

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 website, www.aisc.org/2005spec. Where appropriate, other industry standards are also referenced.

- 1 True/False: The 2005 AISC *Specification* ASD safety factors are calibrated to give the same structural reliability and the same component size as the LRFD method at a live-to-dead load ratio of 3.
- 2 What is the value of second-order amplification in Chapter C of the 2005 AISC *Specification* beyond which the Direct Analysis Method provisions of Appendix 7 must be used?
(a) 1.0 (b) 1.5
(c) 1.7 (d) 2.0
- 3 True/False: When considering local buckling of flanges in built-up I-shaped sections, the 2005 AISC *Specification* includes the effects of web-flange interaction.
- 4 True/False: Because of strain hardening, a ductile steel bar loaded in axial tension can resist without rupture a force greater than the product of its gross area and its specified minimum yield stress.
- 5 What is the difference between the web local yielding and web crippling limit states at a local concentrated force on a member?
- 6 When evaluating existing structures through the use of load testing, is there a need to adjust the tensile yield stress determined by standard ASTM methods of testing?
- 7 True/False: The location of the shear center for a single angle is at the centroid of the section.
- 8 What value of damping, expressed as a percentage of critical damping, is generally used when evaluating steel building motion under wind events:
(a) 1% (b) 2%
(c) 3% (d) 4%
- 9 When working with ASTM A6 W-shapes with flanges of thickness in excess of 2 in., what is the minimum preheat temperature that is required when thermally cutting beam copes and weld access holes?
- 10 True/False: Grinding of paint from surfaces adjacent to joints to be field welded is required to reduce the possibility of porosity and cracking.

steel quiz ANSWERS

- 1 True. This is explained in further detail in Section A1 of the Commentary to the 2005 AISC *Specification*.
- 2 (b) According to Section C2.2 of the 2005 AISC *Specification*, use of the Direct Analysis Method is required when the ratio of second-order effects to first-order effects is greater than 1.5.
- 3 True. According to the Commentary to Section B4, k_c is used in Table B4.1 to account for the interaction of flange and web local buckling in built-up sections.
- 4 True. The tension yielding limit state is still checked, however, because excessive elongation of a tension member can limit its usefulness and precipitate failure of the system.
- 5 Web local yielding applies to both tensile and compressive forces, and limits the extent of yielding in the web. Web crippling on the other hand applies only to compressive forces and prevents crumpling of the web into buckled waves directly beneath the load. Web crippling controls for more slender webs, while web yielding controls for stockier webs. See the Commentary to Sections J10.2 and J10.3 in the AISC *Specification*.
- 6 Yes. According to the Commentary to Section 5.2 of the AISC *Specification*, the static yield stress is of interest, and can be determined using Equation C-A-5-2-1.
- 7 False. The location of the shear center—the point through which a member can be loaded as a beam without causing twist—for a single angle is at the intersection of the mid-lines of the two legs. See Figures C-F10.3 and C-F10.4 in the Commentary to the AISC *Specification*.
- 8 (a) The damping level used in evaluating steel building motion under wind events is approximately 1% of critical damping, as discussed in the Commentary to Section L6 in the AISC *Specification*.
- 9 When the curved part of the access hole is thermally cut, a pre-heat temperature of not less than 150 °F is required; See Section M2.2 of the AISC *Specification*.
- 10 False. Wire brushing to reduce the paint film thickness adjacent to joints to be field welded minimizes weld rejection. Grinding is typically not necessary, as stated in the Commentary to Section M4.5 in the AISC *Specification*.

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.

