

# steel quiz

**LOOKING FOR A CHALLENGE?** *Modern Steel Construction's* monthly Steel Quiz tests your knowledge of steel design and construction. Most of the answers for the questions this month can be found in the AISC *Steel Construction Manual*, 13th edition and *Modern Steel Construction* archives.

- 1 Which standard provides the requirements for geometric and mechanical properties of the usual cold-formed hollow structural sections used in the U.S.?
- 2 True/False: The 13th edition AISC *Manual* provides HSS wall thicknesses that are 93% of the nominal thickness for design purposes.
- 3 Is there such a thing as a hot-formed HSS?
- 4 True/False: The hidden toe of the overlapped branch in an overlapping HSS truss connection should always be fully welded.
- 5 What limits on material properties are imposed in Chapter K of the 2005 AISC *Specification* when designing connections that impose concentrated forces on HSS?
  - a)  $F_y \leq 42$  ksi and  $F_u \leq 58$  ksi
  - b)  $F_y \leq 46$  ksi and  $F_u \leq 58$  ksi
  - c)  $F_y \leq 50$  ksi and  $F_u \leq 62$  ksi
  - d)  $F_y \leq 52$  ksi and  $F_y/F_u \leq 0.8$  ksi
- 6 When designing trusses using HSS, why is it unavoidable that the connections must be considered when selecting the member sizes?
- 7 What type of connection can be used to avoid eccentricity at HSS truss joints as branch sizes become large?
  - a) Gapped connection
  - b) Overlapping connection
  - c) A gusseted connection
  - d) None of the above
- 8 True/False: Just by looking at an HSS truss connection it is possible to tell if it is a T, K, Y or cross connection.
- 9 What is the maximum width-to-thickness ratio permitted for the walls of rectangular HSS used in high-seismic applications?
- 10 True/False: Architecturally Exposed Structural Steel (AESS) requirements apply to HSS only when they are designated as AESS.

# steel quiz ANSWERS

- 1 HSS is covered by ASTM A500, *Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes*. Refer to Section A3 of the 2005 AISC *Specification* for a list of the material standards that are explicitly permitted for use.
- 2 True. Part 1 of the 13th edition AISC *Manual* provides  $t_{des}$  values that are 0.93 times the nominal wall thickness,  $t_{nom}$ . This is based upon requirements in Section B3.12 in the 2005 AISC *Specification*; please see the commentary to this section for more information.
- 3 Yes. ASTM A501, *Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing*, covers the manufacture of hot-formed HSS. However, A501 material generally is not available except by special order, and should not be specified unless its availability can be confirmed before doing so. Refer to the January 2009 *Modern Steel Construction* article "Are You Properly Specify-
- 4 False. The Commentary to Section K2.3 of the 2005 AISC *Specification* states that such welding is required only if the normal components of the two branch forces differ by more than 20%.
- 5 (d) Refer to section K1.2 of Chapter K in the 2005 AISC *Specification*. Note that the AISC Committee on Specifications considers ASTM A500 Grade C material as compliant with these limits.
- 6 HSS trusses generally have members that cannot be reinforced, and yet the local forces on the walls of the HSS usually will control joint designs. Thus, the design of the connection almost always influences the selection of the chord and branch member sizes.
- 7 (b) Overlapping connections typically are used to avoid eccentricities in the connections between branch and chord elements of HSS trusses, unless the branches are small enough and the chords big enough to permit use of gapped connections. Refer to the March 2008 issue of *Modern Steel Construction* for an article entitled "Special Treatment" for more on this.
- 8 False. These definitions do depend upon the appearance of the configuration, but also depend upon the way the forces are distributed in the members that meet at the joint. The specific criteria by which one can tell if a connection is a T, K, Y or cross connection can be found in Section K2 of the 2005 AISC *Specification*.
- 9 Table I-8-1 of the 2005 AISC *Seismic Provisions for Structural Steel Buildings* requires that the slenderness of rectangular HSS walls not exceed  $0.64\sqrt{(E/F_y)}$ .
- 10 True. See Section 10 of the AISC *Code of Standard Practice* for AESS requirements. Also, further information is available in the supplement "Architecturally Exposed Structural Steel," which appeared in the May 2003 issue of *Modern Steel Construction*.

Anyone is welcome to submit questions and answers for Steel Quiz. If you are interested in submitting one question or an entire quiz, contact AISC's Steel Solutions Center at 866.ASK.AISC or at [solutions@aisc.org](mailto:solutions@aisc.org).



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