

Steel Quiz

Steel Quiz, a monthly feature in *Modern Steel Construction*, allows you to test your knowledge of steel design and construction. Answers can generally be found in the *LRFD Manual of Steel Construction*, 2nd edition, but other industry standards are often referenced.

If you or your firm are interested in submitting a *Steel Quiz* question or column, please contact:

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This month's Steel Quiz was contributed by **Victor Shneur, P.E.**, of the LeJeune Steel Company, Minneapolis, MN.

Questions

1. True or False: Short-slotted holes and long-slotted holes are permitted to be used without regard to the direction of loading in slip-critical connections.
2. What is a complete-joint-penetration groove weld?
3. What is the additional required procedure for hot-dip galvanized surfaces to be used in slip-critical connections?
4. What is a "torsionally pinned end" condition?
5. What is the maximum acceptable temperature for cambering ASTM A36, A572, A913, and A992 beams?
6. Which bolts are more ductile: ASTM A325 or A490.
7. How is the shear strength of ASTM A325 and A490 bolts affected by pretension in the fasteners?
8. The amount of structural steel used in the construction of the

Empire State Building is:

- a. 30,000 tons
 - b. 60,000 tons
 - c. 90,000 tons
 - d. 120,000 tons
 - e. 150,000 tons
9. Can ASTM F959 compressive-washer-type direct tension indicators be galvanized?
 10. What is the definition of the "snug-tight" condition for ASTM A325 and A490 bolts?

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Answers

1. True. Refer to the RCSC *Specification for Structural Joints Using ASTM A325 or A490 Bolts* (1994) for special washer requirements when slotted holes are in external plies.
2. From AWS D1.1:2000, Annex B: **complete joint penetration groove weld (statically and cyclically loaded structures)** *A groove weld which has been made from both sides or from one side on a backing having complete penetration and fusion of weld and base metal throughout the depth of the joint.*
3. To provide sufficient slip resistance, hot-dip galvanized surfaces should be roughened. Wire brushing (but not power wire brushing, which tends to polish the surface) is usually used for this purpose.
4. A torsionally-pinned end is an end which is permitted to warp but is not permitted to rotate.
5. 1200°F.
6. ASTM A325 bolts are commonly more ductile than A490 bolts.
7. The commentary on the RCSC *Specification for Structural Joints Using ASTM A325 or A490 Bolts* (1994), Section C4, states: *The shear strength of bolts is not affected by pretension in the fasteners provided the connected material is in contact at the faying surfaces.*
8. b. With about 2.1 million square feet, that works out to be about 57 lbs. per square foot.
9. Only Type 325 direct tension indicators for ASTM A325 bolts can be galvanized. From ASTM F959, Section 5.4.2: *When “zinc coated” is specified, the direct tension indicators shall be zinc coated by the mechanical deposition process in accordance with the requirements of Class 50 of Specification B695.*
10. From the *Specification for Structural Joints Using ASTM A325 or A490 Bolts* (1994), Section 8(c): *...the tightness that exists when all plies in a joint are in firm but not necessarily continuous contact.* Also, from the LRFD *Specification for Structural Steel Buildings*, section J3.1: *...the tightness attained by either a few impacts of an impact wrench or the full effort of a worker with an ordinary spud wrench that brings the connected plies into firm contact.*