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 312/670-2400 ext. 433.

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

Some Building Codes permit a reduction in NDT for welders with less than a 5% rejection rate. How big a sample is used to get the 5%?

The 1991 Uniform Building Code section 2711(k) states that all complete penetration groove welds shall be tested 100% by ultrasonic or radiography. However, with approval of the building official and the engineer responsible, the testing can be reduced to 25% of those welds. This reduction is based on a 5% or less reject rate for the welder. The reject rate is based on the test results of 40 or more welds.

Formula:
reject rate = (number of rejects) / (number of welds)

Example: Welder has completed 25 girders with top and bottom flanges groove welded to column. Welder has 2 rejects.

reject rate = 2 rejects / 50 welds
= 4%

Reject rate is less than 5%, thereby permitting the testing of only $^1/_4$ of that individuals welds. Three rejects out of 50 welds would have required the 100% testing to continue until the ratio improved.

Adrian L. Sherrill
Twining Labs
Long Beach, CA

When was the Vierendeel truss first utilized, why was it named, and for what contributions to structural engineering was he/she recognized?

We have always been interested in the Vierendeel type truss but have not used them except to a very limited degree.

Before the advent of the personal computer, analysis involved too may time intensive hand calculations.

I remembered one of my old college textbooks by L.E. Grinter (*Theory of Modern Steel Structures, Volume II*) where he states:

"A. Vierendeel, formerly a professor at the University of Louvain, Belgium. Vierendeel or open-web trusses have been recently introduced into America..."

This was a 1937 Macmillan Company publication and the method of analysis proposed was far from accurate but served the purpose. Deflections could be considerably more than expected.

Lloyd W. Abbott, P.E.
Lloyd W. Abbott, Consulting Engineer
Tulsa, OK

Can an existing steel beam and concrete slab be made to work together in composite action by adding studs to the steel through cored boles? are there any special considerations?

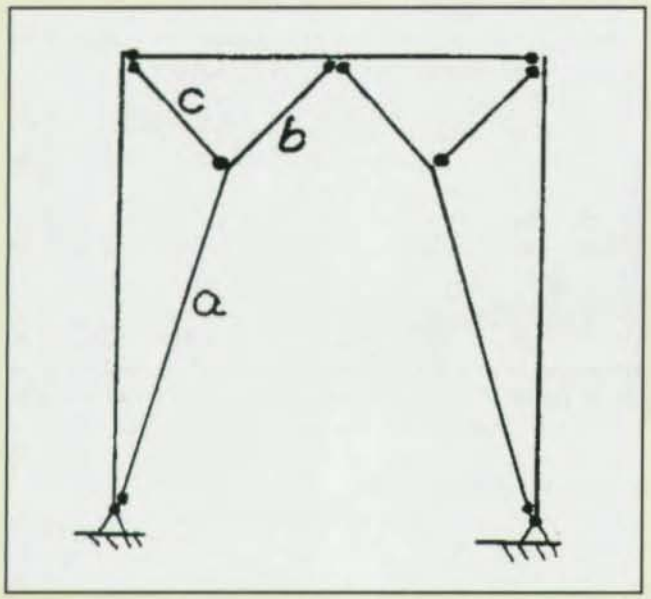
The answer to this question is an emphatic yes. One of the most economical methods to provide for the increased live load capacity of an existing steel beam, that supports a concrete floor system, is to attach headed studs to the top flange so that the slab is engaged for composite action of the entire cross section.

Typically, holes are cored along the centerline of the beam at a predetermined spacing. The holes must have a diameter sufficient enough to allow for the field installation of the studs and placement

of the surrounding grout. Proper preparation of the hole prior to grouting and the use of a high-strength, non-shrink cementitious product to refill the hole is essential to the longterm serviceability of this type of strengthening program.

The analysis of this type of beam is no different than that used for new unshored composite construction. Care should be taken however, when calculating the initial stress levels of the bare steel section to include all existing superimposed dead loads that might be present within the contributory area of the beam. Depending on the size of the steel member, the existing framing conditions and the additional live load requirements, it is sometimes necessary to install a cover plate on the bottom flange of the beam in order to satisfy the requirements of the new loading criteria.

D. Matthew Stuart, P.E.
Mobile, AL



Due to some clearance requirement, a frame has the configuration shown. For out-of-plane buckling, what will be the unbraced lengths for members a, b, and c for different conditions?

The stability problem posed by the kinked brace can be simplified if the entire joint, including member c, is fixed. The out-of-plane bending stiffness can be analyzed as a plane tripod by distributing the out-of-plane load to three supports and calculating the deflection at the joint, providing the effective measure of stiffness. Note that by fixing the end connection of c, the reliance of torsion in a and b in resisting the out-of-plane load is eliminated, i.e. the torsion has largely become a bending moment in c.

John Vasko, P.E.
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Clinton, N.J.

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 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.

The use of channel sections or other light weight narrow flange sections as girts supporting non-bearing exterior wall assemblies against wind load is common practice. How is lateral instability of the unsupported compression flange accounted for when the wall is subject to outward pressure due to suction at the leeward face of the building? These outward forces are equal to or greater than the inward forces.

James C. Peterson, P.E.
McLaren Peterson Associates, Inc.
Seattle, WA

Under the ASD design specification, how is the maximum unbraced length (L_c) of a structural tee beam to be determined if the tee stem is in compression? How is the allowable flexural stress to be calculated if the unbraced length exceeds this limit?

Paul DeArment, P.E.
Howard C. Dutzi & Associates, Inc.
Colorado Springs, CO

Serviceability is a particular concern for crane systems in industrial buildings but is not clearly covered in the standard code literature. What are deflection limits for crane runway systems?