

INTRODUCING THE AISC SHAPES DATABASE V14.0

BY JIE ZUO

This is the first installment of a three-part series on the new companion materials—all available free online—that have been prepared to complement the 14th Edition *Steel Construction Manual*.

14th Ed. +

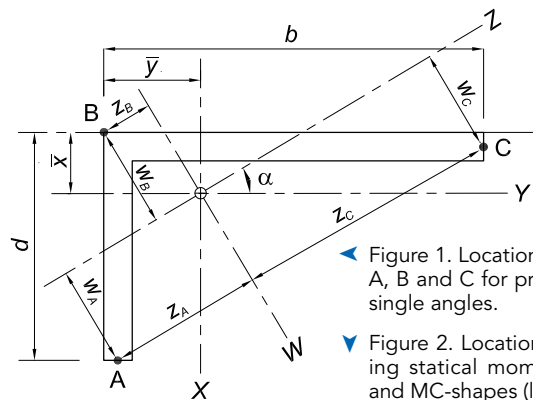
WHEN IT COMES to structural steel design and construction, the most comprehensive resource is the AISC *Steel Construction Manual*. One of its most basic elements is the collection of tables that make up Part 1, which contain commonly used dimensions and properties of nearly all of the structural shapes and sizes available today. The Part 1 data include properties such as gross area, moment of inertia, and width-to-thickness ratios that are used in various design equations and formulas. These—and many more dimensions and properties beyond those provided in the tables in Part 1 of the *Manual*—also are included in electronic format in the AISC Shapes Database.

The AISC Shapes Database was first assembled by Ray Tide, P.E., in the late 1970s in conjunction with the 8th Edition *Manual*, although it was not publicly available until the mid-1980s. Today the database includes less frequently used and more shape-specific properties, such as normalized warping function, W_{no} , for wide-flange shapes and channels, and reduction factors, Q_s , for slender unstiffened compression elements. The AISC Shapes Database is essentially an expanded and more comprehensive electronic version of the tables in Part 1 of the *Manual*, and engineers who are aware of this tool can use it to quickly locate and apply the dimension or property for a specific structural shape being considered in design. It is also useful in developing design and analysis software or creating other steel-related spreadsheets. The updated AISC Shapes Database Version 14.0 was released in September 2011, just a few months after the release of the 14th Edition AISC *Steel Construction Manual*.

Version 14.0 offers a number of improvements and additions. Some additions are a result of new shapes added to the *Manual*. These added shapes include a few new C and MC sizes, a series of smaller double angle sizes (with both short legs back-to-back and long legs back-to-back configurations) and a series of larger HP sizes, up to HP18x204.

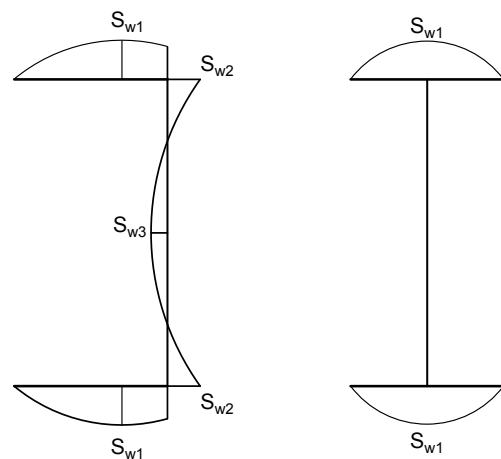
In addition to the new shapes, new properties have been introduced to the database as well. The elastic section modulus and moment of inertia about the principal axes of single angles have been provided to facilitate flexural design. The section modulus is computed for three different points about the w and z axes on a single angle, as shown in Figure 1.

Properties to assist with torsional analysis of channels also have been added. These include the warping statical moment, S_w , about three points on a channel's cross-section (see Figure 2).



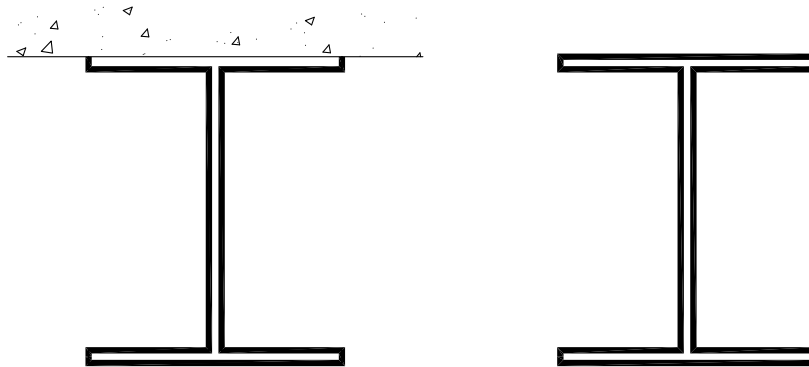
▶ Figure 1. Locations of points A, B and C for properties of single angles.

▶ Figure 2. Locations of warping statical moment for C- and MC-shapes (left) and for W-, M- and S-shapes (right).



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◀ Figure 3. Shape perimeter. Case A is shape perimeter minus one flange width. Case B is full shape perimeter.

Surface area of members is included to help in evaluating how much paint or fireproofing (or any other material applied to the surface) will be needed. The shape perimeter of wide-flange sections has been calculated for two different cases as shown in Figure 3. Case A depicts a scenario where a concrete slab rests on top of the steel section, therefore, reducing the total steel section perimeter by a flange width. Case B depicts a full section perimeter without the flange width deduction. Metric values have been provided in previous versions, but V14.0 is the first to support metric units for all dimensions and properties. These additions highlight the major changes to the new AISC Shapes Database V14.0.

Another tool available is the AISC Historic Shapes Database V14.0 and a “Readme” file. The historic database contains dimensions and section properties

from every AISC *Steel Construction Manual* and many of the producer handbooks published since 1873 that preceded the *Manual*. It does not contain any current values, which should be looked up in the AISC Shapes Database. There are 10 past publications listed, the most recent being the 13th Edition *Steel Construction Manual*, which was released in 2005. In the past, steel producer information, which showed specifically the shapes that were produced by each major mill, was included in the *Manual*, and the historic database reflects that up to the 8th Edition *Manual*. After that time, there was more uniformity in production practices and it was no longer necessary to track this.

The Readme file provides important background information and is essential to those who have not previously used the database. It contains definitions for all the dimensions and properties, as

well as figures and references for additional guidance. Some properties in the database have been generated for use with information in AISC *Steel Design Guides*, and the Readme document will point you to the design guide pertaining to that property. It also lists the historical publications included in the historical database, and gives directions on how to use that resource.

The AISC Shapes Database V14.0 is a wealth of information and can be used in a variety of ways, ranging from automating simple design calculations to building powerful design tools. It is provided in a Microsoft Excel file format and can be stored and moved electronically with ease so you can always have a little piece of the *Manual* handy in your back pocket. The AISC Shapes Database Version 14.0 is available as a free download at www.aisc.org/manual14. **MSC**