

## Appendix C

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### Pedestrian Crosswalk Improvements



**PEDESTRIAN CROSSING STUDY  
SKYWAY AND PEARSON ROAD  
PARADISE, CALIFORNIA**

**FINAL REPORT**

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Study Performed and Compiled  
By the  
California Public Work Studies Program  
At the  
Department of Civil Engineering  
California State University, Chico

By

William E. Bishop  
And  
Thomas C. Ferrara  
Traffic Engineer #413



## 6.0 GENERAL CONCLUSIONS AND RECOMMENDATIONS

The National Cooperative Highway Research Program (NCHRP) Report Number 562 presents a careful procedure to improve crosswalks. The procedure begins by counting pedestrians in the crosswalk during a peak hour. Where pedestrian volumes are high, selected treatments are available to reduce pedestrian delay and improve motorist compliance. None of the crosswalks studied herein in the Town of Paradise reached the peak hour pedestrian volumes that would warrant a study of pedestrian delays at the crosswalk and initiate a traffic signal warrant study. The suggested volume thresholds are 20 pedestrians in a peak hour and 14 pedestrians in a peak hour where the vehicle speeds exceed 35 miles per hour. With the higher pedestrian volumes and high pedestrian delay, the report suggests warning signs, beacons, or devices that are active when pedestrians are present. Where pedestrian volumes are low, the NCHRP report suggests that median refuge islands, curb extensions and other traffic calming activities be completed as feasible.

The opportunities for pedestrians to cross a major arterial and pedestrian safety are certainly of critical importance. Many ways to improve the fourteen crossings are recommended here.

The crosswalks carefully reviewed in this effort cross 4 to 5-lane busy arterial streets. According to the Butte County Association of Government's traffic counts completed in 2002, average daily traffic through the crosswalks ranges between 14,000 and 28,100 vehicles per day. The problem is further complicated because none of the crosswalks serve high pedestrian volumes. Drivers do not frequently encounter pedestrians, and the expectation is to not have to stop.

**Should the town wish, all of the crossings could be improved by adding curb extensions, median refuge islands, and improved lighting.** The site-specific recommendations made here are intended to focus on where the need for improvement is greatest and where the improvements are most practical.

The recommendations here include removal of crosswalks and other pavement markings. Removal of pavement markings is not a simple procedure. Ideally all the paint should be completely removed by sand blasting or other aggressive methods. Removal will leave a scar on the pavement. This scar might cause the removed pavement markings to appear to be present under certain lighting conditions. It is necessary to obliterate the scar by adding an asphalt concrete surface layer to the entire area where the pavement markings once was present. Leaving the pavement marking beneath a new surface layer will simply preserve the marking. At some time in the future some or all of the marking may reappear.

The presence of crosswalk markings has been shown by several studies to be related to higher accident experiences. Other studies argue that marked crosswalks are not related

to higher accident experiences. Citizens and pedestrians generally favor that the markings be present. Some pedestrians in marked crosswalks might feel that the crosswalk markings provide more protection than is in fact provided. The pedestrian may be more likely to fail to take complete responsibility for their personal safety as they cross the roadway.

A four or five-lane pedestrian crossing becomes particularly challenging when a vehicle stops for a pedestrian and blocks the line of sight of a motorist moving in an adjacent lane. Close calls resulting from this situation are often reported.

Pedestrian motor vehicle crashes are fortunately rare in Paradise. One pedestrian injury or death is nonetheless a critical event. Thankfully, there are not enough crashes at a single, common location or with characteristics in common to dictate a specific action. No single action that might be taken to improve a crossing can guarantee that crashes will not occur. Recommendations made here are based on studies involving many locations throughout the USA.

**Crosswalk Markings.** According to the Manual on Uniform Traffic Control Devices, “For added visibility, the area of the crosswalk may be marked with white diagonal lines at a 45-degree angle to the line of the crosswalk or with white longitudinal lines parallel to traffic flow. When diagonal or longitudinal lines are used to mark a crosswalk, the transverse crosswalk lines may be omitted.” The purpose of the markings is to define the pedestrian path of travel across the roadway and alert drivers to the crosswalk location. The white lines parallel to the traffic flow is sometimes termed the continental design. One report published by the Federal Highway Administration, “Designing Sidewalks and Trails for Access Part II of II: Best Practices Design Guide,” states that the continental marking is recommended because research indicates that it is the most visible to motorists. The continental design is depicted below in a Figure 1 as reproduced from the federal report.

The ladder design is created when the continental markings are added to the conventional crosswalk markings depicted below in Figure 2, also from the federal report. The ladder design is not shown but would contain the combined markings of Figure 1 and Figure 2. A third crosswalk marking is the zebra marking. The zebra stripes are similar to the continental markings but are at the 45-degree angle to the line of the crosswalk. The federal report recommended that the continental design be used consistently to mark all crosswalks; otherwise the impact of less visible markings may be weakened by comparison.

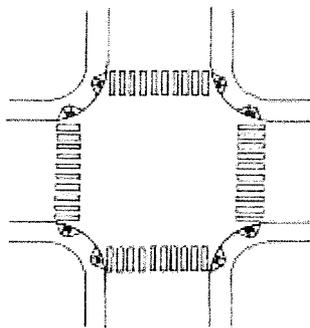


Figure 1 -- Continental Crosswalk Markings

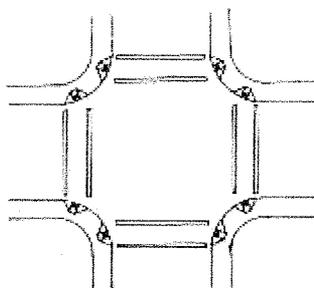


Figure 2 -- Conventional Crosswalk Markings

The Town of Paradise may wish to intensify the crosswalk markings at the busy traffic locations covered by this study. One option, for the Town to seriously consider, is to paint the continental markings at all uncontrolled 4 and 5-lane crossings.

**Education.** With or without the recommended improvements suggested here, the ultimate responsibility for safety at a pedestrian crossing is with the individual pedestrians and motorists involved. The motorist is obligated to stop, to the extent possible, when a pedestrian is present in the crosswalk. Further, a motorist is not legally permitted to pass, in an adjacent lane, a vehicle stopped at the crosswalk. A pedestrian is not allowed to step into a crosswalk when a moving motor vehicle is so close that stepping out may constitute a hazard. Legal considerations aside, the pedestrian is clearly the participant most at risk when crossing. The pedestrian must take responsibility for their own safety by crossing one lane at a time insuring that either there is no approaching traffic or traffic has stopped. All of us at times may be deficient in our duties to act responsibly at a crosswalk. The provision of good sight distance, which has been the focus of this report, will minimize the opportunity for mistakes. Sight distance will also make it easier for all of us to act responsibly.

The Town Department of Public Works in conjunction with the Police Department should conduct a press conference that will emphasize the individual's personal responsibility at crosswalks. Attention to wearing light colors after dark should be included in any education campaign undertaken.

School districts include traffic safety in their curriculums. At Paradise Unified a general treatment of traffic safety is covered in kindergarten. Bus safety is covered every year in grades K through 6. The bus safety curriculum should be extended to cover pedestrian

crossing an uncontrolled 4 or more lane arterial street. Young students below a certain age should be instructed to not attempt a 4 or more lane uncontrolled crossing without adult assistance. The age limit is to be determined by an educator experienced with the learning and judgment capabilities of young children. Coverage of a safe crossing should emphasize not to step out when traffic is approaching and to carefully cross one lane at a time

**Enforcement.** Very few citations relating to a pedestrian crossing are issued in the Town of Paradise. Motorists failing to yield the right-of-way to a pedestrian in a crosswalk should, as often as possible, be reminded with citations. The Town may wish to apply to the State Office of Traffic Safety for funding to support a designated traffic patrol. Prior to any special funding the police should designate two or more officer days per month to focus on the issue of pedestrian safety. The motorist cited for failure to yield the right-of-way to a pedestrian in a crosswalk, will not only be personally reminded, but will remind others. Officers also should occasionally be present on the sidewalk at a busy pedestrian crossing during special events. The officer can remind pedestrians to not step out when traffic is approaching and to carefully cross one lane in time.

**Prioritized Site Specific Recommendation Summary.** The recommendations contained in this report are repeated here and grouped by type. The reader should review the specific site recommendations covered in previous sections to understand alternatives to and the details of each recommendation. The education and enforcement should take priority over the recommendations to make physical improvements to the crossings. Priority is recommended for education and enforcement because no physical improvements can insure that pedestrians and motorists will behave responsibly at the crossings. Certainly the Town should make efforts to encourage improved behavior on the part of pedestrians and motorists. The remaining recommendations repeated in the following sections are in the approximate priority order. If implemented, the improvements will assist pedestrians and motorists in making good crossings of the busy 4 and 5-lane arterial streets.

Adding red curb will enhance sight distance for both pedestrians and motorists. It is fairly inexpensive, yet provides opportunity to both user types to apply the right of way rules in an orderly manner. **Add Red Curb** as described in this report to the crossings at:

- Skyway at Fir Street (uncontrolled intersection)
- Skyway at Boquest Boulevard (uncontrolled intersection)
- Skyway north of Wildwood Lane (mid-block)
- Skyway 300 feet north of Elliott Road (mid-block)
- Pearson Road at Izzy's Burger (mid block, school zone)

Most studies have reported that accidents are more likely to occur at marked crossings than at unmarked crossings. Pedestrians may take more responsibility for their own safety where the perceived protection of crosswalk markings is absent. Details of each

crosswalk removal are covered in previous sections. **Remove Crosswalk Marking at:**

- Skyway at Black Olive Drive (uncontrolled intersection)
- Skyway, between Birch Street and Foster Road (mid-block)
- Pearson Road at Almond Street – east crossing (uncontrolled intersection)

In one case the crosswalk markings are in need of repainting. **Repaint Markings at:**

- Skyway, 5500 Block, in Front of Town Hall (mid-block)

Curb extensions reduce the time and distance that a pedestrian must be in the roadway. When ready to begin a crossing, the pedestrian is closer to the traveled motor vehicle lanes. The pedestrian can be more readily seen by the motorist and has a better field of vision to see approaching vehicles. Curb extensions eliminate the need for red curb, and thus, allow for more parking in business districts. **Construct Curb Extensions at:**

- Skyway, 50 ft north of Birch Street (mid-block)
- Skyway at Foster Road (uncontrolled intersection)

Refuge islands in the median of an arterial street allow the pedestrian to cross one direction of traffic at a time. To install islands at many locations would require street widening. Two locations were identified that would allow islands to be constructed without street widening. Some limitations on left turning vehicles may be imposed in order to install these medians. **Build Pedestrian Median Island at:**

- Skyway, 5500 Block, in Front of Town Hall (mid-block)
- Skyway at Beyond Fitness (mid-block)

The concepts of curb extensions and median refuge islands are depicted in Figures 3 and 4 below. The figures were taken from the report published by the Federal Highway Administration, “Designing Sidewalks and Trails for Access Part II of II: Best Practices Design Guide.” Curb extensions and median refuges are recommended in the mid range of priorities because they will take capital expenditure rather than being done out of operations and maintenance budgets. Time to budget for the improvements and for design will be required.

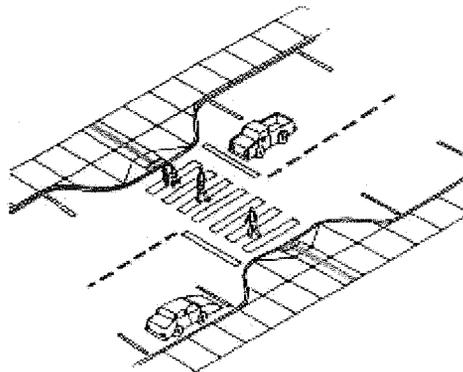


Figure 3 – Example of a Curb Extension

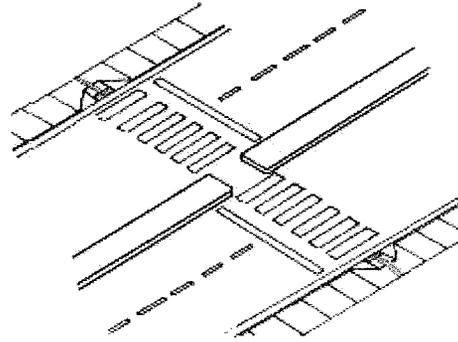


Figure 4 – Example of a Median Refuge Island at Midblock

The addition of a consistent pattern of advance warnings, both pavement markings and signs, and the “at crosswalk” signing is desirable. They are listed as the last priority but are still a priority. Signing is not always recognized by a motorist. It is helpful but will not contribute substantially to the clear perception of a pedestrian beginning to cross at one of the crosswalks. **Add Advance Warning Signs or Markings at:**

Skyway at Foster Road (uncontrolled intersection)

Skyway at Fir Street (uncontrolled intersection)

Skyway at Boquest Boulevard (uncontrolled intersection)

Skyway north of Wildwood Lane (mid-block)

Skyway 300 feet north of Elliott Road (mid-block)

Skyway 600 feet north of Elliott Road (mid-block)

Skyway at Center Street

Pearson Road at Almond Street (uncontrolled intersection)

