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.

Elevated Slab Tolerances

For a steel-framed project with concrete slabs on metal deck, I know that the AISC *Code of Standard Practice* sets the tolerances for the steel, but what typically defines the tolerances for the top of concrete slab on metal deck? Normally, the concrete subcontractor uses the ACI "F" number criteria from the cast-in-place section of the project specifications, but is this correct if one just references the basic ACI and AISC standards without additional project specifications?

Remember that top-of-concrete elevations for a framed slab are as much a function of the design process as they are of the construction process. The "F" numbering system is really a measurement of the contractor's performance of the slab finishing process, rather than of the actual elevation of a framed slab. Therefore, to answer your question, the engineer really needs to be involved in the process of determining what is required to achieve acceptable slab elevation results.

I wrote a SteelWise article for *MSC* (June 2005) titled "Tolerating Tolerances" that discussed the subject in some detail. Back issues of *MSC* can be accessed at **www.modernsteel.com/backissues**.

Kurt Gustafson, S.E., P.E.

OCBF and Tension-Only Bracing

Section 14.2c of the 1997 version of *Seismic Provisions for Structural Steel Buildings* does not allow tension-only bracing. The 2005 version states that tension-only bracing can be used, but not in K, V, or inverted V configurations.

Am I reading this correctly? When did it change that tension-only could be used? I do see that there are many restrictions to this.

There have been substantial changes made to the 2005 *Seismic Provisions* (AISC 341-05) with respect to earlier editions of the document. You are correct that AISC 341-05 permits the use of tension-only braces in OCBF. This is found in the user note under Section 13.1. As per the user note in Section 14.2 the tension-only members in OCBF need not satisfy the slenderness requirement of Section 14.2, but cannot be used in K, V, and inverted V configurations. This change was made possible by the changes in the system design requirements in the referenced ASCE 7-05 standard.

Amanuel Gebremeskel, P.E.

Pretensioned Bearing-Type Joints

Please let me know whether a bearing-type connection can be pretensioned.

If yes, should the pretension (70% of the proof load of the bolt) be taken into account and checked for combined shear and tension when using N- or X-type bolts?

What is the purpose behind pretensioning bearing type joints? Is the pretension to be in accordance with RCSC 2004? Will prying occur in a pretensioned joint?

A bearing-type connection may be snug-tightened or pretensioned. Hence, a bearing connection can be pretensioned.

The pretension force should not be considered part of the tensile load on the fastener. These are not additive. The tension load in a pretensioned bolt does not change when an external tension force is applied until the parts separate, which would require a tension force in excess of the pretension. Additionally, shear deformations occur prior to bolt failure. These deformations also relieve the pretension prior to bolt failure.

The purpose behind pretensioning is generally to minimize the variation of force in the bolt. This should not be confused with slip-critical connections, which are designed to prevent slip. Refer to Section J1.10 of the 2005 AISC specification (**www.aisc.org/2005spec**) and Section 4.2 of the 2004 RCSC specification (**www.boltcouncil.org**) for cases when pretensioned joints are mandated.

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

Historic Shape Data

I am interested in purchasing a copy of the book *Dimensions and Properties, Rolled Shapes—Steel Wrought Iron Beams and Columns, as rolled in the USA, Period 1873 to 1952*. It was compiled and edited by Herbert W. Ferris, and it looks like the 9th printing was in 1983.

The "Ferris Book" has been out-of-print for some time and is no longer available from AISC. *Design Guide 15, Rehabilitation and Retrofit Guide* has superseded the Ferris Book, including shape information up until the year 2000. AISC also has a shapes database CD available that includes historic shapes. Both the design guide and the shapes database are available for AISC members at **www.aisc.org/epubs** or can be purchased from the AISC bookstore at **www.aisc.org/bookstore** by others.

If you still want to find a copy of the Ferris book, check with a used bookstore. Also, copies sometimes pop up for sale on eBay.

Kurt Gustafson, S.E., P.E.

Stiffeners and Concentrated Forces

We need more information on Section J10.8 in the 2005 AISC specification. The basic question is: Where do the $25t_w$ and $12t_w$ parameters come from? What about when you have two stiffeners within $25t_w/2$ of each other? Are the strengths additive? Is there any provision by which the $25t_w$ limit can be increased?

These are based upon stiffener research and testing that goes back many years. The stiffener is assumed to have an effective area of web of $12t_w$ on each side. For an interior location, a total length of $25t_w$ is assumed. ($12t_w$ is approximately half of $25t_w$.) If the stiffener spacing is less than or equal to $25t_w$, the area between the stiffeners is fully effective. On both sides of this area, an additional $12t_w$ is effective. Thus for spacing that is less than $25t_w$ the effective width is $12t_w$ + spacing + $12t_w$ for an interior location. Essentially, this means the effective width for multiple stiffeners can't overlap. Similarly, it can't extend beyond an edge at an exterior location.

Amanuel Gebremeskel, P.E.

Girt Bracing

I am designing a building with vertical siding, channel girts, and sag rods. I was told that the industry standard is to consider the channel braced at the sag rods. How is this possible, since the sag rods are neither at the compression flange nor able to act in compression? Is this the appropriate way to look at bracing the channel, or is there a more appropriate method?

The siding attached to the tension flange of the girt acts like a torsional brace. Unfortunately, it may be an ineffective brace in terms of restraining the compression flange of the girt, since it is attached to the tension flange. One needs to calculate the adequacy of such a brace using Appendix 6 (torsional bracing) in the 2005 AISC specification (a free download from **www.aisc.org/2005spec**).

Procedures in AISC *Design Guide* 7, *Industrial Builidings—Roofs to Anchor Rods*, 2nd edition, for the design of girts are outlined on pages 17 and 18 of the document (**www.aisc.org/epubs**). Note that item 6 mentions that the sag rod acting in conjunction with the siding should be designed to prevent the twist of the girt under suction loads in accordance with Chapter F of the AISC specification. As such, double nutting would be required to provide resistance to twisting.

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

Required Edition of a Standard

Do you have a good response to engineers who forbid the use of the AISC 13th edition for connection design on their projects? I am running across a few engineers who take the position that since the IBC predates the 13th edition, the 13th edition cannot be used.

Your use of the term "13th edition" refers to the AISC *Steel Construction Manual*, which is not a referenced standard in the IBC. The IBC instead references standards like the AISC specification (normally, the one that is in effect at the time of the IBC adoption). The 2006 IBC references ANSI/AISC 360-05, which is the current AISC specification and the basis of the 13th edition *Steel Construction Manual*.

The procedures set forth for connection design in the AISC manual are representative of how the AISC manual committee views the current state-of-the-art in terms of connection design. Much of this is based on engineering judgment, not just application of the *Specification* parameters explicitly. There may be changes from the information presented in previous manuals, based on testing and data compiled since the issue of the old manual. This may be especially true if comparing current practices against those found in the 18-year-old 9th edition ASD manual.

Ultimately, each new manual reflects the state-of-the-art in knowledge, research, and experience. For that reason, it is preferable to use the latest information available if permitted by the applicable building code and/or the authority having jurisdiction. To us, this means the 2005 AISC specification and 13th edition AISC manual. Our experience is that rejection of this approach is the exception rather than the rule.

Kurt Gustafson, S.E., P.E.

Certification Exemption

How does AISC Certification for fabrication of steel building structures relate to the IBC 2003 Paragraph 1704.2.2, Fabricator approval? If a fabricator is AISC Certified, can I assume they qualify for the special inspections exemption under IBC?

The applicable building code for the jurisdiction will often provide an exemption to shop special inspection requirements if a fabricator is approved to perform such work, which can provide a cost savings to the owner. The AISC Certification program essentially satisfies the criteria that are required in the IBC model building code for "approved" status. However, the IBC does not identify any specific certification programs as satisfying fabricator prequalification. Rather, this decision is left to the authority having jurisdiction to determine if the program meets the exemption qualification. Participation in the AISC Quality Certification program is usually accepted, but you may want to check if a particular jurisdiction has made this determination on previous projects and has set a precedent.

Kurt Gustafson, S.E., P.E.

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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.

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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