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.

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 principles to a particular structure.

If you have a question or problem that your fellow readers might help you to solve, please forward it to us. At the same time, feel free to respond to any of the questions that you have read here. Contact *Steel Interchange* via AISC's Steel Solutions Center at:

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Old Beam Sizes

I am analyzing a structure to support a replacement chiller, and found on the original structural framing plans a beam designation of 18B35. The plans are dated 1970, and I am only familiar with W, C, M, and S shapes for steel beams. Can you help me identify what type/size beam this is?

Question from August 2001 Edition of MSC

Sometime after the 6th Edition *Manual* was published in 1963, steel producers expanded their offerings of lightweight shapes to include 18", 21", and 24" depths. These were categorized and labeled "Miscellaneous Shapes (M)" and "Light Beams (B)". Eventually these shapes were refined, standardized, and absorbed into future editions of the AISC *Manual*. Some producers, as a convenience to their customers during interim periods, supplied stick-on supplements to the 6th Edition listing the geometry and properties of the new sections. This explains the presence of the letter "B" in the size designation. The location of the letter bounced around for a while depending on the producer and sometimes the user. Around 1970, it was common (but not standard) practice to locate the letter between the depth and weight-per-foot, thus the 18B35 designation. Thanks to AISC, the industry eventually standardized the nomenclature and currently these lightweight sections are mostly lumped together with the heavier wide-flange shapes and denoted with a "W" at the front, thus the W18x35 designation.

A response to this question in August's Steel Interchange referred to the W18x35 as being I-shaped. This may be a bit confusing as "standard" beam shapes are often referred to as I-beams. The W18x35 should be more properly categorized as an "H" shape.

David T. Ricker
Payson, AZ

1929 Properties

I am performing a structural analysis on a spillway radial gate constructed in 1929. Do you know the strength values for steel used at that time? Also, if there is any difference in strength values for the following members: angles, channels, plates, rivets, and bolts? Any other information you might have on steel from this era would be appreciated, such as, unique failure modes, oddities, etc.

Question from August 2001 Edition of MSC

I would refer to Kent's *Mechanical Engineer's Handbook*, 1936 edition, which lists many of the material properties in question including rivets—a tensile strength of 48 to 52 ksi and a working stress of 0.55 to 0.60 times yield, depending upon grip required—as further taken from ASME *Boiler Code* of that era.

Some of my old "handbooks" go back further. My 1928 "Bethlehem Structural Shapes" handbook lists rivet stresses from 8 to 13.5 ksi, depending upon use, etc. It would take a little more research time to get more definitive answers.

As to the radial gate itself, has the questioner contacted the U.S. Army Corps of Engineers?

William T. Guiher, P.E.
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The following information can be found in *Iron and Steel Beams—1873 to 1952*, published by AISC. Structural steel material used at the time of 1929 was probably ASTM A7 or A9. Both have a minimum tensile strength of 55,000 psi and a minimum yield of 30,000 psi. Rivet steel under the above material specifications has different minimums for tensile strenth (46,000 psi) and for yield strength (25,000 psi).

A structural steel design specification of that era can be found in the first edition *Manual* published by AISC. Copies of this manual can be found in used

bookstores (such as www.powells.com) or online auction sites (such as www.ebay.com).

Dale A. Phillips, P.E.
Louisiana

Having recently completed a similar analysis on a project designed in 1926 and completed in 1930, I offer the following steel properties, as provided on the original construction documents:

Structural Steel Allowable Stresses
(Class A Open Hearth Structural Steel for Buildings)

Tension	16,000 psi
Shear	10,000 psi

Plate Allowable Stresses

Tension	16,000 psi (large items)
	18,000 psi (small items)
Shear	13,500 psi
Bearing	20,000 psi (large items)
	27,000 psi (small items)

Rivet Material Allowable Stresses
(3/4" diameter minimum - 7/8" diameter maximum)

Single shear	10,000 psi
Double shear	20,000 psi

Due to the variability of steel practices at the time (concerning both theory and manufacture), I would recommend an exhaustive search be made to locate the original design properties used for the radial gates in question. Failing that, material tests should be performed to at least confirm the allowable values assumed for design.

Mark Stevenson, P.E.
Chattanooga, TN

Column Splices

I am currently working on a job that has several column splices. The splices are made with outside flange plates only. The upper column is bearing directly on the lower, I am assuming, via a note that reads "finish columns to a column plane". The EOR has called out ½" flange splice plates, ⅞ slip critical bolts, and "fillers as required". What is the largest tolerable gap between splice plate, and upper column flanges? Is this documented somewhere?

Question from August 2001 Edition of MSC

When discussing the W column splices with flange plates shop bolted, field bolted Appendix D of the old AISC publication *Engineering for Steel Construction*, reads: "Furnish sufficient 2 1/2 x 1/8 strip shims to provide 0 to 1/16 clearance each side." This same information is available in Table 11-4 of Volume II of the LRFD *Manual*.

Alireza Mokhtarzadeh, Ph.D., P.E.
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New Questions

There are numerous sources that provide recommendations and opinions regarding permissible lateral drift of steel buildings that are supporting exterior walls comprised of brick veneer or concrete masonry unit (CMU) block. These include AISC Design Guide No. 3 *Serviceability Design Considerations for Low-Rise Buildings* by J. M. Fisher and M. A. West. Does any other established entity comparable to AISC provide explicit specifications for this situation?

Kevin B. Westervelt, S.E., P.E.
Knoxville, TN

It is a general rule that welding on an existing structural member is not permitted unless provisions are made to unload the member first (for example, if the member is being reinforced) and that the weld must not degrade the properties of the material.

Is there a written reference that discusses this, both from a code perspective, and a practical approach?

Alan L. Blosser P.E.