

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 **True or False:** When checking plates that are loaded in compression, the designer needs to consider the limit state of local buckling.
- 2 How many methods of second-order analysis are included in the 2005 AISC specification?
- 3 Does AISC provide a method for designing single angles?
- 4 Which document specifies the design, installation, and inspection requirements for joints that make use of high-strength bolts?
- 5 What is prying action and how is it accounted for?
- 6 In composite floor framing, what defines the minimum required flexural strength of the steel section alone for unshored construction?
- 7 Are channel shapes available as Grade 50?
- 8 **True or False:** An HSS beam to HSS column moment connection in a lateral force resisting frame is not prequalified for use in a special moment frame (SMF).
- 9 When is the use of tension-only bracing permitted in Seismic Design Categories D, E, and F?
 - a. Tension-only bracing is not permitted for use in SDCs D, E, and F.
 - b. Tension-only bracing is permitted for use only in special concentric braced frames (SCBF)
 - c. Tension-only bracing is permitted for use only in ordinary concentric braced frames (OCBF)
- 10 **True or False:** The AISC *Code of Standard Practice* permits the use of architectural, electrical, and/or mechanical design drawings to show requirements for quantities, sizes, and locations of structural steel where it pertains to those trades.

TURN PAGE FOR ANSWERS

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ANSWERS

1 False. Chapter E of the 13th edition AISC specification (available at www.aisc.org/2005spec) checks global buckling of such members. Since the mechanism is the same for local buckling in a plate, local buckling need not be checked.

2 Three. The effective length method and the first-order analysis method are included in Section C2, and the direct analysis method is included in Appendix 7. These three methods are explained in greater detail beginning on page 2-10 in the 13th edition *AISC Steel Construction Manual*.

3 Yes. Section F10 of the 2005 AISC specification and its commentary provide methods for analyzing and designing single angles with equal and unequal legs. The section considers both geometric and principal axis loading for both torsionally restrained and unrestrained conditions.

4 The 2005 AISC specification (Section J3) does, although there are many references from this specification to the 2004 RCSC *Specification for Structural Joints Using ASTM A325 or A490 Bolts*. The latter document is published by the Research Council on Structural Connections and is available as

a free download at www.boltcouncil.org. The 13th Edition AISC manual (available at www.aisc.org/bookstore) also includes a copy of this document.

5 Prying action is a phenomenon in bolted construction that affects bolt tension forces. When a fitting, such as an angle, has a bolt that passes through it while transmitting tension, deformation of the fitting can increase the tensile force in a bolt above that due to the direct tensile force alone. Proper design for prying action includes the selection of bolt diameter and fitting thickness such that there is sufficient stiffness and strength in the connecting element and strength in the bolt. The procedure for this design is found in Part 9 of the 13th edition AISC manual starting on page 9-10.

6 Per Section 13.1c of the 2005 AISC specification, the steel section alone shall have adequate strength to support all loads applied prior to the concrete, attaining 75% of its specified strength f'_c .

7 Yes. While channel shapes are still rolled most predominantly to meet the ASTM A36 standard, it is becoming more common to find channels rolled to the ASTM A572

grade 50 (or ASTM A992, in some cases) standard. One can check availability by contacting a steel fabricator, steel service center, or mill. For a listing of steel mills, service centers, and material availability, visit www.aisc.org/availability.

8 True. There are no HSS beam to HSS column moment connections that are prequalified for use in SMF in AISC 358-05 (available at www.aisc.org/aisc358), or in FEMA 350. If desired, such a detail can be qualified by testing per Appendix S.

9 c. Tension-only bracing is permitted for use only in OCBF; see Section 14.2 of the 2005 AISC *Seismic Provisions* (available for free download at www.aisc.org/2005seismic).

10 False. Section 3.2 of the AISC *Code of Standard Practice* (available for free download at www.aisc.org/code) specifies that all quantities, sizes, and locations of structural steel must be shown or noted in the structural design drawings. It is permitted to use the other trade drawings to define detail configurations and construction information of structural steel.