

*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](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.

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January's *Steel Quiz* was contributed by Sergio Zoruba, Ph.D., of AISC's Steel Solutions Center.

1. Which grade of ASTM F1554 is the preferred material specification for anchor rods?  
whose length, measured parallel to the line of force, exceeds 50 in.?
2. What does tension or compression parallel to the axis of a fillet weld mean? Refer to Table J2.5 of the 1999 *LRFD Specification*.
3. Why is it preferable to limit the slenderness ratio for tension members?
4. What is the difference between structural steel and other steel, iron or metal items?
5. **True or False?** Restraint against longitudinal rotation is required at beam or girder supports.
6. Have end-plate moment connections been tested for seismic applications?
7. How is the required minimum bolt pretension for A325 or A490 high-strength bolts installed in pretensioned joints determined?
8. How would one find the geometric and material properties of a W14x136?
9. What must be done when bolted connections have a fastener pattern
10. Where and when will the 2003 North American Steel Construction Conference (NASCC) be held?

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# STEEL QUIZ

## ANSWERS

1. According to the 3rd edition *LRFD Manual*, ASTM F1554 Grade 36 is the preferred material specification for anchor rod. The availability of ASTM F1554 Grade 55 and 105 should be confirmed prior to their specification.
2. It means that a force is applied equally to the longitudinal axis of the weld and the base metal. An example would be a fillet welded built-up column under axial compression, where there is no net force difference between the fillet weld longitudinal axis and the surrounding base metal.
3. From the 1999 AISC *LRFD Specification Commentary* Section B7, this recommended limit is “based on professional judgment and practical considerations of economics, ease of handling, and care required to minimize inadvertent damage during fabrication, transport and erection.” It is further indicated that this requirement is not strength related. This rule also ensures that a non-prestressed structural brace will be stiff enough that significant lateral deflection of the structure will not be required to activate the strength of the brace. As such, this requirement does not pertain to rod bracing, cable bracing and other light bracing systems that are fabricated and installed with draw to activate the brace.
4. Section 2.1 of the 2000 *Code of Standard Practice* contains a definition and detailed list of items that generally qualify as structural steel. Section 2.2 lists other steel, iron or metal items. The general distinction is that items normally made and provided by a steel fabricator are listed in Section 2.1. Otherwise, the item appears in Section 2.2 and may be furnished by the Fabricator only if specifically contracted to do so.
5. True. This extremely important provision can be found in Section B6 of the 1999 *LRFD Specification*.
6. Yes. The four-bolt unstiffened and eight-bolt stiffened end-plate moment connections are included in FEMA 350 for seismic applications with  $R > 3$ . For other applications, including when  $R$  is taken as 3, refer to AISC *Design Guide 4—Extended End-Plate Moment Connections* and the recently released *Design Guide 16—Flush and Extended Multiple-Row Moment End-Plate Connections*.
7. The value is 70% of the minimum tensile strength of the A325 or A490 high-strength bolt. Refer to Table J3.1 of the 1999 *LRFD Specification* for specific values or Table 8.1 of the 2000 RCSC *Bolt Specification*. For additional information, see AISC *Design Guide 17—High Strength Bolts: A Primer for Structural Engineers*.
8. A trick question, as W14×136 is no longer rolled by the mills nor included in the ASTM A6 Specification. For dimensional, geometric and material properties of older shapes, refer to *Design Guide 15—AISC Rehabilitation and Retrofit Guide: A Reference for Historic Shapes and Specifications*.
9. The design strength of the fasteners must be reduced by 20% to account for the non-uniform distribution of force among the bolts. Refer to Table J3.2 (footnote [e]) of the 1999 *LRFD Specification* and AISC *Design Guide 17—High Strength Bolts: A Primer for Structural Engineers*.
10. The 2003 NASCC will be held in Baltimore, MD on April 2–5, 2003. Check out the advance program included in the December 2002 issue of *Modern Steel Construction*, or visit AISC’s web site, [www.aisc.org](http://www.aisc.org), for more information.