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 Word 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.

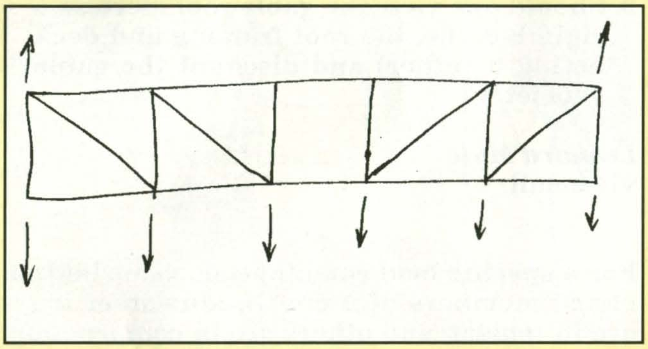
Information on ordering AISC publications mentioned in this article can be obtained by calling AISC at 800/644-2400.

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

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

(From the March 1998 issue)

Is there any need for a diagonal in the center panel of the sketch below (showing a Pratt truss with an odd number of panels)?



Theoretically, all joints for trusses are assumed to be pinned connections, so this truss without a diagonal member in the center panel is virtually a mechanism instead of a structure. Besides, there is no force (there is no need for the diagonal member in this case) on the diagonal member only if the loading condition is perfectly symmetrical. This situation is too ideal in practice, so there is need for the diagonal member to make a stable truss design.

Haisheng Xu, P.E.
OSI Building Systems
Montgomery, AL

(Another answer)

For a simple, plane truss that is internally statically determinate, there is a relationship between the number of joints (j) and the number of members (m) that says:

$m + 3 = 2^*j$

This formula is derived from the fact that at each joint there are 2 scalar force equations (ΣF_x, ΣF_y) and in total, 2^*j equations. Also, there are m two force members in the entire truss, plus three support reactions, giving $m + 3$ unknowns. Thus, for a statically determinate situation, $m + 3 = 2^*j$. This is a necessary, but insufficient condition for the stability of a truss.

If $m + 3 > 2j$, a redundant member is present and the truss is statically indeterminate.

If $m + 3 < 2j$, there is a deficiency in internal members and the truss is unstable.

For the given truss, there are m = 20 members, and j = 12 joints. Using the equation gives the result that m + 3 = 23 and $2j$ = 24. Since 23 is less than 24, the truss is deficient in internal members and is unstable. There is a need for an internal member in the center of the Pratt truss.

Vahid Farzaneh
Civil Engineering Student (Second Year)
Case Western Reserve University

(Another answer)

To say that this truss will not work because it is a mechanism or is unstable is not exactly true under all circumstances. In reality, top and bottom chords are usually continuous, not pinned. A more accurate response would be depending on the conditions such as loading, and proportions (size of open panel to truss), Vierendeel action would occur. This type of truss is very common for prefabricated wood trusses.

Jim Rongoe
Rongo Engineers
Dairen, CT

(From the April 1998 issue)

I have a question concerning the welding of clip angles to the webs of beams that have wide flanges. In placing the weld on the top edge of the clip angle it is impossible to place

an effective weld because the width of the flange causes interference with the weld rod.

How should this problem be addressed when designing this connection?

First, it should be noted that the legs of a fillet weld need not be equal. If the angle at which the electrode engages the weld area causes the legs to be unequal, the weld is still valid subject to AWS D1.1 weld profile limitations even if it isn't beautiful. However, there are other solutions to this perceived dilemma:

1. Lower the angle(s) to provide better electrode access.
2. Clip the top angles to about 45 degrees to improve electrode access.
3. Consider bolting as an alternate method of connecting.

David T. Ricker, P.E.
Payson, AZ

(From the April 1998 issue)

In order to facilitate the fabrication and erection of a long-span plate girder or box beam bridge, would a constructor prefer to have the option of designating the location(s) of the field splice(s)? The constructor would design the splice(s) based upon design loads, moments, and shears shown in the contract documents.

Some constructors would prefer the option of selecting field splice locations in order to take maximum advantage of material availability, and shop and field weight and length limitations. However, some engineers are reluctant to relinquish such important design decisions as the location of field splices, based on strength and aesthetic considerations. And some constructors prefer to be spoon-fed the necessary information, not only loads, moments and shears but splice locations, end connections, and all pertinent data. There is no concise answer to this question: It all depends on the philosophies of the particular constructor and designer.

David T. Ricker, P.E.
Payson, AZ

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 rokach@aiscmail.com.

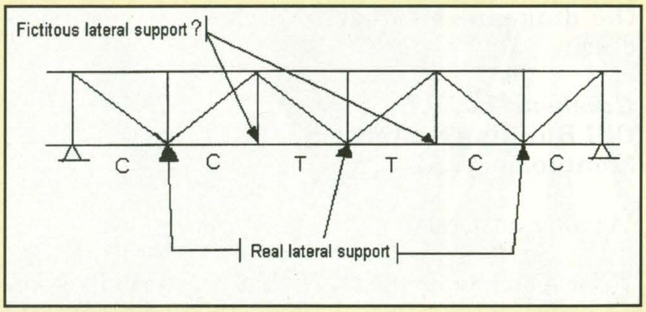
Questions and responses will be printed in future editions of Steel Interchange. Also, if you have a question or problem that readers might help solve, send these to the Steel Interchange Editor.

What is the procedure for analysis of a steel deck diaphragm on a gabled roof? In particular:

1. **What are the chords? Are they developed at the ridge or along walls as with a flat horizontal diaphragm? This is particularly important for aspect ratio considerations.**
2. **Should one view the gable roof more as a rigid box (i.e. the roof framing and deck acting together) and discount the gable geometry?**

Leonard Mule
via email

For a specific load combination, some bottom chord members of a continuous steel truss are in tension and others are in compression. Is it possible to consider that the node, located between a tension and compression member, can behave like a lateral support to evaluate the compression strength with respect to the weak-axis of this member (by analogy to the inflection point of a bending moment diagram acting as a lateral support from beam lateral-torsional buckling)?



Eric Boucher, P. Eng.
BPR Consulting Engineers
Quebec City, Quebec, Canada
via email