

steel quiz

This month's Steel Quiz theme is connections. Most of the answers can be found in the AISC *Specification* and AISC *Steel Manual*, as well as on the AISC and *Modern Steel Construction* websites (www.aisc.org and www.modernsteel.com).

- 1 Which part of the 14th Edition *Manual* provides details for skewed single-plate shear connections?
a) Part 8 b) Part 9
c) Part 10 d) None of the Above
- 2 When making skewed connections with bent angles, why is it recommended that angles should only be bent about 5° maximum?
- 3 When bending plates, where are minimum bending radii recommended?
- 4 Which section of the RCSC *Specification* provides requirements for beveled washers in snug-tight connections?
a) 5.1 b) 6.1.1
c) 6.2.2 d) 7.1
- 5 True/False: All welded skewed connections require the use of the Z-loss dimension in order to calculate the effective throat.
- 6 True/False: The AISC *Design Examples* v14.0 provide examples of skewed connection design.
- 7 Why are skewed joints in the tables in Part 10 of the *Manual* illustrated only up to 45°?
- 8 True/False: Bolts in conventional shear connections at the ends of beams are an example of an end-loaded joint (subject to non-uniform distribution of bolt shear).
- 9 True/False: The 2010 AISC *Specification* provides prescriptive options for designing single-angle compression members connected through one leg only for axial force only.
- 10 True/False: There are guidelines for the design of diaphragms and their connection plates for skewed or curved bridges.

TURN PAGE FOR ANSWERS

- 1 (c) Table 10-14 provides welding details for various angles of skew. As shown in this month's SteelWise (p. 16), there are also other ways to configure the welds. The welds in these connections are designed to develop the strength of the plate. Another good reference on this subject is the 3rd Quarter 2001 *Engineering Journal* article "Design of Skewed Connections" by Kloiber and Thornton.
- 2 The 14th Edition AISC *Steel Construction Manual* discusses bending hot-rolled angles briefly in the section on skewed shear connections in Part 10. For skews above 5°, bent angles tend to bend about the heel fillet rather than the corner of the angle. As a result, bent plates are recommended.
- 3 Table 10-13 in the 14th Edition AISC *Steel Construction Manual* provides recommended minimum radii for cold bending of plates.
- 4 (b) Section 6.1.1 of the RCSC *Specification* (a free download from www.boltcouncil.org) states, "When the outer face of the joint has a slope that is greater than 1:20, with respect to a plane that is normal to the bolt axis, an ASTM F436 beveled washer shall be used to compensate for the lack of parallelism."
- 5 False. At small skew angles, the Z-loss dimension does not apply; the weld sizes are simply adjusted. AWS D1.1 Section 2.4.3.3 covers skewed T-joints with dihedral angles between 60° and 30°. These joints require the use of the Z-loss dimension in order to calculate the effective throat. This is discussed in Parts 8 and 10 of the 14th Edition AISC *Steel Construction Manual*.
- 6 True. The design examples available for free download at www.aisc.org/dg provide illustrated examples of skewed connection design.
- 7 The details shown provide for the necessary clearances for bolt insertion and welding access and clearances. Above 45°, the details are even trickier and the specifier must consider the actual case independent of the illustrated cases.
- 8 False. Figure C-J3.1 in the Commentary to the 2010 AISC *Specification* illustrates joints that are end loaded and those that are not.
- 9 True. The provisions in Section E5 of the 2010 AISC *Specification* provide for an adjusted KL/r value that eliminates the need to consider the eccentricity, within the limitations of the method provided.
- 10 True. AASHTO/NSBA Steel Bridge Collaboration publication G12.1, *Guidelines for Design for Constructability*, discusses design and construction of skewed bridges. You can download this document from the NSBA website at www.aisc.org/contentNSBA.aspx?id=20130.



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