17.2 Design Criteria For Temporary Modular Bridges

17.2.1 GENERAL

This policy addresses design criteria for temporary prefabricated modular steel panel truss bridges.

17.2.2 DEFINITIONS

Temporary Bridge—A bridge that is anticipated to be in service for 5 years or less.

Modular Bridge—A temporary prefabricated modular steel panel truss bridge.

Modular Highway Bridge—A modular bridge built for vehicular traffic.

Modular Construction Bridge—A modular bridge that is not open to public traffic during the construction of transportation projects and is built exclusively for construction vehicular traffic, special equipment, and/or pedestrians.

Modular Pedestrian Bridge—A modular bridge built for pedestrians, bicyclists, equestrians, and light maintenance vehicle traffic.

17.2.3 MODULAR BRIDGE CLASSIFICATIONS

A modular bridge shall be classified as either a “standard bridge” or a “minor bridge”.

A modular bridge is classified as a standard bridge when it satisfies one or more of the following:

- The bridge carries vehicular traffic.
- The bridge crosses over a state highway, a local road, a railroad, or a waterway.

A modular bridge not classified as standard should be classified as minor.

17.2.4 DESIGN REQUIREMENTS

Modular highway and construction bridges shall be designed in accordance with *AASHTO-CA BDS* and as amended in STP 17.1 *Temporary Bridges* and this STP.

Modular pedestrian bridges and modular construction bridges carrying pedestrians only shall be designed in accordance with *AASHTO GSDPB* and as amended in this STP.

17.2.4.1 Strength I

For standard modular construction bridges carrying construction vehicular traffic, the design vehicular live load shall be HL-93 as specified in Article 3.6.1.2.

For modular highway and construction bridges, the stability requirements specified in Article 6.14.2.9 shall apply. The top chord shall be considered as a column with elastic lateral supports at the panel points. The compression resistance shall be in accordance with *AASHTO-CA BDS* using either the effective length factor or the second-order analysis procedure as specified in Articles 4.6.2.5 and C4.6.2.5.

For modular pedestrian bridges, pedestrian loading, vehicle load, and equestrian load shall be as specified in *AASHTO GSDPB* Section 3. The stability requirements specified in the *AASHTO GSDPB* Article 7 shall apply.

17.2.4.2 Strength II

The design criteria for permit vehicles and construction equipment shall meet the Strength II limit state, and shall comply with STP 17.1 and the *AASHTO-CA BDS*.

17.2.4.3 Strength III

For modular bridges, the wind load shall be as specified in STP 17.1.

17.2.4.4 Fatigue

For standard and minor temporary modular bridges, the fatigue limit state as specified in STP 17.1 shall apply.

17.2.4.5 Seismic Design

For modular bridges classified as standard, the seismic load shall be as specified in STP 17.1. Elastic Dynamic Analysis, as specified in *Caltrans Seismic Design Criteria*, shall be used to determine force effects. Force effects may be divided by a response modification factor of 2.0. Resistances shall be based on expected material properties in accordance with *Caltrans Seismic Design Specifications for Steel Bridges*.

For modular bridges classified as “minor”, the seismic design is not required.

17.2.4.6 Extreme Event II

In the interim, during the development of MASH-compliant, physically crash-tested, and approved bridge railing systems for modular bridges, the following criteria are required:

Vehicular railing shall be designed for TL-4 design forces as specified in Article A13.2. The regulatory speed limit shall be posted for 45 MPH or less.

All components in the load path of the modular bridge system shall be designed for TL-4 design forces as specified in Article A13.2.

The post spacing of the vehicular railing shall not exceed 10 ft, as shown in Figure 17.2.4.6-1. The top surface of the top railing shall be a minimum of 3 ft above the roadway surface, and the top traffic side face of the railing shall be set a minimum offset distance of 15 in. in front of the truss, as shown in Figure 17.2.4.6-2. If the top surface of the top railing is 4 ft or higher above the roadway surface, the top traffic side face of the railing shall be set at a minimum offset distance of 8 in. in front of the truss, as shown in Figure 17.2.4.6-3. If the transom spacing exceeds 10 ft but is less than or equal to 15 ft, an additional post shall be installed at the midpoint and designed for TL-2 loading. The maximum clear opening below the bottom rail, the setback distance, and the maximum opening between rails shall satisfy the requirements in Article A13.1.1.

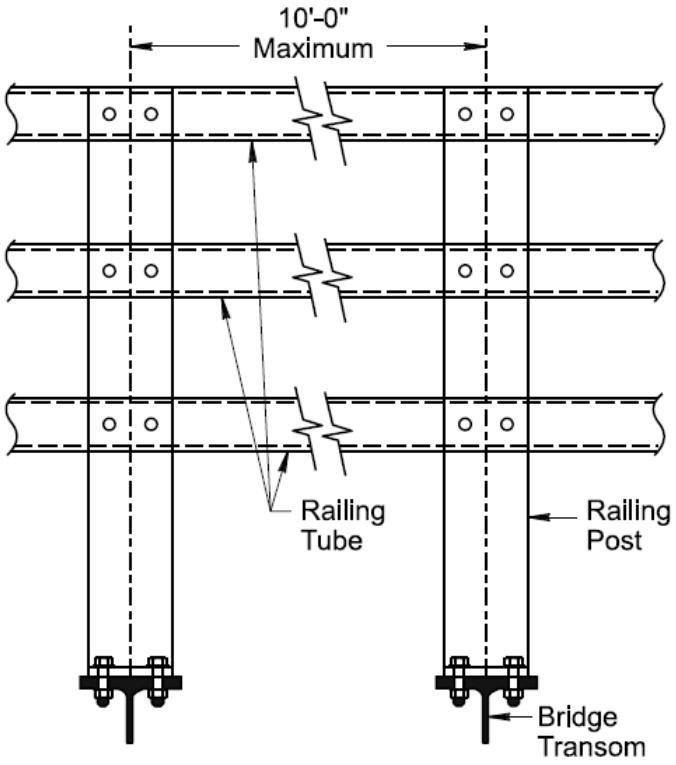

Figure 17.2.4.6-1 Vehicular Railing Elevation

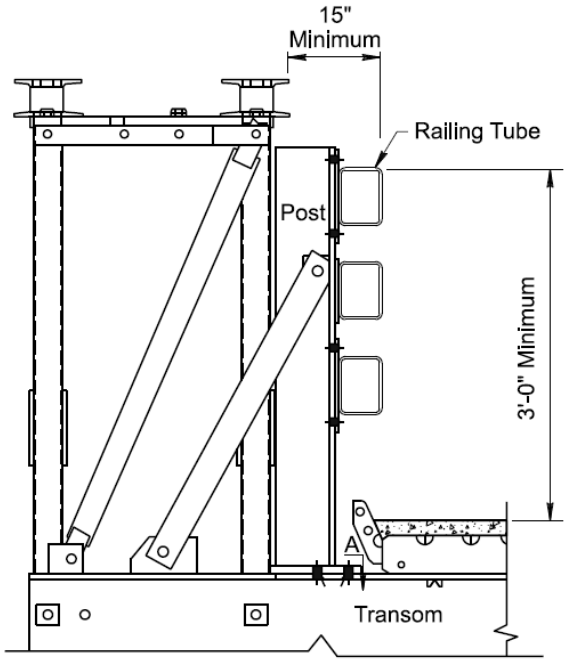

Figure 17.2.4.6-2 Vehicular Railing Offset Requirement for Railing Height of 3 feet

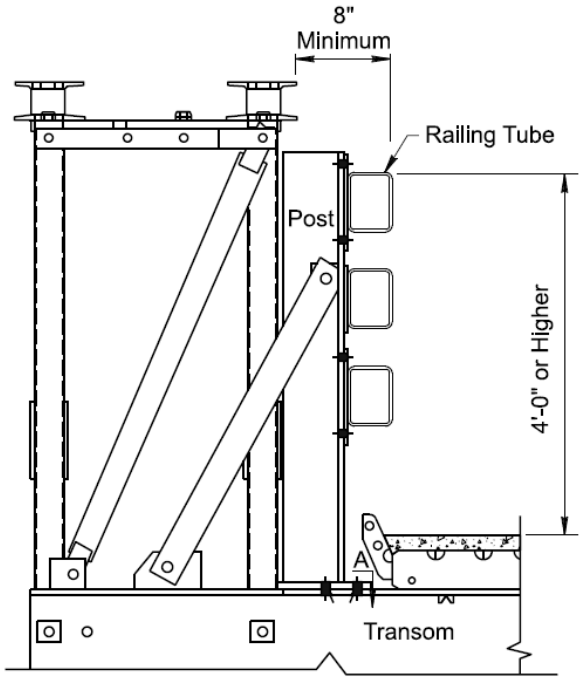

Figure 17.2.4.6-3 Vehicular Railing Offset Requirement for Railing Height of 4 feet

17.2.4.7 Service I

For modular highway bridges classified as standard, the deflection due to live load as specified in Article 3.6.1.3.2 shall not exceed the limit of span length/800.

17.2.4.8 Pedestrian and Bicycle Railings

Pedestrian and bicycle railings shall meet all geometric and load requirements as specified in the current *AASHTO-CA BDS* Section 13, Caltrans *Standard Plans, Bridge Standard Detail Sheets*, Caltrans *Bridge Design Details* Chapter 12, and Caltrans *Highway Design Manual Section 309.5*.

17.2.5 REFERENCES

1. AASHTO. (2017). AASHTO LRFD Bridge Design Specifications, 8th Edition, American Association of State Highway and Transportation Officials, Washington, DC.
2. AASHTO. (2009, 2015). *AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges*, 2nd Edition and 2015 Interim Revisions, American Association of State Highway and Transportation Officials, Washington, DC.
3. Caltrans. (2025). Structure Technical Policy (STP) 17.1, Temporary Bridges, California Department of Transportation, Sacramento, CA.
4. Caltrans. (2025). Caltrans Seismic Design Criteria, Version 2.1, California Department of Transportation, Sacramento, CA.
5. Caltrans. (2025). *Bridge Design Details*, California Department of Transportation, Sacramento, CA.
6. Caltrans. (2024). *Standard Plans,* California Department of Transportation, Sacramento, CA.Caltrans. (2016). *Caltrans Seismic Design Specifications for Steel Bridges,* 2nd Edition, California Department of Transportation, Sacramento, CA.
7. Caltrans. (2020). *Highway Design Manual*, 7th Edition, California Department of Transportation, Sacramento, CA.
8. Caltrans. (2019a). *California Amendments to AASHTO LRFD Bridge Design Specifications*, *8th Edition*, California Department of Transportation, Sacramento, CA.
9. Caltrans. (2025). Bridge Standard Detail Sheets, California Department of Transportation, Sacramento, CA.