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 Word 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: melnick@aiscmail.com** * * * *

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

How does the AISC Code of Standard Practice address the possible tolerance for vertical and horizontal alignment of crane rail in a mill type building?

The AISC Code of Standard Practice does not specifically address crane rail erection tolerance. However, Association of Steel Engineers (AISE) Technical Report #13 gives the following crane rail tolerances. The center-to-center distance of crane rails is not to exceed ¼" from the theoretical dimension. The horizontal misalignment of crane rails is not to exceed ¼" per 50 foot length of runway with a maximum of ½" total deviation from the theoretical location. Crane rails should be centered on the crane girders whenever possible, but in no case should the eccentricity be greater than three-fourths the thickness of the girder web. Vertical misalignment of crane rails measured at the center lines of the columns shall not exceed ¼" per 50 foot length of runway, with a maximum total deviation of ½" from the theoretical location.

Further information on crane runways can be found in AISC Steel Design Guide Series #7, Industrial Buildings, and in the 4th Quarter 1982 issue of Engineering Journal, "Tips for Avoiding Crane Runway Problems".

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What is the correct procedure for checking a structural steel tube wall for local failure due to a load applied by a clip angle?

There are two articles that have appeared in Modern Steel Construction that I use as a reference for the design of all of my connections. (shear tabs, double/single angle stiffened seat, etc.) to HSS walls. The first article appears in the May 1995 edition of Modern Steel Construction entitled "Simple Framing Connections to HSS Columns", the second article appears in the February 1997 edition entitled "Designing with Structural Tubing". Additionally a similar question was asked and answered in the February 1997 Steel Interchange.

Matthew Roblez, P.E.
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via Email

Editors note: AISC has also published a manual covering the design of connections for HSS members, Manual for HSS Connections. *This is available from AISC. There is also a lecture series touring the country on this Manual. Details are on page 22-23.*

AWS 94 Code 2.3.2.4 states "The effective throat shall be the short distance from the joint root to the weld face of the diagrammatic weld." In the AISC Specification it states the same with the addition of "except that, for fillet welds made by the submerged arc process, the effective throat thickness shall be taken equal to the leg size for ⅜" and smaller fillet welds, and equal to the theoretical throat plus 0.11" for fillet welds larger than ⅜".

Why is there an exception specified in AISC? Will SMA process for fillet weld get higher strength and will it cost more?

Is SMA only used in shop conditions?

Some drawings indicate: "SMA process will not be allowed". Why?

Gas metal arc welding with solid filler wire in the short arc mode is not acceptable for structural welding without special procedure qualification tests as per AWS D1.1-96, Section 3.2.1. Welders should be aware that GMAW in the short arc mode, which is by far the most common application of the process, is very susceptible to cold lapping or lack of fusion and is not recommended for materials over 3/16" thick unless special precautions are taken and procedures are qualified through testing.

Tensile strength is only one property characterizing the suitability of an electrode for structural applications. Do not forget the ease of use and impact properties when selecting any filler metal. Weld impact properties and penetration is very poor for many self shielded flux core arc welding electrodes. Many fabricators and engineers are preferring to use submerged arc welding, shielded metal arc welding or gas shielded flux core arc welding to assure better results.

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Via email

Another answer:

Firstly, the generally accepted terminology for the two welding processes mentioned are SMAW for shielded metal arc welding ("stick") and SAW for submerged arc welding. SMAW has historically been the most widely used process for shop and mainly field work. SAW is an automatic process generally used in shop conditions.

The AWS code allows a larger allowable throat dimension for SAW due to the predictably deep penetration at the root of the weld for this controlled process. An SAW weld will have the same strength as any other weld made by another process with thte same effective throat dimension (assuming the electrode or electrode-flux combination have the same tensile strength).

A general statement regarding the economics of SAW versus other processes cannot be made as a cost comparison will include a number of factors including size of weld, length of production weld required, availability of equipment, weld position, and environmental conditions (shop or field location). Commonly, the SAW process will be more economical than SMAW for larger sized welds requiring long production lengths made under shop conditions.

Finally, the reasons for prohibiting SAW or SMAW may be related to the personal experiences of the respective engineer or architect, but both processes can be used effectively with the proper consideration of conditions, use of skilled welders following approved procedures and the application of competent inspection. The choice of process (SAW, SMAW, GMAW, FCAW, etc.) should be left up to the fabricator or erector as they are best suited to select the proper process for each application.

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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.

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.

Clarification is sought when evaluating or designing a built-up section for moving concentrated loads like a crane transversing its girder for interpretation of the b_f variable and resolution of the requirement if equation K1-7 is not met.

First part, should one use the wider compression flange width of the top channel for b_f in the computation of equation K1-7, or the narrower width of the bottom flange.

Second part, if equation K1-7 results in requiring bearing stiffeners, where are they located (i.e. mid span?) since the concentrated load is transient? Also in the commentary section it states that, if the loaded flange is not restrained then the addition of bearing stiffeners alone will be ineffective. From this statement it would appear that both restraint and bearing stiffeners are required, whereas Section K5 states that bearing stiffeners shall be provided in the webs of members with flanges not restrained against relative movement by stiffeners or lateral bracing and subject to concentrated compressive loads when compressive forces exceed the limits established by Equation K1-7.

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