This month’s Steel Quiz is based on the May 2017 SteelWise article “A Tale of Tearouts,” which can be found in the Archives section at www.modernsteel.com.

1. True or False: The limit state of bolt tearout has been removed from the 2016 Specification for Structural Steel Buildings (ANSI/AISC 360-16, available at www.aisc.org/specifications).

2. When one multiplies the least strength of any of the bolts in a connection by the total number of bolts in the connection, this typically conservative method has been referred to as the:
   a. KISS method
   b. Create Flintstones designs method
   c. Poison bolt method
   d. Bolt supplier method

3. True or False: The Specification contains a requirement on how to sum the individual bearing/shear strengths of the bolts.

4. True or False: Tearout between bolt holes, in addition to bolt bearing, is a possible limit state.

5. True or False: Tearout along the edge will generally not govern if the thickness of the plies is equal to the bolt diameter.

6. When determining the strength of a bolt group, how many limit states need to be considered? Bonus points for listing each limit state by name.

7. Determine the maximum permitted nominal strength, $R_n$, based on the strength of the bolt group for the connection shown in Figure 1, below. Use Tables 7-1, 7-4 and 7-5 in the 15 Edition AISC Steel Construction Manual (www.aisc.org/manual).

TURN PAGE FOR THE ANSWERS
1 False. A minor change was made in the 2016 Specification, where the bolt bearing and tearout checks have been broken into two separate equations.

2 c. Poison bolt method. This method can be less work for the designer but can also result in a significant reduction in the predicted strength of a bolted connection.

3 False. A user note is provided in Section J3.6 of the 2016 Specification, describing the preferred method, but other options, such as the poison bolt method mentioned in question 2, could be used. An additional method is also discussed in the Commentary.

4 True. However, for common connection configurations, tearout is typically not a concern between the rows of bolts.

5 True.

6 Five limit states: (1) bolt shear, (2) bearing on the main material, (3) bearing on the connection material, (4) tearout on the main material and (5) tearout on the connection material.

7 \[ R_n = \left( \frac{2 \text{ bolts} \times 44 \text{ kips}}{\text{bolt}} \right) + \left( \frac{2 \text{ bolts} \times 29.3 \text{ kips}}{\text{bolt}} \right) = 146.6 \text{ kips} \]