

# 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 Which manufacturing process is most commonly used in the U.S. to melt the steel used to make ASTM A992 wide-flange shapes?
- 2 Which steelmaking process is most commonly used in the U.S. to melt the steel used to make the coil steel used in the production of ASTM A500 HSS?
- 3 Do steel members contain VOCs (volatile organic compounds)?
- 4 What happens to the lateral torsional buckling strength of a beam when the load is applied above the shear center?
  - a. It stays the same
  - b. It increases
  - c. It decreases
- 5 What types of restraints are addressed in the 2005 AISC specification to prevent lateral torsional buckling?
- 6 When should eccentricity be accounted for in the outstanding leg of a single-angle shear connection?
- 7 For a conventional single plate shear connection as defined in the 13th edition AISC *Steel Construction Manual*, what is the maximum distance from the bolt line to the weld line?
- 8 Can a single plate connection be used with an eccentricity larger than this value?
- 9 What grade of steel is the usual material for an HSS 5.563×0.375, and what is its value of  $F_y$ ?
- 10 What grade of steel is the usual material for a Pipe 5 X-Strong, and what is its value of  $F_y$ ?

TURN PAGE FOR ANSWERS

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## ANSWERS

- 1 W-shapes are most commonly produced in the U.S. using the electric arc furnace (EAF) process.
- 2 More than half of the coil steel in the U.S. is produced using the basic oxygen furnace (BOF) process, but a growing number of HSS producers also use coil steel produced using the EAF process.
- 3 No. The abbreviation "VOCs" stands for volatile organic compounds, and steel, being inorganic, does not contain any VOCs. VOCs may be present in coatings used with steel, however.
- 4 c. The lateral torsional buckling strength of a beam decreases when the load is raised from the shear center, due to the destabilizing effect of the load location; it increases if applied below the shear center. Most common structural details are suitable to transmit the load to the shear center.
- 5 Appendix 6 of the 2005 AISC specification (available for free download at [www.aisc.org/2005spec](http://www.aisc.org/2005spec)) permits either restraint of the compression flange against lateral translation or torsional restraint of the section to achieve bracing against lateral torsional buckling.
- 6 Eccentricity should always be accounted for in the outstanding leg of a single-angle shear connection. See page 10-122 in the 13th edition *AISC Steel Construction Manual* (available at [www.aisc.org/bookstore](http://www.aisc.org/bookstore)).
- 7 The maximum distance from the weld line to the bolt line for a conventional single plate shear connection is 3½ in.
- 8 Yes, though the extended configuration procedure found on page 10-102 of the 13th edition *Steel Construction Manual* is applicable.
- 9 As shown in Table 2-3 in the 13th edition *AISC Steel Construction Manual*, ASTM A500 grade B is the usual material for an HSS 5.563x0.375. It has  $F_y = 42$  ksi (and  $F_u = 58$  ksi).
- 10 From the same table mentioned in the answer to question 9, ASTM A53 grade B is the usual material for a Pipe 5 X-Strong. It has  $F_y = 35$  ksi (and  $F_u = 60$  ksi). Note that the Pipe 5 X-Strong and HSS 5.563x0.375 have essentially identical cross-sectional dimensions, but different strength levels.

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](mailto:solutions@aisc.org).



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