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steel interchange

Sloped Washers

Section 6.1 of the RCSC *Specification* indicates that beveled washers are required for snug-tightened bolts when the outer face of the joint has a slope that is greater than 1:20 with respect to a plane that is normal to the bolt axis. This requirement is not listed in Section 6.2 for pre-tensioned and slip-critical joints. Please confirm that beveled washers are not required when the bolts are pre-tensioned.

Section 6.1.1 covers washer requirements for snug-tightened bolts. However, Section 6.2 states: "Washers are not required in pre-tensioned joints and slip-critical joints, except as required in Section 6.1.1, 6.1.2, 6.2.1, 6.2.2, 6.2.3, 6.2.4 and 6.2.5." Thus, the requirement applies to all conditions where the outer face of the joint has a slope that is greater than 1:20 with respect to a plane that is normal to the bolt axis.

Carlo Lini

Shear Lag

I am designing the connection of an HSS 8×8 brace to a gusset using a splice plate that is 10 in. wide. The HSS is slotted onto the splice plate and connected with four fillet welds, each 8 in. long. AISC *Specification* Table D3.1 Case 4 requires the length of weld (8 in. in my case) to be at least equal to the width of plate (10 in. in my case). Is the arrangement I have described prohibited? If not, how should the shear lag be account for?

Case 4 is intended to apply to the narrower plate shown in the figure, not the wider plate. When checking the wider plate some judgment must be exercised. With an 8-in. weld length, you will develop 75% of the 8-in. portion of the 10-in. plate. Assuming a model based on the Whitmore section, it can be seen that you can easily develop the 1-in. piece of "extra" plate on each side over the length of 8 in. So I would calculate the net area as equal to the thickness of the plate times [(0.75 × 8") + 2"].

Carlo Lini

Rotational Capacity Testing

Can Rotational Capacity Testing be performed by the bolt manufacturer?

Yes. The Rotational Capacity Test is required by ASTM for galvanized ASTM A325 bolts. The A325 standard requires the tests, but does not specify who is to perform the test. It is common for the contractor to perform the test. However, some suppliers will perform the test before the bolts are shipped.

Larry S. Muir, P.E.

Wrench Calibration

How often do the gages in torque wrenches used to install high-strength bolts need to be calibrated?

Neither the AISC *Specification* nor the RCSC *Specification* contains requirements to calibrate the wrench itself. The equipment manufacturer may have a suggested schedule for calibrating the wrench.

For the purpose at hand, though, it may not matter. An accurate measure of the torque applied by the wrench is not necessary for any of the installation methods, since each method is calibrated to achieve the required pretension independent of a specific torque reading or setting on the wrench. Even for the calibrated wrench method only a consistent torque reading/setting is necessary to produce the necessary pretension, not an accurate reading.

Larry S. Muir, P.E.

Slotted Holes in Base Plates

The anchor rods for a column base plate were placed out-of-tolerance. The contractor elongated the base plate holes into 1 5/16-in. × 2 1/16-in. slots so that the base plate could be erected. I am confident the base plate is okay. However, the area of the holes as detailed was 5.41 sq. in., and the area of the slots is 9.35 sq. in. Should I be concerned about bearing on the concrete?

AISC *Specification* Equation J8-2 provides a bearing equation that allows you to take into account an area of concrete larger than the bearing area. A limit of 1.7 is applied to the assumed area. However, if the concrete is confined, then the *Specification* stretches the limit a little further to 2 (see User Note and Commentary to Section I6.2).

I suspect that if you applied the "geometrically similar" concept in J8 within the limits stated to your slotted holes, you would find that the assumed bearing area is such that slots can be deemed to have negligible effect in terms of bearing.

Larry S. Muir, P.E.

Beams with Cap Channels

Does the presence of a cap channel, as is commonly used with crane girders, preclude lateral-torsional buckling such that the section can be designed assuming continuous lateral support?

No. The cap channel will improve resistance to LTB, but it cannot be assumed to preclude it. AISC Design Guide 7 includes crane runway girder design examples that include consideration of lateral-torsional buckling.

Larry S. Muir, P.E.

Location of Pre-installation Verification

A contractor has requested to perform all the pre-installation verification testing for pre-tensioned bolts at the bolt supplier's facility with the third party special inspector present instead of at the job site. Is this acceptable?

Section 7.2 of the RCSC *Specification* is specific in requiring that pre-installation verification must be done "at the site of installation." It does not permit this work to be done by the bolt manufacturer or supplier independently away from the site. As explained in the Commentary, there are variables specific to the shop and the field that can affect installed pretension. The requirement that pre-installation verification be done at the site of installation is intended to ensure that all such variables are addressed when the bolting crew confirms that the procedures they will be using in the actual work successfully produces a pretension that is equal to or greater than the required value.

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

Stiffener Stability

AISC *Specification* Section J10.8 states: "The thickness of a stiffener shall not be less than one-half the thickness of the flange or moment connection plate delivering the concentrated load, nor less than the width divided by 16." Does this mean that the width-to-thickness ratio of the stiffener can be no greater than 16 or that the ratio of flange width of moment connection plate to stiffener thickness can be no greater than 16?

It means the ratio of the stiffener width to stiffener thickness can be no greater than 16. This is essentially a stability check on the stiffener so the width of the element delivering the load is immaterial. It is the width of the stiffener that matters. Equation (4.3-3) in AISC Design Guide 13 illustrates this check if you would like to see it applied as intended in the AISC *Specification*.

Carlo Lini

Galvanized Washers

ASTM A325 Section 4.3.5 states: "Threaded components (bolts and nuts) shall be coated by the same zinc-coating process and the supplier's option is limited to one process per item with no mixed processes in a lot." Must the washers also be galvanized using the same process as the bolts and nuts?

No. The washer is not a threaded component in the assembly, and so mixed galvanizing processes between the washer and the fastener assembly (nut and bolt) are not an issue. The nut and bolt are subject to the requirement for same process because the over-tapping requirements vary by process and this affects the nut stripping strength. Also, there is an impact on lubrication requirements.

Carlo Lini

Concentrated Loads at the Ends of Members

AISC *Specification* Sections J10-2 (Web Local Yielding) and J10-3 (Web Local Crippling) are subject to reductions when the load is applied near the end of the member. We are checking a bolted moment end-plate connection into a column flange near a bolted end-plate column splice. The column flanges and web are welded to the end plate and the end plate has three bolts within the web on each side and three bolts outside of each flange. If the splice is considered the end of the member substantial reinforcement is required. Does the end-plate connection at the column splice increase the yielding and crippling strength? In other words must this really be considered a condition near the end of the member?

Typically, a cap plate or end plate of reasonable thickness with an adequate connection to the member will be such that the member end reductions are not applicable. In practice, it is common to use stiffeners and cap plates at the top of columns to allow the use of *Specification* Equations J10-2 and J10-4 for web local yielding and web local crippling, respectively.

Bo Dowswell, P.E., Ph.D.

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