

steel quiz

Most of the answers to this month's steel quiz can be found in the AISC *Specification* and AISC *Steel Construction Manual* as well as on the AISC and *Modern Steel Construction* websites.

- 1 Which clause in AWS D1.1 provides minimum preheat requirements for prequalified welded joints?
a) Clause 2.5 b) Clause 3.5
c) Clause 6.5 d) None of the Above
- 2 True/False: Chapter I in the 2010 AISC *Specification* addresses composite action between concrete slabs and steel beams encased in concrete, without the use of steel-headed stud anchors.
- 3 True/False: There are connections in AISC 358 that are prequalified for weak-axis connection to I-shaped columns.
- 4 True/False: In the 2010 AISC *Specification*, there is no distinction made in edge distance requirements for rolled, sheared and thermally cut edges for bolt holes.
- 5 True/False: Typically, the relatively small eccentricity between the support and the bolts in all-bolted double angles is neglected.
- 6 True/False: According to the scope of ASTM A709, A992 and A709 Gr. 50S are equivalent.
- 7 True/False: Flexure-shear interaction in plate girders is no longer addressed in the 2010 AISC *Specification* and 14th Edition *Manual*.
- 8 Which Design Guide provides guidance and design examples for web tapered members?
a) 25 b) 24
c) 23 d) None of the above
- 9 True/False: Historic AISC *Specifications* and *Codes* are available as free downloads to AISC members on our website at www.aisc.org/epubs.
- 10 What is the difference between relative and nodal bracing as outlined in Appendix 6 in the 2010 AISC *Specification*?

TURN PAGE FOR ANSWERS

- 1 (b) AWS D1.1, Clause 3.5 and its reference to Table 3.2 establishes the minimum preheats required for prequalified welded joints and states that preheat will be sufficient to prevent weld cracking. Commentary C-3.5 explains that preheat is implemented to promote a slower cooling rate in the welded joint and allows for a higher dissipation rate of hydrogen, which has the propensity to promote cold cracking.
- 2 False. This type of construction is not common today and is no longer covered in the *AISC Specification*. However, it was addressed in historic AISC specifications, as it was more common in the past. When assessing historic work that used this type of construction, there is an *Engineering Journal* paper that may be useful ("Composite Action Without Shear Connectors," 2nd Quarter 1974). AISC members can download *Engineering Journal* papers for free at www.aisc.org/ej; non-members can download them for a nominal fee.
- 3 False. Currently there are no prequalified weak-axis connections in the *Prequalified Connection Standard*. Some options include flanged cruciform columns, boxed wide-flange columns or built-up box columns where frames intersect. Alternatively, project-specific testing can be used to qualify an alternative configuration, such as use of a connection to the column weak axis.
- 4 True. Table J3.4 in the 2010 *AISC Specification* no longer distinguishes between edge types. The Commentary to the 2010 *Specification* explains: "In previous editions of the *Specification*, separate minimum edge distances were given in Tables J3.4 and J3.4M for sheared edges and for rolled or thermally cut edges. Sections J3.10 and J4 are used to prevent exceeding bearing and tearout limits; are suitable for use with thermally cut, sawed and sheared edges; and must be met for all bolt holes. Accordingly, the edge distances in Tables J3.4 and J3.4M are workmanship standards and are no longer dependent on edge condition or fabrication method."
- 5 True. Eccentricity can be neglected in all-bolted double-angle connections. The *AISC Steel Construction Manual* and *AISC Design Examples* provide examples where this eccentricity is neglected for design of double-angle connections.
- 6 True. ASTM A709 was written as an umbrella standard with bridge-specific requirements based upon other available grades of steel. As a result, ASTM A992 (and ASTM A572 and A36) are similar to grades of ASTM A709 used in bridges. ASTM A709 provides guidance and additional requirements for low temperature usage.
- 7 True. The flexure-shear interaction provisions were last included in the 1999 *LRFD Specification* and 3rd Edition *LRFD Manual* and were subsequently removed based upon work performed by D.W. White. This new research showed that the tension-field design equations sufficiently reflect the behavior based on experimental test results. It appears in the 2008 paper "Unified Flexural Resistance Equations for Stability Design of Steel I-Section Members—Overview" in the *Journal of Structural Engineering*.
- 8 (a) *AISC Steel Design Guide 25: Frame Design Using Web-Tapered Members* is available as a free download to AISC members at www.aisc.org/dg; non-members can download it for a nominal fee.
- 9 True. All historic AISC specifications and codes are posted at www.aisc.org/epubs under the heading "Historical Standards." Members can download these documents for free; others can purchase them on a CD compilation.
- 10 Relative bracing is defined in the glossary of the 2010 *Specification* as "Bracing that controls the relative movement of two adjacent brace points along the length of a *beam* or *column* or the relative lateral displacement of two stories in a frame (see *nodal brace*)." A nodal brace is defined as "Bracing that prevents lateral movement or twist independently of other braces at adjacent brace points (see *relative brace*)." There is also a detailed discussion, with figures, in the Commentary to Appendix 6 that covers relative and nodal bracing systems.