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. 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:

How should I connect wide flange beams to all four faces of a structural tube column in such a way as to transfer wind moments as well as dead and live load reactions?

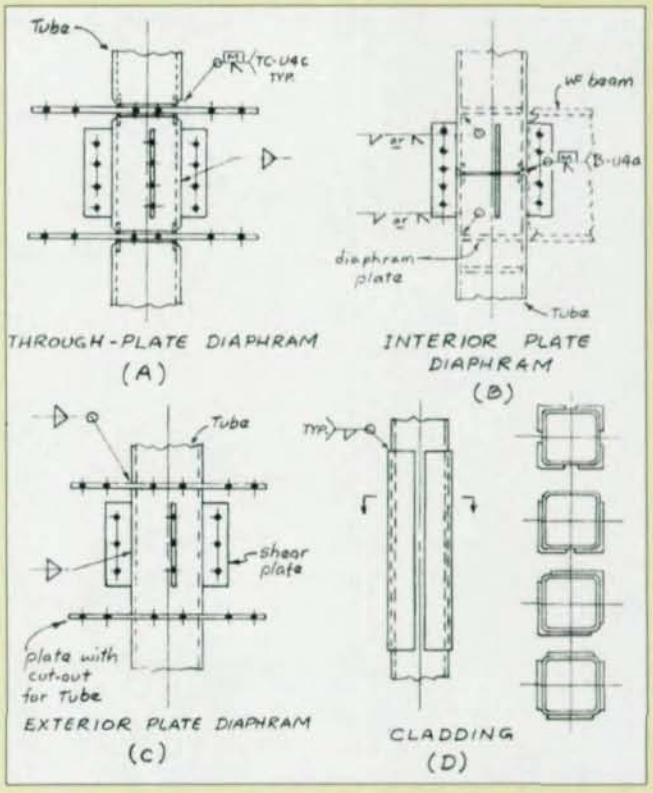
It must be assumed that the tube column is able to resist the bending induced by the various combinations of wind and gravity moment. The tube walls must be protected against localized buckling and stretching and the side walls must have adequate shear capacity, unless the horizontal forces are able to be carried in one face, directly through, and out the opposite face. There are several ways to strengthen a tube column.

1. Internal diaphragm
2. External diaphragm
3. Girdling or cladding
4. Through plate diaphragm.

When all four beams are the same nominal depth, through-plate diaphragms can be used. Figure A is and example of this, showing the tube severed and rewelded to the plates. Another version is shown in Figure C where external diaphragm plates are cut out to the profile of the tube and welded to the tube. The tube remains intact. Figure B shows and example of internal diaphragms. The tube is cut and the diaphragm plates installed where required and the tube rewelded. This is useful if the wide flange beams are of varying nominal depths. In Figure B the moment connection is made by field welding the beam flange directly to the face of the column. The fourth method of reinforcing the tube is by girdling or cladding as shown in Figure D. By extending the reinforcing upward and downward more bending strength can be added. Resistance to shear in the sidewalls can also be increased by girdling.

The gravity load can be resisted by a shear plate or single angle connection or, as noted in Figure E, a stiffener plate can be installed below the bottom flange connection to connect it to a stiffened seat.

Figure F shows several adaptations of external diaphragm plates and their versatility.



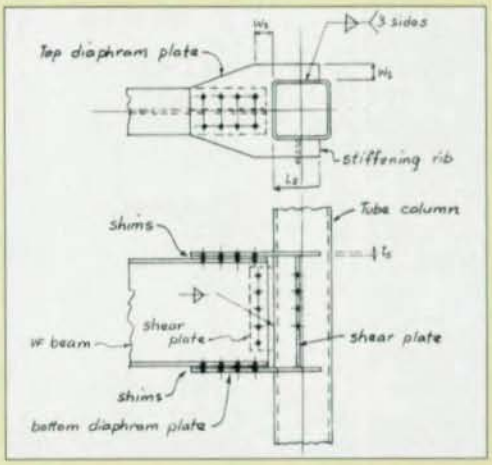


Figure E

Note: A stiffened seat could also be used in lieu of the shear plate.

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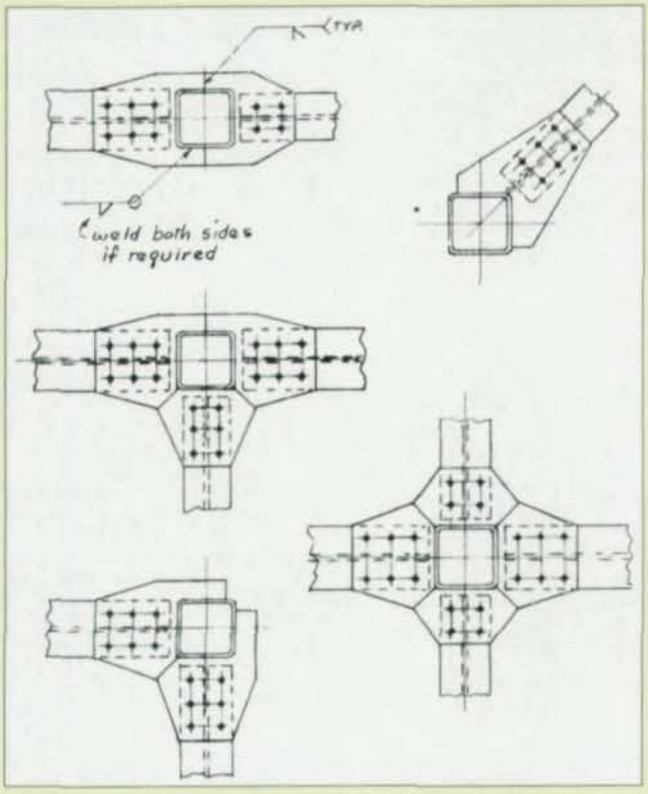

Figure F: Adaptations of external diaphrams

This is but a brief glimpse at a complex type of connection. For further related information I suggest the following references:

1. White, Richard N., "Framing Connection for Square and Rectangular Structural Tubing", AISC Engineering Journal, July 1965.

2. Nippon Steel Metal Products, Inc., "Design Manual of Structural Tubing - Square and Rectangular", 1977.

3. Stelco, Inc., "Hollow Structural Section - Design Manual of Connections", 2nd Edition 1981, Stelco, Inc., Hamilton, Ontario, Canada.

4. Ricker David T., "Comments on the Behavior of Moment Connection of Wideflange Beams to Tube Columns", Address at Structural Steel Fabricators of New England Spring Symposium, Worcester Polytechnic Institute, 1985.

5. Ricker, David T., "Practical Tubular Connections", 1985 ASCE Structural Engineering Conference

David T. Ricker
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Another response:

A simple connection is suggested. Details are provided in Figure 1.

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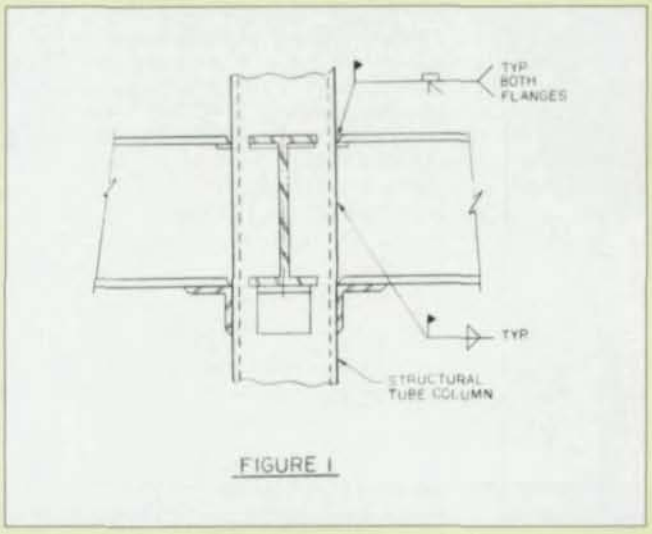

FIGURE 1

Are there any design requirements that an engineer can follow when designing lateral bracing?

When designing lateral bracing the engineer has little in the way of guidance from the AISC Specifications although the commentary suggests referencing the Structural Stability Research Council's *Guide to Design Criteria for Metal Compression Members* (Wiley Interscience , New York, ISBN 0 471-09737-3). In addition the *Handbook of Steel Construction* published by the Canadian Institute of Steel Construction is more specific and does provide design requirements in its section 20.3 Stability of Beams, Girders and Trusses.

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New Questions

Listed below are some 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. 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.

1. Where can I get information on stainless steel bolts?

2. Are there limits on bending a wide flange beam into a radius?