backfill the pipe to provide adequate support and reduce the deflection to 5% or less. The pipeline shall be retested for deflection. The contractor shall reimburse the Owner’s cost of testing for all lines which require repair.
   3. Pipe Leak Test: Sewer mains and laterals shall be tested for leakage (exfiltration) by the use of a low-pressure air test or a hydrostatic test. Contractor shall provide all materials and equipment to perform the leak test.
      a. All testing is to be conducted after backfilling, prior to resurfacing and after service connections are made.

b. Exfiltration Test Using Water:
   1) A minimum head of six feet (6') of water above the crown at the upper end of the test section shall be maintained for a period of four (4) hours during which time it will be presumed that full absorption of the pipe body has taken place and thereafter for a further period of one (1) hour for the actual test of leakage. During this one-hour period, the measured loss shall not exceed the rate of fifty (50) gallons per inch diameter per mile per twenty-four (24) hours.
   2) The maximum length of sanitary sewer for the above allowable leakage test shall be one thousand feet (1,000'). If it is not apparent that leakage test results between any two (2) manholes is satisfactory, then the Engineer may require subsequent tests to establish the more exact location of the leakage areas. Any section of sanitary sewer between any two (2) manholes that does not meet the above requirements shall be rejected and the Contractor, at his expense, shall make the necessary repairs to the sanitary sewer to meet the requirements, and shall make subsequent tests after repairs to assure compliance with the Specifications.

c. Exfiltration Test Using Air:
   1) The Contractor shall furnish all facilities and personnel for conducting the test under the observation of the Engineer. The equipment and personnel shall be subject to the approval of the Engineer. Joints only may be tested in pipe thirty-six inches (36") in diameter, or larger at the option of the Contractor.
   2) The Contractor may desire to make an air test prior to backfilling for his own purpose. However, the acceptance air test shall be made after backfilling has been completed, and compacted.
   3) Immediately following the pipe cleaning, the pipe installation shall be tested with low-pressure air. Air shall be slowly supplied to the plugged pipe installation until the internal air pressure reaches four (4.0) pounds per square inch greater than the greatest back pressure of any ground water in contact with the pipe. At least two (2) minutes shall be allowed for temperature stabilization before proceeding further.
   4) The pipeline shall be considered acceptable when tested at an average pressure of four (4.0) pounds per square inch greater than the greatest back pressure of any ground water in contact with the pipe, if:
      a) The total rate of air loss from any section tested in its entirety between manholes or between manholes and cleanout structures does not exceed two (2.0) cubic feet per minute, or the following table may be utilized as a guideline for a satisfactory test by air for pipe sizes shown:

PIPE DIAMETER	ALLOWABLE PRESSURE DROP IN 10 MINUTES
4”	3.8 PSI
6”	3.2 PSI
8”	2.7 PSI
10”	2.1 PSI
12”	1.8 PSI

      b) Pressure gauges shall be incremented in not more than 1/2 pound increments for accurate tests.

c) If the pipe installation fails to meet test requirements, the Contractor shall determine at his own expense the source or sources of leakage, and he shall repair (if the extent and type of repairs proposed by the Contractor are acceptable to the Engineer), or replace all defective materials or Workmanship. The completed pipe installation shall meet the requirements of this test or the alternative water exfiltration test before being considered acceptable.

d) Safety braces shall be required to hold plugs in place and to prevent the sudden release of the compressed air. Due to the large forces that could be exerted by an escaping plug during the testing of the pipe, workmen shall not be allowed in the manholes in which plugs have been placed while tests are being conducted. The Contractor's testing equipment shall be arranged in such a manner that a pressure relief device will prohibit the pressure in the pipeline from exceeding 10 PSI.

END OF SECTION 33 31 00

SECTION 33 32 10 - FLOW BYPASS SYSTEMS

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. Performance Requirements:
1. It is essential to the operation of the existing sanitary sewer system that there be no interruption in the flow of sewage throughout the duration of the Project. Provide, maintain, and operate all temporary facilities such as dams, plugs, flow-through plugs, pumping equipment (both primary and backup units), conduits, and all necessary power to intercept the sewage flow before it reaches the point where it would interfere with the Work, carry it past the Work, and return it to the existing sewer downstream of the Work.
2. Design, install, and operate the temporary pumping systems where required.
3. Convey the sewage safely past this Work area. Do not stop or impede the main flows under any circumstances.
4. Maintain sewage flow around the Work area in a manner that will not cause surcharging of sewers, damage to sewers, and that will protect public and private property from damage and flooding, including the routing of sewage overflow in the event of failure of any bypass system.
5. Protect water resources, wetlands, and other natural resources.

B. Design Requirements:
1. Provide flow through plugs, pumps of adequate size to handle peak flow, and temporary discharge piping, to ensure that the total flow of the interceptor and service connections can be safely diverted around the section to be replaced.
2. Bypass pumping systems shall be required to be operated 24 hours per day, 7 days per week, including holidays during bypass pumping operations. Qualified personnel shall be on-site at all times during operation of the bypass system to oversee the work and to take immediate action to correct any malfunctions of the system.
3. Install a total of two pumps where pumping is required, each of which shall be capable of pumping the total flows indicated. All pumps shall be online, isolated by individual valves, and be ready for immediate use in the event of an emergency or breakdown of an on-line pump.
4. Install one bypass pump (normal operating) at each service connection or sanitary sewer manhole to be bypassed. There shall be one redundant pump ready for immediate use in the event of an emergency or breakdown of any of the service connection pumps. Each pumping location shall have provisions for immediate installation of a redundant pump without shutting the system down.
5. Each individual discharge pipeline shall be of adequate size to convey the required flow for the system's normal operating pumps without causing upstream sewers to surcharge to more than 24 inches above the crown of the pipeline.
6. Provide onsite portable lights for emergency use only.
7. Provide standby generation facilities for emergency use if pumps are equipped with electric motors.
8. Flow bypass systems shall be designed by CA registered Civil Engineer.
9. Contractor shall provide pipeline plugs as necessary for all shutdowns and temporary bypass operations.

1.2 SUBMITTALS

A. Submit all product data, plans, materials, shop drawings, laboratory test results, material source information, and certificates of compliance listed in this Section under a single submittal cover for review. Incomplete submittals will not be reviewed.

B. Detailed plans and descriptions outlining complete flow diversion plan for flow routing. Bypass system plan shall include an emergency response plan to be followed in the event of a failure of the bypass system, and shall outline in detail the proposed sequencing for all proposed system outages and system startup and switchovers, including time of day and amount of time required. All plans shall be submitted to the Engineer at least 10 working days prior to required operation of bypass system. All plans shall be stamped and signed by a CA registered Civil Engineer.

C. Where pumping is required, submit complete information on pumping system.

D. Where standby generators are required, submit complete information on power generation system.

E. All bypass pumping equipment shall be rated for low noise rate compliance. Decibels of the entire operation shall not exceed 65 dBA at 50 feet. The Contractor shall submit proposed equipment and dBA ratings to the Engineer for approval prior to use.

1.3 QUALITY ASSURANCE

A. Contractor to be completely responsible for any overflow or spillage of raw sewage due to failure of any bypass system.

B. Contractor to pay any fines or costs associated with such spillages.

C. Contractor to be responsible for any cleanup or restoration resulting from such spillages.

D. Contractor shall demonstrate that flow bypass system performs in conformance with these requirements prior to putting into use.

1.4 FLOWS

A. The estimated sewer flows for required bypass system pumping operations involving gravity pipelines are outlined below:

REACH	ESTIMATED PEAK WET WEATHER FLOW (CFS)	ESTIMATED HYDRAULIC CAPACITY (CFS)	ESTIMATED EXCESS CAPACITY DURING PEAK WET WEATHER FLOW (CFS)
4-inch lateral (Existing Site)	0.15	0.20	0.05

1.5 CONTINGENCY

A. During the startup of and/or switchover from a flow bypass system, Contractor shall have tanker trucks available onsite, as a contingency for collection of flows. Size and number of trucks shall be adequate to contain and dispose of all sewage in the case of bypass failure. Tanker trucks may be emptied at a location designated by the City and approved by the Engineer.

PART 2 - PRODUCTS

2.1 PUMP SYSTEMS

A. Pumps may be gas, electric, or diesel powered.

B. Pumps may be end suction or submersible.

C. Bypass piping shall be rubber gasketed, with a minimum pressure rating of 50 psi and no visible leaks under operating conditions. Pipe supports, thrust restraints and valves shall be provided, including an air valve at the high point. Piping shall be sufficiently restrained and supported to prevent movement during pump cycling.

D. Temporary fencing, gates, locks and screening shall be provided to protect and screen the equipment from the public. Contractor shall provide City with keys to locks.

PART 3 - EXECUTION

3.1 GENERAL

A. If pumping is required across a pedestrian walkway, street or driveway that cannot be closed to traffic, the discharge piping shall be temporarily buried, backfilled, and paved.

B. Collapsible conduit adequate to allow crossing by traffic may be used only during work hours when the Contractor is on the project site.

C. Bypass pumping shall be monitored at all times by a competent person familiar with the pumping equipment.

D. New pipelines may be utilized to convey sewage prior to final acceptance, provided all pipe and structures downstream have been tested, cleaned, inspected, and accepted. The trench shall be backfilled; however, surface restoration need not be completed.

E. Contractor shall conform to all safety provisions pertaining to confined space entry when entering any manhole.

F. All bypassing will require coordination with City staff at least 48 hours in advance.

END OF SECTION 33 32 10

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SECTION 33 41 00 - STORM DRAINAGE

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Contractor shall provide all materials, equipment, and labor necessary to furnish and install storm drain pipe, storm drain inlets, pumping systems, and manholes with all necessary fittings and coupling systems and all appurtenant Work, complete and operable, including all connections as shown on the Drawings and as specified herein.

1.2 SUMMARY

A. Section Includes:
1. Storm drainage piping.
2. Drop inlets and manholes.
3. Bedding and cover materials.
4. Foundation drainage pumping system.
5. Accessories.
6. Underground pipe markers.

B. Related Sections:
1. Section 03 30 00, CAST-IN-PLACE CONCRETE: Concrete type.
2. Section 31 00 00, EARTHWORK: Soils and aggregate for backfill in trenches.
3. Section 31 01 40, SHORING AND TRENCH SAFETY.
4. Section 31 23 16, EXCAVATION: Product and execution requirements for excavation and backfill required by this section.
5. Section 31 23 19, DEWATERING.
6. Section 31 23 00, TRENCH EXCAVATION AND BACKFILL: Execution and backfill requirements for trenching required by this section.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO M170 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
2. AASHTO M294 - Standard Specification for Corrugated Polyethylene Pipe, 12- to 60-in Diameter.

B. ASTM International:
1. ASTM A48 - Standard Specification for Gray Iron Castings.
2. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
3. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
5. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.

6. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
7. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
8. ASTM C33 - Standard Specification for Concrete Aggregates.
9. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
10. ASTM C150 - Standard Specification for Portland Cement.
11. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
12. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
13. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
14. ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
15. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
16. ASTM C924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
17. ASTM C969 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
18. ASTM C1103 - Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
19. ASTM C1479 - Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations.
20. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3).
21. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
22. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
23. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
24. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
25. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
26. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
27. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
28. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
29. ASTM F2306 - Standard Specification for 12 to 60 in. Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.
30. ASTM F2648 - Standard Specification for 2 to 60 inch Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications.

C. State of California Department of Transportation 2010 Standard Specifications.

1.4 SUBMITTALS

A. Submit all product data, materials, shop drawings, laboratory test results, material source information, and certificates of compliance listed in this Section under a single submittal cover for review. Incomplete submittals will not be reviewed.

B. Section 01 33 00, SUBMITTAL PROCEDURES: Requirements for submittals.

C. Product Data: Submit data indicating pipe, pipe accessories, and all other storm drainage appurtenances.

D. Shop Drawings:
   1. The Contractor shall submit Shop Drawings for all specialty precast concrete items. Submitted drawings shall show design criteria, all dimensions, inverts, rims, location and type of lifting inserts, and details of reinforcement and joints.
   2. For all precast items that are manufactured, the Contractor shall also submit a list of the design criteria and product data sheets used by the manufacturer.

E. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

F. Manufacturer's Certificate: Certificates of Compliance shall be provided for all products and materials proposed to be used under this Section.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 77 00, CLOSEOUT REQUIREMENTS: Requirements for submittals.

B. Project Record Documents:
   1. Accurately record actual locations of pipe runs, connections, drop inlets, rim elevations, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with specified standards.

B. Testing: All materials testing shall be based upon applicable Test Methods referenced herein for the materials specified. All costs of such manufacturing inspections and tests shall be borne by the Contractor.

1.7 PRE-INSTALLATION MEETINGS

A. Section 01 31 00, PROJECT MANAGEMENT AND COORDINATION: Pre-installation meeting.

B. Convene a pre-installation meeting a minimum one week prior to commencing work of this section.

1.8 COORDINATION

A. Section 01 31 00, PROJECT MANAGEMENT AND COORDINATION: Coordination and project conditions.

B. Coordinate the Work with termination of storm sewer connection outside building, trenching, connection to municipal storm drainage system, and off-site improvements.

PART 2 - PRODUCTS

2.1 STORM DRAINAGE PIPING

A. Reinforced Concrete Pipe (RCP):
1. Standard Specifications – Section 65.
2. Reinforced Concrete Pipe: ASTM C76:
3. Type II Portland Cement: ASTM C150.
4. Pipe Class: III, IV or V per Drawings.
5. Bell and spigot ends.
6. Fittings: Reinforced concrete.
7. Joints: ASTM C443, rubber compression gasket.

B. HDPE Plastic Pipe:
1. Standard Specifications – Section 64.
2. AASHTO M294, high-density polyethylene (HDPE) material.
3. ASTM F2306.
4. Type S: Corrugated exterior, smooth interior.
5. Bell and spigot solvent sealed ends.
6. Fittings: HDPE.
7. Joints: ASTM F477, elastomeric gaskets.

C. PVC Plastic Pipe:
1. ASTM D3034, SDR 26, Poly (Vinyl Chloride) (PVC) material.
2. Bell and spigot style rubber ring sealed gasket joint.
3. Fittings: PVC.
4. Joints: ASTM F477, elastomeric gaskets.

D. Perforated Plastic Pipe
1. Pipe Material:
   a. Standard Specifications – Section 68-2.02D.
      1) AASHTO M278, smooth wall PVC material.
   b. ASTM D3034, SDR 26, Poly (Vinyl Chloride) (PVC) material.
2. Bell and spigot style rubber ring sealed gasket joint.
3. Fittings: PVC.
4. Joints: ASTM F477, elastomeric gaskets.
5. Perforations: as indicated on Drawings.

2.2 FOUNDATION DRAINAGE PUMPING SYSTEM

A. General: Provide a complete and operable packaged foundation drainage simplex pumping system including but not limited to a properly sized sump basin, sump pump, operating controls, local high level alarm switch and signaling device, piping, fittings, valves and appurtenances. The complete packaged system shall be provided by a single manufacturer/supplier.

B. Pump: Provide submersible sump pump, 1-1/4" (minimum) discharge, with a 1/2 HP, single phase, 115 volt capacitor start induction motor with class F insulation. Motor construction to include total Class 25 cast iron housing, permanently lubricated upper and lower ball bearings, stainless steel shaft, carbon and ceramic mechanical seal, and epoxy powder coat finish. The fasteners and suction strainer shall be stainless steel. The pump shall have cast iron support legs, enabling it to be a free standing unit. The legs shall be high enough to allow ¾" solids to enter volute. The pump shall be capable of passing solids up to ¾ inch. Pump performance shall be from 10 GPM at 35 ft. head to 20 GPM at 30 ft. head and the motor is non-overloading anywhere along the curve. The motor amperage shall not exceed 9.8 amps. The minimum power cord length shall be 15 ft.
   1. Manufacturers:
      a. Weil
      b. Liberty
      c. Flygt (Zylem)
      d. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

C. Float Switch: Provide (1) tethered piggyback float switch securely attached to the top of the pump motor or to the discharge pipe. Set the float in such a manner that a minimum of 5 inches of water remains in the sump when the pump shuts off. Secure the float so that it cannot hang up on top of the motor or get wedged against the side wall of the sump or discharge piping.

D. Sump Basin: Provide an 18 inch diameter (minimum) fiberglass or polyethylene basin with factory mounted rail system and pump suspended on stainless steel cable or chain by means of bolt on quick disconnect. The depth of the basin shall be approximately 19 feet allowing a working depth of approximately 5 feet (i.e., the distance from the inlet pipe invert to the sump floor. Verify the sump diameter with the pump manufacturer for the pump model being used.

E. Sump Cover: Provide a sturdy hinged and lockable galvanized steel diamond plate cover for the sump. The thickness shall be 10 gauge. The cover shall have bolt holes for fastening to the sump top flange. The cover shall have a clearance hole for the pump discharge pipe. The cover shall be covered with enamel paint and be installed 6 inches above finish grade elevation.

F. Piping and Fittings: Provide inlet and discharge piping. Provide check valve and shut-off ball valve on discharge pipe. Provide increaser on discharge pipe outside of sump basin to increase the diameter of the discharge pipe to 2 inches.

G. Control Panel: Provide manufacturer’s control panel in a NEMA 4X outdoor enclosure. Mount enclosure to outside wall of building adjacent to sump in an accessible location. Paint to match building color.

H. Alarm: Provide warning device for signaling a high level alarm in the sump. Include 80 db. buzzer, a 1-inch red pilot light, and a Test-Auto-Silence selector switch. Furnish also a float switch which is to be mounted in the sump at an appropriate level.

I. Installation: Install foundation drainage pumping system in accordance with manufacturers written installation instructions. Install sump basin on 6 inches (min) of compacted drain rock. Compact backfill material to 90% R.C. (minimum).

J. Testing and Commissioning: When the installation is complete, the Contractor shall add water to the sump to demonstrate to the Owner and Engineer that the pump system operates at a sufficient flow rate and when the pump power is removed or high level is exceeded, the alarm system functions as desired. Correct any issues with electrical connection of pumps, floats, piping, and ancillaries, and ensure that the packaged pumping system is fully functional and optimized to the application upon completion.

K. Warranty: Provide 12 month warranty on complete packaged pumping system. Warranty shall be valid starting on the date of acceptance. Manufacturer / supplier shall provide a fully comprehensive aftercare service during warranty period, including 24/7 emergency breakdown attendance, preventative maintenance contracts, workshop repair and pumping station refurbishments.

2.3 ACCESSORIES

A. Filter Fabric: Specified in Section 31 00 00, EARTHWORK.

B. Non-shrink Grout: Specified in Section 03 30 00.

2.4 UNDERGROUND PIPE MARKERS

A. Detectable pipe locating tape with magnetic conductor:

B. Dimensions: minimum 6 inches wide by 4 mils thick

C. Tape shall have a minimum strength of 1,500 pounds per square inch (psi) lengthwise and 1,250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

D. Service: direct burial.

E. Tape color: APWA Uniform Color Code for Marking of Underground Utility Locations; "Safety Precaution Green" bright colored.

F. Lettering: minimum of 2 1-inch high permanent black lettering imprinted continuously with "Caution Storm Line Buried Below" over the entire length.

G. Manufacturers:
1. Reef Industries: Terra "D"
2. Allen Systems: Detectatape

3. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

2.5 DROP INLETS AND MANHOLES

A. General:
   1. Precast concrete components shall conform to applicable sections of ASTM C478, ASTM C857 and ASTM C858 and the following:
   2. Concrete shall achieve a minimum 28-day compressive strength of 4,000 pounds per square-inch (psi);
   3. Unless otherwise noted, the precast concrete sections shall be designed to withstand lateral earth and AASHTO H-20 traffic loads;
   4. Cement shall be Type III Portland Cement conforming to ASTM C 150;
   5. Aggregates shall conform to ASTM C33;
   6. Reinforcing steel shall be deformed billet-steel bars, welded steel wire or deformed welded steel wire conforming to ASTM A615, A185 or A497, respectively;

B. Storm Drain Drop Inlets:
   1. Material: Precast concrete.
   2. Frames and Grates: ASTM A123, Hot dip galvanized.
   3. See Drawings for sizes and types.

C. Landscape Drop Inlets
   1. Structure Materials: HDPE, structural-foam polyolefin or polypropolyene
   2. Grate Materials: Ductile iron or cast iron.
   3. Grate Type:
      a. Round, atrium / dome style in landscape and bioretention areas.
      b. Round, flat style in concrete walkways and paved areas.
   4. Coating: Powder coating on ductile iron and cast iron components
   5. Color: Black
   6. Catch Basin Lid and Frame:
   7. Construction: Cast iron construction, removable lid.
   8. Nominal Lid and Frame Size: per Drawings.
   9. Catch Basin, Frame and Grate Manufacturers:
      a. NDS, Inc.
      b. Nyloplast ADS, Inc.
      c. Neenah Foundry.
      d. Old Castle Precast.
      e. Substitutions: Section 01 25 00, SUBSTITUTION PROCEDURES.

D. Manholes:
   1. Material: Precast concrete.
   2. Frames and Covers: ASTM A45, Class 35B, boltable cover
   3. Minimum weight:
      a. Frame: 135 pounds.
      b. Cover: 130 pounds.
   4. Diameter: 48 inch minimum. See Drawings for specific sizes.
   5. Joints in precast sections and frames shall be sealed with Flexible Sealing Compound and External Joint Seals in accordance with Section 33 31 00, SANITARY SEWER.

E. Base Pad:
   1. Precast Concrete.
   2. Cast-in-place concrete of type specified in Section 03 30 00.

2.6 BEDDING AND COVER MATERIALS

A. Bedding: Specified in Section 31 00 00, EARTHWORK.

B. Soil Backfill from Above Pipe to Finish Grade: Specified in Section 31 00 00, EARTHWORK.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 31 00, PROJECT MANAGEMENT AND COORDINATION: Verification of existing conditions before starting work.

B. Verify trench cut and excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

C. All laying, jointing, testing for defects and for leakage, shall be performed in the presence of the Engineer. All material found during the Work progress to have defects will be rejected and the Contractor shall promptly remove such defective material from the site of the Work.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with Engineered Fill or Aggregate Base.

B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 31 23 00, TRENCH EXCAVATION AND BACKFILL for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level materials in continuous layer trench in accordance with Section 31 23 00, TRENCH EXCAVATION AND BACKFILL.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Pipe, fittings, and accessories shall be carefully inspected before and after installation and those found defective shall be rejected. Pipe and fittings shall be free from fins and burrs. Before being placed in position, pipe, fittings, and accessories shall be cleaned and shall be maintained in a

clean condition. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe, fittings, or any other material be dropped or dumped into trenches.

B. Install pipe, fittings, and accessories in accordance with manufacturer's printed instructions and the following provisions. Seal joints watertight.

C. Necessary facilities shall be provided for lowering and properly placing the sections of pipe in the trench.

D. The pipe shall be laid to line and grade with the sections closely jointed.

E. Every precaution shall be taken to prevent flooding the pipe trench before backfilling operations.

F. New pipe shall be connected to existing or new drainage facilities as shown on the Drawings and in accordance with Section 61 of the State Standard Specifications.

G. Drop Inlets shall be installed in accordance with the manufacturer's printed instructions, and as shown on the Drawings.

H. The Contractor shall fill all voids associated with lifting provisions provided by the manufacturer. These voids shall be filled with non-shrinking grout providing a finished surface consistent with adjacent surfaces. The Contractor shall trim all protruding lifting provisions flush with the adjacent concrete surface in a manner which leaves no sharp points or edges.

I. Lay pipe on bedding to slope gradients noted on drawings with maximum variation from indicated slope of 1/8 inch in 10 feet.

J. Install bedding at sides and over top of pipe. Install top cover to minimum compacted thickness as shown on Drawings.

K. Refer to Section 31 23 00, TRENCH EXCAVATION AND BACKFILL for bedding, backfilling and compacting requirements. Do not displace or damage pipe when compacting.

L. Connections of pipe to existing structures and pipes shall be as follows:
   1. Connections to cast-in-place structures shall include a water-stop at mid-wall of the structure.
   2. Connections to pre-cast structures shall include a water-stop at mid-wall of the structure, and opening shall be filled with cement grout.

M. Install warning tape continuous buried 6 inches above pipe line; coordinate with Section 31 23 00, TRENCH EXCAVATION AND BACKFILL.

N. Install site storm drainage system piping to 5 feet of building, or as shown on Drawings.

3.5 INSTALLATION - DROP INLETS AND MANHOLES

A. Excavation and Backfill:

1. Excavate for manholes and drop inlets in accordance with Section 31 00 00, EXCAVATION in location and to depth shown on Drawings. Provide clearance around sidewalls of structure for construction operations.
2. When groundwater is encountered, prevent accumulation of water in excavations in accordance with Section 31 23 19, DEWATERING. Place manholes and drop inlets in dry trench.
3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation.

B. Place base pad, trowel top surface level.

C. Form bottom of excavation clean and smooth to correct elevation.

D. Form and place Cast-In-Place Concrete base pad, with provision for storm drain pipe end sections.

E. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.

F. Lift precast components at lifting points designated by manufacturer.

G. When lowering manholes and drop inlets into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.

H. Set precast structures bearing firmly and fully on crushed stone bedding, compacted in accordance with provisions of Section 31 23 00, TRENCH EXCAVATION AND BACKFILL. Place manhole and drop inlet sections plumb and level, trim to correct elevations, anchor to base pad.

I. Assemble multi-section structures by lowering each section into excavation. Lower, set level, and firmly position base section before placing additional sections.

J. Remove foreign materials from joint surfaces and verify sealing materials are placed properly. Maintain alignment between sections by using guide devices affixed to lower section.

K. Joint sealing materials shall be installed on site.

L. Verify manholes and drop inlets installed satisfy required alignment and grade.

M. Establish elevations and pipe inverts for inlets and outlets as indicated on Drawings.

N. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with mortar.

O. Cut pipe to finish flush with interior of structure.

P. Shape inverts through manhole as shown on Drawings.

Q. Mount frame level in grout, secured to top cone section to elevation indicated.

R. Set cover frames and covers level, without tipping, to correct elevations.

S. Coordinate with other sections of Work to provide correct size, shape, and location.

3.6 FIELD QUALITY CONTROL

A. Section 01 40 00, QUALITY REQUIREMENTS: Field inspecting, testing, adjusting, and balancing.

B. Request inspection prior to and immediately after placing aggregate cover over pipe and around structure.

C. Compaction Testing: In accordance with ASTM D1557.

D. When tests indicate work does not meet specified requirements, remove work, replace and retest.

3.7 PROTECTION OF FINISHED WORK

A. Section 01 73 00, EXECUTION: Protecting finished Work.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.
   1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
   2. Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION 33 41 00

SECTION 41 22 00 - HOISTS AND CRANES

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.1 WORK INCLUDED

A. Equipment items as listed below by Equipment Identifier:
   1. 5392 Hoist, chain, electric, motorized trolley, 2 ton (Ref. Part 2.1)

B. Roughing-in, installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.

C. Wiring, and switching between equipment and utilities.

1.2 QUALITY ASSURANCE

A. Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.

B. Manufacturer's Representative:
   1. Installation: Provide a qualified manufacturer's representative at site to supervise work related to equipment installation, check out, and start up.
   2. Training: Provide technical representative to provide training to Owner's maintenance personnel in operation and maintenance of specified equipment.
   3. Quality standards shall meet or exceed ISO-9001.

1.3 SUBMITTALS

A. Product Data: Submit Product Data in accordance with Division 1 of these specifications.

B. Operations and Maintenance Manual:
   1. Submit Operations and Maintenance Manuals in accordance with Division 1- General Requirements of these specifications.
   2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.
   3. Description of system and components.
   4. Schematic diagrams of electrical, plumbing, and compressed air system.
   5. Manufacturer's printed operating instructions.
   6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

C. Shop Drawings: Submit Shop Drawings in accordance with Division 1.

1.4 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance will be based on the technical requirements herein as determined by Owner and Architect.

1.5 WARRANTY

A. Warrant work specified herein for one year from substantial completion against defects in materials, functions, and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer's recommended preventive maintenance schedule.

D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

E. All parts shall be readily available locally in the United States.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.

C. Provide equipment and material specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

PART 2 - PRODUCTS

2.1 HOIST, CHAIN, ELECTRIC, MOTORIZED TROLLEY, 2 TON
Equipment Identifier: 5392

A. Manufacturer's Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish minimal acceptable standards of quality, features, performance, and construction.
   a. Columbus McKinnon Corporation, Amherst, NY (716) 689-5400
   b. Model: ECMT4008-3-15 with accessories

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.

a. Jet Tools, LaVergne, TN (800) 274-6848
b. Harrington Hoists, Inc., Conona, CA (951) 279-7500

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 23-3/8 inches
b. Width: 11-5/8 inches
c. Height: 8 inches

2. Hoist:
a. Lifting capacity: 4,000 pounds
b. Motor: 1 HP
c. Lifting speed: 8 FPM
d. Lifting range: 23 feet, verify with monorail
e. Headroom, with trolley: 20 inches (maximum)

3. Trolley:
a. Capacity: 4,000 pounds
b. Motor: 1/4 HP
c. Travel speed: 35 FPM
d. Control cable length: 16 feet
e. I-beam size range: 6 to 18 inches, American Standard Section

4. Weight: 213 pounds (represents 10 foot lift)

C. Features/Performance/Construction:
1. Hoist shall have needle and ball type bearings with gears running in oil bath.
2. Frame shall be cast aluminum alloy.
3. Load hook and chain: Hook shall be forged steel with safety clip and shall be attached to cadmium plated chain by bearing type swivel.
4. Safety: Safety features shall include ratches pawl mechanical load brake, overheating, and positive limit switches.
5. Hoist mounting: Hoist shall be lug mounted to trolley for minimum headroom.
6. Pendant height: Pendant shall hang 36 inches above finished floor.

D. Controls: Four push button pendant, with cord strain relief bushings, for hoist UP/DOWN and trolley FORWARD/REVERSE

E. Accessories**:**
1. Festoon kit, 60 feet travel: Coffing No. 3568
2. Chain container, mounted to hoist: Coffing No. 927JG18

F. Utility Requirements: 460 VAC, 3 phase, 1-1/4 HP, provide disconnect

PART 3 - EXECUTION

3.1 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.

3.2 INSTALLATION

A. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect or designated representative.

B. Install equipment in accordance with plans, shop drawings, and manufacturer's instructions:
1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.
2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
3. Anchorage: Attach equipment as directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.

C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.3 TESTING

A. After final installation is complete and prior to authorizing payment, specified equipment shall be checked with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

3.4 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing and installation debris from job site.

D. Notify Architect or designated representative for acceptance inspection.

3.5 TRAINING

A. Direct the technical representative to provide specified hours of training to designated Owner's maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.
1. 5392 Hoist, chain, electric, motorized trolley, 2 ton; 1 hour (minimum)

A. Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.

END OF SECTION 41 22 00

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SECTION 45 39 00 - FABRICATED EQUIPMENT

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.1 WORK INCLUDED

A. Equipment items as listed below by Equipment Identifier:
   1. 1860 Workbench, severe use, 6 feet (Ref. Part 2.1)
   2. 2030 Bench, battery (Ref. Part 2.2)
   3. 3470 Tank, mop, with wringer (Ref. Part 2.3)

B. Installation of equipment with labor, services, and incidentals necessary for complete and operational equipment installation.

1.2 QUALITY ASSURANCE

A. Equipment shall be manufactured by a manufacturer of established reputation with a minimum of five years experience performing similar fabrication techniques.

1.3 SUBMITTALS

A. Shop Drawings shall be submitted in accordance with Division 1 - General Requirements of these specifications.

1.4 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance will be based on the technical requirements herein as determined by Owner and Architect.

1.5 WARRANTY

A. Warrant work specified herein for one year from substantial completion against defects in materials, functions, and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer’s recommended preventive maintenance schedule.

D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.

C. Provide equipment and material specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

PART 2 - PRODUCTS

2.1 WORKBENCH, SEVERE USE, 6 FEET
Equipment Identifier: 1860

A. Manufacturer's Reference:
1. Fabricated as shown on (Equipment Details).

B. Capacities/Dimensions:
1. Overall dimensions:
a. Length: 72 inches
b. Width: 32 inches
c. Height: 34 inches

2. Load capacity: 2,500 pounds
3. Work surface thickness: 3/8 inch

C. Features/Performance/Construction:
1. Legs: Workbench legs shall be fabricated of 3 by 3 by 3/16 inch steel tube.
2. Leg braces: Leg braces shall be 3 by 1/4 inch steel plate continuously welded to tubing.
3. Top braces: Top braces shall be 3 by 3 by 1/4 inch steel angle with continuous electrical welds to tubing.
4. Top: Top shall be 3/8 inch steel plate with 50 percent minimum electrical welds to top braces. Corners of top shall have a 2 inch radius for protection of personnel. All edges shall be ground smooth.
5. Skid plate: Skid plate shall be 4 by 4 by 1/4 inches steel plate with continuous welds to tubing.
6. Welds: All welds shall conform to American Welding Society standards.

D. Finish: Cover all exposed steel surfaces including both sides of top, braces, and legs with one coat of zinc chromate primer and two coats of epoxy per manufacturer's recommendations in Owner's choice of color.

2.2 BENCH, BATTERY
Equipment Identifier: 2030

A. Manufacturer's Reference:

1. Fabricated, as shown on (Equipment Details).
2. Model No.: 2030 bench

B. Capacities/Dimensions:
1. Overall dimensions, nominal:
   a. Length: 108 inches
   b. Width: 24 inches
   c. Height: 20 inches

2. Capacity: 200 pounds per linear foot of bench.
3. Dry paint thickness, minimum: 6 mils.

C. Features/Performance/Construction:
1. Construction: Bench shall be fabricated per specification and as shown.
2. Materials: Unit materials shall be 2 by 4 inch Grade 1 or better hardwood (preferably smooth, straight, kiln dried oak), marine grade wood glue, and zinc plated, No. 12 by 2-3/4 inch flat head wood screws.
3. Assembly: All joints shall be glued and fastened with countersunk wood screws.

D. Finish: All exposed wood surfaces shall be sealed and finished with one to one mix of International Paint Integard-740 epoxy paint product number and curing agent number 4346-B applied per manufacturer's recommendations in Owner's choice of color.

2.3 TANK, MOP, WITH WRINGER
Equipment Mark Number: 3470

A. Manufacturer's Reference:
1. Fabricated; as shown on (Equipment Details)

B. General Description:
1. This item provides a means for rinsing, wringing, and storing mops used in the daily cleaning of bus floors. The unit consists of a two compartment tank; one compartment equipped with a mop holding rack to keep mop handles upright, hereafter referred to as Compartment One, and one compartment equipped with a mop squeezer/ wringer hereafter referred to as Compartment Two. Compartment One is filled with fresh, clean, running water from faucet for rinsing and storing mops. The water overflows into Compartment Two, which is used for dirty rinsing and wringing mops. The overflow from Compartment Two is plumbed to drain. Each compartment is to be fitted with fixtures as described in this specification and as shown.

C. Capacities and Dimensions:
1. Overall dimensions:
   a. Length: 40 inches
   b. Width: 25 inches
   c. Height: 42 inches

2. Tank compartments, nominal:
   a. Capacity: 30 gallons each.
   b. Length: 25 inches.
   c. Width: 21 inches.
   d. Overall tank depth: 18-1/2 inches

e. Depth to overflow: 14 inches.
f. Quantity: Two each per tank unit.

D. Features/Performance/Construction:
1. Tank:
a. Material: Tank shall be fabricated of minimum 16-gauge stainless sheet steel or other approved non-corrosive material with two individual compartments. The tank shall be reinforced as necessary to provide a rigid structure.
b. Construction: Tank shall be constructed with double walled coved corner construction. The inner wall shall be integrally welded to the outer wall and 3/4-inch radius coved interior corners. All welded joints are to be polished to a number 3 finish.
c. Mounting: A reinforcing bottom frame shall be provided for the tank. It shall have provisions for permanently anchoring the tank assembly to a concrete housekeeping pad using concrete anchors and bolts.
d. Cleanouts: Each compartment shall have self-cleaning, solid bronze or brass drain valves to completely drain compartments for cleaning. Drain valves shall be configured with 2 inch male threaded nipples (both ends) and a 2 inch gate valve. Gate valve shall have a 2 inch female threaded connection at outlet side for connection as directed by Owner.
e. Compartment overflow: The divider between compartments shall be fitted with a 2 inch diameter bronze or brass overflow collar placed such that bottom of opening for overflow is 14 inches above bottom of compartments as shown.
f. Tank overflow: Compartment Two shall be fitted with a 2 inch diameter bronze or brass overflow pipe to connect to waste drain such that bottom of opening for overflow is 12 inches above bottom of compartment as shown.

2. Mop holding rack:
a. Description: A rack to hold mops in upright position shall be mounted around Compartment One. It shall have three sides, be flange mounted, and bolted to floor as shown on drawings or mounted directly on tank framing.
b. Construction: Rack shall be fabricated of 1 inch diameter, minimum, stainless steel tubing with stainless steel fittings.

3. Mop squeezer/wringer: Provide a stainless steel, commercially available tank edge mounted wringer.
4. Water tap fixture: A standard hot and cold mixing discharge outlet, threaded to accommodate connection of standard water hose shall be provided by the Plumbing contractor.

E. Accessories:
1. Mop wringer, stainless steel: Royce Rolls No. 3b, (800) 253-9633

F. Utilities Requirements:
1. Domestic water: 3/4 inch connection, 11 GPM
2. Drain: 2 inches

G. Finish: All components to be stainless steel or have other non-corrosive finish.

PART 3 - EXECUTION

3.1 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.

3.2 INSTALLATION

A. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect.

B. Install equipment in accordance with plans, shop drawings, and manufacturer's instructions:
   1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.
   2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
   3. Anchorage: Attach equipment as directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.

C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.3 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

3.4 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing and installation debris from job site.

D. Notify Architect or designated representative for acceptance inspection.

END OF SECTION 45 39 00

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