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steel interchange

Minimum Edge Distance

AISC 360-05 Table J3.5 contains minimum edge distance requirements for bolted connections that depend on whether the edge of the connected part is sheared vs. being thermally cut or rolled. However, edge distance requirements in AISC 360-10 are no longer dependent on edge preparation. What is the reason for this change?

This change is discussed in Section J3.4 of the Commentary to the AISC *Specification* (AISC 360). It states, "In previous editions of the *Specification*, separate minimum edge distances were given in Tables J3.4 and J3.4M for sheared edges and for rolled or thermally cut edges. Sections J3.10 and J4 are used to prevent exceeding bearing and tearout limits, are suitable for use with both thermally cut, sawed and sheared edges, and must be met for all bolt holes. Accordingly, the edge distances in Tables J3.4 and J3.4M are workmanship standards and are no longer dependent on edge condition or fabrication method."

Larry S. Muir, P.E.

Block Shear with Staggered Bolt Pattern

How is the effect of bolt stagger accounted for in the calculation of net tension area for the block shear limit state?

The tension component of the block shear check is based on tension rupture of the net area. The effect of the stagger in the bolt pattern should be calculated using Section B4.3b of the AISC *Specification*, which states:

"The net width of the part shall be obtained by deducting from the gross width the sum of the diameters or slot dimensions as provided in this section, of all holes in the chain, and adding, for each *gage* space in the chain, the quantity $s^2/4g$…"

In the case of block shear the gross width is the width involved in the block shear pattern, and the sum of the diameters or slot dimensions are the portion of the diameters through which the block shear pattern passes. This value is increased by the quantity $s^2/4g$ to obtain the effective net tension component of the block shear area.

Larry S. Muir, P.E

Safety Standards

Does the AISC *Specification* or another standard have safety requirements in addition to OSHA or local safety standards?

No, but we do recognize and help promote the OSHA requirements and safety in general. AISC references the OSHA standards in Part 2 of the AISC *Steel Construction Manual*. Also, safety information can be found on our website at **www.aisc.org/safety**.

Erin Criste

Minimum Size of Fillet Welds

Please explain why AISC 360 Table J2.4 "Minimum Size of Fillet Welds" is based on the thickness of the thinner part joined. Previous editions of the AISC *Specification* were based on the thickness of the thicker part.

Older versions of the AISC *Specification* did use the thicker of the parts joined, even after AWS changed to use of the thinner part joined many editions ago. As noted in the Commentary to AISC *Specification* Section J2.2b, the change was made to recognize the "prevalence of the use of filler metal considered to be 'low hydrogen.'" Preheat requirements also exist today, and modern practices allow the heat input to be regulated properly based upon the thinner part joined.

Erin Criste

Collector Design

AISC *Seismic Design Manual* Example 5.1 illustrates the design of a collector that carries both axial and flexural loads. There is a concrete deck continuously bracing the top flange in the weak direction, yet it is not considered to provide bracing against weak-axis flexural buckling in compression. Is this correct? It seems that the unbraced length should be equal to zero due to the continuous restraint provided by the slab.

For weak-axis buckling, you are correct; the unbraced length for weak-axis flexural buckling is zero. However, the bottom flange of the beam is not restrained from lateral translation along the full length as the top flange is. There remains a torsional buckling mode, and the past approach to recognizing this was to simply consider the beam unbraced in the weak axis. Why? This limit state is not addressed in the AISC *Specification* and receives limited discussion in mechanics texts such as those by Timoshenko and Bleich. Similarly, for simplicity, collectors have traditionally been designed neglecting the effects of slab restraint on their compression strength.

We do recognize this is a conservative approach in most cases, and a better solution is on the horizon. The next edition of the AISC *Seismic Design Manual* will use an approach called constrained axis torsional buckling that considers the top flange restraint that is present. This procedure already has been used in AISC *Design Guide No. 25—Design of Web Tapered Members* for calculating the constrained axis torsional buckling strength of monosymmetric I-shapes. This procedure is similar and can be adapted for doubly symmetric I-shapes.

Heath Mitchell, S.E., P.E.

L_p for HP Shapes

I am having difficulty arriving at the same L_p values as those given in AISC *Steel Construction Manual* Table 4-2 for HP shapes. How are the L_p values in this table calculated?

L_p values listed in the AISC *Manual* for shapes with noncompact flanges are adjusted to account for the noncompactness. If the shape has noncompact flanges, as many HP shapes do, then the value listed in Table 4-2 is L_p' as shown in AISC *Manual* Figure 3-1. The notes for AISC *Manual* Table 3-2 describe the use of L_p' with M_p' and BF to quickly arrive at beam flexural strengths when $L_p' \le L_b \le L_r$.

Brad Davis, S.E., Ph.D.

PJP Groove Weld Callout

I was recently told that it is not necessary to include the effective throat of PJP groove welds in parentheses and that standard practice is to indicate the effective throat as a fraction without parentheses. Is this correct?

No, that is not correct. If all you show on drawings is a dimension, it is very likely that a detailer will transfer that dimension to shop drawings and it will be taken as a depth of preparation dimension. Depending on the welding position, process and bevel angle chosen by the fabricator, it is very possible that they will not achieve the weld size that is required. In my experience as a fabricator, we sometimes saw design drawings that simply showed a dimension and no parentheses. In these cases, we submitted an RFI to the engineer, asking that he or she provide the required effective throat.

It is proper for you to show only the required effective throat on your design details, but that dimension must be in parentheses. Using that information, the fabricator will choose the depth of preparation required based on the weld process used and the position of welding. There is also good information on this topic in AISC's *Steel Design Guide No. 21 Welded Connections—A Primer for Engineers*; see Section 3.4.1.

Keith Landwehr

Built-Up I-Shapes

On one of our projects the fabricator wants to use plates to create built-up I-shapes instead of using rolled W-shapes for members of special moment frames (SMF). Does ASTM A992 cover built-up wide flange shapes?

No, the scope of ASTM A992 does not include plates or shapes built-up from plates. A992 is applicable to hot-rolled structural shapes only. AISC *Steel Construction Manual* Table 2-5 lists the applicable material specifications for plates. One material similar to A992 but applicable to plates is A572 Gr. 50. You may be interested in the *Modern Steel Construction* article "Are You Properly Specifying Materials?" (February 2012 issue), which explains the differences between material specifications, including plate materials.

Since these will be used for SMF beams and columns, you will need to review the requirements of AISC 341 (and AISC 358, if you intend to use a prequalified connection) specific to built-up members and column splices. Among other requirements that may apply, there are areas where CJP groove welded connections between plate elements of the built-up shape are required.

Erin Criste

SFRS Column Shop Splice

Our project is using built-up wide-flanges as columns in the seismic force resisting system (SFRS). There will be staggered shop splices in the web and flange plates used to create the built-up shapes. Do the column splice requirements of AISC 341-10 Section D2.5 apply to these shop splices, or do they only apply to splices made in the field?

The requirements of AISC 341-10 Section D2.5 apply to splices made both in the field and in the fabrication shop. Continuity of the cross-section is necessary. The intent of Section D2.5a is that the full strength of the section must be developed at locations of splices less than 4 ft from the beam-to-column joint. For staggered splices of elements within a column member, the splice of each element is considered individually, per Section D2.5a. If the splice of an element of the built-up shape is located less than 4 ft from the beam-to-column flange connections, then the splice of that particular element must be made with a CJP groove weld. Otherwise, a CJP groove weld is not required, though the splice must still meet the strength requirements of Section D2.5. In all cases, the connection of the web to flanges must be sufficient to develop the required strength at the splice location under consideration.

Erin Criste

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