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:

Are there any limitations on the span to depth ratio of beams required by AISC Specification for Structural Steel Buildings?

One guideline that is given by AISC can be found in the Allowable Stress Design Specification Commentary for Section L3.1, which deals with serviceability design considerations. The commentary states the following:

"Although deflection, rather than stress, is sometimes the criterion of satisfactory designs, there is no single scale by which the limit of tolerable deflection can be defined. Where limitations on flexibility are desirable, they are often dictated by the nature of collateral building components, such as plastered walls and ceilings, rather than by considerations of human comfort and safety. The admissible amount of movement varies with the type of component. The most satisfactory solution must rest upon the sound judgement of qualified engineers. As a guide, the following rules are suggested:

1. The depth of fully stressed beams and girders in floors should, if practicable, be not less than (F_y/800) times the span. If members of less depth are used, the unit stress in bending should be decreased in the same ratio as the depth is decreased from that recommended above.

2. The depth of fully stressed roof purlins should, if practicable, be not less than (F_y/1000) times the span, except in the case of flat roofs."

Although these are only suggested guidelines and not strict limitations, they offer some useful assistance to the question.

Mark D. Hartle, P.E.
Pruitt Eberly Stone, Inc.
Atlanta, GA

What criteria is used to design "NOT STRUCTURAL STEEL" members such as stairs, catwalks, handrail, and toeplates?

For those "NOT STRUCTURAL STEEL" member design concerns, the designer can use either the certified engineering data and material specifications from the individual metal manufacturer/supplier or the Metal Stairs Manual, Pipe Railing Manual, Catwalks Manual, and so on, published by the National Association of Architectural Metal Manufacturers (NAAMM) in addition to the local building codes.

As regard to the load criteria,the building code shall cover the minimum design loads for each subject item, for example 1991 Uniform Building Code, Table 23-A and 23-B.

Kunming Gwo, P.E.
HCI Steel Building Systems, Inc.
Arlington, WA

The *Manual of Steel Construction* includes many items that are used along with structural steel frames, this is very convenient for structural engineers. However, some of the tables do not provide all of the information needed by engineers. One of the tables that AISC includes covers the dimensioning of cotter pins. What is the strength of cotter pins listed in the Manual of Steel Construction? Where can these items be obtained?

Cotter pins are commonly constructed of type AISI 1010 low carbon steel or type 302 stainless steel. Dimensions of the pins and the recommended hole size are covered by ANSI Standard B18.8.1. Dimensions are also tabulated in various machine design books such as *Machinery's Handbook*. Knowing the dimensions and the material (low carbon steel or stainless

steel) one can calculate the shear strength of cotter pins. Cotter pins are manufactured and sold by numerous companies. Local distributors are usually found in the Yellow pages under "Fasteners" or "Bolts and Nuts". Usually distributors of slotted nuts, clevises and similar hardware sell cotter pins even though their Yellow page advertisement may not say so. Manufacturers are listed in the *Thomas Register* under "Cotter Pins" and "Pins: Cotter". *Machinery's Handbook* and the *Thomas Register* can be found in many public or college libraries.

Doug Werner
Douglas Engineering
Westminster, CO

In a partially cover-plated column, how would you analyze the column for governing l/r ratio to calculate F_a?

In the 1st Quarter 1979 AISC *Engineering Journal*, an article with an approximate method is put forward dealing with this question. It requires the calculation of the Euler buckling load of the entire column by some process, typically numerical, and the identification of the most highly stressed segment due to the axial load. Although the column will buckle as a whole, the most highly stressed segment can be used to find an effective Kl/r leading to an allowable axial load for the entire column. Allowable stresses for all segments will follow.

C. P. Mangelsdorf
University of Pittsburgh
Pittsburgh, PA

New Questions

Listed below are questions that we would like the readers to answer or discuss.

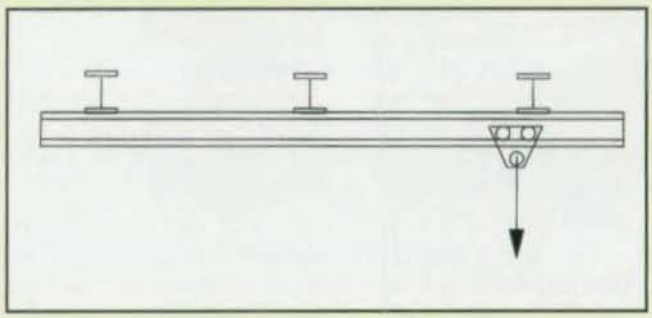
If you have an answer or suggestion please send it to the Steel Interchange Editor, Modern Steel Co nstruction, One East Wacker Dr., Suite 3100, Chic ago, IL 60601-2001.

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.

For a continuous trolley beam with multiple spans and cantilevered ends what is the lateral unbraced length for the bottom flange?

Can the distance between points of moment inflection be considered an unbraced length?

Larry Nix, P.E.
Dallas, TX



What information is available to provide guidance in the design of a ledger angle and its connection to a wall in particular, with the bolt in tension and the lower edge of the vertical leg of the angle in compressive contact with the wall, what is the stress distribution in the angle? Is only part of the angle effective in resisting the applied loads, based on the spacing of the bolts?

Greg Michel, P.E.
Mani Muthiah, M.S.E.
Lescher & Mahoney/DLR Group
Phoenix, AZ