

Steel Quiz, a monthly feature in *Modern Steel Construction*, allows you to test your knowledge of steel design and construction. All references to LRFD specifications pertain to the 1999 *LRFD Specification for Structural Steel Buildings*, available as a free download at

www.aisc.org/lrfdspec

ASD references pertain to the 1989 *ASD Specification for Structural Steel Buildings*. Where appropriate, other industry standards are also referenced.

If you or your firm are interested in submitting a *Steel Quiz* question or column, contact:

The logo for Steel SolutionsCenter features the word "Steel" in a smaller font above "SolutionsCenter", which is in a larger, bold font. A blue swoosh underline is positioned beneath "SolutionsCenter".

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This month's *Steel Quiz* was contributed by **Ashley Byrne**, an AISC summer engineering intern from Penn State University.

1. In non-seismic FR moment connections across girder supports, how must the top flange be connected?
2. True or False: Connections providing design strength shall be designed to support a factored load not less than 10 kips, except for lacing, sag rods, or girts.
3. What is the maximum center-to-center spacing of shear connectors in composite beams according to the 1999 *LRFD Specification*?
4. What purpose does a weld access hole serve?
5. With respect to slip-critical joints, what is the process for producing a galvanized faying surface?

6. What is prying action?
7. What is the tolerance for the elevation of the top of an anchor bolt in reference to the erection drawings?
8. How do water-filled and concrete-filled HSS columns perform in a fire?
9. Is local application of heat permitted to be used to introduce or correct camber?
10. Who is responsible for field painting?

Bonus Question:

11. When bolts cannot be properly identified visually in existing structures, can one assume that the bolts are ASTM A307?

TURN PAGE FOR ANSWERS

STEEL QUIZ

ANSWERS

1. According to the 3rd edition *LRFD Manual* (p. 12-23), the top flange can be directly welded to the top flange of the supporting girder. Also, an independent splice plate can be used to tie the two beams together by use of a longitudinal fillet weld or bolts. This tie plate does not require attachment to the girder flange, although it is sometimes so connected to control noise if the connection is subjected to vibration.
2. True. Refer to the 1999 *LRFD Specification*, Section J1.7.
3. Referring to Section I5.6 of the 1999 *LRFD Specification*, the maximum center-to-center spacing shall not exceed eight times the total slab thickness. In addition, according to Section I3.5b, the spacing of stud shear connectors along the length of a supporting beam shall not exceed 36".
4. The primary purpose of a weld access hole, as the name implies, is to allow the welder access to start and stop the weld beyond the plane of a beam web or other obstruction. At the same time, the weld access hole also minimizes restraint to allow for shrinkage in the welded joint and eliminates the intersection of welds in orthogonal directions (and the associated intersection of stresses).
5. According to the 2000 *RCSC Specifications for Structural Joints Using ASTM A325 or A490 Bolts*, Section 3.2.2(c), galvanized faying surfaces shall first be hot-dip galvanized in accordance with the requirements of ASTM A123 and subsequently roughened by means of hand wire brushing. Power brushing is not permitted. When prepared by roughening, the galvanized faying surface is designated Class C for design.
6. As defined on page *x* of the 2000 *RCSC Specification for Structural Joints Using A325 or A490 Bolts*, prying action is lever action that exists in connections in which the line of application of the applied load is eccentric to the axis of the bolt, causing deformations of the fitting and an amplification of the axial tension in the bolt. Refer to page 9-10 of the 3rd Edition *LRFD Manual* for additional information.
7. According to 2000 *AISC Code of Standard Practice for Steel Buildings and Bridges*, Section 7.5.1(c), the variation in elevation of the tops of Anchor Rods shall be equal to or less than plus or minus 1/2".
8. The answer to this question is found on the AISC website as FAQ 11.2.6 (www.aisc.org/faq). Water or concrete placed inside HSS members acts as a "heat sink," reducing the temperature rise in the steel and significantly enhancing its fire resistance. In the case of concrete-filled HSS columns, the concrete contributes to the load-bearing capacity of the member as the strength of the outside steel shell decreases under heat exposure.
9. Yes. According to the 1999 *LRFD Specification*, Section M2.1, local application of heat or mechanical means is permitted to be used to introduce or correct camber, curvature, and straightness. The temperature of heated areas, as measured by approved methods, shall not exceed 1,100 0F (593 0C) for A514/A514M and A852/A852M steel nor 1,200 0F (649 0C) for other steels.
10. Responsibility for touch-up painting, cleaning, and field painting shall be allocated in accordance with accepted local practices, and this allocation shall be set forth explicitly in the design documents. Refer to 1999 *LRFD Specification*, Section M4.6.
11. Yes. According to the 1999 *LRFD Specification*, Section N2.6, a visually unidentifiable bolt may be assumed to be ASTM A307.