

Office of Bridge Design

Technical Memorandum

Date: September 12, 2007

To: All Bridge Engineering Staff

From: Kevin Goeden
Chief Bridge Engineer

Subject: Technical Memorandum BTM07.2
Steel Girder Cross Frames and
Torsional Analysis of Exterior Girders for Construction Loading

Bent plate type diaphragms should be used in new bridge designs for framing steel girders with web depths 48" and below. "X" or "K" bracing type cross frames with top struts shall be used for web depths greater than 48".

As part of the superstructure design, a torsional analysis of the exterior steel girders for construction loading shall be completed. The analysis should be based on the following assumptions:

- The concrete bridge deck cantilever slab formwork will be constructed using prefabricated steel overhang brackets (w/o needle beams)
- Finish machine rail loads are also to be supported on the overhang brackets
- Size, geometry and spacing of the brackets are similar to past projects with similar girder size and slab cantilevers
- Bidwell boom-truss finish machine rail loading applied with dead loads and construction live load (in accordance with the AASHTO Guide Specifications for Bridge Temporary Works)
- Total lateral deflection limit of 0.25" at any point along the girder top flange

If the torsional analysis indicates that temporary lateral bracing (between diaphragms or cross frames) will be needed, notes to cover the associated contractor falsework submittal requirements shall be included in the plans as follows:

The Contractor shall be required to include with the Falsework Plans, design calculations and details for limiting the top flange of exterior girders from deflecting laterally more than 0.25" during the deck placement operations. Acceptable methods of limiting the lateral torsion of exterior girders include needle beam supports for deck cantilevers, and top flange tie-bars combined with bottom flange struts. Other proposed methods may be submitted for consideration with the falsework plans along with corresponding comprehensive calculations

and details. Any tie-bars, connections, hardware or other items associated with the torsion limiting devices that are permanently cast into the deck slab shall be epoxy coated or made of corrosion resistant material. No welding of any kind will be allowed on steel bridge girders for attachment of torsion limiting devices. All costs associated with furnishing and installing exterior girder torsion limiting devices shall be included with the deck falsework and are incidental to the item Class A45 Concrete, Bridge Deck.

All submitted contractor falsework plans that utilize exterior girder overhang brackets supporting the bridge deck cantilevers and finish machine screed rails (w/o needle beams) shall be analyzed for exterior girder top flange lateral deflection due to torsion. This analysis should be conducted as part of the normal bridge deck falsework check done in the Office of Bridge Design.

Reviewed by: Holly Eisenberg Date: 9-12-07
Approved by: Kevin A. Grech, Chief Bridge Engineer, Date: 9-12-2007

cc: File