

steel quiz

LOOKING FOR A CHALLENGE? *Modern Steel Construction's* monthly Steel Quiz tests your knowledge of steel design and construction. The answers to this month's Steel Quiz can be found in the 2005 *Specification for Structural Steel Buildings* (available as a free download at www.aisc.org/freepubs) and *AISC Steel Design Guide 19, Fire Resistance of Structural Steel Framing*, also a free download for AISC members at www.aisc.org/epubs.

- 1 According to the 2005 AISC *Specification* can plug welds be designed to resist tensile loads?
- 2 Can twist-off-type tension-control (TC) bolts be pretensioned using the turn-of-nut method?
- 3 What are the correct numbers in the following sentences? AISC 358-05 contains ___ prequalified seismic moment connections; AISC 358-05 *Supplement No. 1* adds ___ more prequalified moment connections for seismic frames.
 - a) 2, 2
 - b) 2, 3
 - c) 3, 2
 - d) 3, 3
- 4 True/False: Short-slotted holes are permitted in any and all plies of slip-critical or bearing joints.
- 5 In the 2005 AISC *Seismic Provisions*, are bolts and welds permitted to be designed to share force in the same joint?
- 6 Which of the following connections require that the joint must be slip-critical?
 - a) Simple shear connections with SSL holes perpendicular to the load
 - b) Column splices with STD holes
 - c) Column bases with larger anchor rod holes
 - d) Bracing connections with OVS holes
- 7 True/False: The shear lag factor U in Chapter D of the 2005 AISC *Specification* accounts for connection eccentricity in addition to the shear lag effect.
- 8 What minimum length of protrusion above the top of the nut is required for anchor rods?
 - a) 1 in.
 - b) $\frac{1}{2}$ in.
 - c) No protrusion is required
 - d) Half the nut height plus a plug weld to fill the remaining height will work
- 9 Historically, flexural yielding of braced, compact beams in ASD was based upon the allowable stress $0.66F_y$. How was this allowable stress derived (and why wasn't it just $0.6F_y$)?
- 10 How many SteelTools have been posted at steeltools.org?

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- 1 No. Section J2.3 of the 2005 AISC *Specification* states that plug welds can be designed to resist shear loads only.
- 2 Yes. It is perhaps uncommon to do so, because a TC bolt is configured to incorporate its own pretensioned installation method, but it can be done. One case where this might be done is when the joint does not provide access to get the TC wrench on the bolt.
- 3 (d) AISC 358-05 includes the reduced beam section (RBS), bolted unstiffened extended end-plate (BUEEP), and bolted stiffened extended end-plate (BSEEP) moment connections. *Supplement 1* includes the bolted flange plate (BFP), welded unreinforced flange—welded web (WUF-W), and Kaiser bolted bracket (KBB) moment connections.
- 4 True. Short-slotted holes are permitted in all plies of slip-critical or bearing joints. See Section J3.2 of the 2005 AISC *Specification*.
- 5 No. Because these elements have different load-deformation behavior, the AISC *Seismic Provisions* do not allow sharing of load between welds and bolts in a joint. Note that this does not preclude separate joints in a connection from being different with one a bolted joint and one a welded joint.
- 6 (d) According to Section J3.2 of the 2005 AISC *Specification* slip-critical connections are required in joints that use OVS holes.
- 7 False. The shear lag factor only accounts for the stress flow that results in elements that are connected through some, but not all, of the member cross section. Connection eccentricity is a separate consideration.
- 8 (c) Just like for ASTM A325 and A490 bolts, anchor rods are fully developed when the point of the rod is flush with or extending through the face of the nut.
- 9 This allowable stress, $0.66 F_y$, was applicable to shapes like W-shapes, for which the lower bound shape factor (Z/S) is 1.1. This lower bound was applied to $0.6F_y S_x$ as a way to approximate an increase to $0.6F_y Z_x$ without changing the variables used in the equation. The origin of $0.6F_y$ was, simply, F_y divided by the $\frac{5}{3}$ factor of safety.
- 10 Okay, we really don't expect you to know this answer, but as of writing this column, there are almost 400 SteelTools that have been downloaded almost 12,000 times. There are some great postings there for you to try out, verify, and use, like Alex Tomanovich's slick AISC 13.0 Properties Viewer. Share and receive—help each other!

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.

