

steel quiz

LOOKING FOR A CHALLENGE? *Modern Steel Construction's* monthly Steel Quiz tests your knowledge of steel design and construction. The answers to this month's Steel Quiz can be found in the 2005 *Specification for Structural Steel Buildings* (available as a free download at www.aisc.org/freepubs) and *AISC Steel Design Guide 19, Fire Resistance of Structural Steel Framing*, also a free download for AISC members at www.aisc.org/epubs.

- 1 Which ASTM standards covering bars are referenced in the *AISC Specification*?
 - 2 True/False: The *AISC Specification* cannot be used to design steel castings and forgings.
 - 3 According to the 2005 *AISC Specification*, when should the contract documents require that shapes be supplied with Charpy V-Notch (CVN) toughness of 20 ft-lbs absorbed energy at +70 °F?
 - 4 True/False: Heavy W-shapes (those with flanges that exceed 2 in. in thickness) require special material, design, and fabrication/erection considerations because the perimeter of the heavy cross section is a zone of coarse grain structure and reduced toughness.
 - 5 What is the maximum permitted temperature for heating operations per the *AISC Specification*?
 - a) 800 °F
 - b) 1,000 °F
 - c) 1,100 °F
 - d) 1,200 °F
 - 6 True/False: Steel stud shear connectors shall conform to the requirements of AWS D1.1.
 - 7 Which methods of design for fire conditions are recognized by the *AISC Specification*?
 - 8 True/False: The fire performance of concrete-filled HSS columns can be adversely affected if vent holes are not provided in the steel section.
 - 9 What are two commonly used references to determine proprietary assembly ratings when designing for fire conditions using Qualification Testing?
 - a) *IBC* and the *UL Fire Resistance Directory*
 - b) *IBC* and *ASCE 7*
 - c) *ASCE/SFPE 29* and *IBC*
 - d) *ASCE/SFPE 29* and the *UL Fire Resistance Directory*
 - 10 Is it permissible to use shapes in assemblies that are different from the shape that was rated by testing such as that shown in the *UL Fire Resistance Directory*?
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- 1 According to Section A3 of the 2005 AISC *Specification* bars conform to ASTM A36, A529, A572, and A709 are referenced.
- 2 False. Cast steel that conforms to ASTM A216 Grade WCB with Supplement S11, and steel forgings that conform to ASTM A668, fall within the scope of the AISC *Specification*.
- 3 The supplemental CVN requirement of 20 ft-lbs absorbed energy at +70 °F is required for plates and shapes with flanges that exceed 2 in. in thickness, used as members subject to primary tensile forces due to tension or flexure and spliced using CJP groove welds.
- 4 False. It is the core area of these shapes, not the perimeter, that can have a coarse grain structure and reduced level of toughness. For more information on this subject, download the NASCC conference proceedings for session E13, presented by Duane Miller, available for no charge at www.aisc.org/2010nascconline.
- 5 Trick question, sorry. Both (c) and (d) are correct depending upon the steel grade. According to Section M2.1 of the 2005 AISC *Specification* temperatures of heated areas shall not exceed 1,100 °F for A514 and A852 steel or 1,200 °F for other steel.
- 6 True. According to Section A3.6 of the 2005 AISC *Specification* steel stud shear connectors shall conform to the requirements of AWS D1.1.
- 7 Two methods of design for fire conditions are recognized in Appendix 4 of the 2005 AISC *Specification: Qualification Testing and Engineering Analysis*.
- 8 True. The fire performance of a concrete-filled HSS column improves when heat absorption occurs as the moisture in the concrete is converted to steam. The resulting steam must be released through vent holes in the steel section. See Section VI of AISC *Steel Design Guide 19* for additional information.
- 9 (d) ASCE/SFPE 29 and the UL *Fire Resistance Directory* are two commonly used references when fire-resistant designs are based upon qualification testing. See Section IV of AISC *Steel Design Guide 19* at www.aisc.org/epubs for more information.
- 10 Yes. All test assemblies are based upon a specific member size with spray-on thickness adjustment formulas to account for use of other shapes.

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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