

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 developed from information taken from the sessions on galvanizing at the 2009 NASCC. Sharpen your pencils and go!

- 1 What is the proper order of the following four operations in the galvanizing process? (a) fluxing (b) pickling (c) degreasing (d) zinc bath immersion.
- 2 Which of the following appearances can occur in newly galvanized material? (a) shiny (b) spangled (c) matte gray (d) dull (e) all of the above.
- 3 True/False: Cambered members and bent connection materials can relax when heated in the zinc bath during galvanizing.
- 4 Which of the following is not true about galvanized bolts, nuts and washers?
 - (a) Galvanized fasteners are recommended for connecting hot-dip galvanized parts.
 - (b) Hydrogen embrittlement issues apply if the steel tensile strength F_u is less than 150 ksi.
 - (c) Nuts are galvanized as blanks and the threads are cut afterwards, and the galvanizing on the bolt will protect the inside of the nut.
 - (d) ASTM A325 bolts are permitted to be galvanized; ASTM A490 bolts are not.
- 5 True/False: Double-dipping is a common technique to extend the service life of a galvanized piece.
- 6 How are piece identifiers maintained in the hot-dip galvanizing process?
- 7 True or False: Hot-dip galvanizing is of sufficiently high temperature to burn away weld flux, mill lacquer, paint markers, labels and stickers, paint, and cutting oil. Therefore such items need not be removed prior to galvanizing.
- 8 Which of the following is true about galvanizing?
 - (a) Holes less than $\frac{1}{2}$ in. diameter may fill with zinc.
 - (b) Zinc may not penetrate gaps less than $\frac{3}{32}$ in.
 - (c) After galvanizing, visual inspection is carried out to locate surface defects and thickness of zinc coating is gauged by magnetic resistance testing.
 - (d) All of the above are true.
- 9 True/False: Seal welding of parts in contact eliminates the concern for explosive entrapment of air in the galvanizing process.
- 10 True/False: Copes and weld access holes must be ground when steel is to be galvanized.

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ANSWERS

- 1 The galvanizing process occurs as follows: degreasing to remove dirt, oils, and organic residues; pickling to remove mill scale; fluxing to provide a mild cleaning; and then immersion into a bath of 98%-pure molten zinc. The reaction is complete when the steel reaches the temperature of the zinc bath (5 to 10 minutes, depending on steel thickness).
- 2 (e) all of the above. However, over time the appearance will even out and become very uniform regardless of the initial appearance.
- 3 True. Bent plates, cambered beams, and other bent pieces can relax during the galvanizing process.
- 4 (b) is the incorrect statement. Hydrogen embrittlement issues apply if the steel tensile strength F_u is **greater** than 150 ksi. ASTM A325 and F1852 bolts are comfortably below this strength level and can be galvanized.
- 5 False. Double-dipping is a technique used to permit a longer piece to be galvanized. The typical galvanizing kettle size is 5 to 6 ft wide, 40 to 60 ft long, and 6 to 10 ft deep. The piece to be galvanized must be able to fit in the kettle completely with one dip or two dips from two different angles. This latter option is called double-dipping. The American Galvanizers Association provides a list of kettle sizes available in specific regions (and a lot of other useful information) at www.galvanizeit.org.
- 6 Metal tags, weld beads, and stamping are all options that can be used for marking pieces that will be hot-dip galvanized.
- 7 False. These are all problematic materials that should be avoided and/or removed prior to galvanizing.
- 8 (d) All of the items listed are true.
- 9 False. Seal welding that encloses less than 16 in.² of area does not require venting. However, if this area is greater than 16 in.², vent holes per ASTM A385 should be provided.
- 10 True. This requirement is stated in AISC *Specification* Section M2.2. It is required to help prevent cracking during galvanizing, as explained in Commentary Section M2.11.

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.



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