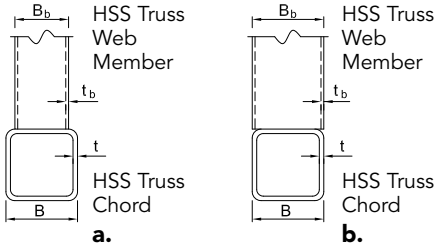
steel quiz

This month's quiz is all about hollow structural sections (HSS). Consult AISC Design Guide 24: *Hollow Structural Section Connections* and the AISC *Specification* for more information.

1 True or False: When designing trusses using HSS, AISC Design Guide 24 recommends that a designer should select a relatively stocky chord (or column) main member.

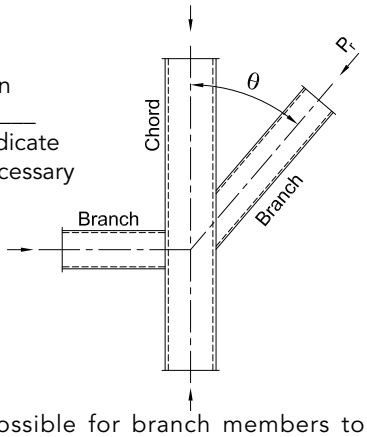
2 For the transfer of axial load, which of two details (**a** or **b**) is preferable per the recommendations given in AISC Design Guide 24?



3 True or False: When designing an HSS truss, one should try to use gapped K-connections instead of overlapped connections.

4 The configuration shown here illustrates a _____ (note that the arrows indicate the load distribution necessary for equilibrium).

a. T-connection
b. Y-connection
c. K-connection
d. Cross-connection
e. a and b



5 True or False: It is possible for branch members to transmit part of their load as K-connections and part of their loads as T-, Y- or cross-connections.

6 The preferred material specification for HSS is:

a. ASTM A500 Gr. B
b. ASTM A500 Gr. C
c. ASTM A1085
d. ASTM A847

7 Use of ASTM A1085 provides the following benefit(s):

a. Tighter material tolerances
b. Maximum specified yield stress of 70 ksi
c. Standard Charpy notch toughness requirement
d. a and b
e. All of the above

TURN PAGE FOR ANSWERS

steel quiz ANSWERS

1 True. The static strength of nearly all HSS connections is enhanced by using stocky chord members. This choice will maximize connection strength and therefore facilitate connection design. Selecting thin HSS can make truss connection design a challenge.

2 **a.** AISC Design Guide 21 recommends that $B_b < B - 4t$. When this expression is met, fillet welding of the branch is usually possible, and difficult, expensive flare-groove welds (arising when $B_b \approx B$) can be avoided. In addition to following this recommendation, a good connection design strategy is to make t_b/t as low as possible and B_b/B as high as possible.

3 True. Gapped connections are easier and less expensive to fabricate than overlapped connections. This is particularly the case with round-to-round HSS welded connections, where branch member ends require complex profiling and the fit-up of members requires special attention.

4 **d.** Cross-connection. A cross-connection is defined as one where the punching load, $P_r \sin \theta$, is transmitted through the chord member and equilibrated by branch member(s) on the opposite side. See section K2 in the AISC *Specification* for definitions of T-, Y- and K-connections.

5 True. This is permitted in Section K2 of the AISC *Specification*. When this is done, the adequacy of the connections is determined by interpolation on the proportion of the available strength of each in total.

6 **b.** ASTM A500 Gr. C. Note that this is a change from what is currently shown in Table 2-4 in the 14th Edition *Manual* and was recently highlighted in the *Modern Steel* article "Are You Properly Specifying Materials?" (February 2015), available at **www.modernsteel.com**.

7 **e.** All of the Above. Although ASTM A500 Gr. C is still more common in the marketplace, ASTM A1085 has some benefits that may help it to eventually become the preferred material. Tighter material tolerances means the 0.93 thickness reduction likely will not be required for A1085 material in the 2016 AISC *Specification*, leading to more economical and efficient designs. A maximum yield stress of 70 ksi will result in a lower expected yield strength and reduced capacity design requirements and column required strengths in seismic designs. A1085 provides a defined level of material toughness that makes HSS more suitable for use in dynamically loaded structures.