

# 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*, 2<sup>nd</sup> edition.

If you or your firm are interested in submitting a Steel Quiz column, please contact Scott Melnick at 312/670-8311 or via email at [melnick@aiscmail.com](mailto:melnick@aiscmail.com). Steel Quiz questions and answers may also be faxed to 312/670-0341.

The questions and answers for this month's Steel Quiz were contributed by **Victor Shneur**, P.E., of the LeJeune Steel Company, Minneapolis, MN. Thank you Victor!

## QUESTIONS

1. What is the maximum root opening for a fillet weld joining two plates 2 inches in thickness each?
2. Why is the maximum plate thickness limited in single-plate connection?
3. What does the term "weldability" mean?
4. What are the limit states for the wall of an HSS at a stiffened seated connection?
5. When should compression web buckling of a W-shape web be checked?
6. Where can one find the design procedure to utilize the directional increase in fillet weld strength?
7. What tolerances are applicable for setting the elevation of an embedded bearing plate?
8. True or False? Eccentricity should always be considered in the design of welds for double-angle connections.
9. Do the surface requirements for slip-critical connections apply to the surfaces under the bolt, washer, or nut?
10. When a single-angle connection is specified, why should there be no weld at the top or heel of the angle at the supporting member?

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## ANSWERS

1. The maximum root opening should be 3/16 inch. Refer to AWS D1.1-98 Section 5.22.1 for requirements for the leg of the fillet weld if the root opening is greater than 1/16 inch.
2. The maximum plate thickness is limited in single plate connections to provide for rotational ductility in the single plate.
3. From AWS D1.1-98, Annex B: weldability is defined as "The capacity of a material to be welded under the imposed fabrication conditions into a specific, suitably designed structure and to perform satisfactorily in the intended service."
4. From the AISC *HSS Connections Manual*, Table 4-2: base metal shear at the weld and a yield line mechanism are the two limit states for the HSS wall at a stiffened seated connection.
5. From the LRFD *Specification*, Section K1.6, Compression Buckling of the Web: this limit state "applies to a pair of compressive single-concentrated forces or the compressive components in a pair of double-concentrated forces, applied at both flanges of a member at the same location."
6. The LRFD *Specification* Appendix J2.4, covers this procedure.
7. From the AISC *Code of Standard Practice for Steel Buildings and Bridges* Section 7.6: "Tolerance on elevation relative to established grades of bearing devices, whether set by the owner or by the erector, is +/- 1/8 in."
8. True. Although eccentricity is commonly ignored for many configurations of connections that utilize bolted joints (within well-defined limits), eccentricity is nearly always considered in the design of connections that utilize welded joints.
9. No. From *A Guide to Engineering and Quality Criteria for Steel Structures: Common Questions Answered*, 4<sup>th</sup> ed., p. 43: "In a slip-critical connection, the faying surfaces are those that resist relative movement (or slip) of the plies. This occurs on the contact surfaces between the plies, not those surfaces under the bolt head or nut."
10. Welding the top or heel of the single angle at the supporting member is omitted to provide the necessary connection flexibility.