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: aiscpmn@interaccess.com * * * ***

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

In the design of braces for axial forces gusset plates are connected to the flat surface of the flanges of WT sections. Should the effect of eccentricity be considered in the design of braces? If eccentricity is to be considered what procedure is to be followed?

WT sections are commonly used as bracing members and in this application these members are subjected to combined axial and flexural loads. With axial loads being transferred through gusset plates, moments are generated as a result of the location of these forces with respect to the neutral axis of the WT section. Hence, it is imperative that in addition to the axial stress, a flexural stress equal to the product of the axial force and the distance (y) from the neutral axis to the flange of the WT be considered in the analysis of the member.

Sam Babatunde, P.E.
Orbital Engineering Inc.
Pittsburgh, PA

Will problems occur if you hot dip galvanize 135 pound crane rail (ASTM A759)? Would you have problems with distortion, strength, alignment, etc.

After a few dozen passes of the crane wheels a path will be worn through the galvanizing on the crown of the rail because the zinc is soft compared to the wheel, and the wheel flanges may scuff the sides of the rail. Small flakes of galvanizing can be expected to fall to the floor. The engineer must decide whether or not this constitutes a problem.

Distortion of the rail due to the heat of galvanizing is unpredictable but can be removed latter so as to obtain proper alignment. Strength should not be appreciably effected.

I question the need for galvanizing a crane rail. Usually there is enough oil and grease seepage from the wheel bearings and gears to keep the rails free from significant erosion, even for exposed runways.

For more on cane runways see "Tips for Avoiding Crane Runway Problems" in the AISC *Engineering Journal* Vol. 19, No. 4, 4th Quarter 1982, p. 181.

Dave Ricker, P.E.
Payson, AZ

How can the accumulated mill, fabrication, and erection tolerances be economically addressed?

The accumulation of tolerances is a real problem requiring special consideration. In my opinion this can be resolved by better mill tolerances whereby tolerances rarely approach the maximum allowances, and finally by corrective action and an acceptable level of quality control in the fabrication facility.

Additionally, the use of oversize, short-slotted, and long-slotted holes for achieving erection within tolerances should not be treated as a "given" but should be approved by the Engineer of Record and meet specific design requirements. This becomes particularly clear under the *Specification for Structural Joints Using ASTM A325 or A490 Bolts*, approved by RCSC, which states that the usage of oversize holes is subject to approval by the Engineer.

In closing, what are, if by, the differences under the AISC *Allowable Stress Design Specification for Structural Steel Buildings* and the *Load and Resistance Factor Design Specification for Structural Steel Buildings* in terms of accumulation of tolerances and also the overall requirements in the usage of oversize holes? The singular reference to the usage of oversize holes "as provided for by the LRFD Specification" seems to imply that there may be some. (Editors Note: the LRFD Specification and the ASD Specification have similar requirements in regard to the accumulation of tolerances and the use of oversize and slotted holes)

Henry Butum, P.E.
CNF Constructors, Inc.
Meriden, CT

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(Editors Note: This question was also answered in the August 1996 issue of Steel Interchange)

What are the equations for the plastic (Z_x, Z_y) and torsional properties (J,C_w) of the built-up shapes, for instance a W shape or S shape, welded with channels or cover plates on one or both flanges; two or three shapes with or without lacing; castellated beams; etc.?

The following information can be used in addition to the reference given in the September issue of Steel Interchange (the publication torsional Analysis of Steel Members). The formula for the computation of plastic section modulus Z:

Z = aA1 = aA2

where A1 = A2 = A/2 (top and bottom half of total area)

A = total area of section

a = distance between centroid of A1 and A2

This is from Appendix D p. 649 of the *Standard Specification for Highway Bridges*, or *Commentary of AISI Bulletin 15*.

Mike Ginsburg, P.E.
Omaha, NE
via email

(Editors Note: This question was also answered in the September 1996 issue of *Steel Interchange*)

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. Questions can also be sent via e-mail to aiscpmn@interaccess.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 published design aids or criteria for the design of a bolted moment ridge splice connection similar to the one shown? If not, would the tee stem analogy be an acceptable alternative to designing the plate thickness for the connection?

Robert Jenson
Butler Heavy Structures
Kansas City, MO
via email

How are stresses and strains calculated in curved I-beam monorails? Curved beam problems can be solved when the load is pointed to the center of the curve or away from the center, However, what is a practical solution for an I-beam monorail with a curve for the trolley?

Trond Thiis
via email