

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 free catalog of AISC publications, circle #10 on the reader service card in the back of this magazine.**

QUESTIONS:

1. When a bolt is specified as fully tensioned, does this mean that the connection is slip-critical?
2. What is skelp?
3. What is an HSS?
4. Which of the following statements is **not** true about weld symbols?
 - a. the size, weld symbol, length of weld, and spacing (as appropriate) are listed in that order from left to right along the reference line
 - b. the field weld symbol always points toward the tail of the reference line
 - c. the arrow-side weld is designated below and the other-side weld above the reference line
 - d. the perpendicular leg of weld symbols such as those shown below must be at the left



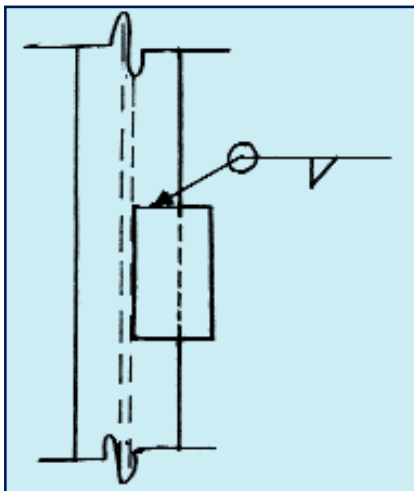
- e. none of the above

5. In the design of a continuous girder with the top flange fully laterally supported, can a point of inflection be considered to be a braced point for lateral-torsional buckling (LTB)?

6. ASTM A325 and A490 provisions include head dimensions that are larger than those for other bolt grades. Why?

7. What is the difference between yield point and yield strength?

8. Why is the weld-all-around symbol invalid as shown below?



9. The variable *S* has three different meanings in the AISC Specification. Can you name them?

10. Which has the greatest influence on the constructed cost of a steel building today, material cost or labor cost?

ANSWERS:

1. No. There are three basic levels of bolt installation: (1) snug-tight bearing, which is permitted for shear connections only, requires only that the connected plies be in firm contact; (2) fully tensioned bearing requires the above plus an installed tension that is at least equal to the value in LRFD Specification Table J3.1; and, (3) slip-critical requires all of the above plus proper preparation of the faying surfaces of the connection. Therefore, while a fully tensioned bearing connection does have the same required installed tension, it is not subject to the same faying surface preparation requirements as a slip-critical connection.

2. Skelp is a term used to describe plate material that will be used in the manufacture of HSS.

3. HSS stands for hollow structural section. Past terminology for such members included pipe, tubing, TS, P, PX, PXX, etc. AISC and the Steel Tube Institute (STI) are currently nearing the completion of the AISC *HSS Connections Manual*, which will use the general term HSS. For example, a round HSS will be designated as HSS 10x0.500, a square HSS will be designated as HSS 8x8x $\frac{1}{2}$, and a rectangular HSS will be designated as HSS 8x3x $\frac{1}{2}$. Note the use of decimal thickness for round HSS and fractional thickness for square and rectangular HSS; perhaps this is another steel quiz question?!

4. e. The above statements are all correct. See LRFD Manual page 8-135 and/or AWS D1.1.

5. No, a point of inflection (PI) by itself does not provide for a braced point. The diagrams at right illustrate that the PI is relevant for the moment diagram and the limit state of flexural yielding. However, for the limit

state of lateral-torsional buckling, the deflected shape shows that the bottom flange can move laterally even at the PI. Therefore, the unbraced length cannot be bounded by the PI.

6. The head size specified in ASTM A325 and A490 is dimensionally equivalent to that for the matching ASTM A563 nut. Therefore, installation is simplified because the same socket or wrench size can be used for both the bolt head and nut.

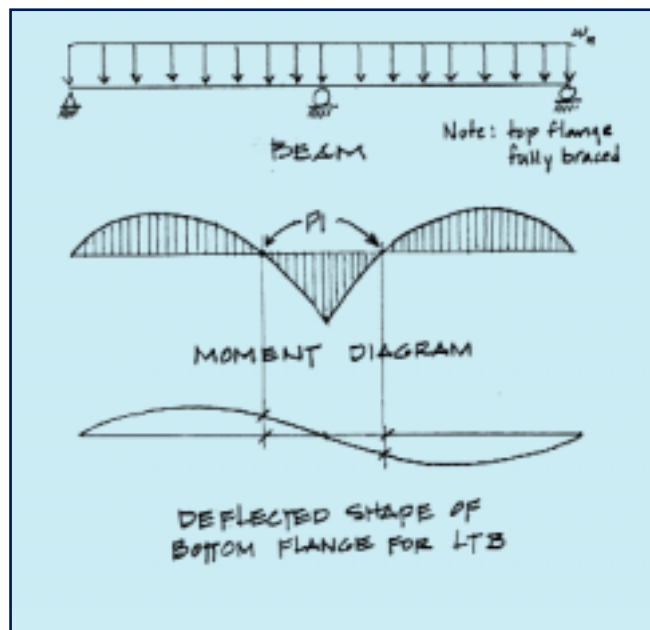
7. As defined in ASTM A370: "yield point is the first stress ... at which the increase in strain occurs without an increase in stress"; "yield strength is the stress at which a material exhibits a specified limiting deviation from the proportionality of stress to strain." Stated more simply, yield point is the upper-bound stress at which yielding begins and yield strength is the lower-bound stress at which the yield plateau occurs through the plastic range until strain hardening begins.

8. The lapped connection would require the "all-around" fillet weld to transition from opposite sides of a common plane, which would create a notch at that transition. Accordingly, LRFD Specification Section J2.2b requires that "fillet welds which occur on opposite sides of a common plane ... be interrupted at the corner common to both welds."

9. The three different meanings are: section modulus, snow load, and spacing of secondary mem-

bers (for ponding calculations).

10. Labor cost. To minimize the total cost of a structural steel frame, simplify the fabrication and erection processes (i.e., the



labor costs). A little extra steel weight, when used appropriately throughout member selection in a project, can be greatly offset by labor cost savings.

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