Steel Interchange is an open 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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THICKNESS OF GUSSET FOR FILLET WELDS

In order to check the minimum gusset plate thickness against the fillet weld size required for strength, the 3rd edition *LRFD Manual* contains the expression $t_{min} = 6.19D/F_u$. However, in the 2nd edition *LRFD Manual*, the expression is $t_{min} = 5.16D/F_y$. Is the new expression based on $F_y = 0.833F_u$ and why use F_u instead of F_y?

Question sent to AISC's Steel Solutions Center

There is no requirement or guarantee that F_y will equal $0.833F_u$. The updated expression in the 3rd edition *LRFD Manual* is derived by equating the design shear rupture strength of the base metal to that of the fillet welds, as shown on page 9-6. In the 2nd edition *LRFD Manual* (Volume II), the expression $t_{min} = 5.16D/F_y$ was derived by equating the design shear yield strength of the base metal to the design shear rupture strength of the fillet welds as illustrated on page 9-15. It should be noted that design shear rupture strength checks are based on F_u, as shown in Section J4.1 of the 1999 *LRFD Specification*, and this is the reason F_y is no longer used.

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PRETENSIONING ANCHOR RODS

ASTM F1554 Grade 105 anchor rods will be used in a coastal area with wind gusts of 130 mph located in a very high seismic zone. We are planning to pretension the anchor rods to avoid the risk of inducing tensile fatigue from loading cycles resulting from wind loads. Do you agree with this as being a valid reason to pretension these rods?

Question sent to AISC's Steel Solutions Center

While you are correct that pretension is required when threaded fasteners are subjected to tensile fatigue, it may not be correct to say that the coastal wind exposure or the seismicity of the application result in tensile fatigue. Wind loading, even for the high wind speed you noted, does not generally produce enough cycles on a building structure to result in fatigue. Fatigue in anchor rods is common, however, when dealing with sign structures, which tend to have a much shorter period of motion.

Regarding the seismicity of your application, again, there are generally not enough cycles, even in many earthquakes, to produce fatigue. However, seismic loadings tend to produce significant load reversals (a loosely defined term that I think of as alternating and repeated applications of the full or near-full design load), for which pretensioned installation may be required.

Charles J. Carter, S.E., P.E.
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THREAD ENGAGEMENT

The 1985 RCSC *Bolt Specification* found in the 9th edition *ASD Manual* uses the phrase "full thread engagement." However, the 2000 RCSC *Bolt Specification* appears to have dropped this nomenclature. Is the phrase "full thread engagement" still used by the RCSC *Bolt Specification*, and, if so, where can we locate this information?

Question sent to AISC's Steel Solutions Center

The latest 2000 RCSC *Bolt Specification* does not use the phrase "full thread engagement" as did the 1985 RCSC *Bolt Specification*. Instead, the new specification uses the wording "sufficient thread engagement." Please refer to page 16.4-xi of the 3rd edition *LRFD Manual* for the following definition:

Sufficient Thread Engagement - Having the end of the bolt extending beyond or at least flush with the outer face of the nut; a condition that develops the strength of the bolt.

This change was initiated to better describe the acceptable condition. Having the nut flush with the end of the bolt provides sufficient thread engagement to develop the strength of the bolt.

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SINGLE-PLATE SHEAR CONNECTION

I have a question on designing single-plate shear connections. Should the weld between the plate and support be designed for shear only, or for both shear and bending moment?

Question sent to AISC's Steel Solutions Center

The current approach to sizing the welds is based on the Astaneh procedure, which develops the strength of the plate. The fillet weld is sized equal to 75% of the plate thickness to ensure that the plate will yield before the fillet welds would fracture. If an approach other than the Astaneh procedure is used, the designer must determine what combination of loadings is appropriate for the design of the welds (and other elements of the connection).

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LATERAL DRIFTS

from October 2001 Steel Interchange

There are numerous sources that provide recommendations and opinions regarding permissible lateral drift of steel buildings that are supporting exterior walls comprised of brick veneer or concrete masonry unit (CMU) block. These include AISC *Design Guide No. 3, Serviceability Design Considerations for Low-Rise Buildings* by J.M. Fisher and M.A. West. Does any other established entity comparable to AISC provide explicit specifications for this situation?

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Seismic considerations might have an impact on the determination of the design drift. IBC 2000 section 1617.3 includes drift limits for seismic considerations. ACI 530-99 section 1.13.5.2.2 requires isolation of masonry from building frames to avoid unintended seismic resistance contributed by masonry partitions. In order to maintain the required separations the construction details at the masonry/frame interfaces might become the controlling factor of the drift limits.

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NEW QUESTIONS

CONSIDERATION OF CONNECTION ECCENTRICITY

In exterior columns, should the eccentricities resulting from the beam connections be considered when the connections are not designed by the SER? For example, when a W-shape beam is framed into an exterior HSS column via a single-plate shear connection, the column could be designed for the eccentricity equal to the distance from its centerline to the bolt line. With that approach, it might make sense not to place the beams at the column lines and laterally brace the column by a light angle section.... Alternatively, the beams could be assumed to extend into the column centerlines and the specialty connection design engineer directed to design the connection for combined shear and moment. Can the AISC *ASD Manual's* tables for single-plate shear connections or eccentric bolted connections be used for that purpose?

If the eccentricity is considered in column design, it should presumably be applied in two directions in corner columns and in columns where the exterior girders deliver vastly unequal reactions from the opposite sides. This might lead to the corner columns actually being heavier than the interior columns, which support four times the load.

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SHOP AND ERECTION DRAWING STANDARD

Does AISC or another organization publish specific standards or specifications for steel detailing and shop drawings? The drawings that I've seen coming from some of the new CAD software have not been consistent from one job to the next, nor have they matched the clarity that good steel detailers produce by hand. NISD publishes guidelines for information to be shown by the design engineer but nothing on standards for what the detailers will provide. I'm looking for some good balanced standards to reference as minimum requirements for steel shop drawings that are submitted to us. Some detailers have advised me that the information is there in the software. So, how can I communicate my requirements up front, so that the advantages of electronic data transfer are realized and properly balanced with the need for clear record documents?

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