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

Elliptical Hollow Sections

AISC 360-05 currently does not address the design of elliptical hollow sections. I was wondering if there are any other resources that can be used to design with these shapes.

The AISC website has a page related to HSS at **www.aisc.org/hss**. It provides information for rectangular and round HSS. Elliptical HSS are currently not as common (and not typically produced) in the U.S. However, the International Committee for the Development and Study of Tubular Structures (CIDECT) publishes design guides that have information on elliptical shapes (**www.aisc.org/cidect**).

There are some producers and possibly service centers that have elliptical shapes available for your project. However, they may not be produced to an ASTM standard. A link to a list of producers and service centers can be found on our steel availability web page (**www.aisc.org/availability**).

Erin Criste

High-Strength Bolts

Are high-strength bolts, nuts and washers required to be produced by the same manufacturer?

Neither the AISC nor RCSC specifications require that bolts, nuts and washers be produced by the same manufacturer. However, there are two conditions where they must be supplied as an assembly: galvanized fasteners and TC bolts. These assemblies can be made up of components from different manufacturers. FAQ 6.2.3 on the AISC website (**www.aisc.org/faqs**) discusses when fasteners must be supplied as assemblies.

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

Ceramic Weld Backing

Can I use a ceramic backing material for complete-joint-penetration groove welds?

AWS D1.1 Section 5.10 lists acceptable materials for backing. Ceramic backing is allowed. However, the prequalified joint details use steel backing, so welding procedure specifications (WPSs) that call for ceramic backing must be qualified by test.

Larry S. Muir, P.E.

Strength of PJP Groove Welds

Is it possible to use the 13th Edition AISC *Steel Construction Manual* Tables 8-4 through 8-11 to determine the capacity of a PJP groove weld group by converting the groove weld size to an equivalent fillet weld size?

No. Tables 8-4 through 8-11 in the 13th Edition AISC *Steel Construction Manual* include the directional strength increase from AISC *Specification* Section J2.4(b). This directional strength increase can only be applied to fillet welds, so these cannot be used to design a PJP groove weld. The elastic method, outlined on page 8-12 of the *Manual*, can be used in the design of a PJP groove weld group.

Larry S. Muir, P.E.

Weld Intersection Fatigue Category

We have a welded plate girder that has a bottom flange with a groove welded splice. The web-to-flange welds are fillet welds that pass over the flange splice. Does this intersection of two welds, the fillet weld passing over the groove weld, fit into a stress category of AISC *Specification* Appendix 3 Table A-3.1?

There is no specific fatigue category for the fillet weld over the groove weld detail you describe. Each joint is evaluated separately. Based on the general condition you describe, the web-to-flange fillet weld is consistent with AISC 360 Table A-3.1 Case 3.1. This is a Stress Category B detail. The flange splice likely is either Case 5.1, 5.2 or 5.3. As long as F_y is less than 90 ksi, Stress Category B applies. Of course you need to confirm this based on your actual detail.

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

Use of Finger Shims

Are finger shims allowed in snug-tightened and pretensioned joints?

Yes, finger shims are allowed in snug-tight and pretensioned connections. They are specifically mentioned in RCSC and AISC standards with regard to slip-critical connections, only to address concerns that the lack of bearing surface at the finger might reduce the slip resistance. The RCSC *Specification* makes it clear that the loss of bearing (clamping) area does not reduce the slip resistance of a slip-critical connection.

Larry S. Muir, P.E.

Plugging Weep Hole in Galvanized HSS

When exposed HSS members are galvanized, is there an AISC requirement that the vent holes be plugged after the member is erected?

There is no AISC provision that specifically requires vent holes for galvanizing be plugged in exposed HSS. However, AISC *Specification* Section M2.10 requires that HSS exposed to water either be sealed or a drain hole provided at the base. The idea is either to prevent moisture from getting in or to allow it a way to get out.

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

Drawing Completeness

Are there any industry standards or accepted industry practices that should be expected to be met for drawings issued for erection?

There are no standards that cover this. AISC *Code of Standard Practice* Section 4.2 simply says that erection drawings must be "complete." The structural steel frame should be able to be erected, bolted and welded using the approved erection drawings. The typical expectation is that sufficient information is provided to locate and install the structural steel members and components, install the proper grade, diameter and length of bolts and make all field welds.

Examples of shop and erection drawings do appear in AISC's *Detailing for Steel Construction*. These illustrations may be useful to you in showing what is usual.

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

steel interchange

End-Plates and CJP Welds

On page 18 of AISC *Steel Design Guide No. 4*, 2nd Edition, there is a requirement that CJP groove welds must be used when the beam flange thickness exceeds ⅜ in. Why is there a restriction on the use of fillet welds?

The use of CJP groove welds was meant as a recommendation for non-seismic connections and is not a hard requirement. All of our test specimens with ⅜ in. or greater flanges had CJP groove welds.

Thomas M. Murray, P.E., Ph.D.

Erection Tolerances

Beam elevations are measured relative to the upper finished splice line per the AISC *Code of Standard Practice*. What affects the actual elevation of the upper finished splice line of an erected column shaft? The *COSP* seems to allow that the actual position of the upper finished splice line is affected by the following:

- **Column length(s) below the upper finished splice line, which vary by allowable fabrication tolerance in cut length per *Code* Section 6.4.1.**
- **Bearing device (leveling nut under base plate) location, which may vary in elevation per *Code* Section 7.6.**

Or, is the beam elevation tolerance applied independent of the framing and relative to an arbitrary datum?

The actual elevation of the upper finish splice line can and normally does vary based upon the actual length of the fabricated column shaft and the elevation of the base. The tolerances for these variations are given in the AISC *Code of Standard Practice*.

Note that these are not the only sources for variation. Other factors, such as fit of splices, differential loading, and temperature variations may contribute to column splice elevation variances. This is why Section 7.13.1.2(b) in the AISC *Code of Standard Practice* says the beam elevation tolerance is applied relative to the measurement from the actual position of the upper finished splice line. The beam elevation tolerances are not applied independently from these other variations.

Charles J. Carter, S.E., P.E., Ph.D.

Special Inspection and AISC Certification

When a steel fabricator has an AISC Certification indicating they have met the quality certification requirements for "Standard for Steel Building Structures," does that fulfill the requirements of *IBC* Section 1704.2.2 Fabricator approval? Also, if a fabricator has an AISC Certification, is shop welding inspection required?

2006 *IBC* Section 1704.2.2 does not specifically mention AISC Certification. Rather, it refers to a fabricator that is "registered and approved to perform such work without special inspection." This approval is obtained from the local jurisdiction and most jurisdictions do deem AISC Certification as meeting the requirements of Section 1704.2.2.

The exemption in *IBC* Section 1704.2.2 allows fabricators with approved QA/QC procedures to use in-house personnel to perform the required inspections. It exempts the need for an inspection agency independent from the fabricator, but it does not exempt the fabricator from performing the required inspections in accordance with *IBC* Chapter 17 and AISC 341.

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

Minimum Number of Bolts

We were told that a minimum of two bolts per connection is required for erection before a beam can be released from the crane regardless of the beam size. Is this correct? I have looked in the AISC *Code of Standard Practice* and the AISC *Steel Construction Manual* and cannot find a section that covers this.

The two-bolt minimum is an OSHA requirement for stability during erection. OSHA 29 CFR §1926.756 Beams and Columns requires a minimum of two bolts per connection before releasing the hoisting line. Separately, AISC does not have any minimum requirement for the number of bolts in a bolted connection other than the requirement that simple shear connections must extend deeper than *T*/2 of the supported beam. Thereafter, the number of bolts must be sufficient to transfer the required loads.

Erin Criste

Column Base Fix

We have been contacted by a local fabricator to provide a fix for a field-modified gravity column. Due to a conflict with the anchor rods, portions of the column flange were removed. Can we provide either plate or angle reinforcing for the flange to make up the area lost by the notches or should we recommend removal and replacement of the column?

Removal and replacement of the column is most likely unnecessary. The easiest option likely is to replace the area lost in a manner such as you propose. Depending on the size and shape of the affected area, removal of flange material at the column base may not have an effect on the performance and strength of the column in terms of its flexural buckling strength. That is, perhaps the variations in cross-section can be accounted for in design. However, depending on the number of columns that were modified, it may cost more for you to determine whether or not a fix is needed than it will cost to just provide local reinforcement in the first place.

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

The complete collection of Steel Interchange questions and answers is available online. Find questions and answers related to just about any topic by using our full-text search capability. Visit Steel Interchange online at **www.modernsteel.com**.

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Steel Interchange is a forum to exchange useful and practical professional ideas and information on all phases of steel building and bridge construction. Opinions and suggestions are welcome on any subject covered in this magazine.

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If you have a question or problem that your fellow readers might help you solve, please forward it to us. At the same time, feel free to respond to any of the questions that you have read here. Contact Steel Interchange via AISC's Steel Solutions Center:

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