
STEEL INTERCHANGE

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. If you have a question or problem that your fellow readers might help you to solve, please forward it to *Modern Steel Construction*. At the same time, feel free to respond to any of the questions that you have read here. Please send them to:

Steel Interchange
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*** **Questions and answers can now be e-mailed to: grubb@aiscmail.com** ***

Answers and/or questions should be clearly presented. E-mail submittals and/or e-mail attachments are welcome.

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To order an AISC publication mentioned in this article, call AISC Publications at 800/644-2400.

Question from September 1999:

ASCE 7-95 section 2.4.3, part (b) states that the effect of two or more transient loads may be reduced provided that the allowable stress is not also increased. AISC's ASD Manual, 9th Ed., section A5.2 allows a 1/3 stress increase provided that the loads are not "calculated on the basis of reduction factors applied to design loads in combinations," and gives ANSI A58.1, which was updated as ASCE 7, as an example. My questions are:

- a) Is it acceptable to use the load combinations specified in ASCE 7, but not to reduce them and use a 1/3 stress increase when designing steel members?**
- b) may the 1/3 stress increase be used when designing for a Dead + Wind combination?**

David MacGregor

In my opinion, the answers to your questions regarding ASCE-7 and the 1/3 stress increase are:

- a) Yes
- b) Yes

Having said that though, I feel the need to qualify my answer and also tell you that not every member of the AISC Specification Committee agrees with me on this.

At first glance, ASCE-7 seems to prohibit a 1/3 increase in stress if the loads have already been reduced because of loads acting in combination. In fact, the wording is: (b) the allowable stress shall not be increased to account for these combinations (underlining mine).

But what if the 1/3 stress increase is *not* to account for loads in combination? Then is it permitted? It has long been my position that the

stress increase (which has been allowed for at least 100 years) was *never* to account for simultaneous action of two or more loads, but to ameliorate the effects of wind which was always applied as a static force.

On the other side, one can argue that modern wind forces are developed taking into account the gusty and localized nature of wind, so there is no need for a correction factor. I can understand this logic, too. However, most damage in wind storms is to glass, certain wall, roof and wall panels, and the forces on these small-tributary area items have been dramatically increased over the last two decades, reflecting the real behavior of wind.

You might refer to my article "The Mysterious 1/3 Stress Increase," in the 2nd Quarter 1977 *AISC Engineering Journal*.

Duane S. Ellifritt, Professor
University of Florida
Gainesville, FL

Another response:

Standard Building Code 1997 section 1609.1.1 "Stress increases" state that "Allowable stresses specified in the appropriate material standard for allowable stress design are permitted to be increased in accordance with the material design standard when stresses are produced by wind or seismic loading, acting alone or in combination with other loads."

The 1997 Uniform Building Code section 1612.3.2, alternate basic load combinations, has load combinations for which "a one-third increase shall be permitted in allowable stresses for all combinations, including W (wind load) or E (seismic load)."

Mike Ginsburg, P.E.
Leo A. Daly
Omaha, NE

STEEL INTERCHANGE

Part I of the AISC *Seismic Provisions for Structural Steel Buildings* (1997), section 13.5, states:

“A beam intersected by V braces shall be capable of supporting all tributary dead and live loads assuming the bracing is not present.”

Can anyone explain to me what exactly is the meaning of this?

***no name given
via email***

The intent is that the beam should be strong enough to carry the vertical loads as a simple-span member on its own. This accounts for the potential for earthquake damage to the inverted V-bracing, which may then be ineffective in resisting the vertical loads.

Unfortunately, the specification language is probably a bit too specific to office-building-type construction to make perfect sense in the case in which you are trying to apply it.

Charles J. Carter, P.E.
American Institute of Steel Construction
Chicago, IL

The *RCSC Specification for Structural Joints Using ASTM A325 or A490 Bolts* (1994), tells us in section 7 (c) (7) that A490 bolts over 1" diameter, when used in slotted or oversized holes in the outer plies, must utilize a single 5/16" ASTM F436 hardened washer to cover said holes. Why can't one use two standard hardened washers (totalling 5/16" thick) to meet this requirement?

David T. Ricker, P.E.
Javelina Explorations
Payson, AZ

According to *A Guide to Design Criteria for Bolted and Riveted Joints*, 2nd edition (Kulak, Fisher, and Struik, John Wiley and Sons, 1987), Chapter 9, tests with 1" bolts in oversized holes showed that washers under the head and nut of the bolt are required to achieve the minimum required tension.

Because the washers are "spanning" the oversized hole, certain thickness washers are required for the bolt to develop its required tension without excessively dishing the washers. A 5/16" thickness washer is recommended. Two 5/32" washers wouldn't work for the same reason two W8x13's stacked one on the other wouldn't carry the same

load with the same deflection as a W16x26: slip between shear planes.

Keith A. Grubb, P.E.
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Comment on a previous response:

In the July issue of *Modern Steel Construction*, Mr. Timothy M. Young answered an April question from Emha Antariksa regarding "laterally unsupported length of the compression flange." Mr. Young begins his answer writing, "Lateral bracing must prevent both twisting and lateral deflection..." However, the AISC *Specification for Structural Steel Buildings, Allowable Stress Design and Plastic Design*, 1989, defines the unbraced length as "distance between cross sections braced against twist or lateral displacement..." which implies that braces must prevent twist or lateral displacement, but not both.

Dr. Joseph Yura's notes from a "Summary of Bracing Recommendations" presented to SEAoT in May 1993 say on page G, "bracing is effective if it resists twist of the cross section and/or lateral movement of the compression flange." So it appears that one or the other is needed, but not both.

Charles Baker
via email

New Questions

Is there an AISC (or equivalent) steel design code for temporary structures which is less conservative than ASD or LRFD?

Mark A. Walters
Westinghouse Electric Company
Monroeville, PA

Does anyone have any information on the availability of angles, channels, and other rolled materials in 50 ksi material, rather than A36? Is the industry trending towards 50 ksi material in those shapes as well as wide flanges?