

steel quiz

LOOKING FOR A CHALLENGE? *Modern Steel Construction's* monthly Steel Quiz tests your knowledge of steel design and construction. Most answers can be found in the 2005 *Specification for Structural Steel Buildings*, available as a free download from AISC's web site, www.aisc.org/2005spec. Where appropriate, other industry standards are also referenced.

This month's Steel Quiz was developed by AISC's Steel Solutions Center. Sharpen your pencils and go!

- 1 Is there a difference between the terms *filler metal* and *weld metal*?
- 2 **True or False:** Block shear rupture should be checked only at bolted connections.
- 3 What methods are available to pretension high-strength bolts?
- 4 What is the most common material specification for hollow structural sections?
- 5 What is the preferred material specification for anchor rods?
- 6 Which bolts can be galvanized?
 - a. ASTM A325
 - b. ASTM A490
 - c. ASTM F2280
 - d. All of the above
- 7 What needs to be done to keep nuts from loosening in a pretensioned joint?
 - a. Use lock washers.
 - b. Use a jam nut.
 - c. Tack-weld the nut to the bolt.
 - d. Nothing
- 8 Must one provide transverse stiffeners at the ends of unframed beams and girders?
- 9 Which are characteristics of special moment frames?
 - a. The design expectation is to withstand significant inelastic deformations under the design earthquake.
 - b. The beam-to-column connections must be capable of sustaining an inter-story drift angle of at least 0.04 radians.
 - c. Qualification testing or prequalification of beam-to-column connections is required.
 - d. All of the above
- 10 What minimum connection depth is recommended for shear connections in the AISC manual?

TURN PAGE FOR ANSWERS

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ANSWERS

- 1** Yes, although it is a somewhat esoteric one. Filler metal is the product sold by the manufacturer used to make a weld. Weld metal is what is in place after the filler metal has been melted to form the joint.
- 2** **False.** It is also required to check block shear rupture around the periphery of welded connections.
- 3** According to the RCSC specification (www.boltcouncil.org), Section 8.2, one of the pretensioning methods in Sections 8.2.1 through 8.2.4 shall be used (these include turn-of-nut pretensioning, calibrated wrench pretensioning, twist-off-type tension-control pretensioning, and direct-tension indicator pretensioning), except when alternative-design fasteners that meet the requirements of Section 2.8 or alternative washer-type indicating devices that meet the requirements of Section 2.6.2 are used—in which case, installation instructions provided by the manufacturer and approved by the EOR shall be followed.
- 4** The preferred material specification for round and rectangular (and square) hollow structural sections is ASTM A500 Gr. B, although ASTM A500 Gr. C is becoming increasingly common.
- 5** The preferred material specification for anchor rods is ASTM F1554 (Gr. 36, 55 and 105), which covers hooked, headed, and threaded and nutted anchor rods. ASTM F1554 Gr. 36 is most commonly specified, although Grades 55 and 105 are normally available when higher strength is required, albeit with potentially longer lead times.
- 6** **a.** Only A325 bolts may be galvanized. As described in Commentary to Section 2.3.3 of the RCSC specification, “ASTM Specifications permit the galvanizing of ASTM A325 bolts but not ASTM A490 or ASTM F2280 bolts. Similarly, the application of zinc to ASTM A490 or ASTM F2280 bolts by metallizing or mechanical coating is not permitted, because the effect of mechanical galvanizing on embrittlement and delayed cracking of these bolts has not been fully investigated to date.”
- 7** **d.** When properly installed, a nut on a pretensioned bolt will not loosen. No special procedures are required. Refer to AISC FAQ 6.5.1 at www.aisc.org/faq.
- 8** Yes. According to the 2005 AISC Specification (www.aisc.org/2005spec), Section J10.7, at unframed ends of beams and girders not otherwise restrained against rotation along their longitudinal axes, a pair of transverse stiffeners—extending the full depth of the web—shall be provided. Also see Section J10.8 for additional stiffener requirements for concentrated forces.
- 9** **d.** All of the above. Refer to Section 9 and Commentary Section 9 of the AISC *Seismic Provisions* (www.aisc.org/2005seismic).
- 10** Generally, it is recommended that the connection cover one-half the T dimension of the supported beam. This is indicated in the AISC manual as a good practice to provide for stability during erection.