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steel interchange

Shop Drawing Requirements for Welds

I have received "approved" shop drawings where groove welds are specified, but the edge preparation is not shown. Does AISC require that weld preparations be shown on a shop drawing?

Yes, the AISC *Specification* references AWS D1.1, and AWS D1.1-10, clause 2.3.5, titled "Shop Drawing Requirements" states:

"Shop drawings shall clearly indicate by welding symbols or sketches the details of groove welded joints and the preparation of base metal required to make them."

Without this information, the fabrication shop would have no direction as to preparation of material, and in the case of partial-joint-penetration groove welds, they would have no knowledge of the required effective weld size.

Keith Landwehr

Moment Connection with Extended Single Plate

I am designing a directly welded flange moment connection between a beam and column. The shear connection is an extended single plate with two columns of bolts. Since this is part of a moment connection that restricts rotation, is it appropriate to use a U_{bs} equal to 1.0 when checking block shear on the extended single plate, rather than 0.5 as recommended by the Commentary AISC 360 Section J4.3 for multiple columns of bolts? In addition, does the minimum weld equal to $\frac{5}{8}t_p$ still apply or can I size the weld based on the required shear strength only?

Part 12 of the 14th Edition AISC *Steel Construction Manual* states that since the angle between the members remains unchanged, eccentricity need not be considered in the shear portion of the moment connection. This justifies the use of U_{bs} = 1.0, rather than the value given in the Commentary to AISC 360 Section J4.3 for such shear connections.

It should be understood that $\frac{5}{8}t_p$ is not a requirement, but rather a provision that can be conservatively applied to practical situations for single-plate connections to ensure that the connection can accommodate simple beam end rotations. The recommendation for a minimum weld size equal to $\frac{5}{8}t_p$ is a ductility check intended to address the uncertainty in the distribution of moments due to the rotational demands of simple connections. Since rotation is restricted by this moment connection, the $\frac{5}{8}t_p$ recommendation also need not be considered.

Larry S. Muir, P.E.

Extended Single Plate Connection

Does the existence of stabilizer plates in an extended single-plate connection to a column web (similar to Figure 10-12 in the 14th Edition AISC *Steel Construction Manual* allow reduction of the eccentricity used in bolt group design? That is, does the bolt group still have to be designed for an eccentricity of *a*, or can a reduced eccentricity equal to the distance from the stabilizer plates to the bolt centroid be used to design the bolt group?

The design procedure presented in the 14th Edition AISC *Manual* explicitly allows other rational design methods to be used. One such method would be to include stiffeners and then design the column for additional moment due to the eccentricity from the face of the column to the end of the stiffeners. Since the column has been designed for the additional moment there is no need to resist this portion of the moment in the bolts. However, the ductility requirements may still need to be satisfied, since the actual distribution of the moment could still vary from the assumed model.

Note that if this approach is taken, the stiffeners are no longer just provided for stability but instead must transfer a defined moment to the support.

Larry S. Muir, P.E.

CVN Testing

Section 6.3 of AISC 341-05 requires CVN testing for certain components of the SLRS. Some heavy material has been purchased and delivered to the fab shop without the required CVN testing. The material was purchased to length so there is no surplus material from which test coupons can be cut. Is there an acceptable form of NDE or other analytical technique that can be used to measure toughness in lieu of CVN testing?

I am not aware of any other method, including NDE, that would provide material toughness information in lieu of CVN testing. As to your predicament, I can only offer the following thoughts:

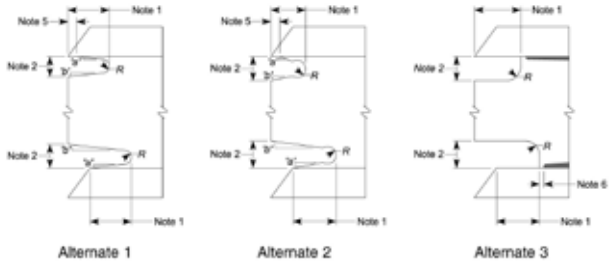
1. If all of the members in question are of the same heat, you may want to consider sacrificing one member to do CVN testing. Assuming the test results are satisfactory, then only the one member would have to be replaced, or possibly spliced, depending on the application.

2. Producing mills occasionally have CVN data that does not appear on your MTR. For example, if another customer ordered the same size material with CVN testing, and it was supplied from the same heat as your material, the results would be on the other customer's MTR, but not on yours. Check with the mill to see if they have CVN data for your material heat(s).

Keith Landwehr

Weld Access Hole Geometry

Can weld access hole Alternate 3 shown in AISC 360-10 Figure C-J1.2 (see below) be used for rolled wide-flange shapes or is its use restricted to built-up shapes?



The AISC *Specification* does not allow Alternate 3 for rolled sections. AISC 360-10 Section J1.6 states, "For sections that are rolled or welded prior to cutting, the edge of the web shall be sloped or curved from the surface of the flange to the *reentrant* surface of the access hole." Alternate 3 is provided to accommodate the geometries involved in built-up members where the weld access hole is cut prior to welding the flange to the web.

There are statements made in the Commentary to Section J1.6 that also discourage the use of Alternate 3 for a rolled section. The Commentary states:

"The geometry of the reentrant corner between the web and the flange determines the level of stress concentration at that location. A 90° reentrant corner having a very small radius produces a very high stress concentration that may lead to rupture of the flange. Consequently, to minimize the stress concentration at this location, the edge of the web is sloped or curved from the surface of the flange to the reentrant surface of the access hole."

It also says, "Stress concentrations at web-to-flange intersections of built-up shapes can be decreased by terminating the weld away from the access hole. Thus, for built-up shapes with fillet welds or partial-joint-penetration groove welds that join the web to the flange, the weld access hole may terminate perpendicular to the flange, provided that the weld is terminated a distance equal to or greater than one weld size away from the access hole."

The three alternatives shown all take measures to reduce the stress concentration at the web-to-flange juncture. Alternate 3 does not do this with a rolled section.

In addition to the technical concerns, it would seem to be difficult and more work to produce an access hole similar to Alternate 3 in a rolled section. Also, the detail would be prone to poor cutting along the flange. Thus, economic concerns also seem to eliminate Alternate 3 for rolled sections.

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

Eccentrically Loaded Single Angles

The strengths given in Table 4-12 of the 14th Edition AISC *Steel Construction Manual* appear to have increased for some of the angle sizes when compared to the same table in the 13th Edition AISC *Manual*. What is the reason for the increase?

You are correct that there are differences. The changes in compressive strength values are due to three revisions made in the procedure used to generate Table 4-12:

1. The 14th Edition *Manual* uses ANSI/AISC 360 Section H2 to determine the strength of the single angle, instead of Section H1 as used in the 13th Edition.

2. In the 14th Edition *Manual*, the flexural strengths used at each point are the same; the minimum is calculated for the section, considering all limit states. This means the interaction equations are the same at each point except for the sign of the flexural terms. In the 13th Edition AISC *Manual*, flexural strengths were being chosen for each point based on limit states applicable at that point. In the 14th Edition, we follow the guidance on what is called the "strict" interpretation in the Commentary to ANSI/AISC 360 Section H2(a).

3. The procedure in the 14th Edition applies the appropriate sign for load direction in the interaction equations. In the 13th Edition, we conservatively summed absolute values.

Erin Criste, LEED Green Assoc.

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