

steel quiz

The Steel Quiz made its first appearance in the November 1995 issue of *Modern Steel Construction*. This month's Quiz takes a look at some of the best questions from 1996.

- 1 To prevent sag and vibration in long, light tension-only diagonal bracing members, they are sometimes fabricated short. This practice is known as inducing:
a. shortening **b.** stretch **c.** draw **d.** full tension
- 2 True or False: The maximum fillet weld size that can be placed along the toe of a channel flange is equal to $\frac{1}{16}$ in. less than the tabulated flange thickness.
- 3 When using heat to camber or straighten members made from ASTM A992 steel, what maximum temperature must be imposed?
- 4 True or False: An ASCE 60-lb crane rail weighs 20 lb per ft.
- 5 What two characteristics define an HP-shape?
- 6 Which of the following is true?
 - a.** A steel lintel embedded in a masonry wall is considered to be structural steel in the *AISC Code of Standard Practice*.
 - b.** For payment purposes, the weight of high-strength bolts is calculated based upon the tabulated weights in the *AISC 14th Edition Steel Construction Manual*.
 - c.** ASTM A529 covers steel that offers atmospheric corrosion resistant properties.
 - d.** *AISC 14th Edition Manual* and *AISC Specification* cover the design of cold-formed steel members.
- 7 Which of the following limit states is not solely serviceability related?
 - a.** deflection of a girder in a floor system under gravity load
 - b.** building drift under wind loading
 - c.** ponding of a roof system due to the accumulation of rainwater
 - d.** floor vibration induced by the operation of mechanical equipment
- 8 True or False: In 1942, the War Production Board sanctioned the use of a 24,000-psi allowable tensile stress instead of the then AISC-specified 20,000-psi, as well as a proportionate increase in allowable shear stress.
- 9 Which of the following applications are covered by the *RCSC Specification*?
 - a.** a bolted expansion joint detail with a slip pad between the steel plies
 - b.** a column base with four headed anchor rods embedded into concrete
 - c.** a girt connection made with ASTM A307 bolts
 - d.** none of the above
- 10 True or False: Composite beam design flexural strength is unaffected by whether the construction is shored or unshored.

TURN PAGE FOR ANSWERS

- 1 **c.** Intentionally fabricating light braces short is known as inducing draw. Bonus trivia: This guidance predates AISC and can be traced back to at least 1918. It was contained in the *Structural Engineers' Handbook: Data for the Design and Construction of Steel Bridges and Buildings* by Milo S. Ketchum.
- 2 **False.** Because channel flanges are not parallel, the toe of the flange is less thick than the average flange thickness tabulated. To comply with Section J2.2b in the *AISC Specification*, which generally limits the maximum weld size to $\frac{1}{16}$ in. less than the thickness of the edge of the connected part, this reduced thickness must be considered.
- 3 According to *AISC Specification* Section M2.1, the temperature may not exceed 1,200 °F.
- 4 **True.** Crane rails are designated by their nominal weight per yard. Therefore, an ASCE 60-lb crane rail weighs 20 lb per ft.
- 5 As defined in the *ASTM A6/A6M* Section 3.1.2.4, HP-shapes (commonly used as bearing piles) are "wide-flange shapes... whose flanges and webs are of the same nominal thickness and whose depth and width are essentially the same."
- 6 **b.** *AISC Code of Standard Practice* Section 9.2.3 indicates that "items for which weights are shown in tables in the *AISC Steel Construction Manual* shall be calculated on the basis of tabulated weights shown therein." Because high-strength bolt weights are so tabulated, they fall under this provision. Choices a, c and d are false: A steel lintel embedded in a masonry wall (i.e., not attached to the structural steel frame) is not structural steel as defined in the *AISC Code of Standard Practice* Section 2.2; *ASTM A588* (not *A529*) covers weathering steel; and *AISI* produces the *Cold-Formed Steel Design Manual* and the *North American Specification for the Design of Cold-Formed Steel Structural Members*.
- 7 **c.** Although ponding results progressively from the incrementally increasing deflection of a flat roof system as rainwater accumulates, the roof system must possess adequate strength to carry the load of the rainwater it retains. For this reason, ponding, as a limit state, is both strength and serviceability related.
- 8 **True.** The following is quoted from *AISC: The First 60 Years*: "In 1942, [the War Production Board] issued temporary national emergency specifications for the design of structural steel. To conserve material [during wartime] the WPB specification committee, on which AISC was represented, sanctioned [the aforementioned increases in allowable stress] but no increase in column stress." Bonus trivia: AISC members can download a free PDF of these temporary national emergency specifications at the Historic Standards link at www.aisc.org/epubs.
- 9 **d.** As stated in *Commentary* Section 1.1 of the *RCSC Specification*, "This specification deals principally with two strength grades of high-strength bolts, *ASTM A325* and *A490*, and with their design, installation and inspection in structural steel joints. These provisions may not be relied upon for high-strength fasteners of other chemical composition, mechanical properties or size. These provisions do not apply when material other than steel is included in the grip—nor are they applicable to anchor rods."
- 10 **True.** Because the nominal flexural strength is achieved after the composite beam has been loaded into the inelastic range (i.e., where stress is no longer proportional to strain), initial stresses in unshored construction need not be considered for the final composite cross section. Note that the steel beam is checked under the wet weight of the concrete separately—and also that total deflection can change for unshored construction.