STEEL QUIZ

STEEL QUIZ, A MONTHLY FEATURE IN *MODERN STEEL CONSTRUCTION*, allows you to test your knowledge of steel design and construction.Unless otherwise noted, all answers can be found in the *LRFD Manual of Steel Construction*. **To receive a free catalog of AISC publications, circle #10 on the reader service card in the back of this magazine.**

Correction:

Thank you to Larry Kloiber of LeJeune Steel Company for pointing out a technical error in the answer to Question 5 in the February 1996 Steel Quiz. A weld placed between plates forming an angle less than 60 degrees is considered to be a partial joint penetration groove weld (hence the Z-loss factor), not a fillet weld as the question and answer indicated.

Questions:

1. When must the bolt/nut assembly be treated as a manufactured matched assembly?

2. For a cambered beam spanning 40 ft, what tolerance is specified on the camber ordinate in the AISC *Code of Standard Practice*?

3. The term matching weld metal is used in LRFD Specification Section J2. To what are these weld metals matched and in what document are the matching weld metals defined?

4. An ASCE 60 pound crane rail weighs 20 pounds per foot, True or False?

5. Which of the following statements is false?

a. all fillet welds that conform to the requirements of AWS D1.1 are prequalified
b. small burrs do not reduce the slip resistance of bolted connections
c. galvanized faying surfaces in slip-critical connections may be roughened by means of power wire brushing
d. a flare weld is a special type of partial-joint-penetration groove weld

6. What two characteristics define an HP-shape?

7. Which of the following definitions generally describes a castellated beam?

a. a beam that has been made composite with a cast-in-place concrete slab above
b. a beam with web holes that has been fabricated from a shallower shape
c. a beam that is cantilevered over the top of a column below
d. a plate girder with periodic transverse stiffening

8. Two limit states for concentrated forces on flanges in LRFD Specification Chapter K are local flange bending and compression buckling of the web. The former is applicable only when the concentrated flange force is tensile and the latter is applicable only when a pair of compressive forces at opposite flanges would tend to pinch the web, True or False?

9. Structurally, is there a difference between a $^1/_2$ H 4 bar and a 1/2 H 4 plate?

10. Square, rectangular, and circular hollow structural sections (HSS) are appropriately ordered to which of the following ASTM Specifications?

a. A6/A6M
b. A500
c. A36
d. a or c

Answers:

1. The RCSC Specification Commentary indicates two cases in which bolts and nuts must be treated as a manufactured matched assembly: when bolts are galvanized (Section C2) and when "tension-control" bolts are specified (Section C8). In the former case, because nut-thread overtapping to accommodate the added thickness of galvanizing may reduce the nut stripping strength, ASTM A325 requires that the galvanized assembly be lubricated and tested by the manufacturer to ensure adequate rotational capacity. In the latter case, some of the negative aspects of this torque-controlled installation method are minimized through good quality control in the matched assembly.

2. AISC *Code of Standard Practice* Section 6.4.5 indicates that, for members less than 50 ft in length, the camber tolerance is minus zero/plus 1/2-in. Note that it further indicates that members received from the rolling mill with 75 percent of the specified camber require no further cambering.

3. Weld metals are matched to the steel grade being welded. Matching weld metals are specified in AWS D1.1-94 Table 4.1.

4. True. Crane rails are designated by their nominal weight per yard. Therefore, an ASCE 60 pound crane rail weighs 20 pounds per foot.

5. c. Power wire brushing polishes the galvanized surface, rather than roughening it; see RCSC Specification Commentary Section C3. Parts a, b, and d are true; see AWS D1.1-94 Section 2.7.1, RCSC Specification Commentary Section C3, and AISC LRFD Manual page 8-127, respectively.

6. As defined in 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 [flange] width are essentially the same."

7. b. Generally speaking, a castellated beam is one that is fabricated from a shallower shape by cutting longitudinally in a zig-zag-like pattern, separating and longitudinally offsetting the resulting sections, and rewelding them back together to form a deeper shape of approximately the same average weight per foot.

8. True. From LRFD Specification Section K1.2, local flange bending applies only to tensile flange forces. From LRFD Specification Section K1.6, compression buckling of the web applies only to a pair of pinching compressive forces at opposite flanges (termed "a pair of compressive single-concentrated forces or the compressive components in a pair of double-concentrated forces"; see LRFD Specification Commentary Section K1.1 and LRFD Manual page 10-35).

9. Structurally no; furthermore, plate is becoming a universally applied term today. However, the historical classification system for such structural material would suggest the following physical difference: all four sides of the $^1/_2$ H 4 bar would be rolled edges, i.e., the mill rolled it to that thickness and width; the $^1/_2$ H 4 plate might have been cut from a $^1/_2$-in. plate of greater width.

10. b. ASTM A500 is appropriate when specifying square, rectangular, and circular HSS. Note that pipe-size rounds (P, PX, and PXX) are also available in material meeting ASTM A53 grade B.