

# 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](http://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 How can LRFD design strength be quickly converted to ASD allowable strength, based upon the 2005 AISC specification?
  - a. divide by 1.5
  - b. divide by 1.7
  - c. multiply by 1.5
  - d. multiply by 1.7
- 2 Is gas-cutting of bolt holes permitted?
- 3 In a compression member, as the slenderness ratio  $KL/r$  increases, the critical stress  $F_{cr}$  will:
  - a. increase
  - b. decrease
  - c. stay the same
  - d. none of these
- 4 Which of the following are all considered high-strength material standards?
  - a. ASTM A36, A307, A449
  - b. ASTM A36, A325, A449
  - c. ASTM A325, A490, F1554 Grade 36
  - d. ASTM A325, A449, A490
- 5 Which resistance factor  $\phi$  and factor of safety  $\Omega$  are usually used to determine the available strength for yielding limit states?
  - a.  $\phi = 0.60$ ,  $\Omega = 2.5$
  - b.  $\phi = 0.75$ ,  $\Omega = 2.0$
  - c.  $\phi = 0.90$ ,  $\Omega = 1.67$
  - d.  $\phi = 1.00$ ,  $\Omega = 1.50$
- 6 **True/False:** Proper bolt pretension can be determined by listening for the audible change of pitch in an impact wrench.
- 7 In high-seismic design, the steel core of a buckling-restrained braced frame (BRBF) must resist at least:
  - a. 50% of the axial force in the brace
  - b. 75% of the axial force in the brace
  - c. 100% of the axial force in the brace
  - d. 110% of the axial force in the brace
- 8 Which of the following configurations is not a groove weld?
  - a. complete joint penetration
  - b. partial joint penetration
  - c. flare bevel
  - d. fillet
- 9 **True/False:** Building product models (BPM) may be used to replace contract drawings and can be implemented as the primary means of designing, representing, and exchanging structural steel data for a project.
- 10 Which of the following is not an approved bolted joint type for structural load transfer?
  - a. finger-tightened
  - b. snug-tightened
  - c. pretensioned
  - d. slip-critical

ANSWERS ON NEXT PAGE

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## ANSWERS

**1** The answer is **a**. A design strength  $\phi R_n$  can be quickly converted to an allowable strength  $R_n/\Omega$  simply by dividing by 1.5. This can be done because  $\Omega/\phi$  is equal to 1.5, as explained in Section C-B3.4 of the commentary to the 2005 AISC specification (a free download from [www.aisc.org/2005spec](http://www.aisc.org/2005spec)).

**2** **Yes.** Section M2.5 of the AISC specification permits thermally cut bolt holes, subject to a surface roughness profile not exceeding 1,000  $\mu\text{in}$ . The AISC specification defines *thermally cut* as "cut with gas, plasma, or laser."

**3** The answer is **b**. Refer to Table 4-22 in the 13th edition AISC manual (available at [www.aisc.org/bookstore](http://www.aisc.org/bookstore)) for tabulated values of available critical stress for compression members.

**4** The answer is **d**. ASTM A325, A449, and A490 are considered high-strength materials. For fastener material strength information, refer to Table 2-5 in the 13th edition AISC manual.

**5** The answer is **c**. (Rupture limit states are generally represented by the resistance factor and factor of safety outlined in **b**.) Refer to page 2-10 of the 13th edition AISC manual for additional information.

**6** **False.** It has been argued that an installer could probably use a tension calibrator to match an audible change in pitch during bolt installation to the minimum bolt pretension. This is, nonetheless, a qualitative estimate that varies from person to person. Section 8 of the 2004 RCSC specification (a free download from [www.boltcouncil.org](http://www.boltcouncil.org)) lists acceptable pretensioning methods.

**7** The answer is **c**. According to Section 16.2a of the 2005 AISC *Seismic Provisions* ([www.aisc.org/2005seismic](http://www.aisc.org/2005seismic)), the steel core must be designed to resist the entire axial force in the brace.

**8** The answer is **d**. A fillet weld is not a groove weld. All the other options are groove welds, including a flare bevel groove weld, which is just a special case of a partial joint penetration groove weld.

**9** **True.** The BPM approach is an alternate approach to the traditional use of contract drawings. This delivery

system allows 3D data to be exchanged between parties under CIS/2. CIS/2 is an electronic data interchange among software applications dealing with steel design, analysis and manufacturing. For additional information, refer to Appendix A of the 2005 AISC *Code of Standard Practice* ([www.aisc.org/code](http://www.aisc.org/code)).

**10** The answer is **a**. A finger-tight joint is not recognized as an acceptable bolted joint type for structural load transfer. Refer to Section 4 of the RCSC specification for additional information.

Anyone is welcome to submit questions 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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