

Section 7 – Bridge Seismic

Cable Restrainer Hardware Details

XS Sheet Numbers

XS7-090

Description of Component



A minimum of two restrainer units (Type 1 or Type 2 for box girder bridges) are required at the hinges for new bridges. Existing bridges with inadequate seats should be retrofitted with the combined pipe extender/cable restrainer units detailed in XS7-071.

Cable Restrainer Hardware is used to securely attach each end of the cable to the facing girders at hinges and expansion joints and also to adjust the cables, so they are effective during earthquakes. A Cable Yield Indicator is also required so that the Area Bridge Maintenance Engineer (ABME) can determine if the cable needs to be replaced.

Standard Drawing Features

XS7-090 shows all the hardware required to securely attach restrainer cables to the girders at hinges and expansion joints. The arrangement of the hardware is important and should be carefully followed.

Design/General Notes

For new bridges the designer should follow Caltrans Seismic Design Criteria which requires that two restrainer units should be placed at every hinge. For existing bridges, the designer can follow Memo to Designers (MTD) 20-4 Seismic Retrofit Guidelines for Bridges in California.

Bridge Design Aids 14-1 Hinge Restrainer Design Method has some good information but should no longer be used for design because Caltrans no longer relies on restrainers to reduce bridge displacement during earthquakes. Similarly, MTD 20-3 Restrainers at Support Joints should be used with caution since many of the restrainers shown are no longer considered effective.

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Additional Drawings Needed to Complete PS&E

XS7-090 Cable Restrainer Hardware Details must be accompanied by the cable restrainer XS Sheets: XS7-040, XS7-041, XS7-50-1, XS7-050-2, XS7-070, and/or XS7-071. Alternatively, the designer can provide their own restrainer plan sheet(s), but because retrofits need to be as standard as possible any significant deviations should follow the project specific criteria per Memo to Designers 20-11.

Contract Specifications

Caltrans Standard Specifications Section 60 Existing Structures; Section 60-40.09 Bridge Joint Restrainers.

Restrictions on Use of Standard Drawings

XS7-090 should be suitable when using the cable restrainer sheets shown in XS7. Other cable restrainer details will require special connections and project specific design criteria per Memo to Designers 20-11.

Special Considerations

The Cable Restrainer Hardware Details should be effective with Type 1 and Type 2 Restrainer Units in concrete box girder, T girder, and I girder bridges. However, they have also been used effectively for other restrainer arrangements on a variety of different types of bridges.