

Modern Steel Construction's monthly *Steel Quiz* 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 from AISC's web site:

[www.aisc.org/lrfdspec](http://www.aisc.org/lrfdspec)

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

Anyone is welcome to submit questions for *Steel Quiz*—one question or 10! If you or your firm are interested in submitting a *Steel Quiz* question or column, contact ►

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This month's quiz was developed by AISC's Engineering and Research department with input from Victor Shneur of LeJeune Steel, Minneapolis. Sharpen your pencils and go!

**1. True or False:** When finger shims are used in bolted joints, the requirements for long-slotted holes are applicable.

**2.** Which of the following statements is true?

- a. All steel must be painted.
- b. Primer is sufficient to prevent corrosion until the building is enclosed.
- c. Steel at the building perimeter requires special coatings, even when isolated by building finishes.

**3.** Is it acceptable to fill weld access holes with weld metal for cosmetic or corrosion-protection reasons?

**4.** When must the strength of a bolted joint be reduced for the number of bolts used?

**5.** Are all shear studs required to be field-installed to eliminate the tripping hazard defined in OSHA's safety regulations for steel erection?

**6.** ASTM F1852 is the standard that provides the twist-off equivalent of an ASTM A325 bolt. Is there an equivalent standard for ASTM A490 bolts in twist-off configuration?

**7.** Can gages other than those shown as workable gages in the 3rd Edition AISC *LRFD Manual of Steel Construction* be used?

**8.** In which of the following situations must the AISC *Seismic Provisions* be met?

- a. Seismic Design Category C with  $R=3$
- b. Seismic Design Category B with  $R=3$
- c. Seismic Design Category D with  $R=8$
- d. Seismic Design Category B with  $R=8$

**9.** What dimensional tolerances apply to welded structural members?

**10. True or False:** approval of shop and erection drawings means the Structural Engineer of Record is accepting responsibility for the accuracy of the detailed dimensions and fit-up in the field.

**Turn page for answers**

## Answers

1. **False**, per *RCSC Specification* Commentary Section 3.3.4. The *RCSC Specification for Structural Joints Using ASTM A325 or A490 Bolts* is a free download at [www.boltcouncil.org](http://www.boltcouncil.org).
2. This is a trick question—all are false as absolute statements!
  - a. Most steel (including that enclosed by building finishes, in contact with concrete or to receive fire protection materials) need not be painted. Steel exposed to a corrosive environment must be protected.
  - b. Primer is a bonding layer that improves the adhesion of the paint layers to the steel, not a protective coating. See Section 6.5.1 of the *AISC Code of Standard Practice*.
  - c. Perimeter steel within the building envelope requires no special treatment. Corrosion can become an issue if the façade fails, but this concern is true for all materials and has its solution in a properly performing façade system.
3. This practice is not recommended as it defeats all the purposes for which the weld access hole was used in the first place (except access for welding). Section 5.17.1 of AWS D1.1/D1.1M:2004 states: “When weld access holes shall be closed for cosmetic or corrosion protection reasons, sealing by use of mastic materials is preferable to welding.”
4. End-loaded connections, such as a flange plate in a moment connection, have a non-uniform distribution of shear on the bolts. Side-loaded joints, like shear connections and gusset edges, do not. To account for the case of end-loaded joints and to keep bolted joint design simple, an across-the-board reduction of 20 percent is already included in the design strength of bolts in the *AISC Specification*. This covers all joints up to 50” in length. For end-loaded joints of length exceeding 50”, an additional 20 percent reduction is necessary per *AISC LRFD Specification* Table J3.2, footnote e.
5. No. There was an article in the May 2001 issue of *Modern Steel Construction* that addresses the OSHA requirements in general, and the tripping hazard requirements specifically (see [www.aisc.org/osha-erection](http://www.aisc.org/osha-erection)). If a shear stud does not cross a walking surface, it is not a tripping hazard and can be shop-installed.
6. No, but such a standard is under development. For now, ASTM A490-strength-level twist-off type tension-control bolt assemblies are used under the alternative design fastener provision in *RCSC Specification* Section 2.8.
7. The gages shown are workable, but not absolutely required, as indicated in the *Manual* definition of the term “workable gages.” Other gages more convenient or common throughout a given project can be used as long as they satisfy edge distance, entering and tightening, and force transfer requirements.
8. The *AISC Seismic Provisions* must be met in both c and d. When in Seismic Design category A, B or C, one can use  $R=3$  and the detailing requirements in the *AISC Seismic Provisions* need not be met. If in Seismic Design Category D, E or F, you must use a system in the *AISC Seismic Provisions* and meet the detailing requirements appropriate for the associated level of  $R$ . Also, if the design is based upon an  $R$  greater than 3, the *AISC Seismic Provisions* requirements for that value of  $R$  must be met regardless of which SDC it is in.
9. The dimensional tolerances for welded structural members are given in AWS D1.1/D1.1M:2004 Section 5.23.
10. **False**. Per *AISC Code of Standard Practice* Section 4.4.1, “... approval shall not relieve the Fabricator of the responsibility for either the accuracy of the detailed dimensions in the Shop and Erection Drawings or the general fit-up of parts that are to be assembled in the field.” ★