

# steel quiz

This month's quiz is based on the 2013 SteelDay webinar "The Life of the K-Factor" ([www.aisc.org/content.aspx?id=35624](http://www.aisc.org/content.aspx?id=35624)). The answers can be found in Chapter C and Appendices 7 and 8 in the 2010 AISC *Specification*.

- 1 Which of the following needs to be considered in design for stability?
  - a) Flexural, axial and shear deformations
  - b) Second-order effects
  - c) Geometric imperfections
  - d) Stiffness reduction due to inelasticity
  - e) Variability in component and system stiffness
  - f) All of the above
- 2 The AISC *Code of Standard Practice* states that the typical out-of-plumbness of a column between work points shall be less than or equal to:
  - a)  $h/60$
  - b)  $h/400$
  - c)  $h/500$
  - d)  $h/600$
- 3 In stability design, what accounts for variability in component and system stiffness?
  - a) Load factors in ASD and LRFD load combinations
  - b) Omega (the ASD factor of safety)
  - c) Phi (the LRFD resistance factor)
  - d) All of the above
  - e) B and C only
- 4 In which year was the first AISC *Specification* written?
  - a) 1921
  - b) 1923
  - c) 1961
  - d) 1963
- 5 In which year was the approximate second-order analysis method ( $B_1$ - $B_2$  Method) first added to the AISC *Specification*?
  - a) 1986
  - b) 1993
  - c) 1999
  - d) 2005
- 6 True or False: Chapter C in the 2010 AISC *Specification* only allows the use of the direct analysis method for stability design.
- 7 Which of the following statements is *not* true regarding the effective length method?
  - a) It allows the use of a first-order analysis.
  - b) The calculation of  $K$  is based upon assumptions that are rarely satisfied in real structures.
  - c) Its use is permitted for a structure with  $B_2 = 1.3$ .
  - d) It does not require the use of reduced stiffness in the analysis.
- 8 True or False: The first-order analysis method is an acceptable method of stability design within its stated limitations and does not require a second-order analysis.

TURN PAGE FOR ANSWERS

- 1 f) AISC 360 Section C1 requires that the effects of all five items on the stability of the structure be considered as part of the analysis and design.
- 2 c) This can be found in AISC *Code of Standard Practice* Section 7.13.1.1 and is used as the basis for the notional load coefficient of 0.002 (which equals 1/500) found in AISC 360 Section C2.2b(1).
- 3 e) Variability in stability design, like other variability in design, is addressed by the resistance factor in LRFD and the safety factor in ASD.
- 4 b) The first AISC *Specification* is dated June 1, 1923. The inaugural Specification Committee consisted of five members who represented "the leading talent in the academic, engineering and architectural professions". They were George F. Swain, Milo S. Ketchum, E. R. Graham, W. J. Thomas and Wilbur J. Watson.
- 5 a) What is now called the approximate second-order analysis method first appeared in Section H1.2a of the 1986 AISC LRFD *Specification*.
- 6 False. Any rational method of design for stability that considers all of the effects listed in AISC 360 Section C1 is permitted; three methods that are deemed to comply with the requirements are given in Chapter C and Appendix 7.
- 7 a) AISC 360-10 Appendix 7 Section 7.2.2 states that the required strengths determined for use with the effective length method must include consideration of second-order effects.
- 8 True. AISC 360-10 Appendix 7 Section 7.3.2 allows required strengths determined for use with the first-order analysis method to be based on a first-order analysis. Second-order effects are implicit in the method and a separate second-order analysis is not required.



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