

**S**TEEL 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.**

## QUESTIONS:

1. Trivia: Why did 39 ft become a popular available length for crane rails?

2. LRFD Specification Table J3.2 indicates that when the pattern of fasteners in a bolted joint exceeds 50 in., tabulated design strengths should be reduced by 20 percent. Why?

3. 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 or seismic loading
- c) ponding of a roof system due to the accumulation of rainwater
- d) floor vibration induced by the operation of mechanical equipment

4. As defined in *AISC Code of Standard Practice* Section 7.9, what is the difference between a self-supporting and a non-self-supporting steel frame?

5. Technical organizations and trade associations are commonly known by their initials. For instance AISC is the American Institute of Steel Construction. What are the full names of the organizations identified by the following letters: AWS, SJI, SDI, STI, AISI, ASTM, IFI, RCSC, and SSPC?

6. 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, True or False?

7. What is the difference between a flare weld and a partial-joint-penetration groove weld?

8. In which of the following cases does block shear rupture apply as a limit state?

- a) to a beam web that is connected to a girder (beam top flange is coped away)
- b) to a double-angle tension member bolted to a gusset plate
- c) to a beam web that is connected to a column flange (the beam end is square-cut)
- d) to all of the above

9. A piece of steel is marked with blue and yellow paint. What grade of steel is it?

10. Both the AISC and RCSC Specifications require that paint on the faying surfaces of slip-critical connections be qualified (providing a minimum slip coefficient) or that such surfaces remain unpainted. Does this requirement apply to the surfaces under the bolt head and nut?

## ANSWERS:

1. They were shipped in open-topped gondola cars that were 40 ft long (source: *On the (Bi)Level*, monthly newsletter of Chicago's Metra commuter rail service).
2. As indicated in *Guide to Design Criteria for Bolted and Riveted Joints* (Figure 5.28, p. 107) the average shear strength per bolt varies with the number of bolts in the joint. To simplify joint design, bolt shear strengths in the RCSC and AISC Specifications incorporate a 20 percent reduction to allow the use of a consistent per-bolt design strength for joints up to 50 in. in length. However, if joint length exceeds 50 in., the designer must further reduce the design strength by another 20 percent.
3. 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.
4. A non-self-supporting steel frame requires interaction with non-structural steel elements (a precast concrete shear wall system, masonry infill, metal deck diaphragms, etc.) for stability while resisting gravity and/or lateral loads, even when completely erected. A self-supporting steel frame, once completely erected, is stable while resisting gravity and/or lateral loads. Note that structural steel and non-structural elements are as defined in AISC *Code of Standard Practice* Section 2.0.
5. The call letters are identified as follows: AWS American Welding Society, SJI Steel Joist Institute, SDI Steel Deck Institute, STI Steel Tube Institute, AISI American Iron and Steel Institute, ASTM American Society for Testing and Materials, IFI Industrial Fasteners Institute, RCSC Research Council on Structural Connections, and SSPC Steel Structural Painting Council. Addresses, telephone and fax numbers for these and many other steel-construction-related organizations are printed in Part 13 of the 2nd Edition AISC LRF D *Manual of Steel Construction*.
6. 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."
7. A flare weld is a special kind of partial-joint-penetration groove weld wherein the convex surface of the connected part(s) creates the joint preparation.
8. a and b. Block shear rupture does not apply to case c because the top flange has not been coped away.
9. From ASTM A6/A6M Section 12.6.3, steel marked with blue and yellow paint is ASTM A588 steel.
10. No. In a slip-critical connection, the faying surfaces are those that resist relative movement (or slip) of the plies, which occurs on the contact surfaces between the plies, not those surfaces under the bolt head or nut.