

Steel Quiz, a monthly feature in *Modern Steel Construction*, allows you to test your knowledge of steel design and construction. All references to LRFD specifications pertain to the 1999 *LRFD Specification for Structural Steel Buildings*, available as a free download at

www.aisc.org/lrfdspec

ASD references pertain to the 1989 *ASD Specification for Structural Steel Buildings*. Where appropriate, other industry standards are also referenced.

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



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This month's *Steel Quiz* was written by Brian Dekker, engineering intern at AISC's Steel Solutions Center.

QUESTIONS

- When is the factor C_b used?
 - Cases involving local buckling
 - Cases involving flexural-torsional buckling
 - Cases involving lateral-torsional buckling
- What is the minimum required radius for the re-entrant corner of a beam cope?
 - $\frac{1}{4}$ "
 - $\frac{3}{8}$ "
 - $\frac{1}{2}$ "
 - none of the above
- True or False: Cambering a beam produces residual stresses that will lower the design strength of the beam.
- True or False: Truss camber should be inspected immediately after it is received in the field.
- True or False: A restrained condition provides a more favorable fire protection rating than an unrestrained condition.
- At 1200°F, ASTM A992 has approximately _____ of its original yield strength.
 - 80%
 - 60%
 - 40%
 - 20%
- True or False: Tension-member slenderness Kl/r should be limited to a maximum of 200.
- True or False: In a beam, a point of inflection (zero moment) can be considered a braced point.
- In January 2001, OSHA made a new requirement that all column base plates must have a minimum of 4 anchor rods. How many anchor rods were required prior to 2001?
 - 3
 - 2
 - 1
 - 0
- A piece of steel is measured to be 100 ft at 60°F. At 120°F, how long will it be?
 - 100 ft
 - 100 ft, $\frac{1}{2}$ in.
 - 100 ft, 6 in.
 - 101 ft

TURN PAGE FOR ANSWERS

STEEL QUIZ

ANSWERS

- 1. c.** C_b is used to find a beam's lateral buckling strength when the actual braced length is longer than limiting unbraced length L_p (in LRFD) or L_c (in ASD) and the moment is not uniform in the unbraced span ($C_b = 1$ for uniform moment).
- 2. d.** There is no minimum radius specified. However, it is noted that a radius of $\frac{3}{8}$ " or more will generally satisfy the requirement to provide a smooth notch-free transition as per Fig. C-J1.2 of the 1999 *LRFD Specification for Structural Steel Buildings*.
- 3. False.** Although the cambering process will induce residual stresses, they do not lower the design strength because they are already accounted for in the design equations.
- 4. False.** As stated in the 2000 AISC *Code of Standard Practice for Steel Buildings and Bridges* section 6.4.5, "For the purpose of inspection, camber shall be measured in the Fabricator's shop in the unstressed condition."
- 5. True.** A restrained rating will generally provide a higher hourly rating, as shown in Tables 2-5 to 2-8 of the third edition *LRFD Manual of Steel Construction*. For the purposes of fire protection, restrained beams are those that have resistance to thermal expansion. See Table 2-10 in the third edition *LRFD Manual*.
- 6. c.** Fig. 2-8(a) from the third edition *LRFD Manual* shows that A992 retains approximately 40% of its yield strength at 1200°F.
- 7. False.** Tension members should be limited to a Kl/r of 300. The Kl/r limit of 200 is preferred for compression members (1999 *LRFD Specification for Structural Steel Buildings*, Section B7).
- 8. False.** Inflection points should not be considered braced points. See "Fundamentals of Beam Bracing," *Engineering Journal*, First Quarter, 2001 by Joseph A. Yura.
- 9. d.** Prior to OSHA's January 18, 2001 29 CFR 1926 Subpart R, there was no requirement for a minimum number of anchor rods used with column base plates, though two were commonly used.
- 10. b.** The coefficient of linear expansion for steel is 0.0000065. The change in length would then be $0.0000065 \times 100 \text{ ft} \times 60^\circ = 0.47 \text{ in.}$