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 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
1 East Wacker Dr.
Suite 3100
Chicago, IL 60601

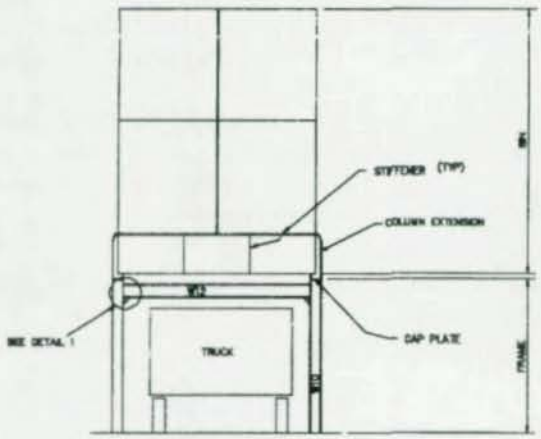
Answers and/or questions should be typewritten and double spaced. Submittals that have been prepared by word-processing are appreciated on computer diskette (either as a Wordperfect file or in ASCII format).

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 principles 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 to questions from previous Steel Interchange columns have been received:

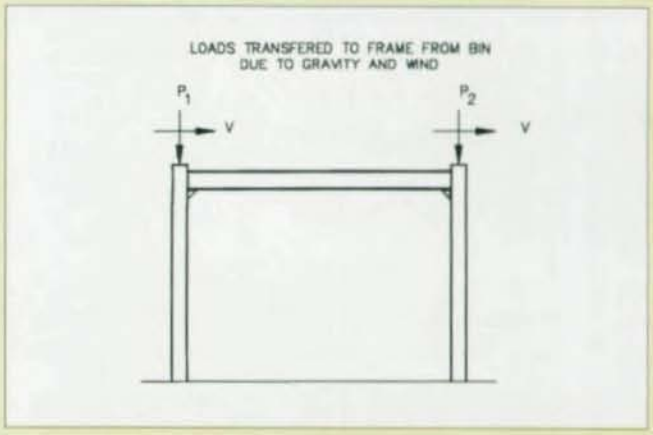
Are there other applications of the bracket connection carrying moment shown in the February 1993 Steel Interchange?



Elevation of rectangular bin

I believe the connection pictured in the February Issue of *Modern Steel Construction* has a practical application in bin construction. The rectangular bin shown is supported by a rigid frame such that trucks may drive under the bin to be loaded. Typically, the bin is prefabricated in sections that are either field welded or bolted together along the stiffeners. These sections are set on top of a previously erected frame.

The bottom portion of the bin is designed as a plate girder which supports the entire gravity load of the stored material and the dead load of the bin. The reactions from this plate girder are transferred to the frame columns through the column extensions as shown in the reaction diagram. These column extensions also transmit any lateral load to the frame. The forces are then transferred to the ground through



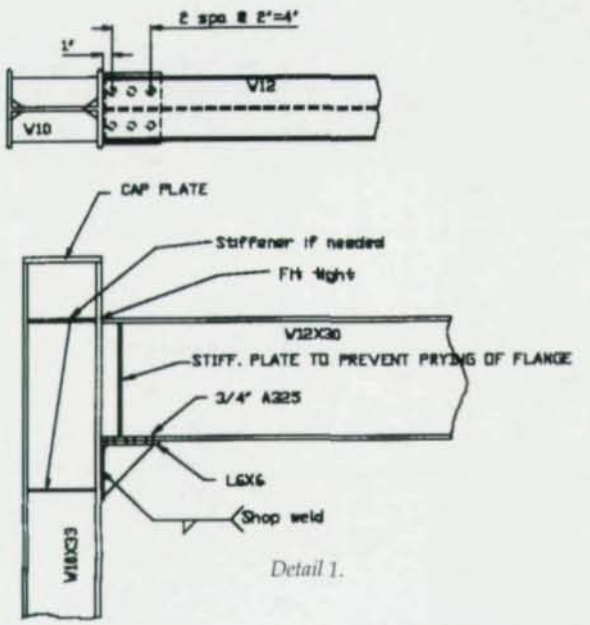
rigid frame action. The maximum moment that occurs at the connection is caused by both the lateral shear and shear due to the sidesway associated with unsymmetrical gravity loading.

The connection shown in Detail 1 can be designed using an approach similar to the design of a connection with an eccentrically applied shear load. This procedure is discussed in *Manual of Steel Construction - Volume II Connections* by AISC.

This connection is slightly different than the one pictured in *Modern Steel Construction*. The full end plate on the girder has been eliminated, and the stiffened bracket has been shop welded to the column. This allows for the use of the bracket as an erection seat as well as the major component of the connection detail. The upper web stiffener on the column was moved to the level of the top flange of the girder. If the fit between the column and the girder is tight, positive moment would cause compression in the top flange of the beam. This would be transferred to the column through bearing of the top flange against the flange of the column. Finally, a web stiffener was added to the girder to prevent local bending of the bottom flange.

The following figure shows the assumed stress distribution on the stiffened bracket. The end moment in the girder is developed by bearing between the bottom flange of the girder and the horizontal leg

Steel Interchange



Detail 1.

of the angle, and tension in the bolts. The moment is then transmitted to the column by shear stress in the shop weld.

To analyze the connection, one should allow the compression stress to equal the allowable bearing stress of the steel. Next, one assumes a neutral axis depth. Computation of the total compressive force is made by the following:

$$C = \frac{b_f F_c c}{2}$$

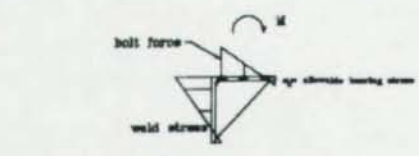
where:

C =compressive force
b_f =flange width of the column
F_c =allowable bearing stresses
c =assumed neutral axis distance.

Equilibrium and similar triangles can then be used to solve for the tension force in the bolts to the left of the neutral axis. After computing the tensile force, a summation of the moments of the bolt forces is made about the centroid of the compression block. This moment is compared to the applied moment and the assumed neutral axis location is adjusted if necessary.

The angle thickness should be selected based on shear and bending stresses between the stiffener plates. This could be computed by assuming that a the horizontal leg of the angle is simply supported between stiffeners.

John F. Ruff, Jr.
Bergmann Associates



Assumed stress distribution on the bracket

New Questions

Listed below 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.

Can an inflection point in a continuous beam be considered a brace point?

Byron Dietrich
Teter Consultants
Visalia, CA

Where is the best place to get information on foriegn specifications and requirements?

Correction

Numerous readers have asked for a clarification of an equation given in the April 1993 Steel Interchange on page 9.

The second equation under the heading "For fully fixed frame (Figure 2)" should read:

$$K = \left(\frac{I_{BM}}{I_{COL}}\right)\left(\frac{h}{L}\right)$$

We regret the confusion.