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 800/644-2400.

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

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

What are the (mill) dimensional tolerances for structural shapes?

Permissible variations for steel as received from the rolling mill are established by ASTM A6/A6M and summarized in Part 1 of the AISC Manual of Steel Construction. These standard tolerances have been developed historically and define the acceptable limits of variation from theoretical dimension, cross-section, flatness, straightness, camber, or sweep for rolled sections prior to fabrication. Standard design practice should always allow and accept these structurally acceptable variations, unless bid documents specifically restrict them. See Figure 1.

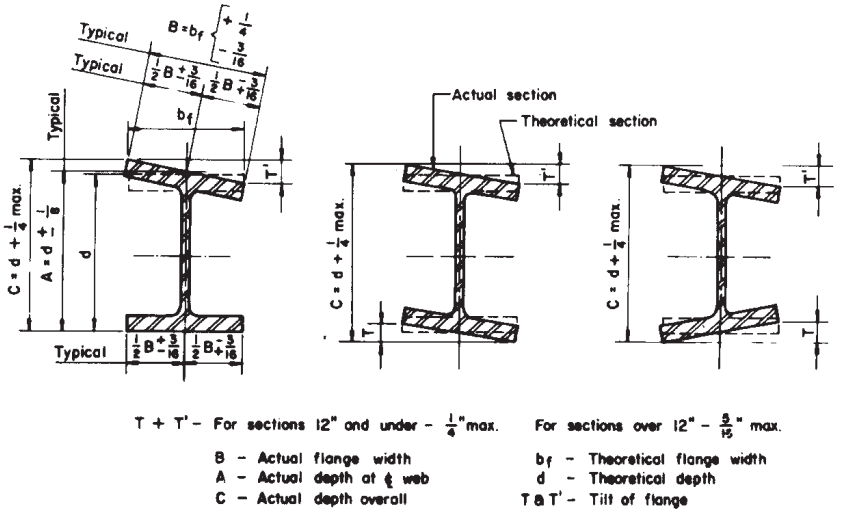

Figure 1: AISC Code of Standard Practice
Mill tolerances on cross-section dimensions

What is moderate reaming as indicated in the AISC Code of Standard Practice Section 7.12?

During the course of erection, it occasionally becomes necessary to ream holes so fasteners can be installed without damage to the threads. This results in a hole that is larger than normal or elongated. Inspectors sometimes require that larger diameter bolts be used to fill the hole.

The hole types recognized by the AISC and RCSC Specifications are standard, oversize, short-slotted, and long-slotted: the maximum nominal dimensions of these holes is also given. Holes not more than 1/32-in. larger in dimension than the true decimal equivalent of the nominal dimension that may result from a drill or reamer of the corresponding nominal diameter are considered to be acceptable. Note that the resulting holes must meet the provisions for minimum edge distance and minimum spacing LRFD Specification Sections J3.3 J3.4, respectively.

The slightly conical hole that naturally results from punching operations is considered to be acceptable. The width of slotted holes which are produced by flame-cutting, or a combination of punching or drilling and flame-cutting shall generally be not more than 1/32-in. Greater than the nominal width except that gouges not more than 1/16-in. Deep are permitted. For statically loaded (building) connections, the flame-cut surface need not be ground; for dynamically loaded (bridges) connections the flame-cut surface must be ground smooth.

What can be done to prevent the nut from coming loose?

In general, when properly installed, the bolt-nut assembly will not come loose. When snug-tight bolts are used, the loading would be such that loosening of a nut (tightened effectively to the full effort of an ironworker with an ordinary spud wrench) would not occur. When fully tensioned

bolts are required, as for slip-critical connections subjected to vibratory or fatigue loading, the installed tension would prevent the nut from coming loose. Some extraordinary cases, such as nuts on anchor rods (for which full-tensioning is difficult), may require further consideration. In such cases, an additional jamb-nut or second nut may be provided; alternatively, the threads can be spiked or marred or the nut can be tack welded to the base metal to prevent it from turning. Note that the latter two solutions are permanent actions.

When must structural steel be painted?

In buildings structures, steel that will be enclosed by building finish, coated with a contact-type fireproofing, or in contact with concrete need not be painted. When enclosed, the steel is trapped in a controlled environment; LRFD Specification Commentary Section M3 indicates that, "The surface condition of steel framing disclosed by the demolition of long-standing buildings has been found to be unchanged from the time of its erection, except at isolated spots where leakage may have occurred. Even in the presence of leakage, the shop coat is of minor influence (Bigos et al, 1954)." A similar situation exists when steel is fire-proofed or in contact with concrete; in fact, paint is best omitted when steel is to be fireproofed since it decreases its adhesion (AISC Manual of Steel Construction).

In exterior exposed applications for building and bridge structures, steel must be protected from corrosion by painting or other means. Likewise, steel must be protected from corrosion in special applications such as the humid environment of a paper processing plant or a structure with oceanfront exposure.

How are permissible deviations from straightness accounted for in fabrication and erection?

Deviations from true straightness and dimension of individual members, within AISC acceptable tolerances, may be compensated for during erection, because of the flexibility of the members relative to the total frame which they are elements. In some structures using heavy, rigid cross-sections, however, the stiffness of the member may preclude any adjustment of camber or sweep which, although within allowable limits, can prevent tight fit-up of connections.

This situation frequently occurs in multistory building columns and may cause difficulty in erecting the floor framing members. Normal detailing practices may compensate in part for this problem; however, special shop layout practices are essential for heavy, rigid framing. To compensate for allowable camber or sweep in heavy, rigid framing, special shop layout techniques to establish straight theoretical working lines between member ends as defined by the AISC Code of Standard Practice.

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.

What are some references for the design and detailing of pot bearings for railroad bridges (heavy design loads)?

Jaan Mannik, P.E.
Mannik & Smith, Inc.
Toledo, OH

What is the best source of information for someone interesting in detailing?

A monorail has a length of 14-ft.-6 1/8-in. between supports, but is curved to an eccentricity of 1-ft.—resulting in torsion on the member which has pinned ends. How should we address this problem? Is the problem torsion, or warping and lateral moment? Do we need to address warping and flexural bending, or does warping include flexure?

A combination section is planned for this monorail, are there any texts which deal with torsion and combination shapes?

Dennis Decator
RUST Engineering and Construction
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Are there any textbooks that deal with the estimating function at a fabrication plant?