16.5 BRIDGE STRENGTHENING

16.5.1 GENERAL

This policy defines the minimum design criteria for bridge strengthening projects.

16.5.2 DEFINITIONS

Bridge strengthening - improvement of the bridge load carrying capacity to a load rating target for facilitating goods movement, primarily by reducing restrictions to permit vehicle traffic.

Inventory Level Rating – Generally corresponds to the rating at the design level of reliability for new bridges in the AASHTO LRFD Bridge Design Specifications, but reflects the existing bridge and material conditions with regard to deterioration and loss of section.

16.5.3 DESIGN CRITERIA

The bridge shall be strengthened to meet load rating targets using the Load and Resistance Factor Rating method defined by the *SM&I Bridge Load Rating Manual*.

The load rating targets shall include a minimum allowance of 200 lb/ft along each girder for future utilities or 35 psf for future wearing surface, whichever generates the greater demand on the girders.

New components shall be designed in accordance with the AASHTO-CA BDS.

Project-specific design criteria[1] for bridge strengthening shall be developed and, at a minimum, include the following:

- Load rating target shall be a permit rating of PPPPPP and an Inventory Level Rating ≥ 1.00, or as approved by the Division of Traffic Operations and the Division of Maintenance - Structure Maintenance & Investigations
- A detailed description of loads considered, including future utilities or wearing surface
- Methods and factors used to calculate the capacity of strengthened components
- Assumed properties of existing materials used in the load rating analyses
- Approach for meeting service limit states, if applicable
- Approach for addressing fatigue limit state, if applicable

16.5.4 CONTRACT PLANS

The following example information shall be included in the General Notes of the structure plans:

DESIGN

- New components: *AASHTO LRFD Bridge Design Specifications* and the *California Amendments*
- Strengthening of existing components: Minimum target rating factors of 1.00 for Inventory Level Rating and PPPPPP for permit rating, based on the *SM&I Bridge Load Rating Manual*
- Additional *DW* = 0.2 klf per girder for future utilities or *DW* = 35 psf for future wearing surface

MATERIALS

- Material strengths assumed for the evaluation[2], including their source (ASTM designations or physical testing)

16.5.5 REFERENCES

1. Caltrans (2021). *Richmond San Rafael Bridge Gusset Plate Strengthening Joints LA4 and LC4 Project Specific Design Criteria**, California Department of Transportation, Sacramento, CA.
2. Caltrans (2022). Caltrans Bridge Design Memo 16.4, *Material Properties for Existing Structures*, California Department of Transportation, Sacramento, CA.
3. Caltrans (2022). Structure Maintenance and Investigations *Bridge Load Rating Manual*, 2nd Edition, California Department of Transportation, Sacramento, CA.

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