

# 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.

\* \* \* \* Questions and answers can now be e-mailed to: [newman@aismail.com](mailto:newman@aismail.com) \* \* \* \*

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

Recently, I contacted several companies with inquires regarding nut couplings for connecting two pieces of 1½" diameter galvanized A36 anchor bolts. Virtually no information pertaining to safe working load; catalog cuts showing size, shape and threaded dimension; or, ASTM material is available to the structural engineer from the nut and bolt industry. Please advise me of information sources.

The Industrial Fasteners Institute (IFI) publishes information on bolting and bolting material. IFI-128 Hex Coupling Nuts includes the dimensions and requirements for these coupling nuts. This Standard and more information on bolting and bolts can be obtained from the Industrial Fasteners Institute, East Ohio Building, Suite 1105, 1717 East Ninth Street, Cleveland, OH 44114-2879 or phone at 216/241-1482 (fax: 216/241-5901).

*Charles J. Wilson*  
 Industrial Fasteners Institute  
 Cleveland, OH

**What tolerance is applicable for the camber ordinate when a beam camber is specified?**

AISC *Code of Standard Practice* Section 6.4.5 indicates that, for members less than 50 ft in length, the camber tolerance is minus zero/plus ½ in.; and additional 1/8 in. per each additional 10 ft of length (or fraction thereof) is allowed for lengths in excess of 50 ft. Note that it further indicates that: (1) members received from the rolling mill with 75 percent of the specified camber require no further cambering; and, (2) inspection of camber must be made in the fabricators shop in the unstressed condition.

**LRFD Specification Table J3.3 specifies maximum hole sizes for bolts. What if an actual hole dimension is between two of the values?**

LRFD Specification Table J3.3 is based upon the Research Council on Structural Connections (RCSC)

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.

Specification Table 1 and specifies the maximum dimensions of standard, oversized, short-slotted, and long-slotted holes. If an actual dimension exceeds the tabulated maximum, it must be treated as the next larger hole size. For

Bolt Diameter	Hole Dimensions			
	Standard (Dia.)	Oversize (Dia.)	Short-slot (Width × Length)	Long-slot (Width × Length)
½	9/16	5/8	9/16 × 11/16	9/16 × 1¼
5/8	11/16	13/16	11/16 × 7/8	11/16 × 15/16
¾	13/16	15/16	13/16 × 1	13/16 × 17/16
7/8	15/16	17/16	15/16 × 1 1/8	15/16 × 21/16
1	17/16	1 1/4	17/16 × 1 5/16	17/16 × 2 1/2
≥ 1 1/8	d + 1/16	d + 9/16	(d + 1/16) × (d + 9/8)	(d + 1/16) × (2.5 × d)

example, a 13/16 in. by 1 ¼ in. slotted hole for a ¾ in. diameter bolt must be treated as a long-slotted hole because it exceeds the maximum short-slotted hole size (13/16 in. by 1 in.). Note that RCSC Specification Section 3 (c) allows a 1/32 in. tolerance on these maximum hole sizes.

**What procedures should be followed in the correction of fabrication errors?**

Because the human element is involved in all phases of structural steel design and fabrication, material inadvertently may be cut short, holes may be misplaced, parts may be located incorrectly, or notches or gouges may occur. It should be noted, however, that not all errors or deviations need to be altered or repaired. Many are acceptable without change or penalty to the structure or its end use. Furthermore, some repair work may be more detrimental, as would that which creates higher residual stresses. In general, the decision should rest with the Structural Engineer of Record (SER) whether or not the deviation is harmful to the end use of the product.

When repair is necessary, it often can be made so that the member will meet all performance criteria. In such cases, the fabricator should be permitted to make the necessary repairs in conformance with the following criteria:

When material is short of minimum required length, welded splices or deposited weld metal, when applied with

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appropriate welding procedures and specified material, should be permissible with the approval of the SER.

Generally, mislocated fastener holes are not detrimental to the strength of a member and may be left open, plug welded in accordance with AWS D1.1 Section 3.7.7, or filled with bolts. Note that ultrasonic inspection should not generally be required for plug-welded fastener holes.

When detail parts are placed in error, minor mislocations should be investigated to determine if relocation is necessary. When relocation is necessary (e.g., when dimensions are critical, the error is major, or the incorrectly placed part is visually unacceptable), the incorrectly placed part should be removed by machining, chipping, grinding, or gouging. Care should be taken not to damage the main material. The surface of the main material should be ground and repaired, if necessary, to meet the surface condition requirements discussed previously in Chapter 1.

Notches or gouges should be repaired using welding procedures appropriate to the material by first preparing the area and subsequently completely filling the defect with weld metal.

Corrective measures to meet the requirements of shop drawings and specifications may generally be made by the fabricator during the normal course of fabrication, using qualified personnel and procedures that meet AISC and AWS Specifications. Such action is considered to be a part of the fabricator's quality control program and should not require either notification of, or approval from, the owner or SER. However, in cases where major work is involved (cutting or removal of welded members from a welded assembly, modification of design, deviation of critical dimensions, etc.), the SER must be consulted and a plan of corrective action agreed upon.

## 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 [newman@aiscmail.com](mailto:newman@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.*

**When, if ever, is it acceptable to “tack” weld the heads of high strength bolts?**

*Matthew Roblez, P.E.*  
Salt Lake City, UT  
via email

**Given a beam coped top and bottom, and a shear load**

**3 times the allowable capacity of the coped section. How is the doubler plate for the beam web designed? Can the plate be split into two, and welded to both sides of the beam web? Does the plate have to be welded on all four sides to the web, or can it be welded on three sides if the beam to girder connection is a bolted double angle?**

*Shipley-Klozik*  
via email

**If a connection combines high-strength bolts and welds, which is installed first? Are the bolts tightened before welding or is welding performed before the bolts are fully tightened? Will slipping of the bolts or cracking of the welds occur if it is not done in the proper manner?**

**How does one design a stepped column (see figure)?**

