13.3 NOTATION

Revise as follows:

\[ b = \text{length of deck resisting post strength or shear load} = h + W_c \quad (A13.4.3.2) \]

\[ D = \text{depth of base plate} \quad (A13.4.3.2) \]

\[ d_e = \text{distance from the outer edge of the base plate to the innermost row of bolts} \quad (A13.4.3.1)(A13.4.3.2) \]
This page is intentionally left blank.
13.8 PEDESTRIAN RAILING
13.8.1 Geometry

Revise as follows:

The minimum height of a pedestrian railing shall be 42.0 in. measured from the top of the walkway. A pedestrian rail may be composed of horizontal and/or vertical elements. The clear opening between elements shall be such that a 6.0 in. diameter sphere shall not pass through.

When both horizontal and vertical elements are used, the 6.0 in. clear opening shall apply to the lower 27.0 in. of the railing, and the spacing in the upper portion shall be such that a 8.0 in. diameter sphere shall not pass through. A safety toe rail or curb should be provided. Rails should project beyond the face of posts and/or pickets as shown in Figure A13.1.1-2.

The rail spacing requirements given above should not apply to chain link or metal fabric fence support rails and posts. Mesh size in chain link or metal fabric fence should have openings no larger than 2.0 in.

C13.8.1

Revise as follows:

The Americans with Disabilities Act (ADA) of 1990, along with it’s implementing regulations, and the California Government Code Section 4450 et al. prescribe that facilities shall be made accessible to persons with disabilities. To comply with the ADA, California Department of Transportation facilities in the highway environment are to follow the guidance included in Design Information Bulletin (DIB) 82. In accordance with DIB 82, pedestrian rail openings shall be spaced such that a 4.0-inch diameter sphere cannot pass through.

The size of openings should be capable of retaining an average size beverage container.
BICYCLE RAILINGS

13.9.1 General

Bicycle railings shall be used on bridges specifically designed to carry bicycle traffic and on bridges where specific protection of bicyclists is deemed necessary.

13.9.2 Geometry

Revise as follows:

The height of a bicycle railing shall not be less than 42.0 in., measured from the top of the riding surface.

- The clear opening between elements shall be such that a 6.0 in. diameter sphere shall not pass through. When both horizontal and vertical elements are used, the 6.0 in. clear opening shall apply to the lower 27.0 in. of the railing, and the spacing in the upper portion shall be such that an 8.0-in. diameter sphere shall not pass through.

- The bicycle rail shall be offset a minimum of 15 inches behind the face of the vehicular rail if the bike rail and the vehicular rail were not successfully crash tested as an integral unit.

- The height of the upper and lower zones of a bicycle railing shall be at least 27.0 in. When pedestrian traffic is anticipated, the upper and lower zones shall have rail spacing satisfying the respective provisions of Article 13.8.1.

If deemed necessary, rubrails attached to the rail or fence to prevent snagging should be deep enough to protect a wide range of bicycle handlebar heights.

If screening, fencing, or a solid face is utilized, the number of rails may be reduced.

C13.9.2

Revise as follows:

Railings, fences or barriers on either side of a shared use path on a structure, or along bicycle lane, shared use path or signed shared roadway located on a highway bridge should be a minimum of 42.0 in. high. The 42.0-in. minimum height is in accordance with the AASHTO Guide for the Development of Bicycle Facilities, 3rd Edition (1999).

On such a bridge or bridge approach where high-speed high-angle impact with a railing, fence or barrier are more likely to occur (such as short radius curves with restricted sight distance or at the end of a long descending grade) or in locations with site-specific safety concerns, a railing, fence or barrier height of 48 inches above the (minimum) should be considered.

The 15-inch bicycle rail offset behind the face of the vehicular rail is required to maintain the vehicular crash test certification if the vehicular rail and bicycle rail were not successfully crash tested as an integral unit.

Anticipated pedestrian traffic does not include occasional pedestrian presence due to vehicle breakdowns.

The need for rub rails attached to a rail or fence is controversial among many bicyclists.
A13.3.2 Post-and-Beam Railings

Revise as follows:

where:

\[ L = \text{post spacing or single-span (ft.)} \]

\[ M_p = \text{inelastic or yield line resistance of all the rails contributing to a plastic hinge (kip-ft.)} \]

\[ M_{\text{post}} = \text{plastic moment resistance of a single post (kip-ft.)} \]

\[ P_p = \text{shear force on a single post which corresponds to } M_{\text{post}} \text{ and is located } \bar{Y} \text{ above the deck (kips)} \]
This page is intentionally left blank.
A13.4.2 Decks Supporting Concrete Parapet Railings

Revise as follows:

For Design Case 1, the deck overhang shall be designed to resist a flexural resistance, $M_S$, inkip-ft./ft. which, acting coincident with the combined effects of tensile force $T$ in kip/ft. and moment $M_{cl}$ as specified herein, exceeds $M_c$ of the parapet at its base. The axial tensile force, $T$, may be taken as:

$$T = \frac{R_w}{L_c + 2H}$$

$$T = 1.2 \left( \frac{F_i}{L_c} \right)$$  \hspace{1cm} (A13.4.2-1)

$$M_{cl} = 1.2 \left( \frac{F_i H}{L_c} \right)$$  \hspace{1cm} (A13.4.2-2)

where:

- $R_w = \text{parapet resistance specified in Article A13.3.1 (kips)}$
- $L_c = \text{critical length of yield line failure pattern (ft.). In the absence of more accurate calculations, } L_c \text{ may be taken as 10 ft for Caltrans Standard Barriers Type 25, Type 732, Type 736, and Type 742; this value of } L_c \text{ is valid for design forces TL-1 through TL-4 shown in Table A13.2-1. At the location of expansion joints, the value of } L_c \text{ shall be half that specified above.}$
- $H = \text{height of wall (ft.)}$
- $T = \text{tensile force per unit of deck length (kip/ft.)}$
- $M_{cl} = \text{moment in the deck overhang due to } F_i \text{ (kip-ft.-ft.)}$

Design of the deck overhang for the vertical forces specified in Design Case 2 shall be based on the overhanging portion of the deck.

CA13.4.2

Delete the 1st and 2nd Paragraphs and replace with the following:

In the design of barrier rails, it is recognized that the crash testing program is oriented towards survival, not necessarily the identification of the ultimate strength of the railing system. This typically produces a railing system that is significantly overdesigned, and in turn would lead to an over-design of the deck overhang that may not be practical.

Therefore, the design of deck overhang for Design Case 1 is based on $F_i$, the transverse force on the barrier rail corresponding to the Test Level as shown in Table A13.2-1, not on the capacity of the barrier rail. To account for uncertainties in the load and mechanisms of failure, and to provide an adequate safety margin, the actual design tensile force acting on the deck overhang and the corresponding design moment obtained through statics are increased by 20%.

When Type 26 barrier rail is used, the design variables for overhang design should be taken as the same as those for Type 732 since barrier upgrade at a later date is possible. For other barrier types not listed, a more rigorous calculation should be made to compute $L_c$.

At an expansion joint, and at the beginning and end of a bridge, the value of $L_c$ will be half that at intermediate locations. This will cause an increase in demands in the overhang region. Consequently, the top reinforcing bars in the overhang should be designed to accommodate this increased demand in this region.
A13.4.3.1 Overhang Design

Revise as follows:

\[
M_d = \frac{M_{\text{post}}}{W_b + d_b} \quad \text{(A13.4.3.1-1)}
\]

\[
T = \frac{P_p}{W_b + d_b} \quad \text{(A13.4.3.1-2)}
\]

CA13.4.3.1

Revise as follows:

Beam and post railing systems, such as a metal system with wide flange or tubular posts, impose large concentrated forces and moments on the deck at the point where the post is attached to the deck.

Vehicle collision on the beam and post railing systems, such as a metal system with wide flange or tubular posts, imposes large concentrated forces and moments on the deck at the point where the post is attached to the deck.
A13.4.3.1 Overhang Design

Revise as follows:

where:

\[ M_{\text{post}} = \text{flexural resistance of railing post (kips)} \]
\[ M_{\text{plastic moment resistance of a single post}} (\text{kip-ft.}) \]

\[ P_p = \text{shear corresponding to } M_{\text{post}} \text{ (kips) shear force on a single post which corresponds to } M_{\text{post}} \text{ and is located } Y \text{ above the deck (kips)} \]

\[ X = \text{distance from the outside edge of the post base plate to the section under investigation, as specified in Figure 1 (ft.)} \]

\[ W_b = \text{width of base plate (ft.)} \]

\[ T = \text{tensile force in deck (kip/ft.)} \]

\[ \Delta d_b = \text{distance from the outer edge of the base plate to the innermost row of bolts, as shown in Figure 1 (ft.)} \]

\[ L = \text{post spacing (ft.)} \]

\[ L_v = \text{longitudinal distribution of vertical force } F_v \text{ on top of railing (ft.)} \]

\[ F_v = \text{vertical force of vehicle laying on top of rail after impact forces } F_t \text{ and } F_L \text{ are over (kips)} \]

Figure A13.4.3.1-1 Effective Length of Cantilever for Carrying Concentrated Post Loads, Transverse or Vertical.
A13.4.3.2 Resistance to Punching Shear

Revise as follows:

The factored resistance of deck overhangs to punching shear may be taken as:

\[
V_r = \phi V_n \quad \text{(A13.4.3.2-2)}
\]

\[
V_n = v_c \left[ W_h + h + 2 \left( E + \frac{B}{2} + \frac{h}{2} \right) h \right] \quad \text{(A13.4.3.2-3)}
\]

\[
v_c = \left( 0.0633 + 0.1265 \frac{\beta_c}{f_c} \right) \sqrt{f_c} \leq 0.1265 \sqrt{f_c} \quad \text{(A13.4.3.2-4)}
\]

\[
\frac{B}{2} + \frac{h}{2} \leq B \quad \text{(A13.4.3.2-5)}
\]

in which:

\[
\beta_c = W_c / D
\]

\[
\beta_c = \text{larger of } W_c / d_b \text{ or } d_c / W_b \quad \text{(A13.4.3.2-6)}
\]
A13.4.3.2 Resistance to Punching Shear

Revise as follows:

β_c = \frac{\text{ratio of the long side to the short side of the concentrated load or reaction area}}{\text{}}

f'_c = 28\text{-day compressive strength of concrete (ksi)}

\phi = \text{resistance factor}

D = \text{depth of base plate (in.)}

d_b = \text{distance from the outer edge of the base plate to the innermost row of bolts (in.)}
This page is intentionally left blank.