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# STEEL CONSTRUCTION



## MANUAL

AMERICAN INSTITUTE  
OF  
STEEL CONSTRUCTION

THIRTEENTH EDITION

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by

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## SCOPE

The dimensions and properties for structural products commonly used in steel building design and construction are given in this Part. For availability and proper material specifications for these products, as well as general specification requirements and other design considerations, see Part 2. For the design of members, see Parts 3 through 6. For the design of connections, see Parts 7 through 15. For AISC Specifications and Codes, see Part 16. For other miscellaneous information, see Part 17. For torsional and flexural-torsional properties of rolled shapes see AISC Design Guide 9, *Torsional Analysis of Structural Steel Members*. For surface areas, box perimeters and areas,  $W/D$  ratios and  $A/D$  ratios, see AISC Design Guide 19, *Fire Resistance of Structural Steel Framing*.

## STRUCTURAL PRODUCTS

### W-, M-, S-, and HP-Shapes

Four types of H-shaped (or I-shaped) members are covered in this Manual:

- W-shapes, which have essentially parallel inner and outer flange surfaces.
- M-shapes, which are H-shaped members that are not classified in ASTM A6 as W-, S-, or HP-shapes. M-shapes may have a sloped inside flange face or other cross-section features that do not meet the criteria for W-, S-, or HP-shapes.
- S-shapes (also known as American standard beams), which have a slope of approximately  $16^{2/3}$  percent (2 on 12) on the inner flange surfaces.
- HP-shapes (also known as bearing piles), which are similar to W-shapes, except their webs and flanges are of equal thickness and the depth and flange width are nominally equal for a given designation.

These shapes are designated by the mark W, M, S or HP, nominal depth (in.) and nominal weight (lb/ft). For example, a W24×55 is a W-shape that is nominally 24 in. deep and weighs 55 lb/ft.

The following dimensional and property information is given in this Manual for the W-, M-, S-, and HP-shapes covered in ASTM A6:

- Design dimensions, detailing dimensions, axial properties, and flexural properties are given in Tables 1-1, 1-2, 1-3, and 1-4 for W-, M-, S-, and HP-shapes, respectively.
- SI-equivalent designations are given in Table 17-1 for W-shapes and in Table 17-2 for M-, S-, and HP-shapes.

Tabulated decimal values are appropriate for use in design calculations, whereas fractional values are appropriate for use in detailing. All decimal and fractional values are similar with one exception: Because of the variation in fillet sizes used in shape production, the decimal value,  $k_{des}$ , is conservatively presented based on the smallest fillet used in production, and the fractional value,  $k_{det}$ , is conservatively presented based on the largest fillet used in production. For the definitions of the tabulated variables, refer to the Nomenclature section at the back of this Manual.

When appropriate, this Manual presents tabulated values for the Workable Gage of a section. The term Workable Gage refers to the gage for fasteners in the flange that provides for entering and tightening clearances and edge distance and spacing requirements. When



components should be compared with the geometry of the cross-section to ensure compatibility. Other gages that provide for entering and tightening clearances and edge distance and spacing requirements can also be used.

## Channels

Two types of channels are covered in this Manual:

- C-shapes (also known as American standard channels), which have a slope of approximately  $16^{2/3}$  percent (2 on 12) on the inner flange surfaces.
- MC-shapes (also known as miscellaneous channels), which have a slope other than  $16^{2/3}$  percent (2 on 12) on the inner flange surfaces.

These shapes are designated by the mark C or MC, nominal depth (in.) and nominal weight (lb/ft). For example, a C12×25 is a C-shape that is nominally 12 in. deep and weighs 25 lb/ft.

The following dimensional and property information is given in this Manual for the channels covered in ASTM A6:

- Design dimensions, detailing dimensions, and axial, flexural, and torsional properties are given in Tables 1-5 and 1-6 for C- and MC-shapes, respectively.
- SI-equivalent designations are given in Table 17-3.

For the definitions of the tabulated variables, refer to the Nomenclature section at the back of this Manual.

## Angles

Angles (also known as L-shapes) have legs of equal thickness and either equal or unequal leg sizes. Angles are designated by the mark L, leg sizes (in.) and thickness (in.). For example, an L4×3× $1/2$  is an angle with one 4-in. leg, one 3-in. leg, and  $1/2$ -in. thickness.

The following dimensional and property information is given in this Manual for the angles covered in ASTM A6:

- Design dimensions, detailing dimensions, and axial, flexural, and flexural-torsional properties are given in Table 1-7. The effects of leg-to-leg and toe fillet radii have been considered in the determination of these section properties. Workable gages on angle legs are tabulated at the end of Table 1-7.
- SI-equivalent designations are given in Table 17-4.

For the definitions of the tabulated variables, refer to the Nomenclature section at the back of this Manual.

## Structural Tees (WT-, MT-, and ST-Shapes)

Three types of structural tees are covered in this Manual:

- WT-shapes, which are made from W-shapes.
- MT-shapes, which are made from M-shapes.
- ST-shapes, which are made from S-shapes.

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