

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.html

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:



One E. Wacker Dr., Suite 3100
Chicago, IL 60601
tel: 312.670.2400
fax: 312.423.4651

solutions@aisc.org

This month's *Steel Quiz* was contributed by **Victor Shneur**, of Lejeune Steel, Minneapolis, MN.

QUESTIONS

1. Per the 1999 AISC Specification, what is the minimum shear stud extension above the top of the steel deck?
2. How do single-plate simple shear connections provide for the rotational ductility?
3. Which of the following is the minimum allowed effective length of a segment of intermittent fillet welding?
 - a. Four times the weld size, but not less than 1.5"
 - b. Three times the thickness of the thickest plate being welded to
 - c. 3"
 - d. As small as the welder can make it
4. Which of the following grades should not be specified for ASTM F1554 anchor rods?
 - a. Grade 36
 - b. Grade 46
 - c. Grade 55
 - d. Grade 70
 - e. Grade 105
5. What is the minimum center-to-center spacing of plug welds?
6. What is a Z loss reduction for partial joint penetration groove welds?
7. What is the "banging bolt syndrome"?
8. Should A325 and A490 bolts be specified for use as anchor rods at column bases?
9. Do the surface requirements for slip-critical connections apply to the surfaces under the bolt head, washer, or nut?
10. How does the heat of welding near A325 and A490 bolts affect the mechanical properties of these bolts?

TURN PAGE FOR ANSWERS

STEEL QUIZ

ANSWERS

1. From Section I3.5a: "Shear stud connectors, after installation, shall extend not less than 1½ in. (38 mm) above the top of the steel deck".
2. As explained on page 9-12 of the LRFD *Manual*, 3rd edition, "For single-plate connections, the geometry and thickness of the plate are configured so that the plate will yield, the bolt group will rotate and/or the bolt holes will elongate at failure prior to the failure of the welds or bolts."
3. a. See LRFD *Specification* Section J2.2b.
4. b & d. ASTM F1554 is applicable in grades 36, 55 and 105.
5. Per AWS D1.1 Section 2.9.1, the minimum spacing is 4 times the diameter of the hole.
6. Z loss reduction is a dimension to account for lack of penetration to the root of partial joint penetration welds. Tables 2.2 and 2.8 of AWS D1.1-2000 give Z loss dimensions for nontubular and tubular connections for different angles, welding processes, and positions.
7. The "banging bolt" syndrome is a slipping of pretensioned bolts into bearing under service loads. As indicated in the *Journal of Structural Engineering* (Vol. 118 No. 12 Dec. 1992), it is "strictly a serviceability issue" and "does not compromise the strength of the connection or the safety of the structure". See this journal for more information on "banging bolts". There was also an interesting article on banging bolts in the November 1999 issue of *Modern Steel Construction*, available for viewing at www.modernsteel.com
8. Absolutely not. As stated in Section 1.2 of ASTM A325 and in Section 1.1 of ASTM A490, "The bolts are intended for use in structural connections/joints." Standards ASTM A325 and ASTM A490 include defined threaded length and heading requirements, and when bolt length exceeds 9½" special order is typically required. ASTM F1554 is recommended.
9. No. The faying surfaces are those in contact within the plies of the joint.
10. As noted in the Commentary of Section J1.9 of the LRFD *Specification for Structural Steel Buildings*, "The heat of welding near bolts will not alter the mechanical properties of the bolts". However, the welder should be careful when welding too close to bolts, especially A490 bolts.