steel quiz

This month's Steel Quiz addresses camber. (Special thanks to Larry Kloiber and Susan Burmeister for their input!) And see the News on page 58 for an update on the viral sensation that is the October 2017 Steel Quiz.

1 Camber is typically induced in members
- **a.** after bolt holes for member connections have been made to the member
- **b.** before bolt holes for member connections have been made to the member

2 In order to avoid damage, the heat used to camber members should not exceed
- **a.** 1,100 °F
- **b.** 1,200 °F
- **c.** 1,300 °F
- **d.** 1,400 °F

3 Looking at Figure 1, if heat is applied to the top side of the beam, this will induce a final camber in which direction?
- **a.** Up
- **b.** Down

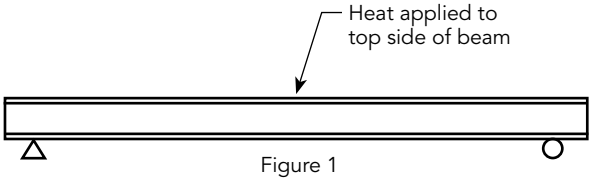

Figure 1

4 Which of the following are not well suited for camber?
- **a.** Crane beams
- **b.** Spandrel beams
- **c.** Cantilevered beams
- **d.** All of the above

5 When determining the amount of beam camber needed, it is common practice to specify a camber equivalent to ____ of the estimated simple-span deflections resulting from the dead load.
- **a.** 90%
- **b.** 80%
- **c.** 70%
- **d.** No reduction

6 Over-cambering a beam could result in
- **a.** vibration issues
- **b.** exposed studs
- **c.** reduction in beam strength
- **d.** all of the above

7 Cambering is clearly a better option for addressing deflection compared to shoring. However, for cases where beam shoring is required, the EOR should carefully consider the increased potential for _____.

TURN PAGE FOR THE ANSWERS.

steel quiz ANSWERS

1 **a.** After bolt holes for member connections have been made to the member. It is more difficult to run a cambered beam through a fabricator's automated process for creating bolt holes.

2 **c.** 1,300 °F. Between 1,100 °F and 1,200 °F is the typical recommended temperature range for cambering common structural steels. The *Specification for Structural Steel Buildings* (ANSI/AISC 360, available at **www.aisc.org/specifications**) Section M2.1 conservatively limits the temperature of heated steels to 1,100 °F for ASTM A514 and ASTM A852 steels and 1,200 °F for other steels. The goal is to keep the steel temperature to less than the phase change temperature, which starts at approximately 1,300 °F. Because it is difficult to accurately measure the steel temperature, the 1,200 °F limit allows local temperature variations without exceeding 1,300 °F for typical steels.

3 **b.** Down.

4 **d.** All of the above. Camber is generally not recommended for these situations and should be carefully considered. It would be a good idea to consult with the contractor before doing so.

5 **b.** 80%. AISC Design Guide 3: *Serviceability Design Considerations for Steel Buildings* (available at **www.aisc.org/dg**) presents the 80% to account for end connection partial restraint. The magnitude of design camber will depend on several factors, including the framing condition and the method of screeding the concrete. Most engineers design for 80% and require the contractor to supply extra concrete and screed level. Some design-build contractors design for 100% and require flexible bar screeds be used to screed a uniform slab thickness.

6 **b.** Exposed studs.

7 Slab cracking. Allowing the dead load deflection to occur after the concrete has set will more likely result in slab cracks. This slab cracking may occur over the girders and can be addressed by providing negative reinforcement. This will make the cracking more distributed and less noticeable.

Steel SolutionsCenter

Anyone is welcome to submit questions and answers for the 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**.