SPECIFICATIONS

Butte County Association of Governments

Butte Regional Transit Operations Center Tenant Improvement

100% Construction Documents

OCTOBER 27, 2015

Kitchell CEM
2750 Gateway Oaks Drive, Suite 300
Sacramento, California 95833

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DIVISION 00

00 11 16 - INVITATION TO BID

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
Tenant Improvement Remodel Project
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 Butte County Association of Governments (BCAG) is the owner/operator of Butte Regional Transit (BRT) or the B-Line. BRT provides drivers, dispatching and maintenance of the BRT day-to-day operations under the oversight of BCAG's Transit Manager and Transit Operations staff to provide daily fixed route and para-transit services throughout the county and cities. BCAG provides the BRTOC campus facility and all vehicles to serve the needs of Butte County public transit.

In September of 2014, construction of a new maintenance and operations facility began adjacent to the existing facility at 326 Huss Lane. Operations and maintenance of services will continue in the existing building until substantial completion of the new BRTOC facility, at which time, the operations will move to the new facility. Following the occupancy, the existing facility will begin a TI remodel phase. Upon completion of all construction, including the remodel, BCAG, BRT and the B-Line will all operate out of one 10-acre campus with 5 buildings at 326 Huss Lane, Chico CA 95928.

The Tenant Improvement Remodel project, consists of the construction remodel of an existing office and maintenance shop building. The existing offices, electrical room, and shop improvements will require soft demo to a cold shell structure. The improvements will include storefront aluminum window wall infill, the BCAG boardroom and associated casework, finishes and Audio Video improvements, approximately 14 offices with conference rooms, reception, restrooms and break room areas. The project will require schedule coordination and cooperation with the Onsite Project contractor who will be completing the exterior improvements around this building at the same time as the tenant improvements inside will occur by this project. This is the fifth building on the Butte County Association of Governments (BCAG) and Butte Regional Transit (B-Line) Campus.

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, Tenant Improvement Remodel**". 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 **Wednesday, January 6th, 2016,** 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, Tenant Improvement Remodel",** along with date and time of bid opening.

Important Dates:
- First day of advertisement and plan availability: December 03, 2015.
- **Mandatory Pre-Bid Conference** to be held Tuesday 12/15/15 at 9 AM at 326 Huss Ln, Chico CA 95928.
- Questions from Contractors must be received by in writing before: 5:00 PM December 17, 2015.
- Final Bid addendum will be issued before: 5:00 PM December 23, 2015.
- Bids must be received at BCAG offices **before**: 2:00 PM January 6, 2016.

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 $ 320.00** for full size plans 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 **$ 160 .00 .** All addendums will be posted through ARC Document Solutions and on the BCAG website; http://www.bcag.org/RFPs/index.html

There will be **a Mandatory 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 Wednesday, Dec 17th, 2015.** 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 **Wednesday, December 23rd, 2015** in a written document; http://www.bcag.org/RFPs/index.html . Main contact for this project is the Owner's Project Manager from Kitchell, Kraig Wilson, telephone (916) 648-9700, and email: kwilson@kitchell.com. ***Email submissions must be addressed to all three of the following individuals:***

kwilson@kitchell.com
jmonnin@kitchell.com
anewsum@bcag.org

A certified check or bid bond for not less than ten percent (10%) of the proposal and conforming to the prescribed bidding procedures shall be submitted with each bid as a guarantee that the bidder, if awarded the Contract, will

fulfill the terms of the bid. This Bid Guarantee shall 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. The Owner reserves the right to refuse any or all proposals or bids or portions thereof.

This project is not limited to pre-qualified general contractors or subcontractors.

Bidding procedures are prescribed in the Project Manual.

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, regarding the prevailing wages and per diem rates shall be applicable to the work to be performed under this contract. Pursuant to Labor Code Section 1773, the general prevailing wage rates and per diem 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.

This project will participate in State of California, Department of Industrial Relations Public works reforms (SB 854) which were signed into law on June 20, 2014. The reforms made several significant changes to the administration and enforcement of prevailing wage requirements by the Department of Industrial Relations (DIR). Among other things, SB 854 established a public works contractor registration program to replace prior Compliance Monitoring Unit (CMU) and Labor Compliance Program (LCP) requirements for bond-funded and other specified public works projects. The fees collected through the program established by SB 854 are

used to fund DIR's public works activities. All contractor's providing bids for this project should familiarize themselves with these requirements at the DIR website;
http://www.dir.ca.gov/Public-Works/PublicWorksSB854.html

To ensure your firm is eligible to bid on this public works project, please visit the following website, review and comply with the requirements all bidders must adhere to;

http://www.dir.ca.gov/Public-Works/Contractors.html

All contractors and subcontractors must furnish electronic certified payroll records directly to the Labor Commissioner (aka Division of Labor Standards Enforcement). The phase-in timetable for this requirement is as follows:

- **April 1, 2015**: For all new projects awarded on or after this date, the contractors and subcontractors must furnish electronic certified payroll records to the Labor Commissioner.
- **January 1, 2016**: As of this date, all contractors must furnish electronic certified payroll records to the Labor Commissioner in our eCPR data system.

Public Works Reforms (SB 854) - Important Information for Awarding Bodies;
NOTICE REQUIREMENTS

As of January 1, 2015: The call for bids and contract documents must include the following information:

- No contractor or subcontractor may be listed on a bid proposal for a public works project (submitted on or after March 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)].
- No contractor or subcontractor may be awarded a contract for public work on a public works project (awarded on or after April 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.
- This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

The awarding body/Owner requires the prime contractor to post job site notices prescribed by regulation. (See 8 Calif. Code Reg. §16451(d) for the notice that previously was required for projects monitored by the CMU.)

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

_____ 11-19-15

EXECUTIVE DIRECTOR DATE

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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
Tenant Improvement Remodel Project

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 Wednesday, January 6th, 2015,** 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:
   Kraig Wilson, Project Manager
   Kitchell
   2812 Bldg. B Hegan Lane
   Chico, CA 95928
   Telephone: (916) 648-9700
   Fax: (916) 648-6534
   Email: kwilson@kitchell.com

3. **BID SUBMISSION.** Bidder should mark Bid envelopes as**: "BID FOR BUTTE REGIONAL TRANSIT OPERATIONS CENTER, TENANT IMPROVEMENT PROJECT"**. 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. **MANDATORY PRE-BID CONFERENCE.** 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.

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, December 17th, 2015.** The Owner's Construction Manager and Architect are:

Kraig Wilson, Project Manager
Kitchell
2812 Hegan Ln, Bldg. B
Chico, CA 95928
Tel: (916) 648-9700
Fax: (916) 648-6534
Email: kwilson@kitchell.com

Jay Monnin, Project Architect
Kitchell
2750 Gateway Oaks Drive, Ste. 300
Sacramento, CA 95833
Tel: (916) 648-9700
Fax: (916) 648-6534
Email: jmonnin@kitchell.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, December 28th, 2015** 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, Tenant Improvement Remodel Project

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, regarding the prevailing wages and per diem rates shall be applicable to the work to be performed under this contract. Pursuant to Labor Code Section 1773, the general prevailing wage rates and per diem 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.

This project will participate in State of California, Department of Industrial Relations Public works reforms (SB 854) which were signed into law on June 20, 2014. The reforms made several significant changes to the administration and enforcement of prevailing wage requirements by the Department of Industrial Relations (DIR). Among other things, SB 854 established a public works contractor registration program to replace prior Compliance Monitoring Unit (CMU) and Labor Compliance Program (LCP) requirements for bond-funded and other specified public works projects. The fees collected through the program established by SB 854 are used to fund DIR's public works activities. All contractor's providing bids for this project should familiarize themselves with these requirements at the DIR website;
http://www.dir.ca.gov/Public-Works/PublicWorksSB854.html

To ensure your firm is eligible to bid on this public works project, please visit the following website, review and comply with the requirements all bidders must adhere to;
http://www.dir.ca.gov/Public-Works/Contractors.html

All contractors and subcontractors must furnish electronic certified payroll records directly to the Labor Commissioner (aka Division of Labor Standards Enforcement). The phase-in timetable for this requirement is as follows:

- **April 1, 2015**: For all new projects awarded on or after this date, the contractors and subcontractors must furnish electronic certified payroll records to the Labor Commissioner.
- **January 1, 2016**: As of this date, all contractors must furnish electronic certified payroll records to the Labor Commissioner in our eCPR data system.

Public Works Reforms (SB 854) - Important Information for Awarding Bodies;

NOTICE REQUIREMENTS

As of January 1, 2015: The call for bids and contract documents must include the following information:

- No contractor or subcontractor may be listed on a bid proposal for a public works project (submitted on or after March 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)].
- No contractor or subcontractor may be awarded a contract for public work on a public works project (awarded on or after April 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.
- This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

The awarding body/Owner requires the prime contractor to post job site notices prescribed by regulation. (See 8 Calif. Code Reg. §16451(d) for the notice that previously was required for projects monitored by the CMU.)

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, Kraig Wilson of Kitchell, at 2812 Hegan Ln Bldg. B Chico, CA 95928; facsimile: (916) 648-6534; and email: kwilson@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, Kraig Wilson, of Kitchell, at 2750 Gateway Oaks Drive., Suite 300, Sacramento CA 95833; facsimile: (916) 648-6534; and e-mail: kwilson@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

This page blank.

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, TENANT IMPROVEMENT REMODEL PROJECT.

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 (Kitchell) 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 00 - GEOTECHNICAL DATA, EXISTING CONDITIONS AND HAZARDOUS MATERIAL SURVEYS

1. SUMMARY

This Section 00 31 00 sets forth the terms and conditions under which Bidder may review, study, use, or rely upon existing geotechnical data at or contiguous to the Site, hazardous materials surveys and existing conditions information concerning existing conditions at or contiguous to the Site, as required in Section 00 52 13 (Agreement).

2. REPORTS AND INFORMATION

A. Bidders may inspect geotechnical reports, hazardous materials surveys and other information regarding existing conditions listed below in paragraph B on the BCAG's website at www.bcag.com . These reports, documents and other information are not part of the Contract Documents. Nevertheless, by submitting a Bid, Bidder accepts full responsibility for reviewing, knowing and understanding the contents of all of these materials.

B. The Owner and its consultants have prepared documents providing a general description of the Site. These documents consist of surveys made available for review and reference. The surveys are the following:

- Forensic Analytical Consulting Services Hazardous Material Survey Report dated August 4, 2015
- Geotechnical Engineering Investigation Report dated May, 2012

3. USE OF INFORMATION ON EXISTING CONDITIONS

A. Above Ground Existing Conditions. Under no circumstances shall the BCAG and KEAS be deemed to make a warranty or representation of existing above ground conditions, as-built conditions, or other above ground actual conditions verifiable by reasonable independent investigation. These conditions are verifiable by Bidder by the performance of its own independent investigation that Bidder must perform prior to bidding and Bidder must not rely on the information supplied by the Owner and Architect regarding existing conditions. Bidder represents and agrees that in submitting its Bid, it is not relying on any information regarding existing conditions supplied by BCAG and TLCD Architecture.

B. Underground Conditions. Information supplied regarding existing Underground Conditions at or contiguous to the Site is based on information furnished to the Owner by others. Except as expressly set forth in this Section 00 31 00 BCAG does not assume responsibility for the accuracy, completeness or thoroughness of this information and Bidder is solely responsible for any interpretation or conclusion drawn from this information. Except as expressly set forth in this Section 00 31 00 (Geotechnical Data & Surveys), the BCAG will be responsible only for the general accuracy of information regarding Underground Conditions.

4. LIMITED RELIANCE PERMITTED ON CERTAIN INFORMATION

A. Geotechnical Data. Except as expressly set forth in this Section 00 31 00, the BCAG and the Architect do not warrant, and makes no representation regarding, the accuracy or thoroughness of any Geotechnical data. Bidder represents and agrees that in submitting its Bid, it is not relying on any Geotechnical data supplied by the BCAG and the Architect, except as specifically set forth herein.

B. Bidder may rely upon the general accuracy of the "technical data" contained in the geotechnical reports and drawings identified above, but only insofar as it relates to subsurface conditions. The term "technical data" in the referenced reports and drawings shall be limited as follows:

1. The term “technical data” shall include actual reported depths, reported quantities, reported soil types, reported soil conditions, and reported material, equipment, or structures that were encountered during subsurface exploration.
2. The term “technical data'” does not include, and Bidder may not rely upon, any other data, interpretations, opinions or information shown or indicated in such drawings or reports that otherwise relate to subsurface conditions or described structures.
3. The term “technical data” shall not include the location of underground utilities or other improvements.
4. Bidder may not rely on the completeness of reports and drawings for the purposes of bidding or construction. Bidder may rely upon the general accuracy of the “technical data” contained in such reports or drawings.
5. Bidder is solely responsible for any interpretation or conclusion drawn from any “technical data” or any other data, interpretations, opinions, or information contained in supplied Geotechnical data.

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. The bidders/contractor for the TI Remodel work must familiarize themselves with the BRTOC Onsite scope of work for the area surrounding the existing building generally defined as Phase 2. See the plans and specifications for the BRTOC Onsite work at http://www.bcag.org/RFPs/index.html and various Builders Exchange plan rooms.

Owner will issue a Notice of Award to allow pre-construction and long lead submittals to begin promptly following the Bid Opening. The Notice to Proceed date will not be issued until it is clear a date the Onsite Contractor will complete Phase 1 of that project, allowing the Owner/Tenant to move out of the existing building. The Notice to Proceed for the TI Remodel project will be issued to start concurrently with the Phase 2 start date for the Onsite Project.

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. Upon substantial completion of Phase 1 and approval by all local and State agencies allowing occupancy, the Owner will relocate from the existing facilities into Phase 1 facilities. Once Owner has relocated all operations into Phase 1, Phase 2 area will be released to Contractor(s) to complete work in that area. 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:

Pre-Con Submittals & Long Lead Procurement	Notice of Award (NOA) date.
Project Start date:	Notice To Proceed (NTP) date.
Milestone 1 – Substantial Completion date:	150 CD's from NTP date.
Milestone 2 - Final Completion date:	30 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.

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 Milestone 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 180 calendar days (CD's) from the date of the Notice to Proceed (NTP).

B. Notice to Proceed date – This date will be determined once the Onsite Contractor has achieved Phase 1 completion:
   a. The Owner has 4 weeks to move out of the existing building and yard before the Tenant Improvement Remodel can start following the Onsite Contractor's Phase 1 completion. It is anticipated the TI Remodel will start approximately March 5, 2016 but may be as much as 1-2 months after this date.

C. Milestone #1 – Substantial Completion of the Tenant Improvement remodel Building, and Site Improvements including a Certificate of Occupancy:
   a. The existing building must be completed including Substantial Completion and Certificate Of Occupancy achieved to allow the Owner's staff and operations to move in and begin operations. The Contractor shall work cooperatively with and coordinate their sequence of work mutually with the Onsite project scheduled Phase 2 work to ensure there are no impacts to the schedule for either project. The Contractor shall not work in the Phase 1 limits or disrupt the Owner's operations in the Phase 1 limits for any reason without prior approval or written authorization. Contractor shall maintain a secure perimeter around their laydown yard and any materials stored on site while it is in use, with contractor furnished temporary fencing.
   b. The Owner's separate Data and Security Contractors will require the Server Rm/IDF room be completed and turned over to them exclusively no later than 21 CD's prior to the Milestone #1 – Substantial Completion (SC) can be achieved. Contractor is required to schedule their work to include the requirements of the Owner's separate Data and Security Contractors to ensure they are both 100% complete with their work in the Server Rm/IDF room. This requires the IDF room be 100% complete 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 Server Rm/IDF rooms. The Contractor must achieve this before 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**.

D. Milestone #5 - 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 30 CD's after Substantial Completion date. All work identified in the Contract Documents shall be complete and approved by Owner team including: final site work, punch lists, Commissioning documentation, As-built construction drawings and record documents, Operations and Maintenance Manuals, Permit Card sign-offs, Agency sign-offs, final cost proposals and contractor change orders, Warranty Request procedures, etc. must be completed 100% to achieve Final Completion. Reference specification sections 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 **$1,000.00 (One Thousand Dollars)** per Calendar Day.

END OF SECTION

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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, TI Remodel Project;**

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.

Bid Prices:

ITEM	DESCRIPTION	PRICE
1.	Lump Sum Base Bid Price: All Work of Contract Documents.	$

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 amounts of any Alternates to be included in the Contract Sum at the time of award.

   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.

6. 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.

7. 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.

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

9. 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".

10. 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.

11. 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).

12. 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, Tenant Improvement Remodel project*** 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 Wednesday, January 6, 2016 .*

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
This page blank.

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**

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.

Contractor may not enter into a contract for public work with an unregistered contractor per Public Works Reforms (SB 854). A listing of current and active PWC registrations pursuant to Division 2, Part 7, Chapter 1 (commencing with section 1720 of the California Labor Code.) can be validated through https://efiling.dir.ca.gov/PWCR/Search.action.

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

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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.

   2013: _____
   2012: _____
   2011: _____

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

This page blank.

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

BUY AMERICA REQUIREMENTS

A bidder or offeror must submit the appropriate Buy America certification (sample below) with all bids or offers on FTA-funded contracts, except those subject to a general waiver. Bids or offers that are not accompanied by a completed Buy America certification must be rejected as nonresponsive. This requirement does not apply to lower tier subcontractors.

Certification requirement for procurement of steel, iron, or manufactured products.
Certificate of Compliance with 49 U.S.C. 5323(j)(1)
The bidder or offeror hereby certifies that it will meet the requirements of 49 U.S.C. 5323(j)(1) and the applicable regulations in 49 C.F.R. Part 661.5.

Date _____
Signature_____
Company Name _____
Title _____
Certificate of Non-Compliance with 49 U.S.C. 5323(j)(1)

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: _____

Federal Use Only:

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

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 (Ml).

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 FORM

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

_____
Signature of Bidder

_____
Date (Area Code) Tel. No.

Local Agency Bidder DBE Information
(Rev 3/09)

_____ _____

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

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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	Concrete Testing & Inspection		
6	Grouting		
7	Concrete Unit Masonry Assemblies (CMU)		
8	Structural Steel Framing		
9	Cold Formed Metal Framing		
10	Pipe and Tube Railings		
11	Metal Canopy		
12	Rough Carpentry		
13	Miscellaneous Rough Carpentry		
14	Sheathing		
15	Interior Architectural Woodwork		
16	P-lam Architectural Cabinets		
17	Thermal Insulation		
18	Sheet Metal Flashing and Trim		
19	Joint Sealants		
20	Hollow Metal Doors and Frames		
21	Flush Wood Doors		
22	Access Doors and Frames		
23	Aluminum-Framed Entrances and Storefronts		
24	Door Hardware		
25	Glazing		
26	Non-Structural Metal Framing		
27	Gypsum Board		
28	Tiling		

29	Acoustic Panel Ceilings		
30	Water Vapor Control for Flooring		
31	Resilient Base and Accessories		
	Linoleum Flooring		
32	Static Control Resilient Flooring		
33	Tile Carpeting		
34	Acoustical Wall Treatment		
35	Painting		
37	Dimensional Letter Signage		
38	Panel Signage		
39	Toilet Compartments		
40	Toilet, Bath, and Laundry Accessories		
41	Fire Protection Cabinets		
42	Fire Extinguishers		
43	Audio-Visual Equipment		
44	Roller Window Shades		
45	Plastic-Laminate-Clad Countertops		
46	Solid Surfacing Countertops		
47	Plumbing Insulation		
48	Plumbing Piping and Pumps		
49	Domestic Water Piping		
50	Sanitary Waste and Vent Piping		
51	Sanitary Waste Piping Specialties		
52	Plumbing Equipment		
53	Plumbing Fixtures		
54	HVAC Vibration and Seismic Controls for HVAC Piping and Equipment		
55	HVAC Testing Adjusting and Balancing		
56	HVAC insulation		
57	HVAC Commissioning		
58	HVAC Instrumentation and Controls		
59	HVAC Piping and Pumps		
60	HVAC Refrigerant Piping		
61	HVAC Air Distribution		
62	HVAC Fiber Glass Reinforced Plastic Duct		
63	HVAC Ducts and Casings		
64	Heating Boilers		
65	Indoor Central-station Air-Handling Units		
66	Self-Contained Air-Conditioners		
67	Split-System Air Conditioning Units		
68	Variable Refrigerant Flow HVAC System		
69	Low Voltage Electrical Power Conductors and Cables		
70	Grounding and Bonding for Electrical Systems		
71	Raceways and Boxes for Electrical Systems Identification of Electrical System		
72	Lighting Control Devices		
73	Low-Voltage Transformers		

74	Enclosed Switches and Circuit Breakers		
75	Lighting		
76	Telecommunications Infrastructure		
77	Access Control System Complete		
78	Fire Detection & Alarm System Complete		
79	Decorative Metal Fences and Gates		
80	Decorative Metal Security Fences and Gates		
81	Other		
82	Other		
83	Other		
84	Other		
85	Other		
86	Other		
87	Other		
88	General Conditions		
89	General Requirements		
90	Bonds/Insurance		
91	Fee/Overhead & Profit		
92	**LUMP SUM BASE BID:**		

END OF SECTION

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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, TI Remodel 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 Tenant Improvement Remodel 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. 5 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 and per diem wages applicable to the locations and work to be done. Contractor shall post the applicable prevailing wage and per diem 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.

   This project will participate in State of California, Department of Industrial Relations Public works reforms (SB 854) which were signed into law on June 20, 2014. The reforms made several significant changes to the administration and enforcement of prevailing wage requirements by the Department of Industrial Relations (DIR). Among other things, SB 854 established a public works contractor registration program to replace prior Compliance Monitoring Unit (CMU) and Labor Compliance Program (LCP) requirements for bond-funded and other specified public works projects. The fees collected through the program established by SB 854 are used to fund DIR's public works activities. All contractor's providing bids for this project should familiarize themselves with these requirements at the DIR website;
   http://www.dir.ca.gov/Public-Works/PublicWorksSB854.html

   To ensure your firm is eligible to bid on this public works project, please visit the following website, review and comply with the requirements all bidders must adhere to;
   http://www.dir.ca.gov/Public-Works/Contractors.html

   All contractors and subcontractors must furnish electronic certified payroll records directly to the Labor Commissioner (aka Division of Labor Standards Enforcement). The phase-in timetable for this requirement is as follows:

   April 1, 2015: For all new projects awarded on or after this date, the contractors and subcontractors must furnish electronic certified payroll records to the Labor Commissioner.

   January 1, 2016: As of this date, all contractors (except those listed as Exemptions just below) must furnish electronic certified payroll records to the Labor Commissioner in our eCPR data system.

   Public Works Reforms (SB 854) - Important Information for Awarding Bodies;
   NOTICE REQUIREMENTS
   As of January 1, 2015: The call for bids and contract documents must include the following information:

   - No contractor or subcontractor may be listed on a bid proposal for a public works project (submitted on or after March 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)].
   - No contractor or subcontractor may be awarded a contract for public work on a public works project (awarded on or after April 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.
   - This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

The awarding body/Owner requires the prime contractor to post job site notices prescribed by regulation. (See 8 Calif. Code Reg. §16451(d) for the notice that previously was required for projects monitored by the CMU.)

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

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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 with Divisions 0 thru 32), 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 and Per Diem 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

   Tenant Improvement Project

   326 Huss Lane, Chico CA 95928

   _____

   The Project Plans are entitled:

   Butte Regional Transit Operations Center, Sheets G001 thru P201

   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

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00 55 00 - NOTICE TO PROCEED

Dated: _____, 2016

To: _____
(Contractor)

Address: _____

_____

CONTRACT FOR:

BCAG, Butte Regional Transit Operations Center Tenant Improvement Remodel 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.

It is expected the Owner will issue a Notice of Award approximately 2 weeks after bids are received and Contractor shall begin all submittal and long lead procurement activities immediately upon receipt of the Notice of Award. The Notice to Proceed date will not be issued until it is clear a date the Onsite Contractor will complete Phase 1 of that project, allowing the Owner/Tenant to move out of the existing building. The Notice to Proceed for the TI Remodel project will be issued to start concurrently with the Phase 2 start date for the Onsite Project.

The Onsite Project 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. Upon substantial completion of Phase 1 and approval by all local and State agencies allowing occupancy, the Owner will relocate from the existing facilities into Phase 1 facilities. Once Owner has relocated all operations into Phase 1, Phase 2 area will be released to Contractor(s) to complete work in that area. Contractor shall not obstruct or interfere with Owner's operations at any time during project without prior approval and written authorization.

Achieve all intermediate milestone dates and allow for occupancy of the Existing Tenant Improvement Remodel building no later than **150** Calendar Days, and Final Completion of the project portion within **180** calendar days from the date when the Contract Time commences to run as provided in Section 00 31 13 (Construction Durations, Phasing and Milestones) 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 **30** calendar days from the date of acceptance of Substantial Completion of all as provided in Section 00 31 13 (Construction Durations, Phasing and Milestones) and Section 007213 (General Conditions).

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

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

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

3. Obtain and submit copies of applicable permits and/or approvals, including but not limited to:
    - Contractor shall secure building permit from the City of Chico Building Department.
    - 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.

4. Submit approved fire protection plan, as required.

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

Butte County Association of Governments

By: _____

Milestone Date Requirements

Milestone No.*	Summary Description*	Calendar Day Duration*	Date Required **
-	Early Submittal & long lead pre-con	TBD	
-	Project Start date	Notice To Proceed (NTP) date	
1	Substantial Completion date	150 CD's from NTP date	
2	Final Completion date	30 CD's from NTP date	

* Reference Section 00 31 13 (Construction Durations, Phasing and Milestones) for specific requirements.

****** Actual Date Required will be determined when 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:

Plans for Butte Regional Transit Operations Center, Tenant Improvement Project

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 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

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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:

Plans for Butte Regional Transit Operations Center, Tenant Improvement Project

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

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00 65 36 - GUARANTEE

To the BUTTE COUNTY ASSOCIATION OF GOVERNMENTS for construction of

BUTTE REGIONAL TRANSIT OPERATIONS CENTER, TENANT IMPROVEMENT 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

TABLE OF CONTENTS

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 Department of Industrial Relations work reform (SB 854) which were signed into law on June 20, 2014. 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 of Award (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. Formal Base Line Schedule. A Formal Base Line 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. An accepted

scheduled by the Owner will be required prior to a Notice to Proceed being issued, 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, and 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 **Two (2)** 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 **Two (2)** 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 its 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 initiated 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 market 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 type 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 (25^{th}) 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, at that time, currently utilized for plan check submission by either the Owner, the Architect, and/or the Construction Manager, and deliver a complete HARDCOPY set of prints. When completed, Contractor shall deliver corrected HARDCOPY to the Owner.

20.11.5.2.4 Contractor shall provide all updates to the plans 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.

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 0, 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 Bidders are hereby notified that provisions of the Labor Code of the State of California, regarding the prevailing wages and per diem rates shall be applicable to the work to be performed under this contract. Pursuant to Labor Code Section 1773, the general prevailing wage rates and per diem 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.

26.13.5 This project will participate in State of California, Department of Industrial Relations Public works reforms (SB 854) which were signed into law on June 20, 2014. The reforms made several significant changes to the administration and enforcement of prevailing wage requirements by the Department of Industrial Relations (DIR). Among other things, SB 854 established a public works contractor registration program to replace prior Compliance Monitoring Unit (CMU) and Labor Compliance Program (LCP) requirements for bond-funded and other specified public works projects. The fees collected through the program established by SB 854 are used to fund DIR's public works activities. All contractor's providing bids for this project should familiarize themselves with these requirements at the DIR website; http://www.dir.ca.gov/Public-Works/PublicWorksSB854.html

To ensure your firm is eligible to bid on this public works project, please visit the following website, review and comply with the requirements all bidders must adhere to; http://www.dir.ca.gov/Public-Works/Contractors.html

26.13.6 All contractors and subcontractors must furnish electronic certified payroll records directly to the Labor Commissioner (aka Division of Labor Standards Enforcement). The phase-in timetable for this requirement is as follows:

April 1, 2015: For all new projects awarded on or after this date, the contractors and

subcontractors must furnish electronic certified payroll records to the Labor Commissioner.

January 1, 2016: As of this date, all contractors must furnish electronic certified payroll records to the Labor Commissioner in our eCPR data system.

26.13.7 **Public Works Reforms (SB 854) - Important Information for Awarding Bodies; NOTICE REQUIREMENTS**

As of January 1, 2015: The call for bids and contract documents must include the following information:

No contractor or subcontractor may be listed on a bid proposal for a public works project (submitted on or after March 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)].

No contractor or subcontractor may be awarded a contract for public work on a public works project (awarded on or after April 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.
This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

The awarding body/Owner requires the prime contractor to post job site notices prescribed by regulation. (See 8 Calif. Code Reg. §16451(d) for the notice that previously was required for projects monitored by the CMU.)

26.13.8 Consequences of Noncompliance: Contractors/Subcontractors shall be subject to penalties enforced by the Department of Industrial Relations in the case of failure to register prior to bidding.

A $2,000 penalty for unregistered contractors that bid on a public works project on or after March 1, 2015

Was awarded a public works contract on or after April 1, 2015

Intentionally allowed registration to lapse while bidding or working on a public works project

$300, in the case of an inadvertent lapse in registration (failure to renew before bidding or working on a public works project) as long as the registration is renewed by December 31, 2015. Renewing with a lapsed registration after that date will result in a $2,000 penalty.

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 apprentice able 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

A. 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…..

B. 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 maintain a clean work site with all trash (especially food wrappers) contained in trash receptacle to prevent attracting wildlife to the site.

C. 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.
d. Implement SWPPP BMP's, contribute and cooperate with Onsite Contractor to maintain existing BMP's put in place. All work must comply with the Water Board's permit issued prior for this phased multi-prime site.

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.

D. 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.

E. Water Pollution Control

1. 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.
2. 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 Offsite & Onsite projects work. Contractor is to assume responsibility of all SWPPP BMP's from the Offsite & Onsite Contractors.
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 by the Owner. 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.

F. 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 project.
- BRTOC Onsite project.
- BRTOC Tenant Improvement Remodel of Existing Building project.

G. 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.

H. 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.

I. 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
- City of Chico
- Holdrege & Kull

Including their officers, directors, employees, agents, and design professionals.

J. 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 Division 01 – Generaly Requirements, 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.

K. Permits, Certificates, Licenses, Fees, Approval

1. **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:

   a. City of Chico Building & Encroachment Permits

(1) 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 B** and SWPPP/BMP requirements in the bid documents.

2. APPENDICES:

APPENDIX A
BCAG Negative Declaration Mitigation Monitoring Measures.

APPENDIX B
1) Storm Water Polution Prevention Plan for BRTOC, Risk Level 2, (WDID #5R04C370218).
2) Central Valley Regional Water Quality Control Board 401 Permit dated 9/11/13.

APPENDIX C
1) Bidders Question Form.

APPENDIX D
Site Logistics Plan.

3. Buy America Act (23 CFR 635.410)

a. For a Federal-aid contract, furnish steel and iron materials to be incorporated into the work that are produced in the United States except:

(1) Foreign pig iron and processed, pelletized, and reduced iron ore may be used in the domestic production of the steel and iron materials [60 Fed Reg 15478 (03/24/1995)]
(2) If the total combined cost of the materials does not exceed the greater of 0.1 percent of the total bid or $2,500, material produced outside the United States may be used.

b. Production includes:
(1) Processing steel and iron materials, including smelting or other processes that alter the physical form or shape (such as rolling, extruding, machining, bending, grinding, and drilling) or chemical composition
(2) Coating application, including epoxy coating, galvanizing, and painting, that protects or enhances the value of steel and iron materials

c. For steel and iron materials to be incorporated into the work, submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications that certifies all production processes occurred in the United States except for the above exceptions.

4. DBE Goal and Certification Status

Bidders are advised that, as required by federal law, the State has established a statewide overall **DBE goal of 7.0%**. This Agency federal-aid contract is considered to be part of the statewide overall DBE goal. The Agency is required to report to Caltrans on DBE participation for all Federal-aid contracts each year so that attainment efforts may be evaluated. To provide assistance in meeting the statewide goal, the Agency may include a DBE Availability Advisory in this contract. Bidders need not achieve the percentage stated in any DBE Availability Advisory as a condition of award.

This Agreement is subject to Title 49, Part 26 of the Code of Federal Regulations (49 CFR 26) entitled “Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs.” In order to ensure the California Department of Transportation (Caltrans) achieves its federally mandated statewide overall Disadvantaged Business Enterprises (DBE) goal, the Owner encourages the participation of DBE’s, as defined in 49 CFR 26, in the performance of Agreements financed in whole or in part with federal funds. The national goal for participation of Disadvantaged Business Enterprises (DBE) is 10%. **The BCAG/agency's overall goal for DBE participation is 7% which applies to this procurement.**

The contractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of this DOT-assisted contract. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as BCAG deems appropriate. Each subcontract the contractor signs with a subcontractor must include the assurance in this paragraph (see 49 CFR 26.13(b)).

As required by federal law, Caltrans has established a statewide overall DBE goal. In order to ascertain whether that statewide overall DBE goal is being achieved, Caltrans is tracking DBE participation on all federally assisted contracts.

To assist Contractors in ascertaining DBE availability for specific item of work, the Agency advises that it has determined that DBE's could reasonably be expected to compete for subcontracting opportunities on this project and the likely DBE Availability Advisory Percentage is 7.0 percent. The Agency also advises that participation of DBE's in the specified percentage is not a condition of award.

The Contract has agreed to carry out applicable requirements of Title 49 CFR 26, in the award and administration of federally assisted Agreements. The regulations in their entirety are incorporated herein and by reference.

The contractor must promptly notify BCAG, whenever a DBE subcontractor performing work related to this contract is terminated or fails to complete its work, and must make good faith efforts to engage another DBE subcontractor to perform at least the same amount of work. The contractor may not terminate any DBE subcontractor and perform that work through its own forces or those of an affiliate without prior written consent of BCAG.

DBE as defined in Title 49 CFR 26 and other small businesses are encouraged to participate in the performance of Agreements financed in whole or in part with federal funds. The Contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out the applicable requirements of 49 CFR, Part 26 in the award and administration of U.S. Department of Transportation assisted contracts. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy, as recipient deems appropriate.

Any subcontract entered into as a result of the Agreement shall contain all the provisions of this section.

The Contractor shall maintain records showing the name and business address of each first tier subcontractor. The records shall also show the name and business address of every DBE subcontractor, DBE vendor of materials and DBE trucking company, regardless of tier. The records shall show the date of payment and the total dollar figure paid to all of these firms. DBE prime contractors shall also show the date of work performed by their own forces along with the corresponding dollar value of the work.

Upon completion of the contract, a summary of these records shall be prepared on "Final Report-Utilization of Disadvantaged Business Enterprises (DBE), First Tier Subcontractors" Form CEM-2402(F) and certified correct by the Contractor or the Contractor's authorized representative, and shall be furnished to the Engineer. The form shall be furnished to the Engineer within 90 days from the date of contract acceptance. The amount of $10,000 will be withheld from payment until a satisfactory form is submitted.

Prior to the fifteenth of each month, the Contractor shall submit documentation to the Engineer showing the amount paid to DBE trucking companies. The Contractor shall also obtain and submit documentation to the Engineer showing the amount paid by DBE trucking companies to all firms, including owner operators, for the leasing of trucks. If the DBE leases trucks from a non DBE, the Contactor may count only the fee or commission the DBE receives as a result of the lease arrangement.

The successful bidder/offeror will be required to report its DBE participation obtained through race-neutral means throughout the period of performance.

If a DBE subcontractor is decertified during the life of the project, the decertified subcontractor shall notify the Contractor in writing with the date of decertification. If a subcontractor becomes a certified DBE during the life of the project, the subcontractor shall notify the Contractor in writing with the date of certification. The Contractor shall furnish the written documentation to the Engineer.

Upon completion of the contract, "Disadvantaged Business Enterprises (DBE) Certification Status Change" Form CEM-2403(F) indicating the DBEs' existing certification status shall be signed and certified correct by the Contractor. The certified form shall be furnished to the Engineer within 90 days from the date of contract substantial completion.

5. Access to Records and Reports for FTA Reporting

The Contractor agrees to provide the Owner, the FTA Administrator, the Comptroller General of the United States or any of their authorized representatives access to any books, documents, papers and records of the Contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts and transcriptions. Contractor also agrees, pursuant to 49 C.F.R. 633.17 to provide the FTA Administrator or his authorized representatives including any PMO Contractor access to Contractor's records and construction sites pertaining to a major capital project, defined at 49 U.S.C. 5302(a)1, which is receiving federal financial assistance through the programs described at 49 U.S.C. 5307, 5309 or 5311.

The Contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.

The Contractor agrees to maintain all books, records, accounts and reports required under this contract for a period of not less than three years after the date of termination or expiration of this contract, except in the event of litigation or settlement of claims arising from the performance of this contract, in which case Contractor agrees to maintain same until the Owner, the FTA Administrator, the Comptroller General, or any of their duly authorized representatives, have disposed of all such litigation, appeals, claims or exceptions related thereto. Reference 49 CFR 18.39(i)(11).

Contractor shall at all times comply with all applicable FTA regulations, policies, procedures and directives, including without limitation those listed directly or by reference in the Master Agreement between Owner and FTA, as they may be amended or promulgated from time to time during the term of this contract. Contractor's failure to so comply shall constitute a material breach of this contract.

6. FEDERAL LAWS FOR FEDERAL-AID CONTRACTS

"Federal Laws for Federal-Aid Contracts," includes specifications required in a Federal-aid construction contract and applies to a Federal-aid contract. Form FHWA-1273 is included in the contract in Section 7-1.50B, "FHWA-1273." Some contract terms on the form are different than those used in other contract parts as shown in the following table:

FHWA-1273 Terms and Department Equivalencies

FHWA-1273 Term	Equivalent Term Used in Other Contract Parts
SHA	Department
SHA contracting officer	Engineer
SHA resident engineer	Engineer

FHWA-1273 Electronic version -- March 10, 1994with revised Section VI

7. REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS
   (1) General
   (2) Nondiscrimination
   (3) Nonsegregated Facilities
   (4) Payment of Predetermined Minimum Wage
   (5) Statements and Payrolls
   (6) Record of Materials, Supplies, and Labor
   (7) Subletting or Assigning the Contract
   (8) Safety: Accident Prevention
   (9) False Statements Concerning Highway Projects
   (10) Implementation of Clean Air Act and Federal Water Pollution Control Act
   (11) Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion
   (12) Certification Regarding Use of Contract Funds for Lobbying

L. ATTACHMENTS

1. Employment Preference for Appalachian Contracts (included in Appalachian contracts only)

M. GENERAL

1. These contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

2. Except as otherwise provided for in each section, the contractor shall insert in each subcontract all of the stipulations contained in these Required Contract Provisions, and further require their inclusion in any lower tier subcontract or purchase order that may in turn be made. The Required Contract Provisions shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these Required Contract Provisions.

3. A breach of any of the stipulations contained in these Required Contract Provisions shall be sufficient grounds for termination of the contract.

4. A breach of the following clauses of the Required Contract Provisions may also be grounds for debarment as provided in 29 CFR 5.12:
   Section I, paragraph 2;
   Section IV, paragraphs 1, 2, 3, 4, and 7;
   Section V, paragraphs 1 and 2a through 2g.

5. Disputes arising out of the labor standards provisions of Section IV (except paragraph 5) and Section V of these Required Contract Provisions shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor (DOL) as set forth in 29 CFR 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the DOL, or the contractor's employees or their representatives.

6. Selection of Labor: During the performance of this contract, the contractor shall not:
   a. discriminate against labor from any other State, possession, or territory of the United States (except for employment preference for Appalachian contracts, when applicable, as specified in Attachment A), or
   b. employ convict labor for any purpose within the limits of the project unless it is labor performed by convicts who are on parole, supervised release, or probation.

N. NONDISCRIMINATION
(Applicable to all Federal-aid construction contracts and to all related subcontracts of $10,000 or more.)

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630 and 41 CFR 60) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The Equal Opportunity Construction Contract Specifications set forth under 41 CFR 60-4.3 and the provisions of the American Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:
   a. The contractor will work with the State highway agency (SHA) and the Federal Government in carrying out EEO obligations and in their review of his/her activities under the contract.
   b. The contractor will accept as his operating policy the following statement:

   "It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, preapprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the SHA contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active contractor program of EEO and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:
   a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.
   b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.
   c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minority group employees.
   d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
   e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minority groups in the area from which the project work force would normally be derived.
   a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to the contractor for employment consideration.
   b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the contractor's compliance with EEO contract provisions. (The DOL has held that where implementation of such agreements have the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Executive Order 11246, as amended.)
   c. The contractor will encourage his present employees to refer minority group applicants for employment. Information and procedures with regard to referring minority group applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:
   a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of his avenues of appeal.

6. Training and Promotion:
   a. The contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.
   b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.
   c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.
   d. The contractor will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women within the unions, and to effect referrals by such unions of minority and female employees. Actions by the contractor either directly or through a contractor's association acting as agent will include the procedures set forth below:
   a. The contractor will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.
   b. The contractor will use best efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.
   c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the SHA and shall set forth what efforts have been made to obtain such information.
   d. In the event the union is unable to provide the contractor with a reasonable flow of minority and women referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies

without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The DOL has held that it shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these specifications, such contractor shall immediately notify the SHA.

8. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment.
   a. The contractor shall notify all potential subcontractors and suppliers of his/her EEO obligations under this contract.
   b. Disadvantaged business enterprises (DBE), as defined in 49 CFR 23, shall have equal opportunity to compete for and perform subcontracts which the contractor enters into pursuant to this contract. The contractor will use his best efforts to solicit bids from and to utilize DBE subcontractors or subcontractors with meaningful minority group and female representation among their employees. Contractors shall obtain lists of DBE construction firms from SHA personnel.
   c. The contractor will use his best efforts to ensure subcontractor compliance with their EEO obligations.

9. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the SHA and the FHWA.
   a. The records kept by the contractor shall document the following:
      (1) The number of minority and non-minority group members and women employed in each work classification on the project;
      (2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women;
      (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees; and
      (4) The progress and efforts being made in securing the services of DBE subcontractors or subcontractors with meaningful minority and female representation among their employees.
   b. The contractors will submit an annual report to the SHA each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data.

O. NONSEGREGATED FACILITIES
(Applicable to all Federal-aid construction contracts and to all related subcontracts of $10,000 or more.)

1. By submission of this bid, the execution of this contract or subcontract, or the consummation of this material supply agreement or purchase order, as appropriate, the bidder, Federal-aid construction contractor, subcontractor, material supplier, or vendor, as appropriate, certifies that

the firm does not maintain or provide for its employees any segregated facilities at any of its establishments, and that the firm does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The firm agrees that a breach of this certification is a violation of the EEO provisions of this contract. The firm further certifies that no employee will be denied access to adequate facilities on the basis of sex or disability.

2. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, timeclocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are, in fact, segregated on the basis of race, color, religion, national origin, age or disability, because of habit, local custom, or otherwise. The only exception will be for the disabled when the demands for accessibility override (e.g. disabled parking).
3. The contractor agrees that it has obtained or will obtain identical certification from proposed subcontractors or material suppliers prior to award of subcontracts or consummation of material supply agreements of $10,000 or more and that it will retain such certifications in its files.

P. PAYMENT OF PREDETERMINED MINIMUM WAGE

(Applicable to all Federal-aid construction contracts exceeding $2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural minor collectors, which are exempt.)

1. General:
    a. All mechanics and laborers employed or working upon the site of the work will be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account [except such payroll deductions as are permitted by regulations (29 CFR 3) issued by the Secretary of Labor under the Copeland Act (40 U.S.C. 276c)] the full amounts of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment. The payment shall be computed at wage rates not less than those contained in the wage determination of the Secretary of Labor (hereinafter "the wage determination") which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor or its subcontractors and such laborers and mechanics. The wage determination (including any additional classifications and wage rates conformed under paragraph 2 of this Section IV and the DOL poster (WH-1321) or Form FHWA-1495) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. For the purpose of this Section, contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b) (2) of the Davis- Bacon Act (40 U.S.C. 276a) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section IV, paragraph 3b, hereof. Also, for the purpose of this Section, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in paragraphs 4 and 5 of this Section IV.
    b. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided, that the employer’s payroll records accurately set forth the time spent in each classification in which work is performed.

c. All rulings and interpretations of the Davis-Bacon Act and related acts contained in 29 CFR 1, 3, and 5 are herein incorporated by reference in this contract.

2. Classification:
   a. The SHA contracting officer shall require that any class of laborers or mechanics employed under the contract, which is not listed in the wage determination, shall be classified in conformance with the wage determination.
   b. The contracting officer shall approve an additional classification, wage rate and fringe benefits only when the following criteria have been met:
      (1) the work to be performed by the additional classification requested is not performed by a classification in the wage determination;
      (2) the additional classification is utilized in the area by the construction industry;
      (3) the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and
      (4) with respect to helpers, when such a classification prevails in the area in which the work is performed.
   c. If the contractor or subcontractors, as appropriate, the laborers and mechanics (if known) to be employed in the additional classification or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the DOL, Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, D.C. 20210. The Wage and Hour Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
   d. In the event the contractor or subcontractors, as appropriate, the laborers or mechanics to be employed in the additional classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. Said Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
   e. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 2c or 2d of this Section IV shall be paid to all workers performing work in the additional classification from the first day on which work is performed in the classification.

3. Payment of Fringe Benefits:
   a. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor or subcontractors, as appropriate, shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly case equivalent thereof.
   b. If the contractor or subcontractor, as appropriate, does not make payments to a trustee or other third person, he/she may consider as a part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The

Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

4. Apprentices and Trainees (Programs of the U.S. DOL) and Helpers:
   a. Apprentices:
      (1) Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the DOL, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or if a person is employed in his/her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.
      (2) The allowable ratio of apprentices to journeyman-level employees on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate listed in the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor or subcontractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman-level hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.
      (3) Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator for the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.
      (4) In the event the Bureau of Apprenticeship and Training, or a State apprenticeship agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor or subcontractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the comparable work performed by regular employees until an acceptable program is approved.
   b. Trainees:
      (1) Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the DOL, Employment and Training Administration.
      (2) The ratio of trainees to journeyman-level employees on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration

shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

(3) Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman-level wage rate on the wage determination which provides for less than full fringe benefits for apprentices, in which case such trainees shall receive the same fringe benefits as apprentices.

(4) In the event the Employment and Training Administration withdraws approval of a training program, the contractor or subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Helpers:

(1) Helpers will be permitted to work on a project if the helper classification is specified and defined on the applicable wage determination or is approved pursuant to the conformance procedure set forth in Section IV.2. Any worker listed on a payroll at a helper wage rate, who is not a helper under an approved definition, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed.

d. Apprentices and Trainees (Programs of the U.S. DOT):

(1) Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

e. Withholding:

(1) The SHA shall upon its own action or upon written request of an authorized representative of the DOL withhold, or cause to be withheld, from the contractor or subcontractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements which is held by the same prime contractor, as much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the SHA contracting officer may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

f. Overtime Requirements:

(1) No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen, or guards (including apprentices, trainees, and helpers described in paragraphs 4 and 5 above) shall require or permit any laborer, mechanic, watchman, or guard in any workweek in which he/she is employed on such work, to work in excess of 40 hours in such workweek unless such laborer, mechanic, watchman, or guard receives compensation at a rate not less than one-and-one-half times his/her basic rate of pay for all hours worked in excess of 40 hours in such workweek.

g. Violation:

(1) Liability for Unpaid Wages; Liquidated Damages: In the event of any violation of the clause set forth in paragraph 7 above, the contractor and any subcontractor responsible thereof shall be liable to the affected employee for his/her unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic, watchman, or guard employed in violation of the clause set forth in paragraph 7, in the sum of $10 for each calendar day on which such employee was required or permitted to work in excess of the standard work week of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 7.

h. Withholding for Unpaid Wages and Liquidated Damages:

(1) The SHA shall upon its own action or upon written request of any authorized representative of the DOL withhold, or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 8 above.

Q. STATEMENTS AND PAYROLLS

(Applicable to all Federal-aid construction contracts exceeding $2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural collectors, which are exempt.)

1. Compliance with Copeland Regulations (29 CFR 3):
   a. The contractor shall comply with the Copeland Regulations of the Secretary of Labor which are herein incorporated by reference.
2. Payrolls and Payroll Records:
   a. Payrolls and basic records relating thereto shall be maintained by the contractor and each subcontractor during the course of the work and preserved for a period of 3 years from the date of completion of the contract for all laborers, mechanics, apprentices, trainees, watchmen, helpers, and guards working at the site of the work.
   b. The payroll records shall contain the name, social security number, and address of each such employee; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalent thereof the types described in Section 1(b)(2)(B) of the Davis Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. In addition, for Appalachian contracts, the payroll records shall contain a notation indicating whether the employee does,

or does not, normally reside in the labor area as defined in Attachment A, paragraph 1. Whenever the Secretary of Labor, pursuant to Section IV, paragraph 3b, has found that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis Bacon Act, the contractor and each subcontractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, that the plan or program has been communicated in writing to the laborers or mechanics affected, and show the cost anticipated or the actual cost incurred in providing benefits. Contractors or subcontractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprentices and trainees, and ratios and wage rates prescribed in the applicable programs.

c. Each contractor and subcontractor shall furnish, each week in which any contract work is performed, to the SHA resident engineer a payroll of wages paid each of its employees (including apprentices, trainees, and helpers, described in Section IV, paragraphs 4 and 5, and watchmen and guards engaged on work during the preceding weekly payroll period). The payroll submitted shall set out accurately and completely all of the information required to be maintained under paragraph 2b of this Section V. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal stock number 029- 005-0014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

d. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his/her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
   (1) that the payroll for the payroll period contains the information required to be maintained under paragraph 2b of this Section V and that such information is correct and complete;
   (2) that such laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR 3;
   (3) that each laborer or mechanic has been paid not less that the applicable wage rate and fringe benefits or cash equivalent for the classification of worked performed, as specified in the applicable wage determination incorporated into the contract.

e. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 2d of this Section V.

f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 231.

g. The contractor or subcontractor shall make the records required under paragraph 2b of this Section V available for inspection, copying, or transcription by authorized representatives of the SHA, the FHWA, or the DOL, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the SHA, the FHWA, the DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

R. RECORD OF MATERIALS, SUPPLIES, AND LABOR
(As of May 22, 2007, Form FHWA-47 is no longer required.)

S. SUBLETTING OR ASSIGNING THE CONTRACT

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the State. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635).
    a. "Its own organization" shall be construed to include only workers employed and paid directly by the prime contractor and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.
    b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole and in general are to be limited to minor components of the overall contract.
2. The contract amount upon which the requirements set forth in paragraph 1 of Section VII is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.
3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the SHA contracting officer determines is necessary to assure the performance of the contract.
4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the SHA contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the SHA has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

T. SAFETY: ACCIDENT PREVENTION

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the SHA contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.
2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

U. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

1. In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by Engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, the following notice shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

V. NOTICE TO ALL PERSONNEL ENGAGED ON FEDERAL-AID HIGHWAY PROJECTS 18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined not more than $10,000 or imprisoned not more than 5 years or both."

W. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $100,000 or more.)

By submission of this bid or the execution of this contract, or subcontract, as appropriate, the bidder, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub.L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Pub.L. 92-500), Executive Order 11738, and regulations in implementation

thereof (40 CFR 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.

2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.
3. That the firm shall promptly notify the SHA of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.
4. That the firm agrees to include or cause to be included the requirements of paragraph 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

1. Instructions for Certification - Primary Covered Transactions:
   (Applicable to all Federal-aid contracts - 49 CFR 29)
   a. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.
   b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
   c. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.
   d. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
   e. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is submitted for assistance in obtaining a copy of those regulations.
   f. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.
   g. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the department or

agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded From Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph f of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Primary Covered Transactions

   a. The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

      (1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

      (2) Have not within a 3-year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

      (3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 1b of this certification; and

      (4) Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

   b. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

3. Instructions for Certification - Lower Tier Covered Transactions:
   (Applicable to all subcontracts, purchase orders and other lower tier transactions of $25,000 or more - 49 CFR 29)

   a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

   b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.
d. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.
h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

4. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Covered Transactions:
   a. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
   b. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

A. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING
(Applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000 - 49 CFR 20)

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

a. 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.
b. 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 Form to Report Lobbying," in accordance with its instructions.

2. 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 31 U.S.C. 1352. 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.
3. The prospective participant also agrees by submitting his or her bid or proposal 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 recipients shall certify and disclose accordingly.

7-1.50C Female and Minority Goals

To comply with Section II, "Nondiscrimination," of "Required Contract Provisions Federal-Aid Construction Contracts," the Department is including in Section 7-1.50C, "Female and Minority Goals," female and minority utilization goals for Federal-aid construction contracts and subcontracts that exceed $10,000.

The nationwide goal for female utilization is 6.9 percent.

The goals for minority utilization [45 Fed Reg 65984 (10/3/1980)] are as follows:

Minority Utilization Goals

Economic Area		Goal (Percent)
174	Redding CA: Non-SMSA Counties: CA Lassen; CA Modoc; CA Plumas; CA Shasta; CA Siskiyou; CA Tehema	6.8
175	Eureka, CA Non-SMSA Counties: CA Del Norte; CA Humboldt; CA Trinity	6.6
176	San Francisco-Oakland-San Jose, CA: SMSA Counties: 7120 Salinas-Seaside-Monterey, CA CA Monterey 7360 San Francisco-Oakland CA Alameda; CA Contra Costa; CA Marin; CA San Francisco; CA San Mateo 7400 San Jose, CA CA Santa Clara, CA 7485 Santa Cruz, CA CA Santa Cruz 7500 Santa Rosa CA Sonoma 8720 Vallejo-Fairfield-Napa, CA CA Napa; CA Solano Non-SMSA Counties: CA Lake; CA Mendocino; CA San Benito	 28.9 25.6 19.6 14.9 9.1 17.1 23.2

177	Sacramento, CA: SMSA Counties: 6920 Sacramento, CA CA Placer; CA Sacramento; CA Yolo Non-SMSA Counties CA Butte; CA Colusa; CA El Dorado; CA Glenn; CA Nevada; CA Sierra; CA Sutter; CA Yuba	 16.1 14.3
178	Stockton-Modesto, CA: SMSA Counties: 5170 Modesto, CA CA Stanislaus 8120 Stockton, CA CA San Joaquin Non-SMSA Counties CA Alpine; CA Amador; CA Calaveras; CA Mariposa; CA Merced; CA Toulumne	 12.3 24.3 19.8
179	Fresno-Bakersfield, CA SMSA Counties: 0680 Bakersfield, CA CA Kern 2840 Fresno, CA CA Fresno Non-SMSA Counties: CA Kings; CA Madera; CA Tulare	 19.1 26.1 23.6
180	Los Angeles, CA:	

	SMSA Counties:	
	0360 Anaheim-Santa Ana-Garden Grove, CA	11.9
	CA Orange	
	4480 Los Angeles-Long Beach, CA	28.3
	CA Los Angeles	
	6000 Oxnard-Simi Valley-Ventura, CA	21.5
	CA Ventura	
	6780 Riverside-San Bernardino-Ontario, CA	19.0
	CA Riverside; CA San Bernardino	
	7480 Santa Barbara-Santa Maria-Lompoc, CA	19.7
	CA Santa Barbara	
	Non-SMSA Counties	24.6
	CA Inyo; CA Mono; CA San Luis Obispo	
181	San Diego, CA:	
	SMSA Counties	
	7320 San Diego, CA	16.9
	CA San Diego	
	Non-SMSA Counties	18.2
	CA Imperial	

For each July during which work is performed under the contract, you and each non-material-supplier subcontractor with a subcontract of $10,000 or more must complete Form FHWA PR-1391 (Appendix C to 23 CFR 230). Submit the forms by August 15.

7-1.50D Training
Section 7-1.50D, "Training," applies if a number of trainees or apprentices is specified in the special provisions.

As part of your equal opportunity affirmative action program, provide on-the-job training to develop full journeymen in the types of trades or job classifications involved.

You have primary responsibility for meeting this training requirement.

If you subcontract a contract part, determine how many trainees or apprentices are to be trained by the subcontractor.

Include these training requirements in your subcontract.

Where feasible, 25 percent of apprentices or trainees in each occupation must be in their 1st year of apprenticeship or training.

Distribute the number of apprentices or trainees among the work classifications on the basis of your needs and the availability of journeymen in the various classifications within a reasonable recruitment area. Before starting work, submit to the Department:

1. Number of apprentices or trainees to be trained for each classification
2. Training program to be used
3. Training starting date for each classification

Obtain the Department's approval for this submitted information before you start work. The Department credits you for each apprentice or trainee you employ on the work who is currently enrolled or becomes enrolled in an approved program.

The primary objective of Section 7-1.50D, "Training," is to train and upgrade minorities and women toward journeymen status. Make every effort to enroll minority and women apprentices or trainees, such as conducting systematic and direct recruitment through public and private sources likely to yield minority and women apprentices or trainees, to the extent they are available within a reasonable recruitment area. Show that you have made the efforts. In making these efforts, do not discriminate against any applicant for training.

Do not employ as an apprentice or trainee an employee:

1. In any classification in which the employee has successfully completed a training course leading to journeyman status or in which the employee has been employed as a journeyman
2. Who is not registered in a program approved by the US Department of Labor, Bureau of Apprenticeship and Training

Ask the employee if the employee has successfully completed a training course leading to journeyman status or has been employed as a journeyman. Your records must show the employee's answers to the questions.

In your training program, establish the minimum length and training type for each classification. The Department and FHWA approves a program if one of the following is met:

1. It is calculated to:
   - Meet the your equal employment opportunity responsibilities
   - Qualify the average apprentice or trainee for journeyman status in the classification involved by the end of the training period

2. It is registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training and it is administered in a way consistent with the equal employment responsibilities of federal-aid highway construction contracts

Obtain the State's approval for your training program before you start work involving the classification covered by the program.

Provide training in the construction crafts, not in clerk-typist or secretarial-type positions. Training is allowed in lower level management positions such as office engineers, estimators, and timekeepers if the training is oriented toward construction applications. Training is allowed in the laborer classification if significant and meaningful training is provided and approved by the division office. Off-site training is allowed if the training is an integral part of an approved training program and does not make up a significant part of the overall training.

The Department reimburses you 80 cents per hour of training given an employee on this contract under an approved training program:

1. For on-site training
2. For off-site training if the apprentice or trainee is currently employed on a federal-aid project and you do at least one of the following:
   - Contribute to the cost of the training
   - Provide the instruction to the apprentice or trainee
   - Pay the apprentice's or trainee's wages during the off-site training period
3. If you comply with Section 7-1.50D, "Training"

Each apprentice or trainee must:

1. Begin training on the project as soon as feasible after the start of work involving the apprentice's or trainee's skill
2. Remain on the project as long as training opportunities exist in the apprentice's or trainee's work classification or until the apprentice or trainee has completed the training program

Furnish the apprentice or trainee:

1. Copy of the program you will comply with in providing the training
2. Certification showing the type and length of training satisfactorily completed

Maintain records and submit reports documenting your performance under Section 7-1.50D, "Training."

END OF DOCUMENT

Appendix B.1 - TI Remodel Project; SWPPP for Contractor Implementation.

STORM WATER POLLUTION PREVENTION PLAN

for

BUTTE REGIONAL TRANSIT OPERATIONS CENTER

RISK LEVEL ***2***

Legally Responsible Person (LRP):

Butte County Association of Governments
2580 Sierra Sunrise Terrace, Suite 100, Chico, 95928
Mr. Andy Newsum
Deputy Director
(530) 879-2468

Approved Signatory:

<QSP Contact Name>
<QSP Title>
<QSP Phone Number>

Prepared for:

Butte County Association of Governments
2580 Sierra Sunrise Terrace, Suite 100, Chico, 95928
Phn (530) 879-2468 Fax (530) 879-2444

Project Address:

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

SWPPP Prepared by:

GHD
2235 Mercury Way, Suite 150, Santa Rosa CA 95407

SWPPP Preparation Date

April, 2014

Estimated Project Dates:

Begin Construction (NTP): October, 2014 Complete Construction: April, 2016

State Water Resources Control Board

NOTICE OF INTENT

GENERAL PERMIT TO DISCHARGE STORM WATER
ASSOCIATED WITH CONSTRUCTION ACTIVITY
(WQ ORDER No. 2009-0009-DWQ)

WDID: 5R04C370218 **Risk Level:** Level2

Property Owner Information

Type: County Agency

Name: Butte County Association of Governments
Address: 2580 Sierra Sunrise Terrace Suite 100
Address 2:
City/State/Zip: Chico CA 95928

Contact Name: Andy Newsum
Title: Deputy Director
Phone #: 530-879-2468
Email: anewsum@bcag.org

Contractor/Developer Information

Name: Butte County Association of Governments
Address: 2580 Sierra Sunrise Terrace Suite 100
Address 2:
City/State/Zip: Chico CA 95928

Contact Name: Andy Newsum
Title: Deputy Director
Phone #: 530-879-2468
Email: anewsum@bcag.org

Construction Site Information

Site Name: Butte Regional Transit Operations Center
Address: 326 Huss Drive
City/State/Zip: Chico CA 95928
County: Butte
Latitude: 39.70481 Longitude: -121.82037
Total Size of Construction Area: 10
Total Area to be Disturbed: 10

Contact Name: Andy Newsum
Title: Deputy Director
Site Phone #: 530-879-2468
Email: anewsum@bcag.org

Construction Start: October 01, 2014
Complete Grading: October 01, 2015
Final Stabilization: April 01, 2016

Risk Values

R: 46 K: 0.59 LS: 0.12

Beneficial Uses/303(d): Yes

Type of Construction: *Other: Transit Facility
Receiving Water: Comanche Creek
Qualified SWPPP Developer: Steve Grupico
RWQCB Jurisdiction: Region 5R - Redding
Phone: 530-224-4845

Certification #: 23542
Email: r5r_stormwater@waterboards.ca.gov

Certification

Name Andy Newsum
Title: Deputy Director

Date: June 25, 2014

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Qualified SWPPP Developer - QSD

Approval and Certification of the Storm Water Pollution Prevention Plan

Project Name: Butte Regional Transit Operations Center

Project Number/ID *Application ID# XXXXX*

"This Storm Water Pollution Prevention Plan and Attachments were prepared under my direction to meet the requirements of the California Construction General Permit (SWRCB Orders No. 2009-009-DWQ as amended by Order 2010-0014-DWQ). I certify that I am a Qualified SWPPP Developer in good standing as of the date signed below."

QSD Signature	*Date*
Steve Grupico	XXXXX
QSD Name	*QSD Certificate Number*
PE, QSD with GHD	(707) 523-1010
Title and Affiliation	*Telephone Number*
Steve.Grupico@GHD.com	
Email	

Legally Responsible Person - LRP

Approval and Certification of the Storm Water Pollution Prevention Plan

Project Name: Butte Regional Transit Operations Center

Project Number/ID *Application ID# XXXXX*

"I certify under penalty of law that this document and all Attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Legally Responsible Person

Signature of Legally Responsible Person or Approved Signatory

Date

Name of Legally Responsible Person or Approved Signatory

Telephone Number

Amendment Log

Project Name: Butte Regional Transit Operations Center

Project Number/ID *Application ID# XXXXX*

Amendment No.	Date	Brief Description of Amendment, include section and page number	Prepared and Approved By
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#
			Name: QSD#

Section 1 SWPPP Requirements

1.1 INTRODUCTION

The Butte Regional Transit Operations Center project is the proposed construction of a new transit administration, operations and maintenance facility for the Butte County Association of Governments (BCAG) providing civil, mechanical, plumbing, and electrical / telecommunications engineering services and LEED certification. The project constructs a new administration and operations building, maintenance building, bus wash facility, and fueling station on a 10 acre site which will serve as the B-Line bus services new main facility. The project includes all new wet and dry utility systems, underground gasoline and diesel fuel storage, parking for 95 bus and paratransit vehicles, and 110 parking spaces for visitors and employees. Site designs include a new primary bus entrance and exit driveways with automatic cantilever gates, excavation, grading, lime treatment of soils, and paving and storm water improvements. Storm drainage is managed on-site using bioretention swales that incorporate tire derived aggregate for retention of storm water. All storm water runoff is treated prior to release, meeting LEED Sustainable Sites and California Storm Water General Permit requirements. It is anticipated that the project will achieve LEED Silver certification.

This Storm Water Pollution Prevention Plan (SWPPP) is designed to comply with California's General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (General Permit or CGP) Order No. 2009-0009-DWQ as amended by Order No. 2010-0014-DWQ (NPDES No. CAS000002) issued by the State Water Resources Control Board (State Water Board). This SWPPP has been prepared following the template provided on the California Storm Water Quality Association Storm Water *Best Management Practice Handbook Portal: Construction* (CASQA, 2010), and also the most current information from the State of California Department of Transportation (Caltrans) statewide storm water program. This SWPPP is designed to address the following:

- Pollutants and their sources, including sources of sediment associated with construction, construction site erosion and other activities associated with construction activity are controlled;
- Where not otherwise required to be under a Regional Water Quality Control Board (Regional Water Board) permit, all non-storm water discharges are identified and either eliminated, controlled, or treated.

Note that the Project is located within the Central Valley Regional Water Quality Control Board (Region 5) jurisdiction.

Site BMPs are effective and result in the reduction or elimination of pollutants in storm water discharges and authorized non-storm water discharges from construction activity to the Best Available Technology/Best Control Technology (BAT/BCT) standard.

1.2 PERMIT REGISTRATION DOCUMENTS

Required Permit Registration Documents (PRDs) shall be submitted to the State Water Board via the Storm Water Multi Application and Report Tracking System (SMARTS) by the Legally Responsible Person (LRP), or authorized personnel (i.e., Approved Signatory) under the direction of the LRP. The project-specific PRDs include:

1. Notice of Intent (NOI);
2. Risk Assessment (Construction Site Sediment and Receiving Water Risk Determination);
3. Site and Vicinity Maps;
4. Annual Fee;
5. Signed Certification Statement (LRP Certification is provided electronically with SMARTS PRD submittal);
6. Post-construction water balance calculation; and
7. SWPPP.

Site and Vicinity Maps can be found in Appendix B. A copy of the submitted PRDs shall also be kept in Appendix C along with the Waste Discharge Identification (WDID) confirmation.

1.3 SWPPP AVAILABILITY AND IMPLEMENTATION

The Contractor shall make working copies of the SWPPP available at the construction site during working hours (as specified) while construction is occurring. It is expected that the contractor will have a master copy of the SWPPP and Water Pollution Control Drawings (WPCDs) appropriate for that contractors work area with all revisions, amendments, and WPCDs.

The SWPPP shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and WPCDs will be left with the field crew and the original SWPPP shall be made available via request by radio or telephone.

The SWPPP shall be implemented concurrently with the start of ground disturbing activities.

1.4 SWPPP AMENDMENTS

The SWPPP shall be revised when:

- there is a General Permit violation,
- there is a reduction or increase in total disturbed acreage,
- Design Build documents are finalized, allowing creation of work area specific WPCDs,
- BMPs do not meet the objectives of reducing or eliminating pollutants in storm water discharges.

The SWPPP shall be amended when:

- there is a change in construction or operations which may affect the discharge of pollutants to surface waters, groundwater(s), or a municipal separate storm sewer system (MS4);
- there is a change in the project duration that changes the project's risk level; or
- deemed necessary by the QSD. The QSD has determined that the changes listed in Table 1.1 can be field determined by the QSP. All other changes shall be made by the QSD as formal amendments to the SWPPP.
- Subsequent phases are defined and scheduled for construction.

The following items shall be included in each amendment:

- Who requested the amendment;
- The location of proposed change;
- The reason for change;
- The original BMP proposed, if any; and
- The new BMP proposed.

Amendments shall be logged at the front of the SWPPP and certification kept in Appendix D. The SWPPP text shall be revised replaced, and/or hand annotated as necessary to properly convey the amendment. SWPPP amendments must be made by a QSD. The following changes have been designated by the QSD as "to be field determined" and constitute minor changes that the QSP may implement based on field conditions.

Table 1.1 List of Changes to be Field Determined

Candidate changes for field location or determination by QSP(1)	Check changes that can be field located or field determined by QSP
Increase quantity of an Erosion or Sediment Control Measure	*X*
Relocate/Add stockpiles or stored materials	*X*
Relocate or add toilets	*X*
Relocate vehicle storage and/or fueling locations	*X*
Relocate areas for waste storage	*X*
Relocate water storage and/or water transfer location	*X*
Changes to access points (entrance/exits)	*X*
Change type of Erosion or Sediment Control Measure	*X*
Changes to location of erosion or sediment control	*X*
Minor changes to schedule or phases	*X*
Changes in construction materials	*X*
(1) Any field changes not identified in this table must be approved by QSD	

1.5 RETENTION OF RECORDS

Paper or electronic records of documents required by this SWPPP shall be retained for a minimum of three years from the date generated or date submitted, whichever is later, for the following items:

- NOI
- SWPPP

- Inspection Log
- Weekly BMP Inspection Checklist(s)
- Pre-Rain Event Inspection Checklist(s)
- 24-hour Rain Event Inspection Checklist(s)
- Post Rain Event BMP Inspection Checklist(s)
- NAL Exceedance Report(s)
- Quarterly Non-Storm Water Inspection Report(s)
- Annual Report(s)

These records shall be available at the Site or Site Office until construction is complete. Records assisting in the determination of compliance with the General Permit shall be made available within a reasonable time, to the Regional Water Board(s), State Water Board or U.S. Environmental Protection Agency (EPA) upon request. Requests in writing by the Regional Water Board(s) for retention of records for a period longer than three years shall be adhered to.

1.6 REQUIRED NON-COMPLIANCE REPORTING

If a discharge violation occurs the QSP shall immediately notify the QSD and LRP, and the LRP or QSD shall file a violation report electronically to the State Water Board within 10 days of identification of non-compliance using SMARTS. Corrective measures will be implemented immediately following the discharge, or written notice of non-compliance from the State or Regional Water Board. Discharges and corrective actions will be documented on the NAL Exceedance Site Evaluation Report Form in Attachment 3 "Example Forms."

The report shall contain the following items:

- The date, time, location, nature of operation and type of unauthorized discharge.
- The cause or nature of the notice or order.
- The control measures (BMPs) deployed before the discharge event, or prior to receiving notice or order.

The date of deployment and type of control measures (BMPs) deployed after the discharge event, or after receiving the notice or order, including additional measures installed or planned to reduce or prevent re-occurrence.

Reporting requirements for Numeric Action Levels (NALs) exceedances are further discussed in Section 7.7.2.7 of this SWPPP.

1.7 ANNUAL REPORT

The General Permit requires that permittees prepare, certify, and electronically submit an Annual Report no later than September 1st of each year. Reporting requirements are identified in Section XVI of the General Permit. Annual reports will be filed in SMARTS and in accordance with information required by the on-line forms. Refer to CGP Section XVI. Annual Reporting Requirements for further information.

1.8 CHANGES TO PERMIT COVERAGE

The General Permit allows for the reduction or increase of the total acreage covered under the General Permit when: a portion of the project is complete and/or conditions for termination of

coverage have been met; when ownership of a portion of the project is purchased by a different entity; or when new acreage is added to the project.

Modified PRDs shall be filed electronically within 30 days of a reduction or increase in total disturbed area if a change in permit covered acreage is to be sought. The SWPPP shall be modified appropriately, shall be logged at the front of the SWPPP and cetrification of SWPPP amendments are to be kept in Appendix D. Updated PRDs submitted electronically via SMARTS shall be kept in Appendix E.

1.9 NOTICE OF TERMINATION

A Notice of Termination (NOT) must be submitted electronically by the LRP via SMARTS to terminate coverage under the General Permit. The NOT must include a final Site Map and representative photographs of the project site that demonstrate final stabilization has been achieved. The NOT shall be submitted within 90 days of completion of construction. The Regional Water Board(s) will consider a construction site complete when the conditions of the General Permit, Section II.D have been met.

Section 2 Project Information

2.1 PROJECT AND SITE DESCRIPTION

2.1.1 Site Description

The Butte Regional Transit Operations Center project constructs a new administration and operations building, maintenance building, bus wash facility, and fueling station on a 10 acre site which will serve as the B-Line bus services new main facility. The project includes all new wet and dry utility systems, underground gasoline and diesel fuel storage, parking for 95 bus and paratransit vehicles, and 110 parking spaces for visitors and employees. Site designs include a new primary bus entrance and exit driveways with automatic cantilever gates, excavation, grading, lime treatment of soils, and paving and storm water improvements. The project is located at 326 Huss Drive in Chico, California.

2.1.2 Existing Conditions

The existing site is approximately 10.00 acres, slopes approximately 0.5 to 1.0% percent from the northeast to southwest through the project site and consists of open grasslands with an existing structure and associated improvements.

2.1.3 Existing Drainage

The project site is located within the Sacramento River watershed. Runoff from the project site is conveyed to Comanche Creek via off site storm drain system. Comanche Creek is identified on the State of California Clean Water Act Section 303(d) list. Comanche Creek is impaired with diuron. No special permits required.

The project has the potential to discharge to the following watercourses that are listed on the Clean Water Act 303(d) List of Water Quality Limited Segments (2006 version) for sediment related impairment, and/or are designated as having beneficial uses of COLD, SPAWNING, and MIGRATORY, including:

- Comanche Creek;
- Sacramento River;

2.1.4 Construction Activities and Associated BMPs Description

Project grading will occur throughout the entire site. Grading will include both cut and fill activities. A currently unknown quantity of fill material will be imported during grading activities. Graded materials are expected to be balanced onsite. Stockpiles, if any, will typically be located at a construction or staging yard. Refer to WPCDs for locations.

The BMPs included in this SWPPP may be utilized at any time by the Contractor or QSP to prevent or reduce potential storm water pollution. Typical BMP recommendations appropriate for each construction activity class are listed below. All Non-Storm Water and all Waste Management BMPs apply at all times as basic good housekeeping measures during construction activities.

This project includes the construction of several structures, underground utilities, asphalt paving, concrete flat work, and associated landscaping.

2.1.5 Developed Condition Description

Post construction runoff will be directed by surface flow towards landscaped areas, vegetated swales and drop inlets.

Table 2.1 Construction Site Estimates

Construction site area	**Approximately 10**	**acres**
Percent impervious before construction	< 26%	2.6
Runoff coefficient before construction	Average C 0.49	
Percent impervious after construction	< 53%	5.3
Runoff coefficient after construction	Average C 0.64	

2.2 PERMITS AND GOVERNING DOCUMENTS

In addition to the General Permit, the following documents have been taken into account as best possible while preparing this SWPPP

- Regional Water Board requirements;
- Contract Documents;

2.3 STORM WATER RUN-ON FROM OFFSITE AREAS

Run-on to the site is generated by point source discharges from up gradient developed land uses, watercourses that run through the site; and up gradient non-point source discharges (dry weather and storm water runoff). The General Permit requires that temporary BMPs be implemented to direct offsite run-on away from disturbed areas through the use of runoff controls. The Contractor may use any of the BMPs included in Table 3.1 to temporarily re-direct site run-on. Run-on to the project site occurs at the north end adjacent to Huss Drive. Run-on is conveyed across the project boundary by overland flows.

2.4 CONSTRUCTION SITE SEDIMENT AND RECEIVING WATER RISK DETERMINATION

A construction site risk assessment has been performed for the project and the resultant risk level is Risk Level 2. The risk level was determined through the use of the site specific method summarized in Appendix 1 of the CGP, which includes calculating the sites sediment and receiving water risk during periods of soil exposure. The risk level is based on project duration, location, proximity to impaired receiving waters and soil conditions. A copy of the Risk Level determination submitted on SMARTS with the PRDs is included in Appendix C.

This project is located within jurisdictions the Central Valley Regional Quality Water Control Board.

Table 2.2 and Table 2.3 summarize the sediment and receiving water risk factors and document the sources of information used to derive the factors.

Table 2.2 Summary of Sediment Risk

RUSLE Factor	Value	Method for establishing value
R	46	NPDES Rainfall Erosivity Factor Calculator
K	0.59	NRCS Web Soil Survey & SWB soils K factor data set
LS	0.12	Maximum allowable LS per RUSLE with fixed R and K factors
Total Predicted Sediment Loss (tons/acre)		**3.26**
Overall Sediment Risk Low Sediment Risk < 15 tons/ acre Medium Sediment Risk >= 15 and < 75 tons/acre High Sediment Risk >= 75 tons/acre		☒ **Low** ☐ **Medium** ☐ **High**

Table 2.3 Summary of Receiving Water Risk

Receiving Water Name	303(d) Listed for Sediment Related Pollutant(1)	TMDL for Sediment Related Pollutant(1)	Beneficial Uses of COLD, SPAWN, and MIGRATORY(1)
Comanche Creek	☐ Yes ☒ No	☐ Yes ☒ No	☒ Yes ☐ No
Overall Receiving Water Risk			☐ **Low** ☒ **High**
(1) If yes is selected for any option the Receiving Water Risk is High			

As summarized above, the project has a medium sediment risk and a high receiving water risk. Per the combined risk level matrix in Appendix 1, the project has a calculated risk level of 2.

This SWPPP has been prepared to address Risk Level 2 requirements (General Permit Attachment D).Risk Level 2 sites are subject to both narrative effluent limitations and numeric effluent standards. The narrative effluent limitations require storm water discharges associated with construction activity to minimize or prevent pollutants in storm water and authorized non-storm water discharges through the use of controls, structures and best management practices. Discharges from Risk Level 2 site are subject to Numeric Action Levels (NALs) for pH and turbidity as shown in Table 2-4.

Table 2.4 Numeric Action Levels (NAL)

Parameter	Unit	Numeric Action Level: Daily Average of Samples
pH	pH units	Lower NAL = 6.5 Upper NAL = 8.5
Turbidity	NTU	250 NTU

2.5 CONSTRUCTION SCHEDULE

The site sediment risk was determined based on the assumption that construction would take place between October, 2014 and April, 2016

Modification or extension of the schedule (start and end dates) may affect risk determination and permit requirements. The LRP shall contact the QSD if the schedule changes during

construction to address potential impact to the SWPPP. The Contractors schedule for planned work shall be created, and copies shall be kept in Appendix F.

2.6 POTENTIAL CONSTRUCTION ACTIVITY POLLUTANT SOURCES

Appendix G: Construction Activities, Materials Used, Associated Pollutants and Indicators provide a list of construction activities and associated materials that are anticipated to be used onsite. These activities and associated materials will or could potentially contribute pollutants, other than sediment, to storm water runoff.

The anticipated activities and associated pollutants were used in Section 3 to select the BMPs for the project. Location of anticipated pollutants and associated BMPs are shown on the WPCDs in Appendix B.

For sampling requirements of non-visible pollutants associated with construction activity refer to Section 7.7.1. For additional data about potential onsite pollutants, refer to the Material Safety Data Sheets (MSDS), which are retained onsite at the construction trailer(s).

2.7 IDENTIFICATION OF NON-STORM WATER DISCHARGES

Non-storm water discharges consist of discharges which do not originate from precipitation events. The General Permit provides allowances for specified non-storm water discharges that do not cause erosion or carry other pollutants.

Non-storm water discharges into storm drainage systems or watercourses, that are not authorized under the General Permit and listed in the SWPPP, or otherwise authorized under a separate NPDES permit, are prohibited.

Discharges of construction materials and wastes, such as fuel or paint, resulting from dumping, spills, or direct contact with rainwater or storm water runoff, are also prohibited.

Non-storm water discharges that are authorized from this project site include the following:

- None

Steps will be taken, including the implementation of appropriate BMPs, to ensure that unauthorized discharges are eliminated, controlled, disposed, or treated on-site.

Activities at this site that may result in unauthorized non-storm water discharges are listed in Appendix G: Construction Activities, Materials Used, Associated Pollutants and Indicators.

2.8 REQUIRED SITE MAP INFORMATION.

The Site and Vicinity Map(s) showing the project location, surface water locations, geographic features, construction site perimeter, general topography and other requirements identified in Attachment B of the General Permit is located in Appendix B. Table 2.6 identifies Map or Sheet Nos. where required elements are illustrated.

Table 2.5 Required Map Information

Included on Map/Plan Sheet No. [1]	Required Element
Vicinity Map(S)	The project's surrounding area (vicinity)
Site Map(s)	Site layout

Table 2.5 Required Map Information

Included on Map/Plan Sheet No. [1]	Required Element
WPCDs & Construction Plans	Construction site boundaries
WPCDs	Drainage areas
WPCDs & Construction Plans	Discharge locations
WPCDs	Sampling locations
WPCDs & Construction Plans	Areas of soil disturbance (temporary or permanent)
WPCDs & Construction Plans	Active areas of soil disturbance (cut or fill)
WPCDs	Locations of runoff BMPs
WPCDs	Locations of erosion control BMPs
WPCDs	Locations of sediment control BMPs
WPCDs & Construction Plans	ATS location (if applicable)
WPCDs & Construction Plans & Biological Assessment	Locations of sensitive habitats, watercourses, or other features which are not to be disturbed
WPCDs & Construction Plans	Locations of all post construction BMPs - September 2012
WPCDs	Waste storage areas
WPCDs	Vehicle storage areas
WPCDs	Material storage areas
WPCDs & Construction Plans	Entrance and Exits
WPCDs	Fueling Locations

Notes: (1) Indicate maps or drawings that information is included on (e.g., Vicinity Map, Site Map, Drainage Plans, Grading Plans, Progress Maps, etc.)

Section 3 Best Management Practices

3.1 SCHEDULE FOR BMP IMPLEMENTATION

Table 3.1 BMP Implementation Schedule

BMP		Implementation	Duration
Erosion Control	EC-1, Scheduling	Prior to Construction	Entirety of Project
	EC-4, Hydroseed	As grading is completed	Until vegetation is established
	SE-1, Silt Fence	Start of Construction	Entirety of Project
	SE-4, Check Dams	During construction for control of concentrated flow	Entirety of Project, not likely to be used
Sediment Control	SE-5, Fiber Rolls	Start of Construction	Entirety of Project
	SE-7, Street Sweeping	Start of Construction	Entirety of Project
	SE-10, Temporary Drain Inlet Protection	Start of Construction near drain inlet	Until Construction activities near drain inlet are complete and site is stabilized
Tracking Control	TC-1, Temporary Construction Entrance	Start of Construction	Entirety of Project
	TC-3, Entrance Outlet Wash	If required to control significant tracking issues	Until there are no significant tracking issues
Wind Erosion	WE-1, Wind Erosion Control	Start of Construction	Entirety of Project

3.2 EROSION AND SEDIMENT CONTROL

Erosion and sediment controls are required by the General Permit to provide effective reduction or elimination of sediment related pollutants in storm water discharges and authorized non-storm water discharges from the Site. Applicable BMPs are identified in this section for erosion control, sediment control, tracking control, and wind erosion control.

If there is a conflict between documents: specific details in the Site Map or WPCDs prevail over guidance in the BMP Fact Sheets. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

3.2.1 Erosion Control

Erosion control, also referred to as soil stabilization, consists of source control measures that are designed to prevent soil particles from detaching and becoming transported in storm water runoff. Erosion control BMPs protect the soil surface by covering and/or binding soil particles.

(1) This construction project will implement the following practices to provide effective temporary and final erosion control during construction:

(2) Preserve existing vegetation where required and when feasible.

(3) The area of soil disturbing operations shall be controlled such that the Contractor is able to implement erosion control BMPs quickly and effectively.

(4) Stabilize non-active areas within 14 days of cessation of construction activities or sooner if stipulated by local requirements.

(5) Control erosion in concentrated flow paths by applying erosion control blankets, check dams, erosion control seeding or alternate methods.

(6) Prior to the completion of construction, apply permanent erosion control to remaining disturbed soil areas.

(7) Sufficient erosion control materials shall be maintained onsite to allow implementation in conformance with this SWPPP.

Table 3.2 indicates the temporary erosion control BMPs that shall be implemented to control erosion. Fact Sheets for temporary erosion control BMPs are provided in Appendix H.

Table 3.2 Temporary Erosion Control BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP Used		If not used, state reason
			YES	NO	
EC-1	Scheduling	✓	✓		
EC-2	Preservation of Existing Vegetation	✓	✓		
EC-4	Hydroseed	✓[2]	✓		
EC-9	Earth Dike and Drainage Swales	✓[3]	✓		
WE-1	Wind Erosion Control	✓	✓		
Alternate BMPs Used:					**If used, state reason:**

[1] Applicability to a specific project shall be determined by the QSD.
[2] The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements.
[3] Run-on from offsite shall be directed away from all disturbed areas, diversion of offsite flows may require design/analysis by a licensed civil engineer and/or additional environmental permitting

These temporary erosion control BMPs shall be implemented in conformance with the following guidelines and as outlined in the BMP Factsheets provided in Appendix H.

Scheduling

Construction activities will be scheduled to reduce the amount of disturbance to the soil at any one time, as well as to reduce the amount of damage that could occur to the soil that is exposed. The first step in the scheduling process is to schedule the work activities to minimize the possibility of having exposed soil during the rainy periods. In addition, the work will be scheduled to disturb minimal amounts of the site at one time, and to protect any disturbed areas as soon as possible in the construction process.

The contractors detailed construction schedule for the period October 2014 to April 2016 is included in Appendix F Construction Schedule.

Appendix F Construction Schedule includes a summary table of precipitation for the last 5 years (2007 to 2011), with average, minimum, & maximum counts for Qualifying & Non-Qualifying precipitation rates broken out by month. Contractor is encouraged to review the information to assist with planning and preparation for precipitation events.

Preservation of Existing Vegetation

Existing vegetation shall be preserved, where applicable since it allows flows to infiltrate, stabilizes soil, and acts as a velocity dissipater. It is recommended to strip and stockpile topsoil, including vegetation, along the edge of the grading limits, then redistribute over disturbed areas to aid in rapid establishment of vegetation. As best possible keep the stockpiled soils slightly damp to damp until redistributed.

Crimp, or track walk, material when redistributed over exposed soils and before applying hydraulic mulch or hydroseeding. Tracking shall be perpendicular to slope for slopes over 3%.

Hydroseeding

Hydroseeding may be used alone only when there is sufficient time in the season to ensure adequate vegetation establishment and erosion control. Otherwise, hydroseeding must be used in conjunction with a soil binder or mulching. Hydroseeding mixtures shall be approved by the QSD.

Exposed surface shall be crimped, or track walked, before application. Tracking shall be perpendicular to slope for slopes over 3%.

Earth Dike and Drainage Swales

Earth dikes/drainage swales and lined ditches shall be used to convey surface runoff down sloping land, intercept and divert runoff to avoid sheet flow over sloped surfaces, divert and direct runoff towards a stabilized watercourse, drainage pipe or channel, re-route storm water run-on around the active construction, or intercept runoff from paved surfaces.

Wind Erosion Control

Wind erosion control and soil/aggregate/debris stockpile management must be incorporated if loose debris is to be left exposed. Wind erosion or dust control consists of covering the source with a wind resistant covering, providing a berm or perimeter BMP, or applying water or other

dust palliatives as necessary to prevent or alleviate dust nuisance generated by construction activities.

Contractor shall limit the use of plastic materials when more sustainable and environmentally friendly alternatives are available. Plastic sheeting used to cover stockpiles or concrete work shall be non photo-degradable and shall be disposed of properly.

This project should employ covering stockpiles of debris as an alternative to applying water or other dust palliatives; however stockpiles may be watered to control the effects of wind erosion if it is the most expedient method. Watering activities shall not create runoff.

Note that if rain is expected the Contractor shall provide stockpile perimeter controls to reduce storm water runoff.

3.2.2 Sediment Controls

Sediment controls are temporary or permanent structural measures that are intended to complement the selected erosion control measures and reduce sediment discharges from active construction areas. Sediment controls are designed to intercept and settle out soil particles that have been detached and transported by the force of water.

Sufficient quantities of temporary sediment control materials shall be maintained on-site throughout the duration of the project, allowing for implementation of temporary sediment controls in the event of rain and for rapid response due to failures or emergencies.

Table 3.3 indicates the sediment control BMPs that shall be implemented to control sediment on the construction site. Fact Sheets for temporary sediment control BMPs are provided in Appendix H. These temporary sediment control BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H.

Table 3.3 Temporary Sediment Control BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP Used		If not used, state reason
			YES	NO	
SE-1	Silt Fence	✓[2] [3]	✓		
SE-4	Check Dams		✓		
SE-5	Fiber Rolls	✓[2][3]	✓		
SE-7	Street Sweeping	✓	✓		
SE-10	Storm Drain Inlet Protection	✓ RL2&3	✓		
TC-1	Stabilized Construction Entrance and Exit	✓	✓		
TC-3	Entrance Outlet Tire Wash		✓		Include as option for severe tracking
Alternate BMPs Used:					**If used, state reason:**
[1] Applicability to a specific project shall be determined by the QSD [2] The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements [3]Risk Level 2 &3 shall provide linear sediment control along toe of slope, face of slope, and at the grade breaks of exposed slope					

Silt Fence

Silt fences shall be placed below the toe of exposed and erodible slopes, down-slope of exposed soil areas, around temporary stockpiles, along streams and channels, and along the perimeter of the project.

Silt fence shall be placed to protect existing wetland as required by project environmental conditions which are included in Section 3.4 Environmental BMPs List and the environmental documentation.

Additional filtration and flow control may be necessary at ends of silt fence if the fencing creates concentrated flow at the ends. Use short lengths of Fiber Roll, or similar, at ends to filter and diffuse concentrated flows.

Note that high visibility orange silt fence is available and serves dual purposes as safety/warning fence and storm water filtration and sediment retention.

Check Dams

Gravel or sand bag barriers maybe used to control runoff velocity within concentrated flow paths at the following intervals:

Flowline Slope	Intervals Between Blocking
Less than 2%	See WPCDs
2% to 4%	100 feet
4% to 10%	50 feet
Greater than 10%	25 feet

Bags shall be placed along the perimeter (low-point) of construction activity, particularly where soil is excavated, in areas of grading, and in areas of demolition to prevent runoff of sediment. At a minimum, adequate stockpiles of gravel bags shall be stockpiled in close proximity during dry weather.

Fiber Rolls

Fiber rolls shall be the primary BMP for containing sediment along the project and at the staging area. The entire perimeter of the construction staging areas shall be lined with fiber rolls. Additionally, areas along the project perimeter where the occurrence of runoff is evident will be lined with fiber rolls. Adequate stockpiles of fiber rolls shall be stockpiled in close proximity to areas of potential exposure, ready to deploy at any time. Unless fiber roll material is completely biodegradable, fiber rolls shall be removed when construction activities are complete.

Fiber rolls may be used as perimeter control around stockpiles, or in any situation where immediate sediment control is necessary. Fiber rolls may be held in place with sandbags or gravel bags for temporary installation, or for installation on hard surfaces.

Fiber rolls shall be placed to protect existing waterways at culvert locations near active construction. As necessary install fiber rolls along top of bank to protect waterway from storm water or other construction related potential pollution sources.

On bare cut slopes install fiber rolls at the following intervals perpendicular to the slope:

Slope (Percent)	Sheet flow length not to exceed
0% to 25% (4:1)	20 feet
25% to 50% (4:1 to 2:1)	15 feet
Over 50% (2:1)	10 feet

Street Sweeping

Street sweeping and/or vacuuming shall include the use of self-propelled and walk-behind equipment to remove sediment from the project site, roadways, and sidewalks. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters. Particular attention shall be given to areas in and around drain inlets and at the construction entrance. Water sweepers shall not be used.

Vacuuming or sweeping shall be completed daily when necessary and prior to any precipitation event.

Storm Drain Inlet Protection

All storm drain inlets within 50 feet of construction activity, or directly receiving storm water runoff from the active construction area, shall be protected at all times during construction activities to prevent or reduce runoff of sediment into storm drain systems. Storm drain inlet protection devices shall be inspected and cleaned as necessary to maintain proper function.

Stabilized Construction Entrance and Exit

Any ingress/egress from a paved surface to a non-paved surface that is subject to tracking of sediment shall have a stabilized entrance/exit tracking control device. This may include the installation of a corrugated metal "shaker" plate type system, a "grizzly" type bar system, or placement of geotextile and aggregate. Due to the nature of this project, Contractor may fabricate "cattle guard" style tracking devices using recycled rail and timber material.

If a stabilized exit does not prevent tracking onto paved and public roadways a tire wash system shall be installed and utilized. Contractor shall provide installations details to QSD for review and approval before installation.

Entrance and/or Exit Tire Wash

Tire washes shall be used where a stabilized construction entrance or exit is not preventing tracking onto public roads and becomes a recurrent issue. Tire washes are typically a system that requires a water source and a percolation pit for disposal of the wash water. Contractor shall provide tire wash system information to QSD for approval prior to use.

3.3 NON-STORM WATER CONTROLS AND WASTE AND MATERIALS MANAGEMENT

3.3.1 Non-Storm Water Controls

Non-storm water discharges into storm drainage systems or waterways, which are not authorized under the General Permit, are prohibited. Non-storm water discharges for which a separate NPDES permit is required by the local Regional Water Board are prohibited unless coverage under the separate NPDES permit has been obtained for the discharge. The selection of non-

storm water BMPs is based on the list of construction activities with a potential for non-storm water discharges identified in Appendix G.

Table 3.4 indicates the Non Storm water BMPs that shall be implemented to control non storm water discharges on the construction site. Fact Sheets for temporary non-storm water control BMPs are provided in Appendix H. Non-storm water BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H.

Table 3.4 Temporary Non-Storm Water BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP Used		If not used, state reason
			YES	NO	
NS-1	Water Conservation Practices	✓	✓		
NS-3	Paving and Grinding Operation		✓		
NS-6	Illicit Connection- Illegal Discharge Connection	✓	✓		
NS-8	Vehicle and Equipment Cleaning	✓	✓		
NS-9	Vehicle and Equipment Fueling	✓	✓		
NS-12	Concrete Curing		✓		
NS-13	Concrete Finishing		✓		
Alternate BMPs Used:					**If used, state reason:**
Vehicle Parking & Storage Onsite					Included as supplemental information in NS-10

[1] Applicability to a specific project shall be determined by the QSD

Water Conservation Practices

Water application rates will be minimized as necessary to prevent runoff and ponding. Water equipment leaks will be repaired immediately. The water truck filling area will be stabilized and shall not allow runoff.

Paving and Grinding Operation

Contractor shall provide BMP's when sawcutting and grinding to prevent slurry run off and to maintain any debris or rubble that these operations may create. Vacuums may be used to control slurry created from saw cutting, sealing, paving, and grinding. Inlets outside of the AC paving area will be protected with the type of DI protection as called out on the WPCDs. Following paving operations, the area will be swept, inlet protection devices will be removed, and the inlets will be inspected for paving materials and cleaned as necessary.

Illicit Connection- Illegal Discharge Connection

The contractor will implement the Illegal Connection/Illegal Discharge Detection Reporting BMP throughout the duration of the project.

Vehicle and Equipment Cleaning

Vehicle and equipment cleaning should be conducted off-site, but if it must occur onsite, it shall only be conducted within the designated staging area or construction yard with temporary secondary containment. Encourage the use of phosphate-free, biodegradable soaps.

Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates. Cleaning of vehicles and equipment with soap, solvents or steam should not occur onsite unless resulting wastes are fully contained and disposed of. Resulting wastes shall not be discharged or buried, and must be captured and recycled or disposed of accordingly.

Cleaning activities shall occur at least 50 ft away from any drainage conveyance or drainage inlet.

Vehicle and Equipment Fueling

Use off-site controlled fueling stations as often as possible. If onsite fueling is necessary, follow these general recommendations:

- Place all equipment or vehicles which are to be fueled in a designated area with the appropriate BMPs installed,
- Never top off vehicles,
- Avoid fueling during rain or provide cover,
- Refuel at least 50 ft away from any drainage conveyance or drainage inlet;
- Place plastic lining beneath vehicle equipment and berm edges.

Absorbent spill cleanup materials and spill kits shall be available in fueling areas and on fueling trucks, and should be disposed of properly after use. Spills or leaks shall be cleaned immediately. Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the absorbent materials promptly and dispose of properly.

Per the D/B Contractor there will be no on-site fuel storage tanks. All fuelers, mechanics, and repairmen shall be supplied with, and trained in the use of, emergency spill kits.

Vehicle and Equipment Parking or Storage at Work Area

If construction equipment is stored or parked at a sensitive work area, or if there is any possibility of leakage from the construction equipment while stored or parked, the Contractor shall provide a containment system similar to NS-10 Vehicle and Equipment Maintenance. At a minimum provide drip pans under all portions of equipment that may leak or drip.

Concrete Curing and Finishing

Protect drain inlets prior to the application of curing compounds. Excess cure water and water from high pressure blasting shall be collected and disposed of, and shall not be allowed to runoff to stormdrain inlets or watercourses. Use wet blankets wherever possible to eliminate excess cure water.

3.3.2 Materials Management and Waste Management

Materials management control practices consist of implementing procedural and structural BMPs for handling, storing and using construction materials to prevent the release of those materials into storm water discharges. The amount and type of construction materials to be utilized at the site will depend upon the type of construction and the length of the construction period. The materials may be used continuously, such as fuel for vehicles and equipment, or the materials may be used for a discrete period, such as soil binders for temporary stabilization.

Waste management consist of implementing procedural and structural BMPs for handling, storing and ensuring proper disposal of wastes to prevent the release of those wastes into storm water discharges.

Materials and waste management pollution control BMPs shall be implemented to minimize storm water contact with construction materials, wastes and service areas; and also to prevent materials and wastes from being discharged off-site. The primary mechanisms for storm water contact that shall be addressed include:

- Direct contact with precipitation;
- Contact with storm water run-on and runoff;
- Wind dispersion of loose materials;
- Direct discharge to the storm drain system through spills or dumping;

Extended contact with specific materials and wastes, such as asphalt cold mix and treated wood products, which can leach pollutants into storm water.

A list of construction activities and associated potential pollutants is provided in Appendix G: Construction Activities, Materials Used, Associated Pollutants and Indicators. Table 3.5 indicates the BMPs that shall be implemented to handle materials and control waste materials associated with these construction activities. Fact Sheets for Materials and Waste Management BMPs are provided in Appendix H.

Table 3.5 Temporary Materials Management BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP Used		If not used, state reason
			YES	NO	
WM-01	Material Delivery and Storage	✓	✓		
WM-02	Material Use	✓	✓		
WM-03	Stockpile Management	✓	✓		
WM-04	Spill Preservation and Control	✓	✓		
WM-05	Solid Waste Management	✓	✓		
WM-06	Hazardous Waste Management	✓	✓		
WM-07	Contaminated Soil Management		✓		
WM-08	Concrete Waste Management	✓	✓		
WM-09	Sanitary-Septic Waste Management	✓	✓		
WM-10	Liquid Waste Management	✓	✓		
Alternate BMPs Used:					**If used, state reason:**

[1] Applicability to a specific project shall be determined by the QSD.

Material Delivery and Storage (Outdoor Storage of Raw Materials)

This BMP is intended to prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the storm water system. Minimize the storage of hazardous materials onsite, store materials in designated area(s), use watertight containers with appropriate secondary containment, conduct regular inspections, and incorporate this training in scheduled safety meetings.

Material Use

Prevent or reduce the discharge of pollutants to the storm drain system from material use by using alternative products, minimizing hazardous material use onsite, and training employees/subcontractors. This BMP is suitable when some potentially hazardous materials are present that may be detrimental if released to the environment. These include detergents, plaster, petroleum products, asphalt and other concrete components, concrete compounds, acids, paints, lime, glues, adhesives, solvents, curing compounds, and other materials.

Outdoor Storage of Raw Materials (Stockpile Management)

Stockpile management procedures are designed to reduce or eliminate air and storm water pollution from stockpiles of soil and other construction materials such as paving materials, portland cement (PCC) rubble, asphalt concrete (AC), AC aggregate, asphalt minder, pressure treated wood, etc.

Any exposed soils, materials, waste, or debris shall be stockpiled in a secure area, covered and/or bermed when not in use. Large stockpiles should be placed within secondary containment, such as providing a perimeter of sandbags, fiber rolls, or silt fence. Stockpiles shall have side slopes no steeper than 2:1. Areas of stockpiles shall be identified by the Contractor and/or QSP on the WPCDs as best possible. New or relocated stockpile locations necessary to respond to changing project conditions shall be added to the WPCDs if used for longer than one (1) work week.

In the event that trenches cannot be backfilled at the end of a work day the contractor shall provide safety measures for open excavations. In the event that trenches cannot be backfilled prior to a rain event the contractor shall prevent precipitation and storm water from entering the trenches.

Spill Prevention and Control

Spill prevention and control is required for projects that may produce an unforeseen spill of a chemical or hazardous substance. The purpose of this plan is to prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training Contractors and sub-contractors.

Spill control procedures are implemented any time chemicals or hazardous substances are stored on the project site, which may include the following:

- Dust palliatives,
- Fuels,
- Lubricants,
- Other petroleum distillates.

Please be advised that practices presented in this section are general. Contractor shall identify appropriate practices for the specific materials used or stored onsite.

Spill Prevention and Control - Education

The following steps should be implemented to help reduce the impacts of leaks and spills:

1. Be aware that different materials pollute in different amounts. Ensure that each employee is aware of what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
2. Educate employees and sub-contractors on potential dangers to humans and the environment from spills and leaks.
3. Incorporate this training into regular safety meetings.
4. Establish a continuing education program to indoctrinate new employees.

Spill Prevention and Control - General Protection Measures

To the extent that work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR Parts 110,117, and 302, and sanitary and septic waste shall be contained at cleaned up immediately;

- Store hazardous materials and wastes in watertight covered containers and protect from vandalism;
- Keep material covered at all times excepting during active use;
- Place a stockpile of spill cleanup materials where it will be readily accessible;
- Train employees in spill prevention and cleanup;
- Spills should be covered and protected from storm water run-on during rainfall to the extent that it doesn't compromise cleanup activities;
- Do not bury or wash spills with water;
- Store and properly dispose of materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose;
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with the Waste Water Management Plan;
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses;
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location; and
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Spill Prevention and Control - Clean Up

For small leaks, use common sense and be sure to clean immediately.

Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous the used cleanup materials must be sent to either a certified laundry (rags) or disposed of as hazardous waste; and,

Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly.

Spill Prevention and Control - Minor Spills

Minor spills typically involve small quantities of oil, gasoline, paint, etc. that can be controlled by the first responder at the discovery of the spill. Use absorbent materials on small spills rather than hosing down or burying the spill. Absorbent materials should be promptly removed and disposed of properly.

The following steps should be taken in the event of a minor spill:

1. Contain the spread of the spill.
2. Recover spilled materials.
3. Clean the contaminated area and properly dispose of contaminated materials.

Spill Prevention and Control - Semi-Significant Spills

Semi-significant spills can be controlled by the first responder along with the aid of other personnel. This response may require the cessation of all other activities.

The following steps should be taken in the event of a semi-significant spill:

1. Contain spread of spill.
2. Notify the Contractors Site Safety Officer (or QSP) immediately.
3. If the spill occurs on paved or impermeable surfaces, clean up using “dry” methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread.
4. If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
5. If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Spill Prevention and Control - Significant/Hazardous Spills

Notify the Contractors Site Safety Officer (or QSP/QSD) immediately. The Contractors Site Safety Officer (or QSP) shall organize and coordinate response personnel to contain and clean up the spill. Ensure personnel wear required personal protective equipment. The spilled material shall be properly identified to determine appropriate materials and methods for removal.

1. Contain/absorb all free liquid and residue, and dispose into hazardous waste containers.
2. Thoroughly decontaminate the spill area; treat all materials affected or used for cleanup as contaminated waste.

3. If any material entered any drains or waterways, perform decontamination of the lines.
4. Clean and inspect emergency response equipment.

The Contractors Site Safety Officer shall inspect the affected area and approve it ready for use prior to any personnel returning or work resuming in the area.

The Contractor shall be equipped to handle significant spills pursuant to this section.

For other significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, notify the local emergency response by dialing 911.

Solid and Hazardous Waste Management

Solid and Hazardous Waste Management as outlined in WM-5 and WM-6 shall be implemented to minimize storm water contact with waste materials and prevent waste discharges. Solid wastes shall be loaded directly onto trucks for offsite disposal. When onsite storage is necessary, solid wastes shall be stored in watertight dumpsters in the general storage area of the contractor's yard.

Trash and waste associated with transients living along the trackway will require proper disposal. Contractor is advised to be cautious with any trash or waste which cannot be identified, and to contact local authorities as appropriate for the following potentially hazardous substances: needles or other material associated with intravenous drug use; containers with liquid that is unlabeled or otherwise unidentifiable; or possible drug manufacturing setups.

Contaminated Soil Management

If contaminated soils are encountered, the QSP shall be notified, the contaminated soils shall be contained, covered if stockpiled, and disposed of per the Contaminated Soil Management BMP. Employees shall be instructed to recognize evidence of contaminated soil, such as buried debris, discolored soil, and unusual odors.

Refer to the project Environmental Impact Report (EIR), the project Environmental Specifications, and the project Program Requirements for specific mitigation measures for contaminated soils.

Concrete Waste Management

Prevent or reduce the discharge of pollutants to storm water from concrete waste by conducting washout offsite or performing onsite washout in a designated area, and training employee and subcontractors. A temporary washout pit shall be implemented at the site during construction. Concrete washouts shall be contained so there is no discharge into the underlying soils or surrounding areas.

Sanitary-Septic Waste Management

Proper sanitary and septic waste management prevents the discharge of pollutants to storm water from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal. Avoid locating such facilities within 50 feet of a watercourse or storm drain inlet and anchor or secure facility to prevent tipping.

Due to the presence of transients along the trackway it is likely that construction activities may include areas with significant human fecal material and associated materials. Small incidences may possibly be removed by using hand tools or small equipment and placing material in plastic garbage bags in trash. If any significant or potentially hazardous conditions are found, contact

the local Public Health Department if within an urban boundary. If located in unincorporated areas, contact the County of Sonoma Permit & Resource Management Department or the County of Marin Public Health Department

Liquid Waste Management

Liquid waste management techniques shall be applied to construction activities that generate non-hazardous byproducts, residuals, or wastes, including drilling slurries and drilling fluids, grease-free and oil-free wastewater and rinse water, dredging, or any other non-storm water liquid discharges not permitted by separate permits.

3.4 POST CONSTRUCTION STORM WATER MANAGEMENT MEASURES

Post construction BMPs are permanent measures installed during construction, designed to reduce or eliminate pollutant discharges from the site after construction is completed.

The General Permit (*Section XIII.A*) requires post-construction runoff reduction. The Butte Regional Transit Operations Center located in an area subject to a Phase II Municipal Separate Storm Sewer System (MS4) permit. The Butte Regional Transit Operations will meet post-construction runoff reduction requirements by implementing non-structural measures and runoff reduction credits using the water balance calculator (refer to *Appendix B Submitted Permit Registration Documents* for attached Water Balance Calculations).

Section 4 BMP Inspection, Maintenance, and Rain Event Action Plans

4.1 BMP INSPECTION AND MAINTENANCE

The General Permit requires routine weekly inspections of BMPs, along with inspections before, during, and after qualifying rain events. A BMP inspection checklist must be filled out for inspections and maintained on-site with the SWPPP. The inspection checklist includes the necessary information covered in Section 7.6. A blank inspection checklist can be found in Appendix I. Completed checklists shall be kept in Attachment 2 "Monitoring Records."

BMPs shall be maintained regularly to ensure proper and effective functionality. If necessary, corrective actions shall be implemented within 72 hours of identified deficiencies and associated amendments to the SWPPP shall be prepared by the QSD.

Specific details for maintenance, inspection, and repair of Construction Site BMPs can be found in the BMP Factsheets in Appendix H.

4.2 RAIN EVENT ACTION PLANS

The Rain Event Action Plans (REAP) is a written document designed to be used as a planning tool by the QSP and the construction team to protect exposed portions of project sites and to ensure that the discharger has adequate materials, staff, and time to implement erosion and sediment control measures. These measures are intended to reduce the amount of sediment and other pollutants that could be generated during the rain event. It is the responsibility of the QSP to be aware of precipitation forecast and to obtain and print copies of forecasted precipitation from NOAA's National Weather Service Forecast Office.

Appendix F Construction Schedule includes a summary table of precipitation for the last 5 years (2007 to 2011), with average, minimum, & maximum counts for Qualifying & Non-Qualifying precipitation rates broken out by month.

The SWPPP includes REAP templates that the QSP will need to customize for each rain event. REAP templates for each applicable project phase can be found in Appendix J. The QSP shall maintain a paper copy of completed REAPs in compliance with the record retention requirements described in Section 1.5 of this SWPPP. Completed REAPs shall be maintained in Appendix J.

The QSP will develop an event specific REAP 48 hours in advance of a precipitation event forecast to have a 50% or greater chance of producing precipitation in the project area. The REAP will be onsite and be implemented 24 hours in advance of any the predicted precipitation event.

In the event that the NOAA forecast does not provide a minimum 48 hours advance notice of a precipitation event, the QSP is not obligated to provide a REAP. However, the QSP and the Contractor shall make all efforts to be prepared for the rain event, including preparing a REAP if possible.

At minimum the REAP will include the following site and phase-specific information:

1. Site Address;
2. Calculated Risk Level (2);
3. Contractors contact information including the name, company and 24-hour emergency telephone number;
4. Erosion and Sediment Control Provider information (if other than contractor) including the name, company and 24-hour emergency telephone number;
5. QSP and QSD information including the name, company, and 24-hour emergency telephone number;
6. Activities associated with each construction phase;
7. Trades active on the construction site during each construction phase;
8. Trade contractor information;
9. Recommended actions for each project phase.

Section 5 Training

Appendix L identifies the QSPs for the project. To promote storm water management awareness specific for this project, periodic training of job-site personnel shall be included as part of routine project meetings (e.g. daily/weekly tailgate safety meetings), or task specific trainings as needed.

The QSP shall be responsible for providing this information at the meetings, and subsequently completing the training logs shown in Appendix K, which identifies the site-specific storm water topics covered as well as the names of site personnel who attended the meeting. Tasks may be delegated to trained employees by the QSP provided adequate supervision and oversight is provided. Training shall correspond to the specific task delegated including: SWPPP implementation, BMP inspection and maintenance, and record keeping.

Documentation of training activities (formal and informal) is retained in SWPPP Appendix K.

Section 6 Responsible Parties and Operators

6.1 RESPONSIBLE PARTIES

The Legally Responsible Party (ies) and QSD are listed below:

Role	Name	Title	Phone Number
LRP	Andy Newsum	Deputy Director	530.879.2468
QSD	Steve Grupico	QSD, PE	707-523-1010

QSPs identified for the project are identified in Appendix L. The QSP shall have primary responsibility and significant authority for the implementation, maintenance and inspection/monitoring of SWPPP requirements. The QSP will be available at all times throughout the duration of the project. Duties of the QSP include but are not limited to:

- Implementing all elements of the Construction General Permit and SWPPP:
  - Ensuring all BMPs are implemented, inspected, and properly maintained;
  - Performing non-storm water and storm water visual observations and inspections;
  - Performing non-storm water and storm sampling and analysis, as required;
  - Performing routine inspections and observations;
  - Implementing non-storm water management, and materials and waste management activities such as: monitoring discharges; general Site clean-up; vehicle and equipment cleaning, fueling and maintenance; spill control; ensuring that no materials other than storm water are discharged in quantities which will have an adverse effect on receiving waters or storm drain systems; etc.;
- The QSP may delegate these inspections and activities to an appropriately trained employee, but shall ensure adequacy and adequate deployment.
- Ensuring elimination of unauthorized discharges.
- The QSPs shall be assigned authority by the LRP and/or QSD to mobilize crews in order to make immediate repairs to the control measures.
- Coordinate with the Contractor(s) to assure all of the necessary corrections/repairs are made immediately and that the project complies with the SWPPP, the Construction General Permit and approved plans at all times.
- Notifying the LRP and/or QSD immediately of off-site discharges or other non-compliance events.

6.2 SUB CONTRACTOR AND MATERIAL SUPPLIER LIST

Contractor shall provide a list of names and contact information all sub-contractors and material suppliers used by the Contractor to the QSP. The QSP shall keep a list of all sub-contractors and material suppliers, with contact information, in Appendix M. Contractor shall identify what service or material is being provided, and the expected

Section 7 Construction Site Monitoring Program

7.1 PURPOSE

This Construction Site Monitoring Program was developed to address the following objectives:

1. To demonstrate that the site is in compliance with the Discharge Prohibitions and applicable NALs of the Construction General Permit;
2. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives;
3. To determine whether immediate corrective actions, additional BMP implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges;
4. To determine whether BMPs included in the SWPPP are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

7.2 APPLICABILITY OF PERMIT REQUIREMENTS

This project has been determined to be a Risk Level 2 project. The General Permit identifies the following types of monitoring as being applicable for Risk Level 2:

- Visual inspections of Best Management Practices (BMPs);
- Visual monitoring of the site related to qualifying storm events;
- Visual monitoring of the site for non-storm water discharges;
- Sampling and analysis of construction site runoff for pH and turbidity;
- Sampling and analysis of construction site runoff for non-visible pollutants when applicable; and
- Sampling and analysis of non-storm water discharges when applicable.

7.3. WEATHER AND RAIN EVENT TRACKING

Visual monitoring, inspections, and sampling requirements of the General Permit are triggered by a qualifying rain event. The General Permit defines a qualifying rain event as any event that produces 0.5 inches of precipitation. A minimum of 48 hours of dry weather will be used to distinguish between separate qualifying storm events.

7.3.1 Weather Tracking

The QSP should daily consult the National Oceanographic and Atmospheric Administration (NOAA) for the weather forecasts. These forecasts can be obtained at http://www.srh.noaa.gov/. Weather reports should be printed and maintained with the SWPPP in Attachment 1 "Weather Reports".

When there is precipitation, the QSP shall ensure that storm precipitation data is obtained from the project site rain gauges listed in Section 7.3.2. Precipitation monitoring will determine the amount of precipitation within the 24 hour period and the total cumulative amount of precipitation for the storm event.

When a likely precipitation event was not forecasted to be a qualifying rain event, but the measured cumulative amount of precipitation for the storm event and the expected severity of the continuing storm event results in 0.5 inches or more of precipitation, the QSP will implement a REAP as soon as possible.

7.3.2 Rain Gauges

The nearest appropriate rain gauge(s) are located at:

- Chico, Municipal (KCIC) - http://forecast.weather.gov/MapClick.php?CityName=Chico&state=CA&site=STO&lat=39.7158&lon=-121.815

7.4 MONITORING LOCATIONS

Monitoring locations are shown on the WPCDs in Appendix B. Monitoring locations are further described in the Sections 7.6 and 7.7, and are listed in tabular form in Attachment 2 Monitoring - Monitoring Locations.

Whenever changes in the construction site might affect the appropriateness of sampling locations, the sampling locations shall be revised accordingly. All such revisions shall be implemented as soon as feasible and the SWPPP amended. Temporary changes that result in a one-time additional sampling location do not require a SWPPP amendment.

7.5 SAFETY AND MONITORING EXEMPTIONS

This project is not required to collect samples or conduct visual observations (inspections) under the following conditions:

- During dangerous weather conditions such as flooding and electrical storms.
- Outside of scheduled site business hours.

Scheduled site business hours shall be as identified in the specifications.

If monitoring (visual monitoring or sample collection) of the site is unsafe **because of the dangerous conditions noted above then the QSP shall document the conditions** for why an exception to performing the monitoring was necessary. The exemption documentation shall be filed in Attachment 2 “Monitoring Records”.

7.6 VISUAL MONITORING

Visual monitoring includes observations and inspections. Inspections of BMPs are required to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Visual observations of the site are required to observe storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources.

Table 7.1 identifies the required frequency of visual observations and inspections. Inspections and observations will be conducted at the locations identified in Section 7.6.3.

Table 7.1 Summary of Visual Monitoring and Inspections

Type of Inspection	Frequency
Routine Inspections	
BMP Inspections	Weekly[1]
BMP Inspections – Housekeeping	Daily
BMP Inspections – Tracking Control	Daily
BMP Inspections – Drain Inlet Protection	Daily
BMP Inspections – Perimeter Control	Daily
Non-Storm Water Discharge Observations	Quarterly during daylight hours
Rain Event Triggered Inspections	
Site Inspections Prior to a Qualifying Event	Within 48 hours of start of qualifying event [2]
BMP Inspections During an Extended Storm Event	Every 24-hour period of a rain event[2]
Site Inspections Following a Qualifying Event	Within 48 hours of end of qualifying event[2]

[1] Most BMPs must be inspected weekly; those identified below must be inspected more frequently.

[2] Inspections are only required during scheduled site operating hours. Note however, these inspections are required daily regardless of the amount of precipitation.

7.6.1 Routine Observations and Inspections

Routine site inspections and visual monitoring are necessary to ensure that the project is in compliance with the requirements of the Construction General Permit. One visual inspection shall be conducted quarterly in each of the following periods: January - March, April-June, July-September, October-December.

7.6.1.1 *Routine BMP Inspections*

Inspections of BMPs are conducted to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

7.6.1.2 *Non-Storm Water Discharge Observations*

Each drainage area will be inspected for the presence of, or indications of, prior unauthorized and authorized non-storm water discharges. Inspections will record:

- Presence or evidence of any non-storm water discharge (authorized or unauthorized);
- Pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.); and
- Source of discharge.

7.6.2 Rain-Event Triggered Observations and Inspections

Visual observations of the site and inspections of BMPs are required prior to a qualifying rain event, every 24-hour period during a qualifying rain event, and within 48 hours of the end of a qualifying rain event. Pre-rain inspections will be conducted after consulting NOAA weather forecasts and determining that a precipitation event with a 50% or greater probability of precipitation has been predicted.

7.6.2.1 *Visual Observations Prior to a Forecasted Qualifying Rain Event*

Within 48-hours of a qualifying rain event a storm water visual monitoring site inspection will include observations of the following locations:

- Storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources;
- BMPs to identify if they have been properly implemented;
- Any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

As necessary the QSP shall implement appropriate corrective actions before the qualifying rain event begins. Consistent with guidance from the State Water Resources Control Board, pre-rain BMP inspections and visual monitoring will be triggered by a NOAA forecast that indicates a probability of precipitation of 50% or more in the project area.

7.6.2.2 *BMP Inspections During an Extended Storm Event*

During an extended rain event BMP inspections shall be conducted at least once every 24 hour period to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

If the construction site is not accessible during the rain event, the visual inspections shall be performed at all relevant outfalls, discharge points, and downstream locations. The inspections should record any projected maintenance activities.

7.6.2.3 *Visual Observations Following a Qualifying Rain Event*

Within 48 hours following a qualifying rain event (0.5 inches of rain) a storm water visual monitoring site inspection is required to observe:

- Identify whether BMPs were adequately designed, implemented, and effective;
- Identify additional BMPs that may be required, and revise the SWPPP accordingly;
- BMPs that require repair or replacement due to rain event damage;
- Identify BMPs which require maintenance to remove sediment, trash, etc... as necessary for proper function of the BMP;
- Inspect storm water storage or containment areas to detect leaks and verify that adequate freeboard remains;
- Discharge of stored or contained rain water.

7.6.3 Visual Monitoring Procedures

Visual monitoring shall be conducted by the QSP or staff trained by and under the supervision of the QSP.

The name(s) and contact number(s) of the site visual monitoring personnel and their training qualifications are provided in Appendix K.

Storm water observations shall be documented on the *Visual Inspection Field Log Sheet* in Attachment 3 "Example Forms". BMP inspections shall be documented on the BMP inspection checklist. Any photographs used to document observations will be referenced on storm water site inspection reports and maintained with the Monitoring Records in Attachment 2. The completed reports will be kept in Attachment 2 "Monitoring Records".

Within 10 days of the inspection the QSP shall submit copies of the completed inspection report to QSD.

7.6.4 Visual Monitoring Follow-Up and Reporting

Correction of deficiencies identified by the observations or inspections, including required repairs or maintenance of BMPs, shall be initiated and completed as soon as possible.

If identified deficiencies require design changes, including additional BMPs, the implementation of changes will be initiated within 72 hours of identification and be completed as soon as possible. When design changes to BMPs are required, the SWPPP shall be amended to reflect the changes.

Deficiencies identified in site inspection reports and correction of deficiencies will be tracked on the *Inspection Field Log Sheet* or *BMP Inspection Report* and shall be submitted to the QSP and shall be kept in Attachment 2 "Monitoring Records".

Within 10 days of the inspection the QSP shall submit copies of the completed *Inspection Field Log Sheet* or *BMP Inspection Report* with the corrective actions to the QSD.

Results of visual monitoring must be summarized and reported in the Annual Report.

7.7 WATER QUALITY SAMPLING AND ANALYSIS

7.7.1 Sampling and Analysis Plan for Non-Visible Pollutants in Storm Water Runoff Discharges

NON-VISIBLE POLLUTANT SAMPLING TRIGGERS

Sampling for non-visible pollutants will be conducted when (1) a breach, leakage, malfunction, or spill is observed; and (2) the leak or spill has not been cleaned up prior to the rain event; and (3) there is the potential for discharge of non-visible pollutants to surface waters or drainage system.

Refer to Appendix G and Section 2.6 for construction materials, wastes, or activities which are potential sources of non-visible pollutants to storm water discharges from the project.

There are no known existing site features that are potential sources of non-visible pollutants to storm water discharges.

The project also has the potential to receive storm water run-on with the potential to contribute non-visible pollutants to storm water discharges from the project. The majority of site run-on will be flow through culverts.

7.7.1.1 *Sampling Criteria*

Collection of discharge samples for non-visible pollutant monitoring will be triggered when any of the following conditions are observed during site inspections conducted prior to or during a rain event.

- Materials or wastes containing potential non-visible pollutants are not stored under watertight conditions. Watertight conditions are defined as (1) storage in a watertight container, (2) storage under a watertight roof or within a building, or (3) protected by temporary cover and containment that prevents storm water contact and runoff from the storage area.
- Materials or wastes containing potential non-visible pollutants are stored under watertight conditions, but (1) a breach, malfunction, leak, or spill is observed, (2) the leak or spill is not cleaned up prior to the rain event, and (3) there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- A construction activity with the potential to contribute non-visible pollutants (1) was occurring during or within 24 hours prior to the rain event, (2) BMPs were observed to be breached, malfunctioning, or improperly implemented, and (3) there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- Soil amendments that have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil have been applied, and there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- Storm water runoff from an area contaminated by historical usage of the site has been observed to combine with storm water runoff from the site, and there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.

Samples for the potential non-visible pollutant(s) and an unaffected background sample shall be collected during the first two hours of discharge from rain events that result in a sufficient discharge for sample collection. Samples shall be collected during the site's scheduled hours and shall be collected regardless of the time of year and phase of the construction.

7.7.1.2 *Sampling Locations*

Sampling locations are based on proximity to planned non-visible pollutant storage, occurrence and use; accessibility for sampling, and personnel safety. Planned non-visible pollutant sampling locations are shown on the WPCDs in Appendix B and in tabular form in Attachment A.

Non-Visible Pollutant Sample Locations – Contractors' Yard
See Attachment 2 Monitoring Locations
Sampling location(s) on the project site and the contractor's yard have been identified for the collection of samples of runoff from planned material and waste storage areas and areas where non-visible pollutant producing construction activities are planned.

Non-Visible Pollutant Sample Locations – Areas of Historical Contamination

See Attachment 2 Monitoring Locations
No sampling locations have been identified for the collection of samples of runoff from areas of historical contamination that have the potential to affect water quality.

Non-Visible Pollutant Sample Locations – Background (Unaffected Sample)
See Attachment 2 Monitoring Locations
Sampling location(s) has been identified for the collection of an uncontaminated sample of runoff as a background sample for comparison with the samples being analyzed for non-visible pollutants. This location(s) was selected such that the sample will not have come in contact with the operations, activities, or areas identified in Section 7.7.1 or with disturbed soils areas.

Non-Visible Pollutant Sample Locations – Site Run-On
See Attachment 2 Monitoring Locations
Sampling locations have been identified for the collection of samples of run-on to the project site. Run-on from these locations has the potential to combine with discharges from the site being sampled for non-visible pollutants. These samples are intended to identify potential sources of non-visible pollutants that originate off the project site.

If a storm water visual monitoring site inspection conducted prior to or during a storm event identifies the presence of a material storage, waste storage, or operations area with spills or the potential for the discharge of non-visible pollutants to surface waters or a storm drain system that is at a location not listed above and has not been identified on the Site Maps or WPCDs, sampling locations will be selected by the QSP using the same rationale as that used to identify planned locations. Non-visible pollutant sampling locations shall be identified by the QSP on the pre-rain event inspection form and/or Rain Event Action Plan prior to a forecasted qualifying rain event.

7.7.1.3 *Monitoring Preparation*

Non-visible pollutant samples will be collected by:

Contractor	☐ Yes	☐ No
Consultant/QSP	☐ Yes	☐ No

The Consultant/QSP may collect samples for laboratory analysis as directed by Laboratory.

Laboratory	☒ Yes	☐ No

Samples on the project site will be collected by the XXXXXX Team and analyzed at the following location:

Laboratory Name:	XXXXX
Address:	XXXXX, California 95928
Phone:	(530) XXX-XXXX
Fax:	(530) XXX-XXXX fax
Point of Contact:	TBD
Primary Sampler:	TBD
Alternate Sampler:	TBD

If one of the triggering conditions is identified during an inspection the QSP shall ensure that adequate sample collection personnel and supplies for monitoring non-visible pollutants are available and will be mobilized to collect samples on the project site in accordance with the sampling schedule.

7.7.1.4 *Analytical Constituents*

Appendix G Construction Activities, Materials Used, Associated Pollutants and Indicators lists the specific sources and types of potential non-visible pollutants on the project site and the water quality indicator constituent(s) for that pollutant.

7.7.1.5 *Sample Collection*

Samples of discharge shall be collected at the designated non-visible pollutant sampling locations shown on the Site Maps in Appendix B or in the locations determined by observed breaches, malfunctions, leak, spills, operational areas, soil amendment application areas, and historical site usage areas that triggered the sampling event.

Grab samples shall be collected and preserved in accordance with the methods identified in the Table, "Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants" provided in Section 7.7.1.6. Only the QSP, or personnel trained in water quality sampling under the direction of the QSP shall collect samples.

Sample collection and handling requirements are described in Section 7.7.7.

7.7.1.6 *Sample Analysis*

Samples shall be analyzed using the analytical methods identified in the Table 7.20.

Samples will be analyzed by: XXXXX Chico CA

Samples will be delivered to the laboratory by:

Driven by Consultant/QSP	☒ Yes	☐ No
Picked up by Laboratory Courier	☒ Yes	☐ No
Shipped	☒ Yes	☐ No

The most expedient and appropriate sample delivery method shall be utilized.

7.7.1.7 *Data Evaluation and Reporting*

The QSP shall complete an evaluation of the water quality sample analytical results.

Site runoff and any downgradient results shall be compared with the associated upgradient/unaffected results and any associated run-on results. Should the runoff/downgradient sample show an increased level of the tested analyte relative to the unaffected background sample, which cannot be explained by run-on results, the BMPs, site conditions, and surrounding influences shall be assessed to determine the probable cause for the increase.

As determined by the site and data evaluation, appropriate BMPs shall be repaired or modified to mitigate discharges of non-visible pollutant concentrations. Any revisions to the BMPs shall be recorded as an amendment to the SWPPP.

The General Permit prohibits storm water discharges that contain hazardous substances equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4. The results of any non-storm water discharge results that indicate the presence of a hazardous substance in excess of established reportable quantities shall be immediately reported to the Regional Water Board and other agencies as required by 40 C.F.R. §§ 117.3 and 302.4.

Results of non-visible pollutant monitoring shall be reported in the Annual Report.

7.7.2 Sampling and Analysis Plan for pH and Turbidity in Storm Water Runoff Discharges

Sampling and analysis of runoff for pH and turbidity is required for this project. This Sampling and Analysis Plan describes the strategy for monitoring turbidity and pH for storm water runoff discharges from the project site and run-on in relation to NALs.

Samples for turbidity will be collected from all drainage areas with disturbed soil areas and samples for pH will be collected from all drainage areas with a high risk of pH discharge.

7.7.2.1 *Sampling Schedule*

Storm water runoff samples shall be collected for pH from all qualifying rain events that result in a discharge from the project site. At minimum, pH samples will be collected from each site discharge location during project phases and drainage areas with a high risk of pH discharge such as near concrete work or soil amendments. A minimum of three samples will be collected per day of discharge during a qualifying event. Samples should be representative of the total discharge from the location each day of discharge during the qualifying event. Typically representative samples will be spaced in time throughout the daily discharge event. If the discharge event is short in duration, collect a minimum of three samples across the site.

When stored or collected water from a qualifying storm event is discharged it shall be tested for turbidity and pH. Stored or collected water from a qualifying event may be sampled at the point it is released from the storage or containment area or at the site discharge location.

Run-on samples shall be collected whenever the QSP identifies that run-on has the potential to contribute to an exceedance of a NAL.

7.7.2.2 *Sampling Locations*

Sampling locations are based on the site runoff discharge locations and locations where run-on enters the site; accessibility for sampling; and personnel safety. Planned pH and turbidity sampling locations are shown on the WPCDs in Appendix B and in tabular form in Attachment A. The tabular form includes the Sample Point ID identified in the WPCDs with coordinates shown in both WGS84 latitude/longitude and NAD83 Zone 3 feet. One hundred fifty two (152) sampling locations have been identified on the WPCDs. The sample point Location and Description fields are to be populated using GIS methods during the initial site inspections.

Turbidity and pH Runoff Sample Locations

See Attachment 2 Monitoring Locations
Sampling location(s) on the project site and the contractor's yard have been identified for the collection of runoff samples.

Turbidity and pH Run-On Sample Locations

See Attachment 2 Monitoring Locations
Sampling locations have been identified for the collection of run-on samples where the run-on has the potential to contribute to an exceedance of a NAL.

7.7.2.3 *Monitoring Preparation*

Turbidity and pH samples will be collected and analyzed by:

Contractor	☐ Yes	☒ No
Consultant/QSP	☒ Yes	☐ No
Laboratory	☐ Yes	☒ No

An adequate stock of monitoring supplies and equipment for monitoring turbidity and pH will be available to the Consultant/QSP. Monitoring supplies and equipment will be stored in a cool temperature environment that will not come into contact with rain or direct sunlight. Sampling personnel will be available to collect samples in accordance with the sampling schedule. Supplies maintained at the project site will include, but are not limited to, field meters, extra batteries; clean powder-free nitrile gloves, sample collection equipment, appropriate sample containers, paper towels, personal rain gear, and *Effluent Sampling Field Log Sheets* forms provided in Attachment 3 "Example Forms".

7.7.2.4 *Field Parameters*

Samples shall be analyzed for pH and turbidity as indicated in Table 7.13

Table 7.2 Sample Collection and Analysis for Monitoring Turbidity and pH

Parameter	Test Method	Minimum Sample Volume[(1)]	Sample Collection Container Type	Detection Limit (minimum)
Turbidity	Field meter/probe with calibrated portable instrument	500 mL	Polypropylene or Glass (Do not collect in meter sample cells)	1 NTU
pH	Field meter/probe with calibrated portable instrument	100 mL	Polypropylene	0.2 pH units

Notes: [1] Minimum sample volume recommended. Specific volume requirements will vary by instrument; check instrument manufacturer instructions.
mL – Milliliter
NTU – Nephelometric Turbidity Unit

7.7.2.5 *Sample Collection*

Samples of discharge shall be collected at the designated runoff and run-on sampling locations shown on the WPCDs in Appendix B and in tabular form in Attachment A. Run-on samples shall be collected within close proximity of the point of run-on to the project.

Only personnel trained in water quality sampling and field measurements working under the direction of the QSP shall collect samples. Sample collection and handling requirements are described in Section 7.7.7.

7.7.2.6 *Field Measurements*

Prior to analysis, field meters shall be calibrated in accordance with manufacturer's specifications. Samples for field analysis shall then be tested in accordance with the field instrument instructions, and the results recorded on *Effluent Sampling Field Log Sheets* forms provided in Attachment 3 "Example Forms".

The field instrument(s) listed in Table 7.14, or approved equal, will be used to analyze the following constituents:

Table 7.3 Field Instruments

Field Instrument (Manufacturer and Model)	Constituent
Oakton pHTestr 20	pH
Oakton T-100	Turbidity

The manufacturers' instructions/operations and maintenance manuals are included in Attachment 4 "Field Meter Instructions". Field sampling staff shall review the instructions prior to each sampling event and follow the instructions in completing measurement of the samples.

- The instrument(s) shall be maintained in accordance with manufacturer's instructions.
- The instrument(s) shall be calibrated before each sampling and analysis event.
- Maintenance and calibration records shall be maintained with the SWPPP.

The QSP may authorize alternate equipment provided that the equipment meets the Construction General Permit's requirements and the manufacturers' instructions for calibration and use are added to Attachment 4 "Field Meter Instructions".

7.7.2.7 *Data Evaluation and Reporting*

Immediately upon completing the measurements for the sampling event, provide the *Effluent Sampling Field Log Sheets* to the QSP for evaluation.

Numeric Action Levels

This project is subject to NALs for pH and turbidity (Table 7.15). Compliance with the NAL for pH and turbidity is based on a daily average. Upon receiving the field log sheets, the QSP shall immediately calculate the arithmetic average of the pH and turbidity samples to determine if the NALs, shown in the table below, have been exceeded.

Table 7.4 Numeric Action Levels

Parameter	Unit	Daily Average
pH	pH units	Lower NAL = 6.5 Upper NAL = 8.5

Table 7.4 Numeric Action Levels

Parameter	Unit	Daily Average
Turbidity	NTU	250 NTU

The QSP shall within 10 days of the sample collection submit copies of the completed *Effluent Sampling Field Log Sheets* to QSD.

In the event that the pH or turbidity NAL is exceeded, the QSP and/or QSD shall immediately notify the LRP and investigate the cause of the exceedance and identify corrective actions.

Exceedances of NALs shall be electronically reported to the State Water Board by QSD through the SMARTS system within 10 days of the conclusion of the storm event. If requested by the Regional Board, a NAL Exceedance report will be submitted. The NAL Exceedance Report must contain the following information:

- Analytical method(s), reporting unit(s), and detection limits of each parameter;
- Date, place, time of sampling, visual observation, and/or measurements, including precipitation; and
- Description of the current BMPs associated with the sample that exceeded the NAL and the proposed corrective actions taken.

7.7.3 Sampling and Analysis Plan for Non-Storm Water Discharges

This Sampling and Analysis Plan for non-storm water discharges describes the sampling and analysis strategy and schedule for monitoring pollutants in authorized and unauthorized non-storm water discharges from the project site in accordance with the requirements of the Construction General Permit.

Sampling of non-storm water discharges will be conducted when an authorized or unauthorized non-storm water discharge is observed discharging from the project site. In the event that non-storm water discharges run-on to the project site from offsite locations, and this run-on has the potential to contribute to a violation of a NAL, the run-on will also be sampled.

There are no authorized non-storm water discharges that have the potential to be discharged from the project site.

Some construction activities have the potential to result in an unplanned (unauthorized) non-storm water discharge if BMPs fail. These activities include:

- Concrete curing;
- Dust Control;
- Equipment cleaning or washing.

7.7.3.1 *Sampling Schedule*

Samples of authorized or unauthorized non-storm water discharges shall be collected when they are observed.

7.7.3.2 *Sampling Locations*

Samples shall be collected from the discharge point of the construction site where the non-storm water discharge is running off the project site.

7.7.3.3 *Monitoring Preparation*

Non-storm water discharge samples will be collected by:

Contractor	☐ Yes	☒ No
Consultant/QSP	☒ Yes	☐ No
Laboratory	☐ Yes	☒ No

An adequate stock of monitoring supplies and equipment for monitoring non-storm water discharges will be available. Monitoring supplies and equipment will be stored in a cool temperature environment that will not come into contact with rain or direct sunlight. Personnel trained in sampling will be available to collect samples in accordance with the sampling schedule. Supplies will include, but are not limited to, clean powder-free nitrile gloves, sample collection equipment, field meters, coolers, appropriate number and volume of sample bottles, identification labels, re-sealable storage bags, paper towels, personal rain gear, ice, and *Effluent Sampling Field Log Sheets* forms provided in Attachment 3 "Example Forms".

Samples on the project site will be collected by the QSP or his/her designee.

As necessary the QSP or his/her designee will contact Analytical Services Laboratory of Petaluma, 24 hours prior to a planned non-storm water discharge or as soon as an unplanned non-storm water discharge is observed. The QSP shall ensure that adequate sample collection personnel, supplies for non-storm water discharge monitoring are available and will be mobilized to collect samples on the project site in accordance with the sampling schedule.

7.7.3.4 *Analytical Constituents*

All non-storm water discharges that flow through a disturbed area shall, at minimum, be monitored for turbidity.

All non-storm water discharges that flow through an area where they are exposed to pH altering materials shall be monitored for pH.

The QSP shall identify additional pollutants to be monitored for each non-storm water discharge incident based on the source of the non-storm water discharge. If the source of an unauthorized non-storm water discharge is not known, monitoring for pH, turbidity, MBAS, TOC, and residual chlorine or chloramines is recommended to help identify the source of the discharge.

Table 7.20 lists the specific sources and types of potential non-visible pollutants on the project site and the water quality indicator constituent(s) for that pollutant.

7.7.3.5 *Sample Collection*

Samples shall be collected at the discharge locations where the non-storm water discharge is leaving the project site. Potential discharge locations are shown on the WPCSs in Appendix B.

Grab samples shall be collected and preserved in accordance with the methods identified in Table 7.20. Only personnel trained in water quality sampling under the direction of the QSP

shall collect samples. Sample collection and handling requirements are described in Section 7.7.7.

7.7.3.6 *Sample Analysis*

Samples shall be analyzed using the analytical methods identified in Table 7.20.

7.7.3.7 *Data Evaluation and Reporting*

The QSP shall complete an evaluation of the water quality sample analytical results. Turbidity and pH results shall be evaluated for compliance with NALs as identified in Section 7.7.2.7.

Runoff results shall also be evaluated for the constituents suspected in the non-storm water discharge. Should the runoff sample indicate the discharge of a pollutant which cannot be explained by run-on results, the BMPs, site conditions, and surrounding influences shall be assessed to determine the probable cause for the increase.

As determined by the site and data evaluation, appropriate BMPs shall be repaired or modified to mitigate discharges of non-visible pollutant concentrations. Any revisions to the BMPs shall be recorded as an amendment to the SWPPP.

Non-storm water discharge results shall be submitted with the Annual Report.

The General Permit prohibits the non-storm water discharges that contain hazardous substances equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4. The results of any non-stormwater discharge results that indicate the presence of a hazardous substance in excess of established reportable quantities shall be immediately reported to the Regional Water Board.

7.7.4 Sampling and Analysis Plan for Other Pollutants Required by the RWQCB

The Regional Water Board has not specified monitoring for additional pollutants.

7.7.5 Training of Sampling Personnel

Sampling personnel shall collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring program (SWAMP) 2008 Quality Assurance Program Plan (QAPP). Certified QSDs and QSPs may collect samples according to section 7.7.6 and 7.11and per collection instructions from the analytical laboratory. QSD and QSP certificates are included in Appendix L Responsible Parties.

7.7.6 Sample Collection and Handling

7.7.6.1 *Sample Collection*

Samples shall be collected at the designated sampling locations shown on the WPCDs in Appendix B and listed in the preceding sections. Samples shall be collected, maintained and shipped in accordance with the SWAMP 2008 Quality Assurance Program Plan (QAPP). Grab samples shall be collected and preserved in accordance with the methods identified in preceding sections.

To maintain sample integrity and prevent cross-contamination, sample collection personnel shall follow the protocols below.

- Collect samples (for laboratory analysis) only in analytical laboratory-provided sample containers;
- Wear clean, powder-free nitrile gloves when collecting samples;
- Change gloves whenever something not known to be clean has been touched;
- Change gloves between sites;
- Decontaminate all equipment (e.g. bucket, tubing) prior to sample collection using a trisodium phosphate water wash, distilled water rinse, and final rinse with distilled water. (Dispose of wash and rinse water appropriately, i.e., do not discharge to storm drain or receiving water). Do not decontaminate laboratory provided sample containers;
- Do not smoke during sampling events;
- Never sample near a running vehicle;
- Do not park vehicles in the immediate sample collection area (even non-running vehicles);
- Do not eat or drink during sample collection; and
- Do not breathe, sneeze, or cough in the direction of an open sample container.

The most important aspect of grab sampling is to collect a sample that represents the entire runoff stream. Typically, samples are collected by dipping the collection container in the runoff flow paths and streams as noted below.

- For small streams and flow paths, simply dip the bottle facing upstream until full.
- For larger stream that can be safely accessed, collect a sample in the middle of the flow stream by directly dipping the mouth of the bottle. Once again making sure that the opening of the bottle is facing upstream as to avoid any contamination by the sampler.
- For larger streams that cannot be safely waded, pole-samplers may be needed to safely access the representative flow.
- Avoid collecting samples from ponded, sluggish or stagnant water.
- Avoid collecting samples directly downstream from a bridge as the samples can be affected by the bridge structure or runoff from the road surface.

Note, that depending upon the specific analytical test, some containers may contain preservatives. These containers should **never** be dipped into the stream, but filled indirectly from the collection container.

7.7.6.2 *Sample Handling*

Turbidity and pH measurements must be conducted immediately. Do not store turbidity or pH samples for later measurement.

Samples for laboratory analysis must be handled as follows. Immediately following sample collection:

- Cap sample containers;
- Complete sample container labels;
- Sealed containers in a re-sealable storage bag;
- Place sample containers into an ice-chilled cooler;
- Document sample information on the *Effluent Sampling Field Log Sheet*; and
- Complete the CoC.

All samples for laboratory analysis must be maintained between 0-6 degrees Celsius during delivery to the laboratory. Samples must be kept on ice, or refrigerated, from sample collection through delivery to the laboratory. Place samples to be shipped inside coolers with ice. Make sure the sample bottles are well packaged to prevent breakage and secure cooler lids with packaging tape.

Ship samples that will be laboratory analyzed to the analytical laboratory right away. Hold times are measured from the time the sample is collected to the time the sample is analyzed. The General Permit requires that samples be received by the analytical laboratory within 48 hours of the physical sampling (unless required sooner by the analytical laboratory).

7.7.6.3 *Sample Documentation Procedures*

All original data documented on sample bottle identification labels, *Effluent Sampling Field Log Sheet*, and CoCs shall be recorded using waterproof ink. These shall be considered accountable documents. If an error is made on an accountable document, the individual shall make corrections by lining through the error and entering the correct information. The erroneous information shall not be erased or obliterated. All corrections shall be initialed and dated.

Duplicate samples shall be identified consistent with the numbering system for other samples to prevent the laboratory from identifying duplicate samples. Duplicate samples shall be identified in the Effluent Sampling Field Log Sheet.

Sample documentation procedures include the following:

Sample Bottle Identification Labels: Sampling personnel shall attach an identification label to each sample bottle. Sample identification shall uniquely identify each sample location.

Field Log Sheets: Sampling personnel shall complete the *Effluent Sampling Field Log Sheet* and *Receiving Water Sampling Field Log Sheet* for each sampling event, as appropriate.

Chain of Custody: Sampling personnel shall complete the CoC for each sampling event for which samples are collected for laboratory analysis. The sampler will sign the CoC when the sample(s) is turned over to the testing laboratory or courier.

7.8 ACTIVE TREATMENT SYSTEM MONITORING

This project does not require a project specific Sampling and Analysis Plan for an ATS because deployment of an ATS is not planned.

7.9 BIOASSESSMENT MONITORING

This project is NOT subject to bioassessment monitoring.

7.10 WATERSHED MONITORING OPTION

This project is NOT participating in a watershed monitoring option.

7.11 QUALITY ASSURANCE AND QUALITY CONTROL

An effective Quality Assurance and Quality Control (QA/QC) plan shall be implemented as part of the Water Quality Program to ensure that analytical data can be used with confidence. QA/QC procedures to be initiated include the following:

- Field logs;
- Clean sampling techniques;
- CoCs;
- QA/QC Samples; and
- Data verification.

Each of these procedures is discussed in more detail in the following sections.

7.11.1 Field Logs

The purpose of field logs is to record sampling information and field observations during monitoring that may explain any uncharacteristic analytical results. Sampling information to be included in the field log include the date and time of water quality sample collection, sampling personnel, sample container identification numbers, and types of samples that were collected. Field observations should be noted in the field log for any abnormalities at the sampling location (color, odor, BMPs, etc.). Field measurements for pH and turbidity should also be recorded in the field log. A Visual Inspection Field Log and an Effluent Sampling Field Log Sheet are included in Attachment 3 "Example Forms".

7.11.2 Clean Sampling Techniques

Clean sampling techniques involve the use of certified clean containers for sample collection and clean powder-free nitrile gloves during sample collection and handling. As discussed in Section 7.7.7, adoption of a clean sampling approach will minimize the chance of field contamination and questionable data results.

7.11.3 Chain of Custody

The sample CoC is an important documentation step that tracks samples from collection through analysis to ensure the validity of the sample. Sample CoC procedures include the following:

- Proper labeling of samples;
- Use of CoC forms for all samples; and
- Prompt sample delivery to the analytical laboratory.

Analytical laboratories usually provide CoC forms to be filled out for sample containers. An example CoC is included in Attachment 3 "Example Forms".

7.11.4 QA/QC Samples

QA/QC samples provide an indication of the accuracy and precision of the sample collection; sample handling; field measurements; and analytical laboratory methods. The following types of QA/QC will be conducted for this project:

☒ Field Duplicates at a frequency of 1 duplicate minimum per sampling event.
(Required for all sampling plans with field measurements or laboratory analysis)

7.11.4.1 *Field Duplicates*

Field duplicates provide verification of laboratory or field analysis and sample collection. Duplicate samples shall be collected, handled, and analyzed using the same protocols as primary samples. The sample location where field duplicates are collected shall be randomly selected

from the discharge locations. Duplicate samples shall be collected immediately after the primary sample has been collected. Duplicate samples must be collected in the same manner and as close in time as possible to the original sample. Duplicate samples shall not influence any evaluations or conclusion.

7.11.5 Data Verification

After results are received from the analytical laboratory, the QSP shall verify the data to ensure that it is complete, accurate, and the appropriate QA/QC requirements were met. Data must be verified as soon as the data reports are received. Data verification shall include:

- Check the CoC and laboratory reports.
  Make sure all requested analyses were performed and all samples are accounted for in the reports.
- Check laboratory reports to make sure hold times were met and that the reporting levels meet or are lower than the reporting levels agreed to in the contract.
- Check data for outlier values and follow up with the laboratory.
  Occasionally typographical errors, unit reporting errors, or incomplete results are reported and should be easily detected. These errors need to be identified, clarified, and corrected quickly by the laboratory. The QSP should especially note data that is an order of magnitude or more different than similar locations, or is inconsistent with previous data from the same location.
- Check laboratory QA/QC results.
  EPA establishes QA/QC checks and acceptable criteria for laboratory analyses. These data are typically reported along with the sample results. The QSP shall evaluate the reported QA/QC data to check for contamination (method, field, and equipment blanks), precision (laboratory matrix spike duplicates), and accuracy (matrix spikes and laboratory control samples). When QA/QC checks are outside acceptable ranges, the laboratory must flag the data, and usually provides an explanation of the potential impact to the sample results.
- Check the data set for outlier values and, accordingly, confirm results and re-analyze samples where appropriate.
  Sample re-analysis should only be undertaken when it appears that some part of the QA/QC resulted in a value out of the accepted range. Sample results may not be discounted unless the analytical laboratory identifies the required QA/QC criteria were not met and confirms this in writing.

Field data including inspections and observations must be verified as soon as the field logs are received, typically at the end of the sampling event. Field data verification shall include:

- Check field logs to make sure all required measurements were completed and appropriately documented;
- Check reported values that appear out of the typical range or inconsistent;
  Follow-up immediately to identify potential reporting or equipment problems, if appropriate, recalibrate equipment after sampling;
- Verify equipment calibrations;
- Review observations noted on the field logs; and

- Review notations of any errors and actions taken to correct the equipment or recording errors.

7.12 RECORDS RETENTION

All records of storm water monitoring information and copies of reports (including Annual Reports) must be retained for a period of at least three years from date of submittal or longer if required by the Regional Water Board.

Results of visual monitoring, field measurements and laboratory analyses must be kept in the SWPPP along with CoCs, and other documentation related to the monitoring.

Records are to be kept onsite while construction is ongoing. Records to be retained include:

- The date, place, and time of inspections, sampling, visual observations, and/or measurements, including precipitation;
- The individual(s) who performed the inspections, sampling, visual observation, and/or field measurements;
- The date and approximate time of field measurements and laboratory analyses;
- The individual(s) who performed the laboratory analyses;
- A summary of all analytical results, the method detection limits and reporting limits, and the analytical techniques or methods used;
- Rain gauge readings from site inspections;
- QA/QC records and results;
- Calibration records;
- Visual observation and sample collection exemption records;
- The records of any corrective actions and follow-up activities that resulted from analytical results, visual observations, or inspections; and
- NAL Exceedance Reports.

Table 7.5 Sample Collection, Preservation and Analysis for Monitoring Pollutants in Non-Storm Water Discharges

Constituent	Analytical Method	Minimum Sample Volume	Sample Bottle	Sample Preservation	Reporting Limit	Maximum Holding Time
Ammonia	EPA 350.3	100 mL	Glass	Refer to Laboratory		
Arsenic	EPA 7060A	250 mL	Polypropylene	Refer to Laboratory		
Battery Acid	Visual Observation of cracked, broken, or malfunctioning battery case					
BOD	EPA 405.1	500 mL	Polypropylene	Store at 4°C	1 mg/L	48 hours
Chlorine, Chloramine	SM 4500	500 mL	Polypropylene	Do not expose to light	0.1 mg/L	Immediate
COD	EPA 410.4	500 mL	Glass-Amber	Store at 4°C, H_2SO_4 to pH<2	10 mg/L	28 days
Construction Debris	Visual Observation of Debris					
Creosote	Visual Observation of Creosote Coating on Timber Products (ties, pilings, etc.)					
Diesel	EPA 8015BB	1 L	Glass-Amber	Store at 4°C	50 µg/L	14 days
Formaldehyde	EPA 8315A	100 mL	Glass	Refer to Laboratory		
Gasoline	EPA 8015B	3 x 40 mL	VOA-Glass	Store at 4°C, HCl to pH<2	50 µg/L	14 days
MBAs, anionic surfactants (detergents)	Visual Observation of Foaming, Bubbles, or Sheen. If needed, use USEPA Methods for Chemical Analysis of Water and Wastes, Method 425.1 (1983), or, APHA Standard Methods, 21st ed., Method 5540 C (2005), or, ASTM D 2330-02 , Methylene Blue Active Substances.					
Metals (Al, Cr, Cu, V, Zn)	EPA 200.8	250 mL	Polypropylene	Store at 4°C	0.2 µg/L	6 months
Nitrates	EPA 300.0	500 mL	Glass	Store at 4°C	0.1 mg/L	14 days
Nitrites	EPA 300.0					
Nitrogen	EPA 351.3	100 mL	Glass	Store at 4°C	0.1 mg/L	28 days

Table 7.5 Sample Collection, Preservation and Analysis for Monitoring Pollutants in Non-Storm Water Discharges

Constituent	Analytical Method	Minimum Sample Volume	Sample Bottle	Sample Preservation	Reporting Limit	Maximum Holding Time
Oil and Grease	EPA 1664A	500 mL	Glass-Amber	Refer to Laboratory		28 days
Paint	Visual Observation of Leaking Containers, Washout, or Spills					
pH	EPA 150.1	100 mL	Polypropylene	None	0.01	Immediate
Phenols	EPA 420.1	500 mL	Glass-Amber	Store at 4°C, H_2SO_4 to pH<2	0.1 mg/L	28 days
Phosphate	EPA 300.0	100 mL	Polypropylene	Store at 4°C	0.1 mg/L	48 hours
Potassium	EPA 200.7	Refer to Laboratory				
Sulfate	EPA 300.0	250 mL	Polypropylene	Store at 4°C	0.1 mg/L	28 days
SVOCs	EPA 8270C	1 L	Glass-Amber	Store at 4°C	10 µg/L	7 days
Synthetic Organics[1]	Refer to VOC or SVOC Notes					
TDS	EPA 160.1	100 mL	Polypropylene	Store at 4°C	1 mg/L	7 days
VOCs	EPA 8260B	3 x 40 mL	VOA-Glass	Store at 4°C, HCl to pH<2	1 µg/L	14 days

[1] Synthetic Organics are defined in Table 1.2 of the CASQA *Stormwater BMP Handbook Portal: Construction* as adhesives, cleaners, sealants, solvents, etc. These are generally categorized as VOCs or SVOCs.

Acronyms:
BOD - Biological Oxygen Demand
COD - Chemical Oxygen Demand
MBAs - Methylene Blue Active Substances

Acronyms:
SVOC - Semi Volatile Organic Compound
TDS - Total Dissolved Solids
VOC - Volatile Organic Compound

Section 8 References

State Water Resources Control Board 2009: Order 2009-0009-DWQ, NPDES General Permit No. CAS000002: National Pollutant Discharges Elimination System (NPDES) California General Permit for Storm Water Discharge Associated with Construction and Land Disturbing Activities, as amended by Order 2010-0014-DWQ NPDES NO. CAS000002. Available on-line at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml.

CASQA 2009, *Stormwater BMP Handbook Portal: Construction*, November 2009, www.casqa.org

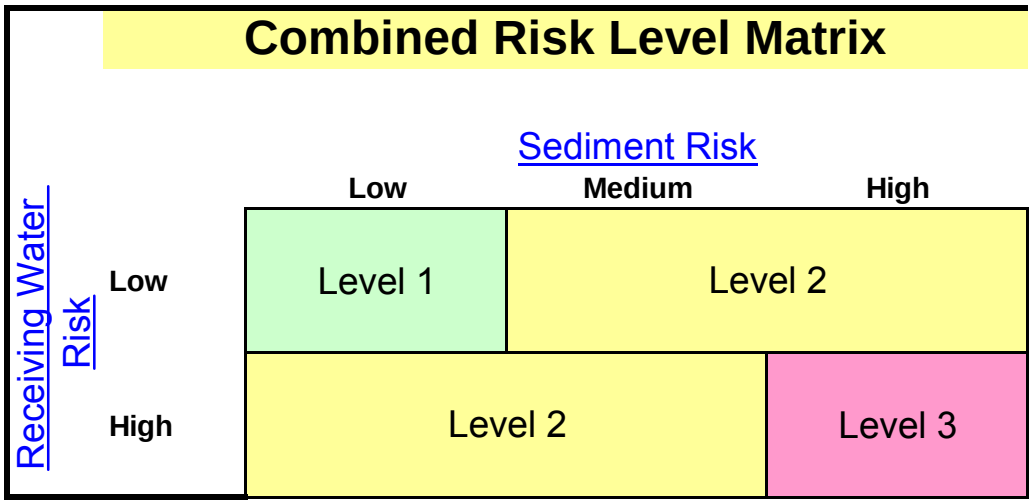
Caltrans Statewide Stormwater Program

http://www.dot.ca.gov/hq/env/stormwater/

APPENDIX A: CALCULATIONS

APPENDIX A1: Risk Analysis

Combined Risk Level Matrix



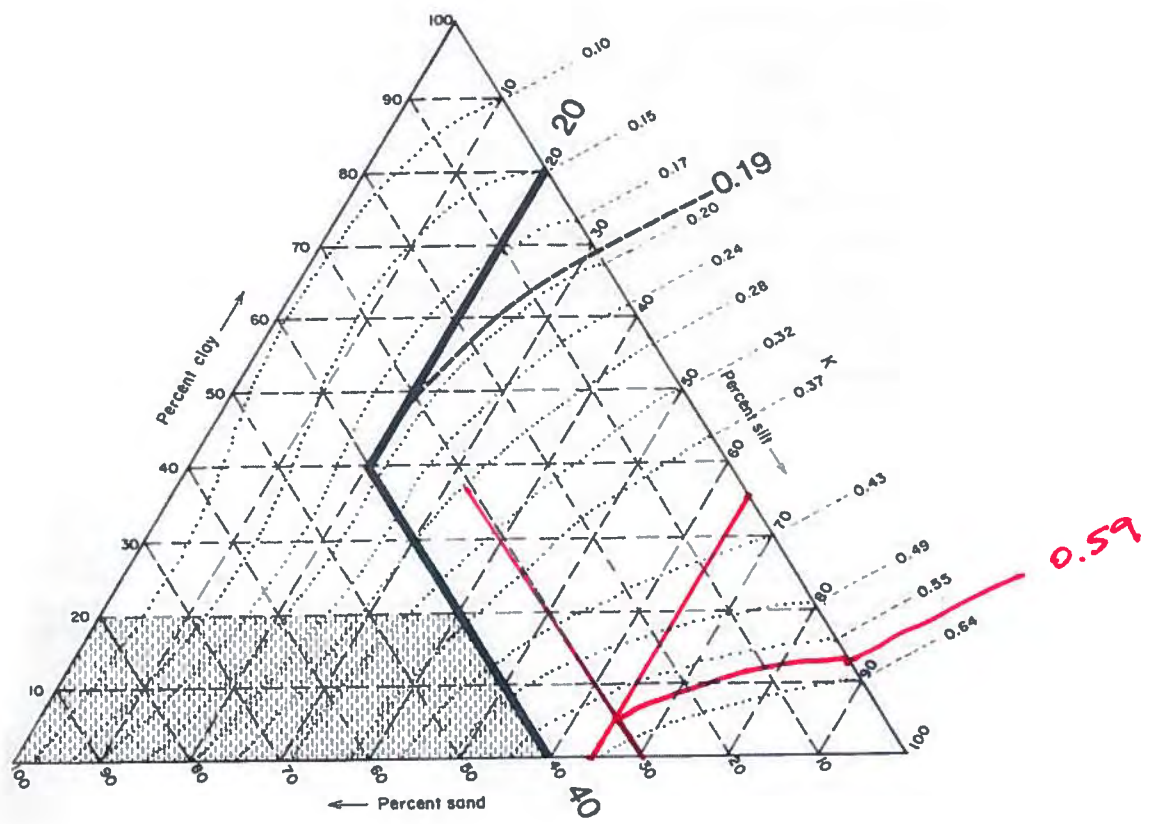
Project Sediment Risk:	**Low**
Project RW Risk:	**High**
Project Combined Risk:	**Level 2**

	A	B	C
1	**Sediment Risk Factor Worksheet**		**Entry**
2	**A) R Factor**		
3	Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.		
4	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
5	**R Factor Value**		46
6	**B) K Factor (weighted average, by area, for all site soils)**		
7	The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.		
8	Site-specific K factor guidance		
9	**K Factor Value**		0.59
10	**C) LS Factor (weighted average, by area, for all slopes)**		
11	The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.		
12	LS Table		
13	**LS Factor Value**		0.12
14			
15	**Watershed Erosion Estimate (=RxKxLS) in tons/acre**		3.2568
16	**Site Sediment Risk Factor**		**Low**
17	Low Sediment Risk: < 15 tons/acre		
18	Medium Sediment Risk: >=15 and <75 tons/acre		
19	High Sediment Risk: >= 75 tons/acre		
20			
21			
22			
23	**GIS Map Method:**		
24	**1.** The R factor for the project is calculated using the online calculator at:		
25	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
26			
27	**2.** The K and LS factors may be obtained by accessing the GIS maps located on the State Water Board FTP website at:		
28	ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwq/cgp/Risk/		

Receiving Water (RW) Risk Factor Worksheet	Entry	Score
A. Watershed Characteristics	**yes/no**	
A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed waterbody impaired by sediment** (For help with impaired waterbodies please visit the link below) or has a **USEPA approved TMDL implementation plan for sediment**?:	**yes**	**High**
http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml		
OR		
A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? (For help please review the appropriate Regional Board Basin Plan)		
http://www.waterboards.ca.gov/waterboards_map.shtml		
Region 1 Basin Plan		
Region 2 Basin Plan		
Region 3 Basin Plan		
Region 4 Basin Plan		
Region 5 Basin Plan		
Region 6 Basin Plan		
Region 7 Basin Plan		
Region 8 Basin Plan		
Region 9 Basin Plan		

Soil Erodibility Factor (K)

The K factor can be determined by using the nomograph method, which requires that a particle size analysis (ASTM D-422) be done to determine the percentages of sand, very fine sand, silt and clay. Use the figure below to determine appropriate K value.



Sheet Flow Length (ft)	Average Watershed Slope (%)							
	0.2	**0.5**	**1.0**	**2.0**	**3.0**	**4.0**	**5.0**	**6.0**
<3	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26
6	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26
9	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26
12	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26
15	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26
25	0.05	0.07	0.10	0.16	0.21	0.26	0.31	0.36
50	0.05	0.08	0.13	0.21	0.30	0.38	0.46	0.54
75	0.05	0.08	0.14	0.25	0.36	0.47	0.58	0.69
100	0.05	0.09	0.15	0.28	0.41	0.55	0.68	0.82
150	0.05	0.09	0.17	0.33	0.50	0.68	0.86	1.05
200	0.06	0.10	0.18	0.37	0.57	0.79	1.02	1.25
250	0.06	0.10	0.19	0.40	0.64	0.89	1.16	1.43
300	0.06	0.10	0.20	0.43	0.69	0.98	1.28	1.60
400	0.06	0.11	0.22	0.48	0.80	1.14	1.51	1.90
600	0.06	0.12	0.24	0.56	0.96	1.42	1.91	2.43
800	0.06	0.12	0.26	0.63	1.10	1.65	2.25	2.89
1000	0.06	0.13	0.27	0.69	1.23	1.86	2.55	3.30

LS Factors for Construction Sites. *Table from Renard et. al., 1997.*

APPENDIX A2: Project Area Calculations

SITE SIZE & DISTURBED AREA ESTIMATE		
Description	Square Feet	Acres
Project SITE		
	435,600	10.0
Total Project Site Area	435,600	10.0
Disturbed Areas	435,600	10.0
Total Project Disturbed Area	435,600	10.0

APPENDIX A3: Site Storm Drainage Report (Post Construction H&H Calculations)

Butte County Association of Governments

Butte Regional Transit
Operations Center Project

Site Storm Drainage

June 2014

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Appendices

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1. Introduction

GHD was retained by TLCD Architecture to provide civil, mechanical, electrical and plumbing engineering services for the Butte Regional Transit Operations Center Project (project). As part of the project, a drainage study has been conducted to address the anticipated post-construction storm water flow rates as well as “Best Management Practices” (BMPs) necessary to manage storm water quantity and quality and protect downstream receiving water bodies.

GHD reviewed and analyzed background information pertinent to the project. The background information includes hydrology, hydraulic and water quality design criteria, existing storm drain infrastructure records and existing topographic information.

The storm drain system and related facilities presented in this study were developed using information available at the time this report was prepared. The hydrologic, hydraulic and water quality analyses, as well as the design, were developed and completed in accordance with the provisions and requirements of the City of Chico Municipal Code Title 18R Design Criteria and Improvement Standards [(1)].The design of project is also intended to meet sustainability requirements for certification through the LEED green building program [(2)].

The construction activates are also required to conform to the State of California Construction General Permit [(3)] for the Storm Water Pollution Prevention Plan (SWPPP) which will be prepared as part of the Contract Document.

The existing site consists of approximately 10 acres of generally open fields. Topography is relatively flat with an approximate 0.5% slope from east to west.

The proposed project includes site development to construct a new administration, operation and maintenance buildings, visitor and staff parking lots, bus parking area, and ancillary improvements.

There is an existing 36-inch storm drain pipe running along the east side of Huss Drive, however the City does not allow the site runoff to be discharged into this storm drain line. As part of the project, a new outfall will be constructed with sufficient capacity to convey runoff from the project site and surrounding parcels into Comanche Creek.

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2. Hydrology

In order for the project to achieve LEED points for post-construction storm water quantity and quality, it must "implement a stormwater management plan that prevents the post-development peak discharge rate and quantity from exceeding the pre-development peak discharge rate and quantity for the 2-year 24-hour design storms for sites with existing imperviousness 50% or less" [(2)]. This LEED criteria is also in conformance with City of Chico's Municipal Code for post-construction volumetric treatment control BMPs requirements.

The County standards recommend utilizing the rational method for estimating design storm runoff. However, the analysis for this site requires developing runoff volumes as well as peak flows. Therefore TR-55 methodology is used as described below.

The US Department of Agriculture (USDA) TR-55 [(4)] is utilized to determine the peak flow rate and volume of storm runoff from the project site. This method begins with a rainfall depth uniformly imposed on the watershed over a specific time distribution. Rainfall is then converted to runoff by using a runoff curve number (CN). Lastly, runoff is transformed into a hydrograph by using unit hydrograph theory and routing procedures that depend on runoff travel time through areas and segments of the watershed. The following sections describe the parameters used to compute peak discharge and runoff volume.

2.1 Watershed Delineation

The pre-development and post-development site is divided into eleven (11) sub-watersheds, including one off-site sub-shed, based on the rough grading plan as presented in Table 2-1. These drainage areas are shown on Figure 1.

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Table 2.1 Sub-watershed Characteristics

						Existing Conditions			Developed Conditions		
Parcel #	Parcel Name	Paved Area (sf)	Unpaved Area (sf)	Total Area (Ft^2)	Total Area (Ac)	Weighted Curve Number	Paved Area (sf)	Unpaved Area (sf)	Total Area (Ft^2)	Total Area (Ac)	Weighted Curve Number
1	BLG	1,502	0	1502	0.03	98	1,502	0	1502	0.03	98
2	2.1	12,385	2,790	15175	0.35	95	12,385	2,790	15175	0.35	95
3	BLG	8,008	0	8008	0.18	98	8,008	0	8008	0.18	98
4	1.1	10,777	4,074	14851	0.34	93	10,777	4,074	14851	0.34	93
5	1.3	17,065	3,495	20560	0.47	95	17,065	3,495	20560	0.47	95
6	1.2	11,605	2,407	14012	0.32	95	11,605	2,407	14012	0.32	95
7	2.2	10,651	270	10921	0.25	98	10,651	270	10921	0.25	98
8	1.7	8,685	17,463	26148	0.60	85	8,685	17,463	26148	0.60	85
9	2.3	29,345	12,010	41355	0.95	92	29,345	12,010	41355	0.95	92
10	3.3	22,918	900	23818	0.55	97	22,918	900	23818	0.55	97
11	3.2	25,435	980	26415	0.61	97	25,435	980	26415	0.61	97
12	1.5	7,311	18,301	25612	0.59	84	7,311	18,301	25612	0.59	84
13	1.6	4,775	16,955	21730	0.50	83	4,775	16,955	21730	0.50	83

						Existing Conditions			Developed Conditions		
Parcel #	Parcel Name	Paved Area (sf)	Unpaved Area (sf)	Total Area (Ft^2)	Total Area (Ac)	Weighted Curve Number	Paved Area (sf)	Unpaved Area (sf)	Total Area (Ft^2)	Total Area (Ac)	Weighted Curve Number
14	3.1	12,000	13,168	25168	0.58	88	25,168	0	25168	0.58	98
15	BLG	1,920	0	1920	0.04	98	1,920	0	1920	0.04	98
16	1.4	16,688	4,587	21275	0.49	94	16,688	4,587	21275	0.49	94
17	BLG	5,590	0	5590	0.13	98	5,590	0	5590	0.13	98
18	3.4	18,090	500	18590	0.43	97	18,090	500	18590	0.43	97
19	BLG	3,344	0	3344	0.08	98	3,344	0	3344	0.08	98
20	4.1	51,730	6,945	58675	1.35	96	51,730	6,945	58675	1.35	96
21	BLG	2,428	0	2428	0.06	98	2,428	0	2428	0.06	98
22	BLG	2,139	0	2139	0.05	98	2,139	0	2139	0.05	98
23	BLG	11,178	0	11178	0.26	98	11,178	0	11178	0.26	98
24	BLG	1,953	0	1953	0.04	98	1,953	0	1953	0.04	98
25	BLG	4,211	0	4211	0.10	98	4,211	0	4211	0.10	98
26	BLG	1,795	0	1795	0.04	98	1,795	0	1795	0.04	98
Total		**303,528**	**104,845**	**408,373**	**9.37**	**93**	**316,696**	**91,677**	**408,373**	**9.37**	**94**

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2.2 Rainfall Events

The 24-hour SCS Hypothetical Storm method is utilized in TR-55 model. This method requires the 24-hour rainfall amount associated with a specific storm frequency. The method also requires the determination of a rainfall distribution. The SCS has defined four distributions within the United States based on storm intensity. TR-55 includes four rainfall distributions based on the geographic regions. Northern California with wet winters and dry summers is represented by Type IA distribution. The 24-hour rainfall depths are obtained from NOAA Atlas 14, Volume 6, Version 2, and presented in Table 2.2.

Table 2.2 Rainfall Characteristics [5]

Rainfall Return Period (yr)	24-hr Rainfall Amount (in)
2	2.81
10	4.45
100	6.49

2.3 Soil Characteristics and Land Use

The major factors that determine CN are the hydrologic soil group, cover type and antecedent runoff conditions. The Natural Resource Conservation Service classifies soils into four hydrologic soil groups (A, B, C and D) according to their minimum infiltration rate. The surface soil in the project area is identified as Chico loam (hydrologic group B) from the “Soil Survey of Butt Area, California, Parts of Butte and Plumas Counties” [6].

Antecedent moisture conditions are classified as either low (AMC I), average (AMC II), or high (AMC III). For the purpose of this study, it is assumed that AMC II curve numbers be applied. AMC

II assumes that 0.5-inches to 1.1-inches of rain had fallen in the watershed of interest over the course of 5-days prior to the initiation of the design storm. Curve numbers developed for AMC II are the most widely used in hydrologic analysis when utilizing the SCS method. Table 2.3 shows the curve numbers used in the hydrologic analyses.

Table 2.3 CN Values

Condition	Cover Type	Curve Number
Pre-development	Open Space – poor condition (grass cover < 50%)	79
Post-development	Paved parking lots, roofs, driveways	98

2.4 Time of Concentration

The time of concentration (T_c) is the time required for surface runoff from the most remote part of the drainage area to reach the design point. T_c is the sum of the sheet flow time, shallow concentrated flow time and the open channel/pipe flow time.

$$T_c = T_{t(sheet)} + T_{t(shallow\ concentrated)} + T_{t(channel)}$$

Based on the City of Chico's standards, minimum time of concentration of 20 minutes and 10 minutes are used respectively for pre- and post-development runoff calculations.

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2.5 Hydrology Modeling

The modeling software used to calculate peak discharge is WinTR-55, a single-event rainfall-runoff small watershed hydrologic model. Two models are created to calculate pre- and post-development runoff rates and volumes for 2-yr, 24-hour, 10-yr, 24 hour and 100-yr, 24 hour storms. Tables 2.4 and 2.5 summarize the hydrology results for pre- and post-development conditions for the drainage areas shown on Figure 1.

Table 2.4 Existing Condition Flow Rates

Existing Conditions					
Parcel #	Parcel Name	Total Area (Ac)	Peak Flow 2-yr (cfs)	Peak Flow 10-yr (cfs)	Peak Flow 100-yr (cfs)
1	BLG	0.03	0.00	0.00	0.00
2	2.1	0.35	0.32	0.55	0.83
3	BLG	0.18	0.25	0.40	0.58
4	1.1	0.34	0.24	0.42	0.64
5	1.3	0.47	0.27	0.47	0.70
6	1.2	0.32	0.19	0.32	0.48
7	2.2	0.25	0.16	0.26	0.39
8	1.7	0.60	0.12	0.31	0.59
9	2.3	0.95	0.19	0.50	0.93
10	3.3	0.55	0.11	0.29	0.54

Existing Conditions					
Parcel #	Parcel Name	Total Area (Ac)	Peak Flow 2-yr (cfs)	Peak Flow 10-yr (cfs)	Peak Flow 100-yr (cfs)
11	3.2	0.61	0.12	0.32	0.60
12	1.5	0.59	0.12	0.31	0.58
13	1.6	0.50	0.10	0.26	0.49
14	3.1	0.58	0.24	0.47	0.77
15	BLG	0.04	0.00	0.00	0.00
16	1.4	0.49	0.10	0.26	0.49
17	BLG	0.13	0.00	0.07	0.13
18	3.4	0.43	0.09	0.22	0.42
19	BLG	0.08	0.00	0.00	0.08
20	4.1	1.35	0.27	0.71	1.33
21	BLG	0.06	0.00	0.00	0.06
22	BLG	0.05	0.00	0.00	0.05
23	BLG	0.26	0.05	0.14	0.26
24	BLG	0.04	0.00	0.00	0.00
25	BLG	0.10	0.00	0.05	0.10
26	BLG	0.04	0.00	0.00	0.00
Total		**9.37**	**5.02**	**8.89**	**13.67**

Table 2.5 Proposed Condition Flow Rates

Developed Conditions					
Parcel #	Parcel Name	Total Area (Ac)	Peak Flow 2-yr (cfs0	Peak Flow 10-yr (cfs0	Peak Flow 100-yr (cfs0
1	BLG	0.03	0.00	0.00	0.00
2	2.1	0.35	0.32	0.55	0.83
3	BLG	0.18	0.25	0.40	0.58
4	1.1	0.34	0.24	0.42	0.64
5	1.3	0.47	0.27	0.47	0.70
6	1.2	0.32	0.19	0.32	0.48
7	2.2	0.25	0.16	0.26	0.39
8	1.7	0.60	0.20	0.43	0.74
9	2.3	0.95	0.48	0.87	1.36
10	3.3	0.55	0.35	0.57	0.84
11	3.2	0.61	0.39	0.63	0.93
12	1.5	0.59	0.18	0.41	0.71
13	1.6	0.50	0.15	0.33	0.58
14	3.1	0.58	0.38	0.61	0.90
15	BLG	0.04	0.00	0.00	0.06
16	1.4	0.49	0.28	0.48	0.73

Developed Conditions					
Parcel #	**Parcel Name**	**Total Area (Ac)**	**Peak Flow 2-yr (cfs0**	**Peak Flow 10-yr (cfs0**	**Peak Flow 100-yr (cfs0**
17	BLG	0.13	0.08	0.13	0.20
18	3.4	0.43	0.27	0.44	0.66
19	BLG	0.08	0.05	0.09	0.13
20	4.1	1.35	0.83	1.38	2.05
21	BLG	0.06	0.00	0.06	0.09
22	BLG	0.05	0.00	0.05	0.08
23	BLG	0.26	0.17	0.28	0.41
24	BLG	0.04	0.00	0.00	0.06
25	BLG	0.10	0.07	0.11	0.16
26	BLG	0.04	0.00	0.00	0.06
Total		**9.37**	**5.27**	**9.13**	**13.88**

As it is shown in Tables 2.4 and 2.5, the development increased the total runoff by 2.69 cfs, 3.28 cfs and 3.60 cfs for 2-year, 10-year and 100-year storms respectively. The detail results from hydrology modeling are presented in Appendix A.

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3. Water Quality

Best Management Practices (BMPs) are incorporated into the design by maximizing opportunities to utilize landscaped areas to attenuate stormwater flows, improve water quality, and minimize the effect of impervious improvements.

City of Chico requires storm water treatment controls in new and redevelopment projects. The post construction treatment control BMPs shall incorporate either a volumetric or flow base control design for the 85th percentile 24-hour runoff event which is equivalent to the measures listed in LEED certification criteria as described in Chapter 2.

3.1 BMP Design

A series of bioswales with bioretention mechanisms throughout the site function as soil and plant-based filtration, retention, and infiltration features to achieve both water quality and volume capture objectives. Figure 1 shows the developed site and proposed bioswales and bioretention system layout. The locations of the swales and bioretention facilities are governed by the grading plan as presented in Figure 2.

Bioretention facilities are located in the median areas of the parking lots and around the perimeter of the site, and have suitable access for inspection and maintenance.

Runoff generated from each sub-watershed is conveyed via sheet flow and shallow concentrated flow to the bioswales. Stormwater infiltrates into the subsurface bioretention system where it is filtered, undergoes biological treatment, and infiltrates into the subsurface. The following design criteria are assumed for sizing the bioretention systems:

- The porosity of the structural soil within the bioretention area is 0.4;
- The depth of the structural soil is minimum 30 inches;
- The swales on the top of bioretention areas are generally trapezoidal in shape with smoothed edges, 7 feet-wide base, maximum depth of 12 inches, 3 to 1 side slopes and 0.2% longitudinal slope.

Bioretention facilities capture and infiltrate 100% of the volume of runoff generated by a 2-year 24-hour storm event; therefore no additional treatment is required. They are also sized to convey 100% of the flow generated by a 10-year 24-hour storm event. Table 3.1 summarizes the water quality sizing calculations for bioretention facilities. Bioretention facilities are shown on Figure 1.

Table 3.1 Biofiltration Facility Characteristics

Estimated Storage Volume per Parcel								
Parcel #	Parcel Name	Developed Conditions *Storage Volume Ac-Ft*	Existing Conditions *Storage Volume Ac-Ft*	Delta Storage Volume (Ac-Ft)	Delta Storage Volume (CF)	Delta TDA Volume (CF)	Calc Storage Area (SF)	Actual Length (FT)
1	BLG	0.000	0.000	0.000	0	0	0	0
2	2.1	0.065	0.065	0.000	0	0	0	0
3	BLG	0.035	0.035	0.000	0	0	0	0
4	1.1	0.033	0.033	0.000	0	0	0	0

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Estimated Storage Volume per Parcel								
Parcel #	Parcel Name	Developed Conditions *Storage Volume Ac-Ft*	Existing Conditions *Storage Volume Ac-Ft*	Delta Storage Volume (Ac-Ft)	Delta Storage Volume (CF)	Delta TDA Volume (CF)	Calc Storage Area (SF)	Actual Length (FT)
5	1.3	0.043	0.043	0.000	0	0	0	155
6	1.2	0.018	0.018	0.000	0	0	0	85
7	2.2	0.014	0.014	0.000	0	0	0	0
8	1.7	0.027	0.011	0.017	726	1116	372	140
9	2.3	0.149	0.058	0.091	3974	6113	1019	120
10	3.3	0.075	0.009	0.066	2880	4431	1108	0
11	3.2	0.094	0.011	0.083	3597	5534	1383	0
12	1.5	0.023	0.010	0.013	566	870	218	285
13	1.6	0.012	0.007	0.005	228	351	88	210
14	3.1	0.091	0.037	0.053	2330	3585	896	0
15	BLG	0.000	0.000	0.000	0	0	0	0
16	1.4	0.046	0.007	0.039	1714	2638	659	195
17	BLG	0.004	0.000	0.004	165	254	51	88
18	3.4	0.043	0.004	0.038	1661	2555	639	0
19	BLG	0.001	0.000	0.001	59	90	30	70
20	4.1	0.262	0.115	0.147	6410	9862	1972	87
21	BLG	0.000	0.000	0.000	0	0	0	65
22	BLG	0.000	0.000	0.000	0	0	0	90
23	BLG	0.015	0.001	0.014	605	930	233	0
24	BLG	0.000	0.000	0.000	0	0	0	52
25	BLG	0.002	0.000	0.002	104	160	64	90
26	BLG	0.000	0.000	0.000	0	0	0	35

4. Hydraulics

The closed conduit storm drain system presented herein is designed to convey the required 10-year 24-hour storm event below the top of grate of the drainage inlets. The flow results of the hydrologic analysis are utilized as inputs to analyze the hydraulics of the storm drain system. The purpose of the hydraulic analysis is to evaluate and design adequately sized swales, conduits and drainage inlets for conveyance of the design storm event.

4.1 Bioswale Design

Runoff from parking areas and buildings is drained toward the swales and bioretention facilities which are designed to accommodate the overland flow. The swales above the bioretention areas are sized using Manning's equation for the peak runoff rate generated by a 100-year 24-hour. They are generally trapezoidal in shape with smoothed edges, ranging from 3-feet to 12 feet-wide at the base, minimum depth of 12 inches, maximum 3:1 side slopes and a maximum 0.5% longitudinal slope.

4.2 Closed Conduits Design

Stormwater flows beyond the bioretention capacity enter closed conduit storm drains via drop inlets located in bioswales. The closed conduit storm drain system is simulated using Haestad Method's StormCAD V8i. The hydraulic design utilizes Manning's equation to relate depth of flow in the waterway to the flow rate (Q), cross sectional area (A), slope (S) and roughness of the conduit (Manning's roughness coefficient "n").

Runoff flow rates computed from hydrologic analysis are assumed to enter the drainage inlets located in bioretention areas after volume capture has been achieved and flow throughout closed conduits to the site outfall located in the western end of the Aztec Drive extension. The design of the closed conduit drainage system consists of precast reinforced concrete pipe, drop inlet and manholes. The following criteria were used for the design of the majority of closed conduit systems:

- Minimum storm drain pipe diameter of 10 inch;
- Minimum allowable slope to meet a self-cleaning full-pipe flow velocity of 2.0 ft/s;
- Minimum pipe cover of 2 feet, measured from the top of pipe to the roadway or ground surface;
- Pipe material: Reinforced Concrete Pipe (RCP, n = 0.012);
- Manholes or drop inlets are placed at intervals of approximately 350 feet on center and at changes in pipe direction or diameter.
- New storm drain system is sized to convey 10-year 24-hour with a free water surface.

The closed conduit drainage system is shown on Figure 1. The results from closed conduit modeling are presented in Appendix B.

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5. Summary and Conclusions

The Butte Regional Transit Operations Center Project (project) existing site consists of approximately 10 acres of generally open fallow agricultural fields. Topography is relatively flat with an approximate 0.5% slope from east to west.

The proposed project includes site development to construct a new administration, operation and maintenance buildings, visitor and staff parking lots, bus parking area, and ancillary improvements. Runoff from the buildings, impervious bus parking area, and pervious visitor and staff parking areas is drained toward bioswales and bioretention facilities which are designed to accommodate the overland flow.

The stormwater system is designed to deliver the surface flow to bioswales and biofiltration facilities prior to entering the new storm drain system located in the Aztec Drive extension. Bioretention facilities achieve both water quality and volume capture objectives of the City of Chico, State of California, and will also meet LEED stormwater requirements.

The bioswales and bioretention facilities are located in the median areas and around the perimeter of the site and have suitable access for inspection and maintenance. All drainage into the BMPs is by gravity overland flow and shallow concentrated flow.

The bioretention systems capture 100% of the volume of runoff generated by 2-year 24-hour storm event; therefore no additional treatment is required. Proposed closed conduit system is adequately sized to convey 10-year 24-hour with a free water surface. Bioswales are sized to hydraulically convey the peak flow rate generated by the 100-year 24-hour storm event.

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References

Chico Municipal Code (2007), *"Title 18R, Design Criteria and Improvement Standards".*

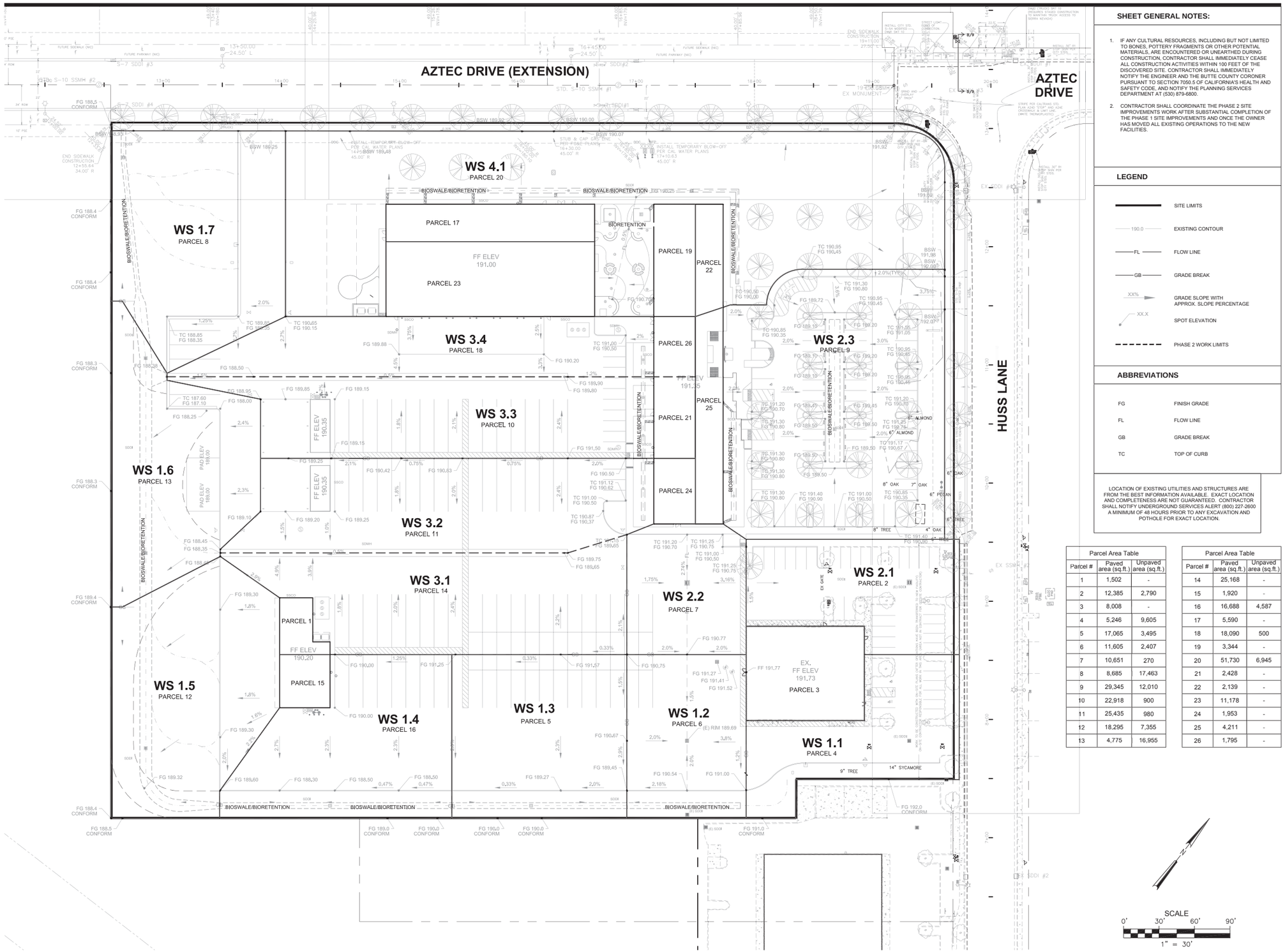
US Green Building Council (2009), *"LEED Reference Guide for Green Building Design and Construction".*

State Water Resources Control Board (2009), *"National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities".*

United States Department of Agriculture (1986), *"Technical Release 55 (TR-55) Urban Hydrology for Small Watersheds".*

National Oceanic and Atmospheric Administration, Atlas 14 (2011), *"Precipitation-Frequency Atlas of the United States, Volume 6 Version 2.0: California".*

United States Department of Agriculture (2006), *"Soil Survey of Butte Area, California, Parts of Butte and Plumas Counties"*



SHEET GENERAL NOTES:

1. IF ANY CULTURAL RESOURCES, INCLUDING BUT NOT LIMITED TO BONES, POTTERY FRAGMENTS OR OTHER POTENTIAL MATERIALS, ARE ENCOUNTERED OR UNEARTHED DURING CONSTRUCTION, CONTRACTOR SHALL IMMEDIATELY CEASE ALL CONSTRUCTION ACTIVITIES WITHIN 100 FEET OF THE DISCOVERED SITE. CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND THE BUTTE COUNTY CORONER PURSUANT TO SECTION 7050.5 OF CALIFORNIA'S HEALTH AND SAFETY CODE, AND NOTIFY THE PLANNING SERVICES DEPARTMENT AT (530) 879-6800.
2. CONTRACTOR SHALL COORDINATE THE PHASE 2 SITE IMPROVEMENTS WORK AFTER SUBSTANTIAL COMPLETION OF THE PHASE 1 SITE IMPROVEMENTS AND ONCE THE OWNER HAS MOVED ALL EXISTING OPERATIONS TO THE NEW FACILITIES.

LEGEND

- SITE LIMITS
- 190.0 — EXISTING CONTOUR
- FL — FLOW LINE
- GB — GRADE BREAK
- XX% — GRADE SLOPE WITH APPROX. SLOPE PERCENTAGE
- XX.X — SPOT ELEVATION
- PHASE 2 WORK LIMITS

ABBREVIATIONS

FG	FINISH GRADE
FL	FLOW LINE
GB	GRADE BREAK
TC	TOP OF CURB

LOCATION OF EXISTING UTILITIES AND STRUCTURES ARE FROM THE BEST INFORMATION AVAILABLE. EXACT LOCATION AND COMPLETENESS ARE NOT GUARANTEED. CONTRACTOR SHALL NOTIFY UNDERGROUND SERVICES ALERT (800) 227-2600 A MINIMUM OF 48 HOURS PRIOR TO ANY EXCAVATION AND POTHOLE FOR EXACT LOCATION.

Parcel Area Table		
Parcel #	Paved area (sq.ft.)	Unpaved area (sq.ft.)
1	1,502	-
2	12,385	2,790
3	8,008	-
4	5,246	9,605
5	17,065	3,495
6	11,605	2,407
7	10,651	270
8	8,685	17,463
9	29,345	12,010
10	22,918	900
11	25,435	980
12	18,295	7,355
13	4,775	16,955

Parcel Area Table		
Parcel #	Paved area (sq.ft.)	Unpaved area (sq.ft.)
14	25,168	-
15	1,920	-
16	16,688	4,587
17	5,590	-
18	18,090	500
19	3,344	-
20	51,730	6,945
21	2,428	-
22	2,139	-
23	11,178	-
24	1,953	-
25	4,211	-
26	1,795	-

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PERMIT REVIEW SET

BCAG BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

B-Line Butte Regional Transit

Butte Regional Transit Operations Center

326 HUSS DRIVE CHICO, CA 95928

BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

PROJECT NUMBER: 11054.03
DATE: 4-18-14
DRAWN BY: CB
CHECKED BY: MK
REVISIONS:

POST-DEVELOPED SITE CONDITION

Figure 1

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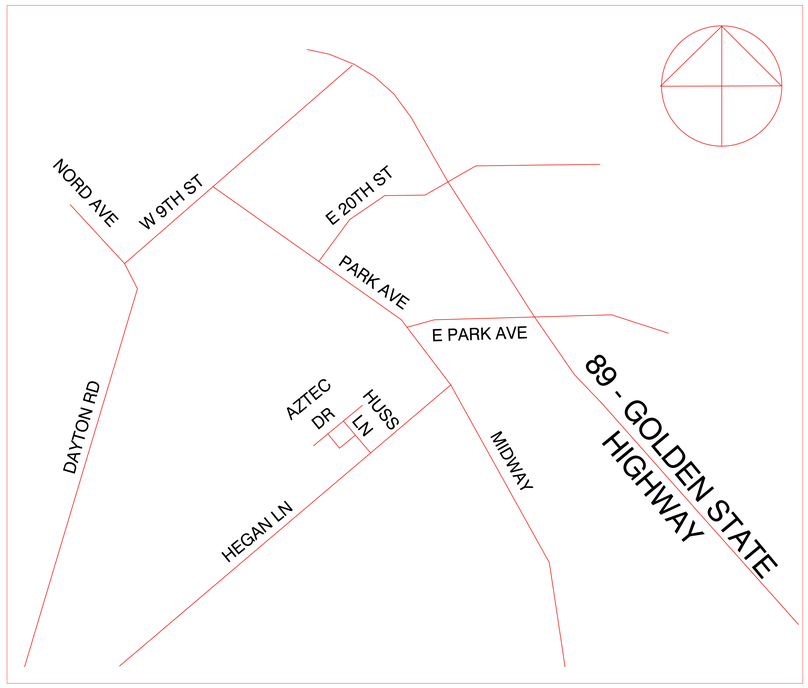
Appendices

BUTTE COUNTY ASSOCIATION OF GOVENMENTS

WATER POLLUTION CONTROL DRAWINGS (WPCDs)
BUTTE REGIONAL TRANSIT OPERATIONS CENTER

326 HUSS DRIVE, CHICO, CA 95928



LOCATION MAP

NOT TO SCALE

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PERMIT REVIEW SET

BCAG BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

B-Line Butte Regional Transit

Butte Regional Transit Operations Center

326 HUSS DRIVE CHICO, CA 95928

BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

PROJECT NUMBER: 11054.03

DATE: 4-18-14

DRAWN BY: CB

CHECKED BY: MK

REVISIONS:

WATER POLLUTION CONTROL PLAN

WP-100

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BEST MANAGEMENT PRACTICES (BMPs) SYMBOLS & LEGEND

NOTE THAT NOT ALL SYMBOLS ARE USED ON WPCDs, ALL LISTED BMPs MAY BE USED FOR PROJECT

EC-1	EC-1	SCHEDULING
EC-9	EC-9	EARTH DIKE AND DRAINAGE SWALES
SC-6	SC-6	INLET PROTECTION
SE-1	SE-1	SILT FENCE
SE-4	SE-4	CHECK DAMS
SE-5	SE-5	FIBER ROLLS
TC-1	TC-1	STABILIZED CONSTRUCTION ENTRANCE AND EXIT
TC-3	TC-3	ENTRANCE OUTLET TIRE WASH

GENERAL LEGEND

###	STORMWATER SAMPLING LOCATION & IDENTIFICATION
	WATERCOURSE OR STORMWATER FLOW DIRECTION

1. REFER TO SWPPP DOCUMENTATION, APPENDICES, & ATTACHMENTS FOR ADDITIONAL NPDES/SWPPP RELATED INFORMATION.

2. INSTALL ALL BMP MATERIALS, STRUCTURES, AND PRODUCTS PER MANUFACTURERS' INSTALLATION REQUIREMENTS.

3. PRESERVE ALL EXISTING VEGETATION TO THE MAXIMUM EXTENT PRACTICAL. ONLY DISTURB AREAS NECESSARY TO COMPLETE CONSTRUCTION.

4. REMOVE ALL EXISTING DEBRIS, TRASH, ETC. PRIOR TO PLACEMENT OF STRAW MULCH AND AT THE END OF EACH DAY. AFTER CONSTRUCTION COMPLETION, ALL BMPs INSTALLED, OR INTRODUCED MATERIALS, SHALL BE REMOVED AND DISPOSED OF OFFSITE UNLESS THEY ARE THE POST-CONSTRUCTION (FINAL) BMPs.

5. AS APPROPRIATE, TEMPORARY EROSION & SEDIMENT CONTROL BMPs SHALL BE INSTALLED AT LEAST 48 HOURS PRIOR TO A PREDICTED PRECIPICATION EVENT (50% OR GREATER PROBABILITY PER NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION (NOAA). ADEQUATE SUPPLIES OF BMP MATERIALS SHALL BE AVAILABLE AND ON-SITE.

6. IDENTIFIED FAILURES OR OTHER SHORTCOMINGS REQUIRING REPAIR, MODIFICATION, OR UPGRADING OF BMPs SHALL BEGIN WITHIN 72 HOURS OF BEING IDENTIFIED, AND SHALL BE COMPLETED AS SOON AS PRACTICAL.

7. INSPECTIONS – REFER TO SWPPP FOR TRAINING, CERTIFICATION, INSPECTION, SAMPLING, AND RECORDING REQUIREMENTS.
   - 7.1. DAILY – BY CONTRACTOR OR QSP/QSD.
     - 7.1.1. ALL IMMEDIATE ACCESS ROADS.
     - 7.1.2. ENTIRE CONSTRUCTION SITE FOR WASTE MANAGEMENT AND NON-STORMWATER ISSUES (GOOD HOUSEKEEPING).
   - 7.2. WEEKLY – BY QSP/QSD OR QSP/QSD TRAINED PERSONNEL.
     - 7.2.1. ALL BMPs FOR CORRECT INSTALLATION AND OPERATION.
   - 7.3. QUARTERLY (Jan-Mar, Apr-Jun, Jul-Sept, Oct-Sept) – BY QSP/QSD.
     - 7.3.1. EACH DRAINAGE AREA WITHIN CONSTRUCTION SITE FOR PRESENCE OR INDICATIONS OF NON-STORM WATER DISCHARGES.
   - 7.4. NON-VISIBLE POLLUTANTS – BY CONTRACTOR OR QSP/QSD
     - 7.4.1. IF ANY BREACH, MALFUNCTION, LEAKAGE, OR SPILL WHICH COULD RESULT IN POLLUTANT DISCHARGE IS OBSERVED DURING ANY INSPECTION, ADDITIONAL INSPECTION AND SAMPLING SHALL BE CONDUCTED FOR ALL NON-VISIBLE POLLUTANT PARAMETERS AS DESCRIBED IN THE SWPPP.
   - 7.5. PRECIPITATION (STORM) EVENT INSPECTIONS – BMP INSPECTION FOR POSSIBLE MAINTENANCE NEEDS BY CONTRACTOR, STORMWATER INSPECTION & SAMPLING BY QSP/QSD.
     - 7.5.1. WITHIN 48 HOURS PRIOR TO QUALIFYING RAIN EVENT.
     - 7.5.2. EACH 24 HOURS DURING EXTENDED PRECIPITATION EVENTS.
     - 7.5.3. WITHIN 48 HOURS AFTER EACH QUALIFYING RAIN EVENT.
     - 7.5.4. INSPECTIONS TO OCCUR DURING BUSINESS HOURS ONLY.
     - 7.5.5. INSPECTIONS SHALL NOT OCCUR DURING POTENTIALLY HAZARDOUS ACCESS OR WEATHER CONDITIONS.

8. FINAL or POST-CONSTRUCTION BMPs – AREAS WILL BE CONSIDERED COMPLETE WHEN THE FINAL BMPs ARE INSTALLED AND VERIFIED BY THE QSP OR QSD. FINAL BMPs WILL GENERALLY CONSIST OF:
   - 8.1. ALL OTHER EXPOSED OR DISTURBED SOILS – ESTABLISH VEGETATIVE COVER. ESTABLISHED VEGETATION IS DEFINED BY VISUALLY ESTABLISHING THAT THERE IS AT LEAST 70% VEGETATED COVER ON THE ENTIRE DISTURBED AREA. CONTRACTOR MAY CONSIDER STRIPPING TOPSOILS AND STOCKPILING FOR LATER DISTRIBUTION OVER DISTURBED AREAS TO AID IN RAPID REGROWTH OF THE NATURALIZED VEGETATION. DURING DRY WEATHER CONDITIONS, CONTRACTOR MAY NEED TO CONSIDER IRRIGATION IN CONJUNCTION WITH DUST CONTROL WATERING TO RAPIDLY ESTABLISH VEGETATION. SEED, THEN STRAW COVER, IS TYPICALLY APPROPRIATE FOR SMALL AREAS. HYDROSEEDING IS TYPICALLY APPROPRIATE FOR LARGE AREAS, AND TO PROVIDE LONGER LASTING PROTECTION FOR SEEDS. GIVEN THE NATURE OF THIS PROJECT, QSD/QSP WILL ACCEPT VIRTUALLY ANY COMBINATION OF BMPs TO ESTABLISH THE VEGETATIVE COVER THAT IS PROPOSED BY THE CONTRACTOR.

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PERMIT REVIEW SET

BCAG BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

B-Line Butte Regional Transit

Butte Regional Transit Operations Center

326 HUSS DRIVE
CHICO, CA 95928

BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

PROJECT NUMBER:
11054.03

DATE:
4-18-14

DRAWN BY:
CB

CHECKED BY:
MK

REVISIONS:

WATER POLLUTION CONTROL PLAN

WP-101

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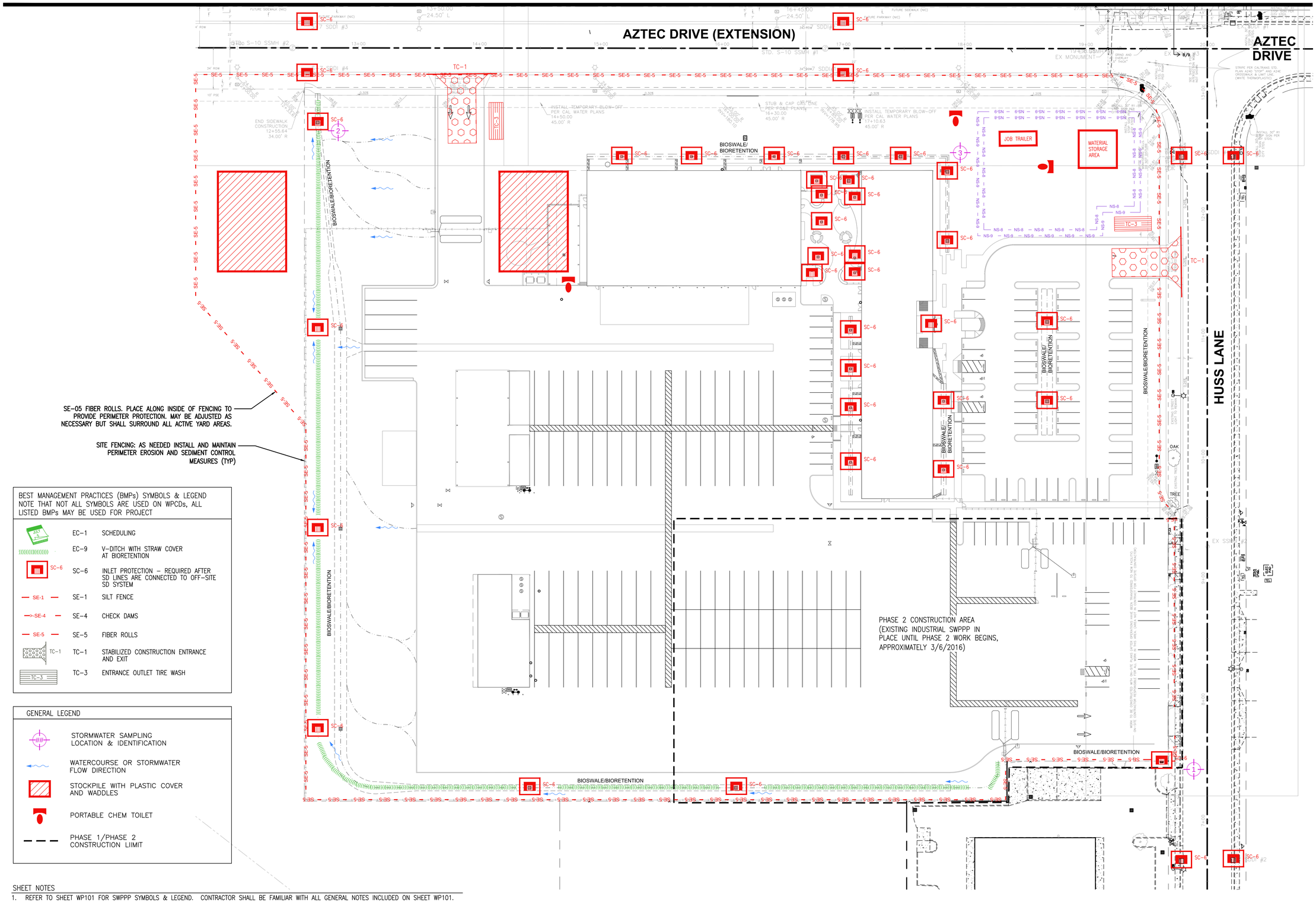

BEST MANAGEMENT PRACTICES (BMPs) SYMBOLS & LEGEND
NOTE THAT NOT ALL SYMBOLS ARE USED ON WPCDs, ALL LISTED BMPs MAY BE USED FOR PROJECT

	EC-1	SCHEDULING
	EC-9	V-DITCH WITH STRAW COVER AT BIORETENTION
SC-6	SC-6	INLET PROTECTION – REQUIRED AFTER SD LINES ARE CONNECTED TO OFF-SITE SD SYSTEM
SE-1	SE-1	SILT FENCE
SE-4	SE-4	CHECK DAMS
SE-5	SE-5	FIBER ROLLS
TC-1	TC-1	STABILIZED CONSTRUCTION ENTRANCE AND EXIT
TC-3	TC-3	ENTRANCE OUTLET TIRE WASH

GENERAL LEGEND

###	STORMWATER SAMPLING LOCATION & IDENTIFICATION
	WATERCOURSE OR STORMWATER FLOW DIRECTION
	STOCKPILE WITH PLASTIC COVER AND WADDLES
	PORTABLE CHEM TOILET
	PHASE 1/PHASE 2 CONSTRUCTION LIMIT

SHEET NOTES

1. REFER TO SHEET WP101 FOR SWPPP SYMBOLS & LEGEND. CONTRACTOR SHALL BE FAMILIAR WITH ALL GENERAL NOTES INCLUDED ON SHEET WP101.
2. ENVIRONMENTAL COMPLIANCE BMPs SUPERCEDE ALL SWPPP BMPs. CONTRACTOR SHALL BE FAMILIAR WITH PROJECT ENVIRONMENTAL COMPLIANCE REQUIREMENTS INCLUDING WATER QUALITY, WETLANDS, FISHERIES, AND CALIFORNIA TIGER SALAMANDER.
3. FINAL LOCATION OF FILTER FENCE, FIBER ROLLS, OR OTHER PERIMETER CONTROL BMPs MAY BE FIELD ADJUSTED OR AUGMENTED AS NECESSARY TO CONFORM TO TOPOGRAPHY AND SITE CONDITIONS, AS APPROVED BY THE QSP OR QSD.
4. FIBER ROLLS SHALL BE USED FOR PERIMETER EROSION AND SEDIMENT CONTROL. REFER TO (BMP SE-5) FOR PROJECT SPECIFIC DETAILS FOR FIBER ROLL APPLICATIONS.
5. CONTRACTOR SHALL PROVIDE STREET STORM DRAINAGE INLET PROTECTION AS NECESSARY TO PREVENT ANY TRACKED MATERIALS FROM ENTERING STORM DRAINAGE SYSTEM ALONG PUBLIC OR PRIVATE ROADS USED FOR PROJECT ACCESS. POTENTIALLY AFFECTED INLETS MAY BE OUT OF THE RIGHT OF WAY, AND/OR NOT SHOWN HEREON.
6. IF STREET SWEEPING IS REQUIRED, VACUUM UNITS SHALL BE USED. DO NOT WASH WATER INTO STORMDRAIN SYSTEM.
7. ACCESS TO PROJECT SITE SHALL BE RESTRICTED TO ENSURE ALL VEHICLE TRAFFIC USES APPROVED CONSTRUCTION ENTRANCES AND EXITS.
8. STABILIZED ROCK CONSTRUCTION ENTRANCES AND EXITS CAN BE REPLACED WITH RUMBLE STRIPS OR ACCEPTABLE ALTERNATE WITH PRIOR APPROVAL FROM QSP OR QSD.
9. ALL NON-STORMWATER (NS) AND WASTE MANAGEMENT (WM) BEST MANAGEMENT PRACTICES APPLY AT ALL TIMES TO CONSTRUCTION ACTIVITIES. REFER TO PROJECT SWPPP MANUAL FOR ADDITIONAL INFORMATION. LOCATION OF NS AND WM BMPs ARE TYPICALLY NOT SHOWN ON WPCDs DUE TO THE DYNAMIC NATURE OF THIS PROJECT.
10. DUST CONTROL MEASURES SHALL BE IMPLEMENTED AT ALL TIMES AS NECESSARY TO PREVENT WIND-BORNE EROSION AND DUST POLLUTION.

3-30-15
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PAGE 1 OF 1

SCALE
0' 30' 60' 90'
1" = 30'

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CONFORMANCE SET
IS FOR REFERENCE ONLY AND IS FURNISHED AS A CONVENIENCE. CONFORMANCE SET DOES NOT REPLACE THE CONTRACT DOCUMENTS OR THE CITY OF CHICO APPROVED PLANS AND SPECIFICATIONS

BCAG BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

B-Line Butte Regional Transit

Butte Regional Transit Operations Center
326 HUSS DRIVE CHICO, CA 95928

BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

PROJECT NUMBER: 11054.03
DATE: 9-12-14
DRAWN BY: CB
CHECKED BY: MK

REVISIONS:

Number	Date	Description
1	7-8-14	PERMIT REVIEW
A1	7-14-14	ADDENDUM #1
A2	7-31-14	ADDENDUM #2
A3	8-6-14	ADDENDUM #3

WATER POLLUTION CONTROL PLAN
WP-102

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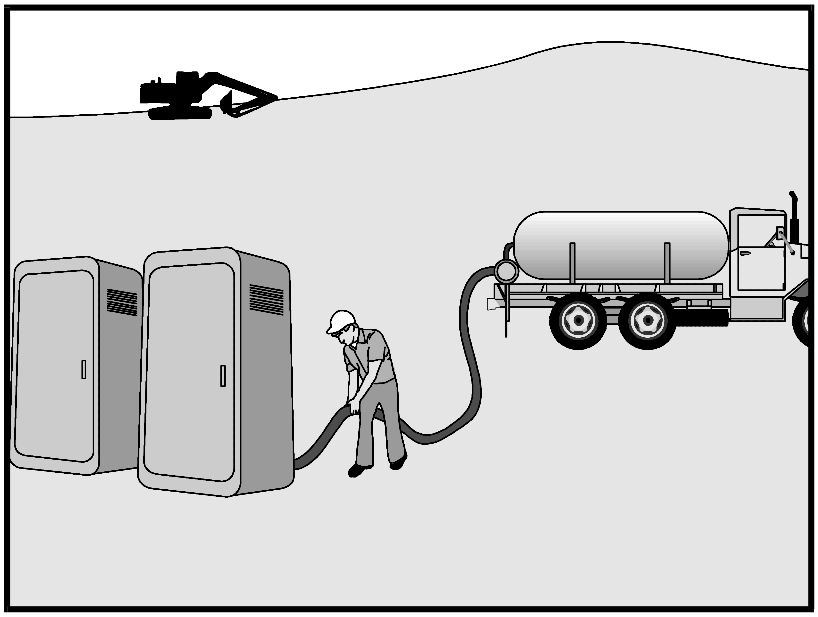
APPENDIX H: STORM WATER BMP HANDBOOK- CONSTRUCTION FACT SHEETS

Sanitary/Septic Waste Management WM-9



Objectives		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	☑
Oil and Grease	
Organics	☑

Potential Alternatives
None

Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.
- Wastewater should not be discharged or buried within the project site.

- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Untreated raw wastewater should never be discharged or buried.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities overflow.

Education

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Costs

All of the above are low cost measures.

Inspection and Maintenance

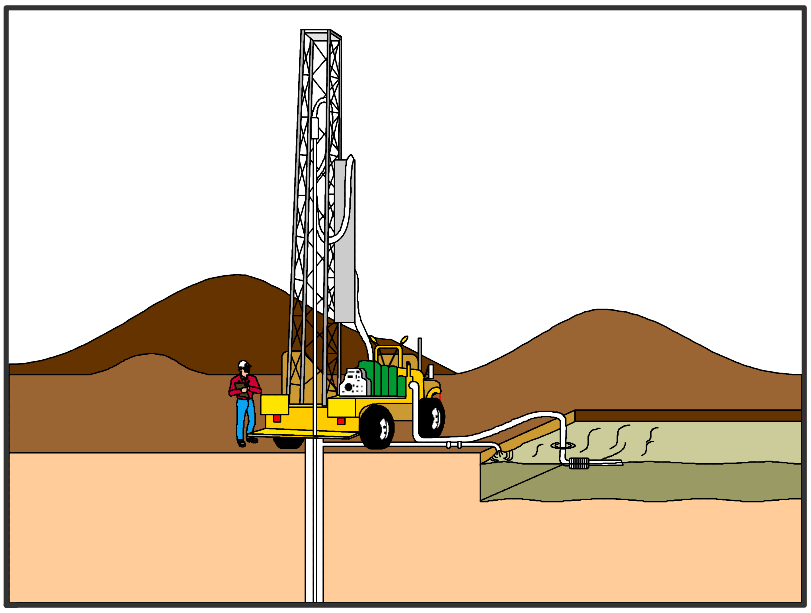
- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Liquid Waste Management WM-10



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Liquid waste management includes procedures and practices to prevent discharge of pollutants to the storm drain system or to watercourses as a result of the creation, collection, and disposal of non-hazardous liquid wastes.

Suitable Applications

Liquid waste management is applicable to construction projects that generate any of the following non-hazardous by-products, residuals, or wastes:

- Drilling slurries and drilling fluids
- Grease-free and oil-free wastewater and rinse water
- Dredgings
- Other non-stormwater liquid discharges not permitted by separate permits

Limitations

- Disposal of some liquid wastes may be subject to specific laws and regulations or to requirements of other permits secured for the construction project (e.g., NPDES permits, Army Corps permits, Coastal Commission permits, etc.).
- Liquid waste management does not apply to dewatering operations (NS-2 Dewatering Operations), solid waste management (WM-5, Solid Waste Management), hazardous wastes (WM-6, Hazardous Waste Management), or concrete slurry residue (WM-8, Concrete Waste

Management).

- Typical permitted non-stormwater discharges can include: water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; flows from riparian habitats and wetlands; and discharges or flows from emergency fire fighting activities.

Implementation

General Practices

- Instruct employees and subcontractors how to safely differentiate between non-hazardous liquid waste and potential or known hazardous liquid waste.
- Instruct employees, subcontractors, and suppliers that it is unacceptable for any liquid waste to enter any storm drainage device, waterway, or receiving water.
- Educate employees and subcontractors on liquid waste generating activities and liquid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Verify which non-stormwater discharges are permitted by the statewide NPDES permit; different regions might have different requirements not outlined in this permit.
- Apply NS-8, Vehicle and Equipment Cleaning for managing wash water and rinse water from vehicle and equipment cleaning operations.

Containing Liquid Wastes

- Drilling residue and drilling fluids should not be allowed to enter storm drains and watercourses and should be disposed of.
- If an appropriate location is available, drilling residue and drilling fluids that are exempt under Title 23, CCR § 2511(g) may be dried by infiltration and evaporation in a containment facility constructed in conformance with the provisions concerning the Temporary Concrete Washout Facilities detailed in WM-8, Concrete Waste Management.
- Liquid wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud, should be contained and not allowed to flow into drainage channels or receiving waters prior to treatment.
- Liquid wastes should be contained in a controlled area such as a holding pit, sediment basin, roll-off bin, or portable tank.
- Containment devices must be structurally sound and leak free.
- Containment devices must be of sufficient quantity or volume to completely contain the liquid wastes generated.

- Precautions should be taken to avoid spills or accidental releases of contained liquid wastes. Apply the education measures and spill response procedures outlined in WM-4, Spill Prevention and Control.

- Containment areas or devices should not be located where accidental release of the contained liquid can threaten health or safety or discharge to water bodies, channels, or storm drains.

Capturing Liquid Wastes

- Capture all liquid wastes that have the potential to affect the storm drainage system (such as wash water and rinse water from cleaning walls or pavement), before they run off a surface.

- Do not allow liquid wastes to flow or discharge uncontrolled. Use temporary dikes or berms to intercept flows and direct them to a containment area or device for capture.

- Use a sediment trap (SE-3, Sediment Trap) for capturing and treating sediment laden liquid waste or capture in a containment device and allow sediment to settle.

Disposing of Liquid Wastes

- A typical method to handle liquid waste is to dewater the contained liquid waste, using procedures such as described in NS-2, Dewatering Operations, and SE-2, Sediment Basin, and dispose of resulting solids per WM-5, Solid Waste Management.

- Methods of disposal for some liquid wastes may be prescribed in Water Quality Reports, NPDES permits, Environmental Impact Reports, 401 or 404 permits, and local agency discharge permits, etc. Review the SWPPP to see if disposal methods are identified.

- Liquid wastes, such as from dredged material, may require testing and certification whether it is hazardous or not before a disposal method can be determined.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management.

- If necessary, further treat liquid wastes prior to disposal. Treatment may include, though is not limited to, sedimentation, filtration, and chemical neutralization.

Costs

Prevention costs for liquid waste management are minimal. Costs increase if cleanup or fines are involved.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Remove deposited solids in containment areas and capturing devices as needed and at the completion of the task. Dispose of any solids as described in WM-5, Solid Waste Management.
- Inspect containment areas and capturing devices and repair as needed.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Spill Prevention, Control & Cleanup SC-11

Photo Credit: Geoff Brosseau

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description

Many activities that occur at an industrial or commercial site have the potential to cause accidental or illegal spills. Preparation for accidental or illegal spills, with proper training and reporting systems implemented, can minimize the discharge of pollutants to the environment.

Spills and leaks are one of the largest contributors of stormwater pollutants. Spill prevention and control plans are applicable to any site at which hazardous materials are stored or used. An effective plan should have spill prevention and response procedures that identify potential spill areas, specify material handling procedures, describe spill response procedures, and provide spill clean-up equipment. The plan should take steps to identify and characterize potential spills, eliminate and reduce spill potential, respond to spills when they occur in an effort to prevent pollutants from entering the stormwater drainage system, and train personnel to prevent and control future spills.

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Approach

Pollution Prevention

- Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

- Develop a Spill Prevention Control and Countermeasure (SPCC) Plan. The plan should include:

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Description of the facility, owner and address, activities and chemicals present
- Facility map
- Notification and evacuation procedures
- Cleanup instructions
- Identification of responsible departments
- Identify key spill response personnel

- Recycle, reclaim, or reuse materials whenever possible. This will reduce the amount of process materials that are brought into the facility.

Suggested Protocols (including equipment needs)

Spill Prevention

- Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

- If consistent illegal dumping is observed at the facility:
  - Post "No Dumping" signs with a phone number for reporting illegal dumping and disposal. Signs should also indicate fines and penalties applicable for illegal dumping.
  - Landscaping and beautification efforts may also discourage illegal dumping.
  - Bright lighting and/or entrance barriers may also be needed to discourage illegal dumping.

- Store and contain liquid materials in such a manner that if the tank is ruptured, the contents will not discharge, flow, or be washed into the storm drainage system, surface waters, or groundwater.

- If the liquid is oil, gas, or other material that separates from and floats on water, install a spill control device (such as a tee section) in the catch basins that collects runoff from the storage tank area.

- Routine maintenance:
  - Place drip pans or absorbent materials beneath all mounted taps, and at all potential drip and spill locations during filling and unloading of tanks. Any collected liquids or soiled absorbent materials must be reused/recycled or properly disposed.
  - Store and maintain appropriate spill cleanup materials in a location known to all near the tank storage area; and ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.
  - Sweep and clean the storage area monthly if it is paved, *do not hose down the area to a storm drain.*

  - Check tanks (and any containment sumps) daily for leaks and spills. Replace tanks that are leaking, corroded, or otherwise deteriorating with tanks in good condition. Collect all spilled liquids and properly dispose of them.

- Label all containers according to their contents (e.g., solvent, gasoline).
- Label hazardous substances regarding the potential hazard (corrosive, radioactive, flammable, explosive, poisonous).
- Prominently display required labels on transported hazardous and toxic materials (per US DOT regulations).
- Identify key spill response personnel.

Spill Control and Cleanup Activities

- Follow the Spill Prevention Control and Countermeasure Plan.
- Clean up leaks and spills immediately.
- Place a stockpile of spill cleanup materials where it will be readily accessible (e.g., near storage and maintenance areas).
- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste. Physical methods for the cleanup of dry chemicals include the use of brooms, shovels, sweepers, or plows.
- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- Chemical cleanups of material can be achieved with the use of adsorbents, gels, and foams. Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.
- For larger spills, a private spill cleanup company or Hazmat team may be necessary.

Reporting

- Report spills that pose an immediate threat to human health or the environment to the Regional Water Quality Control Board.
- Federal regulations require that any oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour).
- Report spills to local agencies, such as the fire department; they can assist in cleanup.
- Establish a system for tracking incidents. The system should be designed to identify the following:

  - Types and quantities (in some cases) of wastes

  - Patterns in time of occurrence (time of day/night, month, or year)

- Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)

- Responsible parties

Training

- Educate employees about spill prevention and cleanup.

- Well-trained employees can reduce human errors that lead to accidental releases or spills:

  - The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.

  - Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.

- Employees should be educated about aboveground storage tank requirements. Employees responsible for aboveground storage tanks and liquid transfers should be thoroughly familiar with the Spill Prevention Control and Countermeasure Plan and the plan should be readily available.

- Train employees to recognize and report illegal dumping incidents.

Other Considerations (Limitations and Regulations)

- A Spill Prevention Control and Countermeasure Plan (SPCC) is required for facilities that are subject to the oil pollution regulations specified in Part 112 of Title 40 of the Code of Federal Regulations or if they have a storage capacity of 10,000 gallons or more of petroleum. (Health and Safety Code 6.67)

- State regulations also exist for storage of hazardous materials (Health & Safety Code Chapter 6.95), including the preparation of area and business plans for emergency response to the releases or threatened releases.

- Consider requiring smaller secondary containment areas (less than 200 sq. ft.) to be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.

Requirements

Costs (including capital and operation & maintenance)

- Will vary depending on the size of the facility and the necessary controls.

- Prevention of leaks and spills is inexpensive. Treatment and/or disposal of contaminated soil or water can be quite expensive.

Maintenance (including administrative and staffing)

- This BMP has no major administrative or staffing requirements. However, extra time is needed to properly handle and dispose of spills, which results in increased labor costs.

Supplemental Information

Further Detail of the BMP

Reporting

Record keeping and internal reporting represent good operating practices because they can increase the efficiency of the facility and the effectiveness of BMPs. A good record keeping system helps the facility minimize incident recurrence, correctly respond with appropriate cleanup activities, and comply with legal requirements. A record keeping and reporting system should be set up for documenting spills, leaks, and other discharges, including discharges of hazardous substances in reportable quantities. Incident records describe the quality and quantity of non-stormwater discharges to the storm sewer. These records should contain the following information:

- Date and time of the incident
- Weather conditions
- Duration of the spill/leak/discharge
- Cause of the spill/leak/discharge
- Response procedures implemented
- Persons notified
- Environmental problems associated with the spill/leak/discharge

Separate record keeping systems should be established to document housekeeping and preventive maintenance inspections, and training activities. All housekeeping and preventive maintenance inspections should be documented. Inspection documentation should contain the following information:

- The date and time the inspection was performed
- Name of the inspector
- Items inspected
- Problems noted
- Corrective action required
- Date corrective action was taken

Other means to document and record inspection results are field notes, timed and dated photographs, videotapes, and drawings and maps.

Aboveground Tank Leak and Spill Control

Accidental releases of materials from aboveground liquid storage tanks present the potential for contaminating stormwater with many different pollutants. Materials spilled, leaked, or lost from

tanks may accumulate in soils or on impervious surfaces and be carried away by stormwater runoff.

The most common causes of unintentional releases are:

- Installation problems
- Failure of piping systems (pipes, pumps, flanges, couplings, hoses, and valves)
- External corrosion and structural failure
- Spills and overfills due to operator error
- Leaks during pumping of liquids or gases from truck or rail car to a storage tank or vice versa

Storage of reactive, ignitable, or flammable liquids should comply with the Uniform Fire Code and the National Electric Code. Practices listed below should be employed to enhance the code requirements:

- Tanks should be placed in a designated area.
- Tanks located in areas where firearms are discharged should be encapsulated in concrete or the equivalent.
- Designated areas should be impervious and paved with Portland cement concrete, free of cracks and gaps, in order to contain leaks and spills.
- Liquid materials should be stored in UL approved double walled tanks or surrounded by a curb or dike to provide the volume to contain 10 percent of the volume of all of the containers or 110 percent of the volume of the largest container, whichever is greater. The area inside the curb should slope to a drain.
- For used oil or dangerous waste, a dead-end sump should be installed in the drain.
- All other liquids should be drained to the sanitary sewer if available. The drain must have a positive control such as a lock, valve, or plug to prevent release of contaminated liquids.
- Accumulated stormwater in petroleum storage areas should be passed through an oil/water separator.

Maintenance is critical to preventing leaks and spills. Conduct routine inspections and:

- Check for external corrosion and structural failure.
- Check for spills and overfills due to operator error.
- Check for failure of piping system (pipes, pumps, flanger, coupling, hoses, and valves).
- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.

- Visually inspect new tank or container installation for loose fittings, poor welding, and improper or poorly fitted gaskets.
- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.
- Frequently relocate accumulated stormwater during the wet season.
- Periodically conduct integrity testing by a qualified professional.

Vehicle Leak and Spill Control

Major spills on roadways and other public areas are generally handled by highly trained Hazmat teams from local fire departments or environmental health departments. The measures listed below pertain to leaks and smaller spills at vehicle maintenance shops.

In addition to implementing the spill prevention, control, and clean up practices above, use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- Perform all vehicle fluid removal or changing inside or under cover to prevent the run-on of stormwater and the runoff of spills.
- Regularly inspect vehicles and equipment for leaks, and repair immediately.
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Immediately drain all fluids from wrecked vehicles.
- Store wrecked vehicles or damaged equipment under cover.
- Place drip pans or absorbent materials under heavy equipment when not in use.
- Use adsorbent materials on small spills rather than hosing down the spill.
- Remove the adsorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- Oil filters disposed of in trashcans or dumpsters can leak oil and contaminate stormwater. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.

- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- Design the fueling area to prevent the run-on of stormwater and the runoff of spills:
  - Cover fueling area if possible.
  - Use a perimeter drain or slope pavement inward with drainage to a sump.
  - Pave fueling area with concrete rather than asphalt.
- If dead-end sump is not used to collect spills, install an oil/water separator.
- Install vapor recovery nozzles to help control drips as well as air pollution.
- Discourage "topping-off' of fuel tanks.
- Use secondary containment when transferring fuel from the tank truck to the fuel tank.
- Use adsorbent materials on small spills and general cleaning rather than hosing down the area. Remove the adsorbent materials promptly.
- Carry out all Federal and State requirements regarding underground storage tanks, or install above ground tanks.
- Do not use mobile fueling of mobile industrial equipment around the facility; rather, transport the equipment to designated fueling areas.
- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Train employees in proper fueling and cleanup procedures.

Industrial Spill Prevention Response

For the purposes of developing a spill prevention and response program to meet the stormwater regulations, facility managers should use information provided in this fact sheet and the spill prevention/response portions of the fact sheets in this handbook, for specific activities. The program should:

- Integrate with existing emergency response/hazardous materials programs (e.g., Fire Department)
- Develop procedures to prevent/mitigate spills to storm drain systems
- Identify responsible departments
- Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures
- Address spills at municipal facilities, as well as public areas

- Provide training concerning spill prevention, response and cleanup to all appropriate personnel

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Stormwater Managers Resource Center http://www.stormwatercenter.net/

APPENDIX I: BMP INSPECTION FORM

BMP INSPECTION REPORT

Date and Time of Inspection:	Date Report Written:

Inspection Type: (Circle one)	Weekly *Complete Parts I,II,III and VII*	Pre-Storm *Complete Parts I,II,III,IV and VII*	During Rain Event *Complete Parts I, II, III, V, and VII*	Post-Storm *Complete Parts I,II,III,VI and VII*

Part I. General Information

Site Information

Construction Site Name: **Butte Regional Transit Operations Center**

Construction stage and completed activities:			Approximate area of site that is exposed:
Photos Taken: (Circle one)	Yes	No	Photo Reference IDs:

Weather

Estimate storm beginning: (date and time)	Estimate storm duration: (hours)
Estimate time since last storm: (days or hours)	Rain gauge reading and location: (in)

Is a "Qualifying Event" predicted or did one occur (i.e., 0.5" rain with 48-hrs or greater between events)? (Y/N)
If yes, summarize forecast:

Exemption Documentation (explanation required if inspection could not be conducted). Visual inspections are not required outside of business hours or during dangerous weather conditions such as flooding or electrical storms.

Inspector Information

Inspector Name:	Inspector Title:
Signature:	Date:

Part II. BMP Observations. Describe deficiencies in Part III.			
Minimum BMPs for Risk Level _____ Sites	Failures or other short comings (yes, no, N/A)	Action Required (yes/no)	Action Implemented (Date)
Good Housekeeping for Construction Materials			
Inventory of products (excluding materials designed to be outdoors)			
Stockpiled construction materials not actively in use are covered and bermed			
All chemicals are stored in watertight containers with appropriate secondary containment, or in a completely enclosed storage shed			
Construction materials are minimally exposed to precipitation			
BMPs preventing the off-site tracking of materials are implemented and properly effective			
Good Housekeeping for Waste Management			
Wash/rinse water and materials are prevented from being disposed into the storm drain system			
Portable toilets are contained to prevent discharges of waste			
Sanitation facilities are clean and with no apparent for leaks and spills			
Equipment is in place to cover waste disposal containers at the end of business day and during rain events			
Discharges from waste disposal containers are prevented from discharging to the storm drain system / receiving water			
Stockpiled waste material is securely protected from wind and rain if not actively in use			
Procedures are in place for addressing hazardous and non-hazardous spills			
Appropriate spill response personnel are assigned and trained			
Equipment and materials for cleanup of spills is available onsite			
Washout areas (e.g., concrete) are contained appropriately to prevent discharge or infiltration into the underlying soil			
Good Housekeeping for Vehicle Storage and Maintenance			
Measures are in place to prevent oil, grease, or fuel from leaking into the ground, storm drains, or surface waters			
All equipment or vehicles are fueled, maintained, and stored in a designated area with appropriate BMPs			
Vehicle and equipment leaks are cleaned immediately and disposed of properly			

Part II. BMP Observations Continued. Describe deficiencies in Part III.			
Minimum BMPs for Risk Level _____ Sites	Adequately designed, implemented and effective (yes, no, N/A)	Action Required (yes/no)	Action Implemented (Date)
Good Housekeeping for Landscape Materials			
Stockpiled landscape materials such as mulches and topsoil are contained and covered when not actively in use			
Erodible landscape material has not been applied 2 days before a forecasted rain event or during an event			
Erodible landscape materials are applied at quantities and rates in accordance with manufacturer recommendations			
Bagged erodible landscape materials are stored on pallets and covered			
Good Housekeeping for Air Deposition of Site Materials			
Good housekeeping measures are implemented onsite to control the air deposition of site materials and from site operations			
Non-Stormwater Management			
Non-Stormwater discharges are properly controlled			
Vehicles are washed in a manner to prevent non-stormwater discharges to surface waters or drainage systems			
Streets are cleaned in a manner to prevent unauthorized non-stormwater discharges to surface waters or drainage systems.			
Erosion Controls			
Wind erosion controls are effectively implemented			
Effective soil cover is provided for disturbed areas inactive (i.e., not scheduled to be disturbed for 14 days) as well as finished slopes, open space, utility backfill, and completed lots			
The use of plastic materials is limited in cases when a more sustainable, environmentally friendly alternative exists.			
Sediment Controls			
Perimeter controls are established and effective at controlling erosion and sediment discharges from the site			
Entrances and exits are stabilized to control erosion and sediment discharges from the site			
Sediment basins are properly maintained			
Linear sediment control along toe of slope, face of slope an at grade breaks (Risk Level 2 & 3 Only)			
Limit construction activity to and from site to entrances and exits that employ effective controls to prevent offsite tracking (Risk Level 2 & 3 Only)			

Ensure all storm, drain inlets and perimeter controls, runoff control BMPs and pollutants controls at entrances and exits are maintained and protected from activities the reduce their effectiveness (Risk Level 2 & 3 Only)			
Inspect all immediate access roads daily (Risk Level 2 & 3 Only)			
Run-On and Run-Off Controls			
Run-on to the site is effectively managed and directed away from all disturbed areas.			
Other			
Are the project SWPPP and BMP plan up to date, available on-site and being properly implemented?			

Part III. Descriptions of BMP Deficiencies

Deficiency	**Repairs Implemented: Note - Repairs must begin within 72 hours of identification and, complete repairs as soon as possible.**	
	Start Date	**Action**
1.		
2.		
3.		
4.		

Part IV. Additional Pre-Storm Observations. Note the presence or absence of floating and suspended materials, sheen, discoloration, turbidity, odors, and source(s) of pollutants(s).

	Yes, No, N/A
Do stormwater storage and containment areas have adequate freeboard? If no, complete Part III.	
Are drainage areas free of spills, leaks, or uncontrolled pollutant sources? If no, complete Part VII and describe below.	
Notes:	
Are stormwater storage and containment areas free of leaks? If no, complete Parts III and/or VII and describe below.	

Notes:	

Part V. Additional During Storm Observations. **If BMPs cannot be inspected during inclement weather, list the results of visual inspections at all relevant outfalls, discharge points, and downstream locations. Note odors or visible sheen on the surface of discharges. Complete Part VII (Corrective Actions) as needed.**	
Outfall, Discharge Point, or Other Downstream Location	
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description

Part VI. Additional Post-Storm Observations. **Visually observe (inspect) stormwater discharges at all discharge locations within two business days (48 hours) after each qualifying rain event, and observe (inspect) the discharge of stored or contained stormwater that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Complete Part VII (Corrective Actions) as needed.**	
Discharge Location, Storage or Containment Area	**Visual Observation**

Part VII. Additional Corrective Actions Required. **Identify additional corrective actions not included with BMP Deficiencies (Part III) above. Note if SWPPP change is required.**	
Required Actions	**Implementation Date**

Date	
Inspector Name	

As appropriate add supplemental inspection information here and attach to inspection report.

BCAG	***WDID: XXXXX***	***Risk Level 2***

Visual Inspection Field Log Sheet						
Inspection Date & Time:			Inspector Name:			
Inspection Type:	☐ Weekly	☐ Before predicted rain	☐ During rain event	☐ Following qualifying rain event	☐ Contained stormwater release	☐ Quarterly non-stormwater

Site Information	
Construction stage and completed activities:	Approximate area of exposed site:

Weather and Observations			
Date Rain Predicted to Occur:		Predicted % chance of rain:	
Estimate storm beginning: _____ (date and time)	Estimate storm duration:_____ (hours)	Estimate time since last storm: _____ (days or hours)	Rain gauge reading:_ _____ (inches)

Observations: If yes identify location					
Odors	Yes ☐	No ☐	Sheen	Yes ☐	No ☐
Floating material	Yes ☐	No ☐	Discolorations	Yes ☐	No ☐
Suspended Material	Yes ☐	No ☐	Turbidity	Yes ☐	No ☐

Site Inspections	
Outfalls or BMPs Evaluated	**Deficiencies Noted**

Photos Taken:	Yes ☐	No ☐	Photo Reference IDs:

Corrective Actions Identified (note if SWPPP/REAP change is needed)

APPENDIX J: RAIN EVENT ACTION PLAN TEMPLATE

Rain Event Action Plan (REAP)
BCAG Project

Date of REAP		**WDID Number:**	**XXXXX**
Date Rain Predicted to Occur:		**Predicted % chance of rain:**	

Predicted Rain Event Triggered Actions

Below is a list of suggested actions and items to review for this project. Each active Trade should check all material storage areas, stockpiles, waste management areas, vehicle and equipment storage and maintenance, areas of active soil disturbance, and areas of active work to ensure the proper implementation of BMPs. Project-wide BMPs should be checked.

Trade or Activity	Suggested action(s) to perform / item(s) to review prior to rain event
Information & Scheduling	❑ Inform trade supervisors of predicted rain. Check scheduled activities and reschedule as needed ❑ Alert erosion/sediment control provider ❑ Coordinate access for storm water sampling with QSD if more than ½ inch rain predicted ❑ Schedule staff for extended rain inspections (including weekends & holidays) ❑ Review WPCDs and project schedule ❑ Other:
Material Storage Areas & Waste Management Areas & Contractor Yards	❑ Material under cover or in sheds (ex: treated woods, concrete, and metals) ❑ Perimeter control around stockpiles ❑ Dumpsters & recycle bins closed with drain holes plugged ❑ Sanitary stations bermed and protected from tipping ❑ Other:
General & Trade Operations	❑ Exterior operations shut down for event (e.g., no concrete pours or paving) ❑ Soil treatments (e.g: fertilizer) ceased within 24 hours of event ❑ Materials and equipment (e.g: tools) properly stored and covered ❑ Waste and debris disposed in covered dumpsters or removed from site ❑ Trenches and excavations protected ❑ Perimeter controls around disturbed areas ❑ Entry/Exit onto public roadways clear of tracking ❑ Fueling and repair areas covered and bermed ❑ Other:
BMPs	❑ Verify that BMPs are in functional condition, or that repairs were made as needed ❑ Check Erosion and Sediment Control (ESC) material stock ❑ Other:
Trackway Work	❑ Cover concrete ties if stored near any potential storm water concentration, or if adjacent to Environmentally Sensitive Area or protected water body ❑ Verify Environmental BMPs and Mitigation Measures implemented as appropriate ❑ Verify that Slope Length Limiting BMP installed appropriately
Crossing Improvements	❑ Entry/Exit onto public roadways clear of tracking ❑ Verify Environmental BMPs and Mitigation Measures implemented as appropriate

Culvert Replacement & Bridge Work	❑ Cover concrete to the maximum extent practical. Special attention near any potential storm water concentration, or if adjacent to Environmentally Sensitive Area or protected water body ❑ Verify Environmental BMPs and Mitigation Measures implemented as appropriate ❑ Stream bank and wetland protection measures in place and functional ❑ Inlet/Outlet protection in place and functional
Other / Notes / Sketches / Concerns	

Attach a printout of the weather forecast from the NOAA website to the REAP.

I certify under penalty of law that this Rain Event Action Plan (REAP) will be performed in accordance with the General Permit by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

_____Date: _____

Qualified SWPPP QSP (Use ink please)

APPENDIX K: TRAINING REPORTING FORM

Trained Contractor Personnel Log

Stormwater Management Training Log and Documentation

Project Name: Butte Regional Transit Operations Center
WDID #: xxxxxx

Stormwater Management Topic: (check as appropriate)

☐ Erosion Control ☐ Sediment Control

☐ Wind Erosion Control ☐ Tracking Control

☐ Non-Stormwater Management ☐ Waste Management and Materials Pollution Control

☐ Stormwater Sampling

Specific Training Objective: _____

Location: _____ Date: _____

Instructor: _____ Telephone: _____

Course Length (hours): _____

Attendee Roster (Attach additional forms if necessary)

Name	Company	Phone

As appropriate, add proof of external training (e.g., course completion certificates, credentials for QSP/QSD).

APPENDIX K1: Training & Certification Document

APPENDIX L: RESPONSIBLE PARTIES

Identification of QSP and QSD

Project Name: Butte Regional Transit Operations Center

WDID #: XXXXX

The following are QSPs associated with this project

Name of Personnel(1)	Company	Date
- QSP		
Steve Grupico - QSD	GHD	

(1) If additional QSPs are required on the job site add additional lines and include information here

APPENDIX M: CONTRACTORS AND SUBCONTRACTORS

Subcontractors and Material Suppliers

Project Name: Butte Regional Transit Operations Center

WDID #: _____

Name of Personnel	Project Role/Responsibility:	Company:	Address:	Phone Number (24/7):

APPENDIX N: CGP ATTACHMENT

Linda S. Adams
Secretary for
Environmental Protection

State Water Resources Control Board

Arnold Schwarzenegger
Governor

Division of Water Quality
1001 I Street • Sacramento, California 95814 • (916) 341-5455
Mailing Address: P.O. Box 100 • Sacramento, California • 95812-0100
Fax (916) 341-5463 • http://www.waterboards.ca.gov

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
GENERAL PERMIT FOR
STORM WATER DISCHARGES
ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE
ACTIVITIES

ORDER NO. 2009-0009-DWQ
NPDES NO**. CAS000002**

This Order was adopted by the State Water Resources Control Board on:	**September 2, 2009**
This Order shall become effective on:	**July 1, 2010**
This Order shall expire on:	**September 2, 2014**

IT IS HEREBY ORDERED, that this Order supersedes Order No. 99-08-DWQ except for enforcement purposes. The Discharger shall comply with the requirements in this Order to meet the provisions contained in Division 7 of the California Water Code (commencing with section 13000) and regulations adopted thereunder, and the provisions of the federal Clean Water Act and regulations and guidelines adopted thereunder.

I, Jeanine Townsend, Clerk to the Board, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the State Water Resources Control Board, on September 2, 2009.

AYE: Vice Chair Frances Spivy-Weber
Board Member Arthur G. Baggett, Jr.
Board Member Tam M. Doduc

NAY: Chairman Charles R. Hoppin

ABSENT: None

ABSTAIN: None

Jeanine Townsend
Clerk to the Board

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LIST OF APPENDICES

STATE WATER RESOURCES CONTROL BOARD
ORDER NO. 2009-0009-DWQ
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
GENERAL PERMIT NO. CAS000002

WASTE DISCHARGE REQUIREMENTS
FOR
DISCHARGES OF STORM WATER RUNOFF ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE ACTIVITIES

I. FINDINGS

A. General Findings

The State Water Resources Control Board (State Water Board) finds that:

1. The federal Clean Water Act (CWA) prohibits certain discharges of storm water containing pollutants except in compliance with a National Pollutant Discharge Elimination System (NPDES) permit (Title 33 United States Code (U.S.C.) §§ 1311 and 1342(p); also referred to as Clean Water Act (CWA) §§ 301 and 402(p)). The U.S. Environmental Protection Agency (U.S. EPA) promulgates federal regulations to implement the CWA's mandate to control pollutants in storm water runoff discharges. (Title 40 Code of Federal Regulations (C.F.R.) Parts 122, 123, and 124). The federal statutes and regulations require discharges to surface waters comprised of storm water associated with construction activity, including demolition, clearing, grading, and excavation, and other land disturbance activities (except operations that result in disturbance of less than one acre of total land area and which are not part of a larger common plan of development or sale), to obtain coverage under an NPDES permit. The NPDES permit must require implementation of Best Available Technology Economically Achievable (BAT) and Best Conventional Pollutant Control Technology (BCT) to reduce or eliminate pollutants in storm water runoff. The NPDES permit must also include additional requirements necessary to implement applicable water quality standards.

2. This General Permit authorizes discharges of storm water associated with construction activity so long as the dischargers comply with all requirements, provisions, limitations and prohibitions in the permit. In addition, this General Permit regulates the discharges of storm water associated with construction activities from all Linear Underground/Overhead Projects resulting in the disturbance of greater than or equal to one acre (Attachment A).

3. This General Permit regulates discharges of pollutants in storm water associated with construction activity (storm water discharges) to waters of the United States from construction sites that disturb one or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface.

4. This General Permit does not preempt or supersede the authority of local storm water management agencies to prohibit, restrict, or control storm water discharges to municipal separate storm sewer systems or other watercourses within their jurisdictions.

5. This action to adopt a general NPDES permit is exempt from the provisions of Chapter 3 of the California Environmental Quality Act (CEQA) (Public Resources Code Section 21100, et seq.), pursuant to Section 13389 of the California Water Code.

6. Pursuant to 40 C.F.R. § 131.12 and State Water Board Resolution No. 68-16,[1] which incorporates the requirements of § 131.12 where applicable, the State Water Board finds that discharges in compliance with this General Permit will not result in the lowering of water quality standards, and are therefore consistent with those provisions. Compliance with this General Permit will result in improvements in water quality.

7. This General Permit serves as an NPDES permit in compliance with CWA § 402 and will take effect on July 1, 2010 by the State Water Board provided the Regional Administrator of the U.S. EPA has no objection. If the U.S. EPA Regional Administrator objects to its issuance, the General Permit will not become effective until such objection is withdrawn.

8. Following adoption and upon the effective date of this General Permit, the Regional Water Quality Control Boards (Regional Water Boards) shall enforce the provisions herein.

9. Regional Water Boards establish water quality standards in Basin Plans. The State Water Board establishes water quality standards in various statewide plans, including the California Ocean Plan. U.S. EPA establishes water quality standards in the National Toxic Rule (NTR) and the California Toxic Rule (CTR).

[1] Resolution No. 68-16 generally requires that existing water quality be maintained unless degradation is justified based on specific findings.

10. This General Permit does not authorize discharges of fill or dredged material regulated by the U.S. Army Corps of Engineers under CWA § 404 and does not constitute a waiver of water quality certification under CWA § 401.

11. The primary storm water pollutant at construction sites is excess sediment. Excess sediment can cloud the water, which reduces the amount of sunlight reaching aquatic plants, clog fish gills, smother aquatic habitat and spawning areas, and impede navigation in our waterways. Sediment also transports other pollutants such as nutrients, metals, and oils and greases.

12. Construction activities can impact a construction site's runoff sediment supply and transport characteristics. These modifications, which can occur both during and after the construction phase, are a significant cause of degradation of the beneficial uses established for water bodies in California. Dischargers can avoid these effects through better construction site design and activity practices.

13. This General Permit recognizes four distinct phases of construction activities. The phases are Grading and Land Development Phase, Streets and Utilities Phase, Vertical Construction Phase, and Final Landscaping and Site Stabilization Phase. Each phase has activities that can result in different water quality effects from different water quality pollutants. This General Permit also recognizes inactive construction as a category of construction site type.

14. Compliance with any specific limits or requirements contained in this General Permit does not constitute compliance with any other applicable requirements.

15. Following public notice in accordance with State and Federal laws and regulations, the State Water Board heard and considered all comments and testimony in a public hearing on 06/03/2009. The State Water Board has prepared written responses to all significant comments.

16. Construction activities obtaining coverage under the General Permit may have multiple discharges subject to requirements that are specific to general, linear, and/or active treatment system discharge types.

17. The State Water Board may reopen the permit if the U.S. EPA adopts a final effluent limitation guideline for construction activities.

B. Activities Covered Under the General Permit

18. Any construction or demolition activity, including, but not limited to, clearing, grading, grubbing, or excavation, or any other activity that results in a land disturbance of equal to or greater than one acre.

19. Construction activity that results in land surface disturbances of less than one acre if the construction activity is part of a larger common plan of development or the sale of one or more acres of disturbed land surface.

20. Construction activity related to residential, commercial, or industrial development on lands currently used for agriculture including, but not limited to, the construction of buildings related to agriculture that are considered industrial pursuant to U.S. EPA regulations, such as dairy barns or food processing facilities.

21. Construction activity associated with Linear Underground/Overhead Utility Projects (LUPs) including, but not limited to, those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.

22. Discharges of sediment from construction activities associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities.[2]

23. Storm water discharges from dredge spoil placement that occur outside of U.S. Army Corps of Engineers jurisdiction (upland sites) and that disturb one or more acres of land surface from construction activity are covered by this General Permit. Construction sites that intend to disturb one or more acres of land within the jurisdictional boundaries of a CWA § 404 permit should contact the appropriate Regional Water Board to determine whether this permit applies to the site.

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[2] Pursuant to the Ninth Circuit Court of Appeals' decision in *NRDC v. EPA* (9th Cir. 2008) 526 F.3d 591, and subsequent denial of the U.S. EPA's petition for reconsideration in November 2008, oil and gas construction activities discharging storm water contaminated only with sediment are no longer exempt from the NPDES program.

C. Activities Not Covered Under the General Permit

24. Routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility.

25. Disturbances to land surfaces solely related to agricultural operations such as disking, harrowing, terracing and leveling, and soil preparation.

26. Discharges of storm water from areas on tribal lands; construction on tribal lands is regulated by a federal permit.

27. Construction activity and land disturbance involving discharges of storm water within the Lake Tahoe Hydrologic Unit. The Lahontan Regional Water Board has adopted its own permit to regulate storm water discharges from construction activity in the Lake Tahoe Hydrologic Unit (Regional Water Board 6SLT). Owners of construction sites in this watershed must apply for the Lahontan Regional Water Board permit rather than the statewide Construction General Permit.

28. Construction activity that disturbs less than one acre of land surface, and that is not part of a larger common plan of development or the sale of one or more acres of disturbed land surface.

29. Construction activity covered by an individual NPDES Permit for storm water discharges.

30. Discharges from small (1 to 5 acre) construction activities with an approved Rainfall Erosivity Waiver authorized by U.S. EPA Phase II regulations certifying to the State Board that small construction activity will occur only when the Rainfall Erosivity Factor is less than 5 (“R” in the Revised Universal Soil Loss Equation).

31. Landfill construction activity that is subject to the Industrial General Permit.

32. Construction activity that discharges to Combined Sewer Systems.

33. Conveyances that discharge storm water runoff combined with municipal sewage.

34. Discharges of storm water identified in CWA § 402(*l*)(2), 33 U.S.C. § 1342(*l*)(2).

35. Discharges occurring in basins that are not tributary or hydrologically connected to waters of the United States (for more information contact your Regional Water Board).

D. Obtaining and Modifying General Permit Coverage

36. This General Permit requires all dischargers to electronically file all Permit Registration Documents (PRDs), Notices of Termination (NOT), changes of information, annual reporting, and other compliance documents required by this General Permit through the State Water Board's Storm water Multi-Application and Report Tracking System (SMARTS) website.

37. Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.

38. This General Permit grants an exception from the Risk Determination requirements for existing sites covered under Water Quality Orders No. 99-08-DWQ, and No. 2003-0007-DWQ. For certain sites, adding additional requirements may not be cost effective. Construction sites covered under Water Quality Order No. 99-08-DWQ shall obtain permit coverage at the Risk Level 1. LUPs covered under Water Quality Order No. 2003-0007-DWQ shall obtain permit coverage as a Type 1 LUP. The Regional Water Boards have the authority to require Risk Determination to be performed on sites currently covered under Water Quality Orders No. 99-08-DWQ and No. 2003-0007-DWQ where they deem it necessary. The State Water Board finds that there are two circumstances when it may be appropriate for the Regional Water Boards to require a discharger that had filed an NOI under State Water Board Order No. 99-08-DWQ to recalculate the site's risk level. These circumstances are: (1) when the discharger has a demonstrated history of noncompliance with State Water Board Order No. 99-08-DWQ or; (2) when the discharger's site poses a significant risk of causing or contributing to an exceedance of a water quality standard without the implementation of the additional Risk Level 2 or 3 requirements.

E. Prohibitions

39. All discharges are prohibited except for the storm water and non-storm water discharges specifically authorized by this General Permit or another NPDES permit. Non-storm water discharges include a wide variety of sources, including improper dumping, spills, or leakage from storage tanks or transfer areas. Non-storm water discharges may

contribute significant pollutant loads to receiving waters. Measures to control spills, leakage, and dumping, and to prevent illicit connections during construction must be addressed through structural as well as non-structural Best Management Practices (BMPs)[3]. The State Water Board recognizes, however, that certain non-storm water discharges may be necessary for the completion of construction.

40. This General Permit prohibits all discharges which contain a hazardous substance in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

41. This General Permit incorporates discharge prohibitions contained in water quality control plans, as implemented by the State Water Board and the nine Regional Water Boards.

42. Pursuant to the Ocean Plan, discharges to Areas of Special Biological Significance (ASBS) are prohibited unless covered by an exception that the State Water Board has approved.

43. This General Permit prohibits the discharge of any debris[4] from construction sites. Plastic and other trash materials can cause negative impacts to receiving water beneficial uses. The State Water Board encourages the use of more environmentally safe, biodegradable materials on construction sites to minimize the potential risk to water quality.

F. Training

44. In order to improve compliance with and to maintain consistent enforcement of this General Permit, all dischargers are required to appoint two positions - the Qualified SWPPP Developer (QSD) and the Qualified SWPPP Practitioner (QSP) - who must obtain appropriate training. Together with the key stakeholders, the State and Regional Water Boards are leading the development of this curriculum through a collaborative organization called The Construction General Permit (CGP) Training Team.

45. The Professional Engineers Act (Bus. & Prof. Code section 6700, et seq.) requires that all engineering work must be performed by a California licensed engineer.

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[3] BMPs are scheduling of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the United States. BMPs also include treatment requirements, operating procedures, and practice to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

[4] Litter, rubble, discarded refuse, and remains of destroyed inorganic anthropogenic waste.

G. Determining and Reducing Risk

46. The risk of accelerated erosion and sedimentation from wind and water depends on a number of factors, including proximity to receiving water bodies, climate, topography, and soil type.

47. This General Permit requires dischargers to assess the risk level of a site based on both sediment transport and receiving water risk. This General Permit contains requirements for Risk Levels 1, 2 and 3, and LUP Risk Type 1, 2, and 3 (Attachment A). Risk levels are established by determining two factors: first, calculating the site's sediment risk; and second, receiving water risk during periods of soil exposure (i.e. grading and site stabilization). Both factors are used to determine the site-specific Risk Level(s). LUPs can be determined to be Type 1 based on the flowchart in Attachment A.1.

48. Although this General Permit does not mandate specific setback distances, dischargers are encouraged to set back their construction activities from streams and wetlands whenever feasible to reduce the risk of impacting water quality (e.g., natural stream stability and habitat function). Because there is a reduced risk to receiving waters when setbacks are used, this General Permit gives credit to setbacks in the risk determination and post-construction storm water performance standards. The risk calculation and runoff reduction mechanisms in this General Permit are expected to facilitate compliance with any Regional Water Board and local agency setback requirements, and to encourage voluntary setbacks wherever practicable.

49. Rain events can occur at any time of the year in California. Therefore, a Rain Event Action Plan (REAP) is necessary for Risk Level 2 and 3 traditional construction projects (LUPs exempt) to ensure that active construction sites have adequate erosion and sediment controls implemented prior to the onset of a storm event, even if construction is planned only during the dry season.

50. Soil particles smaller than 0.02 millimeters (mm) (i.e., finer than medium silt) do not settle easily using conventional measures for sediment control (i.e., sediment basins). Given their long settling time, dislodging these soils results in a significant risk that fine particles will be released into surface waters and cause unacceptable downstream impacts. If operated correctly, an Active Treatment System (ATS[5]) can prevent or reduce the release of fine particles from construction sites.

[5] An ATS is a treatment system that employs chemical coagulation, chemical flocculation, or electro coagulation in order to reduce turbidity caused by fine suspended sediment.

Use of an ATS can effectively reduce a site's risk of impacting receiving waters.

51. Dischargers located in a watershed area where a Total Maximum Daily Load (TMDL) has been adopted or approved by the Regional Water Board or U.S. EPA may be required by a separate Regional Water Board action to implement additional BMPs, conduct additional monitoring activities, and/or comply with an applicable waste load allocation and implementation schedule. Such dischargers may also be required to obtain an individual Regional Water Board permit specific to the area.

H. Effluent Standards

52. The State Water Board convened a blue ribbon panel of storm water experts that submitted a report entitled, “The Feasibility of Numeric Effluent Limits Applicable to Discharges of Storm Water Associated with Municipal, Industrial and Construction Activities,” dated June 19, 2006. The panel concluded that numeric limits or action levels are technically feasible to control construction storm water discharges, provided that certain conditions are considered. The panel also concluded that numeric effluent limitations (NELs) are feasible for discharges from construction sites that utilize an ATS. The State Water Board has incorporated the expert panel’s suggestions into this General Permit, which includes both numeric action levels (NALs) and NELs for pH and turbidity, and special numeric limits for ATS discharges.

Numeric Effluent Limitations

53. Discharges of storm water from construction activities may become contaminated from alkaline construction materials resulting in high pH (greater than pH 7). Alkaline construction materials include, but are not limited to, hydrated lime, concrete, mortar, cement kiln dust (CKD), Portland cement treated base (CTB), fly ash, recycled concrete, and masonry work. This General Permit includes an NEL for pH (6.0-9.0) that applies only at sites that exhibit a "high risk of high pH discharge." A "high risk of high pH discharge" can occur during the complete utilities phase, the complete vertical build phase, and any portion of any phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations to the background pH of any discharges.

54. For Risk Level 3 discharges, this General Permit establishes technology-based, numeric effluent limitations (NELs) for turbidity of 500 NTU. Exceedances of the turbidity NEL constitutes a violation of this General Permit.

55. This General Permit establishes a 5 year, 24 hour (expressed in inches of rainfall) Compliance Storm Event exemption from the technology-based NELs for Risk Level 3 dischargers.

Determining Compliance with Numeric Limitations

56. This General Permit sets a pH NAL of 6.5 to 8.5, and a turbidity NAL of 250 NTU. The purpose of the NAL and its associated monitoring requirement is to provide operational information regarding the performance of the measures used at the site to minimize the discharge of pollutants and to protect beneficial uses and receiving waters from the adverse effects of construction-related storm water discharges. The NALs in this General Permit for pH and turbidity are not directly enforceable and do not constitute NELs.

57. This General Permit requires dischargers with NAL exceedances to immediately implement additional BMPs and revise their Storm Water Pollution Prevention Plans (SWPPPs) accordingly to either prevent pollutants and authorized non-storm water discharges from contaminating storm water, or to substantially reduce the pollutants to levels consistently below the NALs. NAL exceedances are reported in the State Water Boards SMARTS system, and the discharger is required to provide an NAL Exceedance Report when requested by a Regional Water Board.

58. If run-on is caused by a forest fire or any other natural disaster, then NELs do not apply.

59. Exceedances of the NELs are a violation of this Permit. This General Permit requires dischargers with NEL exceedances to implement additional monitoring, BMPs, and revise their SWPPPs accordingly. Dischargers are required to notify the State and Regional Water Boards of the violation through the State Water Boards SMARTs system, and provide an NEL Violation Report sharing additional information concerning the NEL exceedance.

I. Receiving Water Limitations

60. This General Permit requires all enrolled dischargers to determine the receiving waters potentially affected by their discharges and to comply with all applicable water quality standards, including any more stringent standards applicable to a water body.

J. Sampling, Monitoring, Reporting and Record Keeping

61. Visual monitoring of storm water and non-storm water discharges is required for all sites subject to this General Permit.

62. Records of all visual monitoring inspections are required to remain on-site during the construction period and for a minimum of three years.

63. For all Risk Level 3 and Risk Level 2 sites, this General Permit requires effluent monitoring for pH and turbidity. Sampling, analysis and monitoring requirements for effluent monitoring for pH and turbidity are contained in this General Permit.

64. Risk Level 3 sites in violation of the Numeric Effluent Limitations contained in this General Permit and with direct discharges to receiving water are required to conduct receiving water monitoring.

65. For Risk Level 3 sites larger than 30 acres and with direct discharges to receiving waters, this General Permit requires bioassessment sampling before and after site completion to determine if significant degradation to the receiving water's biota has occurred. Bioassessment sampling guidelines are contained in this General Permit.

66. A summary and evaluation of the sampling and analysis results will be submitted in the Annual Reports.

67. This General Permit contains sampling, analysis and monitoring requirements for non-visible pollutants at all sites subject to this General Permit.

68. Compliance with the General Permit relies upon dischargers to electronically self-report any discharge violations and to comply with any Regional Water Board enforcement actions.

69. This General Permit requires that all dischargers maintain a paper or electronic copy of all required records for three years from the date generated or date submitted, whichever is last. These records must be available at the construction site until construction is completed. For LUPs, these documents may be retained in a crew member's vehicle and made available upon request.

K. Active Treatment System (ATS) Requirements

70. Active treatment systems add chemicals to facilitate flocculation, coagulation and filtration of suspended sediment particles. The uncontrolled release of these chemicals to the environment can negatively affect the beneficial uses of receiving waters and/or degrade water quality (e.g., acute and chronic toxicity). Additionally, the batch storage and treatment of storm water through an ATS' can potentially

cause physical impacts on receiving waters if storage volume is inadequate or due to sudden releases of the ATS batches and improperly designed outfalls.

71. If designed, operated and maintained properly an ATS can achieve very high removal rates of suspended sediment (measured as turbidity), albeit at sometimes significantly higher costs than traditional erosion/sediment control practices. As a result, this General Permit establishes NELs consistent with the expected level of typical ATS performance.

72. This General Permit requires discharges of storm water associated with construction activity that undergo active treatment to comply with special operational and effluent limitations to ensure that these discharges do not adversely affect the beneficial uses of the receiving waters or cause degradation of their water quality.

73. For ATS discharges, this General Permit establishes technology-based NELs for turbidity.

74. This General Permit establishes a 10 year, 24 hour (expressed in inches of rainfall) Compliance Storm Event exemption from the technology-based numeric effluent limitations for ATS discharges. Exceedances of the ATS turbidity NEL constitutes a violation of this General Permit.

L. Post-Construction Requirements

75. This General Permit includes performance standards for post-construction that are consistent with State Water Board Resolution No. 2005-0006, "Resolution Adopting the Concept of Sustainability as a Core Value for State Water Board Programs and Directing Its Incorporation," and 2008-0030, “Requiring Sustainable Water Resources Management.“ The requirement for all construction sites to match pre-project hydrology will help ensure that the physical and biological integrity of aquatic ecosystems are sustained. This “runoff reduction” approach is analogous in principle to Low Impact Development (LID) and will serve to protect related watersheds and waterbodies from both hydrologic-based and pollution impacts associated with the post-construction landscape.

76. LUP projects are not subject to post-construction requirements due to the nature of their construction to return project sites to pre-construction conditions.

M. Storm Water Pollution Prevention Plan Requirements

77. This General Permit requires the development of a site-specific SWPPP. The SWPPP must include the information needed to demonstrate compliance with all requirements of this General Permit, and must be kept on the construction site and be available for review. The discharger shall ensure that a QSD develops the SWPPP.

78. To ensure proper site oversight, this General Permit requires a Qualified SWPPP Practitioner to oversee implementation of the BMPs required to comply with this General Permit.

N. Regional Water Board Authorities

79. Regional Water Boards are responsible for implementation and enforcement of this General Permit. A general approach to permitting is not always suitable for every construction site and environmental circumstances. Therefore, this General Permit recognizes that Regional Water Boards must have some flexibility and authority to alter, approve, exempt, or rescind permit authority granted under this General Permit in order to protect the beneficial uses of our receiving waters and prevent degradation of water quality.

IT IS HEREBY ORDERED that all dischargers subject to this General Permit shall comply with the following conditions and requirements (including all conditions and requirements as set forth in Attachments A, B, C, D, E and F)[6]:

II. CONDITIONS FOR PERMIT COVERAGE

A. Linear Underground/Overhead Projects (LUPs)

1. Linear Underground/Overhead Projects (LUPs) include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water and wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g. telephone, telegraph, radio or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to, (a) those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment, and associated ancillary facilities); and include, but are not limited to, (b) underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/ or pavement repair or replacement, and stockpile/borrow locations.

2. The utility company, municipality, or other public or private company or agency that owns or operates the linear underground/overhead project is responsible for obtaining coverage under the General Permit where the construction of pipelines, utility lines, fiber-optic cables, or other linear underground/overhead projects will occur across several properties unless the LUP construction activities are covered under another construction storm water permit.

3. Only LUPs shall comply with the conditions and requirements in Attachment A, A.1 & A.2 of this Order. The balance of this Order is not applicable to LUPs except as indicated in Attachment A.

B. Obtaining Permit Coverage Traditional Construction Sites

[6] These attachments are part of the General Permit itself and are not separate documents that are capable of being updated independently by the State Water Board.

1. The Legally Responsible Person (LRP) (see Special Provisions, Electronic Signature and Certification Requirements, Section IV.I.1) must obtain coverage under this General Permit.

2. To obtain coverage, the LRP must electronically file Permit Registration Documents (PRDs) prior to the commencement of construction activity. Failure to obtain coverage under this General Permit for storm water discharges to waters of the United States is a violation of the CWA and the California Water Code.

3. PRDs shall consist of:

   a. Notice of Intent (NOI)
   b. Risk Assessment (Section VIII)
   c. Site Map
   d. Storm Water Pollution Prevention Plan (Section XIV)
   e. Annual Fee
   f. Signed Certification Statement

   Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.

   Attachment B contains additional PRD information. Dischargers must electronically file the PRDs, and mail the appropriate annual fee to the State Water Board.

4. This permit is effective on July 1, 2010.

   a. **Dischargers Obtaining Coverage On or After July 1, 2010:** All dischargers requiring coverage on or after July 1, 2010, shall electronically file their PRDs prior to the commencement of construction activities, and mail the appropriate annual fee no later than seven days prior to the commencement of construction activities. Permit coverage shall not commence until the PRDs and the annual fee are received by the State Water Board, and a WDID number is assigned and sent by SMARTS.

   b. **Dischargers Covered Under 99-08-DWQ and 2003-0007-DWQ:** Existing dischargers subject to State Water Board Order No. 99-08-DWQ (existing dischargers) will continue coverage under 99-08-DWQ until July 1, 2010. After July 1, 2010, all NOIs subject to State Water Board Order No. 99-08-DWQ will be terminated. Existing dischargers shall electronically file their PRDs no later than

July 1, 2010. If an existing discharger's site acreage subject to the annual fee has changed, it shall mail a revised annual fee no less than seven days after receiving the revised annual fee notification, **or else lose permit coverage**. All existing dischargers shall be exempt from the risk determination requirements in Section VIII of this General Permit until two years after permit adoption. All existing dischargers are therefore subject to Risk Level 1 requirements regardless of their site's sediment and receiving water risks. However, a Regional Board retains the authority to require an existing discharger to comply with the Section VIII risk determination requirements.

5. The discharger is only considered covered by this General Permit upon receipt of a Waste Discharger Identification (WDID) number assigned and sent by the State Water Board Storm water Multi-Application and Report Tracking System (SMARTS). In order to demonstrate compliance with this General Permit, the discharger must obtain a WDID number and must present documentation of a valid WDID upon demand.

6. During the period this permit is subject to review by the U.S. EPA, the prior permit (State Water Board Order No. 99-08-DWQ) remains in effect. Existing dischargers under the prior permit will continue to have coverage under State Water Board Order No. 99-08-DWQ until this General Permit takes effect on July 1, 2010. Dischargers who complete their projects and electronically file an NOT prior to July 1, 2010, are not required to obtain coverage under this General Permit.

7. Small Construction Rainfall Erosivity Waiver

   EPA's Small Construction Erosivity Waiver applies to sites between one and five acres demonstrating that there are no adverse water quality impacts.

   Dischargers eligible for a Rainfall Erosivity Waiver based on low erosivity potential shall complete the electronic Notice of Intent (NOI) and Sediment Risk form through the State Water Board's SMARTS system, certifying that the construction activity will take place during a period when the value of the rainfall erosivity factor is less than five. Where the LRP changes or another LRP is added during construction, the new LRP must also submit a waiver certification through the SMARTS system.

   If a small construction site continues beyond the projected completion date given on the waiver certification, the LRP shall recalculate the rainfall erosivity factor for the new project duration and submit this

information through the SMARTS system. If the new R factor is below five (5), the discharger shall update through SMARTS all applicable information on the waiver certification and retain a copy of the revised waiver onsite. The LRP shall submit the new waiver certification 30 days prior to the projected completion date listed on the original waiver form to assure exemption from permitting requirements is uninterrupted. If the new R factor is five (5) or above, the LRP shall be required to apply for coverage under this Order.

8. In the case of a public emergency that requires immediate construction activities, a discharger shall submit a brief description of the emergency construction activity within five days of the onset of construction, and then shall submit all PRDs within thirty days.

C. Revising Permit Coverage for Change of Acreage or New Ownership

1. The discharger may reduce or increase the total acreage covered under this General Permit when a portion of the site is complete and/or conditions for termination of coverage have been met (See Section II.D Conditions for Termination of Coverage); when ownership of a portion of the site is sold to a different entity; or when new acreage, subject to this General Permit, is added to the site.

2. Within 30 days of a reduction or increase in total disturbed acreage, the discharger shall electronically file revisions to the PRDs that include:

    a. A revised NOI indicating the new project size;

    b. A revised site map showing the acreage of the site completed, acreage currently under construction, acreage sold/transferred or added, and acreage currently stabilized in accordance with the Conditions for Termination of Coverage in Section II.D below.

    c. SWPPP revisions, as appropriate; and

    d. Certification that any new landowners have been notified of applicable requirements to obtain General Permit coverage. The certification shall include the name, address, telephone number, and e-mail address of the new landowner.

    e. If the project acreage has increased, dischargers shall mail payment of revised annual fees within 14 days of receiving the revised annual fee notification.

3. The discharger shall continue coverage under the General Permit for any parcel that has not achieved "Final Stabilization" as defined in Section II.D.

4. When an LRP owns property with active General Permit coverage, and the LRP sells the property, or a parcel thereof, to another person, that person shall become an LRP with respect to whatever parcel was sold. The existing LRP shall inform the new LRP of the General Permit's requirements. In order for the new LRP to continue the construction activity on its parcel of property, the new LRP, or the new LRP's approved signatory, must submit PRDs in accordance with this General Permit's requirements.

D. Conditions for Termination of Coverage

1. Within 90 days of when construction is complete or ownership has been transferred, the discharger shall electronically file a Notice of Termination (NOT), a final site map, and photos through the State Water Boards SMARTS system. Filing a NOT certifies that all General Permit requirements have been met. The Regional Water Board will consider a construction site complete only when all portions of the site have been transferred to a new owner, or all of the following conditions have been met:

    a. For purposes of "final stabilization," the site will not pose any additional sediment discharge risk than it did prior to the commencement of construction activity;

    b. There is no potential for construction-related storm water pollutants to be discharged into site runoff;

    c. Final stabilization has been reached;

    d. Construction materials and wastes have been disposed of properly;

    e. Compliance with the Post-Construction Standards in Section XIII of this General Permit has been demonstrated;

    f. Post-construction storm water management measures have been installed and a long-term maintenance plan[7] has been established; and

[7] For the purposes of this requirement a long-term maintenance plan will be designed for a minimum of five years, and will describe the procedures to ensure that the post-construction storm water management measures are adequately maintained.

g. All construction-related equipment, materials and any temporary BMPs no longer needed are removed from the site.

2. The discharger shall certify that final stabilization conditions are satisfied in their NOT. Failure to certify shall result in continuation of permit coverage and annual billing.

3. The NOT must demonstrate through photos, RUSLE or RUSLE2, or results of testing and analysis that the site meets all of the conditions above (Section II.D.1) and the final stabilization condition (Section II.D.1.a) is attained by one of the following methods:

   a. "70% final cover method," no computational proof required

      OR:

   b. "RUSLE or RUSLE2 method," computational proof required

      OR:

   c. "Custom method", the discharger shall demonstrate in some other manner than a or b, above, that the site complies with the "final stabilization" requirement in Section II.D.1.a.

III. DISCHARGE PROHIBITIONS

A. Dischargers shall not violate any discharge prohibitions contained in applicable Basin Plans or statewide water quality control plans. Waste discharges to Areas of Special Biological Significance (ASBS) are prohibited by the California Ocean Plan, unless granted an exception issued by the State Water Board.

B. All discharges are prohibited except for the storm water and non-storm water discharges specifically authorized by this General Permit or another NPDES permit.

C. Authorized non-storm water discharges may include those from de-chlorinated potable water sources such as: fire hydrant flushing, irrigation of vegetative erosion control measures, pipe flushing and testing, water to control dust, uncontaminated ground water from dewatering, and other discharges not subject to a separate general NPDES permit adopted by a Regional Water Board. The discharge of non-storm water is authorized under the following conditions:

1. The discharge does not cause or contribute to a violation of any water quality standard;

2. The discharge does not violate any other provision of this General Permit;

3. The discharge is not prohibited by the applicable Basin Plan;

4. The discharger has included and implemented specific BMPs required by this General Permit to prevent or reduce the contact of the non-storm water discharge with construction materials or equipment.

5. The discharge does not contain toxic constituents in toxic amounts or (other) significant quantities of pollutants;

6. The discharge is monitored and meets the applicable NALs and NELs; and

7. The discharger reports the sampling information in the Annual Report.

If any of the above conditions are not satisfied, the discharge is not authorized by this General Permit. The discharger shall notify the Regional Water Board of any anticipated non-storm water discharges not already authorized by this General Permit or another NPDES permit, to determine whether a separate NPDES permit is necessary.

D. Debris resulting from construction activities are prohibited from being discharged from construction sites.

E. When soil contamination is found or suspected and a responsible party is not identified, or the responsible party fails to promptly take the appropriate action, the discharger shall have those soils sampled and tested to ensure proper handling and public safety measures are implemented. The discharger shall notify the appropriate local, State, and federal agency(ies) when contaminated soil is found at a construction site, and will notify the appropriate Regional Water Board.

IV. SPECIAL PROVISIONS

A. Duty to Comply

1. The discharger shall comply with all of the conditions of this General Permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA) and the Porter-Cologne Water Quality Control Act and is grounds for enforcement action and/or removal from General Permit coverage.

2. The discharger shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if this General Permit has not yet been modified to incorporate the requirement.

B. General Permit Actions

1. This General Permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the discharger for a General Permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not annul any General Permit condition.

2. If any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under Section 307(a) of the CWA for a toxic pollutant which is present in the discharge and that standard or prohibition is more stringent than any limitation on the pollutant in this General Permit, this General Permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition and the dischargers so notified.

C. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this General Permit.

D. Duty to Mitigate

The discharger shall take all responsible steps to minimize or prevent any discharge in violation of this General Permit, which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance

The discharger shall at all times properly operate and maintain any facilities and systems of treatment and control (and related appurtenances) which are installed or used by the discharger to achieve compliance with the conditions of this General Permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance may require the operation of backup or auxiliary facilities or similar systems installed by a discharger when necessary to achieve compliance with the conditions of this General Permit.

F. Property Rights

This General Permit does not convey any property rights of any sort or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor does it authorize any infringement of Federal, State, or local laws or regulations.

G. Duty to Maintain Records and Provide Information

1. The discharger shall maintain a paper or electronic copy of all required records, including a copy of this General Permit, for three years from the date generated or date submitted, whichever is last. These records shall be available at the construction site until construction is completed.

2. The discharger shall furnish the Regional Water Board, State Water Board, or U.S. EPA, within a reasonable time, any requested information to determine compliance with this General Permit. The discharger shall also furnish, upon request, copies of records that are required to be kept by this General Permit.

H. Inspection and Entry

The discharger shall allow the Regional Water Board, State Water Board, U.S. EPA, and/or, in the case of construction sites which discharge through a municipal separate storm sewer, an authorized representative of the municipal operator of the separate storm sewer system receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the discharger's premises at reasonable times where a regulated construction activity is being conducted or where records must be kept under the conditions of this General Permit;

2. Access and copy at reasonable times any records that must be kept under the conditions of this General Permit;

3. Inspect at reasonable times the complete construction site, including any off-site staging areas or material storage areas, and the erosion/sediment controls; and

4. Sample or monitor at reasonable times for the purpose of ensuring General Permit compliance.

I. Electronic Signature and Certification Requirements

1. All Permit Registration Documents (PRDs) and Notice of Terminations (NOTs) shall be electronically signed, certified, and submitted via SMARTS to the State Water Board. Either the Legally Responsible Person (LRP) or a person legally authorized to sign and certify PRDs and NOTs on behalf of the LRP (the LRP's Approved Signatory) must submit all information electronically via SMARTS.

    a. The LRP's Approved Signatory must be one of the following:

        i. For a corporation: a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (a) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or (b) the manager of the facility if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

        ii. For a partnership or sole proprietorship: a general partner or the proprietor, respectively;

        iii. For a municipality, State, Federal, or other public agency: either a principal executive officer or ranking elected official. The principal executive officer of a Federal agency includes the chief executive officer of the agency or the senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of U.S. EPA);

        iv. For the military: Any military officer who has been designated.

        v. For a public university: An authorized university official

b. Changes to Authorization. If an approved signatory's authorization is no longer accurate, a new authorization satisfying the requirements of paragraph (a) of this section must be submitted via SMARTS prior to or together with any reports, information or applications to be signed by an approved signatory.

2. All Annual Reports, or other information required by the General Permit (other than PRDs and NOTs) or requested by the Regional Water Board, State Water Board, U.S. EPA, or local storm water management agency shall be certified and submitted by the LRP or the LRP's approved signatory as described above.

J. Certification

Any person signing documents under Section IV.I above, shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

K. Anticipated Noncompliance

The discharger shall give advance notice to the Regional Water Board and local storm water management agency of any planned changes in the construction activity, which may result in noncompliance with General Permit requirements.

L. Bypass

Bypass[8] is prohibited. The Regional Water Board may take enforcement action against the discharger for bypass unless:

1. Bypass was unavoidable to prevent loss of life, personal injury or severe property damage;[9]

[8] The intentional diversion of waste streams from any portion of a treatment facility

[9] Severe property damage means substantial physical damage to property, damage to the treatment facilities that causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

2. There were no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated waste, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that could occur during normal periods of equipment downtime or preventative maintenance;

3. The discharger submitted a notice at least ten days in advance of the need for a bypass to the Regional Water Board; or

4. The discharger may allow a bypass to occur that does not cause effluent limitations to be exceeded, but only if it is for essential maintenance to assure efficient operation. In such a case, the above bypass conditions are not applicable. The discharger shall submit notice of an unanticipated bypass as required.

M. Upset

1. A discharger that wishes to establish the affirmative defense of an upset[10] in an action brought for noncompliance shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

   a. An upset occurred and that the discharger can identify the cause(s) of the upset

   b. The treatment facility was being properly operated by the time of the upset

   c. The discharger submitted notice of the upset as required; and

   d. The discharger complied with any remedial measures required

2. No determination made before an action of noncompliance occurs, such as during administrative review of claims that noncompliance was caused by an upset, is final administrative action subject to judicial review.

3. In any enforcement proceeding, the discharger seeking to establish the occurrence of an upset has the burden of proof

[10] An exceptional incident in which there is unintentional and temporary noncompliance the technology based numeric effluent limitations because of factors beyond the reasonable control of the discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

N. Penalties for Falsification of Reports

Section 309(c)(4) of the CWA provides that any person who knowingly makes any false material statement, representation, or certification in any record or other document submitted or required to be maintained under this General Permit, including reports of compliance or noncompliance shall upon conviction, be punished by a fine of not more than $10,000 or by imprisonment for not more than two years or by both.

O. Oil and Hazardous Substance Liability

Nothing in this General Permit shall be construed to preclude the institution of any legal action or relieve the discharger from any responsibilities, liabilities, or penalties to which the discharger is or may be subject to under Section 311 of the CWA.

P. Severability

The provisions of this General Permit are severable; and, if any provision of this General Permit or the application of any provision of this General Permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this General Permit shall not be affected thereby.

Q. Reopener Clause

This General Permit may be modified, revoked and reissued, or terminated for cause due to promulgation of amended regulations, receipt of U.S. EPA guidance concerning regulated activities, judicial decision, or in accordance with 40 Code of Federal Regulations (CFR) 122.62, 122.63, 122.64, and 124.5.

R. Penalties for Violations of Permit Conditions

1. Section 309 of the CWA provides significant penalties for any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any such section in a permit issued under Section 402. Any person who violates any permit condition of this General Permit is subject to a civil penalty not to exceed $37,500[11] per calendar day of such violation, as well as any other appropriate sanction provided by Section 309 of the CWA.

[11] May be further adjusted in accordance with the Federal Civil Penalties Inflation Adjustment Act.

2. The Porter-Cologne Water Quality Control Act also provides for civil and criminal penalties, which in some cases are greater than those under the CWA.

S. Transfers

This General Permit is not transferable.

T. Continuation of Expired Permit

This General Permit continues in force and effect until a new General Permit is issued or the SWRCB rescinds this General Permit. Only those dischargers authorized to discharge under the expiring General Permit are covered by the continued General Permit.

V. EFFLUENT STANDARDS

A. Narrative Effluent Limitations

1. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

2. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

B. Numeric Effluent Limitations (NELs)

Table 1- Numeric Effluent Limitations, Numeric Action Levels, Test Methods, Detection Limits, and Reporting Units

Parameter	Test Method	Discharge Type	Min. Detection Limit	Units	Numeric Action Level	Numeric Effluent Limitation
pH	Field test with calibrated portable instrument	Risk Level 2	0.2	pH units	lower NAL = 6.5 upper NAL = 8.5	N/A
		Risk Level 3			lower NAL = 6.5 upper NAL = 8.5	lower NEL = 6.0 upper NEL = 9.0
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	Risk Level 2	1	NTU	250 NTU	N/A
		Risk Level 3			250 NTU	500 NTU

1. Numeric Effluent Limitations (NELs):

   a. **Storm Event, Daily Average pH Limits –** For Risk Level 3 dischargers, the pH of storm water and non-storm water discharges

shall be within the ranges specified in Table 1 during any site phase where there is a "high risk of pH discharge."[12]

b. **Storm Event Daily Average Turbidity Limit –** For Risk Level 3 dischargers, the turbidity of storm water and non-storm water discharges shall not exceed 500 NTU.

2. If daily average sampling results are outside the range of pH NELs (i.e., is below the lower NEL for pH or exceeds the upper NEL for pH) or exceeds the turbidity NEL (as listed in Table 1), the discharger is in violation of this General Permit and shall electronically file monitoring results in violation within 5 business days of obtaining the results.

3. **Compliance Storm Event**:

   Discharges of storm water from Risk Level 3 sites shall comply with applicable NELs (above) unless the storm event causing the discharges is determined after the fact to be equal to or larger than the Compliance Storm Event (expressed in inches of rainfall). The Compliance Storm Event for Risk Level 3 discharges is the 5 year, 24 hour storm (expressed in tenths of an inch of rainfall), as determined by using these maps:

   http://www.wrcc.dri.edu/pcpnfreq/nca5y24.gif
   http://www.wrcc.dri.edu/pcpnfreq/sca5y24.gif

   Compliance storm event verification shall be done by reporting on-site rain gauge readings as well as nearby governmental rain gauge readings.

4. Dischargers shall not be required to comply with NELs if the site receives run-on from a forest fire or any other natural disaster.

C. Numeric Action Levels (NALs)

1. For Risk Level 2 and 3 dischargers, the lower storm event average NAL for pH is 6.5 pH units and the upper storm event average NAL for pH is 8.5 pH units. The discharger shall take actions as described below if the discharge is outside of this range of pH values.

[12] A period of high risk of pH discharge is defined as a project's complete utilities phase, complete vertical build phase, and any portion of any phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations of the background pH of the discharges.

2. For Risk Level 2 and 3 dischargers, the NAL storm event daily average for turbidity is 250 NTU. The discharger shall take actions as described below if the discharge is outside of this range of turbidity values.

3. Whenever the results from a storm event daily average indicate that the discharge is below the lower NAL for pH, exceeds the upper NAL for pH, or exceeds the turbidity NAL (as listed in Table 1), the discharger shall conduct a construction site and run-on evaluation to determine whether pollutant source(s) associated with the site's construction activity may have caused or contributed to the NAL exceedance and shall immediately implement corrective actions if they are needed.

4. The site evaluation shall be documented in the SWPPP and specifically address whether the source(s) of the pollutants causing the exceedance of the NAL:

    a. Are related to the construction activities and whether additional BMPs are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) determine what corrective action(s) were taken or will be taken and with a description of the schedule for completion.

        AND/OR:

    b. Are related to the run-on associated with the construction site location and whether additional BMPs measures are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) what corrective action(s) were taken or will be taken with a description of the schedule for completion.

VI. RECEIVING WATER LIMITATIONS

A. The discharger shall ensure that storm water discharges and authorized non-storm water discharges to any surface or ground water will not adversely affect human health or the environment.

B. The discharger shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants in quantities that threaten to cause pollution or a public nuisance.

C. The discharger shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants that cause or contribute to an exceedance of any applicable water quality objectives or water quality standards (collectively, WQS) contained in a Statewide Water Quality Control Plan, the California Toxics Rule, the National Toxics Rule, or the applicable Regional Water Board's Water Quality Control Plan (Basin Plan).

D. Dischargers located within the watershed of a CWA § 303(d) impaired water body, for which a TMDL has been approved by the U.S. EPA, shall comply with the approved TMDL if it identifies "construction activity" or land disturbance as a source of the pollution.

VII. TRAINING QUALIFICATIONS AND CERTIFICATION REQUIREMENTS

A. General

The discharger shall ensure that all persons responsible for implementing requirements of this General Permit shall be appropriately trained in accordance with this Section. Training should be both formal and informal, occur on an ongoing basis, and should include training offered by recognized governmental agencies or professional organizations. Those responsible for preparing and amending SWPPPs shall comply with the requirements in this Section VII.

The discharger shall provide documentation of all training for persons responsible for implementing the requirements of this General Permit in the Annual Reports.

B. SWPPP Certification Requirements

1. **Qualified SWPPP Developer:** The discharger shall ensure that SWPPPs are written, amended and certified by a Qualified SWPPP Developer (QSD). A QSD shall have one of the following registrations or certifications, and appropriate experience, as required for:

   a. A California registered professional civil engineer;

   b. A California registered professional geologist or engineering geologist;

   c. A California registered landscape architect;

   d. A professional hydrologist registered through the American Institute of Hydrology;

   e. A Certified Professional in Erosion and Sediment Control (CPESC) ™ registered through Enviro Cert International, Inc.;

   f. A Certified Professional in Storm Water Quality (CPSWQ) ™ registered through Enviro Cert International, Inc.; or

   g. A professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies (NICET);

Effective two years after the adoption date of this General Permit, a QSD shall have attended a State Water Board-sponsored or approved QSD training course.

2. The discharger shall list the name and telephone number of the currently designated Qualified SWPPP Developer(s) in the SWPPP.

3. **Qualified SWPPP Practitioner:** The discharger shall ensure that all BMPs required by this General Permit are implemented by a Qualified SWPPP Practitioner (QSP). A QSP is a person responsible for non-storm water and storm water visual observations, sampling and analysis. Effective two years from the date of adoption of this General Permit, a QSP shall be either a QSD or have one of the following certifications:

   a. A certified erosion, sediment and storm water inspector registered through Enviro Cert International, Inc.; or

   b. A certified inspector of sediment and erosion control registered through Certified Inspector of Sediment and Erosion Control, Inc.

   Effective two years after the adoption date of this General Permit, a QSP shall have attended a State Water Board-sponsored or approved QSP training course.

4. The LRP shall list in the SWPPP, the name of any Approved Signatory, and provide a copy of the written agreement or other mechanism that provides this authority from the LRP in the SWPPP.

5. The discharger shall include, in the SWPPP, a list of names of all contractors, subcontractors, and individuals who will be directed by the Qualified SWPPP Practitioner. This list shall include telephone numbers and work addresses. Specific areas of responsibility of each subcontractor and emergency contact numbers shall also be included.

6. The discharger shall ensure that the SWPPP and each amendment will be signed by the Qualified SWPPP Developer. The discharger shall include a listing of the date of initial preparation and the date of each amendment in the SWPPP.

VIII. RISK DETERMINATION

The discharger shall calculate the site's sediment risk and receiving water risk during periods of soil exposure (i.e. grading and site stabilization) and use the calculated risks to determine a Risk Level(s) using the methodology in

Appendix 1. For any site that spans two or more planning watersheds,[13] the discharger shall calculate a separate Risk Level for each planning watershed. The discharger shall notify the State Water Board of the site's Risk Level determination(s) and shall include this determination as a part of submitting the PRDs. If a discharger ends up with more than one Risk Level determination, the Regional Water Board may choose to break the project into separate levels of implementation.

IX. RISK LEVEL 1 REQUIREMENTS

Risk Level 1 Dischargers shall comply with the requirements included in Attachment C of this General Permit.

X. RISK LEVEL 2 REQUIREMENTS

Risk Level 2 Dischargers shall comply with the requirements included in Attachment D of this General Permit.

XI. RISK LEVEL 3 REQUIREMENTS

Risk Level 3 Dischargers shall comply with the requirements included in Attachment E of this General Permit.

XII. ACTIVE TREATMENT SYSTEMS (ATS)

Dischargers choosing to implement an ATS on their site shall comply with all of the requirements in Attachment F of this General Permit.

[13] Planning watershed: defined by the Calwater Watershed documents as a watershed that ranges in size from approximately 3,000 to 10,000 acres http://cain.ice.ucdavis.edu/calwater/calwfaq.html, http://gis.ca.gov/catalog/BrowseRecord.epl?id=22175 .

XIII. POST-CONSTRUCTION STANDARDS

A. All dischargers shall comply with the following runoff reduction requirements unless they are located within an area subject to post-construction standards of an active Phase I or II municipal separate storm sewer system (MS4) permit that has an approved Storm Water Management Plan.

1. This provision shall take effect three years from the adoption date of this permit, or later at the discretion of the Executive Officer of the Regional Board.

2. The discharger shall demonstrate compliance with the requirements of this section by submitting with their NOI a map and worksheets in accordance with the instructions in Appendix 2. The discharger shall use non-structural controls unless the discharger demonstrates that non-structural controls are infeasible or that structural controls will produce greater reduction in water quality impacts.

3. The discharger shall, through the use of non-structural and structural measures as described in Appendix 2, replicate the pre-project water balance (for this permit, defined as the volume of rainfall that ends up as runoff) for the smallest storms up to the 85th percentile storm event (or the smallest storm event that generates runoff, whichever is larger). Dischargers shall inform Regional Water Board staff at least 30 days prior to the use of any structural control measure used to comply with this requirement. Volume that cannot be addressed using non-structural practices shall be captured in structural practices and approved by the Regional Water Board. When seeking Regional Board approval for the use of structural practices, dischargers shall document the infeasibility of using non-structural practices on the project site, or document that there will be fewer water quality impacts through the use of structural practices.

4. For sites whose disturbed area exceeds two acres, the discharger shall preserve the pre-construction drainage density (miles of stream length per square mile of drainage area) for all drainage areas within the area serving a first order stream[14] or larger stream and ensure that post-project time of runoff concentration is equal or greater than pre-project time of concentration.

[14] A first order stream is defined as a stream with no tributaries.

B. All dischargers shall implement BMPs to reduce pollutants in storm water discharges that are reasonably foreseeable after all construction phases have been completed at the site (Post-construction BMPs).

XIV. SWPPP REQUIREMENTS

A. The discharger shall ensure that the Storm Water Pollution Prevention Plans (SWPPPs) for all traditional project sites are developed and amended or revised by a QSD. The SWPPP shall be designed to address the following objectives:

1. All pollutants and their sources, including sources of sediment associated with construction, construction site erosion and all other activities associated with construction activity are controlled;

2. Where not otherwise required to be under a Regional Water Board permit, all non-storm water discharges are identified and either eliminated, controlled, or treated;

3. Site BMPs are effective and result in the reduction or elimination of pollutants in storm water discharges and authorized non-storm water discharges from construction activity to the BAT/BCT standard;

4. Calculations and design details as well as BMP controls for site run-on are complete and correct, and

5. Stabilization BMPs installed to reduce or eliminate pollutants after construction are completed.

B. To demonstrate compliance with requirements of this General Permit, the QSD shall include information in the SWPPP that supports the conclusions, selections, use, and maintenance of BMPs.

C. The discharger shall make the SWPPP available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone.

XV. REGIONAL WATER BOARD AUTHORITIES

A. In the case where the Regional Water Board does not agree with the discharger's self-reported risk level (e.g., they determine themselves to be a Level 1 Risk when they are actually a Level 2 Risk site), Regional Water Boards may either direct the discharger to reevaluate the Risk Level(s) for their site or terminate coverage under this General Permit.

B. Regional Water Boards may terminate coverage under this General Permit for dischargers who fail to comply with its requirements or where they determine that an individual NPDES permit is appropriate.

C. Regional Water Boards may require dischargers to submit a Report of Waste Discharge / NPDES permit application for Regional Water Board consideration of individual requirements.

D. Regional Water Boards may require additional Monitoring and Reporting Program Requirements, including sampling and analysis of discharges to sediment-impaired water bodies.

E. Regional Water Boards may require dischargers to retain records for more than the three years required by this General Permit.

XVI. ANNUAL REPORTING REQUIREMENTS

A. All dischargers shall prepare and electronically submit an Annual Report no later than September 1 of each year.

B. The discharger shall certify each Annual Report in accordance with the Special Provisions.

C. The discharger shall retain an electronic or paper copy of each Annual Report for a minimum of three years after the date the annual report is filed.

D. The discharger shall include storm water monitoring information in the Annual Report consisting of:

1. a summary and evaluation of all sampling and analysis results, including copies of laboratory reports;

2. the analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit");

3. a summary of all corrective actions taken during the compliance year;

4. identification of any compliance activities or corrective actions that were not implemented;

5. a summary of all violations of the General Permit;

6. the names of individual(s) who performed the facility inspections, sampling, visual observation (inspections), and/or measurements;

7. the date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation (rain gauge); and

8. the visual observation and sample collection exception records and reports specified in Attachments C, D, and E.

E. The discharger shall provide training information in the Annual Report consisting of:

1. documentation of all training for individuals responsible for all activities associated with compliance with this General Permit;

2. documentation of all training for individuals responsible for BMP installation, inspection, maintenance, and repair; and

3. documentation of all training for individuals responsible for overseeing, revising, and amending the SWPPP.

ATTACHMENT B
PERMIT REGISTRATION DOCUMENTS (PRDs) TO COMPLY WITH THE TERMS OF THE GENERAL PERMIT TO DISCHARGE STORM WATER ASSOCIATED WITH CONSTRUCTION ACTIVITY

GENERAL INSTRUCTIONS

A. All Linear Construction Projects shall comply with the PRD requirements in Attachment A.2 of this Order.

B. Who Must Submit

Discharges of storm water associated with construction that results in the disturbance of one acre or more of land must apply for coverage under the General Construction Storm Water Permit (General Permit). Any construction activity that is a part of a larger common plan of development or sale must also be permitted, regardless of size. (For example, if 0.5 acre of a 20-acre subdivision is disturbed by the construction activities of discharger A and the remaining 19.5 acres is to be developed by discharger B, discharger A must obtain a General Storm Water Permit for the 0.5 acre project).

Other discharges from construction activities that are covered under this General Permit can be found in the General Permit Section II.B.

It is the LRP's responsibility to obtain coverage under this General Permit by electronically submitting complete PRDs (Permit Registration Documents).

In all cases, the proper procedures for submitting the PRDs must be completed before construction can commence.

C. Construction Activity Not Covered By This General Permit

Discharges from construction that are not covered under this General Permit can be found in the General Permit Sections II.A &B..

D. Annual Fees and Fee Calculation

Annual fees are calculated based upon the total area of land to be disturbed not the total size of the acreage owned. However, the calculation includes all acres to be disturbed during the duration of the project. For example, if 10 acres are scheduled to be disturbed the first year and 10 in each subsequent year for 5 years, the annual fees would be based upon 50 acres of disturbance. The State Water Board will evaluate adding acreage to an existing Permit Waste Discharge Identification (WDID) number on a case-by-case basis. In general, any acreage to be considered must be contiguous to the permitted land area and the existing

SWPPP must be appropriate for the construction activity and topography of the acreage under consideration. As acreage is built out and stabilized or sold, the Change of Information (COI) form enables the applicant to remove those acres from inclusion in the annual fee calculation. Checks should be made payable to: State Water Board.

The Annual fees are established through regulations adopted by the State Water Board. The total annual fee is the current base fee plus applicable surcharges for all construction sites submitting an NOI, based on the total acreage to be disturbed during the life of the project. Annual fees are subject to change by regulation.

Dischargers that apply for and satisfy the Small Construction Erosivity Wavier requirements shall pay a fee of $200.00 plus an applicable surcharge, see the General Permit Section II.B.7.

E. When to Apply

LRP's proposing to conduct construction activities subject to this General Permit must submit their PRDs prior to the commencement of construction activity.

F. Requirements for Completing Permit Registration Documents (PRDs)

All dischargers required to comply with this General Permit shall electronically submit the required PRDs for their type of construction as defined below.

G. Standard PRD Requirements (All Dischargers)

1. Notice of Intent
2. Risk Assessment (Standard or Site-Specific)
3. Site Map
4. SWPPP
5. Annual Fee
6. Certification

H. Additional PRD Requirements Related to Construction Type

1. Discharger in unincorporated areas of the State (not covered under an adopted Phase I or II SUSMP requirements) and that are not a linear project shall also submit a completed:
   a. Post-Construction Water Balance Calculator (Appendix 2).

2. Dischargers who are proposing to implement ATS shall submit:
   a. Complete ATS Plan in accordance with Attachment F at least 14 days prior to the planned operation of the ATS and a paper copy shall be available onsite during ATS operation.

b. Certification proof that design done by a professional in accordance with Attachment F.

3. Dischargers who are proposing an alternate Risk Justification:
   a. Particle Size Analysis.

I. Exceptions to Standard PRD Requirements

Construction sites with an R value less than 5 as determined in the Risk Assessment are not required to submit a SWPPP.

J. Description of PRDs

1. Notice of Intent (NOI)

2. Site Map(s) Includes:
   a. The project's surrounding area (vicinity)
   b. Site layout
   c. Construction site boundaries
   d. Drainage areas
   e. Discharge locations
   f. Sampling locations
   g. Areas of soil disturbance (temporary or permanent)
   h. Active areas of soil disturbance (cut or fill)
   i. Locations of all runoff BMPs
   j. Locations of all erosion control BMPs
   k. Locations of all sediment control BMPs
   l. ATS location (if applicable)
   m. Locations of sensitive habitats, watercourses, or other features which are not to be disturbed
   n. Locations of all post-construction BMPs
   o. Locations of storage areas for waste, vehicles, service, loading/unloading of materials, access (entrance/exits) points to construction site, fueling, and water storage, water transfer for dust control and compaction practices

3. **SWPPPs**
   A site-specific SWPPP shall be developed by each discharger and shall be submitted with the PRDs.

4. **Risk Assessment**
   All dischargers shall use the Risk Assessment procedure as describe in the General Permit Appendix 1.

   a. The Standard Risk Assessment includes utilization of the following:
      i. Receiving water Risk Assessment interactive map

ii. EPA Rainfall Erosivity Factor Calculator Website
iii. Sediment Risk interactive map
iv. Sediment sensitive water bodies list

b. The Site-Specific Risk Assessment includes the completion of the hand calculated R value Risk Calculator

5. **Post-Construction Water Balance Calculator**
All dischargers subject to this requirement shall complete the Water Balance Calculator (in Appendix 2) in accordance with the instructions.

6. **ATS Design Document and Certification**
All dischargers using ATS must submit electronically their system design (as well as any supporting documentation) and proof that the system was designed by a qualified ATS design professional (See Attachment F).

To obtain coverage under the General Permit PRDs must be included and completed. If any of the required items are missing, the PRD submittal is considered incomplete and will be rejected. Upon receipt of a complete PRD submittal, the State Water Board will process the application package in the order received and assign a (WDID) number.

Questions?

If you have any questions on completing the PRDs please email stormwater@waterboards.ca.gov or call (866) 563-3107.

ATTACHMENT D
RISK LEVEL 2 REQUIREMENTS

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

1. Narrative – Risk Level 2 dischargers shall comply with the narrative effluent standards listed below:

   a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

   b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

2. Numeric – Risk level 2 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU.

B. Good Site Management "Housekeeping"

1. Risk Level 2 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 2 dischargers shall implement the following good housekeeping measures:

   a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

   b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.

2. Risk Level 2 dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:

a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

d. Cover waste disposal containers at the end of every business day and during a rain event.

e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.

g. Implement procedures that effectively address hazardous and non-hazardous spills.

h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require:

i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly.

ii. Appropriate spill response personnel are assigned and trained.

i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

3. Risk Level 2 dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:

   a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.

   b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.

   c. Clean leaks immediately and disposing of leaked materials properly.

4. Risk Level 2 dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:

   a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

   b. Contain all fertilizers and other landscape materials when they are not actively being used.

   c. Discontinue the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.

   d. Apply erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

   e. Stack erodible landscape material on pallets and covering or storing such materials when not being used or applied.

5. Risk Level 2 dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify

all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 2 dischargers shall do the following:

a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

d. Ensure retention of sampling, visual observation, and inspection records.

e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

6. Risk Level 2 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.

7. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall document all housekeeping BMPs in the SWPPP and REAP(s) in accordance with the nature and phase of the construction project. Construction phases at traditional land development projects include Grading and Land Development Phase, Streets and Utilities, or Vertical Construction for traditional land development projects.

C. Non-Storm Water Management

1. Risk Level 2 dischargers shall implement measures to control all non-storm water discharges during construction.

2. Risk Level 2 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

3. Risk Level 2 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

D. Erosion Control

1. Risk Level 2 dischargers shall implement effective wind erosion control.

2. Risk Level 2 dischargers shall provide effective soil cover for inactive[1] areas and all finished slopes, open space, utility backfill, and completed lots.

3. Risk Level 2 dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 2 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.

2. On sites where sediment basins are to be used, Risk Level 2 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.

3. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall implement appropriate erosion control BMPs (runoff control and soil stabilization) in conjunction with sediment control BMPs for areas under active[2] construction.

4. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths[3] in accordance with Table 1.

Table 1 - Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet flow length not

[1] Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.
[2] Active areas of construction are areas undergoing land surface disturbance. This includes construction activity during the preliminary stage, mass grading stage, streets and utilities stage and the vertical construction stage.
[3] Sheet flow length is the length that shallow, low velocity flow travels across a site.

	to exceed
0-25% 20	feet
25-50% 15	feet
Over 50%	10 feet

5. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent offsite tracking of sediment.

6. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire washoff locations) are maintained and protected from activities that reduce their effectiveness.

7. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall inspect on a daily basis all immediate access roads daily. At a minimum daily (when necessary) and prior to any rain event, the discharger shall remove any sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).

F. Run-on and Run-off Controls

Risk Level 2 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 2 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee appropriately trained to do the task(s).

2. Risk Level 2 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 2 dischargers shall begin implementing repairs or

design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.

4. For each inspection required, Risk Level 2 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.

5. Risk Level 2 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:

   a. Inspection date and date the inspection report was written.

   b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.

   c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.

   d. A description of any BMPs evaluated and any deficiencies noted.

   e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.

   f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.

   g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.

   h. Photographs taken during the inspection, if any.

   i. Inspector's name, title, and signature.

H. Rain Event Action Plan

1. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop a Rain Event Action Plan (REAP) 48 hours prior to any likely precipitation event. A likely precipitation event is any weather pattern that is forecast to have a 50% or greater probability of producing precipitation in the project area. The discharger shall

ensure a QSP obtain a printed copy of precipitation forecast information from the National Weather Service Forecast Office (e.g., by entering the zip code of the project's location at http://www.srh.noaa.gov/forecast).

2. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop the REAPs for all phases of construction (i.e., Grading and Land Development, Streets and Utilities, Vertical Construction, Final Landscaping and Site Stabilization).

3. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP ensure that the REAP include, at a minimum, the following site information:

   a. Site Address
   b. Calculated Risk Level (2 or 3)
   c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number
   d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number
   e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number

4. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP include in the REAP, at a minimum, the following project phase information:

   a. Activities associated with each construction phase
   b. Trades active on the construction site during each construction phase
   c. Trade contractor information
   d. Suggested actions for each project phase

5. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop additional REAPs for project sites where construction activities are indefinitely halted or postponed (Inactive Construction). At a minimum, Inactive Construction REAPs must include:

   a. Site Address
   b. Calculated Risk Level (2 or 3)
   c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number
   d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number
   e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number

f. Trades active on site during Inactive Construction
g. Trade contractor information
h. Suggested actions for inactive construction sites

6. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP begin implementation and make the REAP available onsite no later than 24 hours prior to the likely precipitation event.

7. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP maintain onsite a paper copy of each REAP onsite in compliance with the record retention requirements of the Special Provisions in this General Permit.

I. Risk Level 2 Monitoring and Reporting Requirements

Table 2- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
2	X	X	X	X	X	X	

1. Construction Site Monitoring Program Requirements

   a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.

   b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Program to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Programs in compliance with State Water Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.

   c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. **Objectives**

   The CSMP shall be developed and implemented to address the following objectives:

a. To demonstrate that the site is in compliance with the Discharge Prohibitions and applicable Numeric Action Levels (NALs)/Numeric Effluent Limitations (NELs) of this General Permit.

b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives.

c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges.

d. To determine whether BMPs included in the SWPPP/Rain Event Action Plan (REAP) are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

3. **Risk Level 2 – Visual Monitoring (Inspection) Requirements for Qualifying Rain Events**

a. Risk Level 2 dischargers shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.

b. Risk Level 2 dischargers shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.

c. Risk Level 2 dischargers shall conduct visual observations (inspections) during business hours only.

d. Risk Level 2 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.

e. Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 2 dischargers shall visually observe (inspect):

i. all storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.

ii. all BMPs to identify whether they have been properly implemented in accordance with the SWPPP/REAP. If needed, the discharger shall implement appropriate corrective actions.

iii. any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

f. For the visual observations (inspections) described in c.i and c.iii above, Risk Level 2 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.

g. Within two business days (48 hours) after each qualifying rain event, Risk Level 2 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.

h. Risk Level 2 dischargers shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4. **Risk Level 2 – Water Quality Sampling and Analysis**

a. Risk Level 2 dischargers shall collect storm water grab samples from sampling locations, as defined in Section I.5. The storm water grab sample(s) obtained shall be representative of the flow and characteristics of the discharge.

b. At minimum, Risk Level 2 dischargers shall collect 3 samples per day of the qualifying event.

c. Risk Level 2 dischargers shall ensure that the grab samples collected of stored or contained storm water are from discharges subsequent to a qualifying rain event (producing precipitation of ½ inch or more at the time of discharge).

<u>Storm Water Effluent Monitoring Requirements</u>

d. Risk Level 2 dischargers shall analyze their effluent samples for:

i. pH and turbidity.

ii. Any additional parameters for which monitoring is required by the Regional Water Board.

5. **Risk Level 2 – Storm Water Discharge Water Quality Sampling Locations**

Effluent Sampling Locations

a. Risk Level 2 dischargers shall perform sampling and analysis of storm water discharges to characterize discharges associated with construction activity from the entire project disturbed area.

b. Risk Level 2 dischargers shall collect effluent samples at all discharge points where storm water is discharged off-site.

c. Risk Level 2 dischargers shall ensure that storm water discharge collected and observed represent[4] the effluent in each drainage area based on visual observation of the water and upstream conditions.

d. Risk Level 2 dischargers shall monitor and report site run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs or NELs.

e. Risk Level 2 dischargers who deploy an ATS on their site, or a portion on their site, shall collect ATS effluent samples and measurements from the discharge pipe or another location representative of the nature of the discharge.

f. Risk Level 2 dischargers shall select analytical test methods from the list provided in Table 3 below.

g. All storm water sample collection preservation and handling shall be conducted in accordance with Section I.7 “Storm Water Sample Collection and Handling Instructions” below.

6. **Risk Level 2 – Visual Observation and Sample Collection Exemptions**

a. Risk Level 2 dischargers shall be prepared to collect samples and conduct visual observation (inspections) until the minimum requirements of Sections I.3 and I.4 above are completed. Risk

[4] For example, if there has been concrete work recently in an area, or drywall scrap is exposed to the rain, a pH sample shall be taken of drainage from the relevant work area. Similarly, if sediment laden water is flowing through some parts of a silt fence, samples shall be taken of the sediment-laden water even if most water flowing through the fence is clear.

Level 2 dischargers are not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

i. During dangerous weather conditions such as flooding and electrical storms.

ii. Outside of scheduled site business hours.

b. If no required samples or visual observation (inspections) are collected due to these exceptions, Risk Level 2 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the sampling or visual observation (inspections) were not conducted.

7. **Risk Level 2 – Storm Water Sample Collection and Handling Instructions**

a. Risk Level 2 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

b. Risk Level 2 dischargers shall ensure that testing laboratories will receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory), and shall use only the sample containers provided by the laboratory to collect and store samples.

c. Risk Level 2 dischargers shall designate and train personnel to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring Program's (SWAMP) 2008 Quality Assurance Program Plan (QAPrP).[5]

8. **Risk Level 2 – Monitoring Methods**

a. Risk Level 2 dischargers shall include a description of the following items in the CSMP:

i. Visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures.

ii. Sampling locations, and sample collection and handling procedures. This shall include detailed procedures for sample

[5] Additional information regarding SWAMP's QAPrP and QAMP can be found at http://www.waterboards.ca.gov/water_issues/programs/swamp/.
QAPrP:http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/swamp_qapp_master090108a.pdf.
QAMP: http://www.waterboards.ca.gov/water_issues/programs/swamp/qamp.shtml.

collection, storage, preservation, and shipping to the testing lab to assure that consistent quality control and quality assurance is maintained. Dischargers shall attach to the monitoring program an example Chain of Custody form used when handling and shipping samples.

iii. Identification of the analytical methods and related method detection limits (if applicable) for each parameter required in Section I.4 above.

b. Risk Level 2 dischargers shall ensure that all sampling and sample preservation are in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment (including a discharger's own field instruments for measuring pH and turbidity) should be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. Risk Level 2 dischargers shall ensure that all laboratory analyses are conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Board. With the exception of field analysis conducted by the discharger for turbidity and pH, all analyses should be sent to and conducted at a laboratory certified for such analyses by the State Department of Health Services. Risk Level 2 dischargers shall conduct their own field analysis of pH and may conduct their own field analysis of turbidity if the discharger has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to adequately perform the field analysis.

9. **Risk Level 2 – Analytical Methods**

a. Risk Level 2 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

b. **pH**: Risk Level 2 dischargers shall perform pH analysis on-site with a calibrated pH meter or a pH test kit. Risk Level 2 dischargers shall record pH monitoring results on paper and retain these records in accordance with Section I.14, below.

c. **Turbidity**: Risk Level 2 dischargers shall perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on-site or at an accredited lab. Acceptable test methods include Standard Method 2130 or USEPA Method 180.1. The results will be recorded in the site log book in Nephelometric Turbidity Units (NTU).

10. **Risk Level 2 - Non-Storm Water Discharge Monitoring Requirements**

    a. Visual Monitoring Requirements:

        i. Risk Level 2 dischargers shall visually observe (inspect) each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.

        ii. Risk Level 2 dischargers shall conduct one visual observation (inspection) quarterly in each of the following periods: January-March, April-June, July-September, and October-December. Visual observation (inspections) are only required during daylight hours (sunrise to sunset).

        iii. Risk Level 2 dischargers shall ensure that visual observations (inspections) document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. Risk Level 2 dischargers shall maintain on-site records indicating the personnel performing the visual observation (inspections), the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

    b. Effluent Sampling Locations:

        i. Risk Level 2 dischargers shall sample effluent at all discharge points where non-storm water and/or authorized non-storm water is discharged off-site.

        ii. Risk Level 2 dischargers shall send all non-storm water sample analyses to a laboratory certified for such analyses by the State Department of Health Services.

        iii. Risk Level 2 dischargers shall monitor and report run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs.

11. **Risk Level 2 – Non-Visible Pollutant Monitoring Requirements**

a. Risk Level 2 dischargers shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water.

b. Risk Level 2 dischargers shall ensure that water samples are large enough to characterize the site conditions.

c. Risk Level 2 dischargers shall collect samples at all discharge locations that can be safely accessed.

d. Risk Level 2 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

e. Risk Level 2 dischargers shall analyze samples for all non-visible pollutant parameters (if applicable) - parameters indicating the presence of pollutants identified in the pollutant source assessment required (Risk Level 2 dischargers shall modify their CSMPs to address these additional parameters in accordance with any updated SWPPP pollutant source assessment).

f. Risk Level 2 dischargers shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample.

g. Risk Level 2 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis.[6]

h. Risk Level 2 dischargers shall keep all field /or analytical data in the SWPPP document.

12. **Risk Level 2 – Watershed Monitoring Option**

Risk Level 2 dischargers who are part of a qualified regional watershed-based monitoring program may be eligible for relief from the requirements in Sections I.5. The Regional Water Board may approve proposals to substitute an acceptable watershed-based monitoring program by determining if the watershed-based monitoring program

[6] For laboratory analysis, all sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136. Field discharge samples shall be collected and analyzed according to the specifications of the manufacturer of the sampling devices employed.

will provide substantially similar monitoring information in evaluating discharger compliance with the requirements of this General Permit.

13. **Risk Level 2 – Particle Size Analysis for Project Risk Justification**

    Risk Level 2 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

14. **Risk Level 2 – Records**

    Risk Level 2 dischargers shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. Risk Level 2 dischargers shall retain all records on-site while construction is ongoing. These records include:

    a. The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation.

    b. The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements.

    c. The date and approximate time of analyses.

    d. The individual(s) who performed the analyses.

    e. A summary of all analytical results from the last three years, the method detection limits and reporting units, the analytical techniques or methods used, and the chain of custody forms.

    f. Rain gauge readings from site inspections;

    g. Quality assurance/quality control records and results.

    h. Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Sections I.3 and I.10 above).

    i. Visual observation and sample collection exception records (see Section I.6 above).

j. The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

15. **Risk Level 2 – NAL Exceedance Report**

a. In the event that any effluent sample exceeds an applicable NAL, Risk Level 2 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 10 days after the conclusion of the storm event. The Regional Boards have the authority to require the submittal of an NAL Exceedance Report.

b. Risk Level 2 dischargers shall certify each NAL Exceedance Report in accordance with the Special Provisions for Construction Activity.

c. Risk Level 2 dischargers shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three years after the date the annual report is filed.

d. Risk Level 2 dischargers shall include in the NAL Exceedance Report:

i. The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as “less than the method detection limit”).

ii. The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.

iii. A description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

Table 3 – Risk Level 2 Test Methods, Detection Limits, Reporting Units and Applicable NALs/NELs

Parameter	Test Method / Protocol	Discharge Type	Min. Detection Limit	Reporting Units	Numeric Action Level
pH	Field test with calibrated portable instrument	Risk Level 2 Discharges	0.2 pH	units	lower NAL = 6.5 upper NAL = 8.5
Turbidity EPA	0180.1 and/or field test with calibrated portable instrument	Risk Level 2 Discharges other than ATS	1 NTU		250 NTU
		For ATS discharges	1 NTU		N/A

Appendix A - BCAG Negative Declaration Mitigation Monitoring Measures.

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 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.

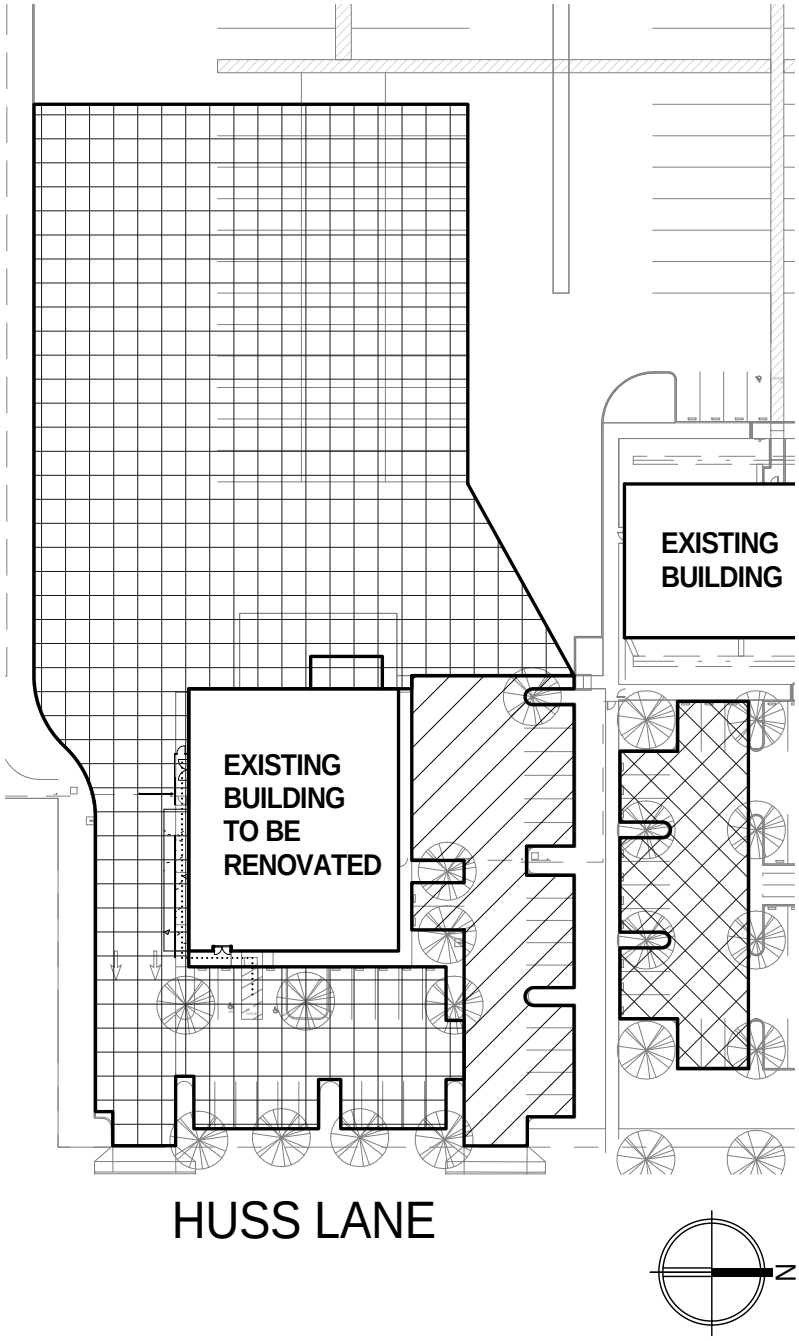
g) Inspect sediment control devices after each storm and remove sediment.

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.



LEGEND:

LAYDOWN FOR TI REMODEL CONTRACTOR MATERIAL STORAGE.

TI CONTRACTOR ACCESS TO ALLOW FOR WORK IN SAME AREA AT SAME TIME AS BROWARD IN PHASE 2. STRAIGHT PATH FOR MATERIALS FROM LAYDOWN INTO EXISTING BUILDING.

INITIAL PHASE 2 SITE WORK BY BROWARD, BEFORE THEY DO WORK IN THE CONTRACTOR ACCESS REGION. TI CONTRACTOR HAS ACCESS TO TI WORK FROM \SOUTH SIDE WHEN THIS OCCURS.

KITCHELL

Capital Expenditure Managers

2750 Gateway Oaks Drive
Sacramento, CA 95833
(916) 648-9700

Title

SITE LOGISTICS PLAN

Project No.		Scale:
5006A3	BUTTE REGIONAL TRANSIT OPERATIONS CENTER TENANT IMPROVEMENT	NTS
		Sheet: APPX. D

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 Newsum/BCAG;
Email: ANewsum@bcag.org

Jay Monnin/Kitchell;
jmonnin@kitchell.com

Kraig Wilson/Kitchell;
kwilson@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 all bid questions.

Appendix B.2 - TI Remodel Project; CV RWQCB 401 Permit.

CALIFORNIA Water Boards

EDMUND G. BROWN JR. GOVERNOR

MATTHEW RODRIQUEZ SECRETARY FOR ENVIRONMENTAL PROTECTION

Central Valley Regional Water Quality Control Board

11 September 2013

Mr. Andy Newsum
Butte County Association of Governments
2580 Sierra Sunrise Terrace, Suite 100
Chico, CA 95928

CLEAN WATER ACT §401 TECHNICALLY CONDITIONED WATER QUALITY CERTIFICATION FOR DISCHARGE OF DREDGED AND/OR FILL MATERIALS FOR THE BCAG TRANSIT FACILITY PROPERTY ACQUISITION PROJECT (WDID#5A04CR00226), CHICO, BUTTE COUNTY

ACTION:

1. ☐ Order for Standard Certification
2. ■ Order for Technically-conditioned Certification
3. ☐ Order for Denial of Certification

WATER QUALITY CERTIFICATION STANDARD CONDITIONS:

1. This certification action is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to §13330 of the California Water Code and §3867 of Title 23 of the California Code of Regulations (23 CCR).

2. This certification action is not intended and shall not be construed to apply to any discharge from any activity involving a hydroelectric facility requiring a Federal Energy Regulatory Commission (FERC) license or an amendment to a FERC license unless the pertinent certification application was filed pursuant to 23 CCR subsection 3855(b) and the application specifically identified that a FERC license or amendment to a FERC license for a hydroelectric facility was being sought.

3. The validity of any non-denial certification action shall be conditioned upon total payment of the full fee required under 23 CCR §3833, unless otherwise stated in writing by the certifying agency.

4. Certification is valid for the duration of the described project. Butte County Association of Governments shall notify the Central Valley Water Board in writing within 7 days of project completion.

ADDITIONAL TECHNICALLY CONDITIONED CERTIFICATION CONDITIONS:

In addition to the four standard conditions, Butte County Association of Governments shall satisfy the following:

1. Butte County Association of Governments shall notify the Central Valley Water Board in writing 7 days in advance of the start of any in-water activities.

2. Except for activities permitted by the U.S. Army Corps under §404 of the Clean Water Act, soil, silt, or other organic materials shall not be placed where such materials could pass into surface water or surface water drainage courses.

3. All areas disturbed by project activities shall be protected from washout or erosion.

4. Butte County Association of Governments shall maintain a copy of this Certification and supporting documentation (Project Information Sheet) at the Project site during construction for review by site personnel and agencies. All personnel (employees, contractors, and subcontractors) performing work on the proposed project shall be adequately informed and trained regarding the conditions of this Certification.

5. An effective combination of erosion and sediment control Best Management Practices (BMPs) must be implemented and adequately working during all phases of construction.

6. All temporarily affected areas will be restored to pre-construction contours and conditions upon completion of construction activities.

7. Butte County Association of Governments shall perform surface water sampling: 1) When performing any in-water work; 2) In the event that project activities result in any materials reaching surface waters or; 3) When any activities result in the creation of a visible plume in surface waters. The following monitoring shall be conducted immediately upstream out of the influence of the project and 300 feet downstream of the active work area. Sampling results shall be submitted to this office within two weeks of initiation of sampling and every two weeks thereafter. The sampling frequency may be modified for certain projects with written permission from the Central Valley Water Board.

Parameter	Unit	Type of Sample	Frequency of Sample
Turbidity	NTU	Grab	Every 4 hours during in water work
Settleable Material	ml/l	Grab	Same as above.
Visible construction related pollutants	Observations	Visible Inspections	Continuous throughout the construction period

8. Activities shall not cause turbidity increases in surface water to exceed:

   (a) where natural turbidity is less than 1 Nephelometric Turbidity Units (NTUs), controllable factors shall not cause downstream turbidity to exceed 2 NTU;
   (b) where natural turbidity is between 1 and 5 NTUs, increases shall not exceed 1 NTU;
   (c) where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20 percent;
   (d) where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs;
   (e) where natural turbidity is greater than 100 NTUs, increases shall not exceed 10 percent.

   Except that these limits will be eased during in-water working periods to allow a turbidity increase of 15 NTU over background turbidity as measured in surface waters 300 feet downstream from the working area. In determining compliance with the above limits, appropriate averaging periods may be applied provided that beneficial uses will be fully protected. Averaging periods may only be assessed by prior permission of the Central Valley Water Board.

9. Activities shall not cause settleable matter to exceed 0.1 ml/l in surface waters as measured in surface waters 300 feet downstream from the project.

10. The discharge of petroleum products or other excavated materials to surface water is prohibited. Activities shall not cause visible oil, grease, or foam in the work area or downstream. Butte County Association of Governments shall notify the Central Valley Water Board immediately of any spill of petroleum products or other organic or earthen materials.

11. Butte County Association of Governments shall notify the Central Valley Water Board immediately if the above criteria for turbidity, settleable matter, oil/grease, or foam are exceeded.

12. Butte County Association of Governments shall comply with all Department of Fish and Wildlife 1600 requirements for the project.

13. Butte County Association of Governments must obtain coverage under the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities issued by the State Water Resources Control Board for any project disturbing an area of 1 acre or greater.

14. The Conditions in this water quality certification are based on the information in the attached "Project Information." If the information in the attached Project Information is modified or the project changes, this water quality certification is no longer valid until amended by the Central Valley Water Board.

15. In the event of any violation or threatened violation of the conditions of this Order, the violation or threatened violation shall be subject to any remedies, penalties, process, or

sanctions as provided for under State law and section 401 (d) of the federal Clean Water Act. The applicability of any State law authorizing remedies, penalties, process, or sanctions for the violation or threatened violation constitutes a limitation necessary to ensure compliance into this Order.

a. If Butte County Association of Governments or a duly authorized representative of the project fails or refuses to furnish technical or monitoring reports, as required under this Order, or falsifies any information provided in the monitoring reports, the applicant is subject to civil monetary liabilities, for each day of violation, or criminal liability.

b. In response to a suspected violation of any condition of this Order, the Central Valley Water Board may require Butte County Association of Governments to furnish, under penalty of perjury, any technical or monitoring reports the Central Valley Water Board deems appropriate, provided that the burden, including cost of the reports, shall be in reasonable relationship to the need for the reports and the benefits to be obtained from the reports.

c. Butte County Association of Governments shall allow the staff(s) of the Central Valley Water Board, or an authorized representative(s), upon the presentation of credentials and other documents, as may be required by law, to enter the project premises for inspection, including taking photographs and securing copies of project-related records, for the purpose of assuring compliance with this certification and determining the ecological success of the project.

ADDITIONAL STORM WATER QUALITY CONDITIONS:

Butte County Association of Governments shall also satisfy the following additional storm water quality conditions:

1. During the construction phase, Butte County Association of Governments must employ strategies to minimize erosion and the introduction of pollutants into storm water runoff. These strategies must include the following:

   (a) the Storm Water Pollution Prevention Plan (SWPPP) must be prepared during the project planning and design phases and before construction;
   (b) an effective combination of erosion and sediment control Best Management Practices (BMPs) must be implemented and adequately working prior to the rainy season and during all phases of construction.

2. Butte County Association of Governments must minimize the short and long-term impacts on receiving water quality from the BCAG Transit Facility Property Acquisition Project by implementing the following post-construction storm water management practices:

   (a) minimize the amount of impervious surface;
   (b) reduce peak runoff flows;
   (c) provide treatment BMPs to reduce pollutants in runoff;
   (d) ensure existing waters of the State (e.g., wetlands, vernal pools, or creeks) are not used as pollutant source controls and/or treatment controls;

(e) preserve and, where possible, create or restore areas that provide important water quality benefits, such as riparian corridors, wetlands, and buffer zones;
(f) limit disturbances of natural water bodies and natural drainage systems caused by development (including development of roads, highways, and bridges);
(g) use existing drainage master plans or studies to estimate increases in pollutant loads and flows resulting from projected future development and require incorporation of structural and non-structural BMPs to mitigate the projected pollutant load increases in surface water runoff;
(h) identify and avoid development in areas that are particularly susceptible to erosion and sediment loss, or establish development guidance that protects areas from erosion/ sediment loss;
(i) control post-development peak storm water run-off discharge rates and velocities to prevent or reduce downstream erosion, and to protect stream habitat.

3. Butte County Association of Governments must ensure that all development within the project provides verification of maintenance provisions for post-construction structural and treatment control BMPs. Verification shall include one or more of the following, as applicable:

(a) the developer's signed statement accepting responsibility for maintenance until the maintenance responsibility is legally transferred to another party; or
(b) written conditions in the sales or lease agreement that require the recipient to assume responsibility for maintenance; or
(c) written text in project conditions, covenants and restrictions for residential properties assigning maintenance responsibilities to a home owner's association, or other appropriate group, for maintenance of structural and treatment control BMPs; or
(d) any other legally enforceable agreement that assigns responsibility for storm water BMP maintenance.

4. Staff of the Central Valley Water Board has prepared total maximum daily load (TMDL) allocations that, once approved, would limit methylmercury in storm water discharges to the Sacramento-San Joaquin Delta. The Central Valley Water Board has scheduled these proposed allocations to be considered for adoption. When the Central Valley Water Board adopts the TMDL and once approved by the Environmental Protection Agency, the discharge of methylmercury may be limited from the proposed project. The purpose of this condition is to provide notice to Butte County Association of Governments that methylmercury discharge limitations and monitoring requirements may apply to this project in the future and also to provide notice of the Central Valley Water Board's TMDL process and that elements of the planned construction may be subject to a TMDL allocation.

REGIONAL WATER QUALITY CONTROL BOARD CONTACT PERSON:

Scott A. Zaitz, R.E.H.S., Redding Branch Office, 364 Knollcrest Drive, Suite 205, Redding, California 96002, szaitz@waterboards.ca.gov, (530) 224-4784

WATER QUALITY CERTIFICATION:

I hereby issue an order certifying that any discharge from Butte County Association of Governments, BCAG Transit Facility Property Acquisition Project (WDID# 5A04CR00226) will comply with the applicable provisions of §301 ("Effluent Limitations"), §302 ("Water Quality Related Effluent Limitations"), §303 ("Water Quality Standards and Implementation Plans"), §306 ("National Standards of Performance"), and §307 ("Toxic and Pretreatment Effluent Standards") of the Clean Water Act. This discharge is also regulated under State Water Resources Control Board Water Quality Order No. 2003-0017 DWQ "Statewide General Waste Discharge Requirements For Dredged Or Fill Discharges That Have Received State Water Quality Certification (General WDRs)."

Except insofar as may be modified by any preceding conditions, all certification actions are contingent on (a) the discharge being limited and all proposed mitigation being completed in strict compliance with Butte County Association of Governments' project description and the attached Project Information Sheet, and (b) compliance with all applicable requirements of the Water Quality Control Plan *for the Sacramento River and San Joaquin River*, Fourth Edition, revised September 2009 (Basin Plan).

Any person aggrieved by this action may petition the State Water Quality Control Board to review the action in accordance with California Water Code § 13320 and California Code of Regulations, title 23, § 2050 and following. The State Water Quality Control Board must receive the petition by 5:00 p.m., 30 days after the date of this action, except that if the thirtieth day following the date of this action falls on a Saturday, Sunday, or state holiday, the petition must be received by the State Water Quality Control Board by 5:00 p.m. on the next business day. Copies of the law and regulations applicable to filing petitions may be found on the Internet at: http://www.waterboards.ca.gov/public_notices/petitions/water_quality or will be provided upon request.

(for) PAMELA C. CREEDON
Executive Officer

SAZ:lmw

Enclosure: Water Quality Order No. 2003-0017 DWQ

cc w/o encl: Ms. Krystel Bell, U.S. Army Corp of Engineers, Sacramento
Department of Fish and Wildlife, Region 2, Rancho Cordova
City of Chico Planning Department, Chico
U.S. Fish and Wildlife Service, Sacramento
Mr. Bill Jennings, CALSPA, Stockton

cc by email w/o encl: U.S. EPA, Region 9, San Francisco
Mr. Bill Orme, SWRCB, Certification Unit, Sacramento

PROJECT INFORMATION

Application Date: 24 July 2013

Applicant: Butte County Association of Governments, Attn: Andy Newsum

Applicant Representatives: NorthStar Engineering, Attn: Ms. Elena Gregg

Project Name: BCAG Transit Facility Property Acquisition Project

Application Number: WDID No. 5A04CR00226

U.S. Army Corps File Number: SPK-2012-01307

Type of Project: Acquiring a portion of 34 acres adjacent to the existing BCAG transit facility, located at Huss Lane.

Project Location: Section 1/2, Township 21 North, Range 1 East, MDB&M. Latitude: 39°42'25" and Longitude: -121°49'40"

County: Butte County

Receiving Water(s) (hydrologic unit): Comanche Creek, which is tributary to Sacramento River. Colusa Basin Hydrologic Unit-Butte Basin Hydrologic Area No. 520.40

Water Body Type: Streambed

Designated Beneficial Uses: The Basin Plan for the Central Valley Water Board has designated beneficial uses for surface and ground waters within the region. Beneficial uses that could be impacted by the project include: Agricultural Supply (AGR); Groundwater Recharge, Water Contact Recreation (REC-1); Warm Freshwater Habitat (WARM); Cold Freshwater Habitat (COLD); Cold Migration of Aquatic Organisms (MIGR); Warm Spawning, Reproduction, and /or Early Development (SPWN); and Wildlife Habitat (WILD).

Project Description (purpose/goal): The BCAG Transit Facility Property Acquisition Project consists of the acquisition of a portion of the 34-acre parcel that is immediately adjacent to the existing BCAG transit facility, located on Huss Lane and the creation of an approximately 10-acre parcel that is contiguous with the existing transit facility site. Due to storm drainage constraints within the area, the future expansion of the existing BCAG facility will require the installation of a new 48 inch diameter storm drain pipe and outfall. From the BCAG expansion area, the pipe will traverse annual grassland along an approximately 1,943 linear foot alignment to Comanche Creek. The storm water outfall will occur along Comanche Creek and will require impacts to the bank of Comanche Creek within the ordinary high water mark of the creek. The outfall will result in the cut of 60 cubic yards of material for the outfall installation. The native material will be backfilled, however, a total of 20 cubic yards of vegetated rip-rap (minimum ¼ ton size) will be placed surrounding the outfall along the bank. The vegetated rip-rap will directly impact ta 30-foot long by 10-foot wide area of the bank (300 square feet, or approximately 0.0069 acre).

Preliminary Water Quality Concerns: Construction activities may impact surface waters with increased turbidity and settleable matter.

Proposed Mitigation to Address Concerns: Butte County Association of Governments will implement Best Management Practices (BMPs) to control sedimentation and erosion. All temporary affected areas will be restored to pre-construction contours and conditions upon completion of construction activities. Butte County Association of Governments will conduct turbidity and settleable matter testing during in-water work, stopping work if Basin Plan criteria are exceeded or are observed.

Fill/Excavation Area: Project implementation will permanently impact 0.0069 acres of un-vegetated streambed.

Dredge Volume: 60 cubic yards of native soil.

U.S. Army Corps of Engineers Permit Number: Nationwide Permit #7 (Outfall Structures and Associated Intake Structures)

Department of Fish and Wildlife Streambed Alteration Agreement: Butte County Association of Governments applied for a Streambed Alteration Agreement in July 2013. Lake & Streambed Alteration Agreement Number: 1600-2013-0167-R2

Possible Listed Species: None

Status of CEQA Compliance: The Butte County Association of Governments issued a final Notice of Determination approving a Mitigated Negative Declaration on 28 February 2013 in compliance with Section 21108 or 21152 of the Public Resources Code, stating the project will not have a significant effect on the environment. Mitigation measures were made a condition of approval. A statement of overriding consideration was not adopted for this project. A Negative Declaration was prepared for this project pursuant to the provisions of CEQA. (State Clearinghouse Number 2012122045).

Compensatory Mitigation: Not Applicable

Application Fee Provided: On 24 July 2013 a certification application fee of $944.00 was submitted as required by 23 CCR §3833b(3)(A) and by 23 CCR §2200(e). A remaining certification fee of $283 was received on 25 August 2013 as required by 23 CCR §3833b(2)(A) and by 23 CCR § 2200(e).

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

SECTION 01 11 00 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Work required to be performed by the Contractor:

Butte Regional Transit Operations Center Tenant Improvement at 326 Huss Lane, Chico, CA.

In conformity with the Drawings and Specifications, the Agreement Between Owner and Contractor, including the General and Supplementary Conditions and other Division 1 Specification Sections, hereinafter identified as applied to this Project; including furnishing all material, labor, tools, equipment and services necessary therefore and incidental thereto, complete and available for intended use.

1.2 PROJECT DESCRIPTION

A. This project is for the renovation of the existing bus maintenance and transit operations center for the Butte County Association of Governments. The scope includes the removal of all equipment and non-structural walls at the building interior and the removal of all roof mounted equipment. New construction includes new walls and equipment as indicated on the plans. Site work is limited to what is depicted on the plans, most site improvements are to occur under a separate permit prior to the renovation of this building. All work is in accordance with the bid/contract documents.

B. The Work will be constructed under a single prime contract.

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

Owner's Representative: Andy Newsum
Phone: 530.879.2468
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

1.4 SPECIFICATIONS

A. The Specifications are those documents bound in the Project Manual and enumerated in the Table of Contents. The General Conditions of the Contract for Construction, Supplementary Conditions, and Division 1 General Requirements of the Specifications apply to all Work under this Contract.

1.5 DRAWINGS

A. The contractor for the Butte Regional Transit Operations Center Tenant Improvement shall examine the bid set dated 12/3/15, which includes, but is not limited to, architectural, structural, mechanical, electrical, and plumbing, prior to bid submittal. The full set of permitted drawings is available for printing at the printing companies and for review and reference at the Plan Rooms listed in the Notice to Bidders. Bidder's bid for the Butte Regional Transit Operations Center Tenant Improvement shall be responsive to and take into account the designed conditions, which are adjacent to or related to the project documented within the complete set of permitted drawings dated 12/3/15 and which shall result in coordinated and integrated equipment and systems complete.

1.6 INTERRUPTION OF SERVICES

A. Contractor shall make provisions to accomplish the work of this Contract without undue interference with BCAG's operations. Interruptions to services for the purpose of making or breaking connection shall be made only after consultation with the Owner a minimum of **ten working days** in advance of connection break, and shall be at such time and of such duration as may be directed.

B. In addition, water, electrical, mechanical and telephone/data lines disconnected for Work of this Contract shall not remain disconnected for more than 4 hours. If these utilities cannot be restored within the 4-hour period. Contractor shall provide temporary utility service to restore required utility at Contractor's expense.

1.7 SEQUENCE OF CONSTRUCTION OPERATIONS

A. The Work will be conducted according to the Contractor's Construction Schedule accepted by the Owner.

B. Before starting construction operations, Contractor shall confer with the Owner to review sequence of construction operations.

C. The Owner desires to have the sequence the Work on-site in a manner to allow the operations of the existing Yard to continue and function for its intended purpose. The existing operations cannot be interrupted to cause impact on the Hall's operations and programs. The Owner does not want to dictate the 'means and methods' of the Contractor however there are operational issues that will need to be addressed.

1.8 HOURS OF WORK

A. Contractor shall perform Work of this Contract on normal workdays and within normal work hours; 7:00 a.m. to 5:00 p.m. After hours work and work on Saturdays, Sundays and holidays may be permitted if approval is received from the Owner at least 2 working days in advance.

1.9 SITE CONDITIONS AND REQUIREMENTS

A. Contractor shall keep drainage facilities, walks, and paved areas clean and free of mud and dirt, obstacles, etc. so that normal drainage and pedestrian and vehicular travel may be maintained.

B. Do not use landscaped area(s) for work operations or storage.

1.10 WORK UNDER OTHER CONTRACTS

A. Coordination with other contractors will be handled through the Project Manager. The Contractor will participate in all coordination meetings between contractors and will work cooperatively to accommodate the needs of other contractors without increasing the costs to the Owner. The Project Manager will set up said meetings and the amount of meetings will be at the discretion of the Project Manager.

1.11 CONTRACTOR USE OF PREMISES

A. General: During the construction period the Contractor shall have full use of the designated Project area for construction operations, including use of the adjacent site areas as coordinated with and permitted by the General Contractor performing all other tenant improvements. The Contractor's use of the premises is limited only by the Owner's right to perform construction operations with its own forces or to employ separate contractors on portions of the Project.

1. Confine operations to areas within Contract limits indicated including staging area and parking zone. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.

2. Keep driveways and entrances serving the premises clear and available to the Owner and the public at all times, including the off-site roadway that leads to the Project site. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

3. Repair and replace damaged existing construction to remain such as curbs, parking lot paving, roadways, site vegetation and utilities.

A. Project Completion Requirements:

1. Before final acceptance, inspect, test and adjust performance of every system or facility of the Work to ensure that overall performance is in compliance with the contract documents.

2. No later than 11 months after the date of Final Acceptance, and after Owner occupancy and use of the Project, return and again inspect, test and adjust the work. Measure performance relative to terms of the acceptance test performed at the end of the job and demonstrate and record compliance. See Document 00 72 00, General Conditions of the Contract for Construction, for details and more information.

3. At eleven (11) months after the date of Final Acceptance, and after Owner occupancy and use of the Project, return and again inspect, test and adjust the work. Measure performance relative to terms of the acceptance test performed at the end of the job and demonstrate and record compliance.

4. Submit a report of results to the Owner and Project Manager.

5. Instruct the Owner's operating personnel on operational requirements needed to maintain compliance.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 25 13 - PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling requests for substitutions made after award of the Contract.

B. The Schedule of Submittals is included under Section 0133 00, "Submittals Procedures."

C. Standards: Refer to Section 01 42 00 "Definitions and Standards" for applicability of industry standards to products specified.

D. Procedural requirements governing the Contractor's selection of products and product options are included under Section 0160 00 "Materials and Equipment."

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions." The following are not considered substitutions:

1. Substitutions requested by Bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.

2. Revisions to Contract Documents requested by the Owner or Architect.

3. Specified options of products and construction methods included in Contract Documents.

4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBSTITUTION PROCEDURE

A. Substitute Products: When the naming of one or more products is followed by "or accepted equal," a substitute product may be offered for consideration. A substitute product is a product other than those specified.

B. Product substitution requests shall be submitted for approval within 45 calendar days from the date of notice to proceed. Any substitution requests submitted after the allocated time may not be accepted.

C. If a substitution is being proposed, submit drawings, specifications, tests, performance data, and other pertinent information required to substantiate the equality of each substitute product.

D. After the designated substitution period other products may be proposed only if a product indicated or specified can be proved to have subsequently become unavailable.

E. Whenever a product is identified in the Contract Documents by reference to manufacturer's name, trade name, catalog number, or the like, it is so identified for the purpose of establishing a standard, and products of other manufacturers may be equally acceptable, provided the proposed products are, in the opinion of the Project Manager/Architect, of equal quality, utility, and appearance.

F. In requesting acceptance of a product other than that identified in the Contract Documents, the Contractor represents that he/she:

1. Has investigated the proposed product and determined that it is equal to or superior in all respects to that indicated or specified.

2. Will furnish the same guarantees/warranties or bonds for the proposed product as for the product indicated or specified.

3. Will coordinate the installation of the proposed product into the Work, and make such other changes as required to make the Work complete and in compliance with the Contract Documents and applicable regulatory requirements at no additional cost to the Owner.

4. Waives claims for additional costs and time associated with the proposed product that may subsequently become apparent.

5. Agrees to pay the Project Manager/Architect for costs of reviewing the proposed substitute product, as specified hereinafter.

G. Request for acceptance of a product other than that indicated or specified in the Contract Documents shall be submitted to the Project Manager/Architect on a “Substitution Request Form”, provided at the end of this section, and accompanied by sufficient information to enable proper evaluation to be made. Only one product may be proposed for a product identified in the Contract Documents. Submit with request:

1. Complete technical data, including drawings, performance specifications, cost data, samples, and test reports of the product proposed. Submit additional information, if required by the Project Manager/Architect.
2. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.

3. Data similar to that specified for the item for which the product is proposed.

4. Complete breakdown of costs indicating the amount to be deducted from the Contract Sum if the proposed product is accepted.

5. Signed statement that the proposed product is in full compliance with the Contract Documents and applicable regulatory requirements.

6. List of other Work, if any, which may be affected by the proposed product. Be responsible for the effect of a proposed product upon related Work in the Project, and pay the additional costs generated by the product if it is accepted, including the cost of the Project Manager/Architect's additional services associated therewith.

7. Information on availability of maintenance service, and source of replacement materials.

8. Sample of manufacturer's standard form of guarantee or warranty for proposed product.

9. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.

10. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.

H. The Project Manager/Architect will review requests for proposed products with reasonable promptness and notify the Contractor, in writing, of his decision to accept or reject such products.

I. The Project Manager/Architect at his/her sole discretion will determine the acceptability of proposed products, and his determination shall be final.

J. Project Manager/Architect's Action: No consideration will be given to a substitute product unless, in the Project Manager/Architect's judgment, it complies with the following conditions.

1. It is equal in quality and serviceability.

2. Its use does not entail changes in details or related construction.

3. It is acceptable in regards to design and artistic effect.

4. There is cost, time, or both, advantage to Owner.

The cost of reviewing such proposed products by the Project Manager/Architect or his/her consultants, or the Owner's consultants, or consultant fees necessary to accommodate the substitution into the Work, shall be processed as a deductive

5. Change Order in accordance with the GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS.

K. Notification: Written notification of decision will be given within a reasonable time after receiving the required technical data. Acceptable substitutions will be processed as Change Orders.

L. Acceptance of a product shall not relieve the Contractor from responsibility for the proper execution of the Work and any other requirements of the Contract Documents.

M. If a proposed product is not accepted, use the product originally specified or indicated.

N. No products other than those indicated or specified in the Contract Documents shall be purchased or incorporated in the Work without the Engineer's prior written acceptance.

PART 2 – PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SUBSTITUTION REQUEST FORM FOLLOWS

SUBSTITUTION REQUEST FORM

TO_____

PROJECT : Butte Regional Transit Operations Center Tenant Improvement

We hereby submit for your consideration the following product instead of the specified item for the above Project:

Proposed Substitution_____
_____

Section _____Paragraph _____Specified Item _____

Attach complete technical data, including laboratory tests, if applicable.

Include complete information on changes to Drawings and Specifications which proposed substitution will require for its proper installation.

Fill in Blanks Below:

A. Does the substitution affect dimensions shown on Drawings? Yes____No____. If yes, clearly indicate changes.

_____

B. What effect does substitution have on other trades?_____
_____
_____

C. What effect does substitution have on construction schedule?_____
_____
_____

D. Differences between proposed substitution and specified item? _____
_____

E. Manufacturer's warranty/guarantees of the proposed and specified items are:_____
_____
_____

_____ Same _____ Different (explain on attachment)

The undersigned certifies that the function, appearance and quality are equivalent or superior to the specified item. The undersigned also certifies that all costs caused by or resulting from the requested substitution including, but not limited to, additional design work, construction changes and review time will be paid by the firm requesting the substitution.

Submitted by:

For Use by Project Manager/Architect

Signature_____ ____Accepted _____Accepted As Noted

Firm_____ ___Not Accepted___Received Too Late

Address_____ By_____

_____ By_____

By_____ Remarks_____

Telephone_____

SECTION 01 26 00 - CONTRACT MODIFICATIONS PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Document 00 72 00/General Conditions of the Contract for Construction and Document 00 73 00/ Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Refer to General Conditions, Article 12 for additional provisions regarding changes in the work. If any provision in this Section 01 26 00 should conflict with any provision in Article 12, this Section shall control.

1.2 NO CHANGES WITHOUT CONSENT; PERFORMING WORK ORDERED

A. No extra Work shall be performed, and no change shall be made, except pursuant to a written Change Order, Work Authorization, or Field Order from the Owner stating that the extra Work or change is authorized, and no claim for any addition to the Contract Price or Time for Completion shall be valid unless ordered. However, nothing in this Section shall excuse the Contractor from diligently proceeding and fully completing the Project.

1.3 CHANGE ORDERS AUTHORIZED; PROCEDURE

A. Authorization

1. Change Orders Authorized. Subject to legal requirements relating to competitive bidding, the Owner may require changes in, additions to, or deletions from the scope of the Work to be performed or the materials to be furnished pursuant to the Contract Documents.

   The Owner may, at any time, without notice to the sureties, by written order designated or indicated to be a Change Order, make any change or modification in the Work, or add to the Work within the general scope of the Contract, including, but not limited to changes:

   a. In the Specifications or Drawings;

   b. In the sequence, method or manner of performance of the Work;

   c. In the Owner-furnished facilities, equipment, materials, service, or site.

2. Owner Directed Changes Requiring an Increase in Contract Sum. If the Change in or addition to the work will result in an increase in the Contract Sum, the Owner shall have the right to require the performance thereof on a Lump Sum basis or a Time and Material basis, all as hereinafter more particularly described. The right of the Owner as aforesaid shall apply with respect to each Change in the Work.

C. Methods of Calculation. Adjustments, if any, to the Contract Price by reason of any such change, addition or deletion, shall be determined by one or more of the following methods, at the Owner's sole discretion. The Contractor shall provide sufficient substantiating data to allow the Owner to evaluate the Contractor's request for a Change Order.

1. By a lump sum proposal by the Contractor accepted or amended by formal action by the Owner; and/or

2. By time and materials charges, limited to the "Actual. Cost" to perform the Work, as defined by Paragraph D of this Article, plus overhead and profit as allowed by Paragraph C of this Section.

D. Overhead/Profit and Allowable Time Limitations on Change Orders. If the Owner elects to have the Change in the Work performed on a Lump Sum basis, its election shall be based on a lump sum proposal, which shall be submitted by the Contractor to the Project Manager within ten (10) days of the Contractor's receipt of a request The Owner reserves the right to request the Contractor to adjust the price of the change order if the Owner disagrees with the Contractor's quoted price. The Owner's request for a lump sum proposal shall not be deemed an election by the Owner to have the change in the Work performed on a lump sum basis. The Contractor's and the Contractor's subcontractor's' proposal shall be itemized and segregated by labor and materials for the various components of the change in, or addition to, the Work (no aggregate labor total will be acceptable) and shall be accompanied by signed proposals of any subcontractors who will perform any portion of the change in, or addition to, the Work and of any persons who will furnish materials or equipment for incorporation therein. 'The proposal shall also include the Contractor's estimate of the time required to perform said changes or additional work

The portion of the proposal relating to labor, whether by the Contractor's forces or the forces of any of its subcontractors, may include reasonable anticipated costs of job site labor, including foremen, who will be directly involved in the change in the Work, for such time as they will be so involved. The Contractor's cost for Project Managers, Project Engineers, Superintendents, Clerical, and like personnel are considered as contained in overhead.

1. The Contractor's proposal for additional Work shall include by itemized breakdown for Work done by Contractor's own forces and including subcontractors with sub-subcontractors' itemized breakdowns:

   a. Cost of labor, including: hourly base wage's, Social Security taxes, Federal or State unemployment taxes, worker's compensation insurance, and fringe benefits required by collective bargaining agreements effective for the Contractor or subcontractor.

   b. Cost of materials and equipment or furnishings which will be incorporated into the permanent Work, including manufacturers or supplier's cost, sales taxes, and cost of delivery.

c. Construction equipment costs (not small tools) for time of use required at Contractor's or Subcontractor's unit rates or at discounted local published rates, whichever is less.

d. General Conditions, General Requirements, supervision, overhead (excluding small tools) and profit applied to items number a, b, and c above for:

(1) Work done by Contractor's own forces; not including bond and insurance premiums, fifteen percent (15%) for work valued under $5,000.00;

(2) Work done by Contractor's own forces, not including bond and insurance premiums, ten percent (10%) for work valued at $5,000.00 or greater;

(3) Work done by subcontractors, all tiers, including bond and insurance premiums, if any, shall not exceed a cumulative total of ten percent (10%);

(4) General Conditions, General Requirements, Supervision, Overhead and Profit for Contractor on Subcontractor's work, five percent (5%);

(5) Under no circumstance will the total allowable mark up for. General Conditions, General Requirements, supervision, overhead (excluding, small tools) and profit, exceed a cumulative total fifteen percent (15%), including markups for all parties involved in a change.

e. Contractor's Performance and Payment Bond premiums, one percent (1 %).

2. In the event that the Contractor fails to submit his proposal within the designated period, the Owner may order the Contractor to proceed with the Change or Addition to the Work and the Contractor shall so proceed. The Owner shall unilaterally determine the reasonable cost and time to perform the Work in question, which determination shall be final and binding upon the Contractor. In no event shall the Contractor allow an unresolved change order to hamper the progress of the work,

3. In the event that the parties are unable to agree as to the reasonable cost and time to perform the change in, or addition to, the work based upon the Contractor's Proposal, and the Owner does not elect to have the Change in the Work performed on a Time and Materials basis, the Owner shall make a unilateral determination of the reasonable cost and time to perform the change in the Work, based on their own estimates, the Contractor's submission, or a combination thereof. A Change Order shall be issued for the amounts of cost and time determined by the Owner and shall become .binding upon the Contractor unless the Contractor submits his protest in writing to the Owner within thirty (30) days of the issuance of the Change Order. Owner has the right to direct in writing the Contractor to perform the change in the Work, which is the subject of such

Change Order. Failure of the parties to reach agreement regarding the cost and time of performing the change in the Work and/or any pending protest shall not relieve the Contractor from performing the change in the Work promptly and expeditiously.

4. If the Owner elects to have the change in the Work performed on a Time and Materials basis, the same shall be performed, whether by the Contractor's forces or the forces of any of its subcontractor or sub-subcontractors, at actual cost to entity performing the change in Work, without any charge for administration, clerical expense, supervision, or superintendence of any nature whatsoever, or the cost, use or rental of tools or plant. The cost of a Change Order on a Time and Materials basis shall be evaluated according to Paragraph 1.03.C. The Contractor shall submit to the Owner daily Time and Material tickets, to include the identification number assigned to the change in Work, the location and description of the change in the Work, the classification of labor employed with names and Social Security numbers, the materials used, the equipment rented (not tools) and such other evidence of cost as the Owner may require. The Owner may require authentication of all Time and Material tickets and invoices by persons designated by the Owner for such purpose. The failure of the Contractor to secure any required authentication shall, if the Owner elects to treat it as such, constitute a waiver by the Contractor of any claim for the cost of that portion of the change in the Work covered by a non-authenticated ticket or invoice; provided, however, that the authentication of any such ticket or invoice by the Owner shall not' constitute an acknowledgment by the Owner that the items were reasonably required for the change in the Work.

5. No costs for General Conditions, General Requirements, supervision, overhead, and profit will be paid by the Owner on account of a change in the work" except as specifically provided in Paragraph 1,03.C. and shall be deemed to include all costs and expenses which the Contractor or any of its subcontractors may incur in the performance of a change in the Work and which are not otherwise specifically recoverable by them pursuant to Paragraph 1.03.

E. "Actual Costs" Defined. The actual cost to perform the Work for purposes of this Section is limited to the applicable labor rates, including Contractor's contributions directly attributable to the Work authorized; and the material man's or supplier's invoice amount for all material and equipment actually used to accomplish the work authorized. All other direct and indirect costs, all costs attributable to the time needed to perform the Work ordered by such Change Orders, and all profit associated with such Work shall be included in the maximum overhead and profit amounts stated hereinabove.

F. Audit and Verification. With respect to any change in the Work resulting in a change in the Contract Sum, the Contractor shall afford and shall require its subcontractors to afford access to the Owner at all reasonable times to any books, correspondence, instructions, receipts, vouchers, memoranda, and records of any kind relating thereto, all of which shall be maintained by the appropriate parties for a period of at least three (3) years from and after the date the Owner makes payment on account of such change in work. The Contractor authorizes the Owner and shall require its subcontractors to authorize the Owner to check directly with any suppliers of labor and material with respect to, and to obtain, sworn statements and waivers of lien, if the Owner so elects.

G. Changes Requiring a Decrease in Contract Sum. If the change in the Work will result in a decrease in the Contract Sum, the Owner shall require a quotation by the Contractor of the amount of such decrease for use in preparing a Change Order. The Contractor's quotation shall be forwarded to the Owner within ten (10) days of the Project Manager's request and, if acceptable to the Project Manager, shall be incorporated in the Change Order. Contractor's quotation shall include all direct costs associated with the decreased scope of work, plus a reasonable dollar amount for overhead. If not acceptable, the parties shall make every reasonable effort to agree as to the amount of such decrease, which may be based on a Lump Sum, properly itemized basis in accordance with Subparagraph 1.03.C.

If the Project Manager and the Contractor are unable to agree on the amount of such decrease, the decrease shall be the total estimated reduction in actual cost of the Work, as determined by the Project Manager in his/her reasonable judgment and the Contractor shall be bound to credit this amount to the Owner.

H. Periodic Change Orders. The Project Manager is authorized to cumulate Work Authorizations and process periodic Change Orders including additions and deletions, and to develop procedures providing the methods' for such processing in addition to and consistent with those set forth in herein.

1.4 WORK AUTHORIZATIONS; PROCEDURE

A. Work Authorizations Authorized. The Owner or designee is authorized to issue Work Authorizations instructing the Contractor to proceed with extra Work.

B. Quotation by Contractor. Other than in extraordinary circumstances, as described below, before a Work Authorization is issued, the Contractor shall submit a quotation setting forth an estimated cost of the Work to be performed with sufficient substantiating data to allow the Owner to evaluate the quotation, and an estimate of the time necessary to perform the Work. If requested by the Project Manager, the Contractor shall provide additional data to support the quotation. The Contractor shall acknowledge the quotation as binding.

C, Request for Price Adjustment. After the extra Work specified on the Work Authorization is .completed, the Contractor may submit a request for a Contract Price Change Order due to the Work Authorization. The request shall be supported with substantiating data to show the actual costs to perform the Work and the overhead and profit being requested, as defined in Sections 1.03.C. and 1.03.0. The maximum price adjustment claimed shall not exceed ONE HUNDRED AND TEN PERCENT (110%) of the approved quotation.

D. Request for Time Adjustment. If the Contractor claims that the Work Authorization has delayed the construction completion time, he shall verify' the claimed delay by demonstrating with reference to the approved Project Progress Schedule that the Work Authorization in fact caused a delay in the overall completion date of the Project. Upon such demonstration; the' Project Manager shall process a request for a Contract Time extension Change Order pursuant to Specification Section 007200, Article 8.

E. Accumulation of Work· Authorizations. At the Project Manager's sole discretion, the Contractor's claims for Change Orders arising from several Work Authorizations may be

accumulated into periodic Change Orders adjusting Contract Price, Time, or both, separately or in one Change Order.
Such periodic Change Orders shall include deductions for changes which constitute Deductive change Orders as defined in Section 1.03.F., during the time period being considered in the periodic Change Order.

F. Immediate Work Authorizations. In the event extraordinary circumstances arise which require extra Work to be authorized before the Contractor, the Owner or designee prepares a quotation may issue an immediate Work Authorization without such quotation. Such Work Authorization shall include a maximum authorized sum over which no price adjustment will be authorized. The determination as to whether circumstances as described above exist is discretionary with the Owner. Such Work Authorizations otherwise shall be processed as specified in this Section.

1.5 FIELD ORDERS; PROCEDURES

A. Field Orders Authorized. The Project Manager may issue Field Orders instructing the Contractor to proceed with Work differing from that shown in the Contract Documents, and which changes the Scope of the Work, by adding or deleting Work, by instructing Work to be located differently than shown on the Contract Drawings, or making other minor changes which the Project Manager determines are in the Owner's best interests.

B. No Price or Time Adjustment Authorized. ·Field Orders are not authorized to change the Contract Price or Time, or to bind the Owner to the payment of any sum to the Contractor.

C. No Cost Adjustments Required. If the change ordered in the Field Order will neither delete nor add costs to the Project, the Field Order shall so note. If the Contractor contends that extra work is required, Section 1.03 shall apply.

D. Cost Adjustments Required: If the change ordered in the Field Order will either delete or add costs to the Project, the Field Order shall instruct the Contractor to submit its quotation. Thereafter, Section 1.02 or Section 1.03, as specified by the Project Manager, shall apply.

E. Proceeding Before Decision. If the Contractor proceeds with Work noted on a Field Order without notifying the Project Manager of its claims that the Work is extra work, the Contractor shall have waived its right to request an adjustment to the Contract Price and/or Time. Such notification must be made prior to commencing any of the work noted on the Field Order.

1.6 EXTRA WORK REQUESTS; PROCEDURE

If the Contractor claims that any Clarification, Field Order, or other instruction issued by the Owner requires Work beyond the Scope of the Agreement for Construction, the following provisions shall apply.

A. Notice to Project Manager. Within ten (10) calendar days, the Contractor shall notify the Project Manager of its request, and submit a quotation for the requested costs, pursuant to Section 1.03.C. The Contractor shall submit additional information requested by the Project Manager to decide the request.

B. Action by Project Manager. The Project Manager shall review the Contractor's submittals and either recommended for approval or deny Contractor's request. If the request is approved, the Project Manager may process either a Change Order or Work authorization, pursuant to this Section. If the request is denied, the Project Manager shall so advise the Contractor. Thereafter, the Contractor shall proceed with the Work in issue. The Project Manager shall issue his/her decision within twenty-one (21) days of receipt of a complete submittal from the Contractor. The Project Manager shall recommend final action to the Owner and the Owner's decision shall be binding on the Contractor.

C. Time. If the request is approved, the time during which the request was being considered shall be included in the time allocation for the Work Authorization adjusting the request, and Article 1.03 shall apply thereto; if the request is adjusted by Change Order, any Time extension authorized thereby shall include the Time during which the request was pending. If the request is denied, no Time adjustment shall be authorized.

D. Effect of Proceeding. If the Contractor proceeds with the Work without notifying the Project Manager pursuant to Paragraph A, or before a decision pursuant to Paragraph B, any claim for a Contract Price and/or Time adjustment shall be waived.

E. Scheduling. The Contractor is responsible to schedule the Work and submit extra-work requests so the time required for decision, as specified in Paragraph B, does not delay the Work in general.

F. Contractor Notice of Change. If the Contractor asserts that any event or occurrence has caused a change in, or addition to, the Work which change causes an increase or decrease in the Contractor's cost or the time required for the performance of any part of the Work under the contract, the Contractor shall, within ten (1 0) days of such event, give the Owner written notice as herein required. Said notice shall include the instructions or circumstances that are the basis of the change and the Contractor's best estimate of the cost and time involved.

1. If the Contractor intends to assert a claim under this Section, he/she must, within. Ten (10) days after receipt of a written Change Order above or the furnishing of a written notice under Paragraph 1.06.F. submit to the Project Manager a written statement setting forth the specific nature and cost of such claim, unless this period is extended by the Project Manager. The statement of claim may be included in the notice under Paragraph 1.06.F. above. Failure to submit such written notice within the specified time frame shall be deemed a waiver of the claim.
   The statement of claim shall include all direct, indirect and impact costs associated with the change, as well as the Contractor's estimate of the schedule impact of the change, if any.

2. If the parties are unable to agree to the reasonable cost and' time to perform the Change, or are unable to agree as to whether a change occurred, the Owner shall make unilateral determination as described in Sub subparagraph 1.03.C.2. The Contractor shall proceed pursuant to the provisions of' that Section.

1.7 CHANGE ORDERS REGARDING TIME FOR COMPLETION

Any time extension authorized by the Owner pursuant to Specification Section 007200 Article 8, herein shall be set forth in a Change Order issued by the Owner's Capital Projects Division Manager and Owner Administrative Officer or the Board of Supervisors.

1.8 CHANGE ORDERS DUE TO UNAVAILABLE MATERIALS

In the event that the Contractor demonstrates good cause for a delay in the Contract Time due to the unavailability of materials, the Owner; in its sole discretion, may either grant a Contract time extension, or utilize this Section.

In the event that the Project is unable to be completed due to unavailable materials, and if the Project is completed otherwise, the Contractor may request to delete the portion of the Project not yet completed from the Agreement for Construction, thereby allowing a Notice of Completion to be filed on the remainder of the Project. The Owner shall approve no such Change Order unless the Contractor accompanies his request with an offer to perform the Work so deleted for a price not to exceed the value of the Work deleted by such Change Order, such Work to be commenced upon delivery of the materials, and diligently prosecuted to completion.

In the event the Owner elects to accept the Contractor's offer, Work done pursuant thereto shall not be construed as Work done on the Project, nor shall such Work be construed as affecting, in any way, the legal significance of the Notice of Completion filed on the Project. The application of this Section is limited as follows:

A. No Change Order shall be issued pursuant to this Section until the Contractor has submitted all documents required for final payment.

B. This Section shall apply only to Work, the completion of which is precluded due to unavailable materials.

C. Utilization of this Section lies solely within the discretion of the Owner, and such discretion hereby is delegated to the Project Manager.

1.9 EFFECT OF CONTRACTOR'S ACCEPTANCE OF CHANGE ORDER

By accepting a Change Order, Contractor agrees to the changes, if any, in the Contract Price specified for each item and to the specified Extension of time allowed, if any, for completion of the entire Work on account of such Change Order, and agrees to furnish all labor and materials and perform all Work necessary to complete all additional Work for the price adjustment and within the time specified. Contractor shall make no additional claim for adjustment to the Contract Price or time, nor, for additional costs or damages, on account of the work referenced in such Change Order.

A Change Order duly issued by the Owner and accepted by the Contractor shall constitute a complete accord and satisfaction as to the work, Contract Price, and Contract Time changed thereby. Contractor shall defend and indemnify the Owner, its officers, employees, agents and consultants, if any Subcontractor asserts any claim against the Owner due to a duly issued and accepted Change Order.

1.10 EFFECT ON SURETIES

All changes authorized by the Contract Documents may be made without notice to, or consent of, the sureties on the Performance and Payment bonds, and shall riot reduce their liability on the bonds.

The Owner reserves the right to require additional Performance or Payment bonds to secure a Change Order. In this event, the Change Order shall be increased by the actual cost of the bond premium for the additional bond amounts if any.

1.11 GENERAL PROVISIONS RELATED TO CHANGES

The Contractor shall not be entitled to any amount for indirect costs, damages, or expenses of any nature, including, but not limited to, so-called "impact" or "cumulative" costs, labor inefficiency, wage, material or other escalations beyond the prices upon which the proposal is based and to which the parties have agreed , and which the Contractor, its subcontractors or sub-subcontractors or any other person may incur as a result of delay, interferences, suspensions, changes in sequence or the like, for whatever cause, whether reasonable or unreasonable, foreseeable or unforeseeable, or avoidable or unavoidable, arising from the performance of any and all changes in the Work performed. It is understood and agreed that the Contractor's sole and exclusive remedy in such event shall be recovery of his direct costs as compensable hereunder and an extension of the contract Time, but solely in accordance with the provisions of the Contract Documents.

No claim by the Contractor hereunder shall be allowed if asserted after final payment under this Contract. No claim relating to or flowing from a particular Change shall be allowed after execution of the Change Order relating to that change.

If any disputes should arise between the parties with respect to an increase or decrease in the Contract Sum or an expansion or contraction in the Contract Time as a result of a change in the Work, the Contractor shall not suspend performance of a change in the Work or the Work itself unless otherwise so ordered by the Owner in writing. The Owner shall, however, pay to the Contractor up to the Owner's reasonable estimated value of the change in the Work, regardless of the dispute, if said change in the Work results in an increase in the Contract Sum; and the Owner shall have the right to decrease the Contract Sum up to the Owner's reasonable estimated value of the change in the work, regardless of the dispute, if said change in the Work results in a decrease in the Contract Sum, and the Contractor shall be bound by the Owner's decision as to amount of payment or credit.

1.12 MINOR CHANGES IN THE WORK

The Owner and/or Project Manager shall have authority to order minor changes in the Work not involving an adjustment in the Contract sum or an extension of the Contract Time, arid not inconsistent with the Contract Documents. Such changes shall be effected by written order, and shall be binding on the Owner and the Contractor. The Contractor shall carry out such written orders' promptly.

END OF SECTION

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SECTION 01 29 00 - APPLICATION FOR PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.

1. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Construction Schedule, List of Subcontracts, and Submittal Schedule.

B. Submittal Schedule requirements are included in Section 013300, "Submittals Procedures".

1.3 SCHEDULE OF VALUES

A. Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule. See Section 013216 "Construction Schedules and Reports" for additional information.

1. Within thirty (30) calendar days after the Award of Contract, the Contractor shall submit Schedule of Values for review by Owner's Project Manager, allocating a dollar value for each activity on the Construction Schedule.

B. Format and Content: Use the Construction Schedule as a guide to establish the format for the Schedule of Values.

1. Identification: Include the following identification on the Schedule of Values:

a. Project name and location.

b. Name of the Owner.

c. Project number.

d. Contractor's name and address.

e. Date of submittal.

2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:

a. Generic name.

b. Related Specification Section.

c. Name of subcontractor.

d. Name of manufacturer or fabricator.

e. Name of supplier.

f. Change Orders (numbers) that have affected value.

g. Dollar value.

h. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items; amounts and line items subject to Project Manager's approval.

a. Dollar value for each activity will be cost including labor and materials.

b. Make sum of activity costs equal to total of each Subcontract that will then equal total of Contract Sum.

c. Separate line items for General Conditions and overhead/profit will be required.

4. Round amounts off to the nearest whole dollar; the total shall equal the Contract Sum.

5. All material storage will be the responsibility of the contractor and stored material will not be reimbursed until said material is installed.

6. Schedule Updating: Update and resubmit the Schedule of Values when Change Orders or Work Authorizations result in a change in the Contract Sum. List each Change Order or Work Authorization as a new line item.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Engineer and paid for by the Owner. See Article 9 of General Conditions for additional information regarding progress payments and final payment.

1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

B. Payment Application Times: Each progress payment date is as indicated in the Agreement. The period of construction Work covered by each Application or Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use AIA Document G702 and Continuation Sheets G 703 as the form for Application for Payment.

D. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.

2. Include amounts of Change Orders issued prior to the last day of the construction period covered by the application.

E. Transmittal: Submit 3 executed copies of each Application for Payment to the Project Manager by means ensuring receipt within 24 hours; one copy shall be complete, including waivers of lien and similar attachments, when required.

1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Project Manager.

F. Waivers of Mechanics Lien and Stop Notice: With each Application for Payment, submit waivers of mechanics lien and stop notices from every entity who may lawfully be entitled to file a mechanics lien or stop notice arising out of the Contract, and related to the Work covered by the payment.

1. Submit partial waivers on each item for the amount requested on each item.

2. When an application shows completion of an item, submit final or full waivers.

3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:

1. List of subcontractors.

2. List of principal suppliers and fabricators.

3. Schedule of Values.

4. Contractor's Construction Schedule (preliminary if not final).

5. Submittal Schedule (preliminary if not final).

6. List of Contractor's staff assignments.

7. List of Contractor's principal consultants.

8. Copies of authorizations and licenses from governing authorities for performance of the Work.

9. Initial survey and damage report.

H. Final Payment Application: Administrative actions and submittals, which must precede or coincide with submittal of the final payment Application for Payment include the following:

1. All pertinent permits and similar approvals such as fire department sign-off.

2. Warranties (guarantees) and maintenance agreements.

3. Test/adjust/balance records.

4. Maintenance instructions.

5. Meter readings.

6. Start-up performance reports.

7. Change-over information related to Owner's occupancy, use, operation and maintenance.

8. Final cleaning.

9. Application for reduction of retainage, and consent of surety.

10. Completion of Project closeout requirements.

11. Completion of items specified for completion after Substantial Completion.

12. Assurance that unsettled claims will be settled.

13. Transmittal of required Project construction records to Owner.

14. Proof that taxes, fees and similar obligations have been paid.

15. Removal of temporary facilities and services.

16. Removal of surplus materials, rubbish and similar elements.

17. Change of door locks to Owner's access.

18. Sign off sheets for waste water treatment tracking conducted by contractor.

19. Post Warranty Bond in the amount of 10% of Final Contract Amount.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

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SECTION 01 31 13 CONTRACTOR COORDINATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Coordinate the Work; do not delegate the responsibility for coordination to any Subcontractor.

B. Resolve differences or disputes concerning coordination, interference, or extent of Work of the various SECTIONS and all sub-trades.

1.2 GENERAL COORDINATION

A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.

1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.

2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

2. Prior written notice of ten (10) working days is required before interruption of any existing system. After written notice the contractor is required to set up a coordination meeting with the Project Manager and Owner personnel. The Project Manager will assist with retrieving the key Owner personnel. The Contractor will submit a plan for interrupting said system that shall include a schedule of events for this operation.

1.3 REQUESTS FOR INFORMATION (RFI)

A. General:

1. Comply with requirements of Article 4 of General Conditions.

2. The Project Manager/Architect will conduct / coordinate RFI status meeting with the Contractor, Owner personnel and others as deemed necessary to update the progress of reviewing RFI's.

3. Submit on form that will be distributed by the Project Manager during the preconstruction meeting.

4. Number RFI's sequentially; include date submitted.

5. Identify Project, Contractor, subcontractor, major supplier, pertinent Drawing Sheet and Detail Number, and Specification Section.

6. Specifically identify time response information is required to avoid impact on Construction Schedule and cost. The time for response should be reasonable to allow for processing and Engineer review, research and response.

7. RFI's are requests for information only. If a reply to an RFI requires additional services by Engineer, or will change scope of Work or Contract Time, Engineer will submit Change Order Request Work Authorization.

8. Allow ten (10) working days for a response after delivery to the Project Manager.

9. Request for Information shall include written and graphic solutions proposed by Contractor. The Project Manager and Engineer will determine if proposal is in accord with Contract Documents and design intent of Project.

10. Contractor's failure to make reasonable effort to propose realistic solution may result in Request for Information returned with no action.

11. Maintain current and accurate Request for Information Log as follows:

    a. Sequentially number each RFI. Indicate current status of RFI's at all times; submit log weekly, and as requested by Project Manager.

    b. Maintain for duration of Contract.

    c. For RFl's submitted in form of drawings follow submittal procedures specified in Section 01 3300, "Submittal Procedures".

12. Requests For Information shall be issued only for information not clearly defined in the contract documents. For those RFl's that are issued that request information that is clearly shown in the contract documents, the Engineer shall be entitled to back charge the Contractor for the actual time spent responding to the RFI. The back charge shall be deducted from the Contractor's next payment application and those funds forwarded to the Engineer as compensation.

    a. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules
2. Installation or removal of temporary facilities
3. Delivery and processing of submittals
4. Weekly progress meetings, RFI status meetings and other project meetings as called by Project Manager
5. Project Closeout activities

1.4 CONSERVATION

A. Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

B. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work. Refer to other sections for disposition of salvaged materials that are designated as Owner's property.

1.5 STAFF NAMES

A. Within 5 days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Project Manager, Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses, telephone and cell numbers and emergency contact numbers.

1.6 COORDINATION OF LAYOUTS

A. Provide basic layouts of grid lines and station points on sub-floors as necessary to facilitate coordination and layout of partitions and Work at and above ceilings.

1.7 COORDINATION DRAWINGS

A. Prepare coordination drawings before beginning fabrication or delivery of materials to the Project site. Such drawings should include, but not be limited to piping, ducts, conduit, fixtures and equipment for all utilities, and should demonstrate that such items will fit in the space available within the structure.

B. Keep copies of the coordination drawings at the jobsite.

C. The Project Manager/Architect will verify that coordination drawings have been made, but will not review the coordination drawings.

1.8 ELECTRICAL and MECHANICAL COORDINATION

A. Use large-scale layout drawings of the electrical, mechanical, security electronics and detention equipment, together with Shop Drawings or layout drawings of other affected Work, to check, coordinate, and integrate the Work to prevent interferences.

B. Perform and complete checking and coordination before commencing construction in the affected areas.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Verify characteristics of interrelated assemblies and equipment for compatibility. Coordinate Work having independent responsibilities for installation connection, or servicing access.

C. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

D. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject and do not install any damaged and defective items.

E. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

F. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Project Manager and/or the Engineer for final decision.

G. Recheck measurements and dimensions, before starting each installation.

H. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

I. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

J. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Project Manager and/or the Engineer for final decision.

3.2 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration prior to Final Acceptance.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

D. Execute daily/weekly cleaning to keep Work, Site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations.

E. Provide on-site containers for collection of waste materials, debris and rubbish.

F. Remove waste materials, debris and rubbish from site periodically and dispose of at legal disposal areas away from site.

G. Do not allow trash containers to overflow.

H. Clean spaces prior to start of finish painting and continue cleaning on as-needed basis until painting is finished.

I. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.

J. Each Sub Contractor:

1. Clean up daily all waste materials, rubbish, and debris resulting from own operations.

2. Place waste materials, rubbish, and debris from ground floor operations outside of building in an area designated by Project Manager and General Contractor.

3. Place waste materials, rubbish and debris from above ground floor operations in chute provided by General Contractor.

4. Oversee cleaning and ensure that building and grounds are maintained free from accumulations of debris.

5. Sprinkle dusty debris with water.

6. At reasonable intervals, minimum once a week, clean-up site and access and dispose of debris off-site.

7. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from interior and exterior surfaces of fixtures, hardware and equipment.

8. Repair, patch, and touch-up marred surfaces to match adjacent finishes damaged by his own operations.

9. Vacuum interior areas when ready for painting.

10. Schedule cleaning operations so that contaminants resulting from cleaning do not fall on wet painted or finished surfaces.

K. Contractor:

1. Oversee cleaning and insure that building and grounds are maintained free from accumulations of waste materials, rubbish, and debris on a daily/weekly schedule.

2. Provide and maintain a rubbish chute from upper floors to ground level.

3. Clean up all un-definable debris.

4. Remove all debris and dispose of offsite.

5. Clean all glass and aluminum surfaces.

6. Leave the work "broom clean".

END OF SECTION

SECTION 01 31 19 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 PRECONSTRUCTION CONFERENCES

A. Prior to commencement of Work, a pre-construction conference will be held to discuss procedures to be followed during the progress of the Work. The meeting will be scheduled after execution of the agreement and prior to commencement of work.

B. Location: On-site.

C. Attending shall be:

1. Owner's Representative/Project Manager/Architect
2. User's Representative
3. Contractor
4. Contractor's Superintendent
5. Major Subcontractors
6. Others as appropriate

D. Agenda: Following is suggested agenda. Actual agenda will be prepared and distributed by Project Manager prior to meeting:

1. Distribution and discussion of:
   a. List of major subcontractors and suppliers
   b. Projected Construction Schedules
   c. Critical work sequencing and reiteration of contract obligation toward meeting milestones
   d. Major equipment deliveries and priorities
   e. Project Coordination
   f. Designation of responsible personnel
   g. Procedures and processing of:
      1. Submittals
      2. Field Orders and Clarifications

3. Proposal requests and quotations

4. Change Orders and Work Authorizations

5. Applications for Payment

6. Requests for Information

h. Procedures for maintaining Record Documents

i. Use of premises:

1. Office, work and storage areas

2. Owner requirements

j. Construction facilities

k. Temporary utilities

l. Security considerations

m. Housekeeping procedures

n. Insurance requirements

o. Wage and hour compliance

p. Conducting work in operating facility

q. Noise control

r. Other Subjects as appropriate

1.2 PROGRESS MEETINGS

A. The Project Manager will schedule and hold meetings weekly. The Project Manager will prepare the Agenda for such meetings and distribute to the Contract Administrator, the Architect, and other interested parties at the next successive meeting.

1. Location: Project site or other acceptable location.

2. Attending shall be:

a. Owner Representative/Project Manager

b. Contractor

c. Contractor's Superintendent

d. Subcontractors, as appropriate to the Agenda

e. Suppliers, as appropriate to the Agenda

f. Others, as appropriate to the Agenda

g. Contract Administrator or representative, as needed

h. User Department representative as needed

3. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.

4. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule.

   a. 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.

5. Review the present and future needs of each entity present, including such items as:

   a. Interface requirements

   b. Time

   c. Sequences

   d. Deliveries

   e. Off-site fabrication problems

   f. Access

   g. Site utilization

   h. Temporary facilities and services

   i. Hours of Work

   j. Hazards and risks (Contractor’s Responsibility)

   k. Housekeeping

   l. Quality and Work standards.

   m. Change Orders

n. Documentation of information for payment requests

6. Reporting: No later than each successive meeting, the Project Manager will distribute copies of minutes of the meeting to each party present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

7. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

1.3 PROGRESS PAYMENT MEETINGS

A. Schedule and hold a billing meeting each month prior to submittal of Application for Payment. Billing meetings shall coincide with last of month progress meeting, whenever possible.

1. Location: Project site or other acceptable location.

2. Attending shall be:

a. Owner’s Representative/Project Manager

b. Contractor

3. Prepare an itemized draft of the month's proposed billing for review with the Project Manager and Architect at the billing meeting. Refer to SECTION 01027 "APPLICATION FOR PAYMENT", for further requirements.

4. Following review of the proposed billing, revise as required, prepare Application for Payment, and submit to the Project Manager. The Project Manager will certify and forward it to the Contract Administrator, who will authorize payment upon receipt of partial waivers of lien from the Contractor and all Subcontractors for previous payment.

1.4 PRE PUNCH LIST MEETING

A. After notification is provided to the Project Manager that the contractor is ready for a punch list to be generated, the Project Manager shall hold a meeting to review the expectations of the punch list.

B. Attending shall be:

1. Owner’s Representative/Project Manager/Architect

2. Maintenance Supervisor

3. Project Manager

4. Contractor

1.5 FINAL CLOSEOUT MEETING

A. Refer to the General Conditions.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION

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SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Timing:

1. Make submittals within the times specified herein and not all at one time. Submit in accordance with the sequence of procurement, fabrication and construction, and according to Submittal Schedule submitted to Project Manager.

2. All submittals are due within 60 days of the Notice of Award.

B. Related Documents:

1. Drawings and general provisions of Contract, including Document 00 72 00/ General Conditions of the Contract for Construction and Document 00 73 00/ Supplementary Conditions and other Division - 1 Specification Sections, apply to this Section.

2. Section 01 60 00/ Materials and Equipment for Product Options and Substitutions.

C. Identification:

1. Identify each submittal and re-submittal with the following information:
   a. Project name and address as they appear on the Contract Documents

   b. Contract name and number

   c. Contractor's name and address

   d. Date of submission

   e. Numbering System: Submittals shall be identified by specification section (i.e., 02810001, 07210-001, 11191-001, etc.) Any re-submittals shall be numbered sequentially according to the original submittal section, followed by the subscript ". 1, .2, .3 submittal number (i.e., 001.1, 001.2, etc.). Submittals and re-submittals shall be kept intact with the original number. Do not add new drawing or information outside the scope of the original Submittal, unless specifically requested. Do not assign a new number for a resubmittal.

   f. Reference: List Specification Section number and product reference as a cross reference for each submittal.

2. Identify each submittal with the following additional identification:

   a. Contractor's stamp with initials or signature, certifying to review of submittal, compliance with Contract Documents, and coordination with

other impacted work, and verification of field measurements. The Engineer will return any submittal not bearing this stamp without being reviewed.

b. Drawing and Specification SECTION numbers to which the submittal applies.

c. Subcontractor's or supplier's name and address

d. Name and telephone number of the individual to contact for additional information regarding the submittal.

e. Whether it is an original or are-submittal

D. Summary:

1. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:

a. Submittal schedule

b. Submittal procedures

c. Daily construction reports

d. Shop Drawings

e. Product Data

f. Samples

g. Manufacturer's' instructions

h. Manufacturers' certificates

2. Administrative Submittals: Refer to other Division - 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

a. Permits

b. Applications for payment

c. Performance and payment bond

d. Insurance certificates

e. List of Subcontractors

1.) The Schedule of Values submittal is included in Section 01 2900 I "Applications for Payment."

2.) CPM Schedule: As specified in Section 01 3216, Construction Progress Schedules and Reports.

3) Inspection and test reports are included in Section 01 4000 "Quality Control" and Section 01 45 29 "Testing Laboratory Services"

E. Coordination of Submittals:

1. General: Prior to submittal for the Engineer's or consultant's review, as applicable, fully coordinate material as follows:

a. Determine and verify field dimensions and conditions, materials, catalog numbers, and similar data.

b. Coordinate shop drawing submittals with previously issued Addenda and Information Bulletins.

c. Coordinate with the various types of Work and public agencies involved.

d. Secure necessary approvals from public agencies and others and signify by stamp, or other means, that approvals have been secured.

e. Unless otherwise specifically permitted by the Engineer, make submittals in groups containing all associated items.

2. Completeness: Submittals shall be complete; partial submittals will be rejected for not complying with the Contract Documents.

1.2 SCHEDULES

A. Submittal Schedule: Include submittal date and date required for return for each submittal required by the Contract Documents. No action will be taken on such submittals without prior receipt, review, and acceptance of Submittal Schedule.

1. Prepare a complete schedule of submittals. Submit within 30 calendar days after Notice to Proceed. See Article 4.12 of the General Conditions for additional information.

NOTE: Some submittals will be required within the first ten calendar days of the Notice To Proceed due to the sequence of Work.

2. Coordinate submittal schedule with the list of subcontracts, schedule of values and the list of products as well as the Contractor's construction schedule.

3. Prepare the schedule in chronological order. Provide the following information:

a. Scheduled date for the first submittal

b. Related Section number

c. Event Number associated with CPM Construction Schedule

d. Submittal category

e. Name of subcontractor

f. Description of the part of the Work covered

g. Scheduled date for re-submittal

h. Scheduled date the Engineer's final release or approval

B. Distribution: Following response to initial submittal schedule, print and distribute 3 copies and an electronic copy (pdf) to the Project Manager. Submit other copies to subcontractors, and other parties required to comply with submittal dates indicated.

1. When revisions are made, distribute 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 construction activities.

C. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting. Instruct recipients to report promptly any problems anticipated by dates or sequences shown in schedule.

1.3 SUBMITTAL PROCEDURES

A. Coordinate preparation and processing submittals with performance of construction activities.

1. Make submittals in groups containing associate items to ensure that information is available for checking each item when received.

a. Partial submittals may be rejected as not complying with requirements of Contract documents and Contractor shall be liable for any resulting delays.

2. Requests for deviation from Contract Documents shall be submitted for consideration before submittal of affected items. Only deviations, which have been previously accepted in writing, shall be included in submittals.

B. Place permanent label or title block on each submittal for identification. Indicate name or entity preparing each submittal in label or title block. See Paragraph 1.01.C herein for further information requirements on each submittal label or title block.

1. Provide space on label or beside title block to record Contractor's and Engineer's review and approval markings and action taken.

C. Contractor's Review:

1. Review submittals for accuracy, completeness, and conformity with Contract Documents.

    a. Submittal shall be construed as stipulating Contractor has thoroughly and completely reviewed, and coordinated data.

    b. Submittals that indicate less than Contractor's full compliance will be returned without action.

    c. Delays caused by failure to comply will not be acceptable basis for extension of Completion Time.

2. Certify submittals have been reviewed and coordinated by adding following affidavit to each submittal:

    "The undersigned certifies this submittal has been reviewed, approved, and coordinated in compliance with requirements of Section 01 33 00 of the Project Manual."

    Signature _ Date__

    Name Printed _ Title__

    a. Submittals not certified by being stamped and signed by Contractor will be returned without action, as will submittals which, in the Project Manager or Project Engineer's opinion, have not been adequately reviewed and coordinated by the Contractor.

D. Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.

E. Package each submittal appropriately for transmittal and handling.

F. Project Manager/ Architect’s Review:

1. Submittals are reviewed for general conformance with design concept and general compliance with information given in Contract Documents only.

2. Review of separate item shall not indicate acceptance of assembly of which item is part.

G. Review shall not relieve Contractor from responsibility for errors or deviations from requirements of Contract Documents.

H. Submittal Log: Maintain accurate submittal log for duration of Contract. Indicate current status of all submittals at all times. Make submittal log available for the Project Manager's review upon request.

I. Re-submittals:

1. Subject to same terms and conditions as original submittal.

2. Project Manager/Architect will accept not more than one re-submittal.

   a. Should additional re-submittals be required, Contractor shall reimburse Owner for Project Manager/Architect's account for time spent in processing additional re-submittals at rate of 2.5 times rate of Direct Personnel Expense (DPE). Direct Personnel Expense is defined as direct salaries of Project Manager/Architect's personnel engaged on Project and portion of costs of mandatory and customary contributions and benefits related thereto, including employment taxes and other statutory employee benefits, insurance, sick leave, holidays, vacations, pensions, and similar contributions and benefits.

3. Claims will not be considered for Contractor's additional time or expense associated with re-submittals.

J. Revisions:

1. Make only those revisions required or accepted by Project Manager/Architect.

1.4 DAILY CONSTRUCTION REPORTS

A. Prepare daily construction reports to record: manpower of the general contractor and each onsite subcontractor, a summary of progress, high & low temperature, precipitation, contract days expended, CPM activities performed and percent complete for each activity, and other pertinent information. Prepare one report for each workday. Submit the report of the previous day no later than 8:00 am the following workday.

1.5 SHOP DRAWINGS, PRODUCT DATA, SAMPLES, AND OTHER SUBMITTALS

A. General:

1. Submit only as required by the various Specification SECTIONS. Do not submit shop drawings, product data, samples or other submittals, unless specifically required.

2. Submit in accordance with the accepted submittal schedule. Send copies of transmittals to the Owner.

3. Submit in the manner and quantities specified hereinafter.

4. Allow a minimum of 10 working days for processing by the Project Manager/Architect and his/her consultants, as applicable. Some submittals may require more processing time based upon consultant's input and the complexity of the submittal. If certain submittals are critical, they should be so identified at time of submission. If a specific submittal cannot be reviewed and returned within 10 working days, the Project Manager/Architect will develop with the Project Manager and Contractor a timely "turn-around" that will not impact the construction schedule.

B. Shop Drawings:

1. Submit a minimum of four (4) prints and electronic copy (pdf).

2. The Project Manager/Architect, as applicable, will review the Shop Drawings; mark the drawings with required revisions; stamp the drawings and indicate "No Exceptions Noted," "Make Corrections Noted," "Revise and Resubmit," or "Rejected," and return the drawings. "Revise and Resubmit" or "Rejected" stamps shall not be construed by the Contractor as a valid reason for an extension of time.

3. Review the returned drawings and take appropriate action as indicated.

    a. If drawings are marked "Revise and Resubmit," make revisions and indicate them with a "cloud," stamp and date, and resubmit in the same manner and number as for the original submittal. Contractor may not proceed with work represented in submittal. Resubmit until "No Exceptions Noted," "or “Make Corrections Noted “ status is given.

    b. If drawings are marked "Rejected," make a new submittal and submit in the same manner and number as for the original submittal. Contractor may not proceed with work represented for one or more of the following reasons:

        1. Since work represented in submittal is not acceptable; submit specified item.

        2. Submittal has not been made in accordance with procedures specified.

        3. Insufficient information is provided to make a determination.
        4. Submittal contains too many errors or omissions to make a determination.

        5. Information provided does not conform to information included in the Contract documents.

        6. Submittal contains excessive extraneous materials making a final determination impossible.

    c. If drawings are marked "No Exceptions Noted" or "Make Corrections Noted", print and distribute copies for Owner and Inspector, as well as those required for Contractor and Subcontractors. Contractor may proceed with work represented in submittal. Project Manager/Architect’s review is not conducted for the purpose of determining the accuracy or completeness of other details, such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment and systems, all of which remain the responsibility of the Contractor.

4. The Project Manager/Architect, or the Owner's consultants, as applicable, may review at their discretion up to one re-submittal and take action, as appropriate, in the same manner as for the original submittal. If more than one re-submittal is required, any associated costs as a result of additional reviews shall be an extra

service of the Project Manager/Architect, or his consultants or the Owner's consultants, as applicable, and will be processed as a deductive Change Order in accordance with the GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS.

5. As with the original submittal, review the returned drawings and take appropriate action as indicated. As specified hereinabove, resubmit and revise until final action by the Project Manager/Architect or his/her consultants, or the Owner's consultants, as applicable. Final action is signified by the markings "No Exceptions Noted," or "Make Corrections Noted," on the returned drawings.

6. Following final action by the Project Manager/Architect or his/her consultants, or the Owner's consultants, as applicable, the Contractor shall make copies and distribute as required for accomplishment and inspection of the indicated Work.

7. Only those Shop Drawings that bear stamps showing final review of the Contractor, Project Manager/Architect's, or the Owner's consultants', as applicable, shall be used.

8. Reproduction and Mailing Costs: The Contractor shall pay the reproduction and mailing costs of all prints.

9. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.

    a. Preparation of coordination Drawings is specified in Section 01 31 00 "Project Management and Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.

    b. Submit coordination Drawings for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space.

C. Product Data:

1. Submit in electronic format required product brochures, catalog cuts, and similar material.

2. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, rough-in diagrams and templates, wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."

    a. Submit electronic copies of product data which Contractor requires.

    b. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which

are not required, mark copies to indicate the applicable information. Include the following information:

1) Manufacturer's printed recommendations

2) Compliance with recognized trade association standards

3) Compliance with recognized testing agency standards

4) Application of testing agency labels and seals

5) Notation of dimensions verified by field measurement

6) Notation of coordination requirements

c. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

3. Review and processing of Product Data shall be the same as that for Shop Drawings.

D. Samples:

1. Submit in the size specified in the individual Specification SECTIONS, and in the quantity required to be returned to the Contractor, together with three additional Samples, which will be retained by the Project Manager/Architect or his/her consultants, or the Owner's consultants, as applicable.

2. Ship samples to the Project Manager's office, carriage prepaid. Samples to be returned to the Contractor will be shipped, carriage collect.

3. Submit samples to illustrate functional and aesthetic characteristics of Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

4. Preliminary Submittals:

a. Unless precise color, pattern, and texture or similar characteristics are specifically described, submit full set of choices for material or product.

b. Preliminary submittals will be reviewed and returned with Project Engineer's mark indicating selection and other action.

c. Engineer reserves right not to make individual determination or selections until all samples of all materials are submitted.

d. Submit samples of all selected colors, patterns, textures or other similar characteristics as selected by Project Manager/Architect.

5. Submit number of samples required by Contractor plus three that will be retained.

a. Where variation in color, pattern, texture or other characteristics are inherent 'in material or product, submit multiple units (not less than 3), that show approximate limits of variations.

b. Accepted samples will form standard of comparison for finished Work.

c. Defects, and deviations in excess of those in accepted samples, are unacceptable and are subject to rejection of completed Work.

6. Include identification on each sample, with full Project information, including:

a. Project name and location

b. Manufacturer and supplier

c. Name, finish, and composition of material
d. Location where material is to be used

e. Specification Section number.

7. Reviewed samples which may be used in the Work are indicated in individual specification sections.

8. Field Samples: Provide field samples as required by individual sections. Install samples in locations as directed, completed and finished.

E. Other Submittals: Submit as specified in the individual Specification Sections.

1.6 MANUFACTURERS INSTRUCTIONS

A. When specified in individual Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturers' instructions and Contract Documents.

1.7 PATTERNS AND COLORS

A. Unless the exact pattern and color of a product are indicated in the Contract Documents, whenever a choice of pattern or color is available for a product, submit accurate color charts and pattern charts to the Project Manager/Architect for his/her review and selection.

1.8 CERTIFICATES OF COMPLIANCE

A. Submit certificates of compliance with the associated Shop Drawings, Product Data, Samples, and other submittals required for the product.

B. Submit on 8-1/2-inch-x-11-inch white paper.

C. Submit three copies.

D. Submit in form of letter or company standard forms, signed by officer of manufacturer.

E. Each certification shall include the following:

1. Project name and location

2. Contractor's name and address

3. Quantity and date or dates of shipment or delivery to which certificate applies

4. Manufacturer's name

F. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

G. Certificates may be recent or previous test results on material or product, but must be acceptable to Project Manager/Architect.

H. The Project Manager/Architect will retain the certificates of compliance; no review reply is intended.

1.9 DEFERRED APPROVAL

A. See drawings for items that require Deferred Approval if applicable.

B. Submit a minimum of five (5) sets of drawings, calculations, product data, samples, etc. for review by the Owner Building Department or 'deferred' Agency. All drawings and calculations must be "wet stamped" and signed.

C. Allow a minimum of three (3) weeks for Owner Building Department or 'deferred' Agency to review.

D. Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

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SECTION 01 35 16 - ALTERATION PROJECT PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

A. Requirements hereunder apply to selective structure demolition and alteration work shown on Drawings and specified in Sections pertaining to crafts or trades involved. Work is primarily in the Existing Facility where alteration and renovation will occur.

B. Provide labor, materials, equipment and transportation as required to complete selective demolition and alteration construction work for selected portions of building or structures as shown on Drawings and performed by applicable crafts or trades for scope indicated.

1.2 RELATED DOCUMENTS

A. Document 00 72 00/ General Conditions of the Contract for Construction.

B. Document 01 74 19/ Construction Waste Management

C. Section 01 35 53/ Project Security Procedures

D. Section 01 73 29/ Cutting and Patching

E. Section 01 74 23/ Field Engineering

F. Section 02 82 00/ Asbestos Remediation (If Required)

G. Section 02 83 00/ Lead Remediation (If Required)

1.3 REMOVAL WORK

A. Perform removal work, including wrecking and cutting necessary to alteration work, changing or elimination of old features, installation of new work, or joining and keying of new work to existing work. Items removed temporarily for convenience of Contractor shall be removed and replaced by Contractor, as approved.

B. Hazardous Materials: Hazardous materials are not anticipated on this project, but if present in construction are to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
2. Hazardous material remediation is specified elsewhere in the Contract Documents.

1.4 SUBMITTALS

A. Qualification Data: Submit qualifications of demolition subcontractor or forces completing Work.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.

2. Interruption of utility services. Indicate how long utility services will be interrupted.

3. Coordination for shutoff, capping, and continuation of utility services.

4. Locations of proposed dust- and noise-control temporary partitions and means of egress.

5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work,

6. Means of protection for items to remain and items in path of waste removal from building.

C. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

D. Pre-demolition Photographs and Videotapes Prior to start of construction, in the presence of the Owner's Project Manager, Contractor shall video tape and survey buildings and grounds affected by this Project and submit itemized list of defects, e.g. broken glass, window screens, salvage items, paving, walks, etc. and how existing conditions of adjoining construction and site improvements, including entry from the private entry roadway/s, finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Contractor shall make a copy of the video tape for Contractor's use and deliver the original to the Owner for use at Project close out. At completion of Project, defects not noted on that list or not verifiable on the videotape shall be corrected or replaced by Contractor at no cost to the Owner. Submit documentation before Work begins.

1.5 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Standards: Comply with ANSI A10.6 and NFPA 241.

D. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 Project Management and Coordination. Review methods and procedures related to selective demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be selectively demolished.

2. Review structural load limitations of existing structure.

3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

5. Review areas where existing construction is to remain and requires protection.

1.6 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

1. Comply with requirements specified in Division 01 Section 01 11 001 Summary.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before selective demolition, Owner will remove the following items: Furnishings, wall murals and other contents.

C. Notify Project Designer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

Storage or sale of removed items or materials on-site are not permitted.

1. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

2. Maintain fire-protection facilities in service during selective demolition operations.

1.7 ADJACENT SURFACES OR FEATURES

A. Replace, patch and finish in kind, adjacent surfaces or features displaced or disturbed In performance of alteration work. Broken and cut units shall be replaced with whole units.

B. Except as otherwise shown or specified, join new work to existing work to match similar existing adjoining work. Prepare existing surfaces to receive new work.

C. Prior to start of construction, in the presence of the Owner's Project Manager, Contractor shall video tape and survey buildings and grounds affected by this Project and submit itemized list of defects, e.g. broken glass, window screens, salvage items, paving, walks, etc. Contractor shall make a copy of the video tape for Contractor's use and deliver the original to the Owner for use at Project close out. At completion of Project, defects not noted on that list or not verifiable on the videotape shall be corrected or replaced by Contractor at no cost to the Owner.

1.8 LAYOUT OF WORK

A. Establish exact layouts, locations, lines and elevations of work in relation to existing work. Obtain and verify measurements for new work in existing areas.

B. Refer also to Section 01 31 00, Project Management and Coordination.

1.9 PROTECTION OF EXISTING WORK

A. Provide protection against weather and construction operations for existing equipment, finishes, floors and floor coverings, furniture, fixtures, hardware and other improvements in and about altered areas.

1.10 SHORING, BRACING, UNDERPINNING

A. Provide temporary support for work as required by construction operations and to ensure safety.

1.11 INTERFERENCE

A. Interference with or inconvenience to occupants shall be kept to a minimum. Contractor will, however, not be required by the Owner to work overtime.

1.12 NOISE

A. Noisy motors, cutting, drilling, and fastening equipment shall be operated without disturbance to occupants of the building or adjacent buildings.

1.13 DUST AND RUBBISH

A. Premises shall be kept clean and in a safe condition. Rubbish shall be removed as it accumulates.

B. Temporary dust-retarding partitions and barricades shall be built around work areas as indicated on the Drawings.

1.14 INTERRUPTION OF SERVICES

A. Interruption of electrical power for performance of work may be permitted only after consultation with Owner's Project Manager. Temporary electrical power shall be provided to meet requirements of this Article. Added cost to Contractor due to necessity of complying with this Article shall be deemed to have been included in lump sum bid amount for Work of this Contract. Refer to requirements in Section 01 11 001 Summary for interruption of services.

B. Contractor shall provide his own temporary construction lighting and power as required in areas where work is being performed, when normal site power is disrupted.

1.15 ACCESS, DELIVERY, AND HAULING

A. Materials and equipment shall be delivered and rubbish removed through passages designated by the Owner and approved by Sheriff’s Office staff. Deliveries of materials and equipment to jobsite shall be made with a Contractor's representative present and Owner Yard Staff present.

B. Keep corridors and entrances, for use of occupants, and reasonable access thereto, clear of building materials, refuse, and the like.

C. Refer to Section 01 60 00 for transportation, handling, and storage requirements.

1.16 CONSTRUCTION AREA

A. Contractor's employees, equipment, and materials shall be restricted to immediate area of construction and subject to approval by Owner Yard Staff for location(s) on-site.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Project Manager and Project Designer for review.

D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs and videotapes.

E. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section 01 11 00/ Summary.

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

2. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents

of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.

4. Maintain adequate ventilation when using cutting torches.

5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

6. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

8. Dispose of demolished items and materials promptly according to Section 017419, Construction Waste Management.

B. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as indicated on Drawings. Do not demolish building elements beyond what is indicated on Drawings without Project Designer's approval.

3.4 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

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SECTION 01 40 00 - QUALITY CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for quality control.

B. Quality control includes inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Project Manager, Owner Inspector or the Engineer.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover-production of standard products as well as customized-fabrication and installation procedures.

2. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.

3. Requirements for the Contractor to provide quality control services required by the Project Manager, Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 RESPONSIBILITIES

A. Contractor Responsibilities: The Contractor shall provide inspections, tests and similar quality control services, specified in individual Specification Sections and required by governing authorities, except where they are specifically indicated to be the Owner's responsibility, or are provided by another identified entity. Costs for these services shall be included in the Contract Sum.

1. The Contractor shall employ and pay an independent agency, to perform specified quality control services, and quality control services required by laws, rules, regulations, and regulatory authorities.

2. The Owner will engage and pay for the services of an independent agency to

perform inspections and tests specified as the Owner's responsibility.

a. Where the Owner has engaged a testing agency or other entity for testing and inspection of a part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the Owner, unless otherwise agreed in writing with the Owner.

3. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

a. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

4. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.

b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.

c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.

d. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.

e. Security and protection of samples and test equipment at the Project site.

B. Duties of Testing Agency: The independent testing agency engaged by the Contractor to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections and by applicable laws, rules, and regulations; shall cooperate with the Project Manager, Owner, Inspector and the Project Engineer and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.

1. The agency shall notify the Project Manager/Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve of accept any portion of the Work.

3. The agency shall not perform any duties of the Contractor

C. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

1.4 SUBMITTALS

A. The independent testing agency shall submit a certified written report of each inspection, test or similar service, to the Project Manager, the Engineer and the Contractor, in duplicate,

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

2. Report Data: Written reports of each inspection, test or similar Service shall include, but not limited to:

a. Date of issuance

b. Project and title number

c. Name, address and telephone number of testing agency

d. Dates and locations of samples and tests or inspections

e. Names of individuals making the inspection or test

f. Designation of the Work and test method

g. Identification of product and Specification Section

h. Complete inspection or test data

i. Test results and interpretation of test results

j. Ambient conditions at the time of sample-taking and testing

k. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.

l. Name and signature of laboratory inspector

m. Recommendations on retesting

1.5 QUALITY ASSURANCE

A. Qualification for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, which are pre-qualified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

B. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State in which the Project is located.

1.6 TEST SELECTION

A. The Contractor shall be responsible for, and shall pay for, all off-site and on-site tests except tests on the following materials/installations:

1. Grout
2. High-strength bolting
3. Structural welding (shop and field)
4. Reinforcing steel
5. Bolts installed in concrete.
6. Expansion and epoxy anchors

B. The Contractor shall notify the Project Manager in writing (3) three working days in advance of time for the above named tests.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

1.1 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements per "Cutting and Patching."

B. Protect construction exposed by or for quality control service activities, and protect repaired construction.

C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION

SECTION 01 42 00 - DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the General Conditions.

1. Indicated refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in Specifications, and similar requirements in Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help locate the reference; no limitation on location is intended except as specifically noted.

2. Directed: Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted" mean "directed by the Project Manager/Architect", "requested by the Project Manager/Architect", and similar phrases. However, no implied meaning shall be interpreted to extend the Project Manager/Architect's responsibility into the Contractor's area of construction supervision.

3. Approve: The term "approved," where used in conjunction with the Engineer's action on the Contractor's submittals, applications, and requests, is limited to the duties and responsibilities of the Engineer as stated in General and Supplementary Conditions. Such approval shall not release the Contractor from responsibility to fulfill Contract requirements unless otherwise provided in the Contract Documents.

4. Regulation: The term "Regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work, whether lawfully imposed by authorities having jurisdiction or not.

5. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."

6. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."

7. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."

8. Installer: An "Installer" is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or sub-subcontractor for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

9. Unless otherwise indicated, the term "experienced," when used with the term "Installer" means having a minimum of 5 previous projects similar in size and scope to this Project, being familiar with the precautions required, and having complied with requirements of the authority having jurisdiction.

10. Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other construction activities as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land upon which the Project is to be built.

11. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 17-Division format and MASTER FORMAT numbering system.

B. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is the abbreviated type. Implied words and meanings will be appropriately interpreted. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and where the full context of the Contract Documents so indicates.

2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

a. The words "shall be" shall be included by inference wherever a colon (:) is used within a sentence or phrase.

C. Assignment of Specialists: The Specification requires that certain specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.

1. This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

2. Trades: Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

1.4 DRAWING SYMBOLS

A. Graphic symbols: Where not otherwise noted, symbols are defined by "Architectural Graphic Standards," published by John Wiley & Sons, Inc., eighth edition.

1.5 INDUSTRY STANDARDS

A. Applicability of Standards: Except where 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. Such standards are made a part of the Contract Documents by reference. Individual Sections indicate which codes and standards the Contractor must keep available at the Project Site for reference.

B. Publication Dates: Where the date of issue of a referenced standard is not specified, comply with the standard in effect as of date of these specifications.

C. Updated Standards: At the request of the Architect, Contractor, or authority having jurisdiction, submit a Change Order Request where an applicable code or standard has been revised and reissued after the date of the Contract Documents and before performance of Work affected. The Project Manager/Architect will decide whether to issue a Proposal Request to proceed with the updated standard.

D. Conflicting Requirements: Where compliance with two or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the Contract Documents indicate otherwise. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to the Engineer for a decision before proceeding.

E. Minimum Quantity or Quality Levels: In every instance the quantity or quality level shown or specified shall be the minimum to be provided or performed. The actual installation may comply exactly, within specified tolerances, with the minimum quantity or quality specified, or it may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for the context of the requirements. Refer instances of uncertainty to the Project Manager/Architect for a decision before proceeding.

F. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.

G. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

1.6 GOVERNING REGULATIONS/AUTHORITIES

A. The Project Manager/Architect has contacted authorities having jurisdiction where necessary to obtain information necessary for the preparation of Contract Documents; that information may or may not be of significance to the Contractor. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.

Copies of Regulations: Obtain copies of applicable regulations and retain at the Project Site, available for reference by parties who have a reasonable need for such reference.

1.7 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 60 00 - MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

B. Schedule of Submittals is included under Section 0133 00, "Submittals."

C. Standards: Refer to Section 01 42 00, "Definitions and Standards" for applicability of industry standards to products specified.

D. Administrative procedures for handling requests for substitutions made after award of the Contract are included under Section 01 25 13, "Product Substitutions."

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

a. "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.

2. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

3. "Equipment", is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.4 DESCRIPTION

A. Material and equipment incorporated in the Work shall be:

1. New, unless otherwise specified.

2. In a condition acceptable to the Owner and the Project Manager/Architect.

3. Suitable for the use intended.

4. In conformance with EPA codes and regulations and applicable air quality control district.

B. No material or equipment shall be used for any purpose other than that for which it is designed or specified.

C. No material shall contain asbestos.

D. No materials or products shall contain formaldehyde in excess of the amount recommended by the State of California Department of Health Services (DOHS).

1.5 TRANSPORTATION AND HANDLING

A. Deliver manufactured products in the manufacturer's original, unbroken containers or packaging, with identifying labels intact and legible.

B. Immediately on delivery, inspect shipments to assure compliance with the requirements of the Contract Documents and reviewed submittals, and to verify that products are properly protected and undamaged.

C. Handle products in a manner to avoid soiling and damaging the products and their packaging.

D. Promptly remove damaged and defective products from the site, and replace at no increase in Contract Sum.

1.6 STORAGE

A. Store manufactured products in accordance with the manufacturers' printed instructions, with seals and labels intact and legible.

1. Store products subject to damage by the elements in weather tight enclosures.

2. Maintain temperature and humidity within the ranges specified by the manufacturers.

B. Exterior Storage:

1. Store fabricated products above the ground, on blocking or skids, to prevent soiling and staining.

2. Cover products which are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.

3. Store loose granular material in a well-drained area on solid surfaces to prevent mixing with foreign matter.

C. Arrange storage to facilitate inspection.

D. Periodically inspect stored products to assure that products are maintained under specified conditions and free from damage and deterioration.

E. Protection After Installation:

1. Provide substantial coverings as necessary to protect installed products from damage from traffic and construction operations. Remove coverings when no longer needed.

2. Maintain temperature and humidity conditions for interior equipment and finish products in accordance with the manufacturers' printed instructions.

1.7 PRODUCT OPTIONS

A. For products indicated or specified only by reference standard, select any product meeting such standard.

B. For products indicated or specified by naming several products or manufacturers, select any one of the products or manufacturers named which complies with the specified requirements.

C. For products indicated or specified by naming only one product and manufacturer, there is no option.

D. Products not meeting the criteria hereinabove, shall be considered Substitutions, and shall be submitted as specified under "Substitution Procedure" Section 01630.

E. "Or accepted equal" means a product accepted by the Project Manager/ Engineer for use in the Work as being equivalent in essential attributes to the product indicated or specified in the Contract Documents. Reference product substitution procedure Section 01630.

1.8 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.

B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface, which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:

   a. Name of product and manufacturer

   b. Model and serial number

   c. Capacity

   d. Speed

   e. Ratings

1.9 SUBSTITUTION PROCEDURE

A. Substitute Products: When the naming of one or more products is followed by "or accepted equal," a substitute product may be offered for consideration. A substitute product is a product other than those specified.

1. Submit offer of substitute product with Bid as an Alternate to Base Bid. List on an Alternate Proposal Sheet; show amount Base Bid will be decreased or increased if alternate is accepted.

2. If informed that a substitution is being considered, drawings, specifications, tests, performance data, and other pertinent information required to substantiate the equality of each substitute product.

OR

3. For a period 30 days after the execution of the Agreement, other products may be proposed in lieu of products identified in the Contract Documents.
4. After such time other products may be proposed only if a product indicated or specified can be proved to have subsequently become unavailable.

5. Whenever a product is identified in the Contract Documents by reference to manufacturer's name, trade name, catalog number, or the like, it is so identified for the purpose of establishing a standard, and products of other manufacturers may be equally acceptable, provided the proposed products are, in the opinion of the Project Manager/Architect, of equal quality, utility, and appearance.

6. In requesting acceptance of a product other than that identified in the Contract Documents, the Contractor represents that he:

   a. Has investigated the proposed product and determined that it is equal to or superior in all respects to that indicated or specified.
   b. Will furnish the same guarantees/warranties or bonds for the proposed product as for the product indicated or specified.

c. Will coordinate the installation of the proposed product into the Work, and make such other changes as required to make the Work complete and in compliance with the Contract Documents and applicable regulatory requirements.

d. Waives claims for additional costs associated with the proposed product that may subsequently become apparent.

B. Request for acceptance of a product other than that indicated or specified in the Contract Documents shall be submitted ((to the Owner and)) the Project Manager/Architect in written form and accompanied by sufficient information to enable proper evaluation to be made. Only one product may be proposed for a product identified in the Contract Documents. Submit with request:

1. Complete technical data, including drawings, performance specifications, cost data, samples, and test reports of the product proposed. Submit additional information, if required by the Project Manager/Architect.

2. Data similar to that specified for the item for which the product is proposed.

3. Effect on the construction schedule.

4. Complete breakdown of costs indicating the amount to be deducted from the Contract Sum if the proposed product is accepted.

5. Signed statement that the proposed product is in full compliance with the Contract Documents and applicable regulatory requirements.

6. List of other Work, if any, which may be affected by the proposed product. Be responsible for the effect of a proposed product upon related Work in the Project, and pay the additional costs generated by the product if it is accepted, including the cost of the Project Manager/Architect's additional services associated therewith.

7. Information on availability of maintenance service, and source of replacement materials.

8. Sample of manufacturer's standard form of guarantee or warranty for proposed product.

C. The Project Manager/Architect will review requests for proposed products with reasonable promptness and notify the Contractor, in writing, of his decision to accept or reject such products.

D. The Project Manager/Architect at his/her sole discretion will determine the acceptability of proposed products, and his determination shall be final.

E. Project Manager/Architect's Action: No consideration will be given to a substitute product unless, in the Project Manager/Architect's judgment, it complies with the following conditions.

1. It is equal in quality and serviceability.

2. Its use does not entail changes in details or related construction.

3. It is acceptable in regards to design and artistic effect.

4. There is cost, time, or both, advantage to Owner.

F. Notification: Written notification of decision will be given within a reasonable time after receiving the required technical data. Acceptable substitutions will be processed as Change Orders.

G. Acceptance of a product shall not relieve the Contractor from responsibility for the proper execution of the Work and any other requirements of the Contract Documents.

H. If a proposed product is not accepted, use the product originally specified or indicated.

I. No products other than those indicated or specified in the Contract Documents shall be purchased or incorporated in the Work without the Project Manager/Architect's prior written acceptance.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents that are undamaged and unused at the time of installation.

1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.

2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience.

1. Visual Matching: Where Specifications require matching an established Sample, the Project Manager/Architect's decision will be final on whether a proposed product matches satisfactorily.

a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for noncompliance with specified requirements.

2. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Project Manager/Architect will select the color, pattern and texture from the product line selected.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION

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SECTION 01 73 29 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This SECTION describes the requirements for performing cutting and patching; patching includes the insertion or projection of other products in or from a surface.

1.2 QUALITY ASSURANCE

A. Design Criteria:

1. Patching shall achieve security, strength, and weather protection, as applicable, and shall preserve continuity of existing fire ratings.

2. Patching shall successfully duplicate undisturbed adjacent finishes, colors, textures, and profiles. Where there is dispute as to whether duplication is successful or has been achieved to a reasonable degree, the Designer's judgment shall be final.

1.3 COORDINATION AND PROTECTION

A. Protect from damage all portions of the Work or work of the Owner or separate contractors adjacent to cutting or patching operations, including excavation.

B. Obtain written permission prior to commencing cutting, patching or excavation operations on the work of the Owner or any separate contractors.

C. Protect adjacent occupied spaces from damage during concrete cutting and coring.

D. Security of facility to be maintained at all times.

E. When requested in writing, allow the Owner or any separate contractor to perform reasonable cutting, patching or excavation operation on the Work.

1.4 SUBMITTALS

A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.

2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.

3. List products to be used and firms or entities that will perform Work.

4. Indicate dates when cutting and patching is to be performed.

5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.

6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.

7. Approval by the Designer to proceed with cutting and patching does not waive the Designer's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials shall be as specified in the applicable, individual SECTIONS of the Specifications and as required to match existing construction. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 GENERAL

A. Perform cutting associated structural reinforcing, and patching in a manner to prevent damage to other Work and to provide proper surfaces for the installation of materials, equipment, and repairs.

B. Do not cut or alter structural members without prior consultation with the Project Manager.

C. Wherever practicable, employ original installer or fabricator providing Work under this Contract to perform cutting and patching for new:

1. Weather-exposed and moisture-resistant products.

2. Fireproofing.

3. Finished surfaces exposed to view.

D. Adjust and fit products to provide a neat installation.

E. Finish or refinish, as required, cut and patched surfaces to match adjacent finishes. Paint over complete surface plane, unless otherwise indicated. Over patched wall or ceiling surfaces, paint to nearest cutoff line for entire surface, such as intersection with adjacent

wall or ceiling, beam, pilasters or to nearest opening frame, unless otherwise indicated. Painted surfaces shall not present a spotty, touched-up appearance.

3.2 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

1. Before proceeding, meet at the 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.

3.3 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.4 PERFORMANCE

A. 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 existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

3. Cut through concrete and masonry using a cutting machine such as a

Carborundum saw or diamond core drill.

4. Comply with requirements of applicable Sections of Division-2 where cutting and patching requires excavating and backfilling.

5. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.

c. a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken area containing the patch, after the patched area has received primer and second coat.

4. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.5 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION

SECTION 01 77 00 - CONTRACT CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This SECTION describes the requirements for Contract closeout, including provisions for final cleaning, project record documents, operating and maintenance data, instruction of Owner's personnel, guarantees/warranties and bonds, service and maintenance contracts, preparation for final inspection, restoration of damaged Work, remedial Work, and extra materials.

1.2 RELATED REQUIREMENTS

A. Documents 00 72 00/General Conditions of the Contract for Construction and 00 73 00/ Supplementary Conditions including all fiscal provisions, legal submittals and other administrative requirements.

B. Section 01 11 00/ Summary.

C. Section 01 31 00 Project Management and Coordination.

D. Section 01 33 00/ Submittal Procedures.

E. Section 01 51 00/ Temporary Facilities and Controls.

F. Section 01 71 23/ Field Engineering.

G. Any other applicable Section containing Closeout provisions and Commissioning.

1.3 CLOSEOUT PROCEDURES

A. Comply with procedures stated in Document 00 72 00/ General Conditions of the Contract for Construction, Article 9/ Payments and Completion for final inspection, Completion of the Work, Acceptance of the Work payment and retention procedures.

B. Contractor shall start developing and completing punch list items a minimum of 45 calendar days prior to the end of the Contract Time as specified Document 00 73 00/ Supplementary Conditions, Article 1.3, Time of Completion and Section 01 33 00/ Submittal Procedures.

C. When Contractor considers the Work complete, the Contractor shall request, in writing, a final inspection to be conducted by the Owner Project Manager. The Owner Project Manager shall conduct a final inspection within 14 days of receipt of the written request. Prior to requesting a final inspection, the Contractor shall have the entire Work completed in accordance with all Contract Requirements, including, but not limited to, all punch list items, and submittal of all documents and products listed in this section and other sections of the Project Manual. It is recommended that the Contractor request the final inspection as early as possible, and prior to the end of Contract Time, to allow for completion of punch list items discovered to be incomplete during the final inspection and for a final re-inspection, to avoid assessment of liquidated damages.

D. The date of Completion of the Work and Acceptance of the Work will be determined as specified in Document 00 72 00, Article 9, Payments and Completion.

E. Final cleaning shall be completed prior to occupancy or requesting a final inspection, whichever comes first. Refer to Section 01 74 23, Cleaning.

1.4 FINAL CLEANING

A. Comply with applicable regulatory requirements during the conduct of cleaning and disposal operations. Special cleaning requirements for specific elements of the Work are included in appropriate Sections of Division 2 through 33.

B. Use cleaning materials that will not create hazards to health or property or cause damage to products or Work. Conduct cleaning and waste disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.

1. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.

2. Burning or burying of debris, rubbish or other waste material on the premises will not be permitted.

C. Use cleaning materials and methods recommended by the manufacturers of the products to be cleaned.

D. Schedule operations to prevent dust and other contaminants resulting from cleaning operations from adhering to wet or newly finished surfaces.

E. Perform the following cleaning operations as applicable to the Work of this Contract:

1. Remove dust, dirt, grease, stains, fingerprints, labels, spilled and spattered, and other foreign materials from interior and exterior surfaces exposed to view.

2. Wash and shine glazing and mirrors.

3. Polish glossy surfaces to a clear shine.

4. Ventilating Systems:

a. Clean permanent filters and replace disposable filters of units operated during construction.

b. Clean ducts, blowers, and coils if units were operated without filters during construction.

5. Vacuum and wipe insides of electrical panels and cabinetwork.

6. Broom-clean interior spaces.

7. Rake clean ground surfaces.

8. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.

9. Remove labels that are not permanent labels.

10. 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 show evidence or repair or restoration. Do not paint over "UL" and similar labels, including mechanical and electrical name places.

11. Wipe surfaces of mechanical and electrical equipment, elevator equipment and similar equipment. Remove excess lubrication, paint and mortar droppings and other foreign substances.

1.5 PROJECT RECORD DOCUMENTS

A. Maintenance of Documents and Samples:

1. Store Project record documents and samples in field office apart from documents used for construction.

2. Maintain Project record documents in a clean, dry, legible condition and in good order.

3. Do not use Project record documents for construction.

B. Recording:

1. Record information carefully and neatly, with felt-tip pens, in color code designated, and in the manner approved in advance by the Designer.

2. Label each document "PROJECT RECORD" in large, neat, printed letters.

C. Record Drawings:

1. Record the following kinds of information on prints:

a. Changes made by Change Orders and other modifications described in the GENERAL CONDITIONS.

b. Locations of significant Work concealed inside the building whose general locations have been changed from those shown on the Contract Documents.

c. Locations of items, not necessarily concealed, which have been changed, with the Designer's prior acceptance, from the locations shown on the Contract Documents.

d. Revisions to routing of piping and conduit.

e. Revisions to electrical circuitry.

f. Actual equipment locations.

g. Duct size and routing.

h. In addition to the previously specified requirements for record drawings:

1. Keep up to date during the entire progress of the Work, and make available to the Designer and the Project Manager at any time.

2. Furnish additional drawings as necessary for clarification.

3. Record deviations from the sizes, locations, and other features of installations shown in the Contract Documents.

4. Establish locations of underground Work by dimensions to column lines or walls, locating turns, and by referenced centerline or invert elevations and rates of fall.

5. Give sufficient information to locate Work concealed in the building.

6. Drawing to Scale:

(a) Locate main runs of piping, conduit, ductwork, and similar items by dimensions.

(b) Locate other items either by dimensions or in relation to spaces within the building.

2. Furnish reproducible record drawings, made from final Shop Drawings which have been updated to show actual conditions, for Work specified in the individual Specification SECTIONS.

3. Mark completely and accurately record prints of Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions. Where Shop Drawings are marked, show cross-reference on Contract Drawing location.

4. Mark record sets with red non-erasable colored pencil/pen; use other colors to distinguish between changes for different categories of the Work at the same location.

5. Note Change Order numbers, Work Authorization numbers, and similar identification.

6. Responsibility for Mark-up: Where feasible, the individual or entity who obtained record data, whether the individual or entity is the installer, subcontractor, or similar entity, is required to prepare the mark-up on record Drawings.

   a. Accurately record information in an understandable Drawing technique.

   b. Record data as soon as possible after it has been obtained. In the case of concealed installation, record and check the mark-up prior to concealment.

D. "As-Built" Drawings:

1. At time of acceptance of the Work and prior to final payment, using the record drawings for reference, prepare electronic "As-Built" drawings using AutoCAD 2007 plan backgrounds furnished by Designer.

2. Employ and pay a professional draftsman to prepare the "As-Built" drawings from the record drawings, using AutoCAD 2007 or newer, saving the final .dwg files to 2007 release format.

3. After completing the preparation of electronic record drawings, print one full-size format image in Adobe Acrobat PDF file format of each Drawing, files shall be named to match the drawing sheet number as represented in the original Contract Documents set. Files shall be arranged in separate folders by discipline and shall be burned onto DVD or CD media. AutoCAD files shall be placed in separate folders from Adobe Acrobat PDF files. Each disc shall be clearly labeled with a machine printed label or laser inscribed markings identifying the Project, contents and date of disc. Provide four (4) copies to Project Manager.

4. After completing the preparation of the Record Drawings, print on bond paper one (1) full size and three (3) half-size sets of each drawing set. Drawing sets shall be complete and include every sheet in the drawing set, whether or not changes and additional information were recorded. Organize the copies into manageable sets. Bind each set with durable paper covers sheets, with appropriate identification, including titles, dates and other information on cover sheets.

5. Organize and bind original marked-up set of prints that were maintained during the construction period in the same manner.

6. Submit the marked-up record set, data disks, and 3 copy sets to the Project Manager for Owner's records; the Designer will retain one (1) half-size set.

E. Specifications and Addenda:

1. Mark each Specification SECTION to record:

a. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually incorporated in the Work.

b. Changes made by Change Order and other modifications described in the GENERAL CONDITIONS.

c. Edit original Adobe Acrobat PDF document specification files provided by Designer; strike out materials/manufacturers not used and insert text boxes to indicate all changes. When completed with the Record Specifications, burn onto either DVD or CD media. Each disc shall be clearly labeled with a machine printed label or laser

d. Inscribed markings identifying the Project, contents and date of disc. Provide four (4) copies to Project Manager.

F. Large-Scale Coordination Drawings:

1. The preparation of large-scale, detailed coordination drawings may be required for the Work of DIVISIONS 03, 04, 05, 21, 22, 23, 26, 27, 28 and 33 of these Specifications, other Sections may also be applicable. These coordination drawings are not Shop Drawings as defined by the GENERAL CONDITIONS, but, together with Shop Drawings or coordination drawings of other affected Work, are used to check, coordinate, and integrate the various types of Work.

2. If furnished, include the coordination drawings as part of the Project record documents.

G. As-Built Construction Schedule: Using as a basis the latest, updated Progress Schedule required by SECTION 01 33 00 "SUBMITTAL PROCEDURES," prepare and transmit a Record Construction Schedule to indicate the actual dates and durations of the various construction activities.

H. Sign and date the completed Project record documents and transmit them to the Designer, who will forward them to the Owner after final acceptance of the Work.

1.6 OPERATION TESTS

A. Reference all Specification Section 01 91 00/ Commissioning and other Sections that provide for Commissioning.

B. Conduct operational tests as required to demonstrate that all systems have been completed and are in compliance with all requirements.

C. Furnish a written record of test results using recording type instruments where applicable.

1.7 OPERATING, MAINTENANCE, AND PRODUCT DATA

A. Reference all Specification Section 01 91 00/ Commissioning and other Sections that provide for Commissioning.

B. General: Where maintenance manuals, record data, and operating instructions are

required in the individual Specification SECTIONS; and manufacturers' product data, specifications, installation instructions, and maintenance instructions for products incorporated in the Work; prepare such in three-ring, durable, plastic binders sized for 8-1/2" x 11" sheets and including at least the following:

1. Identification on, or readable through, the front cover with the Project name and address and the general subject matter contained in the manual.

2. Neatly typewritten index near the front of the manual furnishing immediate information as to locations in the manual of all emergency data regarding the equipment included in the manual.

3. Complete instructions regarding operation and maintenance of the equipment included in the manual.

4. Complete nomenclature of replaceable parts, their part numbers, current cost, and name and address of nearest source of parts.

5. Copy of each guarantee/warranty and service contract issued for the equipment included in the manual.

6. Prepare and include additional data as required for the instruction of the Owner's operating and maintenance personnel.

C. Extraneous Data: Where contents of manuals include manufacturers' catalog pages, clearly indicate the items included in this installation and delete, or otherwise clearly indicate, data, which is not applicable to this installation.

D. Shop Drawings: With each copy of the manual, furnish one set of applicable reviewed Shop Drawings showing changes made during construction.

E. Number of Copies Required:

1. Transmit manuals in the quantity which is required to be returned, plus the following, unless otherwise specified, which will be retained by the Designer for forwarding to the Owner after acceptance of the Work.

   a. Four copies of Mechanical, Security, Building Management System and Electrical manuals.

   b. Two copies of all other manuals.

F. Submittal Schedule: Comply with the following schedule for submittal of operating and maintenance manuals.

1. Before submittal of Request for Final Payment, when each installation that requires submittal of operating and maintenance manuals is nominally complete, submit two copies of each manual to the Designer for review. Include a complete index or table of contents of each manual.

2. The Designer will return one copy with comments within fifteen days of receipt.

3. Submit one copy of the manuals in final form at least fifteen days before Final Inspection. This copy will be returned within fifteen days after Final Inspection, with comments.

4. After Final Inspection make corrections or modifications to comply with the Designer's comments. Submit the specified number of copies of each approved manual to the Designer within fifteen days of receipt of the Designer's comments.

1.8 INSTRUCTION OF THE OWNER'S PERSONNEL

A. Where specified in the individual Specification SECTIONS, furnish qualified personnel for on-the-job instruction of the Owner's operating and maintenance personnel.

B. Furnish instruction, including special start-ups and running time, changing from heating to cooling cycles, prior to occupancy of the building, at no additional expense to the Owner.

C. Training:

1. Schedule training to conform to personnel availability at the facility and to conclude prior to start up of system. The base duration of training shall be determined by the complexity of the system or equipment and shall be done by qualified instructors from the manufacturer or contractor.

2. As part of the operator's training, one lesson plan shall be devoted to reviewing of videotape that shall be incorporated into the training program to allow new employees to view the tape at their own convenience and be able to comprehend the system without the need for an instructor in attendance.

3. Prepare videotapes to assist maintenance personnel in trouble- shooting the systems and making routine repairs. All videotapes shall be made at the Project facility to ensure that the video portrayal is representative of the true systems.

4. In addition to written technical descriptions, the training shall lay out prescribed hands-on-training under the supervision of others who have previously completed the training program. The foregoing techniques are to be developed to produce a program that is self-perpetuating and permits a high level of operator training in the event of high turnover rates among those who are assigned to duties in maintenance.

1.9 GUARANTEES/WARRANTIES AND BONDS

A. General:

1. Manufacturers' warranties notwithstanding warrant the entire Work against defects in materials and workmanship for 24 months from the date of acceptance. Other specified warranties may call for longer warranty period and should be submitted as such.

2. Guarantee/warranty or bond Work as required in the individual Specification

SECTIONS.

3. Warranties between the Contractor and manufacturers, and the Contractor and suppliers, shall not affect guarantees/ warranties between the Contractor and the Owner.

4. The Contractor will not be held responsible for defects due to misuse, negligence, willful damage, improper maintenance, or accident caused by others, nor shall he be responsible for defective parts whose replacement is necessitated by failure of the Owner's maintenance forces to properly clean and service them, provided the Contractor has furnished complete maintenance instructions to the Owner.

5. Compile specified guarantees/warranties and bonds.

6. Co-execute as required.

7. Review guarantees/warranties and bonds to verify compliance with Contract Documents.

8. Transmit to the Designer for review. The Designer will forward guarantees/warranties and bonds to the Owner after acceptance of the Work.

B. Form of Guarantee/Warranty:

1. Submit the guarantees/warranties, typed on the Contractor's letterhead if for the entire Work, or on the Subcontractor's letterhead if for the Work of a Specification Section.

2. Provide guarantee/warranty verbiage in compliance with the standard guarantee/warranty form provided at the end of this section.

C. Submittal Requirements:

1. Time of Submittal:

a. For equipment or component parts of accepted equipment put into service for the Owner's benefit during the progress of the Work, submit guarantees/warranties within 10 days after acceptance of the Work.

b. Otherwise, submit guarantees/warranties within 10 days after date of Substantial Completion, prior to request for Final Payment.

c. For items of Work where acceptance is delayed materially beyond the date of Substantial Completion, furnish updated submittal within 10 days after such delayed acceptance, listing the date of delayed acceptance as the start of the guarantee/warranty period.

2. Form:

a. Assembled in durable, three-ring plastic binders sized for 8-1/2" x 11" sheets. Fold larger sheets to fit into binders.

b. Identification on, or readable through, the front cover with the Project name and address, the Contractor's name and address, and the title "GUARANTEES/WARRANTIES AND BONDS".

3. Number of Original Signed Copies Required: Two each.

D. Review Meeting: 11 months following date of acceptance, hold a meeting for the purpose of review of, and action upon, guarantees/ warranties, bonds, and service and maintenance contracts, as specified in SECTION 01 31 19 "PROJECT MEETINGS" for follow-up meeting.

E. WARRANTY REQUIREMENTS

1. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

2. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

3. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

4. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, right and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

a. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

5. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to counter-sign such commitments are willing to do so.

1.10 SERVICE AND MAINTENANCE CONTRACTS

A. Compile, review, and transmit specified service and maintenance contracts as specified for guarantees/warranties and bonds.

1.11 PREPARATION FOR FINAL INSPECTION

A. Perform final cleaning as specified hereinbefore.

B. Assemble guarantees/warranties, service and maintenance contracts, operating and maintenance instructions, and other items as specified, and transmit to the Designer, who will forward them to the Owner after final acceptance of the Work.

1.12 RESTORATION OF DAMAGED WORK

A. Restore or replace, as specified or determined by the Designer, material and finishes damaged from construction activities at no additional expense to the Owner.

B. Restoration shall be equal to the original Work, and finishes shall match the appearance of existing adjacent Work.

1.13 REMEDIAL WORK

A. Remedial Work necessary owing to faulty workmanship or materials shall be at no additional expense to the Owner.

B. Work shall be coordinated with the Owner and performed at such time and in such manner to cause minimal interruption and inconvenience to the Owner's operations.

1.14 SPARE PARTS and EXTRA MATERIALS

A. Where required in the individual Specification SECTIONS, furnish spare parts and extra materials in the quantities and manners specified. Prior to submitting any parts and materials submit a list of all extra parts and materials required in the specification sections.

B. Delivery and certification of such extra spare parts and materials shall be a prerequisite to Substantial Completion. Deliver to Project Manager for sign-off.

C. Package in clearly identifiable boxes.

1. Indicate manufacturer's name, part name, and stock number.

2. Indicate piece of equipment part or tool is for.

3. Indicate name, address and phone number of closest supplier.

1.15 MISCELLANEOUS RECORD SUBMITTALS

A. Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Immediately prior to Final Acceptance, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the Project Manager for the Owner's records.

1.14 WARRANTY BOND

A. Prior to Final Payment, Contractor shall post a one-year Warranty Bond in the amount of 10% of the Final Contract Price.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION
NOTE: GUARANTEE/WARRANTY FORM FOLLOWS

GUARANTEE/WARRANTY.

_____ (Contractor) hereby unconditionally guarantees that the

_____Work described in SECTIONS _____performed pursuant to the **Butte Regional Transit Operations Center Tenant Improvement** has been done in accordance with the requirements of the Contract Documents and further guarantees the Work of the contract to be and remain free of defects in workmanship and materials for a period of _____ year(s) from the date of recordation of a Notice of Completion, Notice of Cessation, or actual cessation of Work, whichever is longer. The Contractor hereby agrees to repair or replace any and all Work, together with any adjacent Work which may have been damaged or displaced in so doing, that may prove to be defective in its workmanship or material within the guarantee period specified, without any expense whatsoever to Solano Owner; ordinary wear and tear, and unusual abuse and neglect only excepted. The Contractor has provided Contract bonds which will remain in full force and effect during the guarantee period.

The Contractor agrees that within ten (10) calendar days after being notified in writing by Solano Owner of any Work not in accordance with the requirements of the Contract or any defects in the Work, he will commence and prosecute with due diligence all Work necessary to fulfill the terms of this guarantee, and to complete the Work within a reasonable period of time. In the event he/she fails to so comply, he/she does hereby authorize Solano Owner to proceed to have such Work done at the Contractor's expense and he/she will pay the cost thereof upon demand. The Owner shall be entitled to all costs, including reasonable attorney fees, necessarily incurred upon the Contractor's refusal to pay the above costs.

Notwithstanding the foregoing paragraph, in the event of an emergency constituting an immediate hazard to the health or safety of the employees or property of Solano Owner, the Owner may undertake at the Contractor's expense without prior notice, all Work necessary to correct such hazardous condition when it was proven to be defective in its workmanship or materials, and to charge the same to the Contractor as specified in the preceding paragraph.

The guarantee set forth herein is not intended by the parties, nor shall it be construed, as in any way limiting or reducing Solano Owner’s rights to enforce all terms of the Contract Documents referenced hereinabove or the time for enforcement thereof. This guarantee is in addition to, and not in lieu of, the Owner's rights on all other guarantees and warranties required by the Contract Documents.

Subcontractor Signature	Address, License Number	Date
Countersigned By General Contractor	Address, License Number	Date

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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

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 facilities 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

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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:

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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:

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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:

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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
(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:

SECTION 02 41 19 - SELECTIVE DEMOLITION

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. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.
1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for noise control. Indicate proposed locations and construction of barriers.

B. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

1.7 FIELD CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
1. Before selective demolition, Owner will remove the following items:
a. Insert items to be removed by Owner.

B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Storage or sale of removed items or materials on-site is not permitted.

D. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Survey of Existing Conditions: Record existing conditions by use of measured drawings.
1. Comply with requirements specified in Division 01"Photographic Documentation."

2. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 1.

3.3 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly. Comply with requirements in Section 01 74 19 "Construction Waste Management and Disposal."

B. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Architect's approval.

C. Removed and Salvaged Items:
1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.4 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Division 01"Construction Waste Management and Disposal."

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

SECTION 03 10 00 CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes
   1. Formwork for cast-in-place concrete with shoring, bracing, and anchorage.
   2. Openings for other Work.
   3. Form accessories, sealers, and release agents.
   4. Form stripping.

B. Related Sections
   1. Section 03 20 00 - Concrete Reinforcing.
   2. Section 03 30 00 - Cast-In-Place Concrete.

1.2 REFERENCE

A. ACI 318-11 - Building Code Requirements for Reinforced Concrete.

B. ACI 347R - Guide to Formwork for Concrete.

C. AISC - Manual of Steel Construction 14th Edition.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 00.

B. Product Data
   1. Product data for products and materials indicated.
   2. Manufacturer’s technical bulletins and installation/application instructions.
   3. Material Safety Data Sheets (MSDS).

1.4 COORDINATION

A. Coordinate the design, construction and installation of concrete formwork with the requirements for openings, sleeves, chases, reglets, pipes, recesses, nailers, anchors, ties, inserts and other embedded items required by other Sections.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store products subject to damage by dirt and moisture in a clean, dry location, off the ground and suitably protected.

PART 2 PRODUCTS

2.1 MATERIALS

A. Form materials shall be new and undamaged at start of the Work.

B. Use flexible spring-steel forms or laminated boards to form radius bends.

C. Form Lumber: Douglas Fir, Construction Grade, No. 2 or better, S1S2E.

D. Plywood: Five-ply, 3/4 inch thick, APA B-B Plyform, Class I, Exterior Type with mill-oiling treatment omitted.

2.2 EARTH FORMS

A. Where approved, vertical excavated surfaces may be used for forms for slabs on grade and grade beams, provided that the earth will stand without caving and that suitable provisions are taken to prevent raveling of top edges or sloughing of loose materials from the walls of the excavation.

B. Where earth forms are permitted, clear dimensions as indicated shall be maintained and any over-excavation shall be filled monolithically with concrete.

C. Construct wood edge strips at top sides of excavations.

2.3 ACCESSORIES

A. Accessories which will be wholly or partially embedded in concrete, such as ties and hangers, shall be a commercially manufactured type, of metal; wire will not be acceptable.

B. The portion remaining in the concrete shall leave no metal within 1 inch of concrete face and no fractures, spalls, depressions, or other surface disfigurations greater than 3/4 inch in diameter.

C. Spreader cones on ties shall not exceed 1 inch in diameter.

2.4 FINISHES

A. Form Sealer: Type to eliminate grain raise as a result of moisture and shall not interfere with color, bond, or subsequent treatment of concrete surface.
   1. Manufacturers
      a. W.R. Meadows; Duogard II = Water-based form release agent.
      b. BASF Construction Chemicals.; Cast-off: Nonstaining form-release agent.
      c. EDOCO/Burke; “Form Sealer” (also known as “Kwik Koat Form Coating”).

B. Form Release Agent
   1. For Exposed Concrete to Receive Paint or Other Coatings: Chemically active type producing water-insoluble soaps. Release agents shall contain no petroleum solvents such as creosote, paraffin, wax or diesel oils.
   2. Unexposed Concrete: Any type that will not interfere with bond of applied finishes.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive the Work. Notify the Architect, in writing, of any conditions requiring corrective action.

B. If unsatisfactory conditions exist, do not commence the installation until such conditions have been corrected. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Whenever concrete bases or foundations are to be provided for equipment provided as part of the Work of other Sections, verify dimensions for the equipment to be provided before concrete is placed.

B. Coordinate locations of openings, sleeves, chases, reglets, pipes, recesses, nailers, anchors, ties, inserts and other embedded items.

3.3 INSTALLATION

A. All cast-in-place concrete shall be contained by constructed forms or stable earth forms.

B. Design, construct, and brace formwork and temporary falsework to safely support concrete and safely hold personnel during construction operations.

C. Construct forms of sufficient strength and rigidity to produce finished concrete of the precise size, shape, and location indicated, within the specified tolerances. Form assembly shall permit removal in proper sequence without damage to concrete.

D. Arrange forms to permit single placement of exposed areas and panels without joints between adjacent forming materials in the same plane.

E. Construct forms for architectural concrete full height and width between construction joints in concrete surface.

F. Construct forms no higher than 12 inches above the top of a placement or construction joint.

G. Construction Joints
   1. Form in accordance with requirements of Section 03 30 00.
   2. Provide a surfaced strip where construction joints intersect exposed surfaces; faces to provide straight lines at joints. Prior to subsequent placement, remove strip and tighten forms.
   3. Construction joints shall show no overlapping or offsetting of concrete surfaces and shall, as closely as possible, present the same appearance as butted plywood joints.
   4. Joints in a continuous line shall be straight and true.

H. Provide cleanouts as required to permit inspection and thorough cleaning of loose dirt, debris, and waste material. Cleanouts shall not be apparent on concrete surfaces exposed to view in the finished Work.

I. Chamfered Corners
   1. Chamfer exposed corners unless otherwise indicated.
   2. Obtain chamfers by placing 3/4 x 3/4-inch nonstaining moldings in forms. Provide pieces in longest lengths possible and miter joints.

J. For surfaces exposed to view in the finished Work, forms shall be constructed of plywood.

K. For surfaces not exposed to view in the finished Work, forms shall be lumber, form plywood, or any other suitable material.

L. Formwork shall be clean and free of debris when concrete is placed.

M. Forms shall be sufficiently tight to prevent leakage of water and mortar.

N. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only.

O. Locate temporary openings on forms at inconspicuous locations.

P. Provide openings in formwork to accommodate the Work of other Sections. Accurately place and securely support items built into forms.

3.4 FINISHES

A. Treat contact surface of plywood and lumber forms with a form sealer in accordance with the manufacturer's printed instructions.

B. Clean surfaces and reseal before each use to ensure undamaged concrete.

C. Do not use form oil.

3.5 TOLERANCES

A. Construct formwork to tolerances specified in ACI 347, except that anchor bolt setting tolerances shall be in accordance with AISC Code of Standard Practice, Section 7.5.

B. Where tighter tolerances are required to accommodate detention equipment or other items specified in other Sections, construct formwork to the most restrictive tolerance.

3.6 STRIPPING OF FORMS

A. Strip forms using methods which will not damage concrete.

B. Do not remove forms until concrete has attained sufficient strength to support its own weight and construction live loads to be placed thereon without damage to the structure, but not before minimum time as follows:
1. Walls: Two days.
2. Side Forms of Footings, Curbs, Walks, and Paving: 24 hours.
3. Columns: Seven days.
4. Soffits and Side Forms of Beams and Slabs: 10 days.
5. Shoring: 21 days.

3.7 RESHORING

A. Submit reshoring plan to the Architect if forms are to be stripped earlier than specified above.

3.8 RE-USE OF FORMS

A. Re-use of forming materials shall be subject to the approval of the Architect, provided the material is structurally sound, free of defects and blemishes. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. In no case shall forming materials be used more than four times.

B. Clean and repair surfaces of forms to be reused in the Work. Apply new form coating compound as specified for new formwork.

C. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use “patched” forms for exposed concrete surfaces.

END OF SECTION

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SECTION 03 20 00 CONCRETE REINFORCING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Reinforcing steel bars, wire fabric, and accessories for concrete and unit masonry.
B. Related Sections
   1. Section 03 10 00 - Concrete Forming and Accessories.
   2. Section 03 30 00 Cast in Place Concrete.
   3. Section 03 30 50 - Concrete Testing and Inspection.

1.2 REFERENCES

A. ACI 301 Specifications for Structural Concrete.

B. ACI 315 - Details and Detailing of Concrete Reinforcement.

C. ACI 318-11 Building Code Requirements for Reinforced Concrete.

D. ASTM A82 Steel Wire, Plain, for Concrete Reinforcement.

E. ASTM A185 - Steel Welded Wire Reinforcement, Plain, for Concrete.

F. ASTM A615 Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

G. ASTM A706 Low Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

H. CRSI - Manual of Standard Practice, Latest Edition.

I. CRSI - Placing Reinforcing Bars, Latest Edition.

J. WWR-500 - Structural Welded Wire Reinforcement Manual of Standard Practice.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 00 and 01 33 23.
B. Shop Drawings
   1. Detail reinforcement in accordance with ACI 315.
   2. Indicate bending and placing details of reinforcement; bar sizes, spacings, locations, and quantities of reinforcing steel and wire fabric; bending and cutting schedules; supporting and spacing devices.

C. Product Data
   1. Product data for products and materials indicated.
   2. Manufacturer’s technical bulletins and installation/application instructions.
   3. Material Safety Data Sheets (MSDS).

D. Certificates
   1. Welding Certificates: In conformance with AWS D1.4.
   2. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
   3. Mill Test Report: Certified copies of reinforcement materials analysis.

1.4 COORDINATION

A. Coordinate reinforcement with placement of formwork, anchor bolt locations, anchors, inserts, conduit, sleeves, and other items required to be cast in concrete. Ensure reinforcement will not interfere with the placement of such items, formed openings, and other Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Reinforcing steel shall be delivered from the mill in securely tied bundles, each bundle limited to one size and grade of material. Plastic or metal tags in an exposed position on each bundle shall identify the mill, the melt or heat number, and the grade and size of material. Identification of steel shall be maintained after bundles are broken.

B. After fabrication, reinforcing steel shall be bundled and tagged for identification at the site. Tags shall identify the steel by the reinforcement item marking indicated on the approved shop drawings and the quantity of such items contained in the bundle.

C. Segregate to maintain identification after bundles are broken.

D. Store off the ground, protected from the elements and contaminants which could adversely affect bond.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reinforcing Steel
   1. ASTM A615, Grade 60 deformed billet steel bars, plain finish, unless otherwise indicated.

B. Welded Wire Reinforcement: ASTM A185 Plain Type. Provide in flat mats, rolls are not acceptable.

2.2 ACCESSORIES

A. Wire for Ties, Stirrups, and Spiral Reinforcement: ASTM A82, minimum 16 gauge.

B. Splice Sleeves: Steel splice sleeves conforming to requirements of ACI 318 and CBC, Chapter 19 for mechanically spliced reinforcing. Each splice sleeve shall be identified with the size, type, and manufacturer's identification imprinted on the sleeve.
   1. Manufacturers
      a. Splice Sleeve North America; NMB Splice Sleeve.
      b. Erico Products, Inc.; Lenton Interlock Rebar Splicing System.
      c. Dayton/Richmond; US/MC - SAE Coupler Splice System.

C. Chairs, Bolsters, Spacers, Bar Supports, and Other Accessories

1. Conform to requirements of ACI 315; size and shape for strength and support of reinforcement during concrete placement conditions.
2. Where portion of accessories will be within 1/2 inch of concrete surfaces exposed to the weather in the finished Work, such accessories shall be made of stainless steel.
3. Use wire bar type support complying with CRSI recommendations, unless otherwise indicated.
4. For slabs on grade, use supports with sand plates or horizontal runners where wetted base materials will not support chair legs.
5. For exposed to view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are hot dip galvanized, or plastic or stainless steel protected.
6. Over vapor barriers or waterproof membranes use load-bearing bottom pads or precast concrete chairs to prevent penetration of the membrane.

2.3 FABRICATION

A. Fabrication of reinforcement items shall proceed only after approval of bar lists and shop drawings. Each unit of reinforcement shall be fabricated in accordance with the approved bar lists and shop drawings.

B. Reinforcing steel shall be bent cold and shall not be straightened or rebent in a manner that will damage the material.

C. Fabricate reinforcing in accordance with ACI 318 and CBC, Chapter 19.

D. Locate reinforcing splices in accordance with approved shop drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive the Work. Notify the Architect, in writing, of any conditions requiring corrective action.

B. If unsatisfactory conditions exist, do not commence the installation until such conditions have been corrected. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Reinforcement shall be supported and fastened together to prevent displacement by construction loads or by the placement of concrete, beyond the tolerances specified in ACI 301. Sizes and dimensions of supports shall be as required to position the steel as indicated on the Drawings, the approved shop drawings, and in accordance with the minimum concrete protective covering requirements of ACI 301.

B. Provide reinforcing bars full length, to the extent practicable.

C. Splices in Reinforcing Bars

1. Splices will be permitted only where indicated on the Contract Documents, the approved shop drawings, or as otherwise approved by the Architect.
2. Lapped ends of bars may be placed in contact and securely wired or may be separated sufficiently to permit the embedment of the entire surface of each bar in concrete.
3. Lap bars as indicated, but no less than 24 inches.
4. Stagger splices in adjacent bars.
5. Sleeved Splices: Install splice sleeves in accordance with manufacturer's instructions; permitted only where indicated.

D. Lap welded wire fabric reinforcement 12 inches at edges, unless otherwise indicated, and wire together.

E. Obstructions: Should conduit, pipes, inserts, sleeves, or other items interfere with the placement of reinforcement, notify the Architect and obtain approval of procedure before placement of concrete is started.

F. Do not displace or damage vapor barrier.

G. Accommodate placement of formed openings.

H. Dowels shall be tied securely in place before concrete is deposited. Bending of dowels subsequent to concrete placement is not permitted.

3.3 TOLERANCES

A. Reinforcement shall be placed within tolerances specified in ACI 301.

3.4 TESTING AND INSPECTION

A. Testing and inspection shall be in accordance with Section 03 30 50.

B. Obtain inspection and approval of reinforcing before concrete is placed.

3.5 CLEANING

A. At time of concrete placement, reinforcement shall be free of coatings that could adversely affect the bond with concrete.

3.6 REPAIR AND ADJUSTMENT

A. Misplaced bars shall not be bent.

3.7 DEFECTIVE WORK

A. If reinforcing bars are found to be misplaced after concrete has been placed, immediately notify the Architect and make no correction or cutting without the Architect review and recommendations.

B. Required repair or replacement of misplaced reinforcement will be determined by the Architect.

C. Misplaced reinforcement shall be repaired or replaced as recommended by the Architect at no additional expense to Owner.

3.8 PROTECTION

A. Dowels extended for future construction as shown on the Contract Documents shall be protected from weather exposure.

B. Continuously inspect and maintain reinforcement in proper position during concrete operations.

END OF SECTION

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SECTION 03 30 00 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes
   1. Structural concrete for building and structural elements, concrete floors (supported and unsupported), and exterior concrete flatwork.
   2. Expansion and contraction joint devices associated with concrete Work.
   3. Equipment pads, light pole bases, flagpole bases, foundations, and drilled piers.

B. Related Sections
   1. Section 03 10 00 - Concrete Forming and Accessories.
   2. Section 03 20 00 - Concrete Reinforcing.
   3. Section 03 30 50 - Concrete Testing and Inspection.

1.2 REFERENCES

A. ACI 117 - Tolerances for Concrete Construction and Materials.

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.

C. ACI 301 - Specifications for Structural Concrete.

D. ACI 302.1R - Guide for Concrete Floor and Slab Construction.

E. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.

F. ACI 305R - Hot Weather Concreting.

G. ACI 306.1 - Cold Weather Concreting.

H. ACI 308.1 - Curing Concrete.

I. ACI 318-11 - Building Code Requirements for Structural Concrete and Commentary.

J. ACI 350 - Code Requirements for Environmental Engineering Concrete Structures.

K. ACI SP-66 - ACI Detailing Manual.

L. AISC - Manual of Steel Construction 14th Edition.

M. ASTM C33 - Concrete Aggregates.

N. ASTM C39 - Test Method for Compressive Strength of Cylindrical Concrete Specimens.

O. ASTM C94 - Ready-Mixed Concrete.

P. ASTM C150 - Portland Cement.

Q. ASTM C171 - Sheet Materials for Curing Concrete.

R. ASTM C192 - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.

S. ASTM C260 - Air-Entraining Admixtures for Concrete.

T. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

U. ASTM C494 - Chemical Admixtures for Concrete.

V. ASTM C618 - Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

W. ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous Type). Filler Not Exposed to Traffic or Weather.

X. ASTM C1107 - Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

Y. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

Z. ASTM D1752 - Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

AA. ASTM D6690 - Joint and Crack Sealants, Hot Applied, for Concrete and Pavements.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 00

B. Shop Drawings: Indicate locations and details of proposed construction and control joints.

C. Product Data
1. Product data for products and materials indicated.
2. Manufacturer’s technical bulletins and installation/application instructions.
3. Material Safety Data Sheets (MSDS).

D. Samples
1. Submit two, 6-inch long samples of expansion/contraction joint and control joint.

E. Certificates
1. Manufacturer’s Certificate: Certify that products meet or exceed specified requirements.

F. Mix Designs
1. Submit separate mix design for each type of concrete specified.
2. Submit test results on three cylinders for each mix design.
   a. Prepare, age, and cure in accordance with ASTM C192.
   b. Test at seven and 28 days in accordance with ASTM C39.
   c. The test cylinders shall have been prepared from a batch of the proposed mix design.
   d. Where the 28-day tests do not meet specified strength requirements, the mix design will not be acceptable.

G. Concrete Placement Checklist: When required by the Architect, provide checklist in a form approved by the Architect. Checklist to indicate items of Work that must be signed by the Contractor and the Architect prior to placement of concrete.

1.4 COORDINATION

A. Coordinate the installation of items to be embedded in concrete and provide openings in the concrete necessary for performance of Work of other Sections.

B. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

C. Request schedules of items specified under other Sections, but installed under this Section, in addition to templates, template dimensions, and shop drawings required for the installation of those items.

D. Coordinate finish characteristics required by Work of other Sections with curing methods and finishing of concrete surfaces.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle packaged materials in the manufacturer's original, sealed containers, each clearly identified with the manufacturer's name, and name and type of product.

B. Store materials subject to damage by dirt and moisture in a clean, dry location, off the ground, and suitably protected.

C. Store coarse and fine aggregates in separate, covered bins.

D. Store bulk cement in covered bins.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cement: ASTM C150.
   1. Type II, or Type V may be used if type is not indicated on Drawings.
   2. Type V required at all foundations, retaining walls, fence post footings, and any other concrete in contact with soil.

B. Fly Ash: ASTM C618

C. Aggregate: ASTM C33.
   1. Aggregate size shall be 1 inch maximum, unless noted otherwise.
   2. All aggregate shall be of a type producing low shrinkage.
   3. Coarse Aggregate: Granite, limestone, or Clayton blue rock.
   4. Fines: Clean and well graded sands.

D. Acquire cement, flyash, and aggregate from same source for all Work.

E. Water: Potable, clean, not detrimental to concrete, containing less than 500 ppm of chlorides.

2.2 ADMIXTURES

A. Water-Reducing Admixture: ASTM C494.
   1. Euclid Chemical Company, Eucon WR.
   2. Master Builders/BASF; Pozzolith 200N.
   3. Sika Chemical Corp; Plastocrete 161.

B. Water-Reducing and Retarding Admixture: ASTM C494.
   1. Euclid Chemical Company; Eucon Retarder-75.
   2. Master Builders/BASF; Pozzolith 80N.
   3. Sika Chemical Corp; Plastiment.
   4. W.R. Grace; #WRDA-64.

C. Air-Entraining Admixture: ASTM C260.
   1. W. R. Grace; DARAVAIR AT 60.
   2. Cemix Products, Ltd; Cemix A.E.A.
   3. Master Builders/BASF; MBAE90.

D. Accelerator: ASTM C494, Type C or E; Noncorrosive, nonchloride.
   1. Euclid Chemical Company; Accelguard 80.
   2. Master Builders/BASF; Pozzutec 20.
   3. W.R. Grace; Doraset 400.
   4. Submit test report from independent testing laboratory of results of an acceptable accelerated corrosion test method such as that using electrical potential measures, of minimum one year duration, demonstrating noncorrosive nature of product.

E. Bonding Admixture: Acrylic latex, nonrewettable type.
   1. Euclid Chemical Company; Flex-Con.
   2. Dayon(Burke), Conspec; Strong Bond.
   3. Master Builders/BASF; Thoro System Products, Acryl 60.
   4. W. R. Grace; Daraweld C.

F. Mineral Admixture: Fly Ash Pozzolan; ASTM C618, Class F supplementary optional chemical and physical requirements of Tables 1A and 2A, except that the maximum sulfur trioxide shall be 4 percent and the maximum loss on ignition shall be 1.5 percent.
   1. Headwaters Resources; Fly Ash.
   2. Boral Material Technologies.
   3. The SEFA Group.

G. Corrosion Inhibitor: ASTM C494 Type C, All reinforced (including clips and ties) concrete in contact with soil shall have a corrosion inhibitor added. The dosage rate for the corrosion inhibiting admixture shall protect the reinforcing bars in concrete from chloride concentrations as high as 7,000 ppm. If a calcium nitrite inhibitor is used, the dosage rate shall not be less than two gallons per cubic yard of concrete. The calcium nitrite inhibitor solution shall contain a minimum of 30 percent calcium nitrite. A corrosion inhibitor is not necessary in any concrete placed without embedded steel.
   1. W.R. Grace, DCI.
   2. Sika, CNI.
   3. Euclid Chemical Company, Arrmatect.

H. Concrete Encasement Coloring Agent: Mix into concrete as required at the rate of 10 pounds of agent per cubic yard of concrete.

2.3 ACCESSORIES

A. Curing Compound: Liquid membrane, ASTM C309, type I; conforming to volatile organic compound (VOC) limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings.
   1. Creteseal.

B. Sheet Curing Material: ASTM C171.

C. Hardeners: Clear, nonmetallic dust-on type.
   1. Basalite Concrete; Floor Hardener.
   2. Dayton Superior; Emery Tuff.
   3. Lambert Corp.; “Colorhard.”

D. Bonding Agent: Polyvinyl acetate, rewettable type, with visible tinted pigment to verify coverage.
   1. Euclid Chemical Company; Euco-Weld.
   2. Larsen Products Corp.; Weld-Crete.
   3. Dayton-Superior; Concrete Bonder J41.
   4. CGM Incorporated, Perma Weld.

E. Bond Breaker: Nonstaining type, providing positive bond prevention.
   1. Nox-Crete; Silcoseal 2000F.
   2. EDOCO Construction Chemical; Clean Lift 90 Bond Breaker WB.
   3. Dayton Superior Chemical; Maxi-Tilt “E” WB Bond Breaker.

F. Structural Epoxy Bonding Adhesive: Two component, 100 percent solids compound suitable for use on dry or damp surfaces.
   1. Euclid Chemical Company; Eucopoxy LPL, MV or Euco#452 Eprox System, MV.
   2. Sika Chemical Corporation; Sikadur 32 Hi-Mod.
   3. EDOCO Construction Chemicals; Burkepoxy MV.
   4. Dayton-Superior; Resi-Bond J58.

G. Nonshrink Grout: ASTM C1107; nonmetallic; capable of achieving a 95 percent bearing under a 4 by 4-foot baseplate when grout is placed at a fluid consistency.
   1. Euclid Chemical Company; Euco N-S Grout, or Hi-Flow Grout.
   2. Master Builders/BASF; Masterflow 713 plus, Masterflow 928.
   3. EDOCO Construction; EDOCO Nonferrous Nonshrink Grout.
   4. W.R. Meadows; “Sealtight 588” Precision Grout.
   5. Dayton-Superior; Sure-Grip High Performance Grout.
   6. Sika Chemical Corporation; Sika Grout 212.

H. Patching Mortar: Epoxy type, 100 percent solids, suitable for use on damp or dry surfaces.
   1. Euclid Chemical Company; Euco 456 Mortar.
   2. Sika Chemical Corporation; Sikadur 43 Patch-Pak.
   3. EDOCO Construction Chemicals; Burkepoxy Mortar.

I. Patching Compound for Vertical or Overhead Applications: Free flowing, polymer modified, cementitious topping.
   1. Euclid Chemical Company; Verticoat.
   2. Dayton-Superior; Poly-Fast FS.
   3. ARDEX Engineered Cement; ARDEX Poly-top.

4. Sika Chemical Corporation; Sikatop 121 Plus.

J. Abrasive Aggregate for Nonslip Finish
1. Euclid Chemical Company; Nonslip Aggregate.
2. Lambert Corp; EMAG 20.
3. BASF Construction Chemicals; Frictex-NS.
4. Dayton-Superior; Emery Nonslip.

K. Evaporation Retardant
1. Euclid Chemical Company; Eucobar.
2. Master Builders/BASF; Confilm.
3. W.R. Meadows Inc; Evapre.
4. Dayton-Superior; SureFilm (J-74)
5. Creteseal, CS2000.

2.4 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler Type A: ASTM D1751; Asphalt impregnated fiberboard or felt, 1/4 inch thick; tongue and groove profile.

B. Joint Filler Type B: ASTM D1752; Closed cell polyvinyl chloride foam, resiliency recovery of 90 percent if not compressed more than 50 percent of original thickness.

C. Joint Filler Type C: ASTM D1752; Premolded sponge rubber, fully compressible with recovery rate of minimum 95 percent.

D. Epoxy Joint Filler: Two component, 100 percent solids compound; minimum 50 Shore D Hardness.
1. Manufacturers
2. Euclid Chemical Company; Euco 700.
3. Metzger/McGuire Co.; MM-80.
4. EDOCO Construction Chemicals; Burke Reflex Joint Filler.

E. Construction Joint Devices: Integral galvanized steel formed to tongue and groove profile, with removable top strip exposing sealant trough where indicated.

2.5 MIX DESIGNS

A. Cast-In-Place Concrete
1. Mix Designs shall be in accordance with ACI 318, Section 5.2.
2. Instruct Testing Agency to base mix designs on use of materials tested and approved.
3. Concrete mixes shall be designed to meet strengths specified and be of uniform density without segregation when placed.
4. Unless otherwise indicated on Drawings or in other Sections, water-cement ratio which shall control the amount of total water added to concrete for the following conditions:

Concrete Ultimate Compressive Strength (f'c, psi)	W/C Ratio*	Slump without Admixture (inches)
3000	0.50	4+/-1
4000	0.45	4+/-1

5. Air Content
6. 3.5 to 6.5 percent for severe exposure such as concrete in exterior or freezing conditions.
7. Fly Ash
8. Reduction of Portland cement, by weight, is acceptable with addition of an equal weight of fly ash provided the cement reduction is not be less than 25 percent nor more than 40 percent when compared to the mix design without fly ash.
9. Water Reducers
10. Use water-reducing admixtures in all concrete without superplasticizers.
11. Use water-reducing admixtures in all concrete with superplasticizers to allow proper mixing prior to adding superplasticizer.
12. Specifically Prohibited Admixtures
13. Admixtures containing hydrogen chloride, calcium chloride, or thiocyanates.
14. Admixtures containing more than 0.05 percent chloride ions.
15. Unspecified admixtures will not be permitted, unless accepted by the SunPower Representative, and under condition that the Independent Testing Agency modifies mix design as necessary, and each such modification is approved by the Structural Engineer.
16. Concrete may be designed for either pump or conventional placement. If pumping will be used, the mix shall be specifically designed for pumping and shall be so designated.
17. Mix designs are subject to review. Final acceptance of materials will depend upon strength testing after placement.

B. Nonshrink Grout: Mix in accordance with the manufacturer's printed instructions, using potable water from a domestic source.

C. Dry Pack: Mix in proportions, by volume, one part cement to two and one half parts fine aggregate, screening out materials retained on a No. 4 sieve. Mix with water to a consistency such that, when a ball of mixture is compressed in the hand, it will maintain its shape, showing finger marks, but not showing any surface water.

D. Patching Mortar: Mix in proportions, by volume, one part cement to two parts fine aggregate.
   1. Design Requirements: As indicated in the Schedule in Part 4.

2.6 MIXING

A. Batch Plant Conditions
   1. Equipment and plant shall be capable of weighing, proper segregation and efficient handling, and shall be subject to approval. Equipment and plant processes not approved shall not be used in Work.
   2. Use approved automatic metering capable of determining moisture content of sand.

B. General Requirements
   1. Concrete mixing shall comply with ACI 318 Section 5.8.
   2. Mix cement, fine and coarse aggregates, admixtures, and water to exact proportions of mix designs.
   3. Measure fine and coarse aggregates separately in accordance with approved method which provides accurate control and easy checking.
   4. Adjust grading to improve workability; do not add water, unless otherwise recommended by the Architect.
   5. Maintain proportions, values, and factors of approved mixes throughout Work.

C. Admixtures: Use automatic metering dispenser to introduce admixture into mix.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive the Work. Notify the Architect, in writing, of any conditions requiring corrective action.

B. Verify requirements for concrete cover over reinforcement.

C. Verify that anchors, seats, plates, embeds, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

D. Verify all controlling dimensions, for the Work of this Section and related Work, by field measurement prior to start of construction.

E. If unsatisfactory conditions exist, do not commence the installation until such conditions have been corrected. Beginning installation means acceptance of existing conditions.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's written instructions.

B. In locations where new concrete is dowelled to existing work, install dowels as indicated on Contract Documents.

C. Remove loose dirt and foreign matter from excavations and forms; remove standing water and saturated soil from excavations and from cavities. Placing concrete in standing water shall not be permitted. Hardened concrete and foreign materials shall be removed from the inner surfaces of conveying equipment.

D. Thoroughly clean reinforcement and other embedded items free from loose rust and other objectionable matter.

E. Thoroughly wet wood forms, except coated plywood, and adjacent concrete at least one hour in advance of placing concrete; securely close cleanout and inspection ports; repeat wetting as necessary to keep forms damp.

F. Moisten subgrade or sand associated with under-slab vapor barrier system one day prior to placing concrete; maintain moisture until concrete placement.

G. Maintain equipment clean and of sufficient quantity and capacity to efficiently execute the Work.

H. Verify subgrade and forms have been checked for line and grade, and the Work areas have been observed and approved by the Architect.

I. Before depositing new concrete on or against hardened concrete, retighten forms and prepare surface of hardened concrete as follows:
   1. Concrete which has been placed longer than 6-1/2 hours: Sandblast to roughen surfaces. Thoroughly clean of foreign matter and laitance, and moisten with water.
   2. Concrete which has been placed longer than 3-1/2 hours but less than 6-1/2 hours: Remove all laitance from concrete by wire brushing.

3. Apply bonding agent as required in accordance with manufacturer's instructions.

3.3 CONCRETE PLACEMENT

A. Transporting
1. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which prevent the separation or loss of the ingredients, in accordance with ASTM C94.
2. Concrete shall not be dropped freely where reinforcing bars will cause segregation, nor shall it be dropped more than 4 feet.
3. Spouts, elephant trunks, or other approved means shall be used to prevent segregation.
4. Concrete may be pumped from the transit mixer to places of deposit, provided that information on mix design adjustments, equipment data, procedures, and the entire operation are submitted for the Architect prior review.
5. Pumps shall be suitable for the mix, aggregate size, and slump required.
6. Pump operators shall be experienced in the operation of the equipment to be used.
7. Use of aluminum equipment to transport concrete is not permitted.

B. Depositing
1. Place concrete in accordance with ACI 318 Section 5.10.
2. Maintain during placement or until the completion of the section, a plastic surface approximately horizontal.
3. Prevent displacement of reinforcement, anchor bolts, welding plates, and other items required to be embedded in concrete.
4. Before concrete sets, completely remove concrete spilled on forms or reinforcing steel in portions of structure not to be immediately concreted.
5. Place concrete continuously between predetermined expansion, control, and construction joints. An interruption in placing of more than 60 minutes will be cause for shutting down concrete placement operations and the wasting of remaining mixed concrete, concrete in hoppers, and concrete in mixers. In case such interruption occurs, provide construction joints where and as directed, and cut concrete back to such line, cleaning forms and reinforcing as specified herein.
6. Keep a record of the time and data of placing the concrete in each portion of the structure. Keep reports until the completion of the structure, and keep reports open to the review of the Architect.

C. Consolidation
1. Thoroughly consolidate concrete by puddling with suitable tools during placement and thoroughly working around reinforcement, embedded fixtures, and into the corners of forms.
2. In addition to manual spading and tamping, internally vibrate concrete with high-speed mechanical vibrators of sufficient amplitude for adequate consolidation.
3. Vertically insert and remove hand-held vibrators at points 18 to 30 inches apart.
4. Do not use vibrators to transport concrete in forms.
5. Vibrate concrete minimum amount required for consolidation.
6. Do not vibrate concrete placed for slab on grade except at slab edges adjacent to edge forms and at items embedded in the slab.

D. Construction Joints
1. Verify location and conformance with typical details and approved shop drawings. Provide joints only where designated or accepted by the Architect.
2. Construction joints shall be in accordance with CBC Section 1906.4 and ACI 318 Section 6.4.

3. Contact surface of construction joints shall be cleaned and roughened by removing the entire surface and exposing clean aggregate solidly embedded in mortar matrix in accordance with the following procedures:
4. Thoroughly clean surface by sandblasting or chipping the entire surface not earlier than five days after the initial placement.
5. Thoroughly hose wash surface not less than two or more than four hours after concrete is placed. Wash water and chalk-like material to be removed entirely from the contact surface.
6. Contact surfaces of vertical construction joints in suspended slabs shall be sandblasted.
7. Prevent formation of shoulders and ledges.
8. Provide keys across vertical joints as indicated; in addition, place dowels across the joints.
9. Construction joints are required as follows:
10. Slabs on grade.
11. Construct in checkerboard fashion or in alternate strips with keyed joints.
12. Cast in areas small enough to prevent uncontrolled shrinkage cracking.
13. Slab shall be without re-entrant corners.
14. Sections shall have length to width ratios not exceeding 1.5 to 1.
15. Control joints shall be located between construction joints.
16. Cut control joints after concrete finishing, using Soff-Cut Systems or approved equivalent. Take necessary measures to prevent cracking.

3.4 FINISHES

A. Formed Surfaces
1. Smooth Finish: Obtain by the use of plywood, sheet metal, or lined wood forms; no fins, pockmarks, and other irregularities shall be present in the exposed surfaces of concrete.
2. Scored Finish: Roughen surface in an approved manner, or etch with sharp-pointed steel tools to key or otherwise improve the mechanical bond of the surface. Such scoring or roughening shall disturb or otherwise roughen at least 10 percent of the area so scored.
3. Grout-Cleaned Finish
4. Prepare grout of two parts normal Portland cement, one part white cement, and 4-1/2 parts fine aggregate mixed with water to consistency of thick paint.
5. Wet surfaces and rub grout on surfaces using rubber or cork float so that small voids and imperfections are filled.
6. Allow surfaces to dry for approximately one hour, scrape off excess grout with trowel, and then rub surfaces with burlap sacks.
7. Keep surfaces continuously damp for 24 hours.
8. Provide on exposed wall surfaces, vertical surfaces of equipment foundations, and other vertical surfaces for unless otherwise indicated or specified.

B. Unformed Surfaces
1. Floating
2. Provide as first stage for flatwork finishes, unless otherwise specified.
3. Thoroughly consolidate areas, strike off to screeds tamp to recess large aggregate below surface level.
4. Fill voids, reconsolidate, and re-level surfaces as necessary.
5. Do not proceed with subsequent finishes until surface water has absorbed or dried off and surface sheen has become dull.
6. Wood Float Finish
7. Provide as second stage for other finishes, unless otherwise specified.

8. Using approved floating machines or hardwood trowels, float surfaces to required planes and shapes, working just sufficiently to bring surfaces to uniform condition.
9. Work no more than necessary to achieve uniform texture free from irregularities and screed marks; except where receiving fills or mortar beds, leave surfaces in roughened, granular condition for good mechanical bond.
10. Cut and fill surfaces as necessary to true up.
11. When followed by other finishes, floating shall leave small amount of mortar on surfaces without excess of water.
12. Do not proceed with subsequent finishes until surface water has absorbed or dried off and concrete has set sufficiently to prevent fines or water from being worked to the surface.
13. Finish texture shall be fine-grained and granular to provide good slip resistance and shall be reasonably free from directional trowel marks.
14. Provide for exterior and interior surfaces of buildings, unless otherwise indicated or specified.
15. Steel Trowel Finish
16. Using finishing machines or steel trowels, trowel surfaces to produce a dense, hard, smooth steel trowel finish.
17. Commence troweling in one pass just sufficiently to flatten floated surface.
18. Wait until concrete has set sufficiently; then resume steel troweling; continue and repeat as required to obtain a hard steel trowel finish, free of blemishes, ripples, and trowel marks.
19. Do not
    a. Use cement or sand dusting to absorb or otherwise remove surface water.
    b. Commence troweling too soon on freshly placed concrete.
    c. Overwork surfaces by excessive troweling in an area in one pass.
    d. Work out lips, uneven levels, and other irregularities prior to final troweling.
    e. Neatly tool exposed edges, expansion joints, curbs, arises, and other details.
    f. Surface across joints shall be level and free from offsets.
    g. Provide for interior surface not otherwise indicated or specified.
20. Broom Finish
21. Draw a soft-bristled push broom over an initially trowel-finished surface.
22. When coarser surfaces are desired, use a stiffer-bristled broom.
23. Broom finish shall provide a nonslip surface, even if exposed to rain.
24. Provide for exterior flatwork and as indicated or specified.

C. Concrete Hardeners and Sealers
1. Apply in accordance with the manufacturer's printed instructions.
2. Apply hardener at the rate consistent with the manufacturer's definition of light traffic areas.

3.5 CURING

A. Curing shall immediately follow finishing and shall be accomplished for each portion of the Work.

B. Wall Surfaces
1. Cure for a minimum of seven days by form-curing with forms wetted down thoroughly at least four times daily until forms are removed.
2. If forms removed in less than seven days, follow immediately with membrane curing if outside of building, and with fog spray to maintain moist condition inside of building.

C. Flatwork Surfaces
1. Water cure all concrete work, unless noted otherwise.

2. Membrane cure exterior pavement and slab surfaces.
3. Where hardener is approved to be used, cure in accordance with hardener manufacturer's printed instructions.
4. Do not use liquid membrane curing compounds on surfaces to receive other finishes.

D. Maintain concrete temperature above 50 degrees F during curing.

E. Protect concrete from damage during the curing period.

3.6 TOLERANCES

A. Tolerances shall be in accordance with ACI 117.

B. Deviation from plumb or level shall not exceed 1/8 inch within 10 feet in any direction, as determined with a 10 foot straight edge.

C. Anchor Bolts: Setting Tolerances shall be in accordance with AISC Code of Standard Practice, Section 7.5.

3.7 FIELD QUALITY CONTROL

A. Place concrete during hot weather in accordance with ACI 305R.

B. Place concrete during cold weather in accordance with ACI 306R.

C. Do not place concrete during precipitation, unless adequate protection is provided.

3.8 TESTING AND INSPECTIONS

A. Testing and inspection shall be in accordance with Section 03 30 50.

B. Do not place concrete until reinforcing and embeds have been inspected and approved by the Architect.

3.9 REPAIR AND ADJUSTMENT

A. Immediately after removing formwork, concrete surfaces shall be examined by the Architect, and pour joints, voids, rock pockets, tie holes, and similar defects shall be patched at once as directed by the Architect.

B. Submit information on patching mixture and method proposed for use to the Architect for review prior to commencing repair work.

C. Patch honeycomb, aggregate pockets, voids, and holes as follows, unless otherwise directed by the Architect.
1. Chip out until sound concrete is exposed to minimum depth of one inch.
2. Prepare patching mortar with approximately two parts normal Portland cement, one part white cement, and nine parts fine aggregate; vary proportions of cement as necessary to match color of adjacent concrete.
3. Saturate surfaces with water and fill cavities with patching mortar.
4. Cure patches as specified for concrete.

D. Patching Tie Holes
   1. Cut nails and tie wires for form ties flush with the face of the concrete, and leave surfaces smooth and clean.
   2. Remove metal spreader ties on exposed concrete Work, or snap off inside the wall surface.
   3. Patch resulting cone pockets on exposed surfaces as described above.

3.10 DEFECTIVE CONCRETE

A. Concrete not conforming to required lines, details, dimensions, tolerances, finishes, strength, or other specified requirements shall be considered defective. Concrete with excessive honeycomb or embedded debris. Notify the Architect upon discovery of these conditions.

B. With the prior acceptance of the Architect, some minor defective Work may be repaired by use of cement mortar; however, if the defects are serious or affect the strength of the structure or its appearance, the Architect may require the removal and replacement of that portion of the structure affected.

C. Required repair or replacement of defective concrete will be determined by the Architect.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of the Architect for each individual area.

E. Defective concrete shall be repaired or replaced as recommended by the Architect at no additional expense to Owner.

3.11 PROTECTION

A. Provide protection in accordance with manufacturers instructions.

B. Protect concrete from elements including sun and rain.

C. Do not subject concrete to any loads until it is completely cured and has attained its minimum 28-day strength.

D. Protect concrete during and after curing from damage from subsequent construction operations.

E. Cover traffic areas with plywood sheets; maintain paper and plywood in place and in good repair for as long as necessary to protect against damage from construction operations.

F. Keep finished areas free from traffic for a minimum of four days or as necessary until surfaces have set sufficiently to prevent damage.

3.12 SCHEDULE

A. Unless otherwise indicated on Drawings or in other Sections, provide concrete in accordance with the following Table.

CLASS*	28-DAY COMPRESSIVE STRENGTH	MAXIMUM SLUMP**	MAXIMUM AGGREGATE SIZE***	MINIMUM CEMENT POUNDS PER C.Y.****

CLASS*	28-DAY COMPRESSIVE STRENGTH	MAXIMUM SLUMP**	MAXIMUM AGGREGATE SIZE***	MINIMUM CEMENT POUNDS PER C.Y.****
Foundations, drilled piers and equipment pads	3000	4 Inches	1 Inch	470
Items not otherwise indicated	3000	4 Inches	1 Inch	470

*Air Dry Weight shall not exceed 150 pcf for normal weight concrete
** Refer to Section 2.5 MIXES for slump requirements.
*** Maximum aggregate size not more than 1/3 thickness of concrete component.
**** Refer to Section 2.5 MIXES for W/C requirements.

END OF SECTION

SECTION 03 30 50 CONCRETE TESTING AND INSPECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes
   1. Concrete Testing and Inspection required by other Sections.

B. Related Sections
   1. Section 03 20 00 - Concrete Reinforcing.
   2. Section 03 30 00 - Cast-in-Place Concrete.
   3. Section 03 60 00 - Grouting.

1.2 REFERENCES

A. ACI 221R - Guide for Use of Normal Weight and Heavyweight Aggregates in Concrete.

B. ACI 301 - Specifications for Structural Concrete.

C. ACI 305R - Hot Weather Concreting.

D. ACI 306.1 - Cold Weather Concreting.

E. ACI 318-11 - Building Code Requirements for Reinforced Concrete.

F. ASTM C31 - Practice for Making and Curing Concrete Test Specimens in the Field.

G. ASTM C39 - Test Method for Compressive Strength of Cylindrical Concrete Specimens.

H. ASTM C40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.

I. ASTM C42 - Test Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

J. ASTM C88 - Standard Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.

K. ASTM C94 - Ready-Mixed Concrete.

L. ASTM C117 - Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing.

M. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

N. ASTM C138 - Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.

O. ASTM C143 - Test Method for Slump of Hydraulic-Cement Concrete.

P. ASTM C172 - Practice for Sampling Freshly Mixed Concrete.

Q. ASTM C173 - Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

R. ASTM C192 - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.

S. ASTM C289 - Standard Test for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).

T. ASTM C495 - Test Method for Compressive Strength of Lightweight Insulating Concrete.

U. ASTM C513 - Test Method for Obtaining and Testing Specimens of Hardened Lightweight Insulating Concrete for Compressive Strength.

V. ASTM C1077 - Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.

W. ASTM D4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.

X. ASTM F1869 - Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

Y. Caltest 217 - Method of Test for Sand Equivalent.

Z. ICRI Guideline No. 03739 - Guide to Using In-Situ Tensile Pull-Off Tests to evaluate Bond of Concrete.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 00

B. Independent Testing Laboratory shall submit the following:
   1. Testing and Inspection Reports in accordance with Section 01 45 29.
   2. Product Data
      a. Certified copies of mix designs for each concrete class specified.
      b. Ready mix delivery tickets, ASTM C94.
      c. Certified copies of concrete reinforcement test results for tensile and bending strength.
      d. Certified copies of concrete cylinder compressive strength test results at time intervals specified.
      e. Certification that aggregate and gravel are asbestos-free and conform to specified gradations and characteristics.
      f. Certification from vendor that samples originate from and are representative of each lot proposed for use.
      g. Certification that materials meet requirements specified.
   3. Certificates
      a. Batch plant certification.

C. Architect will collect the following:
   1. Product Data
      a. Mill test reports for reinforcing.
      b. Ready mix delivery tickets, ASTM C94.

1.4 COORDINATION

A. Contractor shall allow the Independent Testing Laboratory and the Architect free access to places, whether on or off the job site, where materials are stored, proportioned, mixed, or fabricated; to places where equipment is stored or serviced; and to the job site during times of preparation, installation, erection, placement, curing and patching.

B. Contractor shall supply labor, transportation, and on-site storage facilities required by the Independent Testing Laboratory and the Architect for taking and preparing samples for testing.

C. Contractor shall notify the Independent Testing Laboratory and the Architect in sufficient time prior to fabrication, field welding, mixing, and placement to permit testing and inspecting without delaying the Work; minimum 48 hour notice required, unless otherwise noted.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. The Independent Testing Laboratory shall inspect concrete plant prior to Work to verify following:
   1. Plant is equipped with approved metering devices for determining moisture content of fine aggregate.
   2. Plant quality controls are adequate.

3.2 GENERAL

A. Materials and testing thereof shall comply with ACI 318.

B. Test and inspect in accordance with CBC Chapter 17 and 19 and as specifically outlined in Sections 1704, 1705, and 1903.

3.3 CONCRETE REINFORCING

A. Independent Testing Laboratory shall provide the following testing:
   1. Material Samples
      a. Test for tensile and bending strength in accordance with CBC Chapter 19.
      b. Where positive identification of the heat number and mill certificates cannot be made, two specimens from each 2-1/2 tons, or fraction thereof, of each size and grade shall be tested.

B. Architect will provide the following inspections:
   1. Inspect materials tags and mill certifications.
   2. Inspect placement of all reinforcement for conformance with Drawings and approved shop drawings to confirm size, spacing, and installation.

3.4 CONCRETE AGGREGATE

A. Independent Testing Laboratory shall provide testing and inspection per Table 5.1 of ACI 221R.

3.5 CONCRETE

A. Independent Testing Laboratory shall provide the following testing:
   1. Perform testing in accordance with ACI 318.
   2. Test slump of concrete in accordance with ASTM C143.
   3. Test compressive strength in accordance with CBC Chapters 19 and as follows:
      a. Make and cure specimen cylinders in accordance with ASTM C31 for each class placed at site as directed by the Architect.
      b. Frequency of testing shall be in accordance with ACI 318 Section 5.6.2.

c. Retain one cylinder for 7 day test, one for 14 day test and three for 28 day test. Hold one cylinder for subsequent testing, if necessary.
d. Number each cylinder 1A, 1B, 1C, 1D, 1E, 1F, 2A, 2B, 2C, etc.; date each set; and keep an accurate record of placement on what each set represents.
e. Transport specimen cylinders from job to laboratory.
f. Test specimen cylinders at age 7, 14, and 28 days for specified strength in accordance with ASTM C39.

4. Take core specimens of hardened structure and test specimen in accordance with ASTM C42 when laboratory tests of specimen cylinders show compressive strengths below specified minimum.
5. Test for air entrainment as specified in design mix in accordance with ASTM C173.

B. Architect will provide the following inspections:
1. Review mix designs, certificates of compliance, and samples of materials proposed for use.
2. Verify hot weather concrete placement in accordance with ACI 305R.
3. Verify cold weather concrete placement in accordance with ACI 306R.
4. Concrete placement, sampling, and testing procedures.
5. Inspect concrete surfaces upon removal of formwork to determine acceptance of concrete surfaces and any required repair or replacement.

C. The Contractor shall submit ticket for each batch of concrete delivered to jobsite. Ticket shall bear following information:
1. Design Mix Number.
2. Time of batching.
3. Weight of cement, aggregates, water, and admixtures with maximum aggregate size.
4. Total volume of concrete.

3.6 GROUTING

A. Independent Testing Laboratory shall provide the following testing:
1. Fine Aggregates.
a. Gradation
1) Test in accordance with ASTM C136. 100 percent shall pass No. 8 mesh sieve, no less than 45 percent by weight shall pass No. 4 mesh sieve.
2) Variations from the specified gradations in individual tests will be acceptable if the average of three consecutive tests is within the specified limits and the variation is within the following permissible variations:

U.S. Standard Sieve Size	Permissible Variation in Individual Tests, Percent
30 or Coarser	2
50 or Finer	0.5

3) Test in accordance with ASTM C117: 3 percent maximum by weight passing No. 200 Sieve.
b. Organic Impurities: ASTM C40; color lighter than Standard.
c. Soundness: ASTM C88; 10 percent maximum loss with sodium sulfate.
d. Reactivity: ASTM C289; Innocuous aggregate.
e. Sand Equivalent: CALTEST No. 217; minimum 80.

B. Architect will provide the following inspections:
1. Inspect materials tags and mill certifications.
2. Inspect placement of all reinforcement, plates, and embeds for conformance with Drawings and approved shop drawings to confirm size, spacing, and installation.

3. Verify conformance to manufacturer's written installation instructions.

3.7 CONCRETE PLACED WITHOUT INSPECTION BY SUNPOWER REPRESENTATIVE

A. Architect will determine the most suitable method of ascertaining quality of concrete.

B. Contractor shall bear all expenses for x-ray or other inspection of in-place concrete.

C. Contractor shall bear all expenses for removing concrete determined to be defective.

3.8 RETESTING

A. When tests or inspections reveal failure of materials to meet the Contract requirements, Independent Laboratory shall provide additional tests in accordance with specified requirements as necessary until acceptance. Retesting shall be performed at no additional expense to the Owner.

B. The cost of additional inspections by the Architect made necessary because of the failure of materials to meet the Contract requirements will be deducted from the Contract Price.

END OF SECTION

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SECTION 03 60 00 GROUTING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes
   1. Drypack, Epoxy, Nonshrink, and Cement Grout.

B. Related Sections
   1. Section 03 30 00 - Cast-In-Place Concrete.
   2. Section 03 30 50 - Concrete Testing and Inspection.
   3. Section 05 12 00 - Structural Steel Framing.

1.2 REFERENCES

A. ACI 318-11 - Building Code Requirements for Reinforced Concrete.

B. ASTM C33 - Concrete Aggregates.

C. ASTM C150 - Portland Cement.

D. ASTM C494 - Chemical Admixture for Concrete.

E. CRD-C621 Corps of Engineers - Specification for Nonshrink Grout.

1.3 SUBMITTALS

A. Submit in accordance with 01 33 00

B. Product Data
   1. Product data for products and materials indicated.
   2. Manufacturer’s technical bulletins and installation/application instructions.
   3. Material Safety Data Sheets (MSDS).

C. Certificates
   1. Manufacturer’s Certificate: Certify that products meet or exceed specified requirements.

D. Mix Designs: Submit separate mix design for each type of grout specified.

1.4 COORDINATION

A. Coordinate the installation of grout with the requirements of the Work of other Sections.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle packaged materials in the manufacturer’s original, sealed containers, each clearly identified with the manufacturer’s name, and name and type of product.

B. Store products subject to damage by dirt and moisture in a clean, dry location, off the ground, and suitably protected.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cement: ASTM C150, Type II or Type V Portland cement; low alkali, containing less than 0.60 percent alkalies.

B. Fine Aggregate: ASTM C33, except as modified below; nonreactive; hard, dense, durable particles of either sand or crushed stone, regularly graded from coarse to fine; washed before use.

C. Water
   1. Free from oil and deleterious amounts of acids, alkalies, and organic materials.
   2. Containing not more than 1,000 mg/l of chlorides as Cl.
   3. Containing not more than 1,300 mg/l of sulfates as SO4.
   4. Not containing impurities that may cause a change of more than 25 percent in the setting time of the cement, nor a reduction of more than 5 percent in the compressive strength of the grout at 14 days when compared with the result obtained with distilled water.
   5. Water used for curing shall not contain impurities sufficient to cause discoloration.

D. Acquire cement and aggregate from same source for all the Work.

2.2 ADMIXTURES

A. Admixtures shall be compatible with the grout.

B. Calcium chloride or admixtures containing calcium chloride are prohibited.

C. Water Reducing Retarder: ASTM C494, Type D.
   1. Manufacturers
      a. BASF/Master Builders; Pozzolith 300-R.
      b. Sika Chemical Corp; Plastiment.
      c. Euclid Chemical Company; Eucon Retarder 75.

D. Lubricant Additive for Cement Pressure Grouting
   1. Manufacturers
      a. Specrete; Prepakt Intrusion Aid.
      b. Sika Chemical Corp; Intraplast N.

2.3 DRYPACK GROUT

A. Mix: One part cement, 1-1/2 to two parts sand, water reducing retarder, and water to make a stiff workable mix.

2.4 CEMENT GROUT

A. Mix: One part cement and two parts sand, proportioned by volume, admixtures for pressure grouting, water to make a workable mix.

2.5 NONSHRINK GROUT

A. Corps of Engineers CRD C621; Nonshrink type, pre-mixed compound consisting of nonmetallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 28 days, unless otherwise indicated.

B. Manufacturers
   1. Master Builders/ BASF; Masterflow 713.
   2. Five Star products, Inc; Precision Nonshrink Cement Grout.
   3. Euclid Chemical; Euco Nonshrink Grout.
   4. Five Star Products, Inc.; Five Star Grout.
   5. W.R.Meadows; Sealtight 588.

2.6 EPOXY GROUT

A. Manufacturers
   1. Master Builders/BASF; Concresive 1380.
   2. Sika Chemical Corporation; Sikadur -42.
   3. Euclid Chemical; E3-F.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive the Work. Notify the Architect, in writing, of any conditions requiring corrective action.

B. Verify that anchors, seats, plates, embeds, reinforcement, and other items to be grouted are accurately placed, positioned securely, and will not cause hardship during grouting.

C. Ensure bolts and reinforcing to be installed in horizontal grout holes is slightly bent to accommodate angle of hole.

D. If unsatisfactory conditions exist, do not commence the installation until such conditions have been corrected. Beginning installation means acceptance of existing conditions.

3.2 PREPARATION

A. Holes required for grouting
   1. Drill horizontal holes at a slight downward angle to facilitate holding the grout until setting is complete.
   2. Blow holes clean prior to installation of grout.

B. Thoroughly clean reinforcement and other embedded items free from loose rust and other objectionable matter.

C. Protect elements surrounding Work of this Section from damage or disfiguration.

3.3 INSTALLATION

A. Drypack Grout
1. Roughen surfaces to be built-up with drypack grout by brushing; clean, and coat with bonding compound immediately prior to grout application.
2. Apply drypack grout immediately following application of bonding compound.
3. Apply in bands or strips to form a smooth covering of the required thickness.
4. Completely fill voids; thoroughly compact in place.
5. Slope construction joints; clean and wet surface before application is resumed.
6. Membrane cure drypack grout.
7. Bolts or inserts which have been dry packed or grouted in place shall not be tensioned sooner than seven days after packing.

B. Cement Grout
1. Place using pressure grouting equipment or mixing and placement apparatus of type used for cast-in-place concrete.
2. Agitate diluted grout to keep ingredients mixed.

C. Nonshrink Grout
1. Install in accordance with manufacturer's instructions.

D. Epoxy Grout
1. Install in accordance with manufacturer's instructions.
2. Prime surface of concrete when required by manufacturer's instructions.

E. Pressure Grout
1. Equipment
   a. Designed to place grout at pressures up to 50 psi. Include mixer and holdover agitator tanks.
   b. Gauges: Indicate pressure used for grout placement, up to 50 psi.
   c. Meter: Capable of indicating the volume of grout used, to within 1/10 cubic foot.
2. Prior to grouting, wash clean systems and holes to be grouted.
3. Once begun, complete grouting without stopping. Maintain grout pressure until grout has set.
4. In case of equipment failure, wash out the grouting system sufficiently to ensure fresh grout and adequate bond and penetration will occur upon restarting the grouting operation.

3.4 FIELD QUALITY CONTROL

A. Do not apply drypack grout when ambient temperature is below 40 degrees F. Maintain ambient temperature above 40 degrees F for 48 hours after application.

3.5 TESTING AND INSPECTION

A. Testing and inspection shall be in accordance with Section 03 30 50.

B. Do not place grout until reinforcing and embeds have been inspected and approved by the Architect.

C. Notify the Architect 48 hours before each grouting operation.

3.6 CLEANING

A. Clean, leaving exposed surfaces free from damage, tool marks, stains, discoloration, and other defects and damage.

3.7 DEFECTIVE WORK

A. Grout not conforming to required details, dimensions, tolerances, finishes, strength, or other specified requirements shall be considered defective. Notify the Architect upon discovery of these conditions.

B. Required repair or replacement of defective grout will be determined by the Architect.

C. Do not patch, fill, touch-up, repair, or replace grout except upon express direction of the Architect for each individual area.

D. Defective grout shall be repaired or replaced as recommended by the Architect at no additional expense to the Owner.

3.8 PROTECTION

A. Protect grout from damage from subsequent construction operations.

B. Provide protection in accordance manufacturers instructions.

3.9 SCHEDULE

A. Drypack Grout: Used for built-up surfaces, setting miscellaneous metal items, and minor repairs.

B. Epoxy Grout: Used for repairing cracks by pressure grouting, repairing structural concrete, setting reinforcing dowels into holes for grouting.

C. Nonshrink Grout: Used for bearing surfaces of machinery and equipment bases, column baseplates and bearing plates, setting bolts and reinforcing steel in holes for grouting.

D. Cement Grout: Used for filling nonbearing portions of equipment pads and pressure grouting.

END OF SECTION

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SECTION 04 22 00 - CONCRETE UNIT MASONRY

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. Concrete masonry units.
2. Mortar and grout.
3. Steel reinforcing bars.
4. Masonry-joint reinforcement.
5. Embedded flashing.
6. Miscellaneous masonry accessories.

B. Related Requirements:
1. Section 033000 "Cast-in-Place Concrete" for installing dovetail slots for masonry anchors.
2. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Coordinate with Kitchell Construction Manager.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:
1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:
   1. CMUs.

D. Samples for Verification: For each type and color of the following:
   1. CMUs.
   2. mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: For each type and size of the following:
   1. Masonry units.
      a. Include material test reports substantiating compliance with requirements.
      b. For masonry units, include data and calculations establishing average net-area compressive strength of units.
   2. Cementitious materials. Include name of manufacturer, brand name, and type.
   3. Mortar admixtures.
   4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
   5. Grout mixes. Include description of type and proportions of ingredients.
   6. Reinforcing bars.
   7. Joint reinforcement.
   8. Anchors, ties, and metal accessories.

C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
   1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
   2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.

E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
   1. Build sample panels in sizes approximately 48 inches long by 36 inches high.

2. Where masonry is to match existing, build panels adjacent and parallel to existing surface.
3. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
    a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
    1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
    1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
    2. Protect sills, ledges, and projections from mortar droppings.
    3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
   1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.
   2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

2.3 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

2.4 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

B. CMUs: ASTM C 90.
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2500 psi
   2. Density Classification: Normal weight
   3. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.
   4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.5 LINTELS

A. General: Provide one of the following:

B. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs.

C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 033000 "Cast-in-Place Concrete," and with reinforcing bars indicated.

D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
   1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C 91/C 91M.

E. Mortar Cement: ASTM C 1329/C 1329M.

F. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

G. Aggregate for Grout: ASTM C 404.

H. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for glazed or pre-faced masonry units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.

I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

J. Water: Potable.

2.7 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M, Grade 60.

2.8 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches into masonry but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 641/A 641M, Class 1 coating.
2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
4. Galvanized-Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
6. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.
7. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.9 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Use portland cement-lime mortar unless otherwise indicated.
   3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270 Specification. Provide the following types of mortar for applications stated unless another type is indicated.
   1. Type M or Type S unless indicated otherwise.

D. Grout for Unit Masonry: Comply with ASTM C 476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
   2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2500 psi.
   3. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143/C 143M.

E. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.

   1. Application: Use epoxy pointing mortar for exposed mortar joints with pre-faced CMUs.

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 the Work.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
   2. Verify that foundations are within tolerances specified.
   3. Verify that reinforcing dowels are properly placed.
   4. Verify that substrates are free of substances that would impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:
1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:
1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m).
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m) or 3/8 inch in 20 feet (9 mm in 6 m).
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m).
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m) or 3/8 inch in 20 feet (9 mm in 6 m) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm).

C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches (100 mm). Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:
1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Wet joint surfaces thoroughly before applying mortar.
3. Rake out mortar joints for pointing with sealant.

D. Rake out mortar joints at pre-faced CMUs to a uniform depth of 1/4 inch (6 mm) and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.

E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

F. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

G. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, as indicated on the drawings.

B. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

C. Form control joints in concrete masonry using one of the following methods, unless indicated otherwise:
   1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
   2. Install preformed control-joint gaskets designed to fit standard sash block.
   3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
   4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.

3.8 LINTELS

A. Provide lintels as indicated on the drawings.

B. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.9 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
   1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.10 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.

E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

I. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.11 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch (19 mm). Dampen wall before applying first coat, and scarify first coat to ensure full bond to subsequent coat.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot (3 mm per 300 mm). Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.12 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
   3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
   4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
   5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.13 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
   1. Crush masonry waste to less than 4 inches (100 mm) in each dimension.

2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
3. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 22 00

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SECTION 05 12 00 STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes
   1. Fabrication and erection of structural steel framing members.

B. Related Sections
   1. Section 03 60 00 - Grouting.

1.2 REFERENCES

A. AISC - Manual of Steel Construction 14th Edition.

B. ANSI B18.22.1 - Plain Washers.

C. ANSI B18.23.1 - Beveled Washers.

D. ASTM A36 - Carbon Structural Steel.

E. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless.

F. ASTM A108 - Steel Bar, Carbon and Alloy, Cold-Finished.

G. ASTM A123 - Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products.

H. ASTM A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware.

I. ASTM A307 - Carbon Steel Bolts and Studs, 60,000-psi Tensile Strength.

J. ASTM A325 - Structural Bolts, Steel, Heat Treated, 120/105 KSI Minimum Tensile Strength.

K. ASTM A449 - Hex Cap Screws, Bolts, and Studs, Stell, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.

L. ASTM A490 - Structural Bolts, Alloy Steel, Heat Treated, 150 KSI Minimum Tensile Strength.

M. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.

N. ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

O. ASTM A572 - High Strength Low Alloy Columbium-Vanadium Structural Steel.

P. ASTM A992 - Structural Steel Shapes.

Q. ASTM F1554 - Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

R. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

S. AWS D1.1 - Structural Welding Code - Steel.

T. SSPC PM-SET B/PM-SET C - Society for Protective Coatings: Painting Manuals Volume 1 and 2.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 00

B. Shop Drawings
1. Indicate markings, quantities, materials, and shapes.
2. Indicate profiles, cambers, dimensions, spacing, and locations.
3. Indicate openings, cuts, and holes
4. Indicate attachments, connections, threaded fasteners, rivets, and welds, including methods of connecting, anchoring, fastening, bracing, and attachment to the Work of other Sections.
5. Indicate shop and erection details.
6. Indicate shop and field welds by welding symbols in accordance with AWS A2.4. Indicate net weld lengths.

C. Written Welding Procedures

D. Product Data
1. Product data for products and materials indicated.
2. Manufacturer's technical bulletins and installation/application instructions.
3. Material Safety Data Sheets (MSDS).

E. Certificates
1. Manufacturer's Mill Certificate: Submit certificate that products meet or exceed specified requirements.
2. Mill Test Reports: Submit manufacturer's certificates, indicating structural strength, destructive and nondestructive test analysis.
3. Welder's Certificates: Submit certificates for welders employed on the Work, verifying AWS qualifications within the previous 12 months.

F. Qualification Data
1. For Fabricator
2. For Erector

1.4 QUALIFICATIONS

A. Fabricator: Company specializing in performing the Work of this Section with minimum three years experience.

B. Erector: Company specializing in performing the Work of this Section with minimum three years experience.

C. Welding Qualifications: Prior to commencing welding, welding procedures, welding operations, and welders shall be qualified in accordance with AWS D1.1.
1. Welders who have not performed welding for a period of three or more months shall be requalified.
2. Welders whose work fails to pass inspection shall be requalified before performing further welding.
3. The costs of certifying qualifications shall be paid as part of the Work of this Section.

1.5 COORDINATION

A. Coordinate the design, fabrication, and erection of structural steel with the requirements for openings and support of the Work of other Sections.

B. Coordinate the location and installation of items to be supported by structural steel and provide supports necessary.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver welding electrodes to job site in unbroken containers or packages bearing manufacturer's name.

B. Ship, store, and handle structural steel in a manner to prevent rusting and deformation. Store steel products off grade and positioned to drain rain water readily.

C. Deliver bolts, nuts, and washers in bags or boxes, properly tagged for identification.

D. Store other metal products in a weather-tight and dry place until ready for use in the Work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Structural Steel Members: ASTM A36, A572 and A992, Grade 36 or 50 as indicated.

B. Structural Tubing: ASTM A500, Grade B.

C. Steel Pipe: ASTM A53, Type E or S, Grade B; galvanized where indicated, black elsewhere.

2.2 FASTENERS

A. Bolts and Nuts: ASTM A325 galvanized to ASTM A153 for galvanized members.

B. Plain Washers: ANSI B18.22.1 Type A, galvanized.

C. Beveled Washers: ANSI B18.23.1 galvanized.

D. Anchor Bolts: ASTM A307, ASTM A490, or ASTM F1554 as indicated.

E. Post-Installed Anchors: Proprietary type, designed for intended uses, and ICC ESR evaluated.
   1. Manufacturers
      a. ITW Ramset/Red Head.
      b. Simpson.
      c. Hilti Co.
      d. Powers.

F. Shims and Leveling Devices: Type required for temporary support of base plates; of sufficient size and capacity to support dead load of structure without deformation.

G. All steel and metal fasteners exposed to damp conditions or the weather, except stainless steel, shall be hot-dip galvanized unless otherwise indicated.

2.3 ACCESSORIES

A. Welding Electrodes: AWS D1.1; type required for materials being welded.

B. Nonshrink Grout: In accordance with Section 03 60 00.

C. Temporary Supports, Staying, and Bracing: As required by the conditions of installation.

2.4 FINISHES

A. Shop and Touch-Up Primer
   1. Manufacturers
      a. Tnemec; Tnemec Primers Series V10.
      b. Rust-Oleum ; Red Rusty Metal Primer.
      c. Benjamin Moore & Co.; M07 Universal Metal Primer.

2.5 SHOP FABRICATION

A. Fabricate structural steel in accordance with AISC Specifications, and as indicated.

B. Splices: Locate only as indicated on approved shop drawings or approved by the Architect.

C. Preparation
   1. Prior to fabrication, straighten all materials by methods which will not damage material. Do not straighten any material until methods have been approved by the Architect.
   2. Prior to assembling component parts of a connection, thoroughly clean all contract surfaces of loose rust, scale, and burrs.

D. Shop Welding
   1. Provide welded connections in shop where possible, unless otherwise indicated, in accordance with AWS D1.1.
   2. Welding shall be performed by welders certified to perform the Work.
   3. Weld by shielded-arc method, submerged-arc method, flux-coated arc method, or other method approved by AWS. Perform welding in accordance with AWS D1.1.
   4. Welds exposed to weather or damp conditions in the finished Work shall be continuous and watertight and shall be treated by hot or cold (field) galvanization.

E. Bolted Connections
   1. Bolted connections shall have not less than two bolts.
   2. Punch, drill, or ream holes 1/16 inch larger than bolt diameter.
   3. Ream unfair holes, but only up to next larger bolt size. Comply with General Notes on Structural Drawings.
   4. If types of fastener are not indicated, use ASTM A325 bolts.

2.6 SHOP FINISHING

A. Surface Preparation
   1. Grind smooth weld spatter and sharp edges prior to cleaning.
   2. Prior to application of primer or delivery from shop, clean surfaces as follows:
      a. SSPC SP-2 where structural steel is to receive cementitious fireproofing, or to be encased in cast-in-place concrete, or to be concealed by other construction in the completed Work.
      b. SSPC SP-7 where structural steel is to remain exposed in the completed Work.

B. Shop Primer

1. Shop coat surfaces of structural steel with 3 mil minimum dry film thickness of primer, unless otherwise specified.
2. Do not apply primer to within 2 inches of surfaces to be field welded, or to surfaces to receive cementitious fire-proofing, or to be encased in cast-in-place concrete.
3. Apply two coats of primer to surfaces of steel assemblies that will remain permanently concealed after assembly.
4. Apply shop primer within eight hours of surface cleaning.
5. Shop primer, of poor quality or insufficient thickness shall be touched-up or recoated by the fabricator, and to a condition acceptable to the Architect.

C. Temporary Coating
1. Coat contact faces of steel which will be grouted for bearing, such as column base plates and similar items, with an oil-based, rust-inhibitive temporary coating containing no metallic pigment.
2. Manufacturers
   a. Houghton International Company; Rust-Veto 342.
   b. Lanco; Polyurethane Oil Red Oxide Primer MM-100.
   c. Columbia Paint & Coatings; Industrial Acrylic DTM Polyurethane.

2.7 QUALITY CONTROL

A. Materials and fabrication procedures are subject to inspection and test in mill, shop, and field. Such inspections and tests will not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements. Promptly remove and replace materials or fabricated components that do not comply.

2.8 TESTING AND INSPECTION

A. Testing and inspection shall be in accordance with CBC Section 1705.2.1.

B. Independent Testing Laboratory shall provide the following testing:
1. Perform testing in accordance with Section 01 45 29.
2. Perform nondestructive weld testing in accordance with CBC, Section 1705.2.1.

2.9 TOLERANCES

A. Tolerances shall be in accordance with AISC Code.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive the Work. Notify the Architect, in writing, of any conditions requiring corrective action.

B. If unsatisfactory conditions exist, do not commence the installation until such conditions have been corrected. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Verify that field measurements are as indicated on Drawings and approved shop drawings. Report discrepancies to the Architect for clarification or resolution prior to starting erection.

B. Anchor Bolts
   1. Upon completion of concrete placement, anchor bolts shall be rechecked for correct location and elevations; make necessary corrections.
   2. Projecting portion of anchor bolts shall be wire brushed, the washers and nuts replaced, and the bolt protected from dust and other foreign materials by a wrapping of a waterproof material.

3.3 ERECTION

A. Install and erect structural steel in accordance with AISC Code and Specifications.

B. Allow for erection loads and provide temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Column or column base plates shall be set on a steel shims or otherwise supported and the structure aligned and plumbed prior to grouting under the base plates.

D. Place temporary bracing necessary for erecting before bolting in accordance with AISC recommendations. Additional or temporary bracing shall be provided wherever design loads may be exceeded during erection or placing of equipment.

E. Welding
   1. Welding will be permitted only as indicated on the approved shop drawings.
   2. Welding shall be performed by welders certified to perform the Work.
   3. Weld by shielded-arc method, submerged-arc method, flux-coated arc method, or other method approved by AWS. Perform welding in accordance with AWS D1.1.
   4. Welds exposed to weather or damp conditions in the finished Work shall be continuous and watertight and shall be treated by hot or cold (field) galvanization.

F. Bolted Connections
   1. Bolted connections shall have not less than two bolts.
   2. Ream unfair holes, but only up to next larger bolt size.
   3. As erection progresses, bolt up the Work to assume dead loads, lateral forces, and erection stresses.

G. Assembly Using Standard Threaded Fasteners
   1. Beveled Washers: Provide under bolt heads or nuts riding on surfaces exceeding 5 percent slope with respect to head or nut.
   2. Tighten bolts for full bearing under heads and nuts and to snugtight condition.

H. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings, or isolators. Aluminum in contact with concrete or grout shall be protected with a heavy coat of bituminous paint or two coats of zinc chromate.

I. After steel is aligned, grout under base plates and elsewhere indicated in accordance with Section 03 60 00.

3.4 FINISHES

A. After erection, prime welds, abrasions, and surfaces not shop primed except surfaces to be in contact with concrete and surfaces to receive spray-on fireproofing or insulation.

B. Field paint unpainted field connections, bolts, and similar parts with primer.

3.5 ERECTION TOLERANCES

A. Erection tolerances shall be in accordance with AISC Code.

B. Anchor Bolts: Setting Tolerances shall be in accordance with AISC Code of Standard Practice, Section 7.5.

C. Individual members shall be considered plumb or level where the error does not exceed 1:750.

D. Plumb displacement of the center line of columns from the established column line shall be no more than 1/4 inch, noncumulative.

E. Framing shall be considered level if framing members, measured from the top of column connections, do not vary more than plus or minus 1/4 inch.

F. Horizontal dimensions shall not vary more than plus or minus 1/4 inch per 100 feet for the length or width of the structure, but not to exceed a total of one inch.

G. Maximum Offset From True Alignment: 1/4 inch.

3.6 TESTING AND INSPECTION

A. Testing and inspection shall be in accordance with CBC Section 1705.2.1.

B. Independent Testing Laboratory shall provide the following testing:
1. Perform testing in accordance with of Section 01 45 29.
2. Perform nondestructive weld testing in accordance with CBC, Section 1705.2.1.

3.7 CLEANING

A. After erection, thoroughly clean surfaces of foreign a deleterious matter such as dirt, mud, oil, and grease that could impair bonding of finishes, concrete, or fireproofing.

3.8 REPAIR AND ADJUSTMENTS

A. Structural members shall not be cut or altered without prior approval of the Architect.

B. Flame cutting will be permitted only as specifically approved by the Architect.

C. Only light drifting will be permitted to draw parts together.

D. Draft punching to match unaligned holes will not be permitted. Enlargement of holes necessary to make connections resulting from misfit shall be performed by the reaming or drilling, and the proper size bolt shall then be used. Ream unfair holes only up to next larger bolt size.

E. Repair abraded areas of shop-applied coatings, and areas of weld where the shop-applied coating has been damaged with a primer or galvanizing repair compound, as applicable, that is compatible with the shop coating.

3.9 DEFECTIVE WORK

A. Structural steel not conforming to required lines, details, dimensions, tolerances, finishes, strength, or other specified requirements shall be considered defective. Notify the Architect upon discovery of these conditions.

B. Required repair or replacement of defective steel will be determined by the Architect.

C. Do not patch, fill, touch-up, repair, or replace steel except upon express direction of the Architect for each individual area.

D. Defective steel shall be repaired or replaced as recommended by the Architect at no additional expense to Owner.

3.10 PROTECTION

A. Protect structural steel from damage from subsequent construction operations.

END OF SECTION

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Load-bearing wall framing.
2. Exterior wall framing.
3. All other cold formed/light gage framing shown on the structural drawings.

B. Related Requirements:
1. Section 092216 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed steel framing product indicated.

B. Shop Drawings:
1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

B. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 FRAMING MATERIALS

A. Manufacturers: Member of the Steel Stud Manufacturers Association (SSMA) per ICC-ES Evluation Report ESR-3064P.

B. Plates, accessories, and framing members: Mill Certified ASTM A653, structural quality (SS), formed to shapes indicated unless indicated otherwise, with solid web. Grade 33 (Fy=33 ksi) for 18 gage and thinner and Grade 50 (Fy=50 ksi) for 16 gage and thicker material.

2.2 ACCESSORIES

A. Bracing, furring, bridging, plates, gussets, clips: Formed sheet steel, thickness per the drawings or 18 gage minimum; same finish as steel framing members.

B. Screws: Hot dip galvanized or equivalent self drilling, self tapping. ITW Buildex Traxx, or approved equivalent. Install per drawings and manufacturer’s recommendations and requirements.

C. Welding: In accordance with CBC, AWS D1.1 and AWS D1.3.

D. Primer: Touch-up for galvanizing surfaces as approved in advance by the Architect.

2.3 FINISHES

A. Studs and accessories: Galvanized to ASTM A653 G60 coating class unless noted otherwise.

B. Joists, purlins, other framing accessories: Galvanized to ASTM A653 G60 coating class unless noted otherwise.

2.4 FABRICATION

A. Fabricate cold-formed steel 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.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
   3. Fasten cold-formed steel framing members by welding or screw fastening as indicated on the drawings. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

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 of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install cold-formed steel framing in accordance with the structural drawings. Where drawings conflict with manufacturer’s recommendations, the structural drawings will govern.

B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding or screw fastening as indicated on the drawings. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

E. 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.

F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

G. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

H. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 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 per CBC requirements, see CBC section 1705.2.2.1.1.

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.

3.4 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel 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 steel framing is without damage or deterioration at time of Substantial Completion.

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. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. 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.

D. 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 orASTM 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 fastenersunless 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 withASTM 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" andSection 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 75 00 - METAL CANOPY

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. 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.

C. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.

D. 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.

E. 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 metal canopies 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 metal canopies, 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 CANOPY SYSTEM

A. Canopy 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 canopies consisting of modular framed panels with perforated sheet infill and outriggers for mounting to exterior wall surfaces.
      a. Sunshade panel: Modular panel with perimeter frame.
      b. Panel Size: Per drawings.
      c. Panel Type: Perforated, flat.
      d. Thickness: 1/8”
      e. Perforation Pattern: Staggered, round.
      f. Open Area: 33%
      g. Diameter: 3/16”
      h. 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.

B. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

C. 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.

D. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.

E. Install concealed gaskets, joint fillers, insulation, sealants, and flashings, as the Work progresses, to make exterior decorative formed metal items weatherproof.

F. 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.

G. 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.

H. 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 10 00 - 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. Framing with dimension lumber.
2. Framing with timber.
3. Rooftop equipment bases and support curbs.
4. Wood blocking, cants, and nailers.
5. Wood furring.
6. Wood sleepers.
7. Utility shelving.
8. Plywood backing panels.
9. All other wood construction not covered in other sections.

B. Related Requirements:
1. Section 061600 "Sheathing."

1.3 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Timber: Lumber of 5 inches nominal or greater in least dimension.

D. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. RIS: Redwood Inspection Service.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. 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. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Expansion anchors.

1.6 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: 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**,"** for the following:

1. Dimension lumber framing.
2. Timber.

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. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified.

C. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

D. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

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 that 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.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat 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 above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 LUMBER MATERIALS

A. Lumber Grading Rules: Comply with UBC Standard 23-1 and WCLIB or WWPA. 4x and thicker members shall be free of heart center.

B. Beams 6x and thicker and posts 6x6 and larger: Douglas Fir-Larch species, Select Structural grade, 19 percent maximum moisture content at time of installation.

C. All other framing not otherwise indicated: Douglas Fir-Larch species, No. 1 grade, 19 percent maximum moisture content at time of installation.

D. Wall studs: Douglas Fir-Larch species, No. 1 grade, 19 percent maximum moisture content at time of installation.

E. Blocking: Douglas Fir-Larch species, No. 1 grade, 19 percent maximum moisture content at time of installation.

F. Sill Plates: Pressure preservative treated Douglas Fir-Larch species, No. 1 grade, 19 percent maximum moisture content at time of installation.

G. 1x Roof or Wall Sheathing Boards: Douglas Fir-Larch species, No. 2 grade, 19 percent maximum moisture content at time of installation.

2.4 SHEATHING MATERIALS

A. See Section 061600 “Sheathing.”

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction,

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

1. Plywood 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."

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough 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 or Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

2.8 STRUCTURAL FRAMING CONNECTORS

A. Galvanized steel, sized to suit framing conditions or as shown on the drawings. Simpson Strong-Tie, or approved equivalent, installed per manufacturer's instructions for maximum rated load capacities.

2.9 MISCELLANEOUS MATERIALS

A. Building Paper: No. 15 asphalt felt, or spun bonded polyethylene as directed by the Architect.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

D. Structural framing connectors: Install structural framing connectors to comply with manufacturer's written instructions.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

G. 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.

H. 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.

I. Securely attach rough 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 CBC's California Building Code.

J. 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.

K. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Comply with indicated fastener patterns where applicable.
2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or 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. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

D. 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 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

3.4 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide framing as shown on the drawings.

3.5 FLOOR JOIST FRAMING INSTALLATION

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:

1. As indicated on the drawings.

B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.

C. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches from top or bottom.

D. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.

E. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

F. Provide solid blocking between joists under jamb studs for openings.

3.6 FRAMING INSTALLATION

A. Install timber with crown edge up and provide not less than 4 inches of bearing on supports. Provide continuous members unless otherwise indicated; tie together over supports as indicated if not continuous.

B. Where beams or girders are framed into pockets of exterior concrete or masonry walls, provide 1/2-inch air space at sides and ends of wood members.

C. Install wood posts using metal anchors indicated.

D. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

3.7 STAIR FRAMING INSTALLATION

A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:

1. Size: 2-by-12-inch nominal size, minimum.
2. Material: solid lumber.
3. Notching: Notch rough carriages to receive treads, risers, and supports; leave at least 3-1/2 inches of effective depth.
4. Spacing: At least three framing members for each 36-inch clear width of stair.

B. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

3.8 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 rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 10 53 - 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.

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- 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 think.
   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 16 00 – 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.

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. 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.
      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 40 23 - 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.

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 Not used

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

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SECTION 06 41 16 - 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. 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.

C. Samples for Initial Selection:
   1. Plastic laminates.
   2. PVC edge material (manufacturers full range)
   3. Thermoset decorative panels.

D. 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."

B. 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.

C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

D. Catches: Magnetic catches, BHMA A156.9, B03141.

E. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.

F. 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.

G. 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 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.

H. 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.

I. 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.

J. 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.

K. Door and Drawer Silencers: BHMA A156.16, L03011.

L. 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.

M. 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 surface.

END OF SECTION

SECTION 07 21 00 - 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.

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 degrees.

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
Exterior Wall Cavity	Faced glass-fiber blanket	6 inches	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

SECTION 07 62 00 - 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.

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. 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.

C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.

D. 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. 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.

B. 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.

C. Recycled Content of Steel-Sheet Flashing and Trim: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

D. 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:
      A. 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 079200 "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.

C. 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.

D. 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 92 00 - 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 80 00 "Glazing" for glazing sealants.
   2. Section 09 29 00 "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 06 71 – DOOR HARDWARE SCHEDULE

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 references specification sections relating to commercial door hardware for the following:

1. Swinging doors.
2. Sliding Doors.
3. Other doors to the extent indicated.

B. Commercial door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical and access control door hardware.
3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
4. Automatic operators.
5. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Sections “Flush and Clad Wood Doors”.
3. Division 08 Section “Door 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 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.

E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

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. 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.

D. 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.

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 the Related Sections.

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.

D. Source Limitations: Obtain each type and variety of Door Hardware specified in the Related Sections from a single source, qualified supplier 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 applicable model building code.

F. 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.

1.5 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 and Frame Preparation: 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.

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.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Refer to “PART 3 – EXECUTION” for required specification sections.

PART 3 - EXECUTION

3.1 DOOR HARDWARE SETS

A. The door 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. The supplier is responsible for handing and sizing all products as listed in the door hardware sets. Quantities listed are for each pair of doors, or for each single door.

C. Products listed in the Door Hardware Sets must meet the requirements described in the specification sections noted.

1. Section 08 71 00 – Door Hardware.
2. Section 08 74 00 – Access Control Hardware.

D. Manufacturer's Abbreviations:

1. MK - McKinney
2. RF - Rixson
3. SA - Sargent
4. BL - Blumcraft
5. FO - Folger Adam
6. HS - HES
7. RO - Rockwood
8. NO - Norton
9. PE - Pemko
10. SU - Securitron
11. 00 – Other

Hardware Schedule

Set: 1.0

Doors: 117.2, 125, 51

2	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Hinge	TA2714 QC12 4-1/2" x 4-1/2"	US26D	MK
1	Integrated Card Reader Lock furnished and installed by 082813 Access Control	DG2 21 H1-82271 LNNJ	US26D	SA
1	Door Closer	PR7500	689	NO
1	Kickplate	K1050 10" 4BE CSK	US32D	RO
1	Door Stop	409	US32D	RO
1	Gasketing	S44D		PE
1	ElectroLynx Harness	QC-C Hinge to J box		MK
1	ElectroLynx Harness	QC-C hinge to lockset		MK

Set: 2.0

Doors: 68, 73

2	Floor Closer	626 PH 328N LFP	626	RF
2	Panic	H-100-A	630	BL
2	Cylinder	DG2 21 41	US26D	SA
1	Door Stop Electric Strike @ Act.	ES-100-D	630	BL
1	Electric Strike	310-1 3/4	630	FO
2	Door Stop	463	US32D	RO
1	Threshold	Type 11 x 176A FHSL14		PE
1	Balance of hardware by door supplier.			00

Set: 3.0

Doors: 69

1	Floor Closer	626 PH 328N LFP	626	RF
1	Panic	H-100-A	630	BL
1	Cylinder	DG2 21 41	US26D	SA
1	Door Stop Single	S-100-S	630	BL
1	Threshold	Type 11 x 176A FHSL14		PE
1	Balance of hardware by door supplier.			00

Set: 4.0

Doors: 70

1	Padlock	DG2 21 758 C HS		SA
1	Balance of hardware by door supplier.			00

Set: 5.0

Doors: 104, 106, 107, 108, 109, 110, 114, 115, 116, 119, 120, 121, 122, 123, 124, 128

3	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Office Lock	DG2 21 7955 LNNJ	US26D	SA
1	Door Stop	409	US32D	RO
1	Gasketing	S773D		PE

Set: 6.0

Doors: 105, 135

3	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	DG2 21 7904 LNNJ	US26D	SA
1	Door Stop	409	US32D	RO

Set: 7.0

Doors: 117.1

3	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Office Lock	DG2 21 7955 LNNJ	US26D	SA
1	Door Closer	PR7500	689	NO
1	Kickplate	K1050 10" 4BE CSK	US32D	RO
1	Door Stop	409	US32D	RO
1	Gasketing	S773D		PE

Set: 8.0

Doors: 117.3

1	Floor Closer	626 PH 328N LFP	626	RF
1	Panic	H-100-A	630	BL
1	Cylinder	DG2 21 41	US26D	SA
1	Electric Strike	310-1 3/4	630	FO

1	Door Stop	463	US32D	RO
1	Door Stop Single	S-100-S	630	BL
1	Threshold	Type 11 x 176A FHSL14		PE
1	Balance of hardware by door supplier.			00

Set: 9.0

Doors: 126, 127

3	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Mortise Deadlock	DG2 21 4877	US26D	SA
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	409	US32D	RO
1	Gasketing	S773D		PE

Set: 10.0

Doors: 129

3	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Exit Device	DG2 12 16 21 43 8813 ETNJ	US32D	SA
1	Door Closer	PR7500	689	NO
1	Kickplate	K1050 10" 4BE CSK	US32D	RO
1	Door Stop	409	US32D	RO
1	Gasketing	S773D		PE

Set: 11.0

Doors: 131, 132, 133

3	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Office Lock	DG2 21 7955 LNNJ	US26D	SA
1	Door Closer	R 7500	689	NO
1	Kickplate	K1050 10" 4BE CSK	US32D	RO
1	Door Stop	409	US32D	RO
1	Threshold	173A FHSL14		PE
1	Acoustic Seal Set	PEMKOSTCSET-1A		PE

Set: 12.0

Doors: 136

3	Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK
1	Storeroom Lock	DG2 21 7904 LNNJ	US26D	SA
1	Door Closer	CPS7500T	689	NO
1	Kickplate	K1050 10" 4BE CSK	US32D	RO
1	Threshold	as detailed X FHSL14		PE
1	Gasketing	S773D		PE
1	Sweep	315CN 36"		PE
1	Latch Protector	325	US26D	RO

Set: 13.0

Doors: 137

4	Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK
1	Hinge	TA2314 QC12 4-1/2" x 4-1/2"	US32D	MK
1	Hinge	TA2314 QC4 4-1/2" x 4-1/2"	US32D	MK
1	Exit Device	43 55 MD8610	US32D	SA
1	Exit Device with Card Reader furnished and installed by section 082813 Access Control	DG2 21 43 H1-MD-8674 106 x ETNJ	US32D	SA
2	Door Closer	PR7500	689	NO
2	Kickplate	K1050 10" 4BE CSK	US32D	RO
2	Door Stop	463	US32D	RO
2	Sweep	315CN 36"		PE
2	ElectroLynx Harness	QC-C Hinge to J box		MK
2	ElectroLynx Harness	QC-C hinge to lockset		MK

Notes: Threshold and gasketing part of hollow metal STC door package.

END OF SECTION 08 06 71

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SECTION 08 11 13 - 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 Section "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.
   4. Timely Industries

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. Extrior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazd Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Astragls: Provide overlapping astragals as noted in door hardware sets in Division
4. 08 Secion "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.
5. Contiuous 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.

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.
      a. 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 31 13 - 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.

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. 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. 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. 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. 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 west 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 bot generally accessible to public	Rated	
AD5	Public and staff spaces, spaces generally accessible to staff and public.	Rated	
AD6	Exterior.	Non-Rated	

END OF SECTION

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SECTION 08 41 13 - 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. 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.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. 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.

F. 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.

G. 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 "FieldQuality Control" Article.
   3. 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.

L. Acoustic Isolation Performance: Where shown on plans, storefront system to provide an STC rating of 39 or greater.

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

SECTION 08 80 00 - 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.

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.

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 SPANDREL GLASS

A. Basis of Design: Subject to compliance with requirements, provide Viracon ‘Viraspan’ Warm Grey V948 or:
   1. Approved equal.

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-e2, 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.

2.12 SPANDREL-GLASS TYPES

B. Glass Type GL-3: 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. Winter U-Factor: 0.31 maximum.
   8. Provide safety glazing labeling.

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.

D. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

E. 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.

F. 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

SECTION 09 22 16 - 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.

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. Medium 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 clocking 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. 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 29 00 - 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. 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, provided materials and construction ideantical 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. 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.

E. Noise Reducing Gypsum Board: ASTM C 840; GA-216
   1. Basis of Design: Subject to compliance with requirements, provide Certain Teed Corporation "QuietRock 530" 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: 52 (OL 11-0646)
   7. Outlet (openings) Sealing: Putty Pads (ASTM E 90)
   8. Edge Sealing: ¼ inch gap all wall edges, (ASTM C 919) Continues 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

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 30 00 - 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. 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.

C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

D. 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 Not Used

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 (Restroom 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.

END OF SECTION

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SECTION 09 51 13 - 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. 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. 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 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.

2.3 ACOUSTICAL PANELS – (APC1)

A. Basis-of-Design Product: Subject to compliance with requirements, provide Ecophon Gedina A or comparable product by one of the following:
   1. Approved equal.

B. Physical Characteristics

   a. Type: XII (per ASTM E1264)
   b. Form: 2 (per ASTM E1264)
   c. Pattern: G (per ASTM E1264)
   d. Edges: square
   e. Size:
      1) Gedina A:
         1. 2'x2'
   f. Thickness: 9/16"
   g. Finished Surface: Akutex T
   h. Finished Surface Color: White 500
   i. Panel Backing: Single layer of smooth, resin-bonded glass tissue
   j. Core Composition: Glasswool
   k. Recycled Content: 71%
      1) 1% (pre-consumer)
      2) 70% (post-consumer)

C. Performance Criteria
   a. Sound Absorption Rating per ISO 11654 (E-200 mounting)
      i. Class A absorber
   b. Noise Reduction Coefficient (NRC) per ASTM C423 (E-400 mounting)
      i. 0.90
   c. Sound Absorption Average (SAA) per ASTM C423 (E-400 mounting)
      i. 0.92
   d. Articulation Class (AC) per ASTM E1111
      i. 190
   e. Light Diffusion per DIN 5036
      i. 99%
   f. Light Reflectance (LR) per ASTM E1477
      i. Minimum 0.84
   g. Humidity Resistance per ISO 4611
      i. Warranted to withstand relative humidity of up to 95% at 104ºF without sagging, warping or delaminating for 10-years
   h. Clean Room Classification
      i. Class 5 per ISO 14644-1
   i. Flame Spread Classification per ASTM E84
      i. Class A

D. Independent Certifications and Recommendations

a. Indoor Climate Label – highest class for ceiling panels
b. Nordic Swan Eco-label
c. Recommended by Swedish Asthma and Allergy Association
d. M1 classification from Building Information Foundation (RTS)

2.3 SUSPENSION SYSTEM

A. Manufacturer: CertainTeed Ceilings
B. Product
   1. Name: [15/16" Classic Stab, 15/16" Classic Aluminum Capped Stab, 15/16" Classic Hook, 15/16" Classic Aluminum Capped Hook, 15/16" Classic Environmental Stab, 9/16" Elite Narrow Stab]
C. Physical Characteristics
   1. Structural Classification: [Intermediate Duty, Heavy Duty] (per ASTM C635)
   2. Double web design manufactured of hot-dipped galvanized steel
   3. Flange Size:
      a. 15/16"
      b. 9/16"
   4. Color: White
D. Components
   1. Main Runners
      a. Size: 12'
   2. Cross Tees
      a. Size: [8', 5', 4', 2', 1']
   3. Stabilizer Bars
      a. Size: [4', 2']
   4. Edge Molding
      a. Type: [angle, shadow-line]
      b. Profile: As selected by the Architect
E. Attachment Devices: Anchors sufficient for five-times design load indicated in ASTM C635 (Table 1). Wire for hangers of size and type to suit intended application, complying with ASTM C641, Class 1 zinc coating, not less than 12 gauge
   1. Seismic Restraints: Pursuant to CISCA recommendations, ASTM E580 and local code requirements
   2. ICC-ES Evaluation Service Report (ESR-3336)
      a. Suspended Ceilings Framing Systems and Seismic Perimeter Clip
   3. City of Los Angeles Research Report (RR 25978)
      a. Suspended Ceilings Framing Systems and Seismic Perimeter Clip

2.4 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.

2.5 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.

2.6 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.

2.7 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. 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.
   8. 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 61 05 - 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.

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 ft^2 per 24 hours to 3 lbs per 1000 ft^2 per 24, and have resulted in maintained water vapor reduction rate of less than 3 lbs per 1000 ft^2 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

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 controlsystem 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 65 13 - 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. 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

C. 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 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

2.2 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.

2.3 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.
   5. 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

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SECTION 09 65 16.13 - 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. 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.

C. 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.

D. 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.

E. 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 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.

2.2 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.

2.3 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

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SECTION 09 65 36 - 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. 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.

C. Samples for Initial Selection: For each type of static-control resilient flooring.

D. Samples for Verification: For each type of static-control resilient flooring, of size indicated below:
   1. Floor Tile: Full-size units.

E. 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
         2) 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 68 13 - 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. Shop Drawings: Show the following
   1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required on 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.

C. 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.

D. 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 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.

2.2 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.

2.3 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 00 84 00 - ACOUSTICAL WALL TREATMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Custom fabricated acoustical wall panels.

1.2 REFERENCES

A. ASTM International:
   1. ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   2. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
   3. ASTM E795 Standard Practices for Mounting Test Specimens During Sound Absorption Tests.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. Surface Burning Characteristics (ASTM E84):
      a. Flamespread: 25 maximum.
      b. Smoke Developed: 450 maximum.
      c. Fire ratings for all fabric covered panels is based on testing of the panel wrapped with the standard in stock fabric, Guilford of Maine, Model FR 701.

1.4 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit product data sheet, for specified products.

C. Shop Drawings: Submit shop drawings showing layout, edge profiles and panel components, including anchorage, accessories, finish colors and textures.

D. Samples: Submit selection and verification samples of finishes, colors and textures.

E. Test Reports: Certified test reports showing compliance with specified performance requirements.
   1. Standard Systems: Submit certified copies of previous test reports substantiating performance of system in lieu of retesting.

1.5 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Section.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

1.6 PROJECT CONDITIONS

A. Environmental Requirements: Do not install panels until wet work, such as concrete and plastering, is complete; the building is enclosed; and the temperature and relative humidity are stabilized at 60 - 80 degrees F (16 - 27 degrees C) and 35% MINIMUM RH and 55% MAXIMUM RH, respectively. All products constructed with wood or wood fiber content must be stored for at least 72 hours in the controlled environment specified herein prior to installation to allow the materials to stabilize.

PART 2 PRODUCTS

2.1 ACOUSTICAL WALL PANELS

A. Manufacturer: Kinetics Noise Control.
   1. Contact: PO Box 655, 6300 Irelan Place, Dublin, OH 43017; Telephone: (614) 889-0480; Fax: (614) 889-0075; E-mail: intsales@kineticsnoise.com; Web site: www.kineticsnoise.com.
   2. Or approved equal

2.2 MANUFACTURED UNITS

A. HardSide Panels:
   1. Thickness: 1 inch (25.4 mm)
   2. Size: As indicated on the drawings up to a maximum 48 inch (1219 mm) x 120 inch (3048 mm) panel.
   3. Core: [1 inch (25.4 mm) density.
   4. Edge Detail: Beveled, hardened with non-resin, Class A hardening solution.
   5. Facing: Factory approved customer selected fabric.
      a. Color: As selected from panel manufacturer's stocked range of colors
   6. Sound Absorption (ASTM C423): Noise Reduction Coefficient as follows:
      a. 1 inch (25.4 mm) Panel: 0.80, minimum.
   7. Mounting Accessories: Velcro

2.3 FABRICATION

A. General: Treat fabric wrapped panels using heat shrink process to develop fully taut facing.

B. HardSide and High Impact HardSide Panels: Wrap panel edges and return facing fabric 1 - 2 inches (25.4 - 51 mm) on back of panel. Secure fabric with adhesive applied to edges and back of panel only.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.2 EXAMINATION

A. Site Verification of Conditions: Verify that substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.
   1. Verify that stud spacing is 16 inches (406 mm) oc, maximum, for panels installed over open studs.
   2. Do not install panels until unsatisfactory conditions are corrected.

3.3 CLEANING

A. Follow manufacturer's instructions for cleaning panels soiled during installation. Replace panels that cannot be cleaned to as new condition.

B. Keep site free from accumulation of waste and debris.

END OF SECTION

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SECTION 09 91 00 – 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	70 to 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. 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 10 14 19 - 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 01 40 00 "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. Cat Characters: Characters with uniform faces, sharp corners and precise lines and profiles and as follows:
   1. Manufacturers: Subject to compliance with requirements, available offering products that may be incorporated into the Work include, but are not to, the following:
      a. ACE Sign Systems, Inc.
      b. Allen Markings International.
      c. APCO Graphics, Inc.
      d. 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

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SECTION 10 14 23 – 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.

A. 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 21 13 - 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 10 35 " Miscellaneous Rough Carpentry" for blocking.
   2. Section 10 28 00 "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. 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.

C. 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

SECTION 10 28 00 - TOILET 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. Underlavatory guards.
   3. Custodial accessories.

B. Related Sections:
   1. Section 22 40 00 “Plumbing 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. Heat-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 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.

2.4 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

2.5 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 44 13 - 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 44 16 - 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 44 13 "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:
   1. 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 11 52 00 - 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 50 00 “Metal Fabrications” for slotted channel framing for projector mount installation.
   2. Section 06 40 53 "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. 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:
   1. Seamless Construction: Provide screens, in sizes indicated, without seams.
   2. 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

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SECTION 12 24 13 - 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 92 00 “Joint Sealants” for sealants at perimeter of shade system
   3. Section 26 05 00 “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. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples: For each exposed product and for each color and texture specified, 10 inches long.

D. Samples for Initial Selection: For each type and color of shadeband material.
   1. Include Samples of accessories involving color selection.

E. 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.

F. 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 Not Used

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 36 23.13 - 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 41 16 “Plastic Laminate Faced Architectural Cabinets” for architectural cabinets.
3. Section 12 36 61.16 “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. 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.

C. Samples for Initial Selection:
1. Plastic laminates.

D. 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. 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. 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 36 61.16 - 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 50 00 “Metal Fabrications” for countertop supports.
   2. Section 22 00 00 "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. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

C. Samples for Initial Selection: For each type of material exposed to view.

D. 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

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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 sleeves.

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

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 SYSTEM

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 Systems	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

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.

E. Shop Drawings: Indicate layout of piping systems, including equipment, critical dimensions, and sizes. In addition to Section 133300 SUBMITTAL PROCEDURES provide shop drawings in a REVIT 2014 model

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. Flages, 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. Basis of design as indicated on Drawings.
      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. Trench Drain (TD-1):
   1. Manufacturer:
      a. Basis of design as indicated on Drawings.
      b. Substitutions: Permitted.
   2. Trench drain construction: High Density Polyethylene (HDPE) body with UV stabilization, modular drain channel with bedding feet, tongue and groove snap fit connection, and smooth radius bottom.
   3. Grate: HDPE, heel-proof, Class A.
   4. Provide no-hub end outlet connection on trench drains where indicated on the Drawings.

C. Trench Drain (TD-2):
   1. Manufacturer:
      a. Basis of design as indicated on Drawings.
      b. Substitutions: Permitted.
   2. Trench drain construction: High Density Polyethylene (HDPE) body with UV stabilization, wide reveal modular drain channel with bedding feet, tongue and groove snap fit connection, , 0.75% built-in slope and smooth radius bottom.
   3. Grate: Galvanized Ductile Iron, slotted, lock-down, Class C rated per DIN EN1433 top load classification, confirming to ASTM specification A536-84, Grade 80-55-06.
   4. Provide no-hub end outlet connection on trench drains where indicated on the Drawings.

D. Trench Drain (TD-3):
   1. Manufacturer:
      a. Basis of design as indicated on Drawings.
      b. Substitutions: Permitted.
   2. Trench drain construction: Fiber Reinforced Polymer (FRP) body with UV stabilization, wide reveal modular drain channel with bedding feet, tongue and groove snap fit connection, 0.75% built-in slope and smooth radius bottom.

3. Grate: Galvanized Ductile Iron, slotted, lock-down, Class C rated per DIN EN1433 top load classification, confirming to ASTM specification A536-84, Grade 80-55-06.
4. Frame: One quarter inch thick Carbon Steel construction, conforming to ASTM specification A36, with regular concrete anchors, integral grate lock-down bars, and powder coat finish. All welds shall be performed by a certified welder per ASTM standard AWS D1.1.
5. Provide no-hub end outlet connection on trench drains where indicated on the Drawings.

E. 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, basis of design manufacturer/model number indicated on Drawings.

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. Manufacturer: Basis of design scheduled on drawings.

B. 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. Manufacturer: 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.

M. Coordinate trench drain installations with concrete work.

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 ¼ inches and smaller	6	½
Copper tube 1 ½ inches and larger	10	½
PVC (all sizes)	4	3/8
Steel, 3 inches and smaller	12	½
Steel, 4 inches and larger	12	5/8

END OF SECTION 22 10 00

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SECTION 22 11 16 DOMESTIC WATER PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Settlement Joints.
2. Copper pipe and fittings for above and below ground installation.
3. Pipe wrap for all domestic water piping installed below ground and inside grout-filled block walls.
4. Insulation for copper pipe through concrete, grade beams and footings.
5. Electric heat tracing for domestic water temperature maintenance.
6. Dielectric unions and fittings.

B. This Contractor shall furnish all labor, materials, pipe supports, sleeves, hangers, tools, equipment and perform all work and services necessary for furnishing and installation of a complete domestic water piping system. Although all work is not specifically shown or specified, all valves, appurtenances and devices incidental to or necessary for a sound, secure, complete and compatible installation shall be furnished and installed as part of this work.

C. Domestic water piping installed below ground and under slab in all buildings (i.e. trap primer lines, etc) shall be supported either from the structural slab or direct burial. Scope and direction is indicated on the Plumbing Plans.

1.2 DEFINITIONS

A. Water Service Piping: Water piping outside the building that conveys water to the building.

B. Service Entrance Piping: Water piping approximately 5-feet outside the building, between water service piping and water distribution piping.

C. Water Distribution Piping: Water piping from a point approximately 5-feet outside the building that conveys water to fixtures and equipment throughout the building.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with the following minimum working pressure ratings, unless otherwise indicated:

1. Domestic Water Service Piping, Below Ground: 160 psig.
2. Domestic Water Distribution Piping, Above Ground: 125 psig.

1.4 SUBMITTALS

A. Product Data for settlement joints, below and above ground pipe, fittings, couplings, hangers, pipe coating and pipe wrap for pipe installed below ground and installed in grout-filled block walls, seismic bracing and thrust and/or restraint or blocking at base of domestic water riser. Provide manufacturer's catalog information.

B. Shop Drawings

1. For underground and above ground systems, and all mechanical and plumbing chases. Include plans, elevations, sections, and details.
2. In accordance with Sections 23 05 29 and 23 05 48.

C. Calculations: In accordance with Sections 23 05 29 and 23 05 48.

D. Water Samples: Specified in Disinfection of Domestic Water Piping System Article in Part 3.

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Settle joints shall be FM approved.

1.6 RECORDS

A. Provide record of all pipe tests and provide as part of O & M Manual.

B. Include certificate of Tests in O&M Manual.

C. Include certificate of Health Department approval of domestic water quality in O&M Manual.

D. Provide certificate of Domestic water piping system disinfecting and include in O & M Manual.

1.7 DRAWING SCHEDULE

A. Refer to sheet notes and schedule on Drawings for model numbers, symbols, etc. for additional information concerning products specified in this section.

PART 2 PRODUCTS

2.1 SETTLEMENT JOINT

A. General: Provide settlement joint on all domestic water service entrance pipe to each building, as indicated on the Underground Plumbing Plans.

B. Settlement joint shall be manufactured of 65-45-12 ductile iron conforming to the material requirements of ASTM A536.84 and ANSI/AWWA C153/A21.53. Provide foundry certification of material with submittal.

C. Each settlement joint shall be pressure tested prior to shipment against it own restraint to a minimum of 350 psi (250 psi for flexible expansion joints 30 inches diameter and larger.) A minimum 2:1 safety factor, determined from the published pressure rating, shall apply. Factory Mutual Approval for the 12-inch and smaller sizes is required.

D. Each settlement joint shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of 20 degrees, 3-inch to 12-inch; and 4-inches minimum expansion.

E. All internal surfaces (wetted parts) shall be lined with a minimum of 15-mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213 and shall be holiday tested with a 1500-volt spark test conforming to said specification. Sealing gaskets shall be constructed of EPDM. The coating and gaskets shall meet ANSI/NSF-61.

F. All external surfaces shall be coated with a catalyzed coal tar epoxy conforming to the material requirements of AWWA C210. Appropriately sized polyethylene sleeves, meeting ANSI/AWWA C105/A21.5, shall be included for direct buried applications.

G. Manufacturer's certification of compliance to the above standards and requirements shall be provided with submittal.

2.2 PIPING MATERIALS

A. General: The application of the following pipe, tube, and fitting materials and joining methods required for plumbing piping systems are indicated in Part 3 Article "Pipe Fittings and Applications."

B. Hard Copper Tube: ASTM B88, Type L, water tube, drawn temper for above ground and in wall installation.

C. Set Copper Tube: ASTM B88, Type K, water tube, annealed temper for below ground installation.

1. COPPER PIPE AND FITTINGS

a. Soft Copper Tube: ASTM B88, Types K (ASTM B88M, Types A and B), water tube, annealed temper.

1) Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2) Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
3) Copper Unions: MSS SP-123/ASME B16.18, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

a) Threaded Ends: Threads conforming to ASME B1.20.1.

b. Hard Copper Tube: ASTM B88, Types L (ASTM B88M, Types B and C), water tube, drawn temper.

1) Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought- copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2) Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
3) Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

    a) Threaded Ends: Threads conforming to ASME B1.20.1.

4) Copper, Grooved-End Fittings: ASTM B75 (ASTM B75M) copper tube or ASTM B584 bronze castings.

    a) Copper-Tubing, Keyed Couplings: Copper-tube dimensions and design similar to ANSI/AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.

5) Alternate Fitting Option: For piping 4-inches and smaller, copper press fittings conforming to the material and sizing requirements of ASME B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM. Fittings shall be IAPMO and UPC listed.

2.3 JOINING MATERIALS

A. Solder, brazing, and welding filler metals are specified in Section 22 05 00, Common Work Results for Plumbing.

2.4 PIPE WRAP BELOW GROUND AND WITHIN GROUT-FILLED BLOCK WALLS

A. General: Provide pipe wrap for all copper pipe installed below ground and for all horizontal and vertical copper pipe installed inside grout-filled block walls.

1. Cleaning: Remove loose scale, rust, dirt, oil and grease before wrapping. Wire brush as required; use solvent for removal of oil and grease.
2. Provide Calpico Inc. pipe wrapping polyvinyl tape, 20-mil thickness, with identification as per IAPMO-CPC Code for all horizontal and vertical copper piping installed inside grout-filled block walls.
3. Encase in one layer of an ANSI/AWWA C105, 8-mil polyethylene jacket all ground copper pipe installed below ground. Install jacket per ANSI/AWWA C105/A21.5.
4. Encase in two layers of an ANSI/AWWA C105, 8-mil polyethylene jacket, all ductile iron pipe installed below ground. Install jacket per ANSI/AWWA C105/A21.5.

2.5 DIELECTRIC PIPE FITTINGS

A. General: Provide dielectric pipe fittings, unions and waterways to protect domestic water copper pipe from deterioration caused by galvanic and stray current corrosion. Provide dielectric fitting, union or waterway where dissimilar metals are used in piping systems.

1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.
2. Insulating Material: Suitable for system fluid, pressure, and temperature.
3. Dielectric Unions: Factory-fabricated, union assembly for 250 psig minimum working pressure at a 180 degrees F temperature.

    a. Manufacturers: Epco Sales, Inc.; Watts Industries, Inc. - Water Products Division or Zurn Industries, Inc. - Wilkins Division.

4. Dielectric Flanges: Factory-fabricated, companion-flange assembly for 150 or 300 psig minimum pressure to suit system pressures.

    a. Manufacturers: Epco Sales, Inc. or Watts Industries, Inc. - Water Products Division.

5. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

    a. Provide separate companion flanges and steel bolts and nuts for 150 or 300 psig minimum working pressure to suit system pressures.
    b. Manufacturers: Advance Products & Systems, Inc. ; Calipco, Inc. or Pipeline Seal and Insulator, Inc.

6. Dielectric Couplings: Galvanized-steel coupling, having inert and noncorrosive, thermoplastic lining, with threaded ends and 300 psig minimum working pressure at 225 degrees F temperature.

    a. Manufacturers: Calpico, Inc. or Lochinvar Corp.

7. Dielectric Nipples: Electroplated steel nipple, having inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300 psig working pressure at 225 degrees F temperature. Nipples shall be listed by IAPMO/UPC and SBCCI PST and ESI.

    a. Manufacturers: Precision Plumbing Products, Inc.; Sioux Chief manufacturing Co.,Inc, Perfection Corp. or Victaulic Co. of America.

2.6 PIPE ESCUTCHEONS

A. General: Provide solid (not split-hinged) pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with

nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas. All areas with escutcheons shall be vandal proof.

B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide solid cast brass or sheet brass escutcheons, solid pipe escutcheons.

C. Pipe Escutcheons for Dry Areas: Provide solid sheet metal escutcheons.

D. Manufacturer: Chicago Specialty, Producers Specialty, Sanitary-Dash.

2.7 FIRE BARRIER PENETRATION SEALS

A. Provide seals for opening through fire-rated walls, floors, or ceiling used as passage for mechanical components such as piping or ductwork. Refer to details on Drawings.

1. Piping: Provide fire stopping material.

PART 3 EXECUTION

3.1 SERVICE ENTRANCE PIPING

A. Extend building domestic water piping 5 feet outside building and connect to water service piping. Coordinate invert elevations, pipe sizes and points of connection with the existing site conditions.

3.2 PREPARATION OF FOUNDATION FOR BURIED PIPING

A. Grade trench bottom to provide smooth, firm, stable, and rock-free foundation throughout length of piping.

B. Remove unstable, soft and unsuitable materials at surface on which piping is to be laid and backfill with clean sand or pea gravel to indicated level.

C. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped-sand backfill. Dig holes at each end of pipe joint to relieve loads and to ensure continuous bearing of pipe barrel on foundation.

3.3 PIPING AND FITTINGS APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Grooved joints may be used on aboveground grooved-end piping.

D. Underground Domestic Water Service Entrance Piping: Use the following piping materials:

1. 6 inches and Smaller: Soft copper tube, Type K, cast-copper-alloy, soldered-joint pressure fittings; and soldered joints with Alloy Sn95 solder.

2. All copper pipe installed below finished grade and slab shall be encased in one layer of an ANSI/AWWA C105, 8-mil polyethylene jacket installed per ANSI/AWWA C105/A21.5.

E. Aboveground Domestic Water Distribution Piping: Use the following piping materials:

1. 6 inches and Smaller: Hard copper tube, Type L wrought-copper or cast-copper-alloy pressure fittings; copper unions; bronze flanges and soldered joints with Alloy Sn95 solder.
2. Provide transition fitting (C900 PVC-to-Copper) at location indicated outside the building.

3.4 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use full port ball or butterfly valves.
2. Throttling Duty: Use full port ball or butterfly valves.
3. Hot Water, Balancing Duty: Calibrated balancing valves, comply with the requirements of Section 22 05 23.
4. Drain Duty: Hose-end drain valves.
5. Isolation Duty: Use full port ball valves.
6. Back Flow: Swing check valves.

B. All iron body valves installed below finished grade shall be encased in two layers on an ANSI/AWWA C105, 8-mil polyethylene jacket installed per ANSI/AWWA C105/A21.5.

3.5 PIPING INSTALLATION

A. Contamination Prevention:

1. Pipe interiors shall be kept free of debris.
2. Interior surfaces of domestic water pipes, valves and fittings shall be protected against contamination, as well as debris. All openings in pipelines shall be closed with watertight plugs when worked is halted on the system. Sealing and packing materials shall not support growth of bacteria. Trenches that become wet shall be treated with calcium hypochlorite granules to prevent bacterial growth.

B. General:

1. The installation of the domestic water systems shall conform to the latest edition of California Plumbing Code (CPC) and this specification.
2. Piping installation shall be coordinated with respect to space available for HVAC, fire protection and electrical installation. In case of conflict in the routing of the piping and ducting, the routing of the ducting shall govern. Installed piping shall not interfere with the operation or accessibility of doors or windows; shall not encroach on aisles, passageways and equipment and shall not interfere with the servicing or maintenance of equipment. Pipe shall be cut accurately to measurements established at the construction site and shall be worked into place without springing or forcing, properly clearing all openings and equipment. Pipe shall not be bent. Cutting or weakening of structural members to facilitate piping installation is not permitted.

3. Pipes shall have burrs removed by reaming and shall be so installed as to permit free expansion and contraction without damage to joints or hangers. Piping above ground shall run parallel with the lines of the building unless otherwise noted on the drawings. Service pipe, valves and fittings shall be kept a sufficient distance from other work to permit finished covering not less than 1-inch from such other work and not less than 1-inch between finished covering on the different services.

C. Extend domestic water distribution piping to a point 5 feet outside each building and in sizes and locations indicated. Connect to water service entrance piping, coordinate point of connection with the existing site conditions. Provide transition fitting, C900 PVC-to-copper.

D. Install underground copper tubing according to CDA's "Copper Tube Handbook."

E. Install wall penetration system at service pipe penetration through foundation wall. Make installation watertight.

F. Install butterfly valve, hose-end drain valve, strainer, pressure gauge, temperature gauge, and test tee with valve, at water service entrance.

G. Install aboveground domestic water piping level without pitch and plumb.

H. Provide and install electric heat trace temperature maintenance on all non-recirculating domestic hot water systems to maintain temperatures indicated on Drawings. Heat trace shall extend from water heater to within 15 feet minimum of each fixture. Install per manufacturer's instructions.

3.6 JOINT CONSTRUCTION

A. Soldered Joints: Use ASTM B813, water-flushable, lead-free flux; ASTM B32, lead-free-alloy solder; and ASTM B828 procedure, unless otherwise indicated.

B. Grooved Joints: Assemble joints with keyed-coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

C. Option for fittings: Copper press connections. Copper press fittings shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

3.7 VALVE INSTALLATION

A. General: Valves shall be installed at the locations shown on the drawings, as required by code and for isolation of equipment, plumbing fixtures, etc. All valves shall be installed with the stems between the horizontal the 90 degrees vertical. Provide access to all concealed valves by means of access doors furnished and installed by the Contractor.

B. Sectional Valve: Install sectional valves close to water main on each branch and riser serving 2 or more plumbing fixtures or equipment connections and where indicated. Use ball valves for piping 4 inches and smaller. Use butterfly valves for piping 5 inches and larger.

C. Install shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball valves for piping 4-inches and smaller. Use butterfly valves for piping 5 inches and larger.

D. Drain Valves: Install drain valves on each plumbing equipment item located to drain equipment for service and repair. Install drain valves at base of each water riser, at low points in horizontal piping, and where required to drain water distribution piping system.

1. Install hose-end drain valves at low points in water mains, risers, and branches.
2. Install stop-and-waste drain valves where indicated.

E. Balancing Valve: Install balancing valve on the hot water and hot water return loops as indicated on the Drawings and Riser Diagrams Comply with Section 22 05 23 for balancing valves.

F. Check Valves: Install swing check valve on discharge side of each pump and elsewhere as indicated. Use MSS SP-80, Class 125, cast-bronze body for 2-inch and smaller piping.

G. Mechanical and Plumbing Chases: Install ball valve on each branch serving each plumbing chase.

3.8 HANGER AND SUPPORT INSTALLATION

A. Comply with the requirements for seismic-restraint devices and pipe hanger and supports.

B. Install hangers for horizontal and vertical piping with the following maximum spacing and minimum rod sizes:

1. Support vertical copper tube at each floor.
2. Install supports for vertical copper tubing every 10 feet.

C. Conform to Table below for maximum spacing of supports:

Pipe Material	Horizontal In Feet	Vertical In Feet	Rod Size In Inches
Copper Tubing 1-1/4 inches and smaller:	6	10	3/8 inch
Copper Tubing 1-1/2 inches and larger:	10	10	1/2 inch

D. Support horizontal and vertical piping inside each mechanical chase using cold formed metal framing (“Superstrut”).

3.9 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water distribution piping to exterior water service entrance piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to the following:

1. Water Heaters: Install cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
2. Plumbing Fixtures: Install cold and hot water supply piping in sizes indicated, but not smaller than required by the latest edition of California Plumbing Code (CPC) and/or authorities having jurisdiction.
3. Equipment: Connect cold and hot water supply piping to equipment as indicated, but not smaller than equipment connections and as required by CPC. Provide ball valve and union for each connection; provide drain valve on drain connection. Use flanges instead of unions for 5-inches and larger.

3.10 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:

1. Do not enclose, cover, or put piping into operation until all piping is inspected and approved by local plumbing official and/or authority having jurisdiction.
2. During progress of the installation, notify local plumbing official and/or authority having jurisdiction at least 24 hours prior to time inspection must be made. Perform tests specified below in presence of the local plumbing official and/or authority having jurisdiction:

    a. Roughing-in Inspection: Arrange for inspection of piping system before concealing or closing-in after roughing-in and prior to setting fixtures.
    b. Final Inspection: Arrange for final inspection by local plumbing official and/or authority having jurisdiction to observe tests and to ensure all systems are in compliance with requirements of the latest edition of California Plumbing Code.

3. Reinspection: When a plumbing official finds that a piping system will not pass test or inspection, Contractor shall make the required corrections and arrange for reinspection by the plumbing official.
4. Reports: Prepare inspection reports and have them signed by the local plumbing official and/or authority having jurisdiction. A copy of all inspection reports to be included in the O & M Manuals.
5. Provide written report to Architect and Engineer that all copper piping installed below ground and inside grout filled block walls have been coated and wrapped with approved pipe wrap. Written report shall be included in the O & M Manuals.

B. Test domestic water distribution piping as follows:

1. Test for leaks and defects in new water distribution piping system and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced domestic water distribution piping until it has been tested and approved. Expose work that was covered or concealed before it has been tested and approved for testing.
3. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

4. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.11 ADJUSTING

A. Adjust balancing valves in hot-water system to provide adequate flow.

1. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
2. Adjust calibrated balancing valves to flows indicated on the Plumbing Drawings or Domestic Water Piping Diagram.

3.12 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete and clean.

B. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Disinfect potable domestic water distribution piping as follows:

1. Purge new domestic water distribution piping systems before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed by that authority, the procedures described in either AWWA C651 or AWWA C652 or as described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 of outlets.
e. If final disinfectant residual test less than 25 mg/L, repeat treatment.
f. Flush disinfectant from system until residual equal to that of incoming water or 1.0mg/L.
g. Take samples no sooner than twenty-four (24) hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651. Provide laboratory results to Owner’s Representative. Obtain approval from local health department.

D. Prepare and submit reports of purging and disinfecting activities.

E. Completely flush all domestic hot and cold water risers to eliminate all debris in the lines before using any flush valves.

F. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.13 STARTUP SERVICES

A. Verify incoming water pressure and temperature.

B. Replace all strainer screens with new at all mechanical and plumbing equipment.

C. Fill water systems. Check potable water expansion tanks to determine that they are not air bound and that system is completely full of water.

D. Before operating systems, perform these steps.

1. Close drain valves, hydrants, and hose bibbs.
2. Open all valves to full open position.
3. Open throttling valves to proper setting.
4. Remove plugs used during testing of piping systems and plugs used for temporary sealing of piping during installation.
5. Remove and clean strainer screens and aerators. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used, clean, and ready for use.

E. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

F. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.14 PROTECTION

A. Protect piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of day or when work stops.

END OF SECTION

SECTION 22 13 16 SANITARY WASTE AND VENT PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Hub and Spigot pipe and Fittings (below ground).
2. No-Hub Pipe, fittings (above ground).
3. No-Hub Heavy Duty Couplings (above ground).
4. Settlement Joints.
5. Pipe Wrap for all sanitary waste and vent and grease waste and vent piping installed below ground and inside grout-filled block walls.
6. Settlement Joints.
7. Pipe Escutcheons.
8. Fire Barrier Penetration Seals.

B. This Contractor shall furnish all labor, materials, sleeves, hangers, supports, tools, equipment and perform all work and services necessary for furnishing and installation of a complete sanitary waste and vent piping system. Although all work is not specifically shown or specified, all appurtenances and devices incidental to or necessary for a sound, secure, complete and compatible installation shall be furnished and installed as part of this work.

C. This Contractor shall furnish to Owner's Representative a digital record of all underground sanitary waste and vent and grease waste and vent piping prior to issuing Certificate of Occupancy. Contractor shall review with the Owner's Representative entire underground waste and vent system for each building. All blockages and debris found shall be removed and piping systems replaced at no cost to the Owner.

1.2 DEFINITIONS

A. Sanitary Waste and Vent Piping: Piping inside the building that conveys waste water and vapors from fixtures and equipment throughout the building.

B. Service Entrance Piping: Sanitary sewerage piping to a point approximately 5 feet outside each building between outside building sewer piping and inside sewer piping.

C. Sewerage Piping: Building sewer piping outside building that conveys sanitary sewerage from building.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.
2. Indirect Waste and Vent Piping: 10-foot head of water.
3. Grease Waste and Vent Piping: 10-foot head of water.

1.4 SUBMITTALS

A. Product Data for settlement joints, hub and spigot pipe and fittings, No-hub pipe, fittings, and heavy duty couplings, hangers, supports, pipe wrap for pipe installed below ground and installed in grout filled block walls, thrust and/or restraints or blocking at base of each sanitary stack, and seismic bracing. Provide manufacturers catalog information.

B. Shop Drawings

1. For underground and above ground systems, and all mechanical and plumbing chases. Include plans, elevations, sections, and details.
2. Details for the installation of the sanitary waste and vent piping for to be supported from the structural slab.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of CISPI, IAMPO and the specified testing agency.

B. Comply with the provisions of ASME B31.9 “Building Services Piping,” for materials, products, and installation.

C. All cast iron pipe and fittings shall be manufactured in the United States. Pipe shall bear the label or stamp that the cast iron was manufactured in the United States, with collective trademark of the Cast Iron Soil Pipe Institute.

D. Submittal for No-Hub heavy duty couplings to include copy of compliance to the requirements of FM 1680 Class I.

1.6 TESTING

A. Sanitary and Grease Waste and Vent Piping:

1. Test all building sanitary and grease sewer and venting to ensure system is water tight.
2. All sanitary and grease drainage piping shall be tested to the point of connection to mains outside each building.
3. Refer to Part 3, Article “Testing” of this section.

B. Records:

1. Provide record of all pipe tests and include in O&M Manual.
2. Include certificate of all Tests in O & M Manual.
3. Include digital record of all underground sanitary waste; grease waste and vent piping systems in O&M Manual.

1.7 DRAWING SCHEDULE

A. Refer to schedules on drawings for model numbers, symbols, and additional information concerning products specified in this section.

PART 2 PRODUCTS

2.1 PIPING MATERIALS MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products in each category, by one of the following listed from that category:

1. Hub and Spigot Cast Iron Pipe and Fittings:

   a. AB&I, Oakland, California.
   b. Charlotte Pipe & Foundry Company, Charlotte, North Carolina.
   c. Tyler Pipe Industries, Tyler, Texas.

2. No-Hub Cast Iron Pipe and Fittings:

   a. AB&I, Oakland, California.
   b. Charlotte Pipe & Foundry Company, Charlotte, North Carolina.
   c. Tyler Pipe Industries, Tyler, Texas.

3. No-Hub Heavyweight Couplings:

   a. Anaco, Inc., Oakland, California; Husky SD4000-Orange Shield.
   b. Clamp-All Corporation, Haverhill, MA; Clamp All Hi Torque 125.
   c. No other couplings are acceptable.

2.2 HUB AND SPIGOT SOIL, WASTE AND VENT PIPING

A. Hub and Spigot Pipe and Fittings:

1. Service Cast Iron pipe and fittings shall be manufactured from gray cast iron with a tensile strength of not less than 21,000 psi.
2. Pipe and fittings shall comply with ASTM A74. Compression gaskets shall be hydrostatically (water) tested by the manufacturer to verify compliance.
3. Joints shall be made with an elastomeric compression gasket meeting requirements of ASTM C564.

2.3 CAST-IRON NO-HUB SOIL, WASTE AND VENT PIPING AND FITTINGS

A. No-Hub Pipe: Hubless cast iron pipe and fittings shall be manufactured from gray cast iron with a tensile strength of not less than 21,000 psi. Pipe and fittings shall comply with ASTM A888 and CISPI 301. Each length of pipe shall be hydrostatically (water) tested by the manufacturer to verify compliance. All systems shall utilize a separate waste and vent system.

B. Joints for Hubless Cast Iron Pipe and Fittings Above Grade: Couplings for joining hubless cast iron soil pipe and fittings conforming to ASTM A888, shall be 3 inches wide for nominal pipe sizes 1-1/2 to 4 inches in diameter, 4 inches wide for nominal pipe sizes 5 to 10 inches in diameter. Shields shall have a minimum thickness of 0.015 inches (28 gauge) type 304 stainless

steel. Worm drive clamps shall be type 304 stainless steel with a minimum clamp torque of 80 in/lbs. Sealing Gasket shall be neoprene conforming to ASTM C564. Couplings shall conform to FM 1680, Class 1 or ASTM C1540.

1. Alternate to above, cast iron split clamps secured by stainless steel bolts and nuts with neoprene gasket conforming to ASTM C564, as manufactured by MG Coupling Company.
2. FM approved couplings may be hung with one hanger per length of pipe for 10-foot lengths and at every third fitting where they are contiguous in conformance with manufacturers installation instructions.

2.4 PIPE WRAP FOR BELOW GROUND PIPING

A. General: Provide pipe wrap for all cast iron pipe installed below ground and cast iron pipe installed inside grout-filled block walls.

B. All underground grease waste, waste and vent cast iron piping installed below finished grade shall be encased in two (2) layers of an ANSI/AWWA C105, 8-mil polyethylene jacket installed per ANSI/AWWA C105/A21.5.

2.5 SETTLEMENT JOINTS

A. General: Provide settlement joints on all service entrance sanitary waste and grease waste pipe from each building as indicated on the Plumbing Drawings.

B. Flexible settlement joints shall be manufactured of 65-45-12 ductile iron conforming to the material requirements of ASTM A536.84 and ANSI/AWWA C153/A21.53. Provide foundry certification of material with submittal.

C. Each settlement joint shall be pressure tested prior to shipment against its own restraint to a minimum of 350 psi (250 psi for flexible expansion joints 30 inches diameter and larger.) A minimum 2:1 safety factor, determined from the published pressure rating, shall apply. Factory Mutual Approval for the 12 inch and smaller sizes is required.

D. Each settlement joint shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of: 20 degrees for 3 inches to 12 inches, and 4 inches minimum expansion.

E. All internal surfaces (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213 and shall be holiday tested with a 1500 volt spark test conforming to said specification. Sealing gaskets shall be constructed of EPDM. The coating and gaskets shall meet NSF/ANI 61.

F. All external surfaces shall be coated with a catalyzed coal tar epoxy conforming to the material requirements of AWWA C210. Appropriately sized polyethylene sleeves, meeting ANSI/AWWA C105/A21.5, shall be included for direct buried applications.

G. Manufacturer’s certification of compliance to the above standards and requirements shall be provided with submittal.

2.6 PIPE ESCUTCHEONS

A. General: Provide solid (not split-hinged) pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas. All areas with escutcheons shall be vandal proof.

B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide solid cast brass or sheet brass escutcheons, solid pipe escutcheons.

C. Pipe Escutcheons for Dry Areas: Provide solid sheet metal escutcheons.

D. Manufacturer: Chicago Specialty, Producers Specialty, Sanitary-Dash.

2.7 FIRE BARRIER PENETRATION SEALS

A. Provide seals for opening through fire-rated walls, floors, or ceiling used as passage for mechanical components such as piping or ductwork. Refer to details on Drawings.

1. Piping: Provide fire stopping material.

PART 3 EXECUTION

3.1 SERVICE ENTRANCE PIPING

A. Extend building sanitary and grease waste piping and connect to building sanitary and grease drainage piping of size and in location indicated on the underground plumbing drawings for service entrance to each building in. Coordinate invert elevations, pipe sizes and points of connection with the existing site conditions. Install cleanout and extension to grade at connection of building sanitary and grease drainage.

B. Provide settlement joint at each service entrance to each building as indicated on the Plumbing Drawings.

3.2 PREPARATION OF FOUNDATION FOR BURIED PIPING WHERE BUILDING IS SLAB-ON-GRADE

A. Grade trench bottom to provide smooth, firm, stable, and rock-free foundation throughout length of piping.

B. Remove unstable, soft and unsuitable materials at surface on which piping is to be laid and backfill with clean sand or pea gravel to indicated level.

C. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped-sand backfill. Dig holes at each end of pipe joint to relieve loads and to ensure continuous bearing of pipe barrel on foundation.

3.3 PIPE SUPPORT FOR BUILDING WITH SUPPORTED SLABS

A. Attach all sanitary and grease waste drainage piping to structural slab as indicated on the underground plumbing plans for each building.

B. Comply with the requirements of Article 1.5 D of this Section.

3.4 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.

B. Underground, Sanitary and Grease Waste Drainage Piping: Use the following:

1. 2 to 8 inches: Use service weight hub and spigot cast-iron pipe and fittings.
2. Encase all underground piping in two (2) layers of ANSI/AWWA C105, 8-mil polyethylene jacket installed per ANSI/AWWA C105/A21.5 Standards.

C. Aboveground, Sanitary and Grease Waste Drainage Piping: Use the following:

1. 2 to 8 inches: Use hubless cast-iron pipe; hubless cast-iron pipe fittings; and hubless cast-iron heavy duty stainless steel couplings.

3.5 SANITARY AND GREASE WASTE AND VENT PIPING INSTALLATION

A. General: Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

B. Make changes in direction for sanitary and grease waste drainage piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

C. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in piping and pull past each joint as completed.

D. Install sanitary and grease drainage piping at the following minimum slopes, except where another slope is indicated on the plumbing drawings:

1. Building Sanitary and Grease Waste Drain: 1/4 inch per foot (2 percent) downward in direction of flow for piping 6 inches and smaller; unless otherwise indicated on the Drawings.

2. Horizontal Storm Drainage Piping: 1/4 inch per foot (2 percent)downward in direction of flow, unless otherwise indicated on the Drawings.

E. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

F. Do not enclose, cover, or put piping into operation until it is inspected and approved by local plumbing inspector or authorities having jurisdiction.

G. Underground Horizontal Piping: Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

H. Trench shall be wide enough to assemble joints.

I. Trench Bottom shall be stable enough to support the complete barrel of the pipe. If possible, barrel to rest on even undisturbed soil. If it becomes necessary to excavate deeper than needed, place and tamp back fill material to provide an appropriate bed. Holes shall be provided at each joint for the couplings to allow for continuous support of the barrel along the trench bottom.

J. Maximum deflection (change in the direction of the line) shall not exceed ½-inch per foot of pipe.

K. Maintain proper alignment during backfilling, stabile the pipe in proper position by partial backfilling and cradling.

L. Piping laid on grade shall be adequately secured to prevent misalignment when slab is poured.

M. Closet bends installed under slabs shall be adequately secured.

N. Aboveground Horizontal Piping, Suspended: Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

O. Support horizontal pipe and fittings at sufficiently close intervals to maintain alignment and prevent sagging or grade reversal. Support each length of pipe at every coupling, located not more than 18-inches for the joint.

P. Support terminal ends of all horizontal runs or branches at each change of direction or alignment with approved hanger.

Q. Closet bends installed above ground shall be firmly secured.

R. Horizontal pipe and fittings 6 inches and larger shall be braced to prevent horizontal movement. Provide at every branch opening or change of direction by the use of braces, blocks, rodding or other suitable method to prevent movement or joint separation.

S. Vertical Piping: Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

T. Support vertical piping at sufficiently close intervals to maintain alignment and to support the weight of the pipe and its contents. Support stacks at their bases and at each floor level. Provide riser clamps not to exceed 15'-0".

U. If vertical piping is to stand free of any support or if no structure element is available for stability during construction, secure the piping in its proper position by means of adequate stakes or braces fastened to the pipe.

V. Closet bends installed above ground shall be firmly secured.

3.6 JOINT CONSTRUCTION

A. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Hubless Joints: Make with heavyweight rubber gasket.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with Section 23 05 29 for pipe hanger and support devices and Section 23 05 48 for seismic-restraint devices.

B. Conform to Table below for maximum spacing of supports:

Pipe Material	Horizontal In Feet	Vertical In Feet
Cast Iron Soil Pipe	5	15

C. Pipe Attachments: Install the following:

1. Riser Clamps: MSS Type 8 or Type 42 for vertical runs.
2. Adjustable Steel Clevis Hangers: MSS Type 1 for individual straight runs to 100 feet and less.

D. Support cast-iron soil pipe and fittings not included in Table, at a maximum horizontal spacing of 5 feet, except 10-foot sections of pipe may be supported at 10-foot spacing and at a maximum vertical spacing of 15 feet.

3.8 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect sanitary and grease waste drain piping to exterior sanitary drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect sanitary and grease waste drainage piping to the following:

1. Plumbing Fixtures and Equipment: Connect drainage piping in sizes indicated on Plumbing Drawings.

3.9 FIELD QUALITY CONTROL

A. During installation, notify local plumbing official or authority having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by local plumbing official and/or authority having jurisdiction to observe tests and to ensure all systems are in compliance with requirements.

B. Reinspection: If local plumbing official and/or authority having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by local plumbing official and/or authority having jurisdiction. A copy of all inspection reports shall be included in the O&M Manuals.

3.10 TESTING

A. Test sanitary and grease drainage and vent piping according to procedures of local plumbing inspector and as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed drainage and vent piping until it has been tested and approved. Expose for testing work that has been covered or concealed before it has been tested and approved.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in piping installation. Tightly close all openings in the piping system, torque all couplings to recommended 80 in/lbs and all bends, changes of direction and ends of runs should be properly restrained prior to testing. Contractor shall have the option of hydrostatic or air test the system(s) as followings:

    a. Hydrostatic or Water Test: Prior to the hydrostatic test expelled all air from the system. A hydrostatic test of 10 feet of hydrostatic pressure (4.3 pounds per square inch) shall be performed. Test system for a minimum of 15 minutes, water level must not drop. Inspect joints for leaks.
    b. Air Test: The system shall be pressurized to a maximum of 6 psi utilizing a gauge graduated to no more than 3 times the test pressure. The gauge shall be monitored during the 15 minute test. A reduction of more than 1 psi during the test period indicates failure of the test.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch water column. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without

introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.11 CLEANING

A. Clean interior and exterior of piping prior to installation. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.12 STARTUP SERVICES

A. Before operating systems, perform these steps:

1. Remove all plugs used during testing of piping systems and plugs used for temporary sealing of piping during installation.

B. Check plumbing equipment and verify proper settings, adjustments, and operation.

C. Check plumbing specialties and verify proper settings, adjustments, and operation.

D. Refer to Part I, article 1.2/F.

3.13 PROTECTION

A. Protect all piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of day or when work stops.

END OF SECTION

SECTION 22 13 19 SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Cleanouts.
2. Floor Drains.
3. Floor Sinks.
4. Flashing Materials.

B. Coordinate electrical requirements with electrical contractor prior to commencing Work.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:

1. Sanitary Waste and Vent Piping: 10-foot head of water.

1.3 SUBMITTALS

A. Shop Drawings

1. Shop drawings and elevations of interceptor.
2. Waterproofing and tie-down details for fully immersed interceptor.

B. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:

1. Flashing Materials.
2. Cleanouts.
3. Floor Drains.
4. Floor Sinks.
5. Vandal Proof Vent Caps.

C. Calculations

1. Calculations for fully immersed interceptor.

D. Field test reports.

1.4 QUALITY ASSURANCE

A. Design Concept: Drawings indicate capacities, size, profiles, and dimensional requirements of plumbing specialties and system components. Components having equal performance characteristics that deviate from the indicated size and dimensions may be considered, provided

such deviations do not change the design concept or intended performance. Refer to Division 01.

B. Manufacturer's Qualifications: Firms regularly engaged in manufacture of interceptors of types and capacities required, whose products have been in satisfactory use in similar service for not less than 3 years.

C. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Codes and Standards:

1. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.
2. PDI Compliance: Test and rate grease interceptors in accordance with PDI Standard G101, Testing and Rating Procedure for Grease Interceptors.
3. Comply with State Health Department.

1.5 EXTRA MATERIALS

A. Deliver extra materials to OWNER. Furnish extra materials matching products installed as described below. Package them with protective covering for storage and identify with labels clearly describing contents.

B. Operating Keys (Handles): Furnish 1 extra key for each key-operated hose bibb and hydrant installed.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handle interceptors carefully to prevent damage, and/or breaking. Do not install damaged or broken interceptors; replace with new.

B. Store interceptors in clean dry place. Protect from weather, dirt, water, construction debris, and physical damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Floor Drains / Floor Sinks:

1. Jay R.Smith Mfg. Co., Smith Industries, Inc.
2. Zurn by Hydromechanics Div., Zurn Industries, Inc.
3. Wade Div., Tyler Pipe.

B. Cleanouts:

1. Jay R.Smith Mfg. Co., Smith Industries, Inc.

2. Zurn by Hydromechanics Div., Zurn Industries, Inc.
3. Wade Div., Tyler Pipe.

2.2 CLEANOUTS

A. General: Size cleanouts as indicated on Drawings, or where not indicated, same size as connected drainage piping. Cleanouts larger than 4 inches are not required except where indicated.

B. Cleanouts: ASME A112.36.2M, cast-iron body with straight threads and gasket seal or taper threads for plug, flashing flange and clamping ring, and a brass closure plug. Cleanouts for installation in floors not having membrane waterproofing may be furnished without clamping ring. The Product Data Sheets at end of Part 3 of this Section indicate deck plate shape, top-loading classification, access cover, finish, and other specific features.

C. Products: Subject to compliance with requirements, provide one of the products specified in each Sanitary Waste Piping Specialties Product Data Sheet at end of this Section.

2.3 FLOOR DRAINS

A. General: Size outlets as indicated on Product Data Sheet or drawings.

B. Floor Drains/Floor Sink: ASME A112.6.3, cast-iron body, with seepage flange and clamping device. Floor drains for installation in floors not having membrane waterproofing may have seepage flange without clamping device. Floor drains for use as area drains in exterior slab on grade may be furnished with anchor flange instead of seepage flange and clamping device. The Product Data Sheet at end of Part 3 of this Section indicates shape, dimensions, strainer and body top finish, top-loading classification, sump size, and specific features. Provide removable sediment baskets for building.

C. Products: Subject to compliance with requirements, provide one of the products specified in each Sanitary Waste Piping Specialties Product Data Sheet at end of this Section.

2.4 FLASHING MATERIALS

A. Lead: ASTM B 749, Type L51121, copper-bearing sheet, at least 4 psf (0.0625-inch thick) for general use, and at least 6 psf (0.0937-inch thick) for burning (welding), except as otherwise indicated.

B. Roof Flashing Assemblies: Manufactured assembly consisting of 4-psf lead flashing collar with boot and skirt extending at least 8 inches from pipe, with galvanized steel boot reinforcement and counter flashing fitting.

1. Option 1: Open top.

PART 3 EXECUTION

3.1 PIPING SPECIALTY INSTALLATION

A. Install trap seal primer valves with valve outlet piping pitched down toward drain trap a minimum of 1/8 inch per foot (1 percent) and connect to floor drain body, trap, or inlet fitting. Adjust valve for proper flow.

B. Install cleanouts in above-ground piping and building drain piping as indicated, and where not indicated, according to the following:

1. Size same as drainage piping up to 4-inch size. Use 4-inch size for larger drainage piping except where larger size cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping 4-inches and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil or waste stack.

C. Install cleanout deck plates (covers), of types indicated, with top flush with finished floor, for floor cleanouts for piping below floors.

D. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.

E. Install flashing flange and clamping device with each stack and cleanout passing through floors having waterproof membrane.

F. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to the manufacturer’s written instructions.

3.2 FLOOR DRAIN

A. Install drains according to manufacturer’s written instruction , in locations indicated.

B. Trap drains connected to sanitary building drain.

C. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

D. Position drains for easy accessibility and maintenance.

3.3 CONNECTIONS

A. Drainage Runouts to Fixtures: Provide drainage and vent piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated, but not smaller than required by plumbing code.

B. Locate drainage piping runouts as close as possible to bottom of floor slabs supporting fixtures or drains.

C. Electrical Connections: Power wiring and disconnect switches are specified in Division 26.

1. Grounding: Connect unit components to ground according to the National Electrical Code and Section 26 05 26.

3.4 FLASHING INSTALLATION

A. Provide flashing Manufactured in a single piece except where large pans, sumps; or other drainage shapes are required.

B. Install 4-psf lead flashing or 16-oz. per sq. ft. copper, except when another weight or material is specified.

C. Install 8-psf lead flashing or heavier where burning (welding) of lead sheets is required.

D. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with membrane waterproofing.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum sleeve length of 10-inches, and skirt or flange extending at least 8-inches around pipe..
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8-inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 3-inches around specialty.

E. Set flashing on floors and roofs in solid coating of bituminous cement.

F. Secure flashing into sleeve and specialty clamping ring or device.

G. Install flashing for piping passing through roofs with counter flashing or commercially made flashing fittings.

H. Extend flashing up vent pipe passing through roofs and turn down into pipe or secure flashing into cast-iron sleeve having calking recess.

I. Fabricate and install lead sheet flashing and pans, sumps, and other drainage shapes as indicated. Install drain connection when indicated.

J. Fabricate and install copper sheet flashing and pans, sumps, and other drainage shapes as indicated. Install drain connection when indicated.

K. Fabricate and install galvanized-steel sheet flashing and pans, sumps, and other drainage shapes as indicated. Install drain connection when indicated.

L. Fabricate and install elastic-membrane sheet flashing and pans, sumps, and other drainage shapes as indicated. Install drain connection when indicated.

3.5 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each, trap seal primer system.

1. Text: Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled trap seal primer systems and grease recovery units and their installation, including piping and electrical connections. Report results in writing.

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.7 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

C. Protect interceptors during remainder of connection period, to avoid clogging with construction materials and debris, and to prevent damage from construction and traffic.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain trap seal primer systems. Comply with the requirements of Division 01.

3.9 ADJUSTING

A. Adjust operation and correct deficiencies discovered during startup services.

3.10 SANITARY WASTE PIPING SPECIALTIES SCHEDULES

A. Provide plumbing specialties as scheduled on the following "Data Sheets." Each Data Sheet begins with a new page.

SANITARY WASTE PIPING SPECIALTIES DATA SHEET

Cleanout Type:	FCO.
Description:	Floor cleanout with round adjustable scorated nickel bronze top, lead seal and “Lekeromate” seal.
Appropriate Standard:	ASME A112.36.2M.
Material:	Cast-iron body.
Shape:	Round.
Top-Loading Classification:	Medium Duty.
Cover Finish:	Provide round top.
Closure Plug:	Brass.
Products:	J.R.Smith 4020. Wade. Zurn.

Note: All floor cleanouts shall have vandal proof screws.

SANITARY WASTE PIPING SPECIALTIES DATA SHEET

Cleanout Type:	CO.	
Description:	Cleanout; cast iron caulk ferrule with lead seal plug.	
Appropriate Standard:	ASME A112.36.2M.	
Material:	Cast-iron body.	
Shape:	Round.	
Top-Loading Classification:	--	
Cover Finish:	--	
Closure Plug:	--	
Products:	J.R.Smith Wade. Zurn.	4400.

Note: For installation in Mechanical Chases only.

SANITARY WASTE PIPING SPECIALTIES DATA SHEET

Floor Drain Type:	2” FD	
Description:	2-inch floor drain for Guard Tower, 2” outlet size.	
Appropriate Standard:	ASME A112.6.3; ASSE; PDI; ASPE	
Material:	Cast-iron.	
Shape:	Round top.	
Dimensions of Top:	5 inch Diameter	
Top-Loading Classification:	Medium Duty.	
Cover and Body Top Finish:	Nickel bronze.	
Manufacturer:	J.R.Smith Wade Zurn	2005C-NB-U. Series W-1100 Series Z-415

END OF SECTION

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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

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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 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. Pipe Hangers and Supports.
2. Vertical Piping Clamps.
3. Hanger-Rod Attachments.
4. Building Attachments.
5. Pipe Shields.

1.2 DEFINITIONS

A. Terminology: As defined in MSS SP 90, Guidelines on Terminology for pipe hangers and supports.

1.3 QUALITY ASSURANCE

A. Manufacturer's qualifications: Firms regularly engaged in manufacture of supports and anchors, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Codes and Standards

1. Code Compliance: Comply with applicable codes pertaining to product materials and installation of supports and anchors.
2. Qualify welding processes and welding operators according to AWS D1.1, Structural Welding Code-Steel.

    a. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

3. Qualify welding processes and welding operators according to ASME Boiler and Pressure Vessel Code, Section IX: Welding and Brazing Qualifications.
4. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100.

    a. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems
    b. Listing and Labeling Agency Qualifications: A Nationally Recognized Testing Laboratory (NRTL) as defined in OSHA Regulation 1910.7.

5. Licensed Engineer: Prepare hanger and support design drawings and calculations for seismic restraint of piping and equipment. Include seal and signature of Registered Structural Engineer licensed in the State of California certifying compliance with Specifications.
6. MSS Standard Compliance:

a. Provide pipe hangers and supports of which materials design and manufacture comply with MSS SP-58. Select and apply pipe hangers and supports, complying with MSS SP-69.
b. Fabricate and install pipe Local and supports, complying with MSS SP-89.
c. Terminology used in this Section is defined in MSS SP-90.

C. Corrosion Resistance: Provide hot-dip galvanized steel, cadmium plating, or other approved corrosion resistant materials for exterior work and for work which will be subject to outdoor exposure during construction.

D. Coordination

1. Coordinate resiliently supported work with other trades to avoid rigid contact with the building. Inform other trades such as drywall, plastering, or electrical, to avoid any contact which would reduce the vibration isolation.

E. Conflicts and Discrepancies

1. Bring to the Owner's Representative's attention prior to installation any conflicts with other trades which will result in unavoidable contact to equipment, piping, etc., described herein, due to inadequate spaces, etc. Corrective work necessitated by conflicts after installation shall be at Contractor's expense.
2. Bring to the Owner's Representative's attention prior to installation any discrepancies between the Specifications and field conditions, changes required due to specific equipment selection, etc., prior to installation. Corrective work necessitated by discrepancies after installation shall be at Contractor's expense.

F. Inspection and Instruction

1. Obtain inspection and approval from the Owner's Representative of any installation to be covered or enclosed prior to such enclosure.

1.4 VIBRATION ISOLATION

A. Comply with the requirements of Section 23 05 48.

1.5 SEISMIC RESTRAINTS

A. Submit manufacturer's technical product data, including installation instructions for each type of support and anchor. Include the following:

1. Manufacturer's data (catalog cuts and data sheets), for each manufactured component including hangers, attachments, inserts, thermal shields anchors and guides, auxiliary framing and wall seals. Provide a project specific hanger and support schedule indicating all devices, manufacture and model, where used. Cross reference to product data and specification paragraph. Data shall demonstrate that components comply with Specifications.
2. Support and Bracing Shop Drawings: Submit plans, sections, details, schedules and other information necessary to describe support hangers for all HVAC systems. Submittal shall indicate location and type of all hangers and supports. Each attachment to the building structure shall have vertical and horizontal point loads identified.

3. Maintenance Data: Submit maintenance data and parts list for each type of support and anchor. Include this data, product data, and shop drawings in maintenance manual in accordance with requirements of Division 1.
4. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
5. Shop drawings for each type of hanger and support, indicating dimensions weights, required clearances, and methods of component assembly.
6. Licensed Engineers hanger and support drawings specified in the "Quality Assurance' Article
7. Licensed Engineer's hanger and support installation report specified in the "Field Quality Control" Article.

PRODUCTS

1.6 GENERAL

A. Where not fully called for in the Contract Documents, design of HVAC hangers and supports shall be the Mechanical Contractor's responsibility. Design shall conform to accepted engineering practice using a safety factor of 2-1/2.

1.7 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:

1. Superstrut, Gold Galv.
2. B -Line Systems, lnc.
3. Elcen Metal Products Co.
4. Fee & Mason Mfg.Co.; Div. Figgie International ITT Grinnel Corp.
5. Hubbard Enterprises / HOLDRITE.
6. Tolco.

1.8 MANUFACTURED HORIZONTAL PIPING HANGERS AND SUPPORTS

A. General: Except as otherwise indicated, provide factory fabricated horizontal piping hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide felt-lined hangers and supports for copper piping systems in direct contact with copper piping components including galvanized coatings where installed for piping and equipment that will not have a field applied finish. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper piping.

B. Thermal-Hanger Shield Inserts: 100 psi average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Shield Insert shall cover entire circumference of pipe and be of length indicated by manufacturer for pipe size and thickness of insulation by CSS Pre-Insulated Supports.

C. Powder-Actuated Drive-Pin Fasteners: Powder-actuated type, drive-pin attachments are not acceptable.

D. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

E. Adjustable Steel Clevises Hangers: MSS Type 1.

F. Yoke Type Pipe Clamps: MSS Type 2.

G. Steel Double Bolt Pipe Clamps: MSS Type 3.

H. Steel Pipe Clamps: MSS Type 4.

I. Pipe Hangers: MSS Type 5.

J. Adjustable Swivel Pipe Rings: MSS Type 6.

K. Adjustable Steel Bond Hangers: MSS Type 7.

L. Adjustable Band Hangers: MSS Type 9.

M. Adjustable Swivel Rings, Band Type: MSS Type 10.

N. Split Pipe Pings: MSS Type 11.

O. Extension Split Pipe Clamps: MSS Type 12.

P. U-Bolts: MSS Type 24.

Q. Clips: MSS Type 26.

R. Pipe Slides and Slide Plates: MSS Type 35, including one of the following plate types:

1. Plate: Unguided type.
2. Plate: Guide type.
3. Plate: Hold-down Clamp type.

S. Pipe Saddle Supports: MSS Type 36, including steel pipe base support and cast-iron floor flange.

T. Pipe Stanchion Saddles: MSS Type 37, including steel pipe base support and cast-iron floor flange.

U. Adjustable Pipe Saddle Supports: MSS Type 38, including steel pipe base support and cast-iron floor flange.

V. Single Pipe Rolls: MSS Type 41.

W. Adjustable Roller Hangers: MSS Type 43.

X. Pipe Roll Stands: MSS Type 44.

Y. Pipe Rolls and Plates: MSS Type 45.

Z. Adjustable Pipe Roll Stands: MSS Type 46.

AA. Makeshift, field devised methods of HVAC pipe support, such as with the use of scrap framing materials, are not allowed. Support and positioning of piping shall be by means of engineered methods that comply with IAPMO PS 42.

1.9 VERTICAL PIPING CLAMPS

A. General: Except as otherwise indicated, provide factory-fabricated vertical piping clamps complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide felt-lined or copper-plated clams for copper-piping systems.

B. For vertical mid-span supports of piping 4-inch and under, use Hubbard Enterprises/HOLDRITE Stout Brackets with Hubbard Enterprises/HOLDRITE Stout Clamps or two-hole pipe clamps (MSS Type 26).

C. Two-Bolt Riser Clamps: MSS Type 8.

D. Four-Bolt Riser Clamps: MSS Type 42.

1.10 HANGER-ROD ATTACHMENTS

A. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods.

B. Steel Turnbuckles: MSS Type 13.

C. Steel Clevises: MSS Type 14.

D. Swivel Turnbuckles: MSS Type 15.

E. Malleable Iron Sockets: MSS Type 16.

F. Steel Weldless Eye Nuts: MSS Type 17.

1.11 BUILDING ATTACHMENTS

A. General: Except as otherwise indicated, provide factory-fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Powder-actuated fasteners are not acceptable.

B. Concrete Inserts

1. Cast-in-Place Concrete Inserts: MSS Type 18.
2. Post-Installed Anchors: Proprietary type, designed for intended uses, and ICC ESR evaluated.

    a. Manufacturers

        1) ITW Ramset/Red Head.
        2) Simpson.
        3) Hilti Co.

C. Top Beam C-Clamp: MSS Type 19.

D. Side Beam or Channel Clamps: MSS Type 20.

E. Center Beam Clamps: MSS Type 21.

F. Welded Beam Attachments: MSS Type 22.

G. C-Clamps: MS Type 23.

H. Top Beam Clamps: MSS Type 25.

I. Side Beam Clamps: MSS Type 27.

J. Steel Beam Clamps with Eye Nut: MSS Type 28.

K. Linked Steel Clamps with Eye Nut: MSS Type 29.

L. Malleable Beam Clamps: MSS Type 30.

M. Steel Brackets: One of the following for indicated loading:

1. Light Duty: MSS Type 31.
2. Medium Duty: MSS Type 32.
3. Heavy Duty: MSS Type 33.

N. Side Beam Brackets: MSS Type 34.

O. Plate Lugs: MSS Type 57.

P. Horizontal Travelers: MSS Type 58.

Q. Powder-Actuated Fasteners: Not allowed.

1.12 INSULATED PIPE SUPPORTS (PIPE SHIELDS)

A. All insulated lines shall be protected at the point of support by insulated pipe supports provided and installed by the pipe erector.

B. All insulated pipe supports shall be load rated. Load ratings shall be established by pipe support manufacturer based upon testing and analysis in conformance with the latest edition of the following codes:

1. ASME B31.1, MSS SP-58, MSS SP-69, and MSS SP-89.

C. Manufacturer: Pipe Shields Incorporated (PSI); Michigan; B-Line.

D. Insulated Pipe Supports.

1. Pipe supported on rod hangers
2. Pipe supported on Flat Surfaces.
3. Pipe supported on pipe rolls.
4. Pipe Guides [PSI, Michigan.
5. Anchors.
6. Riser Pipe Supports.

E. Insulation

1. 360-degrees insulation, encased in 360-degrees sheet metal shield.
2. Provide assembly of same thickness as adjoining pipe insulation.
3. Insulating Material:

a. Cold Piping (below 50 degrees F): Urethane foam, 100 psi compressive strength.
b. Hot piping (above 50-degrees F): Calcium silicate, 100 psi compressive strength, treated with water repellent.

1.13 MISCELLANEOUS MATERIALS

A. Auxiliary Steel:

1. Provide auxiliary structural steel as required for supports, anchors, guides, seismic restraints and vibration isolators.
2. All structural steel systems to be designed in accordance with AISC Steel Handbook.
3. All systems to be secured to building structure in a method acceptable to and approved by the Project Structural Engineer.
4. Steel Work: Fabricate neatly. Grind off excess burrs and welding spatter. Paint with rust inhibitive primer.

B. Steel Plates, Shapes and Bars: Provide products complying with ASTM A36.

C. Cement Grout: Portland cement (ASTM C150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C404, Size No.2). Mix at a ratio of 1.0 part cement to 2.0 parts sand, by volume, with minimum amount of water required for placement and hydration.

D. Heavy Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS Standards.

E. Pipe Alignment Guides: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of bolted two-section outer cylinder and base with two section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any), and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

1. Manufacturers

a. Hyspan.
b. Metraflex.

F. Plenum Rated Pipe Clamps: ASTM E84 25/50 plastic clamps from Hubbard Enterprises/Holdrite.

EXECUTION

1.14 GENERAL

A. Install devices in accordance with manufacturer's recommendations.

B. Examine areas and conditions under which supports and anchors are to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

C. Support of pipe tubing and equipment shall be accomplished through means of engineered products specific to each application. Makeshift field devised methods will not be allowed.

D. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

1.15 PREPARATION

A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the Work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.

B. Prior to installation of hangers, supports, anchors and associated Work, Installer shall meet at Project site with Contractor, Installer of each component of associated Work, Inspection and testing agency representatives (if any), Installers of other Work requiring coordination with Work of this Section and the Owner's Representative for purpose of reviewing material selections and procedures to be followed in performing the Work in compliance with requirements specified.

1.16 INSTALLATION OF BUILDING ATTACHMENTS

A. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms.

B. Loading on Steel Beams

1. Do not place eccentric loads on steel beams for loads greater than 50-pounds.
2. For loads greater than 50 pounds, use attachments which create concentric loading.

C. Cast-in Place Concrete Inserts

1. Install before concrete is placed. Fasten inserts securely to forms.
2. Install with reinforcing bar through opening at top of insert or with steel plate to distribute load, as detailed on Drawings.
3. Maximum load per insert in slabs shall be 200 pounds, with a minimum spacing of 5 feet in any direction. For loads greater than 200 pounds, or where spacing cannot be maintained, make attachment to building structure or auxiliary steel, rather than to slab.

D. Concrete Wedge Anchor Inserts: Maximum tension load per insert shall not exceed manufacturer's published rating.

E. Powder-Actuated Fasteners: Not allowed.

1.17 INSTALLATION OF HANGERS AND SUPPORTS

A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacing complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports of smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping. Install in accordance with Seismic Restraint manual Guidelines for Mechanical Systems (SMACNA).

1. Materials, design and type numbers per MSS-58.

B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.

C. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, felt-lined.

D. Provisions for Movement: Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.

E. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

F. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.1 Power Piping Codes are not exceeded.

G. Insulated Piping: Comply with the following installation requirements:

1. Provide insulated pipe support (pipe shield) at each support of insulated piping.
2. Select model of insulated pipe support according to published recommendations of insulated pipe support manufacturer, based on pipe size, pipe material, fluid medium, fluid temperature, support spacing, and type of support.
3. Submit tabulation showing proposed uses of insulated pipe supports for different applications.

H. Provide pipe supports on all DWV vertical piping penetrating floor slabs.

I. All hanger components shall be Superstrut Gold Galv.

1. Vertical Piping: Superstrut clamps attached to the pipe above each floor to rest on the floor. Provide copperplate on copper tubing. Provide additional support at base of cast iron risers. Provide intermediate support for vertical piping greater than 12 feet in length.
2. Individually Suspended Piping: Superstrut J-Hanger or Clevis, complete with threaded rod. All hangers on supply and return piping handling heating hot water or steam shall have a swing connector at point of support. Copper pipe will be used in conjunction with felt lined hangers.

Pipe Size	Rod Size
2-inch and Smaller	3/8-inch
2-1/2-inch to 3-1/2-inch	1/2-inch
4-inch to 5-inch	5/8-inch
6-inch	3/4-inch
8-inch and up	7/8-inch

3. Provide 3/8 inch or support of PVC and CPVC and provide continuous support.
4. Trapeze Suspension: Superstrut 1-5/8-inch width channel in accordance with manufacturer's published load ratings. No deflection to exceed L/180 of a span.
5. Trapeze Supporting Rods: Shall have a safety factor of 5; securely anchor to building structure.
6. Pipe Straps: Superstrut 702 isolate copper pipe with two thicknesses of 2-inch wide 10-mil polyvinyl tape (Cush-A-Strip or Cush-A-Clamps). Where used for seismic support systems, provide Superstrut 702 or C708 series pipe straps.

J. Concrete Inserts: Superstrut C302 continuous insert or 452-TB spot insert. Do not use powder-actuated fasteners for support of overhead piping unless approved by the Owner's Representative.

1. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.
2. Install concrete inserts in new construction prior to placing concrete. Superstrut 452-TB, C745, or C302.
3. Install post-installed concrete anchors after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.

K. Steel Connectors: Beam clamps with retainers.

1. Install hangers and supports complete with necessary inserts, bolts, rods, nuts washers, and other accessories

L. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

M. Support to Structure

1. Steel Structure: Provide and install additional steel bracing as required to suit structure. Provide through bolts with length to suit requirements of the structural components. Burning or welding on any structural member may only be done if approved by the Owner's Representative.

N. Rubber Neoprene Pipe Isolators

1. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Architectural Drawings shall show location of acoustical walls.
2. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. Superstrut S716 or A716.

O. Pipe Hangers and Support Spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and space at or within following maximum limits. Note that spacing listed are recommended maximums; increased spacing requirements due to California Building Code requirements, CCR Title 24, or other regulations in force and applicable for this contract shall be adhered to.

Pipe Diameter	Steel Fluid	Steel Vapor	Copper Fluid
1/2 to 1-inch	6	8	6
1-1/4 to1-1/2-inch	8	10	6
Over 2-inch	10	10	10

P. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.

Q. Provide rigid insulation and a 12-inch long, 18 gauge galvanized sheet metal shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering or CSS Pre-Insulated Calcium Silicate Support.

R. Insulate copper tubing from ferrous materials and hangers with felt lined hangers.

S. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.

T. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power-actuated fasteners will not be allowed.

1.18 ADJUSTING AND CLEANING

A. Hanger Adjustment: Adjust hangers so as to distribute loads equally on attachments.

B. Support Adjustment: Provide grout under supports so as to bring piping and equipment to proper level and elevations.

C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

1.19 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint and exposed areas immediately after erection of hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA1 requirements for touching up field-painted surfaces.

1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal is specified in Section 09 91 23.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

1.20 FIELD QUALITY CONTROL

A. Licensed Engineer's Report: Prepare hanger and support installation report. Include seal and signature of Registered Structural Engineer, licensed in the State of California, certifying compliance with Specifications.

END OF SECTION

SECTION 23 05 48 - VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Vibration Isolators.
2. Seismic Restraints.
3. Flexible Connectors.

1.2 QUALITY ASSURANCE

A. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture.

B. All items of a given type shall be the product of the same manufacturer.

C. Provide necessary design for avoidance of excessive noise and vibration in building due to operation of machinery or equipment, or due to interconnected piping or conduit.

D. Installation of all vibration isolation units, and associated hangers and bases, shall be under direct supervision of vibration isolation manufacturer's representative.

1.3 REGULATORY REQUIREMENTS

A. Provide seismic restraints for pipes and equipment, including pipes above roofs, supported from below in accordance with the requirements of the California Code of Regulations, Title 24, Parts 3, 4, and 5.

1.4 SUBMITTALS

A. Shop drawings and product data; submittal shall include:

1. Concrete and steel details for equipment.
2. Vibration isolation devices: Catalog cuts, isolation efficiencies and rated static deflections.
3. Welds or anchor bolt locations.
4. Reinforcing and template steels.
5. Number and locations of seismic restraints for each piece of equipment; specific details of restraints including anchor bolts for mountings and maximum load at each location.
6. Spring O.D., free operation, and solid height of springs and ratio of horizontal to vertical stiffness.
7. Number and location of vibration isolators for each piece of equipment including actual operating load for each vibration isolator.

B. Seismic calculations for each seismic restraint sized and signed by registered Structural Engineer licensed in the State of California.

C. Manufacturer's installation instructions.

D. Manufacturer's Installation Report as specified in the "Field Quality Control" Article.

PART 2 PRODUCTS

2.1 VIBRATION ISOLATORS

A. Manufacturers

1. Mason Industries, Inc.
2. Vibration Mountings and Controls, Inc.
3. Vibration Eliminator Company.
4. Peabody Noise Control, Inc.

B. Manufactured Units.

1. Isolator Type "PN"; three layers of 1/4-inch neoprene waffle pad bounded between 16 gauge sheet metal shims or 3/4-inch thick neoprene waffle pad consisting of 2-inch square modules separated by thin web. Load distribution top plate utilized as required with additional 1/5 inch thick washer and bushing when pads are anchored to structure.
2. Isolator Type "NM": Double deflection neoprene mountings having a minimum static deflection of .35 inch. Metal surfaces neoprene covered to avoid corrosion. Friction pads top and bottom.
3. Isolator Type "NML": Neoprene mountings with integral seismic restraints and consisting of captive steel insert embedded in neoprene. Mountings may be used in tension and shear as well as compression. Neoprene pad may be bonded to base plate for additional deflection as required.
4. Isolator Type "MS": Spring type, free standing and laterally stable without any housing, complete with 1/4-inch neoprene acoustical friction pad or neoprene cup between base plate and support. Provide leveling height and solid spring height in submittals.
5. Isolator Type "MSL": Spring type mountings designed to resiliently resist seismic forces in all directions. Snubbing in all modes with adjustment to limit upward, downward and horizontal travel to a maximum of 1/4 inch before contacting snubbers. Provide spring with same characteristics as described in Type MS mountings. Provide mountings with leveling bolts that must be rigidly bolted to equipment, and with ports or openings to verify possible overload conditions. In submittals include spring diameter, deflections, compressed spring height and solid spring height.
6. Isolator Type "HN": Vibration hangers which contain minimum .35-inch static deflection neoprene element. Neoprene rod isolation bushing shall pass through hanger box lower hole to prevent metal to metal contact.
7. Isolator Type "HS": Vibration hangers which contain steel spring seated in 1/4-inch thick neoprene cup with integral rod isolation bushing. Bushing shall pass through lower hanger box hole to prevent metal-to-metal contact. Provide spring diameters and hanger box lower hole sizes large enough to permit hanger rod to swing through 30 degree arc. Provide minimum additional travel to solid equal to 50 percent of rated deflection.

2.2 SEISMIC RESTRAINTS

A. Manufacturers

1. Midland-Ross Superstrut.
2. Pipe Shields, Inc.
3. B-Line.

B. Restraint Types

1. Type R-1: Provide directional seismic restraints with interlocking steel members restrained by replaceable, minimum 1/4-inch thick bridge bearing neoprene bushing, capable of rotation after installation to verify isolation system is out of contact with restraints. Incorporate minimum air gap of 1/8 inch in snubber design in all directions before contact is made between rigid and resilient surfaces.
2. Type R-2: Restraints of all isolated suspended piping, ductwork and equipment using steel cables arranged to achieve required all-directional restraint and sized to resist seismic loads. Indicate proposed method of achieving sufficient slack to avoid short circuiting vibration isolators in submittal drawing.

C. General Requirements

1. Provide seismic restraints for all vibration isolated equipment, ductwork and piping.
2. Restrain supported and suspended equipment and piping by devices capable of restraint in all three mutually orthogonal directions.
3. For suspended equipment, utilize stranded steel aircraft cable plus modifications to isolators to prevent excessive vertical motion.
4. Seismic restraints must be installed and adjusted so equipment and piping vibration isolation is not degraded by utilization of restraints.

2.3 FLEXIBLE CONNECTORS

A. Manufacturers

1. Mason Industries, Inc.
2. Amber Booth.

B. Neoprene Connectors

1. Use flexible EPDM connectors on equipment as indicated on drawings or on equipment schedule, manufactured of multiple layers of frictioned nylon cord with EPDM cover and liner. Do not use steel wire or rings as internal pressure reinforcement. Provide straight connectors with two spheres with a centered molded external ductile iron ring to maintain two spherical shapes. Two inch and smaller sizes may have threaded ends. Provide floating flanges with recess to lock bead wire in raised face EPDM flanges. Use tapered twin sphere connectors as described above where line size changes are required in straight piping runs.
2. Flanged equipment may be directly connected to neoprene elbows in size range 2-1/2 to 12 inches, if piping makes 90 degree turn and flanges are equal sized. Long radius reducing EPDM elbows may be used in place of steel or cast iron elbows at pump connections.
3. When pressure would cause connector to extend beyond its rated elongation, employ control rods using 1-1/2-inch thick bridge-bearing neoprene washer bushings designed for maximum loading of 1000 psi.

4. Provide twin sphere connectors with minimum rating of 250 psi at 170 degree F and 165 psi at 250 degree F. Provide elbows and reducing twin spheres with minimum pressure rating of 220 psi at 170 degree F and 145 psi at 250 degree F. Limit neoprene materials to 220 degree F. Certified safety factors shall be a nominal 4 to 1 with minimum acceptable test results of 3.6 to 1. Tests shall cover burst, flange leakage, extension without control rods and flange retention at 50 percent of burst pressure without control rods.
5. Include in submittals test reports by independent consultants showing minimum reduction of 20 DB in vibration accelerations and 10 DB in sound pressure levels at typical blade passage frequencies.

C. Flexible Stainless Steel Hose

1. Provide flexible stainless steel hose with stainless steel braid and carbon steel fittings. Provide flanged fittings for sizes 3-inch and larger, and make nipples for smaller sizes. Use bronze braided flexible hose with female sweat ends for copper lines. Install hoses on equipment side of shut-off valves horizontally and parallel to equipment shafts whenever possible. Flexible metal hose shall be Type BSS or BFF.

PART 3 EXECUTION

3.1 GENERAL

A. Isolate plumbing equipment from building structure by means of noise and vibration isolators.

B. Install isolators in accordance with manufacturer's written instructions.

C. Vibration isolators must not cause change of position of equipment or piping resulting in piping stresses or misalignment.

D. Make no rigid connections between equipment and building structure that degrade noise and vibration isolation system.

1. Loop electrical conduit connections to isolated equipment to allow free motion.

E. Do not use isolator leveling bolts as jacking screws.

F. Verify that installed isolators and mounting systems permit equipment motion in all directions.

G. Install vibration isolators for motor driven equipment.

3.2 SEISMIC CONTROL

A. Provide seismic restraints for pipes and equipment per CBC, CMC, and CPC, including pipes above roofs, supported from below.

B. Design and provide restraints to prevent permanent displacement in any direction caused by lateral motion, overturning, or uplift.

C. Provide approved resilient restraining devices as required to prevent equipment and piping motion in excess of 1/4 inch.

D. Provide capability of safely accepting external forces without failures.

E. Do not short circuit vibration isolation systems or transmit objectionable vibration or noise.

F. Provide restraint for piping in mechanical rooms for pipe sizes covered by SMACNA.

G. Designs: Where designs, etc., are neither indicated nor referenced, submit such designs, together with supporting calculations prepared by Structural Engineer registered in the State of California. Calculations shall substantiate seismic restraint capability to safely accept external forces without failure and maintain equipment in position.

H. Rigidly Supported Piping

1. Where required for all systems, except sprinkler piping system, restrain per SMACNA seismic standards.

I. Flexibly Supported Piping

1. Provide and locate restraints to allow normal operation of systems without transmitting vibrations to building structure.
2. Locations of Restraints: Per SMACNA and Factory Mutual where applicable.
3. Construction of Restraint: Steel cables, installed slack, may be used.

3.3 EQUIPMENT ISOLATION AND SEISMIC CONTROL

A. Position equipment and structural base on blocks or wedges at proper operating height. Set steel bases for 1-inch clearance between pad and base. Set concrete bases for 2-inch clearance.

B. Provide operating load conditions prior to transferring base isolator loads to springs and remove wedges.

C. Adjust or provide additional resilient restraints to flexibly limit startup equipment lateral motion to 1/4 inch.

D. Prior to startup, clean out all foreign matter between bases and equipment.

E. Verify that there are no isolation short circuits in the base, isolators or seismic restraints.

F. Position all corner or side seismic restraints with equipment operating for proper operating clearance.

3.4 PIPING ISOLATION AND SEISMIC RESTRAINT

A. Isolate piping outside of shafts as follows:

1. Water piping 1-1/4 inch and larger in mechanical equipment rooms: Within 50 feet or 100 pipe diameters whichever is smaller, of connected rotating equipment and pressure reducing stations.

a. Piping where exposed on roof.

B. Provide spring isolators on piping connected to isolated equipment as follows:

1. Up to 4 inches in diameter, first 3 points of support.
2. 1.5 to 8 inches in diameter, first 4 points of support.
3. 10 inches and over in diameter, first 6 points of support.
4. Static deflection of first point shall be twice deflection of isolated equipment.

C. Locate Isolators:

1. Close to building structure.

a. Hanger boxes butted to ceiling structure.

2. Between building structure and supplementary steel if required.

D. Supplementary steel to be sized for maximum deflection of 0.08 inches at center span.

E. Seismic restraint spacing shall be in accordance with specified hanger spacing.

F. Provide Seismic Restraint For All Piping:

1. In equipment room.
2. On roofs.
3. In shafts and in ceiling of occupied spaces.

3.5 FIELD QUALITY CONTROL

A. Provide inspection by manufacturer's representative of all vibration isolating devices after installation of all devices.

B. Submit written report by manufacturer regarding installation error, improper selection of devices, and other faults that could affect performance of system. Include report on steps to properly complete isolation work.

END OF SECTION

SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

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 sleeves.

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

SECTION 23 05 93 - TESTING, ADJUSTING AND BALANCING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Testing, adjustment, and balancing of air systems.
2. Measurement of final operating condition of HVAC systems.
3. Sound measurement of equipment operating conditions.
4. Vibration measurement of equipment operating conditions.

1.2 REFERENCES

A. AABC - National Standards for Field Measurement and Instrumentation, Total System Balance.

B. NEBB - Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

1.3 TOLERANCES

A. Adjust air systems to plus or minus 5 percent for supply, return and exhaust systems from figures indicated.

B. Indicate system air leakage loss. Loss shall not exceed 3 percent.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Name of adjusting and balancing agency for approval within 30 days after award of Contract.

C. Test Reports: Report Forms.

1. Submit reports on AABC National Standards for Total System Balance or NEBB forms.
2. Forms shall include the following information:
   a. Title Page:
      1) Company name, address, telephone number.
      2) Project name, location.
      3) Project Architect
      4) Project Engineer
      5) Project Contractor
      6) Project Altitude
   b. Instrument List:
      1) Instrument description; manufacturer; model; serial number; range; calibration date.
   c. Air Moving Equipment:
      1) Location; manufacturer; model; air flow, specified and actual; return air flow, specified and actual; outside air flow, specified and actual; total static pressure

(total external), specified and actual; inlet pressure; discharge pressure; fan RPM.

d. Exhaust Fan Data:
   1) Location; manufacturer; model; air flow, specified and actual; total static pressure (total external), specified and actual; inlet pressure; discharge pressure; fan RPM.
e. Return Air/Outside Air Data:
   1) Identification/location; design air flow; actual air flow; design return air flow; actual return air flow; design outside air flow; actual outside air flow; return air temperature; outside air temperature; required mixed air temperature; actual mixed air temperature; design outside/return air ratio; actual outside/return air ratio.
f. Electric Motors:
   1) Manufacturer; HP/BHP; phase, voltage, amperage; nameplate, actual, no load; RPM; service factor; starter size, rating, heater elements.
g. V-Belt Drive:
   1) Identification/location; required driven RPM; driven sheave, diameter and RPM; belt, size and quantity; motor sheave, diameter and RPM; center to center distance, maximum, minimum, and actual.
h. Duct Traverse:
   1) System zone/branch; duct size; area; design velocity; design air flow; test velocity; test air flow; duct static pressure; air temperature; air correction factor.
i. Air Distribution Test Sheet:
   1) Air terminal number; room number/location; terminal type; terminal size; area factor; design velocity; design air flow; test (final) velocity; test (final) air flow); percent of design air flow.

j. Sound Level Report:
   1) Location; octave bands - equipment off; octave bands - equipment on.
k. Vibration Test:
   1) Location of points:
      a) Fan bearing, drive end.
      b) Fan bearing, opposite end.
      c) Motor bearing, center (if applicable).
      d) Motor bearing, drive end.
      e) Motor bearing, opposite end.
      f) Casing (bottom or top).
      g) Casing (side).
      h) Duct after flexible connection (discharge).
      i) Duct after flexible connection (suction).
   2) Test readings:
      a) Horizontal, velocity and displacement.
      b) Vertical, velocity and displacement.
      c) Axial, velocity and displacement.
   3) Normally acceptable readings, velocity and acceleration.
   4) Unusual conditions at time of test.
   5) Vibration source (if non-complying).
l. Prior to commencing work, draft reports indicating adjusting, balancing, and equipment data required.

m. Draft copies of report for review prior to final acceptance of Project. Provide final copies for Owner's Representative and for inclusion in operating and maintenance manuals.
n. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index 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.
o. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.

D. Closeout Submittals.

E. Project Record Documents:

1. Submit record documents under provisions of Division 01.
2. Accurately record actual locations of balancing valves and rough setting.

1.5 QUALITY ASSURANCE

A. Agency shall be company specializing in adjusting and balancing of systems specified in this Section with minimum three years documented experience certified by AABC. Perform Work under supervision of AABC Certified Test and Balance Engineer or registered Professional Engineer.

B. Total system balance shall be performed in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance.

C. Pre-Installation Meetings:

1. Convene a conference two weeks prior to commencing work of this Section, under provisions of Division 1.

1.6 SEQUENCING AND SCHEDULING

A. Sequence work under provision of Division 01.

B. Sequence work to commence after completion of systems, and schedule completion of work before Substantial Completion of Project.

C. Provide assistance in final adjustment and test of smoke control system with Fire Authority.

1.7 TESTING AND STARTUP PROCEDURE

A. The following procedures shall be used for starting and testing of each item of equipment.

B. Prior to testing and/or starting, clean inside each piece of equipment and provide clean filters and strainers. Owner's Representative will inspect.

C. Prior to equipment startup, submit in writing to Owner's Representative approval to begin Checking Equipment/Test Procedure and Startup Procedure. Submit manufacturer's recommendations for startup/testing.

D. Checking Equipment/Test Procedure:
   1. Fans:
      a. Record serial numbers, model, brand, etc.
      b. Lubricate where necessary.
      c. Check belts.
      d. Check rotation.
      e. Check voltage and phase.
      f. Check for free movement.
      g. Turn fan on and begin testing.
   2. Split Systems/Heat Pumps:
      a. Record serial numbers, model, brand, etc.
      b. Lubricate where necessary.
      c. Check rotation.
      d. Check voltage and phase.
      e. Check for free movement.
      f. Evacuate lines as per manufacturer's recommendations and hold to 48 hours without leak.
      g. Request the presence of a Owner's Representative.
      h. In the presence of a Owner's Representative:
         1) Demonstrate that the lines have been evacuated to the recommended micron level and are holding without leaks.
         2) Turn on vacuum pump, close valve on pump and turn pump off.
         3) Demonstrate that lines are holding a vacuum.
      i. Open suction and liquid valves.
      j. Turn unit on.
      k. Install gages and add a small amount of refrigerant if necessary to compensate for the line length and evaporator coil.
      l. Begin testing unit.

E. Startup Procedure:

   1. Fans:
      a. Check control sequence of fan. Check interlocks.
      b. Correct deficiencies.
      c. Request the presence of a Owner's Representative and control Subcontractor for startup test.
      d. In the presence of a Owner's Representative:
         1) Check control sequence of fan. Check interlocks.
   2. Split Systems/Heat Pumps:
      a. Initiate test mode outlined in factory startup manual to verify defrost cycle.
      b. Turn system to automatic operation at thermostat.
      c. Check that unit cools, heats and fan runs.
      d. Request the presence of a Owner's Representative and Control Subcontractor for startup test.
      e. In the presence of a Owner's Representative:

1) Turn unit off.
2) Set time clocks to manual mode.
3) Turn unit back on.
4) Initiate test mode outlined in factory startup manual to verify defrost cycle.
5) Turn system to automatic operation at thermostat.
6) Check that unit cools, heats and fan runs.
7) Replace all covers on unit and put time clock in automatic mode.

f. If all items are found satisfactory, unit is turned into 5-day test:
   1) Run system at 60 degrees F cooling for 24 hours regardless of seasonal load and system design.
   2) Run system at 80 degrees F heating for 24 hours regardless of seasonal load and system design.
   3) Run system at indoor design temperature for 72 hours using a temperature recorder.

g. If system satisfies above set of requirements, system is deemed satisfactory.

h. Verify with Owner's Representative for actual room temperature required during heating and cooling.

F. Where equipment and components are interlocked into a system, test and verify proper operation as a complete system.

PART 2 PRODUCTS

2.1 GENERAL

A. Products and materials shall be as described in pertinent sections of Division 23.

PART 3 EXECUTION

3.1 EXAMINATION

A. Before commencing work, verify that systems are complete and operable. Ensure the following:

1. Equipment is operable and in safe and normal condition.
2. 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. Fan rotation is correct.
7. Fire and volume dampers are in place and open.
8. Coil fins have been 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 has been minimized.
12. Pump rotation is correct.
13. Proper strainer baskets are clean and in place.
14. Service and balance valves are open.

15. Air vents are installed and operating properly.

B. Report any defects or deficiencies noted during performance of services to Owner's Representative.

C. Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.

D. If, for design reasons, system cannot be properly balanced, report as soon as observed.

E. Commencement of work indicates acceptance of existing conditions.

3.2 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Owner's Representative to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

3.3 ADJUSTING

A. Adjust work under provisions of Division 01.

B. Recorded data shall represent actually measured, or observed condition.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

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.

F. Air System Procedure

1. Adjust air distribution systems to provide required or design supply, return, and exhaust air quantities.
2. Make air quantity measurements in ducts by Pilot tube traverse of entire cross sectional area of duct.
3. Measure air quantities at air inlets and outlets.
4. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
5. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
6. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
7. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

8. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
9. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions. Set minimum position for outside air dampers to achieve indicated minimum outside air CFM's.
10. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
11. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
12. Take sound level reading at two diffusers per zone at approximately 5 feet above floor. Readings shall be between 43 and 41 db.

3.4 CONTROL COORDINATION

A. Cooperate with control system installer and equipment installer in making adjustments to equipment as required to accomplish indicated performance.

END OF SECTION

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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-ft2-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 to 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	.05 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
6. Authority to assure equipment and systems are fully operational and ready for functional performance testing.
7. Provide equipment, materials, and labor necessary to correct deficiencies found during commissioning process to fulfill contract and warranty requirements.
8. Provide operation and maintenance information and record drawings to Commissioning Authority for review verification and organization, prior to distribution.
9. Provide assistance to Commissioning Authority to develop, edit, and document system operation descriptions.
10. 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

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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. Gas detection system.
11. 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. Indicate layout of piping systems, including equipment, critical dimensions, and sizes. In addition to Section 01 3300 SUBMITTAL PROCEDURES provide shop drawings in a REVIT 2014 model
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.
9. Gas detection 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.
   7. 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.

2.12 GAS DETECTION SYSTEM

A. Complete gas detection system in full compliance with 2013 California Fire Code, 2311.7.

B. Gas detection system to provide:
   1. Audible and visual alarm in repair garage.
   2. Deactivation of all heating systems in repair garage.
   3. Activation of mechanical ventilation in repair garage.

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.

M. Install and test gas detection system to operate in full accordance with California Building Codes and California Fire Code section 2311.7.2.2. Signal alarms, deactivate heating systems and

interlock system with ECU-2 in the Maintenance Building for non-continuous operation during unoccupied hours.

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
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, whenever the gas detection system is activated, 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
   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 ScheduleTime 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.
    d. The unit shall signal an alarm, and require manual reset, but continue to operate if:
        1) Gas detection system is activated.

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) 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
      5) (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.
      6) The boilers are enabled only when:
         a) The programmed schedule is on.
         b) The outside air (OA) temperature is less than the HW system outside air lockout temperature (adjustable).
         c) Any of the HW valves are calling for heat, in either occupied or unoccupied mode.
         d) 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:
      1) The programmed schedule is on.
      2) The outside air (OA) temperature is less than the HW system outside air lockout temperature (adjustable).
      3) Any of the HW valves are calling for heat, in either occupied or unoccupied mode.
      4) Seasonal enable flag is on.

5) 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).
6) Gas detection system is not activated.

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 inconcrete 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.

I. SEQUENCE OF OPERATION FOR SELF-CONTAINED AIR CONDITIONER:
1. The Self-Contained Air Conditioning system serves the MDF Room 129 in the Administration Building.
2. System control Overview:
   a. A wall-mounted thermostat with room setpoint adjustment, 75 degrees Fahrenheit, shall be furnished for occupant control.

b. Unit fan operates continuously.
c. Upon rise in space temperature above cooling setpoint, compressor/condensing equipment stages on to maintain setpoint.
d. When cooling setpoint temperature is met, compressor/condensing equipment stages off.

3. The following features shall be interfaced with HVAC controls:
   a. Operating status.
   b. System diagnostics and safety alarms.
   c. Monitor constant and variable motor loads.
   d. Signal an alarm to the HVAC control system when cooling setpoint cannot be maintained for 20 minutes.

J. SEQUENCE OF OPERATION FOR SPLIT-SYSTEM AIR CONDITIONER:
1. The Split-System Air Conditioner serves the Money Room 408 in the Fueling Building.
2. System control Overview:
   a. A wall-mounted thermostat with room setpoint adjustment, 72/72 degrees Fahrenheit occupied cooling/heating, and 85/60 degrees Fahrenheit unoccupied cooling/heating, shall be furnished for occupant control.
   b. Unit operation shall be programmable for occupied and unoccupied periods, seven days per week.
   c. Unit evaporator fan operates continuously during occupied hours.
   d. Unit evaporator fan operates intermittently during unoccupied hours.
   e. Upon rise in space temperature above cooling setpoint, compressor/condensing equipment stages on to maintain setpoint.
   f. When cooling setpoint temperature is met, compressor/condensing equipment stages off.
   g. Upon drop in space temperature below heating setpoint, compressor/condensing equipment stages on to maintain setpoint.
   h. When heating setpoint temperature is met, compressor/condensing equipment stages off.
3. The following features shall be interfaced with HVAC controls:
   a. Signal an alarm to the HVAC control system when cooling or heating setpoint cannot be maintained for 20 minutes.

END OF SECTION 23 09 00

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. In addition to Section 133300 SUBMITTAL PROCEDURES provide shop drawings in a REVIT 2014 model

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
6. characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements. Include manufacturer’s catalogue information.
7. 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. Stainless Steel Pipe: Vent pipe constructed of AL29-4C or 29-4 (S44735) superferritic stainless steel, with a minimum thickness of .015” for diameters 3”-8”.
      a. Type: Factory built by a single manufacturer, single wall, for use on Category II, III and IV appliances.
      b. Temperature and pressure: For a maximum continuous flue gas temperature of 550 degrees Fahrenheit, and an internal static pressure of 9” w.g.
      c. Fittings: All parts shall be compatible with other single wall and double wall products of the same manufacturer, with common joint mechanism integral to each fitting..
      d. Joints: Ring and tab mechanism, manufactured from AL29-4C or 29-4 (S44735), with factory installed gasket to seal joint, and gasket lube from the same manufacturer. Male and female overlapping metal-metal connection to contain condensate.
      e. Sizing: Vent system is to be sized in accordance with appliance manufacturer’s specifications, NFPA 54-National Fuel Gas Code (ANSI Z223.1), ASHRAE recommendations and other applicable codes.

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. Flages, 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 Separators:
1. In-Line Air Separators: Cast iron for sizes 1-1/2 inch and smaller, or steel for sizes 2 inch and larger; ASME tested and stamped; for 125 psig operating pressure.

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.

B. In-Line Boiler Circulator Pumps:
1. Type: Close coupled, in-line, direct drive, single stage. Cast-iron casing, with flanged connections, for 150 psig maximum working pressure.
2. Construction: Cast iron casing, with suction and discharge gage ports, seal flush connection, flanged suction and discharge, fully enclosed dynamically balanced noryl impeller, permanently lubricated 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 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 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 practical at common elevations.

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.

K. Install Flue and Combustion Air Piping in strict compliance with manufacturer's instructions, and all pertinent local, regional, and national building and mechanical codes and regulations. Slope flue piping for 1/4" per foot pitch back to appliance so condensate flows back toward the appliance to the required drains at all times.

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 near 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

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 horizontal combustion air and flue pipe adjacent to each fitting, with 5 feet maximum spacing between hangers.

G. Support vertical piping at every other floor. Support vertical cast iron pipe at each floor at hub.

H. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

I. Support riser piping independently of connected horizontal piping.

J. Provide copper plated hangers and supports for copper piping.

K. Design hangers for pipe movement without disengagement of supported pipe.

L. 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:

PE 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 ½ (Note 1)	9	11	1/2	1/2
3	10	12	1/2	1/2

B. Plastic and Ductile Iron 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 23 00 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. Refrigerant piping used for air-conditioning applications.

1.2 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include Pressure drop based on manufacturer's test data.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Comply with ASHRAE 15, Safety Code for Refrigeration Systems.

B. Comply with ASME B31.5, Refrigeration Piping and Heat Transfer Components.

1.4 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 degrees F.

2.2 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 degrees F.

B. Packed-Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 degrees F.

C. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 degrees F.

D. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 115-V ac coil.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 degrees F.
8. Manual operator.

F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by and NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 degrees F.

G. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 degrees F.
6. Superheat: Nonadjustable.
7. Reverse-flow option (for heat-pump applications).
8. End Connections: Socket, flare, or threaded union.
9. Working Pressure Rating: 450 psig.

H. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig.
5. Maximum Operating Temperature: 275 degrees F.

I. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.

2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 degrees F.

J. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60-ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 degrees F.

K. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurements.
7. Maximum Pressure Loss: 2 psig.
8. Rated Flow: 10-tons.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 240 degrees F.

L. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Rated Flow: 10-tons.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 240 degrees F.

M. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig.

4. Maximum Operating Temperature: 275 degrees F.

2.3 REFRIGERANTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, bur are not limited to the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Arkema Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

C. ASHRAE 34, R-22: Monochlorodifluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Suction Lines NPS 1½ and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with soldered joints.

B. Suction Lines NPS 4 and Smaller MPS 2 to NPS 4 for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.

C. Hot-Gas and Liquid Lines and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with soldered joints.

D. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.

E. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications:

1. NPS 1½ and Smaller: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with soldered joints.
2. NPS 1½ and Smaller: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.
3. NPS 2 to NPS 3: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
4. NPS 4: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.

F. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.

G. Safety-Relief-Valve Discharge Piping:

1. NPS 1½ and Smaller: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with soldered joints.
2. NPS 1½ and Smaller: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed joints.
3. NPS 2 to 3: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
4. NPS 4: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at strainers if they are not an integral part of strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

E. Install a full-sized, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalize liners are required, make connection where it will reflect suction line pressure at bulb location.

H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

L. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install Refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to buildings walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 8 Section “Access Doors and Frames” if valves or equipment requiring maintenance is concealed behind finished surfaces.

L. Install refrigerant piping in protective conduit where installed below ground.

M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

N. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do no apply heat near expansion-valve bulb.

P. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

Q. Seal penetrations through fire and smoke barriers according to Section 07 84 00, Firestopping.

R. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

S. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

T. Seal pipe penetrations through exterior walls according to Section 07 90 00, Joint Protection for materials and methods.

U. Identify refrigerant piping and valves according to Section 23 05 53, Identification for HVAC Piping and Equipment.

3.4 PIPE JOINT CONSTRUCTION

A. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

B. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Section 23 05 29, Hangers and Supports for HVAC Piping and Equipment.

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20-feet long.
2. Roller hangers and spring hangers for individual runs 20-feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20-feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 60-inches; minimum rod size, 1/4-inch.
2. NPS 5/8: Maximum span, 60-inches; minimum rod size, 1/4-inch.
3. NPS 1: Maximum span, 72-inches; minimum rod size, 1/4-inch.
4. NPS 1-1/4: Maximum span, 96-inches, minimum rod size, 3/8-inch.
5. NPS 1-1/2: Maximum span, 96-inches, minimum rod size, 3/8-inch.
6. NPS 2: Maximum span, 96-inches; minimum rod size, 3/8-inch.
7. NPS 2-1/2: Maximum span, 108-inches; minimum rod size, 3/8-inch.
8. NPS 3: Maximum span, 10-feet; minimum rod size, 3/8-inch.
9. NPS 4: Maximum span, 12-feet; minimum rod size, 1/2-inch.

D. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping and specialties. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Line Test Pressure for Refrigerant R-410A:

    a. Suction Lines for Air-Conditioning Applications: 185 psig.
    b. Suction Lines for Heat-Pump Applications: 325 psig.
    c. Hot-Gas and Liquid Lines: 325 psig.

4. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in No. 3 above.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer’s written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.

3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

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.
8. In addition to Section 01 3300 SUBMITTAL PROCEDURES provide shop drawings in a REVIT 2014 model

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. fVolume 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 balances, 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 thermaloverload 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 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. 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:
3. 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 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 contours to a specifically designed and teste4d 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 modeIing 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.
a. Disposable Panel Filters: Fiber blanket, factory sprayed with flameproof, non-drip, non-volatile adhesive.
2. Nominal Size, Thickness and Performance Rating: Per Section 23 73 00, INDOOR CENTRAL-STATION AIR-HANDLING UNITS.

I. 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

Z. VAV box clearances; provide sufficient maintenance clearance for maintenance and control access according to manufacturer recommendations.

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 Standard:
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:
   a. 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.
   b. 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.
   c. FRP ductwork shall be designed using a safety factor of 10 to 1 for pressure and 5 to 1 for vacuum without exception.
   d. Out-of-roundness of duct shall be limited 1% of the diameter.
   e. Length of all flanged duct sections shall not vary more than ± 1/2 inch at 70°F.
   f. 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.
   g. Laminates:
      1) 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.
      2) 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%.
      3) Interior layer: Nominal 90 mils thick composed of at least two layers of chopped strand mat. Resin content shall be 75%.
      4) Structural layer: Type E glass to meet minimum wall thickness as specified. The total wall thickness includes the inner surface.
         a) Contact molded structural layer shall include alternate layers of chopped strand mat and woven roving.
         b) 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.
      5) Exterior corrosion layer: Single A or C Veil shall be applied to all cut exterior.
   h. Fittings:
      1) All fittings shall be hand lay-up construction fabricated from the same resin and have the same strength as the FRP ductwork.
      2) The internal diameter of all fittings shall be equal to the adjacent duct.
      3) The tolerance on angles of all fittings shall be ± 1 degree up to and including 24-inch diameter.
   i. Elbows:
      1) Elbows 24-inch diameter and smaller shall be smooth radius.
      2) Elbows 30-inch and larger shall be mitered. Provide a minimum of two mitered joints (3-piece) for all elbows above 45 degrees.
   j. Flanges:

1) Provide flanged connections to flexible connectors, expansion joints, vessels, demisters, fans, silencers and other locations as shown on the Drawings.
2) Flanges shall be hand lay-up construction. Dimensions shall be in accordance with NBS PS 15-69 and the Duct Dimension Schedule.
3) 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.
4) Flange faces shall be perpendicular to the axis of the duct with 1/2 degree.
5) Flange faces shall be flat to within ± 1/32 inch up to and including 18-inch diameter.
6) Gaskets shall be EPDM, full face and minimum 1/8-inch thickness.
7) All bolts, nuts and washers shall be Type 316 stainless steel.

k. Joints:
1) Provide all butt and strap joints in accordance with NBS PS 15-69.
2) 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.
3) 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

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SECTION 23 31 00 - HVAC DUCTS AND CASINGS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes

1. Duct Materials.
2. Ductwork - General.
3. Round Ductwork.
4. Flexible Ductwork.
5. Plenums.

1.2 DEFINITIONS

A. Duct Sizes: Outside clear dimensions.

B. Pressure Classifications:

1. SMACNA 2-inch Standard with Seal Class A:

a. Ductwork and plenums installed outdoors.
b. Housing Building supply ductwork and plenums between air handling unit and points where ducts enter chases.

2. SMACNA 1-inch Standard with Seal Class C:

a. Other ductwork and plenums other than listed above, unless indicated otherwise.

C. Seam: Locks or weld applied longitudinally to close section of duct, e.g., longitudinal seam, spiral seam.

D. Joint: Abutting connection between duct sections for continuity of air passage, e.g., cross joint, transverse joint, coupling.

E. Reinforcement: Hardware applied to strengthen duct, e.g., girth angles, tie rods, fasteners (not connectors), etc.

F. Stiffening: Folding, bending, beading, crossbreaking or corrugating of sheets to achieve strength through shape, e.g., pocket lock secures joint and is transverse stiffener, with girth angle and/or fasteners applied (not connectors), joint or stiffener.

1.3 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select size and type of air-moving and distribution equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by the Owner's Representative. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.4 REGULATORY REQUIREMENTS

A. Construct ductwork to California Mechanical Code..

1.5 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data:

1. Provide make and model, gages for each duct size, material data sheets, and information for fittings.

C. Shop Drawings: CAD-generated and drawn to 1/4-inch equals 1-foot scale. Show fabrication and installation details for metal ducts.

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Duct layout indicating sizes and pressure classes.
3. Elevations of top and bottom of ducts.
4. Dimensions of main duct runs from building to grid lines.
5. Fittings.
6. Reinforcement and spacing.
7. Seam and joint construction.
8. Penetrations through fire-rated and other partitions.
9. Equipment installation based on equipment being used on Project.
10. Duct accessories, including access doors and panels.
11. Hangers and supports, including methods for duct and building attachment, vibration isolation, and seismic restraints.

D. Quality Control Submittals:

1. Coordination Drawings: reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved.

    a. Ceiling suspension assembly members.
    b. Other systems installed in same space as ducts.
    c. Ceiling and wall-mounting access doors and panels required to provide access to dampers and other operating devices.
    d. Ceiling-mounting items, including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

2. Welding certificates.
3. Field quality-control test reports.

E. Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for kitchen hood exhaust systems.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, Structural Welding Code - Steel, for hangers and supports and AWS D9.1, Sheet Metal Welding Code, for duct joint and seam welding.

B. NFPA Compliance:

1. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
2. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect ductwork, accessories and purchased products from damage during shipping, storage and handling. Prevent end damage and prevent dirt and moisture from entering ducts and fittings.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Spiral Round Ducts:

1. United McGill.

B. Flexible Connections:

1. Ventfabrics, Inc..
2. Duro Dyne.

C. Flexible Ducts:

1. Thermaflex.
2. United McGill.
3. Automatic Industries, Inc.

D. Spring Fasteners:

1. Dzus.
2. Simmons “Quick-Lock.”

E. Duct Protective Coatings:

1. Varni-lite Corporation of America.

F. Duct Sealants:

1. Minnesota Mining and Manufacturing Company (3M).
2. Benjamin Foster Company.
3. United McGill Corporation.
4. Hardcast Corporation Inc.

5. Miracle Adhesive Corporation.

G. Spin-in Fittings:

1. Modular Metals.
2. R & J Manufacturing.

2.2 DUCT MATERIALS

A. General: Non-combustible or conforming to requirements for Class 1 air duct materials, or UL 181.

B. Steel Ducts: ASTM A653 galvanized steel sheet, lock-forming quality, having zinc coating of 1.25-ounce per square foot for each side in conformance with ASTM A90.

C. Aluminum Ducts: ANSI/ASTM B209; aluminum sheet, alloy 3003-H14. Mill finish. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength.

D. Stainless Steel Ducts: ASTM A167, Type 304 18-8. Concealed: Finish 2B or 3. Exposed: Finish 3 or 4.

E. Fasteners: Rivets, bolts, or sheet metal screws.

1. Screws and Rivets:

a. Same material as sheet, except as noted.
b. On aluminum sheets, provide cadmium plated or stainless steel.
c. Zinc or cadmium plated, permitted on galvanized sheets.
d. Minimum Screw Size: No. 1C.
e. Minimum Rivet Size: 4-lb.

F. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic. Gaskets: Continuous, reinforced, inert self-conforming type. 1/8-inch thick. Width, to match angle connection.

G. Hard-Setting Joint Tape:

1. Two-part Tape:

a. Mineral impregnated woven fiber tape.
b. Impregnated with activator/adhesive of polyvinyl acetate type.

2. UL Listed:

a. Flame Spread: 10.
b. Smoke Contributed: 0.

H. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

I. Spring Fasteners:

1. Oval head stud and receptacle.
2. Screwdriver slot.
3. Self-ejecting.
4. Similar to Dzus.

J. Angles, tie rod and shapes for reinforcing ducts in accordance with SMACNA Duct Construction Standards, except as noted.

K. Duct Lining: Not allowed.

2.3 DUCTWORK - GENERAL

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.

C. Construct T's, bends, and elbows with radius of not less than 1½ times width of duct on centerline. Where not possible and where rectangular elbows are used, provide turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Only where absolutely unavoidable, divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.

E. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10-percent duct area, split into two ducts maintaining original duct area.

2.4 ROUND DUCTWORK

A. General:

1. Flow low pressure.
2. Prefabricated spiral lockseam duct.
3. Prefabricated fittings.

a. Same manufacturer as duct and as detailed.
b. Continuity welded seams.
c. Die-stamped elbows for 8-inches or smaller.
d. Mitered elbows larger than 8-inches.

1) 2 Gores: less than 35 degrees.
2) 3 Gores: 36 degrees through 71 degrees.
3) 5 Gores: over 71 degrees.

4. Not Acceptable:

    a. Corrugated or flexible metal duct.
    b. Shop fabricated circular duct, except above maximum factory-fabricated size.
    c. Fiberglass ductwork.

5. Provide ducts with gauges meeting CMC and NFPA 90A, whichever is more strict.

B. Round Duct and Fittings:

1. Duct Construction:

Duct Diameter (in)	Spiral Duct Gage	Fitting Gage
3-14	26	20
15-26	24	20
27-36	22	20
37-50	20	18
51-60	18	16

2. Similar to United Sheet Metal “Uniseal” with “Uniform” fittings.

C. Accessories: Factory fabricated.

1. Couplings.
2. Volume dampers.
3. Bellmouth fittings.
4. End caps.
5. Fire damper access section.
6. Angle rings.
7. Insulation Ends: Connections of double to single wall ducts.

2.5 FLEXIBLE DUCTS

A. General:

1. Use only where specified or indicated.
2. UL 181, Class I Air Duct.
3. Labeled for compliance with CMC.

B. Low Pressure:

1. Insulated Flexible Duct:

    a. Minimum working pressure 1.5-inches w.g.
    b. Nominal 1-inch insulation with vapor barrier.
    c. Maximum thermal conductivity 0.27-Btuh/sq. ft. degrees f/inch at 75 degrees F.

2. Use At Following Locations:

   a. Connection to ceiling air outlets in non-secure areas.
   b. As indicated.

2.6 PLENUMS

A. Fabricate plenums in accordance with SMACNA HVAC Duct Construction Standards and construct for operating pressures indicated.

B. Mount floor mounted plenums on 4-inch high concrete curbs. At floor, rivet panels on 8-inch centers to angles. Where floors are acoustically insulated, provide liner of 18-gauge galvanized expanded metal mesh supported at 12-inch centers, turned up 12-inches at sides with sheet metal shields.

C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection. Provide clear wire glass observation ports, minimum 6 by 6-inch.

D. Fabricate acoustic plenums with reinforcing turned inward. Provide 16-gauge back facing and 22-gauge perforated front facing with 3/32-inch diameter holes on 5/32-inch centers. Construct panels 3-inches thick packed with 4.5-lb/cu ft minimum glass fiber media, on inverted channels of 16-gauge.

PART 3 EXECUTION

3.1 INSTALLATION

A. General:

1. Construct with gauges, joints, bracing, reinforcing, and other details per CMC, ASHRAE, SMACNA, or NFPA standard unless specified otherwise.

   a. Comply with most stringent.
   b. Provide ducts with NFPA 90A gauges when traversing smoke zones.

2. Install ductwork of sizes, runs and connections as shown on the drawings.
3. Verify all dimensions at the site, making all field measurements and shop drawings necessary for fabrication and erection of sheet metal work. Dimensions shown are net free areas. Make allowances for beams, pipes or other obstructions in building construction and for work of other trades. Check plans showing work of other trades and consult with Owner's Representative in the event of any interference.
4. Fabricate ductwork in workmanlike manner with airtight joints, presenting smooth surfaces on inside, neatly finished on outside, construct with curves, bends, turning vanes to aid in easy flow of air. Make internal ends of slip joints in direction of airflow.
5. Construct, brace and support ducts and air plenums to prevent sagging and to minimize vibration when fans are operating.
6. Maintain rectangular cross section of ductwork unless otherwise shown.
7. Blow out all dirt and foreign matter from ductwork, and clean diffusers, registers and grilles before fans are started.

8. Unless otherwise noted, construct ductwork as specified for low pressure ductwork.
9. All angle irons required for ductwork construction and support shall be galvanized.
10. Construct of galvanized sheet metal, except where otherwise indicated.
11. Diagonally crossbrace all panels on metal rectangular ducts over 18-inches in either direction. Beading for reinforcing is acceptable.
12. Duct dimensions indicated are net, outside, clear dimensions.
13. Alter duct sizes on basis of equal friction where required to facilitate installation.
14. Penetrations of ducts are forbidden without approval from the Owner's Representative. Provide airtight rubber grommets at unavoidable penetrations of hanger rods.
15. At exposed duct penetrations of walls, floors and ceilings, provide sheet metal angle type escutcheons.
16. At supply diffusers, grilles and/or registers extend branch duct 1-foot beyond air outlet.
17. Install exposed ducts to maintain not less than 7-feet head clearance, unless indicated otherwise.
18. Tapers: Pitch sides of duct in "diverging" or "converging" airflow maximum of 1 to 4 taper.
19. Duct Opening:

    a. Provide openings where required to accommodate thermometers, smoke detectors, controllers, etc. Insert through airtight rubber grommets.
    b. Provide Pitot tube openings where required for testing of systems:

        1) Complete with metal cap with spring device or screw to ensure against air leakage.
        2) For Pitot tube test install test holes.

    c. Where openings are provided in insulated ductwork, install insulation material inside metal ring.

    d. At fire dampers and fire/smoke dampers, allow adequate length of duct to install duct access door.

20. Tapers:

    a. Pitch sides of duct in a "diverging" airflow maximum of 20 degrees.
    b. Pitch sides of duct in a "converging" airflow maximum of 30 degrees.
    c. Design elbows for minimum friction with inside radius not less than width of duct. Use square elbows with hollow double radius type duct turns where radius is less than duct width. Attach duct turns to duct securely with spot weld, screws, or rivets. Friction type attachment not acceptable.

21. Branch Duct Connections: Make branch duct connections to other ducts or plenums in such a manner that it provides a smooth airflow with minimum turbulence and minimum air pressure drops at the connections. Use parallel flow connections or 45-degree clinch collars or bell mouth, and provide air volume control dampers. Straight tap connections are not acceptable unless specifically shown.
22. Flashing Ducts Through Roof: Install flashing to cover top and sides of curb and fit closely around duct. Cover tope edge of base flashing with collar soldered to duct and turned down over base flashing. Fabricate flashing from 24-gauge galvanized steel. See HVAC details on plans for further information.

23. Test Holes: Drill instrument test holes into ductwork for Pitot tube tests. Install hole covers attached to ductwork by sheet metal screws. Locate test holes at intake and discharge from each air handling unit and as shown.
24. Remove all debris and oily residue from ductwork and plenums after manufacturing and prior to installation.
25. Cover and seal all openings in ductwork during transportation and storage; remove just prior to installation. Prevent dirt and moisture from entering ductwork after installation. Cover and seal openings at the end of each work day.

B. Elbows and Transitions:

1. Construct radius elbows with inside radius not less than duct width.
2. Use square turns in rectangular ductwork, unless indicated otherwise, at following locations:

    a. Immediately upstream from supply air outlets.
    b. Where required to facilitate installation.

3. Provide turning vanes in miter elbows in round and rectangular ducts.
4. Where indicated, provide turning vanes of special size and shape.
5. Tow-way Splits:

    a. Supply, return and exhaust.
    b. Two Elbows:

        1) Proportionally sized per SMACNA Duct Standards.
        2) Radius or square.

    c. Single fitting acceptable with turning vanes. Duct opening sized as above.

C. Rectangular Duct Joints:

1. Standing seams, except where flush drive slip seam called for.
2. Use flush, drive-slip, for:

    a. Exposed ducts.
    b. Where required for clearance.
    c. In ducts no wider than 60-inches.

D. Joint Sealing:

1. Seal transverse and longitudinal joints of sheet metal ducts, including angle iron connections, by one of following methods:

    a. Six ounce canvas strip, six inches wide. Adhere with lagging adhesive.
    b. Applications as recommended by manufacturer.

2. Seal punched holes and corner cracks.
3. After installation and balancing reseal joints found to be leaking.

E. Aluminum Ductwork:

1. Aluminum Sheets: One gauge heavier than galvanized steel as tabulated.

2. Joints and seams made watertight by soldering, aluminum welding.
3. Grilles on aluminum ductwork: aluminum.
4. Separate aluminum ducts, casings, plenums, housing and louvers from direct contact with concrete by resilient gasketing or caulking compound.
5. Pitch down to 1/8-inch to 1/4-inch per foot toward air intake opening.

F. Stainless Steel Ductwork Material Thickness and Construction Details: As specified for low pressure ductwork except as noted otherwise. Pitch down to 1/8-inch to 1/4-inch per foot toward air intake opening.

G. When exposed ducts are located within ten feet of the floor or ground in an inmate accessible area:

1. Ducts shall be welded rectangular ducts; minimum 14-gauge. Sections shall be welded or screwed together with security type screws; slip joints are not allowed.
2. Mount tight against ceiling or deck above with supports made from minimum 14-gauge material. Fasten mounting with security type screws.
3. Cover cracks exceeding 1/32-inch wide between duct and ceiling or deck with 1/4-inch thick steel angle, minimum 1 by 1-inch size, spot welded to the duct and bolted to the ceiling or deck with security type screws.

3.2 ROUND DUCTWORK

A. Fittings: Factory fabricated with radius of elbows and angles minimum of 1½-times diameter of duct. Where tee fittings of conical type change in shape from round to rectangular, utilize a transformation joint with a taper ratio of 1 to 7.

B. Joints Between Ducts:

1. Made with beaded sleeve joints as scheduled.
2. Duct sealer applied to male end.
3. Mechanically fastened with sheet metal screws or pop rivets.
4. Over joint and screw or rivet heads, apply coating of duct sealer.
5. Cover entire joint with duct tape.

C. Joints, Duct and Fitting:

1. Slip projecting collar of fittings into duct. Insertion length 2-inches minimum.
2. Apply duct sealer. Seal and tape as specified above.
3. Mechanically fasten per following Fastening Schedule:

No. of Rivets	Diameter	Slip Joint
4	8-inches	3/4-inch
6	9 to 16-inches	1-inch
7	17-inches and larger	1 1/4-inch

D. Junctions Between Ducts: Branch takeoff conical 90 degrees.

E. Horizontal Supports:

1. One or two-piece clamp band strap.
2. Minimum: One per section.
3. Support fittings to prevent sagging.

F. Vertical Support: One of the following:

1. Clamp bands with extended ends supported by floor.
2. Clamp bands with knee bracing.
3. Pedestal at base of vertical.

3.3 FLEXIBLE DUCTWORK

A. Provide insulated flexible ducts continuous, single pieces not over seven feet in length, adequately supported, and have a minimum inside bending radius of two-thirds the internal diameter, but not installed with a radius of bend less than two duct diameters.

B. Provide 4-inches wide sheet metal protection saddles under ductwork at each hanger.

C. Where flexible ducts join other ductwork and air terminals, apply duct sealer to outside surface of collar. Secure duct to collar with sheet metal screws and clamps, and seal joint with three wraps of pressure sensitive vapor seal adhesive tape.

D. Use only on supply air application.

1. At non-security ceiling air outlets.

E. Install flexible ducts in as straight a manner as possible. Cut ducts to lengths required, maximum 7-feet, rather than create bends to take up excess lengths. Terminate flexible duct perpendicular to the connection.

F. Connect flexible ducts to metal ducts with draw bands.

G. Use crimp joints with or without bead for joining round duct sizes 8-inch and smaller with crimp in direction of air flow.

H. Use double nuts and lock washers on threaded rod supports.

3.4 DUCT HANGERS AND SUPPORTS

A. General:

1. Attachment to structure, as specified in Section 23 05 09 - Hangers and Supports for HVAC Piping and Equipment.
2. Seismic restraints shall be as specified in Section 23 05 08 - Vibration Isolation and Seismic Control.

B. Horizontal Duct Supports:

1. Support horizontal ducts with hangers of size and spacing as indicated in pertinent SMACNA HVAC Duct Construction Standards.
2. Install hangers at each change in direction of duct.
3. Strap Hangers:

    a. Extend strap down both sides of ducts.
    b. Turn under bottom one inch minimum.
    c. Metal screw hangers to bottom of duct, upper and lower sides of ducts, and not more than 12-inches on center.

4. Angle Hangers:

    a. Provide angle hangers formed by extended vertical bracing angles.
    b. Or by rods connecting to bottom angles if size or bracing angles conform to hanger schedule.

5. Support horizontal ducts on the roof with supports of size and spacing as indicated on the drawings.
6. Vertical Duct Supports: Support vertical ducts at every floor.

    a. Use angles or channels riveted to ducts.
    b. Set angles or channels on floor slab or structural steel members placed in opening, unless otherwise noted.

3.5 SLEEVES

A. Sleeves are specified in Section 23 05 00 - Common Work Results for HVAC.

3.6 LEAKAGE

A. General:

1. Leakage of ductwork and plenums shall not exceed 3-percent of design cfm. The 3-percent leakage limit applies to each duct system as a whole.
2. Leakage shall be determined by summation of all supply outlet cfm’s on any one system subtracted from the total cfm developed by the unit serving that system.
3. Balancer to inform Owner’s Representative of any system that exceeds the 3-percent leakage allowance.
4. Contractor to inspect the systems that exceed the 3-percent leakage allowance and reseal leaking ductwork at no additional cost to the owner until the leakage rate is within the 3-percent allowance.

END OF SECTION

SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Volume control dampers.
2. Backdraft dampers.

1.2 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: For the Following:

1. Backdraft dampers.
2. Volume dampers.
3. Motorized control dampers.

C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Special fittings.
2. Manual-volume damper installations.
3. Motorized-control damper installations.
4. Wiring Diagrams: Power, signal and control wiring.

D. Quality Control Submittals.

1. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinating penetrations and ceiling-mounting items. Show ceiling-mounting items. Show ceiling-mounting access panels and access doors required for access to duct accessories.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, Installation of Air Conditioning and Ventilating Systems, and NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.

1.4 MAINTENANCE

A. Extra Materials

1. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

a. Fusible Links: Furnish quantity equal to 10-percent of amount installed.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Multiblade Volume Dampers:

1. Ruskin Manufacturing Company.
2. Air Balance Inc.
3. American Warming and Ventilating Inc.

B. Backdraft Dampers:

1. Air Balance, Inc.
2. American Warming and Ventilating Inc.
3. Ruskin Manufacturing Company.

C. Damper Hardware:

1. Ventfabrics, Inc.
2. Duro Dyne Corporation.
3. Young Regulator Company.

2.2 VOLUME CONTROL DAMPERS.

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated.

B. Fabricate splitter dampers of material same gage as duct to 24-inches size in either direction, and two gages heavier for sizes over 24-inches.

C. Fabricate splitter dampers of double thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum ¼-inch diameter rod in self aligning, universal joint action flanged bushing with set screw.

D. Fabricate single blade dampers for duct sizes to 12 x 48-inch.

E. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 by 72-inch (300 x 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

F. Except in round ductwork 12-inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

G. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30-inches (750 mm) provide regulator at both ends.

H. Single Blade Dampers:

1. Galvanized Steel Ductwork: 16-gauge galvanized steel, except as noted.
2. Low Pressure Systems: SMACNA HVAC Duct Construction Standards, except as noted.

a. Bearing at one end of damper rod: Similar to Ventlok No. 60 or Ruskin.
b. Accessible quadrant at other end of damper rod:

1) With lever and lockscrew, similar to Ventlok No. 635. or Ruskin.
2) Insulated Ducts: Quadrants mounted on bracket to clear insulation; similar to Ventlok Nos. 637, 638, or 639. Selection based on insulation thickness.

c. For Inaccessible Dampers in Ceiling Spaces: Provide metered gear assembly with concealed ceiling regulator at other end of damper rod.

1) With end bearing at the other end of damper rod, similar to Ventlock No. 607.
2) With metered gears, similar to Ventlock No. 680 or Ruskin.
3) With concealed damper regulator, similar to Ventlock No. 677 or Ruskin. One with 2-5/8-inch diameter paintable coverplate provided with an additional set of security screws.
4) Required interconnecting hardware and set of regulator wrenches.

d. Self-locking Splitter Damper Assembly with Accessible Quadrant: With a damper blade bracket, a double lead threaded rod, a universal joint, a lever and lockscrew, similar to Ventlock No. 690 or Ruskin.

e. Abbreviated Self-locking Splitter Damper Assembly for Inaccessible Ceiling:

1) With damper blade bracket, a double lead threaded rod and an extended shaft universal joint, similar to Ventlock No. 691 or Ruskin.
2) Provide required hardware as specified under For Inaccessible Damper above.

I. Multiblade Dampers for Low Pressure Systems:

1. Opposed blade damper. Maximum 8-inches wide for ducts over 14-inches.
2. Rated at 10 cfm per sq. foot at 4-inches differential pressure.
3. Similar to Ruskin Model CD454.

2.3 BACKDRAFT DAMPERS

A. Description:

1. Extruded aluminum construction.
2. Vinyl blade edge seals.
3. Blade ends overlapping frame.
4. Similar to Air Balance Inc., Series 700 or Ruskin.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions. Manufacturers' installation instructions shall be made available to the Owner's Representative and inspecting authorities.

B. Provide balancing dampers at points on low pressure supply, return, and exhaust systems at the following locations:

1. In all duct splits and branches of supply, return and exhaust systems.

2. In duct serving single outlets.
3. At open return duct above ceilings.
4. At duct splits above 36-inches deep.
5. In duct connected to common plenum.
6. Where shown on drawings.
7. Install balancing dampers at the split or branch take-off.
8. Dampers at air outlets and inlets cannot be used in lieu of balancing dampers.

C. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

D. The construction and installations for damper openings in wall and ceilings shall conform to Chapter C, CBC, and the manufacturer's approved installation instructions.

END OF SECTION

SECTION 23 34 00 - HVAC FANS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Ceiling Exhaust Fans.
2. Accessories.

1.2 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.

C. Fabrication: Conform to AMCA 99.

1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data

1. Submit information including air flow capacities, static pressures, rpm, sound levels at design operating point. Provide fan curve clearly showing plotted design point.
2. For adjustable axial fan blades, provide performance data and fan curves for at least five blade settings.

C. Shop Drawings

1. Submit full set of drawings showing a minimum of three views with all dimensions clearly shown, including duct connections.

D. Quality Control Submittals

1. Provide factory test reports with each submittal.
2. Manufacturer’s Installation Instructions.

E. Closeout Submittals

1. Operation and Maintenance data include instructions for lubrication, motor and driven replacement, spare parts list, and wiring diagrams.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect motors, shafts, and bearings from weather and construction dust.

1.5 SYSTEM START-UP

A. Refer to Sections 23 05 00 and 23 05 93.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Greenheck.

B. Loren Cook Company.

C. Penn Ventilator.

2.2 CEILING EXHAUST FANS

A. Ceiling mounted, direct drive centrifugal type, steel housing, Units over 100-cfm shall include 1/2-inch acoustical insulation.

B. Integral ceiling grille constructed of non-yellowing high-strength polymer or high impact polystyrene. Grilles for larger sizes shall be aluminum.

C. Duct collar shall be constructed of steel and shall accept a minimum 6-inch duct size. Collar shall include integral backdraft damper.

D. Motor shall be mounted on vibration isolators. Disconnect shall be internal plug-in type.

E. Fan wheel shall be forward-curved centrifugal type, statically and dynamically balanced.

2.3 ACCESSORIES

A. Consult notes in equipment schedules for exact options to include with fans.

B. Dampers: Welded steel construction, consisting of two semi-circular vanes pivoted on oil-retaining bearings in short casing section, finished with one coat enamel. Provide airstream operation closing blades by reverse air flow and gravity. Hand operation with handwheel control of screw and link mechanism.

C. Inlet Screens: Galvanized steel welded grid to fit inlet bell.

D. Access Doors: Shaped to conform to casing with quick opening latches and gaskets.

E. Blade Pitch Actuator: Factory mounted and calibrated, electric actuator requiring single phase power and accepting electric input.

F. Vibration Detector: Factory installed vibration switch to stop fan.

G. Guide Vanes: Welded steel construction with airfoil vanes and casing flanges, finished to match casing.

H. Adjustable Inlet Vanes: Steel construction with blades supported at both ends cantilevered with two permanently lubricated bearings, variable mechanism out of airstream terminating in single control lever with control shaft for double width fans and locking quadrant.

I. Inlet Bell: Bell mouth inlet fabricated of steel with flange.

J. Outlet Cones: Fabricated of steel with flanges, outlet area/inlet area ration of 1.5/1.0, with center pod as recommended by manufacturer.

K. Scroll Drain: 1/2-inch steel pipe coupling welded to low point of fan scroll.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Do not operate fans for any purpose until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

C. Install fans as specified, with resilient mountings and flexible electrical leads. Refer to Section 23 05 48.

D. Install flexible connections specified in Section 23 33 00 between fan inlet and discharge ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

E. Install fan restraining snubbers as required. Refer to Section 23 05 48. Flexible connectors shall not be in tension while running.

F. Provide sheaves required for final air balance.

G. Provide safety screen where inlet or outlet is exposed.

H. Pipe scroll drains to nearest floor drain.

I. Provide backdraft dampers on discharge of exhaust fans and as indicated.

J. Secure roof exhausters with lag screws to roof curb. Provide shims or spacers between roof curb and fan.

K. Ceiling Fans: Provide adjustable mounting brackets to allow for ceiling thickness.

L. Provide access to adjustable blade axial fan wheels for varying blade angle setting. Adjust blades for varying range of volume and pressure.

M. Provide floor mounted axial fans with reinforced legs. Provide ceiling suspended units with support brackets bolted to casing flange.

3.2 DEMONSTRATION

A. Instruct Owner personnel under provisions of Division 01.

B. Provide instruction for 5 people.

C. Duration: 1 working day, coincident with instruction period specified in other Division 23 sections.

D. Demonstrate system and instruct Owner personnel in operation, repair, and maintenance of the work of this section.

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

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. 10. Complete standalone control system, factory provided, field installed, wired, and programmed.
   11. DX refrigeration final stage of cooling with all refrigeration specialties and controls furnished by the factory, including a refrigerant charge of R-410A.

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. The base frame shall have factory pre-drilled holes, around the entire perimeter, at the proper height, size and spacing as recommended by the air handling unit manufacturer for attaching the base frame to the mounting curb. The Contractor shall attach

the base frame to the mounting curb with screws of a size recommended by the air handling unit manufacturer.

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. 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. 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.
8. 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.
9. 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.
10. 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.
11. Installation: Coils to be installed in accordance with manufacturer’s instructions and any
12. 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, and factory coated with Thermaguard protective coating for water vapor protection. 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 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).]
   5. Provide a sump water hardness sensor with factory automatic sump blow down to maintain water hardness levels at a factory set threshold level.

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. Exhaust air, backdraft damper.
   c. Direct Evaporative Cooler face and bypass, with factory installed and wired modulating actuator. Face and bypass shall provide modulation of supply air temperature.
   d. Outdoor air shut off damper.
   e. Recirculation damper for morning warm-up.

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
s. Building static 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 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 for Indirect Cooling Sump:
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. The base frame shall have factory pre-drilled holes, around the entire perimeter, at the proper height, size and spacing as recommended by the air handling unit manufacturer for attaching the base frame to the mounting curb. The Contractor shall attach the base frame to the mounting curb with screws of a size recommended by the air handling unit manufacturer.
   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 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 fansAMCA'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.

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J. 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.

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).]
   5. Provide a sump water hardness sensor with factory automatic sump blow down to maintain water hardness levels at a factory set threshold level.

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. Exhaust air, backdraft damper.

c. Direct Evaporative Cooler face and bypass, with factory installed and wired modulating actuator. Face and bypass shall provide modulation of supply air temperature.
d. Outdoor air shut off damper.
e. Recirculation damper for morning warm-up.

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 for Indirect Cooling Sump:
   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

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

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 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 to the schedules included in the contract documents. 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. All electrical work shall be supervised by an Electrician with a minimum of 10 years of experience on comparable projects or tasks.

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. Coordinate the provision of all Utility substructures, including but not limited to concrete pads, concrete pull and junction boxes, conduit, pull ropes, trenching, bedding, backfill, warning / locating tape, and associated accessories with Utility requirements. Coordinate all Utility inspections according to Utility requirements. Obtain Utility acceptance of substructures in writing prior to closing Utility trenches. Costs associated with opening trenches that have not been accepted by the Utility shall be the responsibility of the Contractor.

D. 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 disconnected from feeders, branch circuits closed, fixtures and devices permanently connected, lamps removed from sockets and wall switches closed.
2. 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.
3. Tests as required by other sections of these Specifications.
4. Tests as prescribed by individual equipment manufacturers whether or not described in these Specifications.

E. 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.

F. 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 power and lighting circuit wiring and lighting control cables shall be installed in conduit.

C. Wiring for auxiliary electrical systems such as fire alarm, security, telecommunications/data, and other similar systems shall be installed in conduit unless specifically noted otherwise in the drawings.

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-486B Wire Connectors.

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 Disciplines, 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 lighting and branch circuit wiring shall be minimum No. 12 AWG copper conductor unless otherwise indicated.

B. Wire and cable routing indicated is diagrammatic unless dimensioned. Route wire and cable as required to complement project conditions.

C. The Contractor shall be responsible for 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 for all conductors #2 AWG and larger. Provide test report with measured values.

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. Southwire Co.
2. Cerrowire
3. General Cable Corp.
4. Okonite Co.
5. Approved Equal.

2.2 BUILDING WIRE AND CABLE

A. Lighting and branch circuit wire and cable shall be UL83 compliant, insulated, single conductor, copper, solid or stranded, rated for 600-volts AC. The insulation shall be rated for 90 degrees Celsius, THW, THHN/THWN-2, RHW or XHHW, per ANSI/NFPA 70.

B. Feeder wire and cable #2 AWG and larger shall be UL83 compliant, insulated, single conductor, aluminum, compact stranded, AA-8000 series alloy, rated for 600-volts AC. The insulation shall be rated for 90 degrees Celsius, THHN/THWN-2 or XHHW, per ANSI/NFPA 70.

C. For Interior Dry Location: Use only building wire, THHN/THWN insulation rated 90 degree Celsius, in raceway.

D. For Exterior Wet or Dry Locations: Use XHHW-2 or THHN/THWN-2 insulation rated for 90 degree Celsius, in raceway.

E. For Underground Dry or Wet Locations: Use XHHW-2 or THHN/THWN-2 insulation rated 90 degree Celsius, in raceway.

F. For connections to electrical equipment, coordinate wire type with equipment manufacturer.

2.3 WIRING CONNECTORS

A. Split Bolt Connectors:
   1. Burndy LLC.
   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. Burndy LLC.
   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. Burndy LLC.
   2. Thomas & Betts Co.
   3. 3-M Co.
   4. Or Approved Equal.

2.4 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. Integral color coded insulation is also acceptable.
   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. 120/208-Volts
   a. Phase A – Black
   b. Phase B – Red
   c. Phase C – Blue

d. Neutral – White
e. Ground – Green

2. 277/480-Volts
   a. Phase A - Brown
   b. Phase B - Orange
   c. Phase C – Yellow
   d. Neutral - White or Natural Gray
   e. Ground – Green
3. 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. Unless specifically prohibited by manufacturer installation instructions, 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 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. Use connectors listed for the wire material, size and insulation type.
2. Clean conductor surfaces before installing lugs and connectors. Where an anti-oxidation lubricant is used, apply liberally, coating all exposed conductor surfaces.
3. Use suitable cable fittings and connectors.
4. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
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 #4 AWG or lager 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 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. Investigation shall include (but not be limited to): breaking splices in the cable and re-testing individual lengths, identifying lengths that are not achieving required test values, repairing or replacing those lengths, and remaking splices. Once the complete assembly tests within the required deviation, the investigation will be considered complete. Document all test procedures and results for review by the Engineer.
      e. Minimum insulation-resistance values should not be less than 50 meg-ohms.

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

A. Section 26 05 19 – Low Voltage Electrical 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.

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 26 05 26 - 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	3/4 “
Aboveground equipment or panel feeders or 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, AND HANDHOLES

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 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.

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 la, 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.
7. 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 ADJUSTING

A. Install knockout closures in unused openings in boxes.

3.8 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

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 mainte- nance 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 decorativeand/or specialty fixtures. Dimming control for specialty fixtures with incandescent, fluorescent, or LED lamping.
4. 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
5. 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 26 05 00 - Common Work Results for Electrical

B. Section 26 51 00 - 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. Board Room 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, then 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 atthe 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 dateline 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 backup 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 nonvolatile 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 26 05 00 and 26 51 00.

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 – provision of single-phase and three-phase general purpose, individually mounted, dry-type transformers of the two-winding type, self-cooled, with ratings and voltages as indicated on the drawings.

1.2 REFERENCE STANDARDS

A. ANSI C57.96 Guide for Loading Dry-Type Distribution and Power Transformers

B. National Electrical Manufacturers Association:
   1. NEMA ST 1 - Specialty Transformers (Except General Purpose Type).
   2. NEMA ST 20 - Dry Type Transformers for General Applications.
   3. NEMA TP-1 - Guide for Determining Energy Efficiency for Distribution Transformers

C. International Electrical Testing Association:
   1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 DESIGN REQUIREMENTS

A. Transformers shall be designed, manufactured, and tested in accordance with the latest applicable ANSI, NEMA and IEEE standards. All 600-volt class transformers 2 kVA through 750 kVA shall be UL listed and bear the UL label.

B. Transformers shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year operation, with normal life expectancy as defined in ANSI C57.96.

C. Transformer shall be energy efficient type, meeting the requirements of NEMA TP 1.

1.4 SUBMITTALS

A. Product Data:
   1. Outline and support point dimensions of enclosures and accessories.
   2. Unit weight, voltage, kVA, and impedance ratings and characteristics.
   3. Tap configurations, insulation system type, and rated temperature rise.
   4. Winding configuration.
   5. Terminations / Connection points.

B. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

C. Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

D. Submit calculations and anchoring methods (anchor bolt size, embedment and assembly details) to meet California Seismic Zone IV requirements.

E. Manufacturer's Certification and Test Reports:
   1. Indicate loss data, efficiency at 25, 50, 75 and 100 percent rated load, and sound level. Factory test data on a prototypical unit of identical size and features is acceptable.
   2. Manufacturer's Certificate. Certify that products meet or exceed specified requirements.

F. Field Quality Control Submittals: Indicate results of Contractor furnished tests and inspections.

1.5 CLOSEOUT SUBMITTALS

A. Record Documentation: Record actual locations of transformers.

B. Operation and Maintenance Manual.

C. Field Test Report

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years of experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver transformers individually wrapped for protection and mounted on shipping skids.

B. Inspect transformers as they arrive on site for damage and immediately report any damage discovered to the Owner and the Engineer.

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.

D. 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. The transformers shall be as manufactured by one of the following manufacturers:
   1. General Electric Co.
   2. Cutler-Hammer.
   3. Square D Co.
   4. Or Approved equal

2.2 STANDARD DRY-TYPE TRANSFORMERS

A. Transformers shall be NEMA ST-20 Class AA dry-type, voltage, phase, kVA rating, and method of mounting as indicated in the drawings. All three-phase transformers shall have three-winding primaries and three-winding secondary.

B. Insulation System
   1. Transformers shall be insulated as follows:
      a. 3 through 30 kVA - 180 degrees C insulation system.
      b. 45-kVA and above - 220 degrees C insulation system.
   2. Required performance shall be obtained without exceeding the above indicated temperature rise in a 40°C maximum ambient, with a 30°C average over 24 hours.
   3. All insulation material shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635.
   4. Transformers 30 kVA through 225 kVA shall be 115° C temperature rise above 40° C ambient. 115° C rise transformers shall be capable of carrying a 15 percent continuous overload without exceeding 150° C rise in a 40°C ambient.
   5. Limit transformer surface temperature rise to maximum of 50 degrees C.

C. Core and Coil Assemblies
   1. Transformer core shall be constructed with high grade, non-aging, grain-oriented silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities shall be substantially below the saturation point.
   2. The transformer core volume shall allow sufficient transformer operation at 10 percent above the highest tap voltage.
   3. The core laminations shall be tightly clamped and compressed.
   4. Coils shall be wound of electrical grade copper or aluminum with continuous wound construction, terminations brazed or welded.
   5. On units rated 3 kVA and above, the core and coil assembly shall be impregnated with non-hygroscopic, thermosetting varnish and cured to reduce hot spots and seal out moisture. The assembly shall be installed on vibration-absorbing pads.

D. Taps
   1. For transformers rated 25 kVA and larger, provide primary windings with 6 taps; two 2-1/2 % increments above full-rated voltage and four 2-1/2 % increments below full-rated voltage.

E. Provide terminal enclosure, with screw cover, to accommodate primary and secondary coil wiring connections and electrical supply raceway terminal connector.
   1. Compartment temperature to 75° C when transformer is operating continuously at rated load with ambient temperature of 40° C.
   2. Provide wiring connections suitable for stranded copper wiring, rated 75° C, and loaded to the 75° C ampacity.

F. Basic Impulse Level
   1. 10-kV for transformers less than 300-kVA

G. Grounding
1. Ground core and coil assembly to enclosure by means of a visible flexible copper-grounding strap. Provide grounding in accordance with these Specifications.

H. Enclosure
1. The enclosure shall be made of heavy gauge steel and shall be degreased, cleaned, primed, and finished with ANSI 61 color weather-resistant enamel. All transformers shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring. The maximum temperature of the enclosure shall not exceed 90° C. The core of the transformer shall be grounded to the enclosure.
2. On units rated 3 kVA and above, the enclosure construction shall be ventilated NEMA 1 suitable for indoor use, with lifting lugs as required. All ventilation openings shall be protected against falling dirt and water
3. On outdoor units, the enclosure shall be ventilated, NEMA 3R suitable for outdoor use, with weather shields over ventilation openings.

I. Nameplate
1. Provide Manufacturer's nameplate that includes transformer kVA, primary and secondary voltage, impedance, temperature rating, winding connection data, and overload capacity based on rated allowable temperature rise

J. Sound Level
1. Transformer sound levels shall be per NEMA ST 20 Table 3-9, as follows:

Equivalent	Average Sound Level in Decibels	
Winding KVA	1.2 KV or Less	Above 1.2 KV
1-9	40db	45db
10-50	45db	50db
51-150	50db	55db
151-300	55db	58db
301-500	60db	60db
501-700	62db	62db

2.3 SOURCE QUALITY CONTROL

A. The following factory test results shall be provided for each transformer:
1. Ratio tests at the rated voltage connection and at all tap connections
2. Polarity and phase relation tests on the rated voltage
3. Applied potential tests
4. Induced potential test
5. No-load and excitation current at rated voltage on the rated voltage connection.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify mounting supports are properly sized and located including concealed bracing in walls.

B. Provide concrete housekeeping pad for mounting and leveling of the transformer.

3.2 INSTALLATION

A. Install transformer(s) in accordance with manufacturer's instructions.

B. Set transformer plumb and level.

C. Use flexible conduit, in accordance with Section 26 05 33, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

D. Support transformers in accordance with NEC requirements.
   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.
   4. Provide seismic restraints.

E. Install grounding and bonding in accordance with Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS as outlined below:
   1. Dry Type Air-Cooled Transformers, 600 Volt and Below (167-kVA Single-Phase, 500-kVA Three-Phase, and smaller).
      a. Visual and Mechanical Inspections
         1) Compare equipment nameplate data with drawings and specifications.
         2) Inspect physical, electrical and mechanical condition.
         3) Verify that resilient mounts are free and that any shipping brackets have been removed.
         4) Inspect all bolted electrical connections for high resistance using one of the following methods:
            a) Use of low-resistance ohm meter in accordance with NETA ATS Section 7.2.1.1.2 (Electrical Tests).
            b) 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.
      b. Electrical Tests
         1) Perform resistance measurements through all bolted connections with a low- resistance ohmmeter, if applicable, in accordance with Section 7.2.1.1.1 (Visual and Mechanical Inspection).
         2) Perform insulation-resistance tests winding-to-winding and each winding-to-ground with test voltage in accordance with NETA ATS Table 10.5.
         3) Perform turns ratio tests at all tap positions.

4) Verify that as-left tap connections are as specified.

c. Test Values

1) Compare bolted connection resistances to values of similar connections.
2) Bolt-torque levels should be in accordance with NETA ATS Table 10.12 unless otherwise specified by manufacturer.
3) 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 that deviate from similar connections by more than 50 percent of the lowest value.
4) Insulation-resistance test values at one minute should not be less than the values calculated in accordance with the formula in NETA ATS Table 10.5. Results shall be temperature corrected in accordance with NETA ATS Table 10.14.
5) Turns-ratio test results should not deviate more than one-half percent from either the adjacent coils or the calculated ratio.
6) In the event that a transformer fails any of the above testing, andrepairs/corrections cannot be made in the field while maintaining all appropriate product listings, replace the transformer at no cost to the owner with a new unitand repeat the testing.

B. Energize primary circuit at rated voltage and frequency from normal power source and test transformer, including, but not limited to, audible sound levels, to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at the site, then retest to demonstrate compliance otherwise, remove and replace with new units and proceed with re-testing.

3.4 ADJUSTING

A. Measure primary and secondary voltages and make appropriate tap adjustments.

3.5 CLEANING

A. Remove grease, spilled/splashed paint, and wipe transformer down prior to final punch walk.

END OF SECTION 26 22 00

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. General Electric Co.
   2. Cutler-Hammer.
   3. Square D Co.
   4. Siemens
   5. 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. Tin 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 unless otherwise noted on the drawings.
   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 - 35,000 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).
      a.

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 shall match panelboard rating. Series ratings are not acceptable.

PART 3 – EXECUTION

3.1 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 these Specifications.

H. Ground and bond panelboard enclosure according to these Specifications. Connect equipment ground bars of panels in accordance with NEC.

3.2 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.

3.3 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

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

A. Section 26 05 00 - Common Work Results for Electrical

B. Section 26 05 53 - 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.

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 26 05 00.
   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 26 05 53.

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

A. Section 26 05 00 - Common Work Results for Electrical

B. Section 26 05 53 - 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:
   1. Square D Company
   2. 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:
   1. Square D Company
   2. 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 26 05 53.

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 51 00 - LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Interior lighting fixtures, lamps, ballasts, hangars, trim and diffusers.

B. Exterior lighting fixtures, lamps, ballasts, and poles.

C. Supports, suspension systems, and blocking.

1.2 REFERENCES

A. ANSI C78.379 - Electric Lamps - Classification of the Beam Patterns of Reflector Lamps.

B. ANSI C82.1 - Line Frequency Fluorescent Lamp Ballast.

C. ANSI/NFPA 101 - Life Safety Code.

D. International Electrotechnical Commission (IEC)
   1. IEC 801-2 Electrostatic Discharge Testing Standard.
   2. IEC/EN 60669-2-1 Switches for household and similar fixed electrical installations - electronic switches.

E. Illuminating Engineering Society of North America (IESNA)
   1. LM-79 – Electrical and Photometric Measurements of Solid State Lighting Products.
   2. LM-80 – Measuring Lumen Maintenance of LED Light Sources.

F. National Electrical Manufacturer's Association (NEMA) SSL-1 – Electronic Drivers for LED Devices, Arrays, or Systems.

G. Underwriters Laboratories, Inc. (UL) 8750 – Light Emitting Diode (LED) Light Sources for Use in Lighting Products

1.3 SUBMITTALS

A. Product Data
   1. Light fixtures.
   2. Lamps.
   3. Ballasts.

1.4 EXTRA MATERIALS

A. LED Fixtures
   1. Provide 5 percent or two, whichever is greater, of each complete interior LED fixture type for Owner stock for future replacement.
   2. Provide one of each complete exterior LED wall or pole mount fixture for Owner stock for future replacement.

B. Other Fixtures
   1. Provide 10 percent or four, whichever is greater, of each type of tempered glass lens.
   2. Provide 5 percent or two, whichever is greater of each plastic and other security lens type.
   3. Provide 10 percent or one case, whichever is greater, replacement lamp for each lamp installed.
   4. Provide 5 percent or two, whichever is greater, of each ballast type.

1.5 WARRANTEE

A. Fixtures and ballasts shall have a minimum five year warrantee.

PART 2 – PRODUCTS

2.1 LIGHT FIXTURES – GENERAL

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. 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.

C. Provide lighting fixtures in the finishes and colors as noted on the Drawings.

D. Provide the UL and IBEW labels on all lighting fixtures.

E. 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.

F. Make-up fixtures with Type AF or equal fixture wire. Provide an identified, approved landing lug for equipment ground wires.

2.2 LED LIGHT FIXTURES

A. General
   1. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.
   2. LED light fixtures shall be a factory assembled luminaire including all required driver and light engine modules integral to and within a single houseing. Lead lengths between driver and light engine shall not exceed 3 feet. Remote luminaire/driver installations are not acceptable.
   3. LED light fixtures shall be Reduction of Hazardous Substances (RoHS) compliant.

B. LED Driver Modules

1. Description: Universal voltage switching-mode LED driver module with a rated lifetime of not less than 50,000 hours when operated at an ambient temperature of less than 60-degrees C.
2. LED drivers shall include native 0-10V dimming capabilities without additional control devices or field-installed circuitry. Integral short-circuit, open-circuit and overload fault protection to prevent driver failure.
3. LED drivers shall be capable of producing adequate output current to produce the specified light levels. Compatibility of driver and LED light engine must be tested and ensured by driver manufacturer.
4. Minimum efficiency: 85% at full load.
5. Minimum Operating Ambient Temperature: -20° C (-4° F).
6. Input Voltage: 120V to 277V (±10%) AC at 60Hz. Drivers that require DC input shall include an integral converter that accepts standard line voltage AC.
7. Power Factor: ≥ 0.95.
8. Total Harmonic Distortion: ≤ 20% and meet ANSI C82.11 maximum allowable THD requirements
9. Designed and tested to withstand electrostatic discharges up to 15,000 V without impairment per IEC 801-2.
10. Electrolytic capacitors to operate at least 20 degrees C below the capacitor's maximum temperature rating when the driver is under fully-loaded conditions and case temperature is 62 degrees C.
11. Maximum inrush current of 2 amperes for 120-Volt and 277-Volt drivers.
12. Withstand up to a 4,000 volt surge without impairment of performance as defined by ANSI C62.41 Category A.
13. Inaudible in a 27 dBA ambient.

C. LED Light Engine Modules
1. Minimum CRI: 80.
2. Color Temperature: 3500K, unless otherwise noted.
3. Minimum Rated Life: 50,000 hours as per LM79.

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. 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.

3.5 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 51 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. 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. 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 (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 28 13 00 - 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. 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 – “Door Schedule”.
   2. Division 08 Section – “Hollow Metal Doors and Frames”.
   3. Division 08 Section – “Flush Wood Doors”.
   4. Division 08 Section – “Aluminum-Framed Entrances and Storefronts”.
   5. Division 26 Sections for connections to electrical power system and for low- voltage wiring work.
   6. 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. 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. 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. 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 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 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 andAccessories).
   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 28 13 00

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, 30, 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 Wheelock NS/NH 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.

1. Notifier SR series or Approved Equal.

C. The explosion proof strobe only appliance as indicated on the drawings shall be a synchronized strobe light with candela rating to meet the intended application. The appliance shall be red for wall mounting. The appliance shall be listed for use in a NEC Class 1 division 1 environment.

1. Cooper SM 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 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 PRELIMINARY 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 32 31 19 - 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." 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.

D. High-Performance Coating: Apple 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 Sampled for color, texture, and coverage. Remove ad refinish, or recoat work that doesn’t 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 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 32 31 19

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. 1ASTM 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/ft2, 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. 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. 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.
4. 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 – COATING PERFORMANCE REQUIREMENTS		
Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area
Corrosion Resistance	B117, D714 & D1654	Corrosion Resistance over 1,500 hours (Scribed per D1654; failure mode is accumulation of
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact
Weathering Resistance	D822 D2244, D523 (60˚ Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of

TABLE 2 – 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.						

END OF SECTION 32 31 19.13