

steel quiz

Most of the answers to this month's steel quiz can be found in the AISC *Steel Construction Manual* and other AISC publications available at www.aisc.org/epubs. See also SteelWise from the February 2009 *MSC*, available for free at www.modernsteel.com/backissues.

- 1 True/False: There are applications in which the protective oxide patina may not form on uncoated weathering steel.
- 2 To what color does weathering steel's initial rust bloom turn over time?
 - a) Dark tan
 - b) Dark purple-brown
 - c) Dark grey
 - d) Doesn't change color, remains red-orange
- 3 True/False: Interior passes of multi-pass welds on weathering steel can be made with conventional electrodes for the body of the weld, provided the external passes are made with electrodes of a chemical composition matched to that of the base metal.
- 4 True/False: Unlike conventional carbon steel, weathering steels do not require surface preparation for coatings.
- 5 What ASTM designations apply to weathering steel?
 - a) A588
 - b) A709 Grade 50W
 - c) A847
 - d) All of the above
- 6 True/False: Weathering grades of bolts, nuts and washers typically are specified for bolted joints of weathering steel components.
- 7 Modifying which of the following can help reduce the natural frequency of a structural system?
 - a) Mass
 - b) Stiffness
 - c) Shape
 - d) All of the above
- 8 Deflection used to be the primary criterion evaluated for wind-induced vibration of a building. What other considerations are now recognized as important?
 - a) Fatigue
 - b) Deflection
 - c) Occupant comfort
 - d) All of the above
- 9 True/False: Leaning columns must be designed for second-order moments per the stability requirements of ANSI/AISC 360 Chapter C.
- 10 True/False: The stiffness reduction factors used in the Direct Analysis Method are used for strength and serviceability checks.

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ANSWERS

- 1 True. The formation of the oxide patina depends on repeated wet/dry cycles and the presence of oxygen. This does not happen when the steel is continuously submerged in water or buried in soil. The patina also is interrupted where water run-off containing deicing salts is not directed away from the steel.
- 2 (b) Dark purple-brown. This process takes place over time and depends on several factors, including exposure and atmospheric conditions.
- 3 True. Interestingly, conventional electrodes also are suitable for single-pass welds because the melted base metal will sufficiently infuse the weld metal with the alloying elements and provide the expected patina formation.
- 4 False. Proper surface preparation also is important for weathering steel, when it is to receive a protective coating.
- 5 (d) Depending on the specific end-use there are a variety of relevant material standards. A few of the more common types are ASTM A588, A709 Grade 50W, and A847.
- 6 True. "Type 3" bolts and corresponding nuts and washers offer fasteners with similar weathering characteristics in connections in weathering grade base metals.
- 7 (d) Changes in the stiffness of the structural members, the mass of the structure or the overall structural shape all can be made to adjust the vibratory response of the structure under lateral loading.
- 8 (d) Deflection, occupant comfort and fatigue are all recognized as important considerations. For additional information see the article "Challenging Vibration in Engineered Structures," in the March 2004 issue of *MSC*. It is available as a free download at www.modernsteel.com/backissues.
- 9 False. Leaning columns are treated as pin-ended members and their stability is provided by the lateral system. ANSI/AISC 360 Chapter C does require that the system stability effect consider the gravity load on these columns, however, when the lateral system is analyzed and designed.
- 10 False. The stiffness reduction factors given in the 2010 AISC *Specification* Section C2.3 do not apply to serviceability criteria, such as drift.



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