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
Modern Steel Construction
One East Wacker Dr., Suite 3100
Chicago, IL 60601-2001

Answers and/or questions should be typewritten and double-spaced. Submittals that have been prepared by word-processing are appreciated on computer diskette (either as a Wordperfect file or in ASCII format).

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 principals to a particular structure.

Information on ordering AISC publications mentioned in this article can be obtained by calling AISC at 800/644-2400.

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

The following responses from previous Steel Interchange columns have been received:

If a connection combines high-strength bolts and welds, which is installed first? Are the bolts tightened before welding or is welding performed before the bolts are fully tightened? Will slipping of the bolts or cracking of the welds occur if it is not done in the proper manner?

Load and Resistance Factor Design Specification for Structural Steel Buildings Section J1.9 and Commentary states that a connection with bolts designed as slip critical high strength bolts are permitted to share loads with welds, but it is advisable to fully tension the bolts before the weld is made. If the weld is placed first, angular distortion from the heat of the weld might prevent the faying action required for development of the slip critical force. When the bolts are fully tensioned before the weld is made, the slip critical bolts and the weld may be assumed to share the load on a common shear plane. The heat of welding near bolts will not alter the mechanical properties of the bolts.

So, if welding is done first, faying action cannot be assured and slipping of bolts may occur followed by premature cracking of welds. Then, bolts must be conservatively considered in bearing action, not sharing loads, and welds designed to support the whole load, due to their inherent stiffness.

Miguel Angel Dodes Traian
Buenos Aries, Argentina

Another response:

The use of hybrid connections (those that combine welds and bolts) is disallowed in bearing type connections for new construction according to both the Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design and Load and Resistance Factor Design Specification for Structural Steel Buildings (Section J1.10 of ASD and J1.9 of LRFD). Such connections are allowed in new construction for slip critical joints, however.

The respective Commentary in both Specifications advises that when welds and bolts are used in combination in slip critical joints, the bolts should be fully tightened first. If the weld is made first, the distortion caused by the heat of welding could prevent the faying action required for the development of the connection. Conversely, if the bolts are installed and fully tensioned first, the heat of welding will not change the mechanical properties of the bolts.

Thomas M. Pienoski, P.E.
Stephen W. Redman
R.E. Warner and Associates
Westlake, OH
via email

Are special tolerances required to accommodate the cladding on structural steel frames?

Provisions must be made for differential movement between the cladding and the structure, as well as for the lateral deflection capacity of thecladding. In a manufactured steel building, for instance, the recommended lateral drift of the structural frame should not be exceeded. Additionally, the lateral deflection capacity of the wall panels must not be exceeded, and sufficient lateral movement capacity must be provided via panel joints and expansion joints. Finally, thermal movement provisions must be included in the design. Panel buckling and panel connection failures more often occur due to insufficient thermal movement capacity than from insufficient lateral load resistance.

Matthew B. Filippini
Chicago, IL
via email

New Questions

Listed below are questions that we would like the readers to answer or discuss.

If you have an answer or suggestion please send it to the Steel Interchange Editor, Modern Steel Construction, One East Wacker Dr., Suite 3100, Chicago, IL 60601-2001.

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Questions can also be sent via e-mail to newman@aiscmail.com.

Questions and responses will be printed in future editions of Steel Interchange. Also, if you have a question or problem that readers might help solve, send these to the Steel Interchange Editor.

Are there any advantages or disadvantages to using A325 or A490 Type 3 (weathering steel) high strength bolts on exposed exterior bolted structural steel members which are A36 steel? Is there any problem with corrosion between the two types of materials?

S. Kalat
Raytheon Engineers and Constructors, Inc.
Seoul, Korea

Our office design the structures for tall highway billboard signs. Recently another engineer reviewed our calculations and questioned the use of A490 bolts. He felt they were being used in a repetitive tension load. He wants A325 bolts to be used rather than A490 bolts.

These signs are loaded principally by wind loads though dead loads do add a small tension stress to some of the connections.

Please comment on the premise that wind constitutes a repetitive load. Fatigue was not mentioned.

Please also comment on the use of A490 bolts in tension due to wind loads.

Emil C. Hach
Hach & Ebersole, Consulting Engineers
Twinsburg, OH

When rolled wide flange sections are used as lintels to support masonry wall openings, should the allowable stress be reduced in accordance with Formulae F1-6 and F1-7 from the AISC Specification for the following cases:

Masonry is placed on the top flange. Sides are open. Masonry is unreinforced except for horizontal joint reinforcing.

Same condition as above except masonry is placed on each side of the web between the flanges.

Y Eugene Yamamoto
Eugene Yamamoto & Associates
Chicago, IL

The structural steel design manuals establish a minimum length of thread on structural bolts, referencing ANSI B18.2.1. They also give a formula of 2D+1/4" for bolts less than 6" in length, and 2D+1/2" for bolts longer than 6" long. What are the consequences if the bolts are fabricated with thread lengths less than this amount, but still capable of making up a proper connection? Is this grounds for rejecting the bolts? Why is this length the same regardless of what type of bolted connection (N, X, SC) is used? It would seem that the thread length values should differ depending on the type. Finally, the Specification for Structural Joints Using ASTM A325 or A490 Bolts states "The length of the bolts shall be such that the ends of the bolt will be flush with or outside the face of the nut when properly installed." With this added criteria, it would seem that the thread lengths could be shorter than those specified in the Table, because a single nut and washer is never greater than 2D in length.

Richard Portier, P.E.
Butler Heavy Structures
Kansas City, MO
via email

Are there any recommendations or reference materials on the design and or analysis of details (e.g. loads and connection designs) for square bins and hoppers, towable trailers, supports, and stands.

R.C. Parsaghian
Granite City, IL