IF YOU'VE EVER ASKED YOURSELF "WHY?" about something related to structural steel design or construction, C 's monthly Steel Interchange column is for you! Send your questions or comments to solutions@aisc.org.

ASTM A500 Ro nd

A steel subcontractor on our project says he has a U.S.-made A500 Grade B round HSS. I believe that this material only comes in square and rectangular shapes. Can you confirm the availability of these shapes?

Round HSS are routinely produced to meet the requirements of ASTM A500 Grade B; it is in fact the usual material specification for round HSS in the U.S. The mechanical properties are slightly different than rectangular/square, but it is still A500 Grade B.

For square/rectangular shapes the minimum yield stress for ASTM A500 grade B is 46ksi, and the minimum tensile stress is 58ksi.

For round HSS in ASTM A500 grade B, the minimum yield stress is 42ksi, and the minimum tensile stress 58ksi.

This can be verified by consulting Table 2-3 of the 13th edition AISC *Steel Construction Manual*. Availability can also be verified by using the availability database on the AISC web site, which lists several domestic producers: **www.aisc.org/availability**.

As a general rule of thumb, ASTM A500 HSS cross sections that match up with ASTM A53 pipe cross sections are available. For other cross sections, check with a fabricator, steel service center, or mill.

Martin Anderson

A325SC Bol ?

How are ASTM A325SC bolts designed and installed? In past projects we typically used A325N and we are now using A325SC. Do both of these types of bolts need to be checked for bearing?

When dealing with high-strength bolted connections, it is probably best to consider the difference in terminologies pertaining to the bolt type versus that of the connection type. The A325 example refers to the bolt type, while the SC or N refers to required installation details for the connection type and geometry respectively.

Bolt Types

The most common types of bolts used in structural steel applications meet either the ASTM A325 or A490 Standard. There are also twist-off types of bolts, which are equivalent to these bolt types: ASTM F1852 equivalent to ASTM A325, and ASTM F2280 equivalent to ASTM A490. The property requirements are the same for a particular bolt type regardless of the type or details of the connection in which it is to be used.

Connection Types

There are three basic connection types used in structural steel applications: Snug-Tightened, Pretensioned, and Slip-Critical. Descriptions of these connection types and installation requirements can be found in the RCSC *Specification* (a free download at **www.boltcouncil.org**). In all joint types the connection is required to be checked for bearing, which could occur at some time during the life of the structure.

Snug-Tightened Connections: In this connection type, it is required that the faying surfaces of the connection be brought into firm contact. While some pretension of the bolts is required to bring the surfaces into firm contact, there is no specific requirement for a level of pretension that must be induced into the bolts. Thus, while there is some level of clamping force in the connection as a result of the installation requirement to bring the surfaces into firm contact, this type of connection is assumed to provide the least level of safety against slip. The bolts in these connection types are always assumed to be in bearing against the base material, and thus the connection is defined as a bearing connection.

Pretensioned Connections: This type of connection generally is just like a snug-tightened joint, except it also requires that a specified pretension be applied to the bolts in the connection, once the firm contact of faying surfaces has been achieved. It is still a bearing-type joint, and the shear strength design parameters are identical to those of the snug-tightened joint.

Slip-Critical Connections: This connection type is just like a pretensioned connection with the addition of surface preparation requirements to provide the required level of slip resistance. To achieve this goal, there is a specified level of friction coefficient required for the faying surfaces in the connection. After the faying surfaces are brought into firm contact, the bolts are required to be installed to a specified level of pretension, which is the same as that required for a pretensioned connection. Thus, the bolt installation procedure for slip-critical connections is identical to that required for pretensioned connections, the difference being in the preparation requirements for the faying surfaces of the respective connection types.

Threads In or Out of the Shear Plane

One parameter that we have not discussed to this point is the N designation cited in your example. This designation is an indication of where the threads of a bolt are assumed to be located with respect to the shear plane(s) in a connection. The N assumes that the threads of the bolt will be located within the shear plane; an X assumes that the plies are detailed to exclude the threads from the shear plane. The shear strength is reduced if the plies are detailed such that the threads are located within the shear plane.

Kurt Gustafson S.E., P.E

Connec ing a Cambered Tr

We have a 120-ft-long, 12-ft-high truss made up of wide-flange beams for the upper and lower chords. The truss will be fabricated with a 5-in. camber. At the worse loading condition, the truss will still be 1 in. above flat. How is the connection made from the member end to the column? Will the fabricator detail the member so the bolt holes in the cambered member are vertical and in line to the connection plate or angles holes, or do they offset the bolt holes? If the