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 Which of the following is not considered a thermal cutting process?
- **a.** gas
- **b.** plasma
- **c.** laser
- **d.** punch

2 Which of the following are structural nut material standards listed in the AISC specification?
- **a.** ASTM A193
- **b.** ASTM A194
- **c.** ASTM A563
- **d.** ASTM A325

3 **True/False:** Lateral-torsional buckling is a concern for an I-shaped member under weak-axis flexure.

4 Which limit state would be incorrectly assigned to a member?
- **a.** lateral-torsional buckling in a flexure member
- **b.** flexural-torsional buckling in a flexure member
- **c.** tension yielding in a tension member
- **d.** tension rupture in a tension member

5 **True/False:** Drift is evaluated at service loads.

6 Planing or finishing of sheared or thermally cut edges of plates and shapes is:
- **a.** mandated by the *Specification*
- **b.** required only if called for in the contact documents
- **c.** required only if called for by the inspector
- **d.** not required

7 **True/False:** The length of a slotted hole is measured from center-to-center of the circular ends of the slot.

8 **True/False:** Inelastic deformation is permitted in simple shear connections.

9 What is the shear lag factor, *U*, for the case where a tension load is transmitted directly to each of the cross-sectional elements by fasteners or welds?
- **a.** 1.0
- **b.** 0.9
- **c.** 0.6
- **d.** 0.5

10 **Yes/No:** Are the compact limiting width-thickness ratios (λ_p) applicable to uniform compression limit state checks for flanges of rolled I-shaped sections?

TURN PAGE FOR ANSWERS

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ANSWERS

1 The answer is **d**, punch. Refer to the definition of thermal cutting in the glossary of the 2005 AISC specification (a free download from www.aisc.org/2005spec).

2 The answers are **b** and **c**. ASTM A194 and A563 are listed in Section A3.3 of the 2005 AISC specification as nut material standards. Note that ASTM A193 is a steel bolting material typically used as threaded rod, whereas ASTM A325 is a high-strength bolting material.

3 **False.** Flexure about the weakest axis is not prone to lateral-torsional buckling, because the shape is stiffer about the strong axis than it is about the weakest axis. Referring to Section F6 of the 2005 AISC specification, two limit states are checked for weak-axis flexure of I-shapes, namely yielding and flange local buckling.

4 The answer is **b**. Flexural-torsional buckling is a limit state that may occur in singly symmetric columns or compression struts, such as single and double angles, tees and channels. It is characterized by the simultaneous flexure and twisting of the compression member.

5 **True.** Refer to Section L4 of the 2005 AISC specification for additional information. Note that serviceability load combinations are usually different than the LRFD and ASD load combinations used for design for strength. *AISC Design Guide 3*, second edition, provides discussion on serviceability design considerations for steel buildings.

6 The answer is **b**. Per Section M2.3 of the AISC specification:
Planing or finishing of sheared or thermally cut edges of plates or shapes is not required unless specifically called for in the contract documents or included in a stipulated edge preparation for welding.

7 **False.** The length of a slotted hole length is measured as the out-to-out distance.

8 **True**, provided the deformations are self-limiting. See Section B3.6a of the 2005 AISC specification.

9 The answer is **a**. The shear lag factor, U, is unity for Case 1 of Table D3.1 in the 2005 AISC specification. This recognizes that there is no shear lag effect in this particular case, as the effective area is equivalent to the net area of the tension member.

10 **No**. Compressive strength of a member is based on whether or not the member contains slender elements. Compact and non-compact sections are treated similarly for compression members. Therefore, λ_p is not applicable for design of rolled I-shape compression members; only λ_r is. See Table B4.1 of the AISC specification (a free download at www.aisc.org/2005spec) for limiting width-thickness ratios for compression elements. For axially loaded columns λ_r defines the slenderness limit up to which the axial load can reach the yield capacity of the section, F_yA, if the column is short—i.e., there is no column buckling. If the slenderness exceeds λ_r, the cross section is slender, and a "Q" factor must be applied to the yield stress.

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**.

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