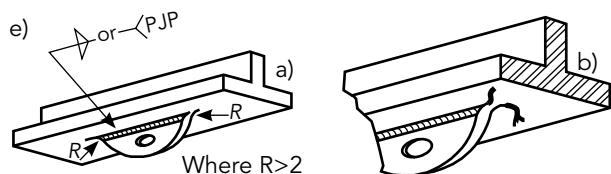
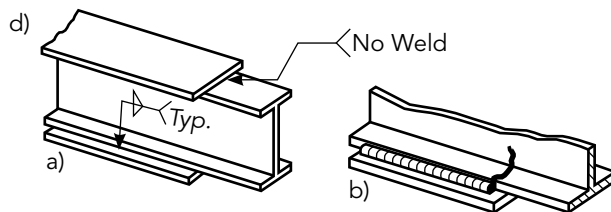
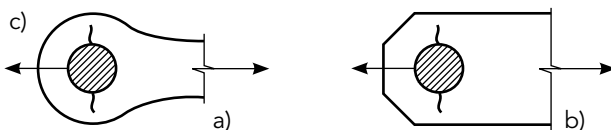
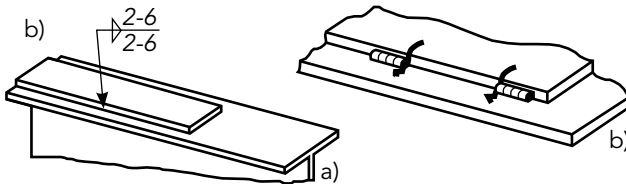
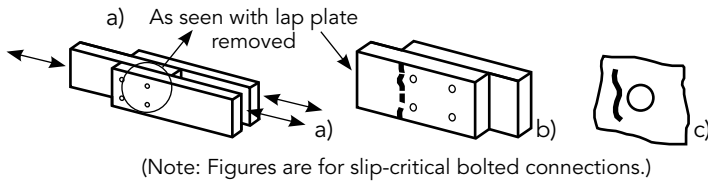


steel quiz

The theme for this month's Steel Quiz is HSS and fatigue, and the answers can be found in the *AISC Specification*, *AISC Steel Construction Manual* and *AISC Design Guides*, as well as at www.aisc.org and www.modernsteel.com.

- 1 True or False: Nominal weight and area tabulated for HSS in Part 1 of the *AISC Manual* are directly related by the density of steel (490 lb/ft³).
- 2 True or False: The workable flat dimension for HSS is based on a corner radius equal to $2.25t_{nom}$.
- 3 The chord-stress interaction parameter, Q_f , in the tables in Chapter K of the 2010 *AISC Specification* reflects a reduction for _____ in the chord.
- 4 Match the figure below with the appropriate fatigue stress category as described in Appendix 3 of the *AISC Specification*. (Hint: Definition choices can be selected multiple times and some choices not at all.)



Choose from Fatigue Stress Categories:
A, B, B', C, D, E and E'

- 5 ASTM Standard _____ is a new standard for HSS.
- 6 True or False: Seismic and wind loads are considered a fatigue load and require consideration of information in Appendix 3 in the *AISC Specification*.
- 7 Of the following, which material standards apply to HSS?
 - a) A500
 - b) A1085
 - c) A847
 - d) All of the above
- 8 True or False: In typical applications, CVN testing is not required beyond what may be specified in the ASTM for the product.
- 9 True or False: The yield and tensile strengths of steel are not considered in the fatigue limits for different weld details in AISC Appendix 3.
- 10 According to AISC 360 Appendix 3, fatigue must be considered when the number of cycles is _____ than 20,000 and the live load stress range is _____ than the threshold allowable stress range.
 - a) Less, less
 - b) Greater, less
 - c) Less, greater
 - d) Greater, greater

TURN PAGE FOR ANSWERS

- 1 False. The nominal weight is calculated based on the nominal wall thickness of the HSS, while the area is calculated based on the design wall thickness of the HSS ($t_{des} = 0.93t_{nom}$). A new product may eliminate the need to do this (we'll get back to that in Question 5).
- 2 True. This is a reflection of current industry practice, although ASTM A500 allows a greater maximum corner radius of $3t_{nom}$.
- 3 Axial compression. The connection strength is reduced when compression is present in the chord.
- 4 a) B b) E c) E d) E' e) D
- 5 Answer: ASTM 1085-13 *Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS)* contains requirements for: tighter material tolerances and a single minimum yield stress of 50 ksi, maximum specified yield stress of 70 ksi and standard requirement for notch toughness. Learn more at www.aisc.org/hss.
- 6 False. The glossary of the AISC *Specification* defines "statically loaded" as "Not subject to significant fatigue stresses. Gravity, wind and seismic loadings are considered to be static loadings."
- 7 d) There are several applicable material standards for HSS. Some of these are listed in Table 2-4 of the 14th Edition *Manual*. A500 is the preferred material specification but A1085 is a new standard. A847 is for improved corrosion resistance (or weathering steel).
- 8 True. Typical members used in structural steel buildings do not require additional CVN testing. However, there are specific instances where the AISC 360 and AISC 341 require additional CVN testing. For more information on when these requirements apply, see AISC 360 Sections A3.1c, A3.1d and J1.5, and AISC 341 Sections A3.3 and A3.4.
- 9 True. This is based on fracture mechanics principals and research that have been conducted to investigate fatigue issues.
- 10 d) In AISC 360 Appendix 3, there are two triggers that must be satisfied in order to require fatigue to be specifically addressed in the design of a member or component. First, there must be more than 20,000 cycles and second, these cycles must exceed the threshold stress range for the fatigue detail.



Steel
SolutionsCenter

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.