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!

Bolt Installation Using Hand Wrenches

In my current project, bolts are longer in length than specified at many places. This is not permitting use of a calibrated torque wrench. Can we use DTI washers and an open ended wrench to tighten the bolts?

Question sent to AISC's Steel Solutions Center

The 2004 *Research Council on Structural Connections (RCSC) Bolt Specification* (**www.boltcouncil.org**) allows four different pretensioning techniques (turn-of-nut, calibrated wrench, twist-off bolts, and direct-tension-indicator washers). Since you've already eliminated the calibrated wrench method and it does not sound like the bolts you have are the twist-off type, that leaves you with the DTI method and turn-of-the-nut method. Either one can be used.

One special consideration with bolts that are longer than specified—make sure the nut does not jam on the thread runout in the installation. Where a nut might jam, you can add a washer or washers under the nut to eliminate the problem. As far as using an open ended wrench, you may have some difficulty. Snug-tight is considered the full effort of an ironworker using a spud wrench. Achieving pretensioning, if required for the connection, by a spud or open ended wrench may be very difficult, considering the effort that would be involved.

Sergio Zoruba, Ph.D., P.E.
American Institute of Steel Construction

Column Splice Erection Tolerances

What is the maximum gap allowable between the column face and the splice plates in a case where the bolts are only snug-tight (no pretensioning required)? I know we need erection clearance of at least 1/16", but does this have to be further shimmed when assembled in the field? In other words, what should the final installed fit-up look like?

Question sent to AISC's Steel Solutions Center

Providing erection clearance is a smart move. The suggested typical column splice details shown in the AISC *LRFD Manual of Steel Construction*, 3rd Edition, Case VI-A (pages 14-38 and 14-39) indicates that erection clearance should be provided and that sufficient strip shims should be provided to obtain 0" to 1/16" clearance on each side. Based on your description of the fit-up, it appears that your connection is within this recommended clearance. A gap such as this is easily drawn together in bolt installation, even with bolts that are snug-tightened.

As far as the installed condition and what gap is permitted, the *RCSC Specification* calls for the plies to be brought into firm contact. RCSC defines firm contact as "… the plies … solidly seated against each other, but not necessarily in continuous contact."

Kurt Gustafson, S.E., P.E.
American Institute of Steel Construction

Structural Steel Inspection

My firm specializes in inspection and materials testing. I am looking for a publication that covers the basics of structural steel inspection. Do you have any recommendations from AISC's publications or other sources?

Question sent to AISC's Steel Solutions Center

AISC is presently developing a specification for the qualification of steel structures inspectors, which will be a valuable source of information on steel inspection.

The International Code Council (ICC) publishes a document titled *Structural Steel Inspection and Field Practices Workbook*. The workbook is available from the following ICC web link, **www.iccsafe.org/dyn/prod/4021S.html**.

Kurt Gustafson, S.E., P.E.
American Institute of Steel Construction

Shear on Anchor Rods

I am working on a project that was built in 1957-1958 and I am trying to check the existing column anchor bolts for shear. I have the 6th Edition *Manual of Steel Construction* (1967) which gives shear values for ASTM A307, A7, and A373 steel (F_v = 10 ksi). Do you know what type of steel (F_v) was predominately used in the late 1950s for anchor bolts?

Question sent to AISC's Steel Solutions Center

Anchor rods (as we call them today) have historically been the "stepchild" of the construction industry. Design specifications, both AISC and ACI, until recently did not thoroughly cover the subject of foundation anchorage. Anchors used in the 1950s were probably unfinished bolts, which could have been ASTM A307 or A7.

Today AISC recommends that designers avoid taking shear in anchor rods because base plates have extra-oversized holes resulting in significant deformations required to achieve bearing of the base plate on the rod. One must also recognize the limited bending capacity most rods could provide. Remember that if a base plate does bear against the anchor rod, there is likely some eccentricity of the shear load that will cause bending in the rod. AISC *Design Guide 1: Column Base Plates* covers the subject of the design of base plates and includes discussion on these subjects. This document is available from **www.aisc.org/epubs**.

Kurt Gustafson, S.E., P.E.
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Seismic End-Plate Moment Connection

There was a *Steel Quiz* answer (July 2005, question nine) that stated seismic moment end-plate connections are to be prepared as slip-critical bolted joints, but designed as bearing joints. The answer refers to Section 7.2 of the 2002 AISC *Seismic Provisions for Structural Steel Buildings*, but not the

corresponding Commentary, which better explains the provision and specifically relaxes the requirement of faying surface preparation for moment end-plate connections.

Question sent to AISC's Steel Solutions Center

None of the qualifying tests for seismic moment end-plate connections used slip-critical bolted joints; therefore, faying surface preparation is not required for this particular connection type.

Section 7.2 of the 2002 *Seismic Provisions* technically does not exclude seismic moment end-plate connections from faying surface preparation requirements. However, the Commentary to Section 7.2 mentions that the faying surface preparation requirement may be relaxed for this particular connection. Hence the source of confusion, as Commentary language cannot be interpreted as a specification provision.

This will be clarified in the upcoming 2005 AISC *Seismic Provisions* as a direct exemption to be found in Section 7.2.

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Hot-Dip Galvanizing and Vent Holes

I have a situation with an HSS 10×6×3/8 fitted with WT connections that enclose both ends. It is exposed to the weather so it has been specified as hot-dip galvanized. The question has been asked if the HSS will need vent holes, and, if so, how many and on which side for dipping? I am of the opinion that we will not need holes. Am I correct in this assumption?

Question sent to AISC's Steel Solutions Center

"It is important to properly vent hollow, overlapped, and contacting surfaces to prevent trapped moisture or gas from flashing to steam in the heated galvanized kettle, which may result in localized uncoated surfaces. Additionally, pressure increases resulting from trapped moisture flashing to steam can violently rupture the fabrication, endangering galvanizing plant personnel. ASTM A385 contains guidelines for properly venting numerous types of assemblies."

(Answer taken from the June 2005 *Modern Steel Construction* article "Specifying and Detailing for Hot-Dip Galvanizing: An Overview for Engineers, Architects, and Detailers" by Rahrig and Krzywicki. The article can be downloaded from *MSC*'s web site at **www.modernsteel.com**.*)*

Sergio Zoruba, Ph.D., P.E.
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NEW QUESTION

Conduit and Composite Slabs

Is it permitted to run electrical conduit in the concrete floor slabs of composite steel beams? If so, how does one determine or specify an amount or size of conduit permitted? What if a large amount of conduit crosses perpendicular to a beam at either the center span, where compression is a concern, or the near the support, where shear transfer is a concern?

Question sent to AISC's Steel Solutions Center

Do you have an answer? Send your response to the Steel Solutions Center at solutions@aisc.org. We'd like to hear from you!

Steel Interchange is a forum for Modern Steel Construction readers 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.

The opinions expressed in Steel Interchange do not necessarily represent an official position of the American Institute of Steel Construction, Inc. and have not been reviewed. It is recognized that the design of structures is within the scope and expertise of a competent licensed structural engineer, architect or other licensed professional for the application of principles to a particular structure.

If you have a question or problem that your fellow readers might help you to 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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