Modern Steel Construction's monthly *Steel Quiz* allows you to test your knowledge of steel design and construction. All references to LRFD specifications pertain to the 1999 *LRFD Specification for Structural Steel Buildings*, available as a free download from AISC's web site:

www.aisc.org/lrfdspec

ASD references pertain to the 1989 *ASD Specification for Structural Steel Buildings*. Where appropriate, other industry standards are also referenced.

Anyone is welcome to submit questions for *Steel Quiz*—one question or 10! If you or your firm are interested in submitting a *Steel Quiz* question or column, contact ▶

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

1. Are ASTM F436 washers hardened?

2. Can ASTM A193 bolting materials be used in steel framed connections?

3. **True/False:** The effective throat thickness of a CJP groove weld is the thickness of the thinner part joined.

4. When designing double-angle members, are the torsional (J) and warping constants (C_w) twice that of the individual single-angles?

5. Does the $0.93t$ requirement for HSS apply to ASD designs?

6. The variation in dimension between the centers of adjacent anchor rod within a group shall be equal to or less than:
   a. $^1/_8$ inch
   b. $^1/_4$ inch
   c. $^1/_2$ inch
   d. 1 inch

7. **True/False:** Erectors are responsible for field painting of bolt heads, nuts, field welds, and any abrasions to the shop coat on structural steel.

8. In the Special Segment of Special Truss Moment Frames (STMF), why are flat bars used as diagonal web members?

9. Which of the following is not a prequalification variable parameter for columns in Seismic Load Resisting Systems?
   a. flange thickness
   b. weight per foot
   c. web thickness
   d. depth

10. **True/False:** ASTM A500 Grade B (F_y = 42 ksi) and Grade C (F_y = 46 ksi) round HSS are available in cross-sections matching ASTM A53 Grade B pipe (F_y = 35 ksi).

Turn page for answers

Answers

1. **Yes**, ASTM F436 washers are always hardened. Refer to the *Standard Specification for Hardened Steel Washers* (ASTM F436-04) for additional information on hardness requirements.

2. Not without approval by the Engineer of Record. The 1999 AISC *LRFD Specification* (**www.aisc.org/lrfdspec**), Section A3, outlines approved materials for use under the specification. ASTM A193 falls under the category of anchor rods and threaded rods, rather than the bolting material category in Section A3. It therefore cannot be used as a bolting material for steel framed connections, unless the Engineer of Record decides to permit it. In addition, ASTM A193 rods are not addressed in the installation and inspection requirements outlined in the 2000 *RCSC Specification* (a free download from **www.boltcouncil.org**).

3. **True.** The effective throat cannot be thicker than the thinner part joined. Refer to Section J2.1a of the 1999 AISC *LRFD Specification* for this particular requirement.

4. **Yes.** The torsional constant, *J*, of a double-angle member is twice the torsional constant of each individual angle. The same is true for the warping constant, C_w.

5. Absolutely. The 0.93*t* design thickness requirement (93% times the nominal wall thickness) applies to both ASD and LRFD designs using ERW HSS. The 1989 AISC *ASD Specification* was updated with this requirement with the release of *Supplement No. 1 to the Specification for Structural Steel Buildings* (ASD, 1989). Download a free copy of the ASD *Supplement* from **www.aisc.org** (click on the free downloads link).

6. The answer is b, or ¼ inch. It is important to realize that it is difficult to achieve precise setting of adjacent anchor rod groups, even when using a template or setting plate (which helps for setting just one group for a particular column). Refer to the AISC 2000 *Code of Standard Practice*, Section 7.5.1(b) (a free download from **www.aisc.org/code**).

7. **False.** This responsibility is one that must be specifically assigned in the contract documents. As a default condition, neither the erector nor the fabricator is responsible for field painting per Section 7.17 of the AISC 2000 *Code of Standard Practice*.

8. Because of their high ductility. Section 12.5 (Part I) of the 2002 AISC *Seismic Provisions* (a free download from **www.aisc.org/seismic**) requires that flat bars be used as diagonal web members. Refer to the Commentary Section 12.5 for additional information.

9. Web thickness, c, is not a prequalification variable. Refer to Appendix P, Section P4(2) of the 2002 AISC *Seismic Provisions*.

10. **True.** This is especially important to remember if you need a higher strength equivalent to ASTM A53 Grade B pipe. Perhaps more important is that ASTM A500 product is NOT generally available in cross-sections not matching ASTM A53 grade B pipe. For up-to-date shape and HSS availability, simply visit **www.aisc.org/availability**.