

# 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:

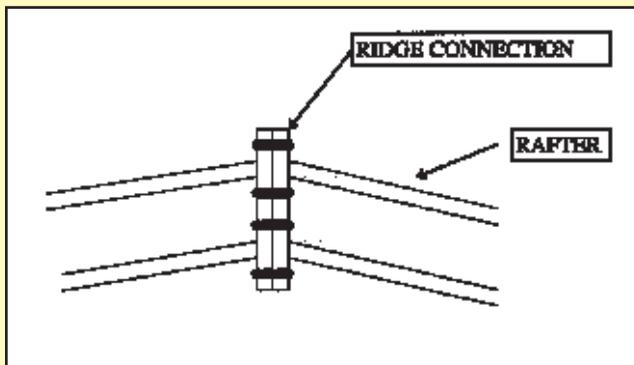
**Steel Interchange**  
**Modern Steel Construction**  
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Chicago, IL 60601-2001

Answers and/or questions should be typewritten and double-spaced.

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

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

**Are there any published design aids or criteria for the design of a bolted moment ridge splice connection similar to the one shown? If not, would the tee stem analogy be an acceptable alternative to designing the plate thickness for the connection?**



The “tee stem” analogy is the philosophy for that connection resistance, treated as an extended end plate. I think that the best design aid available is AISC Design Guide No. 4, *Extended End-Plate Moment Connections*, by Thomas Murray.

**Miguel A. Dodes Traian**  
Buenos Aires, Argentina

**Under What Conditions, if any, is it acceptable to flame cut bolt holes, and what references sub-**

stantiate this?

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.

Flame cutting of holes in a factory setting is fairly typical for holes in webs or other surfaces that do not lend themselves to a systematic punching operation. Computer control programs and machinery allow great flexibility in both hole sizes and shapes that can be created. The RCSC *Specification for Structural Joints*, Section 3(c) speaks to hole types permitted. Specifically, the following points are made. “The width of slotted holes which are produced by flame cutting or a combination of drilling or punching and flame cutting shall generally be not more than  $\frac{1}{32}$ ” greater than the nominal width except that gouges not more than  $\frac{1}{16}$ ” deep shall be permitted. For statically loaded connections, the flame cut surface need not be ground.” The issue should be “what is the condition of the hole upon completion” rather than “what method has been chosen to create the hole.”

**Allen J. Harrold, P.E.**  
Butler Manufacturing Company  
Grandview, MO

**Another answer:**

ASHTO *Standard Specification for Highway Bridges*, Fifteenth Edition (1992) Division II Art. 11.4.8.1 states: “All holes for bolts shall be either punched or drilled.”

AREA *Manual for Railway Engineering* (1994) Chapter 15, Part 3 and Part 9 provide requirements for punched and drilled holes.

LRFD *Specification for Structural Steel Buildings* (1993) Section M2.5 and *Specification for Structural Steel Buildings - Allowable Stress Design* (1989) Section M2.5 refer to RCSC *Specification for Structural Joints Using ASTM A325 or A490 Bolts*.

RCSC *Specification for Structural Joints Using*

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ASTM A325 or A490 Bolts (6/8/88) Section 3(c) states: "The width of slotted holes which are produced by flame cutting or a combination of drilling or punching and flame cutting shall generally be not more than  $\frac{1}{32}$ " greater than the nominal width except that gouges not more than  $\frac{1}{16}$ " deep shall be permitted. For statically loaded connections, the flame cut surface need not be ground."

According to this, flame cutting may be used for slotted holes for structural steel buildings only.

*Mike Ginsburg, P.E.*

APA, Inc.

Omaha, NE

## Another Answer:

We suggest the following: Flame cut holes cannot be made in fracture critical members at any time; for conditions of low loading, i.e., gusset plates for timber connections, A36 steel and A307 bolts, etc. holes may be flame cut if the following provisions are met:

- The hole be burned through to within about  $\frac{1}{4}$ " of the bolt diameter, i.e. a  $\frac{9}{16}$ " flame cut for a  $\frac{13}{16}$ " hole. After burning, the hole be reamed to the appropriate diameter.
- The work be performed by a category 3 certified welder.
- A heat sink be used if possible to keep heat from damaging the area around the burn.

These precautions should minimize the affect of the heat on the steel.

*Steve Foster, P.E.*

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via email

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.

**AISC LRFD load factors and combinations address conditions encountered in buildings and bridges. What load factors and combinations should be used for steel structures supporting pre-packaged equipment (such as skid-mounted and modular units) and subject to temporary ground and sea transportation motion forces?**

*John C. Clarkin*

UOP Equitec Services, Inc.

**What is the in-plane effective length factor for each column of the frame shown assuming: a) the beam to be continuous but not rigidly connected to the center column? And b) the beam to be discontinuous at the center column with simple connections to it?**

*Frisco Lacsina*

San Leandro, CA

## 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,

