

steel quiz

LOOKING FOR A CHALLENGE? *Modern Steel Construction's* monthly Steel Quiz tests your knowledge of steel design and construction. Most answers can be found in the 2005 *Specification for Structural Steel Buildings*, available as a free download from AISC's web site, www.aisc.org/2005spec. Where appropriate, other industry standards are also referenced.

This month's Steel Quiz was provided by the Steel Joist Institute. Sharpen your pencils...

- 1 How can I locate the reaction at the end of an open-web steel joist at the center of a beam?
- 2 Are standard joists designed to resist any concentrated loads not at a panel point?
- 3 What special bridging requirements apply when the joist is detailed with bottom-chord bearing, or when a joist has a full-depth cantilevered end condition?
- 4 Can joists be designed for a moving point load at top and/or bottom chords?
- 5 True or False: KCS joists are designed so that a single 200-lb concentrated load can be placed between panel points without the need for reinforcing with an additional web.
- 6 Is a row of uplift bridging required for roof joists designed with 10 psf gross wind uplift and 15 psf dead load?
- 7 Can open-web steel joist size be controlled by the required fire rating?
- 8 What is the minimum bearing length when installing a K-Series joist that is detailed to have a 2½-in. R Type top-chord extension, and the connection detail shows the full length of the bearing seat and extension resting on the steel support?
- 9 What is the minimum bearing seat depth (height) for an LH-Series joist installed at a 1:12 slope?
- 10 What is the minimum number of rows of bridging required for a 26K8 with a span length of 46 ft-8 in.?

- 1 Provide a note on the drawing such as, "Joist manufacturer to proportion the joist such that the working point is centered on the support." Note that the bearing depth may have to be increased to accomplish this. Conservatively, for every inch you increase the bearing depth, you get an extra inch of clearance to the end diagonal web. For K-Series joists, there is normally only 4 in. of clearance. For LH-Series, there are 6 in. For every additional inch you need, deepen the seats an inch.
- 2 No. Any additional loading should be taken into account when specifying the uniform loads. Otherwise, request that the joists be designed for a concentrated load at any panel point, or at any location along the joist top or bottom chord.
- 3 A row of diagonal bridging must be located near the support for lateral stability. This bridging must be installed as the joist is erected.
- 4 Yes. The joist design will be designed for the worst condition for each member in the joist for the load applied anywhere along the length of the joist.
- 5 False. Chord bending due to concentrated loads must be handled with an extra web member shop- or field-applied for K-Series (and KCS*), LH- and DLH-Series. *Note: KCS joists are a subset of K-Series joists.
- 6 Yes, using ASCE 7-05 load combinations:
 In LRFD, net uplift = $0.9D - 1.6W = 0.9(15) - 1.6(10) = -2.5$ psf
 In ASD, net uplift = $0.6D - W = 0.6(15) - 10 = -1$ psf
- 7 Yes. Several Underwriter's Laboratories (UL) designs have a minimum joist size, as well as minimum depth and weight per foot, maximum spacing, minimum bridging size, or minimum element size. In addition, when a UL design requires a reduction in the design stress level of a steel joist, the specifying professional must apply the proper stress level reduction in the selection process.
- 8 Five inches. The SJI *Standard Specification for Open Web Steel Joists, K-Series*, Section 5.3(b) states that the joist "shall extend a distance of not less than 2½ in. over the steel supports." This does not consider the joist extension. Because the R Type extended end is fully supported on the steel, it also must be considered when calculating the required bearing length for the installed joist.
- 9 Six inches. This is given in the table "Sloped Seat Requirements for Slopes 3/8:12 and Greater, LH- and DLH-Series Steel Joists" found in the Accessories and Details section of the 42nd Edition *SJI Catalog*.
- 10 Four rows. Reference *SJI Standard Specifications for Open Web Steel Joists, K-Series*, Table 5.4-1. Note that this joist span length is also in the red shaded area of the SJI Load Tables; therefore, one of these bridging rows nearest mid-span must be bolted cross bridging.

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.

