

steel quiz

LOOKING FOR A CHALLENGE? Modern Steel Construction's monthly Steel Quiz tests your knowledge of steel design and construction. The answers for many of this month's questions can be found in the 2005 AISC Specification for Structural Steel Buildings (available as a free download at www.aisc.org/freepubs) and the 2009 RCSC Specification for Structural Joints Using High-Strength Bolts (available as a free download at www.boltcouncil.org).

- 1 What are the current reference standards used in the U.S. for welded design and construction in buildings?
- 2 True/False: The American Welding Society is a part of the American Institute of Steel Construction.
- 3 Which of the following statements is most correct about the use of bolts in combination with welds to resist the load in a connection?
 - a) The use of bolts in combination with welds in the same connection is not permitted by AISC.
 - b) The use of bolts in combination with welds in the same connection is permitted by AISC, subject to the discretion of the Engineer of Record.
 - c) Shear connections with standard or short slotted holes transverse to the load are permitted to share load with longitudinally loaded fillet welds.
 - d) (c) is correct except the strength of the bolts shall not be taken as greater than 50% of the available strength of bearing-type bolts in the connection.
- 4 Why is the square root of 2 involved in the determination of the effective throat dimension of a fillet weld?
- 5 True/False: According to the 2005 AISC Specification, the Engineer of Record shall indicate in the contract document the effective throat required for a partial joint penetration groove weld.
- 6 True/False: The AISC Specification requires that steel backing must be removed after welding in all cases.
- 7 True/False: Welding is hot enough to burn away coatings without impairing the weld to be made.
- 8 True/False: When detailing and fabricating an extended end plate seismic moment connection as given in ANSI/AISC 358-05, Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications, it is prohibited to use a weld access hole in the detail for the CJP groove weld between the flange of the beam and the end plate.
- 9 What is the fillet weld size that must be used between a backing bar that is not removed and the column flange when making CJP groove welds between beam and column flanges of a prequalified seismic moment connection?
 - a) $\frac{1}{8}$ in.
 - b) $\frac{1}{4}$ in.
 - c) $\frac{5}{16}$ in.
 - d) $\frac{1}{2}$ in.
- 10 True/False: Welded joints that are required to comply with the AISC Seismic Provisions must comply with AWS D1.8.

- 1 ANSI/AISC 360-05, Specification for Structural Steel Buildings (for R=3 systems) and ANSI/AISC 341-05, Seismic Provisions for Structural Steel Buildings (for systems detailed for seismic resistance) establish the fundamental requirements and invoke provisions in AWS D1.1, Structural Welding Code—Steel (ANSI/AISC 360 and ANSI/AISC 341) and D1.8, Structural Welding Code—Seismic Supplement (ANSI/AISC 341).
- 2 False. The AWS is an independent organization that advances the science, technology and application of welding and has more than 50,000 members. AWS and AISC work closely together on many important issues related to welded structural steel connections.
- 3 (d) According to Section J1.8 of the 2005 AISC Specification, shear connections with standard or short slotted holes transverse to the load are permitted to share the load with longitudinally loaded fillet welds as long as the strength of the bolts is not taken as greater than 50% of the available strength of bearing-type bolts in the connection.
- 4 For the usual case of a fillet weld of equal leg sizes, the effective throat can be determined from the leg size divided by the square root of 2.
- 5 False. The 2005 AISC Specification does not prescribe how the effective throat of partial joint penetration groove welds must be communicated to the fabricator. Rather, a user note in Section J2.1(a) suggests two methods that can be used: indication of either the effective throat or the weld strength required in the contract documents.
- 6 False. Steel backing is commonly left in place when it does not result in unintended load paths or unanticipated stress rises. Structures where fatigue or seismic loading is anticipated have more stringent requirements on how to handle steel backing bars.
- 7 False. Primers, paints, galvanizing and other coatings require consideration and may need to be removed prior to welding. See Section 12.2 of AISC Steel Design Guide No. 21, Welded Connections—A Primer for Engineers for more information. All 24 AISC design guides are available as free downloads for AISC members at www.aisc.org/epubs. There is a nominal charge for non-members.
- 8 True. Testing had demonstrated that the weld access hole in extended end-plate moment connections for seismic applications interrupts the load transfer to the bolts inside the flange and prevents proper development of the beam flange. See Fig. 2.10 of AISC Steel Design Guide No. 4, Extended End-Plate Moment Connections for Steel Buildings, for how to specify and fabricate the connection between the flange and end-plate without weld access holes.
- 9 (c) According to Section 3.3.3 of ANSI/AISC 358-05, a $\frac{5}{16}$ -in. fillet weld shall be used to connect the backing bar to the column in cases where the backing bar is not removed when making CJP welds between beam and column flanges.
- 10 True. The requirements in AWS D1.8 (which in the 2010 AISC Seismic Provisions replaces Appendix W in ANSI/AISC 341-05 as a reference document) must be met for high-seismic welding.



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Anyone is welcome to submit questions and answers for Steel Quiz. If you are interested in submitting one question or an entire quiz, contact AISC's Steel Solutions Center at 866.ASK.AISC or at solutions@aisc.org.