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. Submitalls 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 800/644-2400.

*** Questions and answers can now be e-mailed to: aisepmn@interaccess.com ***

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

What is acceptable practice for determining the load capacity for a lifting beam, similar to that shown in the accompanying sketch, for which there is no lateral support? Is it appropriate to use the full beam length to determine the bending strength of the member? Is doing so overly conservative? Are there design considerations other than strong axis bending capacity?

Lifting beams have no fixed lateral support. Engineers disagree on what to use for the unsupported length of a lifting beam and strength calculations. The assumption that the unsupported length is the length between the outermost lifting holes has as much validity as any other assumption and is supported by a history of good performance.

Generally, compact column shapes with adequate unbraced length, L_u, are good choices for lifting beams. ANSI/ASME B30.20 requires a design factor of 3 based on yield strength when designing lifting beams. The other components of the lifting beam, shackles, lines, and hooks are usually rated for about 1/3 of their ultimate capacity. The questioner should not be concerned with being overly conservative in lifting beam design, where failure could be catastrophic.

There are many other considerations in lifting beam design too numerous to mention here. A reference on lifting beam design is Design and Construction of Lifting Beams, published in the 4th quarter 1991 issue of the AISC Engineering Journal p. 149.

David Ricker, P.E.
Payson, AZ

ANOTHER ANSWER:

When we design a spreader beam in our office, we take the entire beam to be an unbraced member. We check stress in the beam for dead load only and under full load.

Spreader beams usually have pick points near the ends. For the case of a uniform load there is a potential of load redistribution in the deflected shape, if the load being picked is stiffer than the beam.

The cables are often connected at the top in a sling. The horizontal component of the diagonal cable causes an axial load between cable connections, as well as an eccentricity due to the application of the horizontal load at the top surface of the beam.

We find that large diameter pipes often make the best spreader beams. Lowell E. Wenzel, P.E.
Wenzel Engineering Inc.
Bloomington, MN

Is it permissible to use controlled heat to straighten, curve, or camber structural steel shapes?

There exists sufficient experience and evidence to justify the use of controlled localized heating to straighten, curve, or camber structural steel
members. AWS D1.1 permits heat straightening of members distorted by welding and stipulates rules for this procedure. These rules are equally applicable for all heat straightening or curving. Furthermore, LRFD Specification Section M2.1 and the discussion on page 1-12 of the 2nd Edition of the LRFD Manual provide a sound basis for the use of controlled heat to straighten, curve, camber, and form structural steel.

Under What Conditions, if any, is it acceptable to flame cut bolt holes, and what references substantiate this?

AISC Specifications Section M5 discusses only punched, drilled, and sub-punched and reamed holes. This has always been interpreted that flame cut holes are not permitted. An exception is made in the Research Council on Structural Connections (RCSC) Specification for Structural Joints Using ASTM A325 and A490 Bolts Section 3(c) which states that “... the width of slotted holes which are produced by flame cutting...”. This implies that slotted holes can be flame cut.

Research on flame cut holes was reported in Effect of Hole-Making on the Strength of Double Lap Joints, published in the AISC Engineering Journal, 4th quarter 1982, p. 170 which gives good evidence that a reasonably smooth flame cut hole is as good as a hole made by other procedures.

My recommendation is that flame cut holes ordinarily should not be permitted in the project specifications but if a field remedy had to be made, I would permit a flame cut hole (inspected by Engineer) rather than ship an otherwise perfectly good piece of steel back to the shop.

Robert O. Disque, P.E.
Gibble Norden Champion
Old Saybrook, CT

When must high-strength bolts be ordered as a bolt/nut assembly from a single manufacturer?

The RCSC Specification Commentary indicates two cases in which bolts and nuts must be treated as a manufactured matched assembly: when bolts are galvanized (Section C2) and when “tension-control” bolts are specified (Section C8). In the former case, because nut-thread over-tapping to accommodate the added thickness of galvanizing may reduce the nut stripping strength, ASTM A325 requires that the galvanized assembly be lubricated and tested by the manufacturer to ensure adequate rotational capacity. In the latter case, some of the negative aspects of this torque-controlled installation method are minimized through good quality control of the matched assembly.

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 aiscpmn@interaccess.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.

OSHA safety requirements state that tie off points for full protection be designed and evaluated for a 5000 pound load. What is the correct load combination and associated steel member stress condition for acceptance for this required load?

Nathan B. Smith, P.E.
Idaho Falls, ID
via email

In designing a beam with cylindrical tubular section, can you use stiffener/reinforcement rings (angles, FB’s, etc.) if you adopt a wall thickness which is less than what is theoretically required? If so, how do you design the rings?

Francesca R. Tonicelli, P.E.
Melrose Metal Products
Fremont, CA

Are there special design requirements for the design of deep structural steel girders (deeper than or equal to 12 feet)?

Timothy E. Donovan, P.E.
North Weymouth, MA