

BRIDGE BULLETIN 2015-4

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To: All Bridge Designers

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Subject: ADOT Bridge Design Guidelines

Web Site: <http://www.azdot.gov/business/engineering-and-construction/bridge/guidelines>

Please note that the following ADOT Bridge Design Guidelines sheets have been updated:

SECTION 5 - CONCRETE STRUCTURES

5.1 SCOPE

5.7.3.4 Control of Cracking by Distribution of Reinforcement

SECTION 6 - STEEL STRUCTURES

6.1 SCOPE

SECTION 13 - RAILINGS

13.4 GENERAL

The following pages summarize all of the updates.

Summary of the Updates

SECTION 5 - CONCRETE STRUCTURES

5.1 SCOPE

This Section contains guidelines to supplement provisions of Section 5, Concrete Structures, of the AASHTO LRFD Bridge Design Specifications. These provisions apply to the design of bridges, retaining walls, and other appurtenant highway structure components constructed of normal density concrete reinforced with steel bars, welded wire reinforcement, prestressing strands, prestressing bars, or prestressing wires. Concrete deck design criteria are specified in Section 9 of these guidelines.

All design engineers are advised to review the example problems in Appendix – A of these guidelines for proper and correct application of various provisions of the AASHTO LRFD Specifications and these guidelines for design of bridge structural components.

Minimum vertical clearance for a bridge should be established based on future roadway configuration. For bridges spanning over railroads, minimum vertical clearance shall be based on the most recent railroad grade separation guidelines.

Design level load ratings of all bridges shall be performed per MBE (The Manual for Bridge Evaluation) latest edition, while the stress limits for concrete shall conform to ADOT Bridge Design Guidelines. For new bridges the design Operating Load Rating (using HL93 live load) shall be 1.8 or more. For widening of bridges the minimum design Operating Load Rating (using HL93 live load) shall be the Operating Load Rating (using HL93 live load) of the existing bridge or 1.5, whichever is greater. Coordination and approval from ADOT Bridge Group will be required in instances where these provisions cannot be met, for widening of existing bridges.

5.7.3.4 Control of Cracking by Distribution of Reinforcement

~~For structures other than deck slabs, the tensile stress in the mild steel reinforcement at the service limit state, f_s , shall be limited to $0.6f_y$.~~

Except for columns and drilled shafts, in general, for service limit state, the allowable tensile stress in reinforcing steel, f_s , shall be limited to 30 ksi, unless noted otherwise for specific bridge types and structural members in these guidelines. When the Strut-and-Tie model is used for design of structures and components, crack control provisions specified in AASHTO LRFD Article 5.6.3.6 shall be met.

SECTION 6 - STEEL STRUCTURES

6.1 SCOPE

This section contains guidelines to supplement provisions of Section 6 of the AASHTO LRFD Bridge Design Specifications for the analysis and design of steel components, splices and

connections for beam and girder structures, frames, trusses and arches, as applicable. Metal deck systems in relation to steel stay-in-place formwork are covered in Section 9 of these guidelines.

Minimum vertical clearance for a bridge should be established based on future roadway configuration. For bridges spanning over railroads, minimum vertical clearance shall be based on the most recent railroad grade separation guidelines.

Design level load ratings of all bridges shall be performed per MBE (The Manual for Bridge Evaluation) latest edition. For new bridges the design Operating Load Rating (using HL93 live load) shall be 1.7 or more. For widening of bridges the minimum design Operating Load Rating (using HL93 live load) shall be the Operating Load Rating (using HL93 live load) of the existing bridge or 1.5, whichever is greater. Coordination and approval from ADOT Bridge Group will be required in instances where these provisions cannot be met, for widening of existing bridges.

SECTION 13 – RAILINGS

13.4 GENERAL

Bridge railing design for new bridges should be based on the current AASHTO LRFD Bridge Design Specifications for the selected Test Level.

All new bridge railings installed on the State Highway System should have a minimum of TL-4 rating. The preferred TL-4 bridge railing is the 34 32-inch F-shape bridge concrete barrier; and preferred TL-5 bridge railing is the 44 42-inch F-shape bridge concrete barrier. Other acceptable TL-4 and TL-5 bridge railings are available from ADOT Bridge Group.

44 42-inch F-shape bridge concrete barriers shall be used on directional ramps for freeway-to-freeway interchanges where ramps cross traffic lanes or highly occupied areas.

Bridge railings currently in use that have been found acceptable under the crash testing and acceptance criteria specified in NCHRP Report 230 will be considered as meeting the requirements of NCHRP Report 350 without the need of further testing.

For bridge modification considerations, existing bridge railings will normally be evaluated using AASHTO Standard Specifications for Highway Bridges and bridge railings replacements should be designed to either the AASHTO Standard Specifications or to the AASHTO LRFD Bridge Design Specifications, as appropriate on a case-by-case basis.

When sound walls are needed on a bridge, they should be placed behind bridge railings to maintain the intent of the design and to ensure that the railings will perform according to their crash test levels. A minimum gap of 2 inches should be maintained between the railings and the sound walls.

The following is a list of ADOT's railings structure detail drawings, method of measurement, and bid item numbers:

Structure Detail Drawing		Method of measurement	Bid Item Number
SD 1.01: 32 34 32-inch F-shape Bridge Concrete Barrier and Transition		Linear Foot	6011130 6011140
SD 1.02: 42 44 42-inch F-shape Bridge Concrete Barrier and Transition		Linear Foot	6011131 6011141
SD 1.03: Thrie Beam Guard Rail Transition System		Each	9050430
SD 1.04: Combination Pedestrian – Traffic Bridge Railing		Linear Foot	6011132
SD 1.05: Pedestrian Fence for Bridge Railing SD 1.04		Linear Foot	6011133
SD 1.06: Two Tube Bridge Rail (4 sheets)		Linear Foot	6011134
SD 1.11: Barrier Junction Box	Type I	Each	7320475
	Type II	Each	7320476

Structure Detail Drawings are available on the Bridge Group website ([click here](#)).

Bridge concrete barriers and parapets shall not be constructed using slip forms. Painting the inside of bridge barriers should be avoided due to long-term maintenance concerns.

Rustication on the exterior of bridge barriers and parapets shall be limited to a thickness of 1 ½ in. Rustication may extend the full height of the barrier and parapet, excluding the ~~44~~ 42-inch (nominal) F-shape bridge concrete barrier. The rustication height for ~~44~~ 42-inch (nominal) F-shape barriers shall be limited to the bottom 32 inches, measured from the top of deck.