specwise

WHAT'S NEW IN THE SPEC?

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New HSS standards and changes to slender elements, shear strength, angles, connections, advanced analysis and re design are just a few of the updates in the 2016 AISC *Speci cation*.

AISC IS SET to release the 2016 edition of the *Speci cation for Structural Steel Buildings* (ANSI/AISC 360-16) in the near future.

Changes from the 2010 edition re ect the Committee on - fect design procedures. A complete list of differences between the 2010 and 2016 AISC *Speci cation* will soon be available as a free download at **www.aisc.org/manualresources**.

HSS S a a

ASTM A1085 and ASTM A1065 have been added to the 2016 *Speci cation* as approved hollow structural section (HSS) material standards. ASTM A1085 is a newly developed material standard that has more stringent requirements than other already approved HSS standards (such as ASTM A500), including a mass tolerance and a stricter wall thickness tolerance. As a result of these requirements, the design wall thickness can be taken as the full nominal wall thickness.

ASTM A1065 is an HSS standard based on the use of already approved ASTM plate material standards. Due to the similarly reduced tolerances of these existing plate standards, design wall thickness for A1065 can also be taken as the full nominal wall thickness. It is important to note, however, that the 2016 *Speci cation* still requires that the design thickness of other HSS materials, including the more common ASTM A500, be taken as 0.93 times the nominal wall thickness.

Additionally, ASTM A1085 and A1065 specify a minimum yield stress of 50 ksi regardless of shape. Further information on the bene ts and impact of A1085 is detailed in the September 2013 article "Hollow Product, Solid Bene t," available at **www.modernsteel.com**.

S E C

The method for determining compressive strength of members with slender elements has been revised in the 2016 *Speci- cation*. Since 1969, the *Speci cation* used an approach centered on a reduction factor, *Q*, which modi ed the column critical stress. For slender unstiffened elements, *Q* was given by equations that included the width-to-thickness ratio of the element and was a constant for a particular shape, regardless of the load on the column; these *Q* values were tabulated in the *Manual*. For stiffened elements, *Q* was based on the ratio of a reduced effective area to the gross area of the member and was a function of the magnitude of the column stress.

While the 2010 *Speci cation* used a reduced effective area approach for stiffened elements, this methodology has now been re ned and expanded to include both stiffened and unstiffened elements. The new provisions determine the reduced effective area and use that along with the unmodi ed column critical stress to determine compressive strength. As in the past, classi - cation of members as slender element members, as determined in Table B4.1a, is based on the assumption that the column stress has reached the yield stress, F_y. Thus, members that were considered slender in prior editions of the *Speci cation* continue with that same designation. However, because the magnitude of the stress on the column in uences the local buckling of the member elements (for all but round HSS), members that have been designated as slender element members may not actually experience a reduction in strength due to that slender element. For round HSS, the effective area is based on the diameter-to-thickness ratio and the yield stress of the material.

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The changes in determining compressive strength for members with slender elements have signi cantly altered the nominal compressive strength of select steel shapes (the difference for one such case is shown in Figure 1). Further information on the impact of this change and other affected shapes can be found in the third-quarter 2016 *Engineering Journal* article "Notes on the AISC 360-16 Provisions for Slender Compression Elements in Compression Members."

S a S . . I-S a M a C a .

Chapter G of the 2016 *Speci cation* includes two signi cant changes in the provisions for I-shaped members and channels. The provisions for determining shear strength without consideration of tension eld action have been revised to allow for inclusion of some post-buckling strength. This leads to an increase in available shear strength for certain built-up girders. In addition, the web plate shear buckling coef cient has been increased from 5 to 5.34 to better re ect its theoretical derivation. Since all W-shapes have webs that will be controlled for shear by the limit state of yielding, these changes will not impact the shear strength of these members.

For tension eld action, several of the restrictions found in the 2010 *Speci cation* have been relaxed—designers may see some increased shear strength for interior panels of beams with

J when applicable to HSS connections and only uses Chapter K for speci c requirements pertinent to HSS and box-section connections. This resulted in the Chapter K tables being revised to re ect a reduction in the types of connections covered in that chapter, with the other cases treated according to the more fundamental approaches provided in Chapter J.

A a a F C .

Appendix 1 permits the use of analysis methods that are more sophisticated than those normally used in design. Section 1.2 has been added to Appendix 1 in the 2016 *Speci cation* to permit elastic analysis that includes direct modeling of system and member imperfections. The advantage of this analysis approach is in the determination of compressive strength using only the member cross-section strength without the need to consider member length effects.

For re design, the 2016 version of Appendix 4: Structural Design for Fire Conditions includes two additions. A new table relating bolt temperature to available strength is provided, and a simpli ed method is presented for calculating the nominal exural strength of a composite beam using the bottom ange temperature. This new method incorporates the use of a tabulated retention factor dependent on the bottom ange temperature and the nominal exural strength of the composite beam at ambient temperature, calculated according to the provisions of Chapter I.

These are just some of the changes to the *Speci cation* and should not be thought of as the only ones that might impact a particular project. A complete review is highly recommended so that one is familiar with the new version when building codes that incorporate it are adopted. For additional information on the major differences between the 2010 and 2016 *Speci cation*, take a look at the 2016 NASCC: The Steel Conference presentare-