

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 the staff of AISC's Steel Solutions Center. Sharpen your pencils and go!

- 1 What is the difference between nodal and relative bracing?
 - a. b
 - b. $b - t$
 - c. $b - 2t$
 - d. $b - 3t$
- 2 If the corner radius is unknown, the width of a rectangular HSS used to calculate the slenderness is:
 - a. b
 - b. $b - t$
 - c. $b - 2t$
 - d. $b - 3t$
- 3 **True/False:** Serviceability limit states are evaluated under factored loads.
- 4 Of the three types of bolted joint types, namely snug-tightened, pretensioned and slip-critical, which are known as bearing joints?
 - a. only snug-tightened joints
 - b. snug-tightened and pretensioned joints
 - c. pretensioned and slip-critical joints
 - d. slip-critical joints
- 5 Is it acceptable to substitute SAE J429 grades 5 and 8 bolts for ASTM A325 and A490 bolts, respectively?
- 6 **True/False:** According to the AISC *Code of Standard Practice*, in the event of a conflict between the design drawings and the CAD files or copies thereof, the design drawings shall govern.
- 7 According to the 2005 AISC *Code of Standard Practice*, grouting of column bases is the responsibility of which party?
 - a. Owner's Designated Representative for Design
 - b. Owner's Designated Representative for Construction
 - c. Fabricator
 - d. Erector
- 8 **True/False:** The weights of shop or field weld metal and protective coatings shall be included in the calculated weight for the purposes of payment.
- 9 Are rolled and cut threads equally acceptable for anchor rods?
- 10 **True/False:** A requirement to remove run-off tabs will necessitate the removal of run-off tabs and backing bars.

TURN PAGE FOR ANSWERS

steel quiz

ANSWERS

1 Nodal bracing occurs at discrete points along a member. A girt attached to a column, or a vertical full-depth cross-frame located between two plate-girders (i.e. common in steel bridges), are examples of nodal braces. Nodal bracing prevents lateral movement or twists independently of other braces at adjacent brace points.

Relative bracing controls the relative movement of two adjacent brace points along the length of a member or the relative lateral displacement of two stories in a frame. Vertical X-bracing between a pair of columns and horizontal cross-bracing between the compression flanges of two beams are considered relative braces.

Refer to Appendix 6 of the 2005 AISC specification (www.aisc.org/2005spec) for general stability bracing provisions for columns and beams.

2 The answer is **d**. According to Section B4.2(d) of the 2005 AISC specification, when the corner radius is unknown, the width of the stiffened element shall be taken as the corresponding outside dimension minus three times the design wall thickness. The design wall thickness is 0.93 times the nominal wall thickness for electric-resistance-welded HSS per Section B3.12.

3 False. Serviceability limit states are evaluated under service loads, as defined in the glossary of the 2005 AISC specification.

4 The answer is **b**. Snug-tightened and pretensioned joints are considered bearing joints, as the shear force is transmitted by the bolts bearing against the connection elements. In slip-critical joints, the faying surfaces are prepared to

provide a calculable resistance against slip so as to initially prevent bearing. However, it should be noted that the current AISC and RCSC specifications (www.boltcouncil.org) require that bearing be checked in slip-critical joints in the event that slippage occurs. Refer to Section 5.3 of AISC *Design Guide 17: High-Strength Bolts* (www.aisc.org/epubs).

5 No. The strength properties of SAE J429 grade 5 bolts and ASTM A325 bolts are identical; likewise, SAE J429 grade 8 bolts are the strength equivalent of ASTM A490 bolts. However, these material specifications differ in that ASTM A325 and A490 specify thread length and head size, whereas SAE J429 does not. Additionally, quality assurance and inspection requirements for ASTM A325 and A490 bolts are more stringent.

6 True, except when the contract documents indicate that a three-dimensional digital building product model replaces contract drawings. Refer to Sections 4.3(b) and Appendix A of the 2005 AISC *Code of Standard Practice for Steel Buildings and Bridges* (www.aisc.org/code).

7 The answer is **b**. According to Section 7.7 of the 2005 AISC *Code of Standard Practice*, the Owner's Designated Representative for Construction (usually the general contractor, construction manager, or a similar authority at the job site) shall be responsible for grouting.

8 False. The weights of shop or field weld metal and protective coatings shall not be

included according to Section 9.2.5 of the 2005 AISC *Code of Standard Practice*.

9 Yes. The use of either rolled or cut threads is permitted in ASTM F1554 Section 6.2. Rolled threads are formed by pressing threading dies into the shank to displace the surplus of the metal outward. Cut threads are made with a thread-cutting die or by lathe cutting.

10 False. Run-off tabs (or weld tabs) are different from backing or back up bars. These serve different purposes, and removal of each may be required for different reasons. The two are referred to in different and separate provisions of the AWS *Structural Welding Code-Steel D1.1*. Backing, often in the form of back up bars, supports the molten weld metal where a gap is provided to assure fusion through the thickness of the joint. Run-off tabs (or weld tabs) extend the groove lengthwise beyond the design weld to eliminate defects common where passes are terminated, from forming in the designed weld. With one exception, neither backing nor run-off tabs need to be removed from statically loaded joints for structural reasons, though one or the other may need to be removed for architectural reasons. An exception is in T- and corner joints welded with a filler metal that is not certified to meet a CVN toughness requirement—the backing must be removed unless the weld strength is limited. Appendix 3 of the 2005 AISC specification and the AISC seismic provisions (www.aisc.org/seismic) contain guidance for when removal of backing and weld tabs is required in specific joints.