

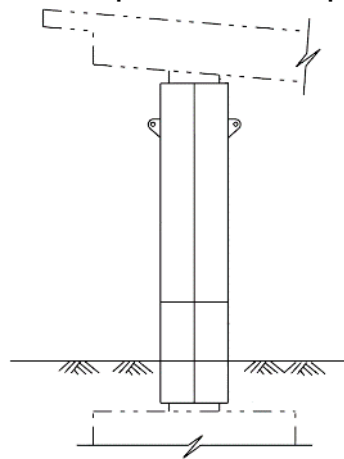
Section 7 – Bridge Seismic

Seismic Retrofit Using Steel Column Casing

XS Sheet Numbers

XS7-010

Description of Component



Seismic retrofit of existing concrete columns is mainly due to deficiency in flexural confinement, lap splices in plastic hinge regions, or lack of seismic shear capacity. In many experimental programs, providing steel casings on the outside perimeter of existing concrete columns has shown substantial improvement in the ductile and shear response of concrete columns. When lap splices are located in the plastic hinge region of columns, the steel casing provides adequate clamping pressure, preventing lap splice from slipping. Also, steel column casings will restrain additional dilation of the plastic hinge regions of existing columns, preventing cracking and buckling

of main column reinforcement. The additional clamping pressure induced by steel casing acts similar to that of column hoops and helps to enhance column shear capacity.

Standard Drawing Features

XS7-010 provides details for Type F, and Type P/F, steel column casings and includes instructions for fabricating, welding, placing, and grouting a steel column casing.

Design/General Notes

Designers must determine the required thickness of steel casing and show it on contract plans. The method to estimate the thickness of steel column casings for circular and rectangular columns are provided in BDM 16.11 - Seismic Retrofit Using Steel Column Casing. The minimum casing thickness for a circular column is obtained directly from Equations 16.11.5.2-1 and 16.11.5.3-1, as applicable. The minimum casing thickness for square columns is obtained from the Design Charts provided in BDM 16.11. The required steel casing thicknesses due to flexural confinement, lap splices, and shear strength enhancement are not additive. The largest steel casing thickness shall control as the required thickness. A minimum casing thickness of 3/8 inch is recommended based on previous field experience with casing installation.

Welded Field Splice

Optional welded field splice is allowed for long columns. Welded horizontal splice must not be located where moment demand exceeds $0.75M_p$.

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Casing Opening

If the existing bridge column has a drainage pipe or conduit for utility at the steel casing location, the pipe/conduit should be extended outside the casing a minimum of 3 inches from the face of the column casing. The designer should check the condition of existing drainage or utility in columns. For existing pipes, provide a pipe extender of the same diameter. For steel pipes, the pipe extender must be connected by a butt weld or steel pipe sleeve. If the existing pipe is PVC, the sleeve connection in Std. Plans B7-6 must be used. The steel pipe extender is shown on the plans; however, the designer must modify the details based on the existing condition.

Limit of Polyethylene for Type P/F casing

Polyethylene must be extended from the top of the footing to the end of starter bars in existing columns. The limit must be shown on the Contract Plans.

Additional Drawings Needed to Complete PS&E

Columns with flares, tapers, and other non-prismatic shapes require additional drawing(s) to show the details of the steel casing. Tall columns require an additional drawing(s) showing supports and other details to prevent buckling of steel casing during lifting and grouting.

Contract Specifications

Caltrans Standard Specifications Section 60 Existing Structures; Section 60-40.06 Steel Column Casings.

Restrictions on Use of Standard Drawings

Very wide, tall, or non-prismatic columns may require special details and the project-specific design criteria per BDM 1.5 *Project-Specific Design Criteria*.

Special Considerations

The Office of Bridge Architecture and Aesthetics shall be consulted to obtain a workable and aesthetically pleasing solution when different plate thicknesses are joined, exterior stiffeners are attached, or through bolts are installed