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*. **To receive a copy of the 1997 AISC Publications List, please call 800/644-2400 or fax 312/670-5403.**

QUESTIONS:

1. To what ASTM Specifications are hollow structural sections (HSS) commonly ordered?

2. True or False? The nominal wall thickness should be used in all calculations involving HSS.

3. True or False? The AISC Specification for the Design of Steel Hollow Structural Sections (1997) is exclusively LRFD.

4. True or False? The AISC Seismic Provisions for Structural Steel Buildings (1997) is exclusively LRFD.

5. True or False? The AISC Seismic Provisions are applicable to structural steel buildings in all seismic areas.

6. Is it necessary to mill bearing surfaces after sawing?

7. Is it permissible to use controlled heat to straighten, curve, or camber structural steel?

8. What is “tension field action"?

9. At the time of the first AISC Specification (1923), which structural steel was used and what was its strength?

10. Give the URLs (i.e., Internet addresses) of some World Wide Web sites related to structural steel.

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ANSWERS:

1. According to the AISC *Hollow Structural Sections Connections Manual* (1997): ASTM A500 and A847 are appropriate when specifying square, rectangular, and round HSS. These specifications cover cold-formed production of both welded and seamless HSS; ASTM A847 offers atmospheric corrosion resistance properties similar to those of ASTM A588 for W shapes. Pipe-size rounds (standard weight, extra strong, and double-extra strong) are also available in ASTM A53 Grade B material.

2. False. As stated in the Commentary on Section 1.2.2 of the AISC *Specification for the Design of Steel Hollow Structural Sections* (contained in the 1997 HSS Connections Manual): "ASTM A500 tolerances allow for a wall thickness that is not greater than plus/minus 10% of the nominal value. Because the plate and strip from which electric-resistance-welded (ERW) HSS are made are produced to a much smaller thickness tolerance, manufacturers in the U.S. consistently produce ERW HSS with a wall thickness that is near the lower-bound wall thickness limit. Consequently, AISC and the Steel Tube Institute of North America (STI) recommend that 0.93 times the nominal wall thickness should be used for calculations involving engineering design properties of ERW HSS.... Submerged-arc-welded (SAW) HSS are produced with a wall thickness that is near the nominal thickness and require no such reduction."

3. True. The 1997 HSS Specification is officially a supplement to the 1993 *AISC LRFD Specification.*

4. False. Although the 1997 Seismic Provisions is predominantly an LRFD document, an ASD Alternative is the subject of Part III.

5. False. As stated in Section I.1: : "These Provisions shall apply to buildings that are classified in the Applicable Building Code as Seismic Design Category D (or equivalent) and higher or when required by the Engineer of Record." In general, the AISC Seismic provisions are mandatory in areas of high seismicity and for essential facilities in areas of moderate seismicity. Use of these provisions elsewhere is not mandatory unless specified by the EOR.

6. No. According to Section M2.6 of the *AISC LRFD Specification*: "Compression joints which depend on contact bearing...shall have the bearing surfaces of individual fabricated pieces prepared by milling, sawing, or other suitable means." The AISC Code of Standard Practice for Steel Buildings and Bridges (1992), in Section 6.2.2, states: "Surfaces noted as 'finished' on the drawings are defined as having a maximum ANSI [i.e., ANSI/ASME B46.1] roughness height value of 500. Any fabricating technique, such as friction sawing, cold sawing, milling, etc., that produces such a finish may be used." Cold-sawing equipment produces cuts that are satisfactory.

7. Yes. AWS D1.1-98 (Structural Welding Code—Steel), Section 5.26.2, permits heat straightening of members that are distorted by welding and provides rules for this procedure. These rules are equally applicable for all heat straightening or curving. Also, the current AISC *LRFD Specification* (Section M2.1) and the Second Edition of the *LRFD Manual* (p. 1-12) provide a basis for the use of controlled heat to straighten, curve, camber, and form structural steel.

8. Tension field action is the post-buckling behavior of a plate girder panel under shear force in which diagonal tensile stresses develop in the web and compressive forces develop in the transverse stiffeners in a manner analogous to a Pratt truss. When tension field action is considered, *LRFD Specification* Appendix G3 applies; otherwise, Section F2 is used.

9. The 1923 *AISC Specification* required ASTM A9 steel: tensile strength = 55 to 65 ksi, minimum yield point = half of tensile strength, and allowable stress for tension or bending = 18 ksi.

10. Web sites providing information on structural steel include:
    http://www.aisc.org
    http://www.modernsteel.com
    http://www.steel.org
    http://www.steel-link.com