

1.2 Steel Structure Design and Detailing

1.2.1 Steel Girders

Design

Design according to *AASHTO LRFD Bridge Design Specifications* **unless specified otherwise in this document**.

The minimum strength for deck concrete is 4000 psi with an approximate modulus elasticity of 3800 ksi. The modular ratio "n" does not need to be an integer number and for 4000 psi concrete must not be less than 7.60.

Oregon Department of Transportation does not require Certified Erector qualification for erection of steel bridges. For a complex project in which a contractor with such qualification is deemed necessary, obtain Bridge Engineering Section approval prior to including such requirement in the contract documents.

The top ½" of deck concrete thickness is considered sacrificial layer of deck concrete and does not contribute to deck strength. Beta version of deck design worksheet for steel girder bridges is located at:

ftp://ftp.odot.state.or.us/bridge/bddm/MathCad_Templates/

Please forward your comments or suggestions to the Steel Bridge Design Standards Engineer.

Top and bottom mats of reinforcing steel do not need to be on same alignments or spacing. Limit reinforcing steel spacing of steel girder bridge decks in conformance with AASHTO LRFD Bridge Design Specifications.

Replace the first paragraph of C6.13.6.1.4a of AASHTO LRFD Design Specifications with "For flexural members, it is recommended that the smaller section at the point of splice be taken as the side of the splice that has the smaller calculated moment of inertia for the noncomposite steel section"

Curved and skewed deck girder bridges have the potential for three dimensional deflection and rotation. Longer spans magnify the rotation of the girders and cause unaccounted stresses on the diaphragm connections. Include a note in the contract drawings that the girder webs should be plumb in the final condition. This requires the erector to force fit the diaphragms with the girders out-of-plumb prior to deck placement. Rotation of girders resulting from the deck placement plumbs the girders web and releases stresses caused from force fitting the diaphragms.

Steel tub (box) girders are visually pleasing structures and are more expensive than usual steel plate girders because of fabrication cost. One of the main concerns in steel tubs or box girders in the State of Oregon is corrosion inside the girders. In the construction drawings, require inside surfaces of boxes or tubs (bottom flange, top flange, web and diaphragm) to be painted with a silver gray prime coat. Painting inside the tub (box) girders will prevent corrosion resulting from leakage thru the deck and condensation. Light color paint also increases illumination inside the tub (box) and eases detection of corrosion or cracks in steel members. Consider other corrosion protection measures as specified herein.

Whenever the end of steel members is cast inside concrete, the end of the member cast in concrete requires a 3 coat paint system as shown in Figure 1.2.1.10C.

Consult with the Steel Bridge Design Standards Engineer for the latest design aids and design computer programs.

Submit a request for a design deviation to the State Bridge Engineer before replacing an established detail or method from this manual. This may include design methods and/or details established in other states or may been used previously in this State, design methods and/or details presented in research reports, design methods and/or details developed by AASHTO/NSBA Collaboration, details and fabrication methods recommended by NSBA, or innovative design methods and/or details developed by designers. This requirement is not intended to inhibit innovation or the ability of the designer to exercise good engineering judgment. On the contrary, it is intended to allow good innovative ideas to be used and to potentially become part of this manual.

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Fatigue Design Requirements - All welded and bolted connections shall be designed for infinite fatigue design life. Details category E or E' shall not be used in any steel girder bridge (plate girders, tub girders or box girders) connections.