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).

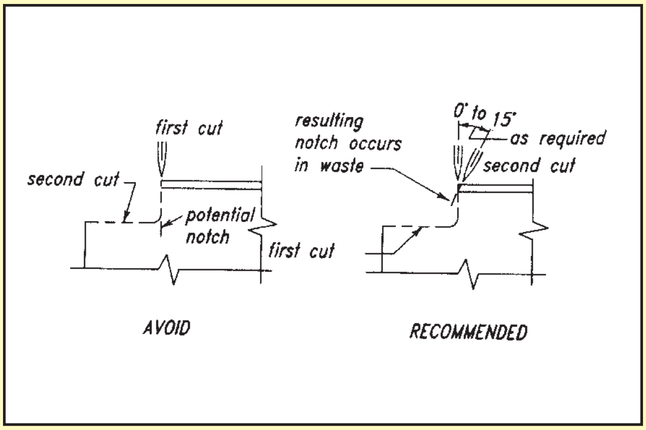
The opinions expressed in *Steel Interchange* do not necessarily represent an official position of the American Institute of Steel Construction, Inc. and have not been reviewed. It is recognized that the design of structures is within the scope and expertise of a competent licensed structural engineer, 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:

When beams are coped, to what radius must the re-entrant corner be shaped?



The AISC *Manual of Steel Construction Load and Resistance Factor Design, Volume II* (1994) recommends on page 8-225 that an approximate minimum radius to which the re-entrant corner of a beam cope must be shaped is ½ in. While there is nothing magical about a 1½-in. radius, this value is recommended to emphasize that square-cut corners and significantly smaller radii do not provide the smooth transition required.

When a cope corner has been square-cut, a common solution is to punch or flame cut additional material at the corner to provide a smooth transition as shown in the figure. Note that the sides of the cope need not meet the radius transition tangentially.

What corrective procedures are available when variations in surface condition do not meet specified tolerances?

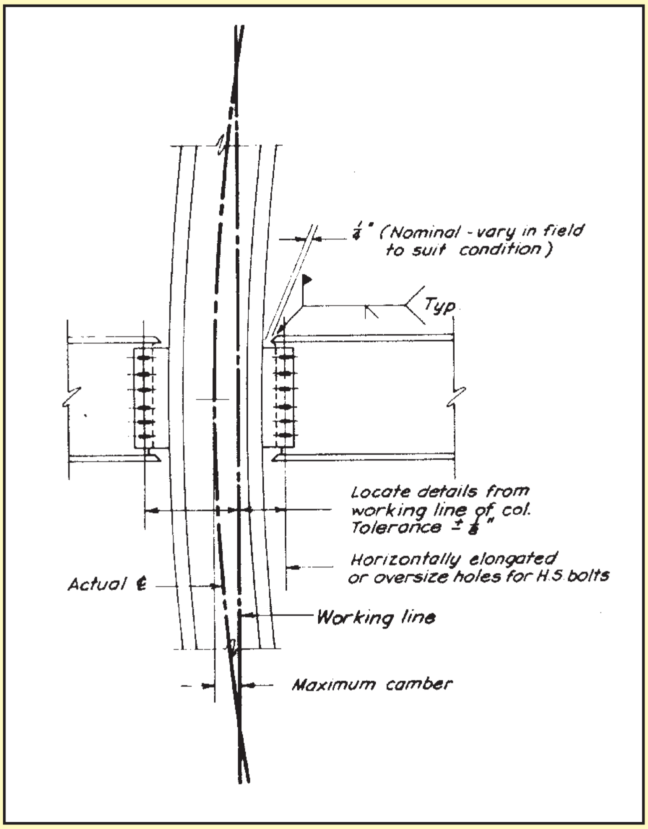
ASTM A6/A6M Section 9 specifies corrective reconditioning procedures that the rolling mill may perform before shipment to the steel fabricator. These corrective reconditioning procedures may alternatively be performed by the fabricator, at the fabricator's option, when variations described in ASTM A6/A6M are discovered or occur after receipt of the material from the rolling mill. Furthermore, the limitations specified therein are only intended to be applied to operations performed at the rolling mill, not to surface reconditioning or repairs made in the fabrication shop. Since the fabricator has qualified welders and special equipment, surface variations or defects exceeding those permitted in ASTM A6/A6M can be repaired satisfactorily, provided the work is done by qualified welders following welding procedures appropriate to the material being repaired.

How can the accumulated mill, fabrication, and erection tolerances be economically addressed?

While individual member tolerances are usually self-compensating and of minor significance in the overall structure, the possibility exists that these tolerances may accumulate and lead to misalignments that are difficult to correct in the field.

As an example of the effect individual member tolerance may have on the total structure, consider the tolerances on columns and beams. Individual tolerances come from several sources: ASTM A6/A6M and AWS D1.1 specify permissible camber and sweep; the AISC *Code of Standard Practice* specifies the permissible variation from detailed length for members framed to other steel parts; the Commentary on the AISC *Code of Standard Practice* illustrates mill tolerances on the cross-section.

The AISC publication *Quality Criteria and Inspection Standards* illustrates a case where individual members fabricated within permissible tolerances



could make it impossible to erect a heavy two-story column within the allowable plumbness tolerance of +/-1:500 (+/-0.72 in. for a 30-ft-long column). Although this condition would be unusual and represents the worst case with all permissible member tolerance accumulated in one direction, it is evident that the accumulation of tolerances is a real problem requiring special consideration.. Other possible examples are double-angle and end-plate connection to columns, attached shelf or spandrel angles, and other similar conditions. Special detailing, fabrication, and erection techniques may be used to minimize the effects, but details for material supported by the steel framing must provide for tolerances.

The use of oversized holes, short-slotted holes, and long-slotted holes, as provided for by the *LRFD Specification for Structural Steel Buildings*, is a satisfactory method for achieving erection within tolerances as illustrated in the figure. Other satisfactory methods include the use of finger shims, shop layout to working lines, and recognition of tolerances accumulation in details for collateral material, e.g. curtain wall, stonework, etc.

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 the tightening requirements for anchor bolts?

In the design of braces for axial forces gusset plates are connected to the flat surface of the flanges of WT sections. Should the effect of eccentricity be considered in the design of braces? If eccentricity is to be considered what procedure is to be followed?

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Are the rules in the AISC *Specification for Structural Steel Buildings* appropriate to use when designing in a foreign country? How about when the material follows a foreign structural steel specification?