

HSS

# ARTICLE

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**AISC 360-16, CHAPTER K**

by Kim Olson, PE  
Technical Consultant, Steel Tube  
Institute

As you are probably aware, there have been many changes to Chapter K of AISC 360-16. In 2010, the chapter was titled "Design of HSS and Box Member Connections," and it contained the majority of the information necessary to design connections with HSS. In 2016, the title is "Additional Requirements for HSS and Box-Section Connections". Chapter K no longer contains all the information needed to design HSS connections, but now consists of requirements that aren't already covered in other parts of the specification, namely Chapter J. The introduction to Chapter K now contains a statement that the requirements of Chapter J also apply.

In the 2010 Specification, the tables in Chapter K were easy to use, but contained a lot of repetition of information contained elsewhere in the Specification. The 2010 tables also contained a long list of limits of applicability, which may have made engineers feel that if the limits aren't met, the connection can't be done. This wasn't the intention. If the limits are not met, an engineer should use rational analysis to check the connection rather than pulling one equation from the table.

In the 2016 Specification, there is also a limit pertaining to the end of a member, however, this is not a new phenomenon. The new limit of applicability states that if a connection is made closer than a certain distance from a member's end, extra steps must be made to assure the adequacy of the connection. Although this is only shown for certain connections in Chapter K, the distance to the end of the member should be considered globally.

There have not been many changes to the Specification where connections to round HSS are concerned; most of the changes occurred with rectangular members. It's easiest to navigate the new Specification by recognizing the similarities between connecting to the face of a rectangular HSS and connecting to the web of a wide-flange. Both could be considered thin plate members spanning to supports on each side; the HSS wall spanning to its sidewalls, the WF web spanning to the flanges. Therefore, the checks to the HSS wall can be made using the equations furnished in Chapter J for webs by substituting the WF variables for HSS variables.

The limits of applicability for most rectangular HSS connections have been removed, giving the designer more perceived freedom. However, because of this, more checks will need to be made to ensure the controlling limit state is accounted for. Much like we already do for WF connections, we will check several limit states. No longer is a table given that details which limit state is going to control the HSS connection as long as we are within certain parameters.

Other items of note:

- In AISC 360-10, a shear plate connection checked punching shear in the HSS wall per equation K1-3. In AISC 360-16, punching shear of the HSS wall is now checked with equation 10-7 in Part 10 of the 15th Edition Steel Construction Manual. This section of the Manual states that as long as the HSS wall is not a slender element, plastification will not control. In this case, the Manual makes explicitly clear that a certain limit state will not control. In most other connections, it does not give such guidance; it is up to the designer to determine which limit states could control.
- Designers will find that not all pertinent checks are detailed in the Specification itself (whether it be Chapter J or K). We are often sent into Parts 9 or 10 of the 15th Edition Steel Construction Manual.

In order to ease this transition to the 2016 Specification, the Steel Tube Institute has produced a Limit State Table that details the various limit states, where they can be found in the 2016 Specification, what variable substitutions need to be made, and what the analogous check was in the 2010 Specification. This tool can be found on the [Steel Tube Institute website](http://www.steel-tube-institute.org).

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