STEEL CONSTRUCTION

MANUAL

AMERICAN INSTITUTE OF STEEL CONSTRUCTION

FOURTEENTH EDITION

PART 1

DIMENSIONS AND PROPERTIES

SCOPE

The dimensions and properties for structural products commonly used in steel building design and construction are given in this Part. Although the dimensions and properties tabulated in Part 1 reflect "commonly" used structural products, some of the shapes listed are not commonly produced or stocked. These shapes are usually only produced to order, and will likely be subject to mill production schedules and minimum order quantities. For availability of shapes, go to **www.aisc.org**. For torsional and flexural-torsional properties of rolled shapes see AISC Design Guide 9, *Torsional Analysis of Structural Steel Members* (Seaburg and Carter, 1997). 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* (Ruddy et al., 2003).

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 $16^2/_3\%$ (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

the listed value is footnoted, the actual size, combination, and orientation of fastener 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 $16^2/_3$% (2 on 12) on the inner flange surfaces.
- MC-shapes (also known as miscellaneous channels), which have a slope other than $16^2/_3$% (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. The S_z value that is given in Table 1-7 is based on the largest perpendicular distance measured from the z-axis to the center of the thickness at the tip of the angle toe(s) or heel. Additional properties of single angles are provided in the digital shapes database available at **www.aisc.org**. These properties are used for calculations involving z and w principal axes. For unequal leg angles, the database includes I, and values of S at the toe of the short leg, the heel, and the toe of the long leg, for the w and z principal axes. For equal leg angles, the database includes I, and values of S at the toe of the leg and the heel, for w and z principal axes.
- Workable gages on angle legs are tabulated in Table 1-7A.
- Compactness criteria for angles are tabulated in Table 1-7B.
- 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

These shapes are designated by the mark WT, MT or ST, nominal depth (in.) and nominal weight (lb/ft). WT-, MT- and ST-shapes are split (sheared or thermal-cut) from W-, M- and S-shapes, respectively, and have half the nominal depth and weight of that shape. For example, a WT12×27.5 is a structural tee split from a W-shape (W24×55), is nominally 12 in. deep and weighs 27.5 lb/ft. Although off-center splitting or splitting on two lines can be obtained by special order, the resulting nonstandard shape is not covered in this Manual.

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

- Design dimensions, detailing dimensions, and axial, flexural and torsional properties are given in Tables 1-8, 1-9 and 1-10 for WT-, MT- and ST-shapes, respectively.
- SI-equivalent designations are given in Table 17-5 for WT-shapes and in Table 17-6 for MT- and ST-shapes.

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

Hollow Structural Sections (HSS)

Three types of HSS are covered in this Manual:

- Rectangular HSS, which have an essentially rectangular cross section, except for rounded corners, and uniform wall thickness, except at the weld seam(s)
- Square HSS, which have an essentially square cross section, except for rounded corners, and uniform wall thickness, except at the weld seam(s)
- Round HSS, which have an essentially round cross section and uniform wall thickness, except at the weld seam(s)

In each case, ASTM A500 covers only electric-resistance-welded (ERW) HSS with a maximum periphery of 64 in. The coverage of HSS in this Manual is similarly limited.

Rectangular HSS are designated by the mark HSS, overall outside dimensions (in.), and wall thickness (in.), with all dimensions expressed as fractional numbers. For example, an HSS10×10×$^1/_2$ is nominally 10 in. by 10 in. with a $^1/_2$-in. wall thickness. Round HSS are designated by the term HSS, nominal outside diameter (in.), and wall thickness (in.) with both dimensions expressed to three decimal places. For example, an HSS10.000×0.500 is nominally 10 in. in diameter with a $^1/_2$-in. nominal wall thickness.

Per AISC *Specification* Section B4.2, the wall thickness used in design, t_{des}, is taken as 0.93 times the nominal wall thickness, t_{nom}. The rationale for this requirement is explained in the corresponding *Specification* Commentary Section B4.2.

In calculating the tabulated b/t and h/t ratios, the outside corner radii are taken as $1.5t_{des}$ for rectangular and square HSS, per AISC *Specification* Section B4.1. In other tabulated design dimensions, the corner radii are taken as $2t_{des}$. In the tabulated workable flat dimen-

sions of rectangular (and square) HSS, the outside corner radii are taken as $2.25t_{nom}$. The term workable flat refers to a reasonable flat width or depth of material for use in making connections to HSS. The workable flat dimension is provided as a reflection of current industry practice, although the tolerances of ASTM A500 allow a greater maximum corner radius of $3t_{nom}$.

The following dimensional and property information is given in this Manual for the HSS covered in ASTM A500, A501, A618 or A847:

- Design dimensions, detailing dimensions, and axial, strong-axis flexural, weak-axis flexural, torsional, and flexural-torsional properties are given in Tables 1-11 and 1-12 for rectangular and square HSS, respectively.
- Design dimensions, detailing dimensions, and axial, flexural and torsional properties are given in Table 1-13 for round HSS.
- SI-equivalent designations are given in Tables 17-7, 17-8 and 17-9 for rectangular, square and round HSS, respectively.
- Compactness criteria of rectangular and square HSS are given in Table 1-12A.

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

Pipe

Pipes have an essentially round cross section and uniform thickness, except at the weld seam(s) for welded pipe.

Pipes up to and including NPS 12 are designated by the term Pipe, nominal diameter (in.) and weight class (Std., x-Strong, xx-Strong). NPS stands for nominal pipe size. For example, Pipe 5 Std. denotes a pipe with a 5-in. nominal diameter and a 0.258-in. wall thickness, which corresponds to the standard weight series. Pipes with wall thicknesses that do not correspond to the foregoing weight classes are designated by the term Pipe, outside diameter (in.), and wall thickness (in.) with both expressed to three decimal places. For example, Pipe 14.000x0.375 and Pipe 5.563x0.500 are proper designations.

Per AISC *Specification* Section B4.2, the wall thickness used in design, t_{des}, is taken as 0.93 times the nominal wall thickness, t_{nom}. The rationale for this requirement is explained in the corresponding *Specification* Commentary Section B4.2.

The following dimensional and property information is given in this Manual for the pipes covered in ASTM A53:

- Design dimensions, detailing dimensions, and axial, flexural and torsional properties are given in Table 1-14.
- SI-equivalent designations are given in Table 17-10.

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

Double Angles

Double angles (also known as 2L-shapes) are made with two angles that are interconnected through their back-to-back legs along the length of the member, either in contact for the full length or separated by spacers at the points of interconnection.

These shapes are designated by the mark 2L, the sizes and thickness of their legs (in.), and their orientation when the angle legs are not of equal size (LLBB or SLBB).[1] For example, a 2L4x3x1/2 LLBB has two angles with one 4-in. leg and one 3-in. leg and the 4-in. legs are back-to-back; a 2L4x3x1/2 SLBB is similar, except the 3-in. legs are back-to-back. In both cases, the legs are 1/2-in. thick.

The following dimensional and property information is given in this Manual for the double angles built-up from the angles covered in ASTM A6:

- Design dimensions, detailing dimensions, and axial, strong-axis flexural, weak-axis flexural, torsional, and flexural-torsional properties are given in Table 1-15 for equal-leg, LLBB and SLBB angles. In each case, angle separations of zero in., 3/8 in. and 3/4 in. are covered. The effects of leg-to-leg and toe fillet radii have been considered in the determination of these section properties. For workable gages on legs of angles, see Table 1-7A.

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

Double Channels

Double channels (also known as 2C- and 2MC-shapes) are made with two channels that are interconnected through their back-to-back webs along the length of the member, either in contact for the full length or separated by spacers at the points of interconnection.

These shapes are designated by the mark 2C or 2MC, nominal depth (in.), and nominal weight per channel (lb/ft). For example, a 2C12x25 is a double channel that consists of two channels that are each nominally 12 in. deep and each weigh 25 lb/ft.

The following dimensional and property information is given in this Manual for the double channels built-up from the channels covered in ASTM A6:

- Design dimensions, detailing dimensions, and axial, strong-axis flexural, and weak-axis flexural properties are given in Tables 1-16 and 1-17 for 2C- and 2MC-shapes, respectively. In each case, channel separations of zero, 3/8 in. and 3/4 in. are covered.

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

W-Shapes and S-Shapes with Cap Channels

Common combined sections made with W- or S-shapes and channels (C- or MC-shapes) are tabulated in this Manual. In either case, the channel web is interconnected to the W-shape or S-shape top flange, respectively, with the flange toes down. The interconnection of the two elements must be designed for the horizontal shear, q, where

$$q = \frac{VQ}{I} \tag{1-1}$$

[1] LLBB stands for long legs back-to-back. SLBB stands for short legs back-to-back. Alternatively, the orientations LLV and SLV, which stand for long legs vertical and short legs vertical, respectively, can be used.

where

I = moment of inertia of the combined cross section, in.^{4}
Q = first moment of the channel area about the neutral axis of the combined cross section, in.^{3}
V = vertical shear, kips
q = horizontal shear, kips/in.

The effects of other forces, such as crane horizontal and lateral forces, may also require consideration, when applicable.

The following dimensional and property information is given in this Manual for combined sections built-up from the W-shapes, S-shapes and cap channels covered in ASTM A6:

- Design dimensions, detailing dimensions, and axial, strong-axis flexural, and weak-axis flexural properties of W-shapes with cap channels are given in Table 1-19.
- Design dimensions, detailing dimensions, and axial, strong-axis flexural, and weak-axis flexural properties of S-shapes with cap channels are given in Table 1-20.

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

Plate Products

Plate products may be ordered as sheet, strip or bar material. Sheet and strip are distinguished from structural bars and plates by their dimensional characteristics, as outlined in Table 2-2 and Table 2-4.

The historical classification system for structural bars and plates suggests that there is only a physical difference between them based upon size and production procedure. In raw form, flat stock has historically been classified as a bar if it is less than or equal to 8 in. wide and as a plate if it is greater than 8 in. wide. Bars are rolled between horizontal and vertical rolls and trimmed to length by shearing or thermal cutting on the ends only. Plates are generally produced using one of two methods:

1. Sheared plates are rolled between horizontal rolls and trimmed to width and length by shearing or thermal cutting on the edges and ends; or
2. Stripped plates are sheared or thermal cut from wider sheared plates.

There is very little, if any, structural difference between plates and bars. Consequently, the term plate is becoming a universally applied term today and a PL$^1/_2$ in.×4$^1/_2$ in.×1ft 3 in., for example, might be fabricated from plate or bar stock.

For structural plates, the preferred practice is to specify thickness in $^1/_{16}$-in. increments up to $^3/_8$-in. thickness, $^1/_8$-in. increments over $^3/_8$-in. to 1-in. thickness, and $^1/_4$-in. increments over 1-in. thickness. The current extreme width for sheared plates is 200 in. Because mill practice regarding plate widths vary, individual mills should be consulted to determine preferences.

For bars, the preferred practice is to specify width in $^1/_4$-in. increments, and thickness and diameter in $^1/_8$-in. increments.

Raised-Pattern Floor Plates

Weights of raised-pattern floor plates are given in Table 1-18. Raised-pattern floor plates are commonly available in widths up to 120 in. For larger plate widths, see literature available from floor plate producers.

Crane Rails

Although crane rails are not listed as structural steel in the AISC *Code of Standard Practice* Section 2.1, this information is provided because some fabricators may choose to provide crane rails. Crane rails are designated by unit weight in lb/yard. Dimensions and properties for the crane rails shown are given in Table 1-21. Crane rails can be either heat treated or end hardened to reduce wear. For additional information or for profiles and properties of crane rails not listed, manufacturer's catalogs should be consulted. For crane-rail connections, see Part 15.

Other Structural Products

The following other structural products are covered in this Manual as indicated:

- High-strength bolts, common bolts, washers, nuts and direct-tension-indicator washers are covered in Part 7.
- Welding filler metals and fluxes are covered in Part 8.
- Forged steel structural hardware items, such as clevises, turnbuckles, sleeve nuts, recessed-pin nuts, and cotter pins are covered in Part 15.
- Anchor rods and threaded rods are covered in Part 14.

STANDARD MILL PRACTICES

The production of structural products is subject to unavoidable variations relative to the theoretical dimensions and profiles, due to many factors, including roll wear, roll dressing practices and temperature effects. Such variations are limited by the dimensional and profile tolerances as summarized below.

Hot-Rolled Structural Shapes

Acceptable dimensional tolerances for hot-rolled structural shapes (W-, M-, S- and HP-shapes), channels (C- and MC-shapes), and angles are given in ASTM A6 Section 12 and summarized in Tables 1-22 through 1-26. Supplementary information, including permissible variations for sheet and strip and for other grades of steel, can also be found in literature from steel plate producers and the Association of Iron and Steel Technology.

Hollow Structural Sections

Acceptable dimensional tolerances for HSS are given in ASTM A500 Section 11, A501 Section 12, A618 Section 8, or A847 Section 10, as applicable, and summarized in Tables 1-27 and 1-28, for rectangular and round HSS, respectively. Supplementary information

can also be found in literature from HSS producers and the Steel Tube Institute, such as *Recommended Methods to Check Dimensional Tolerances on Hollow Structural Sections (HSS) Made to ASTM A500.*

Pipe

Acceptable dimensional tolerances for pipes are given in ASTM A53 Section 10 and summarized in Table 1-28. Supplementary information can also be found in literature from pipe producers.

Plate Products

Acceptable dimensional tolerances for plate products are given in ASTM A6 Section 12 and summarized in Table 1-29. Note that plate thickness can be specified in inches or by weight per square foot, and separate tolerances apply to each method. No decimal edge thickness can be assured for plate specified by the latter method. Supplementary information, including permissible variations for sheet and strip and for other grades of steel, can also be found in literature from steel plate producers and the Association of Iron and Steel Technology.

PART 1 REFERENCES

Ruddy, J.L., Marlo, J.P., Ioannides, S.A. and Alfawakhiri, F. (2003), *Fire Resistance of Structural Steel Framing*, Design Guide 19, AISC, Chicago, IL.

Seaburg, P.A. and Carter, C.J. (1997), *Torsional Analysis of Structural Steel Members*, Design Guide 9, AISC, Chicago, IL.

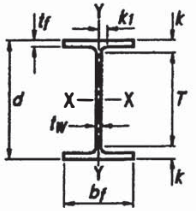


Table 1-1
W-Shapes
Dimensions

Shape	Area, A	Depth, d		Web			Flange				Distance				
				Thickness, t_w		$\frac{t_w}{2}$	Width, b_f		Thickness, t_f		k		k_1	T	Workable Gage
											k_{des}	k_{det}			
	in.^{2}	in.		in.		in.	in.		in.		in.		in.	in.	in.
W44×335[c]	98.5	44.0	44	1.03	1	1/2	15.9	16	1.77	1 3/4	2.56	2 5/8	1 5/16	38 3/4	5 1/2
×290[c]	85.4	43.6	43 5/8	0.865	7/8	7/16	15.8	15 7/8	1.58	1 9/16	2.36	2 7/16	1 1/4		
×262[c]	77.2	43.3	43 1/4	0.785	13/16	7/16	15.8	15 3/4	1.42	1 7/16	2.20	2 1/4	1 3/16		
×230[c,v]	67.8	42.9	42 7/8	0.710	11/16	3/8	15.8	15 3/4	1.22	1 1/4	2.01	2 1/16	1 3/16		
W40×593[h]	174	43.0	43	1.79	1 13/16	15/16	16.7	16 3/4	3.23	3 1/4	4.41	4 1/2	2 1/8	34	7 1/2
×503[h]	148	42.1	42	1.54	1 9/16	13/16	16.4	16 3/8	2.76	2 3/4	3.94	4	2		
×431[h]	127	41.3	41 1/4	1.34	1 5/16	11/16	16.2	16 1/4	2.36	2 3/8	3.54	3 5/8	1 7/8		
×397[h]	117	41.0	41	1.22	1 1/4	5/8	16.1	16 1/8	2.20	2 3/16	3.38	3 1/2	1 13/16		
×372[h]	110	40.6	40 5/8	1.16	1 3/16	5/8	16.1	16 1/8	2.05	2 1/16	3.23	3 5/16	1 13/16		
×362[h]	106	40.6	40 1/2	1.12	1 1/8	9/16	16.0	16	2.01	2	3.19	3 1/4	1 3/4		
×324	95.3	40.2	40 1/8	1.00	1	1/2	15.9	15 7/8	1.81	1 13/16	2.99	3 1/16	1 11/16		
×297[c]	87.3	39.8	39 7/8	0.930	15/16	1/2	15.8	15 7/8	1.65	1 5/8	2.83	2 15/16	1 11/16		
×277[c]	81.5	39.7	39 3/4	0.830	13/16	7/16	15.8	15 7/8	1.58	1 9/16	2.76	2 7/8	1 5/8		
×249[c]	73.5	39.4	39 3/8	0.750	3/4	3/8	15.8	15 3/4	1.42	1 7/16	2.60	2 11/16	1 9/16		
×215[c]	63.5	39.0	39	0.650	5/8	5/16	15.8	15 3/4	1.22	1 1/4	2.40	2 1/2	1 9/16		
×199[c]	58.8	38.7	38 5/8	0.650	5/8	5/16	15.8	15 3/4	1.07	1 1/16	2.25	2 5/16	1 9/16		
W40×392[h]	116	41.6	41 5/8	1.42	1 7/16	3/4	12.4	12 3/8	2.52	2 1/2	3.70	3 13/16	1 15/16	34	7 1/2
×331[h]	97.7	40.8	40 3/4	1.22	1 1/4	5/8	12.2	12 1/8	2.13	2 1/8	3.31	3 3/8	1 13/16		
×327[h]	95.9	40.8	40 3/4	1.18	1 3/16	5/8	12.1	12 1/8	2.13	2 1/8	3.31	3 3/8	1 13/16		
×294	86.2	40.4	40 3/8	1.06	1 1/16	9/16	12.0	12	1.93	1 15/16	3.11	3 3/16	1 3/4		
×278	82.3	40.2	40 1/8	1.03	1	1/2	12.0	12	1.81	1 13/16	2.99	3 1/16	1 3/4		
×264	77.4	40.0	40	0.960	15/16	1/2	11.9	11 7/8	1.73	1 3/4	2.91	3	1 11/16		
×235[c]	69.1	39.7	39 3/4	0.830	13/16	7/16	11.9	11 7/8	1.58	1 9/16	2.76	2 7/8	1 5/8		
×211[c]	62.1	39.4	39 3/8	0.750	3/4	3/8	11.8	11 3/4	1.42	1 7/16	2.60	2 11/16	1 9/16		
×183[c]	53.3	39.0	39	0.650	5/8	5/16	11.8	11 3/4	1.20	1 3/16	2.38	2 1/2	1 9/16		
×167[c]	49.3	38.6	38 5/8	0.650	5/8	5/16	11.8	11 3/4	1.03	1	2.21	2 5/16	1 9/16		
×149[c,v]	43.8	38.2	38 1/4	0.630	5/8	5/16	11.8	11 3/4	0.830	13/16	2.01	2 1/8	1 1/2		

[c] Shape is slender for compression with F_y = 50 ksi.
[h] Flange thickness greater than 2 in. Special requirements may apply per AISC *Specification* Section A3.1c.
[v] Shape does not meet the h/t_w limit for shear in AISC *Specification* Section G2.1(a) with F_y = 50 ksi.

Table 1-1 (continued)
W-Shapes
Properties


W44-W40

Nominal Wt.	Compact Section Criteria		Axis X-X				Axis Y-Y				r_{ts}	h_o	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	I	S	r	Z	I	S	r	Z			J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{6}
335	4.50	38.0	31100	1410	17.8	1620	1200	150	3.49	236	4.24	42.2	74.7	535000
290	5.02	45.0	27000	1240	17.8	1410	1040	132	3.49	205	4.20	42.0	50.9	461000
262	5.57	49.6	24100	1110	17.7	1270	923	117	3.47	182	4.17	41.9	37.3	405000
230	6.45	54.8	20800	971	17.5	1100	796	101	3.43	157	4.13	41.7	24.9	346000
593	2.58	19.1	50400	2340	17.0	2760	2520	302	3.80	481	4.63	39.8	445	997000
503	2.98	22.3	41600	1980	16.8	2320	2040	249	3.72	394	4.50	39.3	277	789000
431	3.44	25.5	34800	1690	16.6	1960	1690	208	3.65	328	4.41	38.9	177	638000
397	3.66	28.0	32000	1560	16.6	1800	1540	191	3.64	300	4.38	38.8	142	579000
372	3.93	29.5	29600	1460	16.5	1680	1420	177	3.60	277	4.33	38.6	116	528000
362	3.99	30.5	28900	1420	16.5	1640	1380	173	3.60	270	4.33	38.6	109	513000
324	4.40	34.2	25600	1280	16.4	1460	1220	153	3.58	239	4.27	38.4	79.4	448000
297	4.80	36.8	23200	1170	16.3	1330	1090	138	3.54	215	4.22	38.2	61.2	399000
277	5.03	41.2	21900	1100	16.4	1250	1040	132	3.58	204	4.25	38.1	51.5	379000
249	5.55	45.6	19600	993	16.3	1120	926	118	3.55	182	4.21	38.0	38.1	334000
215	6.45	52.6	16700	859	16.2	964	803	101	3.54	156	4.19	37.8	24.8	284000
199	7.39	52.6	14900	770	16.0	869	695	88.2	3.45	137	4.12	37.6	18.3	246000
392	2.45	24.1	29900	1440	16.1	1710	803	130	2.64	212	3.30	39.1	172	306000
331	2.86	28.0	24700	1210	15.9	1430	644	106	2.57	172	3.21	38.7	105	241000
327	2.85	29.0	24500	1200	16.0	1410	640	105	2.58	170	3.21	38.7	103	239000
294	3.11	32.2	21900	1080	15.9	1270	562	93.5	2.55	150	3.16	38.5	76.6	208000
278	3.31	33.3	20500	1020	15.8	1190	521	87.1	2.52	140	3.13	38.4	65.0	192000
264	3.45	35.6	19400	971	15.8	1130	493	82.6	2.52	132	3.12	38.3	56.1	181000
235	3.77	41.2	17400	875	15.9	1010	444	74.6	2.54	118	3.11	38.1	41.3	161000
211	4.17	45.6	15500	786	15.8	906	390	66.1	2.51	105	3.07	38.0	30.4	141000
183	4.92	52.6	13200	675	15.7	774	331	56.0	2.49	88.3	3.04	37.8	19.3	118000
167	5.76	52.6	11600	600	15.3	693	283	47.9	2.40	76.0	2.98	37.6	14.0	99700
149	7.11	54.3	9800	513	15.0	598	229	38.8	2.29	62.2	2.89	37.4	9.36	80000

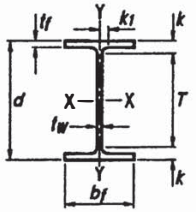


Table 1-1 (continued)
W-Shapes
Dimensions

Shape	Area, A	Depth, d		Web			Flange				Distance				Work-able Gage
				Thickness, t_w		$\frac{t_w}{2}$	Width, b_f		Thickness, t_f		k		k_1	T	
											k_{des}	k_{det}			
	in.^{2}	in.		in.		in.	in.		in.		in.	in.	in.	in.	in.
W36×652[h]	192	41.1	41	1.97	2	1	17.6	17 5/8	3.54	3 9/16	4.49	4 13/16	2 3/16	31 3/8	7 1/2
×529[h]	156	39.8	39 3/4	1.61	1 5/8	13/16	17.2	17 1/4	2.91	2 15/16	3.86	4 3/16	2		
×487[h]	143	39.3	39 3/8	1.50	1 1/2	3/4	17.1	17 1/8	2.68	2 11/16	3.63	4	1 7/8		
×441[h]	130	38.9	38 7/8	1.36	1 3/8	11/16	17.0	17	2.44	2 7/16	3.39	3 3/4	1 7/8		
×395[h]	116	38.4	38 3/8	1.22	1 1/4	5/8	16.8	16 7/8	2.20	2 3/16	3.15	3 7/16	1 13/16		
×361[h]	106	38.0	38	1.12	1 1/8	9/16	16.7	16 3/4	2.01	2	2.96	3 5/16	1 3/4		
×330	96.9	37.7	37 5/8	1.02	1	1/2	16.6	16 5/8	1.85	1 7/8	2.80	3 1/8	1 3/4		
×302	89.0	37.3	37 3/8	0.945	15/16	1/2	16.7	16 5/8	1.68	1 11/16	2.63	3	1 11/16		
×282[c]	82.9	37.1	37 1/8	0.885	7/8	7/16	16.6	16 5/8	1.57	1 9/16	2.52	2 7/8	1 5/8		
×262[c]	77.2	36.9	36 7/8	0.840	13/16	7/16	16.6	16 1/2	1.44	1 7/16	2.39	2 3/4	1 5/8		
×247[c]	72.5	36.7	36 5/8	0.800	13/16	7/16	16.5	16 1/2	1.35	1 3/8	2.30	2 5/8	1 5/8		
×231[c]	68.2	36.5	36 1/2	0.760	3/4	3/8	16.5	16 1/2	1.26	1 1/4	2.21	2 9/16	1 9/16		
W36×256	75.3	37.4	37 3/8	0.960	15/16	1/2	12.2	12 1/4	1.73	1 3/4	2.48	2 5/8	1 5/16	32 1/8	5 1/2
×232[c]	68.0	37.1	37 1/8	0.870	7/8	7/16	12.1	12 1/8	1.57	1 9/16	2.32	2 7/16	1 1/4		
×210[c]	61.9	36.7	36 3/4	0.830	13/16	7/16	12.2	12 1/8	1.36	1 3/8	2.11	2 5/16	1 1/4		
×194[c]	57.0	36.5	36 1/2	0.765	3/4	3/8	12.1	12 1/8	1.26	1 1/4	2.01	2 3/16	1 3/16		
×182[c]	53.6	36.3	36 3/8	0.725	3/4	3/8	12.1	12 1/8	1.18	1 3/16	1.93	2 1/8	1 3/16		
×170[c]	50.0	36.2	36 1/8	0.680	11/16	3/8	12.0	12	1.10	1 1/8	1.85	2	1 3/16		
×160[c]	47.0	36.0	36	0.650	5/8	5/16	12.0	12	1.02	1	1.77	1 15/16	1 1/8		
×150[c]	44.3	35.9	35 7/8	0.625	5/8	5/16	12.0	12	0.940	15/16	1.69	1 7/8	1 1/8		
×135[c,v]	39.9	35.6	35 1/2	0.600	5/8	5/16	12.0	12	0.790	13/16	1.54	1 11/16	1 1/8		
W33×387[h]	114	36.0	36	1.26	1 1/4	5/8	16.2	16 1/4	2.28	2 1/4	3.07	3 3/16	1 7/16	29 5/8	5 1/2
×354[h]	104	35.6	35 1/2	1.16	1 3/16	5/8	16.1	16 1/8	2.09	2 1/16	2.88	2 15/16	1 3/8		
×318	93.7	35.2	35 1/8	1.04	1 1/16	9/16	16.0	16	1.89	1 7/8	2.68	2 3/4	1 5/16		
×291	85.6	34.8	34 7/8	0.960	15/16	1/2	15.9	15 7/8	1.73	1 3/4	2.52	2 5/8	1 5/16		
×263	77.4	34.5	34 1/2	0.870	7/8	7/16	15.8	15 3/4	1.57	1 9/16	2.36	2 7/16	1 1/4		
×241[c]	71.1	34.2	34 1/8	0.830	13/16	7/16	15.9	15 7/8	1.40	1 3/8	2.19	2 1/4	1 1/4		
×221[c]	65.3	33.9	33 7/8	0.775	3/4	3/8	15.8	15 3/4	1.28	1 1/4	2.06	2 1/8	1 3/16		
×201[c]	59.1	33.7	33 5/8	0.715	11/16	3/8	15.7	15 3/4	1.15	1 1/8	1.94	2	1 3/16		
W33×169[c]	49.5	33.8	33 7/8	0.670	11/16	3/8	11.5	11 1/2	1.22	1 1/4	1.92	2 1/8	1 3/16	29 5/8	5 1/2
×152[c]	44.9	33.5	33 1/2	0.635	5/8	5/16	11.6	11 5/8	1.06	1 1/16	1.76	1 15/16	1 1/8		
×141[c]	41.5	33.3	33 1/4	0.605	5/8	5/16	11.5	11 1/2	0.960	15/16	1.66	1 13/16	1 1/8		
×130[c]	38.3	33.1	33 1/8	0.580	9/16	5/16	11.5	11 1/2	0.855	7/8	1.56	1 3/4	1 1/8		
×118[c,v]	34.7	32.9	32 7/8	0.550	9/16	5/16	11.5	11 1/2	0.740	3/4	1.44	1 5/8	1 1/8		

[c] Shape is slender for compression with $F_y = 50$ ksi.
[h] Flange thickness greater than 2 in. Special requirements may apply per AISC *Specification* Section A3.1c.
[v] Shape does not meet the h/t_w limit for shear in AISC *Specification* Section G2.1(a) with $F_y = 50$ ksi.

Table 1-1 (continued)
W-Shapes
Properties

W36-W33

Nominal Wt.	Compact Section Criteria		Axis X-X				Axis Y-Y				r_{ts}	h_o	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	I	S	r	Z	I	S	r	Z			J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{6}
652	2.48	16.3	50600	2460	16.2	2910	3230	367	4.10	581	4.96	37.6	593	1130000
529	2.96	19.9	39600	1990	16.0	2330	2490	289	4.00	454	4.80	36.9	327	846000
487	3.19	21.4	36000	1830	15.8	2130	2250	263	3.96	412	4.74	36.6	258	754000
441	3.48	23.6	32100	1650	15.7	1910	1990	235	3.92	368	4.69	36.5	194	661000
395	3.83	26.3	28500	1490	15.7	1710	1750	208	3.88	325	4.61	36.2	142	575000
361	4.16	28.6	25700	1350	15.6	1550	1570	188	3.85	293	4.58	36.0	109	509000
330	4.49	31.4	23300	1240	15.5	1410	1420	171	3.83	265	4.53	35.9	84.3	456000
302	4.96	33.9	21100	1130	15.4	1280	1300	156	3.82	241	4.53	35.6	64.3	412000
282	5.29	36.2	19600	1050	15.4	1190	1200	144	3.80	223	4.50	35.5	52.7	378000
262	5.75	38.2	17900	972	15.3	1100	1090	132	3.76	204	4.46	35.5	41.6	342000
247	6.11	40.1	16700	913	15.2	1030	1010	123	3.74	190	4.42	35.4	34.7	316000
231	6.54	42.2	15600	854	15.1	963	940	114	3.71	176	4.40	35.2	28.7	292000
256	3.53	33.8	16800	895	14.9	1040	528	86.5	2.65	137	3.24	35.7	52.9	168000
232	3.86	37.3	15000	809	14.8	936	468	77.2	2.62	122	3.21	35.5	39.6	148000
210	4.48	39.1	13200	719	14.6	833	411	67.5	2.58	107	3.18	35.3	28.0	128000
194	4.81	42.4	12100	664	14.6	767	375	61.9	2.56	97.7	3.15	35.2	22.2	116000
182	5.12	44.8	11300	623	14.5	718	347	57.6	2.55	90.7	3.13	35.1	18.5	107000
170	5.47	47.7	10500	581	14.5	668	320	53.2	2.53	83.8	3.11	35.1	15.1	98500
160	5.88	49.9	9760	542	14.4	624	295	49.1	2.50	77.3	3.09	35.0	12.4	90200
150	6.37	51.9	9040	504	14.3	581	270	45.1	2.47	70.9	3.06	35.0	10.1	82200
135	7.56	54.1	7800	439	14.0	509	225	37.7	2.38	59.7	2.99	34.8	7.00	68100
387	3.55	23.7	24300	1350	14.6	1560	1620	200	3.77	312	4.49	33.7	148	459000
354	3.85	25.7	22000	1240	14.5	1420	1460	181	3.74	282	4.44	33.5	115	408000
318	4.23	28.7	19500	1110	14.5	1270	1290	161	3.71	250	4.40	33.3	84.4	357000
291	4.60	31.0	17700	1020	14.4	1160	1160	146	3.68	226	4.34	33.1	65.1	319000
263	5.03	34.3	15900	919	14.3	1040	1040	131	3.66	202	4.31	32.9	48.7	281000
241	5.66	35.9	14200	831	14.1	940	933	118	3.62	182	4.29	32.8	36.2	251000
221	6.20	38.5	12900	759	14.1	857	840	106	3.59	164	4.25	32.6	27.8	224000
201	6.85	41.7	11600	686	14.0	773	749	95.2	3.56	147	4.21	32.6	20.8	198000
169	4.71	44.7	9290	549	13.7	629	310	53.9	2.50	84.4	3.03	32.6	17.7	82400
152	5.48	47.2	8160	487	13.5	559	273	47.2	2.47	73.9	3.01	32.4	12.4	71700
141	6.01	49.6	7450	448	13.4	514	246	42.7	2.43	66.9	2.98	32.3	9.70	64400
130	6.73	51.7	6710	406	13.2	467	218	37.9	2.39	59.5	2.94	32.2	7.37	56600
118	7.76	54.5	5900	359	13.0	415	187	32.6	2.32	51.3	2.89	32.2	5.30	48300

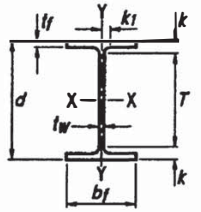


Table 1-1 (continued)
W-Shapes
Dimensions

Shape	Area, A	Depth, d		Web			Flange				Distance					Work-able Gage
				Thickness, t_w		$\frac{t_w}{2}$	Width, b_f		Thickness, t_f		k		k_1	T		
											k_{des}	k_{det}				
	in.^{2}	in.		in.		in.	in.		in.		in.	in.	in.	in.		in.
W30×391[h]	115	33.2	33 1/4	1.36	1 3/8	1 1/16	15.6	15 5/8	2.44	2 7/16	3.23	3 3/8	1 1/2	26 1/2		5 1/2
×357[h]	105	32.8	32 3/4	1.24	1 1/4	5/8	15.5	15 1/2	2.24	2 1/4	3.03	3 1/8	1 7/16			
×326[h]	95.9	32.4	32 3/8	1.14	1 1/8	9/16	15.4	15 3/8	2.05	2 1/16	2.84	2 15/16	1 3/8			
×292	86.0	32.0	32	1.02	1	1/2	15.3	15 1/4	1.85	1 7/8	2.64	2 3/4	1 5/16			
×261	77.0	31.6	31 5/8	0.930	15/16	1/2	15.2	15 1/8	1.65	1 5/8	2.44	2 9/16	1 5/16			
×235	69.3	31.3	31 1/4	0.830	13/16	7/16	15.1	15	1.50	1 1/2	2.29	2 3/8	1 1/4			
×211	62.3	30.9	31	0.775	3/4	3/8	15.1	15 1/8	1.32	1 5/16	2.10	2 1/4	1 3/16			
×191[c]	56.1	30.7	30 5/8	0.710	11/16	3/8	15.0	15	1.19	1 3/16	1.97	2 1/16	1 3/16			
×173[c]	50.9	30.4	30 1/2	0.655	5/8	5/16	15.0	15	1.07	1 1/16	1.85	2	1 1/8	▼		▼
W30×148[c]	43.6	30.7	30 5/8	0.650	5/8	5/16	10.5	10 1/2	1.18	1 3/16	1.83	2 1/16	1 1/8	26 1/2		5 1/2
×132[c]	38.8	30.3	30 1/4	0.615	5/8	5/16	10.5	10 1/2	1.00	1	1.65	1 7/8	1 1/8			
×124[c]	36.5	30.2	30 1/8	0.585	9/16	5/16	10.5	10 1/2	0.930	15/16	1.58	1 13/16	1 1/8			
×116[c]	34.2	30.0	30	0.565	9/16	5/16	10.5	10 1/2	0.850	7/8	1.50	1 3/4	1 1/8			
×108[c]	31.7	29.8	29 7/8	0.545	9/16	5/16	10.5	10 1/2	0.760	3/4	1.41	1 11/16	1 1/8			
×99[c]	29.0	29.7	29 5/8	0.520	1/2	1/4	10.5	10 1/2	0.670	11/16	1.32	1 9/16	1 1/16			
×90[c,v]	26.3	29.5	29 1/2	0.470	1/2	1/4	10.4	10 3/8	0.610	5/8	1.26	1 1/2	1 1/16	▼		▼
W27×539[h]	159	32.5	32 1/2	1.97	2	1	15.3	15 1/4	3.54	3 9/16	4.33	4 7/16	1 13/16	23 5/8		5 1/2[g]
×368[h]	109	30.4	30 3/8	1.38	1 3/8	11/16	14.7	14 5/8	2.48	2 1/2	3.27	3 3/8	1 1/2			5 1/2
×336[h]	99.2	30.0	30	1.26	1 1/4	5/8	14.6	14 1/2	2.28	2 1/4	3.07	3 3/16	1 7/16			
×307[h]	90.2	29.6	29 5/8	1.16	1 3/16	5/8	14.4	14 1/2	2.09	2 1/16	2.88	3	1 7/16			
×281	83.1	29.3	29 1/4	1.06	1 1/16	9/16	14.4	14 3/8	1.93	1 15/16	2.72	2 13/16	1 3/8			
×258	76.1	29.0	29	0.980	1	1/2	14.3	14 1/4	1.77	1 3/4	2.56	2 11/16	1 5/16			
×235	69.4	28.7	28 5/8	0.910	15/16	1/2	14.2	14 1/4	1.61	1 5/8	2.40	2 1/2	1 5/16			
×217	63.9	28.4	28 3/8	0.830	13/16	7/16	14.1	14 1/8	1.50	1 1/2	2.29	2 3/8	1 1/4			
×194	57.1	28.1	28 1/8	0.750	3/4	3/8	14.0	14	1.34	1 5/16	2.13	2 1/4	1 3/16			
×178	52.5	27.8	27 3/4	0.725	3/4	3/8	14.1	14 1/8	1.19	1 3/16	1.98	2 1/16	1 3/16			
×161[c]	47.6	27.6	27 5/8	0.660	11/16	3/8	14.0	14	1.08	1 1/16	1.87	2	1 3/16			
×146[c]	43.2	27.4	27 3/8	0.605	5/8	5/16	14.0	14	0.975	1	1.76	1 7/8	1 1/8	▼		▼
W27×129[c]	37.8	27.6	27 5/8	0.610	5/8	5/16	10.0	10	1.10	1 1/8	1.70	2	1 1/8	23 5/8		5 1/2
×114[c]	33.6	27.3	27 1/4	0.570	9/16	5/16	10.1	10 1/8	0.930	15/16	1.53	1 13/16	1 1/8			
×102[c]	30.0	27.1	27 1/8	0.515	1/2	1/4	10.0	10	0.830	13/16	1.43	1 3/4	1 1/16			
×94[c]	27.6	26.9	26 7/8	0.490	1/2	1/4	10.0	10	0.745	3/4	1.34	1 5/8	1 1/16			
×84[c]	24.7	26.7	26 3/4	0.460	7/16	1/4	10.0	10	0.640	5/8	1.24	1 9/16	1 1/16	▼		▼

[c] Shape is slender for compression with $F_y = 50$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
[h] Flange thickness greater than 2 in. Special requirements may apply per AISC *Specification* Section A3.1c.
[v] Shape does not meet the h/t_w limit for shear in AISC *Specification* Section G2.1(a) with $F_y = 50$ ksi.

Table 1-1 (continued)
W-Shapes
Properties

W30-W27

Nominal Wt.	Compact Section Criteria		Axis X-X				Axis Y-Y				r_{ts}	h_o	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	I	S	r	Z	I	S	r	Z			J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{6}
391	3.19	19.7	20700	1250	13.4	1450	1550	198	3.67	310	4.37	30.8	173	366000
357	3.45	21.6	18700	1140	13.3	1320	1390	179	3.64	279	4.31	30.6	134	324000
326	3.75	23.4	16800	1040	13.2	1190	1240	162	3.60	252	4.26	30.4	103	287000
292	4.12	26.2	14900	930	13.2	1060	1100	144	3.58	223	4.22	30.2	75.2	250000
261	4.59	28.7	13100	829	13.1	943	959	127	3.53	196	4.16	30.0	54.1	215000
235	5.02	32.2	11700	748	13.0	847	855	114	3.51	175	4.13	29.8	40.3	190000
211	5.74	34.5	10300	665	12.9	751	757	100	3.49	155	4.11	29.6	28.4	166000
191	6.35	37.7	9200	600	12.8	675	673	89.5	3.46	138	4.06	29.5	21.0	146000
173	7.04	40.8	8230	541	12.7	607	598	79.8	3.42	123	4.03	29.3	15.6	129000
148	4.44	41.6	6680	436	12.4	500	227	43.3	2.28	68.0	2.77	29.5	14.5	49400
132	5.27	43.9	5770	380	12.2	437	196	37.2	2.25	58.4	2.75	29.3	9.72	42100
124	5.65	46.2	5360	355	12.1	408	181	34.4	2.23	54.0	2.73	29.3	7.99	38600
116	6.17	47.8	4930	329	12.0	378	164	31.3	2.19	49.2	2.70	29.2	6.43	34900
108	6.89	49.6	4470	299	11.9	346	146	27.9	2.15	43.9	2.67	29.0	4.99	30900
99	7.80	51.9	3990	269	11.7	312	128	24.5	2.10	38.6	2.62	29.0	3.77	26800
90	8.52	57.5	3610	245	11.7	283	115	22.1	2.09	34.7	2.60	28.9	2.84	24000
539	2.15	12.1	25600	1570	12.7	1890	2110	277	3.65	437	4.41	29.0	496	443000
368	2.96	17.3	16200	1060	12.2	1240	1310	179	3.48	279	4.15	27.9	170	255000
336	3.19	18.9	14600	972	12.1	1130	1180	162	3.45	252	4.10	27.7	131	226000
307	3.46	20.6	13100	887	12.0	1030	1050	146	3.41	227	4.04	27.5	101	199000
281	3.72	22.5	11900	814	12.0	936	953	133	3.39	206	4.00	27.4	79.5	178000
258	4.03	24.4	10800	745	11.9	852	859	120	3.36	187	3.96	27.2	61.6	159000
235	4.41	26.2	9700	677	11.8	772	769	108	3.33	168	3.92	27.1	47.0	141000
217	4.71	28.7	8910	627	11.8	711	704	100	3.32	154	3.89	26.9	37.6	128000
194	5.24	31.8	7860	559	11.7	631	619	88.1	3.29	136	3.85	26.8	27.1	111000
178	5.92	32.9	7020	505	11.6	570	555	78.8	3.25	122	3.83	26.6	20.1	98400
161	6.49	36.1	6310	458	11.5	515	497	70.9	3.23	109	3.79	26.5	15.1	87300
146	7.16	39.4	5660	414	11.5	464	443	63.5	3.20	97.7	3.76	26.4	11.3	77200
129	4.55	39.7	4760	345	11.2	395	184	36.8	2.21	57.6	2.66	26.5	11.1	32500
114	5.41	42.5	4080	299	11.0	343	159	31.5	2.18	49.3	2.65	26.4	7.33	27600
102	6.03	47.1	3620	267	11.0	305	139	27.8	2.15	43.4	2.62	26.3	5.28	24000
94	6.70	49.5	3270	243	10.9	278	124	24.8	2.12	38.8	2.59	26.2	4.03	21300
84	7.78	52.7	2850	213	10.7	244	106	21.2	2.07	33.2	2.54	26.1	2.81	17900

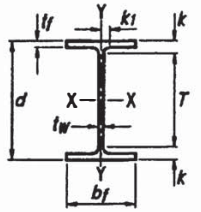


Table 1-1 (continued)
W-Shapes
Dimensions

Shape	Area, A	Depth, d		Web			Flange				Distance				
				Thickness, t_w		$\frac{t_w}{2}$	Width, b_f		Thickness, t_f		k		k_1	T	Workable Gage
											k_{des}	k_{det}			
	in.^{2}	in.		in.		in.	in.		in.		in.		in.	in.	in.
W24×370[h]	109	28.0	28	1.52	1 1/2	3/4	13.7	13 5/8	2.72	2 3/4	3.22	3 5/8	1 9/16	20 3/4	5 1/2
×335[h]	98.3	27.5	27 1/2	1.38	1 3/8	11/16	13.5	13 1/2	2.48	2 1/2	2.98	3 3/8	1 1/2		
×306[h]	89.7	27.1	27 1/8	1.26	1 1/4	5/8	13.4	13 3/8	2.28	2 1/4	2.78	3 3/16	1 7/16		
x279[h]	81.9	26.7	26 3/4	1.16	1 3/16	5/8	13.3	13 1/4	2.09	2 1/16	2.59	3	1 7/16		
×250	73.5	26.3	26 3/8	1.04	1 1/16	9/16	13.2	13 1/8	1.89	1 7/8	2.39	2 13/16	1 3/8		
×229	67.2	26.0	26	0.960	15/16	1/2	13.1	13 1/8	1.73	1 3/4	2.23	2 5/8	1 5/16		
×207	60.7	25.7	25 3/4	0.870	7/8	7/16	13.0	13	1.57	1 9/16	2.07	2 1/2	1 1/4		
×192	56.5	25.5	25 1/2	0.810	13/16	7/16	13.0	13	1.46	1 7/16	1.96	2 3/8	1 1/4		
×176	51.7	25.2	25 1/4	0.750	3/4	3/8	12.9	12 7/8	1.34	1 5/16	1.84	2 1/4	1 3/16		
×162	47.8	25.0	25	0.705	11/16	3/8	13.0	13	1.22	1 1/4	1.72	2 1/8	1 3/16		
×146	43.0	24.7	24 3/4	0.650	5/8	5/16	12.9	12 7/8	1.09	1 1/16	1.59	2	1 1/8		
×131	38.6	24.5	24 1/2	0.605	5/8	5/16	12.9	12 7/8	0.960	15/16	1.46	1 7/8	1 1/8		
×117[c]	34.4	24.3	24 1/4	0.550	9/16	5/16	12.8	12 3/4	0.850	7/8	1.35	1 3/4	1 1/8		
×104[c]	30.7	24.1	24	0.500	1/2	1/4	12.8	12 3/4	0.750	3/4	1.25	1 5/8	1 1/16		
W24×103[c]	30.3	24.5	24 1/2	0.550	9/16	5/16	9.00	9	0.980	1	1.48	1 7/8	1 1/8	20 3/4	5 1/2
×94[c]	27.7	24.3	24 1/4	0.515	1/2	1/4	9.07	9 1/8	0.875	7/8	1.38	1 3/4	1 1/16		
×84[c]	24.7	24.1	24 1/8	0.470	1/2	1/4	9.02	9	0.770	3/4	1.27	1 11/16	1 1/16		
×76[c]	22.4	23.9	23 7/8	0.440	7/16	1/4	8.99	9	0.680	11/16	1.18	1 9/16	1 1/16		
×68[c]	20.1	23.7	23 3/4	0.415	7/16	1/4	8.97	9	0.585	9/16	1.09	1 1/2	1 1/16		
W24×62[c]	18.2	23.7	23 3/4	0.430	7/16	1/4	7.04	7	0.590	9/16	1.09	1 1/2	1 1/16	20 3/4	3 1/2[g]
×55[c,v]	16.2	23.6	23 5/8	0.395	3/8	3/16	7.01	7	0.505	1/2	1.01	1 7/16	1	20 3/4	3 1/2[g]
W21×201	59.3	23.0	23	0.910	15/16	1/2	12.6	12 5/8	1.63	1 5/8	2.13	2 1/2	1 5/16	18	5 1/2
×182	53.6	22.7	22 3/4	0.830	13/16	7/16	12.5	12 1/2	1.48	1 1/2	1.98	2 3/8	1 1/4		
×166	48.8	22.5	22 1/2	0.750	3/4	3/8	12.4	12 3/8	1.36	1 3/8	1.86	2 1/4	1 3/16		
×147	43.2	22.1	22	0.720	3/4	3/8	12.5	12 1/2	1.15	1 1/8	1.65	2	1 3/16		
×132	38.8	21.8	21 7/8	0.650	5/8	5/16	12.4	12 1/2	1.04	1 1/16	1.54	1 15/16	1 1/8		
×122	35.9	21.7	21 5/8	0.600	5/8	5/16	12.4	12 3/8	0.960	15/16	1.46	1 13/16	1 1/8		
×111	32.6	21.5	21 1/2	0.550	9/16	5/16	12.3	12 3/8	0.875	7/8	1.38	1 3/4	1 1/8		
×101[c]	29.8	21.4	21 3/8	0.500	1/2	1/4	12.3	12 1/4	0.800	13/16	1.30	1 11/16	1 1/16		

[c] Shape is slender for compression with $F_y = 50$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
[h] Flange thickness greater than 2 in. Special requirements may apply per AISC *Specification* Section A3.1c.
[v] Shape does not meet the h/t_w limit for shear in AISC *Specification* Section G2.1(a) with $F_y = 50$ ksi.

Table 1-1 (continued)
W-Shapes
Properties

W24-W21

Nominal Wt.	Compact Section Criteria		Axis X-X				Axis Y-Y				r_{ts}	h_o	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	I	S	r	Z	I	S	r	Z			J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{6}
370	2.51	14.2	13400	957	11.1	1130	1160	170	3.27	267	3.92	25.3	201	186000
335	2.73	15.6	11900	864	11.0	1020	1030	152	3.23	238	3.86	25.0	152	161000
306	2.94	17.1	10700	789	10.9	922	919	137	3.20	214	3.81	24.8	117	142000
279	3.18	18.6	9600	718	10.8	835	823	124	3.17	193	3.76	24.6	90.5	125000
250	3.49	20.7	8490	644	10.7	744	724	110	3.14	171	3.71	24.4	66.6	108000
229	3.79	22.5	7650	588	10.7	675	651	99.4	3.11	154	3.67	24.3	51.3	96100
207	4.14	24.8	6820	531	10.6	606	578	88.8	3.08	137	3.62	24.1	38.3	84100
192	4.43	26.6	6260	491	10.5	559	530	81.8	3.07	126	3.60	24.0	30.8	76300
176	4.81	28.7	5680	450	10.5	511	479	74.3	3.04	115	3.57	23.9	23.9	68400
162	5.31	30.6	5170	414	10.4	468	443	68.4	3.05	105	3.57	23.8	18.5	62600
146	5.92	33.2	4580	371	10.3	418	391	60.5	3.01	93.2	3.53	23.6	13.4	54600
131	6.70	35.6	4020	329	10.2	370	340	53.0	2.97	81.5	3.49	23.5	9.50	47100
117	7.53	39.2	3540	291	10.1	327	297	46.5	2.94	71.4	3.46	23.5	6.72	40800
104	8.50	43.1	3100	258	10.1	289	259	40.7	2.91	62.4	3.42	23.4	4.72	35200
103	4.59	39.2	3000	245	10.0	280	119	26.5	1.99	41.5	2.40	23.5	7.07	16600
94	5.18	41.9	2700	222	9.87	254	109	24.0	1.98	37.5	2.40	23.4	5.26	15000
84	5.86	45.9	2370	196	9.79	224	94.4	20.9	1.95	32.6	2.37	23.3	3.70	12800
76	6.61	49.0	2100	176	9.69	200	82.5	18.4	1.92	28.6	2.33	23.2	2.68	11100
68	7.66	52.0	1830	154	9.55	177	70.4	15.7	1.87	24.5	2.30	23.1	1.87	9430
62	5.97	50.1	1550	131	9.23	153	34.5	9.80	1.38	15.7	1.75	23.1	1.71	4620
55	6.94	54.6	1350	114	9.11	134	29.1	8.30	1.34	13.3	1.72	23.1	1.18	3870
201	3.86	20.6	5310	461	9.47	530	542	86.1	3.02	133	3.55	21.4	40.9	62000
182	4.22	22.6	4730	417	9.40	476	483	77.2	3.00	119	3.51	21.2	30.7	54400
166	4.57	25.0	4280	380	9.36	432	435	70.0	2.99	108	3.48	21.1	23.6	48500
147	5.44	26.1	3630	329	9.17	373	376	60.1	2.95	92.6	3.46	21.0	15.4	41100
132	6.01	28.9	3220	295	9.12	333	333	53.5	2.93	82.3	3.43	20.8	11.3	36000
122	6.45	31.3	2960	273	9.09	307	305	49.2	2.92	75.6	3.40	20.7	8.98	32700
111	7.05	34.1	2670	249	9.05	279	274	44.5	2.90	68.2	3.37	20.6	6.83	29200
101	7.68	37.5	2420	227	9.02	253	248	40.3	2.89	61.7	3.35	20.6	5.21	26200

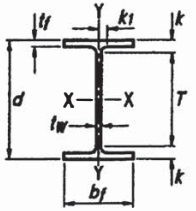


Table 1-1 (continued)
W-Shapes
Dimensions

Shape	Area, A	Depth, d		Web			Flange				Distance				
				Thickness, t_w		$\frac{t_w}{2}$	Width, b_f		Thickness, t_f		k		k_1	T	Workable Gage
											k_{des}	k_{det}			
	in.^{2}	in.		in.		in.	in.		in.		in.	in.	in.	in.	in.
W21×93	27.3	21.6	21 5/8	0.580	9/16	5/16	8.42	8 3/8	0.930	15/16	1.43	1 5/8	15/16	18 3/8	5 1/2
×83[c]	24.4	21.4	21 3/8	0.515	1/2	1/4	8.36	8 3/8	0.835	13/16	1.34	1 1/2	7/8		
×73[c]	21.5	21.2	21 1/4	0.455	7/16	1/4	8.30	8 1/4	0.740	3/4	1.24	1 7/16	7/8		
×68[c]	20.0	21.1	21 1/8	0.430	7/16	1/4	8.27	8 1/4	0.685	11/16	1.19	1 3/8	7/8		
×62[c]	18.3	21.0	21	0.400	3/8	3/16	8.24	8 1/4	0.615	5/8	1.12	1 5/16	13/16		
×55[c]	16.2	20.8	20 3/4	0.375	3/8	3/16	8.22	8 1/4	0.522	1/2	1.02	1 3/16	13/16		
×48[c,f]	14.1	20.6	20 5/8	0.350	3/8	3/16	8.14	8 1/8	0.430	7/16	0.930	1 1/8	13/16		
W21×57[c]	16.7	21.1	21	0.405	3/8	3/16	6.56	6 1/2	0.650	5/8	1.15	1 5/16	13/16	18 3/8	3 1/2
×50[c]	14.7	20.8	20 7/8	0.380	3/8	3/16	6.53	6 1/2	0.535	9/16	1.04	1 1/4	13/16		
×44[c]	13.0	20.7	20 5/8	0.350	3/8	3/16	6.50	6 1/2	0.450	7/16	0.950	1 1/8	13/16		
W18×311[h]	91.6	22.3	22 3/8	1.52	1 1/2	3/4	12.0	12	2.74	2 3/4	3.24	3 7/16	1 3/8	15 1/2	5 1/2
×283[h]	83.3	21.9	21 7/8	1.40	1 3/8	11/16	11.9	11 7/8	2.50	2 1/2	3.00	3 3/16	1 5/16		
×258[h]	76.0	21.5	21 1/2	1.28	1 1/4	5/8	11.8	11 3/4	2.30	2 5/16	2.70	3	1 1/4		
×234[h]	68.6	21.1	21	1.16	1 3/16	5/8	11.7	11 5/8	2.11	2 1/8	2.51	2 3/4	1 3/16		
×211	62.3	20.7	20 5/8	1.06	1 1/16	9/16	11.6	11 1/2	1.91	1 15/16	2.31	2 9/16	1 3/16		
×192	56.2	20.4	20 3/8	0.960	15/16	1/2	11.5	11 1/2	1.75	1 3/4	2.15	2 7/16	1 1/8		
×175	51.4	20.0	20	0.890	7/8	7/16	11.4	11 3/8	1.59	1 9/16	1.99	2 7/16	1 1/4	15 1/8	
×158	46.3	19.7	19 3/4	0.810	13/16	7/16	11.3	11 1/4	1.44	1 7/16	1.84	2 3/8	1 1/4		
×143	42.0	19.5	19 1/2	0.730	3/4	3/8	11.2	11 1/4	1.32	1 5/16	1.72	2 3/16	1 3/16		
×130	38.3	19.3	19 1/4	0.670	11/16	3/8	11.2	11 1/8	1.20	1 3/16	1.60	2 1/16	1 3/16		
×119	35.1	19.0	19	0.655	5/8	5/16	11.3	11 1/4	1.06	1 1/16	1.46	1 15/16	1 3/16		
×106	31.1	18.7	18 3/4	0.590	9/16	5/16	11.2	11 1/4	0.940	15/16	1.34	1 13/16	1 1/8		
×97	28.5	18.6	18 5/8	0.535	9/16	5/16	11.1	11 1/8	0.870	7/8	1.27	1 3/4	1 1/8		
×86	25.3	18.4	18 3/8	0.480	1/2	1/4	11.1	11 1/8	0.770	3/4	1.17	1 5/8	1 1/16		
×76[c]	22.3	18.2	18 1/4	0.425	7/16	1/4	11.0	11	0.680	11/16	1.08	1 9/16	1 1/16		
W18×71	20.9	18.5	18 1/2	0.495	1/2	1/4	7.64	7 5/8	0.810	13/16	1.21	1 1/2	7/8	15 1/2	3 1/2[g]
×65	19.1	18.4	18 3/8	0.450	7/16	1/4	7.59	7 5/8	0.750	3/4	1.15	1 7/16	7/8		
×60[c]	17.6	18.2	18 1/4	0.415	7/16	1/4	7.56	7 1/2	0.695	11/16	1.10	1 3/8	13/16		
×55[c]	16.2	18.1	18 1/8	0.390	3/8	3/16	7.53	7 1/2	0.630	5/8	1.03	1 5/16	13/16		
×50[c]	14.7	18.0	18	0.355	3/8	3/16	7.50	7 1/2	0.570	9/16	0.972	1 1/4	13/16		
W18×46[c]	13.5	18.1	18	0.360	3/8	3/16	6.06	6	0.605	5/8	1.01	1 1/4	13/16	15 1/2	3 1/2[g]
×40[c]	11.8	17.9	17 7/8	0.315	5/16	3/16	6.02	6	0.525	1/2	0.927	1 3/16	13/16		
×35[c]	10.3	17.7	17 3/4	0.300	5/16	3/16	6.00	6	0.425	7/16	0.827	1 1/8	3/4		

[c] Shape is slender for compression with $F_y = 50$ ksi.
[f] Shape exceeds compact limit for flexure with $F_y = 50$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
[h] Flange thickness greater than 2 in. Special requirements may apply per AISC *Specification* Section A3.1c.

Table 1-1 (continued)
W-Shapes
Properties

W21-W18

Nominal Wt.	Compact Section Criteria		Axis X-X				Axis Y-Y				r_{ts}	h_o	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	I	S	r	Z	I	S	r	Z			J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{6}
93	4.53	32.3	2070	192	8.70	221	92.9	22.1	1.84	34.7	2.24	20.7	6.03	9940
83	5.00	36.4	1830	171	8.67	196	81.4	19.5	1.83	30.5	2.21	20.6	4.34	8630
73	5.60	41.2	1600	151	8.64	172	70.6	17.0	1.81	26.6	2.19	20.5	3.02	7410
68	6.04	43.6	1480	140	8.60	160	64.7	15.7	1.80	24.4	2.17	20.4	2.45	6760
62	6.70	46.9	1330	127	8.54	144	57.5	14.0	1.77	21.7	2.15	20.4	1.83	5960
55	7.87	50.0	1140	110	8.40	126	48.4	11.8	1.73	18.4	2.11	20.3	1.24	4980
48	9.47	53.6	959	93.0	8.24	107	38.7	9.52	1.66	14.9	2.05	20.2	0.803	3950
57	5.04	46.3	1170	111	8.36	129	30.6	9.35	1.35	14.8	1.68	20.5	1.77	3190
50	6.10	49.4	984	94.5	8.18	110	24.9	7.64	1.30	12.2	1.64	20.3	1.14	2570
44	7.22	53.6	843	81.6	8.06	95.4	20.7	6.37	1.26	10.2	1.60	20.3	0.770	2110
311	2.19	10.4	6970	624	8.72	754	795	132	2.95	207	3.53	19.6	176	76200
283	2.38	11.3	6170	565	8.61	676	704	118	2.91	185	3.47	19.4	134	65900
258	2.56	12.5	5510	514	8.53	611	628	107	2.88	166	3.42	19.2	103	57600
234	2.76	13.8	4900	466	8.44	549	558	95.8	2.85	149	3.37	19.0	78.7	50100
211	3.02	15.1	4330	419	8.35	490	493	85.3	2.82	132	3.32	18.8	58.6	43400
192	3.27	16.7	3870	380	8.28	442	440	76.8	2.79	119	3.28	18.7	44.7	38000
175	3.58	18.0	3450	344	8.20	398	391	68.8	2.76	106	3.24	18.4	33.8	33300
158	3.92	19.8	3060	310	8.12	356	347	61.4	2.74	94.8	3.20	18.3	25.2	29000
143	4.25	22.0	2750	282	8.09	322	311	55.5	2.72	85.4	3.17	18.2	19.2	25700
130	4.65	23.9	2460	256	8.03	290	278	49.9	2.70	76.7	3.13	18.1	14.5	22700
119	5.31	24.5	2190	231	7.90	262	253	44.9	2.69	69.1	3.13	17.9	10.6	20300
106	5.96	27.2	1910	204	7.84	230	220	39.4	2.66	60.5	3.10	17.8	7.48	17400
97	6.41	30.0	1750	188	7.82	211	201	36.1	2.65	55.3	3.08	17.7	5.86	15800
86	7.20	33.4	1530	166	7.77	186	175	31.6	2.63	48.4	3.05	17.6	4.10	13600
76	8.11	37.8	1330	146	7.73	163	152	27.6	2.61	42.2	3.02	17.5	2.83	11700
71	4.71	32.4	1170	127	7.50	146	60.3	15.8	1.70	24.7	2.05	17.7	3.49	4700
65	5.06	35.7	1070	117	7.49	133	54.8	14.4	1.69	22.5	2.03	17.7	2.73	4240
60	5.44	38.7	984	108	7.47	123	50.1	13.3	1.68	20.6	2.02	17.5	2.17	3850
55	5.98	41.1	890	98.3	7.41	112	44.9	11.9	1.67	18.5	2.00	17.5	1.66	3430
50	6.57	45.2	800	88.9	7.38	101	40.1	10.7	1.65	16.6	1.98	17.4	1.24	3040
46	5.01	44.6	712	78.8	7.25	90.7	22.5	7.43	1.29	11.7	1.58	17.5	1.22	1720
40	5.73	50.9	612	68.4	7.21	78.4	19.1	6.35	1.27	10.0	1.56	17.4	0.810	1440
35	7.06	53.5	510	57.6	7.04	66.5	15.3	5.12	1.22	8.06	1.51	17.3	0.506	1140

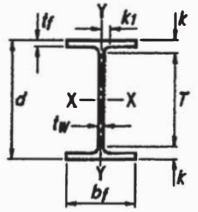


Table 1-1 (continued)
W-Shapes
Dimensions

Shape	Area, A	Depth, d		Web			Flange				Distance				
				Thickness, t_w		$\frac{t_w}{2}$	Width, b_f		Thickness, t_f		k		k_1	T	Workable Gage
											k_{des}	k_{det}			
	in.^{2}	in.		in.		in.	in.		in.		in.	in.	in.	in.	in.
W16×100	29.4	17.0	17	0.585	9/16	5/16	10.4	10 3/8	0.985	1	1.39	1 7/8	1 1/8	13 1/4	5 1/2
×89	26.2	16.8	16 3/4	0.525	1/2	1/4	10.4	10 3/8	0.875	7/8	1.28	1 3/4	1 1/16		
×77	22.6	16.5	16 1/2	0.455	7/16	1/4	10.3	10 1/4	0.760	3/4	1.16	1 5/8	1 1/16		
×67[c]	19.6	16.3	16 3/8	0.395	3/8	3/16	10.2	10 1/4	0.665	11/16	1.07	1 9/16	1		
W16×57	16.8	16.4	16 3/8	0.430	7/16	1/4	7.12	7 1/8	0.715	11/16	1.12	1 3/8	7/8	13 5/8	3 1/2[g]
×50[c]	14.7	16.3	16 1/4	0.380	3/8	3/16	7.07	7 1/8	0.630	5/8	1.03	1 5/16	13/16		
×45[c]	13.3	16.1	16 1/8	0.345	3/8	3/16	7.04	7	0.565	9/16	0.967	1 1/4	13/16		
×40[c]	11.8	16.0	16	0.305	5/16	3/16	7.00	7	0.505	1/2	0.907	1 3/16	13/16		
×36[c]	10.6	15.9	15 7/8	0.295	5/16	3/16	6.99	7	0.430	7/16	0.832	1 1/8	3/4		
W16×31[c]	9.13	15.9	15 7/8	0.275	1/4	1/8	5.53	5 1/2	0.440	7/16	0.842	1 1/8	3/4	13 5/8	3 1/2
×26[c,v]	7.68	15.7	15 3/4	0.250	1/4	1/8	5.50	5 1/2	0.345	3/8	0.747	1 1/16	3/4	13 5/8	3 1/2
W14×730[h]	215	22.4	22 3/8	3.07	3 1/16	1 9/16	17.9	17 7/8	4.91	4 15/16	5.51	6 3/16	2 3/4	10	3-7 1/2-3[g]
×665[h]	196	21.6	21 5/8	2.83	2 13/16	1 7/16	17.7	17 5/8	4.52	4 1/2	5.12	5 13/16	2 5/8		3-7 1/2-3[g]
×605[h]	178	20.9	20 7/8	2.60	2 5/8	1 5/16	17.4	17 3/8	4.16	4 3/16	4.76	5 7/16	2 1/2		3-7 1/2-3
×550[h]	162	20.2	20 1/4	2.38	2 3/8	1 3/16	17.2	17 1/4	3.82	3 13/16	4.42	5 1/8	2 3/8		
×500[h]	147	19.6	19 5/8	2.19	2 3/16	1 1/8	17.0	17	3.50	3 1/2	4.10	4 13/16	2 5/16		
×455[h]	134	19.0	19	2.02	2	1	16.8	16 7/8	3.21	3 3/16	3.81	4 1/2	2 1/4		
×426[h]	125	18.7	18 5/8	1.88	1 7/8	15/16	16.7	16 3/4	3.04	3 1/16	3.63	4 5/16	2 1/8		
×398[h]	117	18.3	18 1/4	1.77	1 3/4	7/8	16.6	16 5/8	2.85	2 7/8	3.44	4 1/8	2 1/8		
×370[h]	109	17.9	17 7/8	1.66	1 11/16	13/16	16.5	16 1/2	2.66	2 11/16	3.26	3 15/16	2 1/16		
×342[h]	101	17.5	17 1/2	1.54	1 9/16	13/16	16.4	16 3/8	2.47	2 1/2	3.07	3 3/4	2		
×311[h]	91.4	17.1	17 1/8	1.41	1 7/16	3/4	16.2	16 1/4	2.26	2 1/4	2.86	3 9/16	1 15/16		
×283[h]	83.3	16.7	16 3/4	1.29	1 5/16	11/16	16.1	16 1/8	2.07	2 1/16	2.67	3 3/8	1 7/8		
×257	75.6	16.4	16 3/8	1.18	1 3/16	5/8	16.0	16	1.89	1 7/8	2.49	3 3/16	1 13/16		
×233	68.5	16.0	16	1.07	1 1/16	9/16	15.9	15 7/8	1.72	1 3/4	2.32	3	1 3/4		
×211	62.0	15.7	15 3/4	0.980	1	1/2	15.8	15 3/4	1.56	1 9/16	2.16	2 7/8	1 11/16		
×193	56.8	15.5	15 1/2	0.890	7/8	7/16	15.7	15 3/4	1.44	1 7/16	2.04	2 3/4	1 11/16		
×176	51.8	15.2	15 1/4	0.830	13/16	7/16	15.7	15 5/8	1.31	1 5/16	1.91	2 5/8	1 5/8		
×159	46.7	15.0	15	0.745	3/4	3/8	15.6	15 5/8	1.19	1 3/16	1.79	2 1/2	1 9/16		
×145	42.7	14.8	14 3/4	0.680	11/16	3/8	15.5	15 1/2	1.09	1 1/16	1.69	2 3/8	1 9/18		

[c] Shape is slender for compression with $F_y = 50$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
[h] Flange thickness greater than 2 in. Special requirements may apply per AISC *Specification* Section A3.1c.
[v] Shape does not meet the h/t_w limit for shear in AISC *Specification* Section G2.1(a) with $F_y = 50$ ksi.

Table 1-1 (continued)
W-Shapes
Properties

W16-W14

Nominal Wt.	Compact Section Criteria		Axis X-X				Axis Y-Y				r_{ts}	h_o	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	I	S	r	Z	I	S	r	Z			J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{6}
100	5.29	24.3	1490	175	7.10	198	186	35.7	2.51	54.9	2.92	16.0	7.73	11900
89	5.92	27.0	1300	155	7.05	175	163	31.4	2.49	48.1	2.88	15.9	5.45	10200
77	6.77	31.2	1110	134	7.00	150	138	26.9	2.47	41.1	2.85	15.7	3.57	8590
67	7.70	35.9	954	117	6.96	130	119	23.2	2.46	35.5	2.82	15.6	2.39	7300
57	4.98	33.0	758	92.2	6.72	105	43.1	12.1	1.60	18.9	1.92	15.7	2.22	2660
50	5.61	37.4	659	81.0	6.68	92.0	37.2	10.5	1.59	16.3	1.89	15.7	1.52	2270
45	6.23	41.1	586	72.7	6.65	82.3	32.8	9.34	1.57	14.5	1.87	15.5	1.11	1990
40	6.93	46.5	518	64.7	6.63	73.0	28.9	8.25	1.57	12.7	1.86	15.5	0.794	1730
36	8.12	48.1	448	56.5	6.51	64.0	24.5	7.00	1.52	10.8	1.83	15.5	0.545	1460
31	6.28	51.6	375	47.2	6.41	54.0	12.4	4.49	1.17	7.03	1.42	15.5	0.461	739
26	7.97	56.8	301	38.4	6.26	44.2	9.59	3.49	1.12	5.48	1.38	15.4	0.262	565
730	1.82	3.71	14300	1280	8.17	1660	4720	527	4.69	816	5.68	17.5	1450	362000
665	1.95	4.03	12400	1150	7.98	1480	4170	472	4.62	730	5.57	17.1	1120	305000
605	2.09	4.39	10800	1040	7.80	1320	3680	423	4.55	652	5.44	16.7	869	258000
550	2.25	4.79	9430	931	7.63	1180	3250	378	4.49	583	5.35	16.4	669	219000
500	2.43	5.21	8210	838	7.48	1050	2880	339	4.43	522	5.26	16.1	514	187000
455	2.62	5.66	7190	756	7.33	936	2560	304	4.38	468	5.17	15.8	395	160000
426	2.75	6.08	6600	706	7.26	869	2360	283	4.34	434	5.11	15.7	331	144000
398	2.92	6.44	6000	656	7.16	801	2170	262	4.31	402	5.05	15.5	273	129000
370	3.10	6.89	5440	607	7.07	736	1990	241	4.27	370	5.00	15.2	222	116000
342	3.31	7.41	4900	558	6.98	672	1810	221	4.24	338	4.95	15.0	178	103000
311	3.59	8.09	4330	506	6.88	603	1610	199	4.20	304	4.87	14.8	136	89100
283	3.89	8.84	3840	459	6.79	542	1440	179	4.17	274	4.80	14.6	104	77700
257	4.23	9.71	3400	415	6.71	487	1290	161	4.13	246	4.75	14.5	79.1	67800
233	4.62	10.7	3010	375	6.63	436	1150	145	4.10	221	4.69	14.3	59.5	59000
211	5.06	11.6	2660	338	6.55	390	1030	130	4.07	198	4.64	14.1	44.6	51500
193	5.45	12.8	2400	310	6.50	355	931	119	4.05	180	4.59	14.1	34.8	45900
176	5.97	13.7	2140	281	6.43	320	838	107	4.02	163	4.55	13.9	26.5	40500
159	6.54	15.3	1900	254	6.38	287	748	96.2	4.00	146	4.51	13.8	19.7	35600
145	7.11	16.8	1710	232	6.33	260	677	87.3	3.98	133	4.47	13.7	15.2	31700

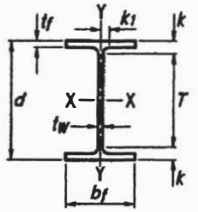


Table 1-1 (continued)
W-Shapes
Dimensions

Shape	Area, A	Depth, d		Web Thickness, t_w		$\frac{t_w}{2}$	Flange Width, b_f		Flange Thickness, t_f		Distance k		k_1	T	Work-able Gage
											k_{des}	k_{det}			
	in.^{2}	in.		in.		in.	in.		in.		in.		in.	in.	in.
W14×132	38.8	14.7	14 5/8	0.645	5/8	5/16	14.7	14 3/4	1.03	1	1.63	2 5/16	1 9/16	10	5 1/2
×120	35.3	14.5	14 1/2	0.590	9/16	5/16	14.7	14 5/8	0.940	15/16	1.54	2 1/4	1 1/2		
×109	32.0	14.3	14 3/8	0.525	1/2	1/4	14.6	14 5/8	0.860	7/8	1.46	2 3/16	1 1/2		
×99[f]	29.1	14.2	14 1/8	0.485	1/2	1/4	14.6	14 5/8	0.780	3/4	1.38	2 1/16	1 7/16		
×90[f]	26.5	14.0	14	0.440	7/16	1/4	14.5	14 1/2	0.710	11/16	1.31	2	1 7/16		
W14×82	24.0	14.3	14 1/4	0.510	1/2	1/4	10.1	10 1/8	0.855	7/8	1.45	1 11/16	1 1/16	10 7/8	5 1/2
×74	21.8	14.2	14 1/8	0.450	7/16	1/4	10.1	10 1/8	0.785	13/16	1.38	1 5/8	1 1/16		
×68	20.0	14.0	14	0.415	7/16	1/4	10.0	10	0.720	3/4	1.31	1 9/16	1 1/16		
×61	17.9	13.9	13 7/8	0.375	3/8	3/16	10.0	10	0.645	5/8	1.24	1 1/2	1		
W14×53	15.6	13.9	13 7/8	0.370	3/8	3/16	8.06	8	0.660	11/16	1.25	1 1/2	1	10 7/8	5 1/2
×48	14.1	13.8	13 3/4	0.340	5/16	3/16	8.03	8	0.595	5/8	1.19	1 7/16	1		
×43[c]	12.6	13.7	13 5/8	0.305	5/16	3/16	8.00	8	0.530	1/2	1.12	1 3/8	1		
W14×38[c]	11.2	14.1	14 1/8	0.310	5/16	3/16	6.77	6 3/4	0.515	1/2	0.915	1 1/4	13/16	11 5/8	3 1/2[g]
×34[c]	10.0	14.0	14	0.285	5/16	3/16	6.75	6 3/4	0.455	7/16	0.855	1 3/16	3/4		3 1/2
×30[c]	8.85	13.8	13 7/8	0.270	1/4	1/8	6.73	6 3/4	0.385	3/8	0.785	1 1/8	3/4		3 1/2
W14×26[c]	7.69	13.9	13 7/8	0.255	1/4	1/8	5.03	5	0.420	7/16	0.820	1 1/16	3/4	11 5/8	2 3/4[g]
×22[c]	6.49	13.7	13 3/4	0.230	1/4	1/8	5.00	5	0.335	5/16	0.735	1 1/16	3/4	11 5/8	2 3/4[g]
W12×336[h]	98.9	16.8	16 7/8	1.78	1 3/4	7/8	13.4	13 3/8	2.96	2 15/16	3.55	3 7/8	1 11/16	9 1/8	5 1/2
×305[h]	89.5	16.3	16 3/8	1.63	1 5/8	13/16	13.2	13 1/4	2.71	2 11/16	3.30	3 5/8	1 5/8		
×279[h]	81.9	15.9	15 7/8	1.53	1 1/2	3/4	13.1	13 1/8	2.47	2 1/2	3.07	3 3/8	1 5/8		
×252[h]	74.1	15.4	15 3/8	1.40	1 3/8	11/16	13.0	13	2.25	2 1/4	2.85	3 1/8	1 1/2		
×230[h]	67.7	15.1	15	1.29	1 5/16	11/16	12.9	12 7/8	2.07	2 1/16	2.67	2 15/16	1 1/2		
×210	61.8	14.7	14 3/4	1.18	1 3/16	5/8	12.8	12 3/4	1.90	1 7/8	2.50	2 13/16	1 7/16		
×190	56.0	14.4	14 3/8	1.06	1 1/16	9/16	12.7	12 5/8	1.74	1 3/4	2.33	2 5/8	1 3/8		
×170	50.0	14.0	14	0.960	15/16	1/2	12.6	12 5/8	1.56	1 9/16	2.16	2 7/16	1 5/16		
×152	44.7	13.7	13 3/4	0.870	7/8	7/16	12.5	12 1/2	1.40	1 3/8	2.00	2 5/16	1 1/4		
×136	39.9	13.4	13 3/8	0.790	13/16	7/16	12.4	12 3/8	1.25	1 1/4	1.85	2 1/8	1 1/4		
×120	35.2	13.1	13 1/8	0.710	11/16	3/8	12.3	12 3/8	1.11	1 1/8	1.70	2	1 3/16		
×106	31.2	12.9	12 7/8	0.610	5/8	5/16	12.2	12 1/4	0.990	1	1.59	1 7/8	1 1/8		
×96	28.2	12.7	12 3/4	0.550	9/16	5/16	12.2	12 1/8	0.900	7/8	1.50	1 13/16	1 1/8		
×87	25.6	12.5	12 1/2	0.515	1/2	1/4	12.1	12 1/8	0.810	13/16	1.41	1 11/16	1 1/16		
×79	23.2	12.4	12 3/8	0.470	1/2	1/4	12.1	12 1/8	0.735	3/4	1.33	1 5/8	1 1/16		
×72	21.1	12.3	12 1/4	0.430	7/16	1/4	12.0	12	0.670	11/16	1.27	1 9/16	1 1/16		
×65[f]	19.1	12.1	12 1/8	0.390	3/8	3/16	12.0	12	0.605	5/8	1.20	1 1/2	1		

[c] Shape is slender for compression with $F_y = 50$ ksi.
[f] Shape exceeds compact limit for flexure with $F_y = 50$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
[h] Flange thickness greater than 2 in. Special requirements may apply per AISC *Specification* Section A3.1c.

Table 1-1 (continued)
W-Shapes
Properties

W14-W12

Nominal Wt.	Compact Section Criteria		Axis X-X				Axis Y-Y				r_{ts}	h_o	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	I	S	r	Z	I	S	r	Z			J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{6}
132	7.15	17.7	1530	209	6.28	234	548	74.5	3.76	113	4.23	13.7	12.3	25500
120	7.80	19.3	1380	190	6.24	212	495	67.5	3.74	102	4.20	13.6	9.37	22700
109	8.49	21.7	1240	173	6.22	192	447	61.2	3.73	92.7	4.17	13.4	7.12	20200
99	9.34	23.5	1110	157	6.17	173	402	55.2	3.71	83.6	4.14	13.4	5.37	18000
90	10.2	25.9	999	143	6.14	157	362	49.9	3.70	75.6	4.10	13.3	4.06	16000
82	5.92	22.4	881	123	6.05	139	148	29.3	2.48	44.8	2.85	13.4	5.07	6710
74	6.41	25.4	795	112	6.04	126	134	26.6	2.48	40.5	2.83	13.4	3.87	5990
68	6.97	27.5	722	103	6.01	115	121	24.2	2.46	36.9	2.80	13.3	3.01	5380
61	7.75	30.4	640	92.1	5.98	102	107	21.5	2.45	32.8	2.78	13.3	2.19	4710
53	6.11	30.9	541	77.8	5.89	87.1	57.7	14.3	1.92	22.0	2.22	13.2	1.94	2540
48	6.75	33.6	484	70.2	5.85	78.4	51.4	12.8	1.91	19.6	2.20	13.2	1.45	2240
43	7.54	37.4	428	62.6	5.82	69.6	45.2	11.3	1.89	17.3	2.18	13.2	1.05	1950
38	6.57	39.6	385	54.6	5.87	61.5	26.7	7.88	1.55	12.1	1.82	13.6	0.798	1230
34	7.41	43.1	340	48.6	5.83	54.6	23.3	6.91	1.53	10.6	1.80	13.5	0.569	1070
30	8.74	45.4	291	42.0	5.73	47.3	19.6	5.82	1.49	8.99	1.77	13.4	0.380	887
26	5.98	48.1	245	35.3	5.65	40.2	8.91	3.55	1.08	5.54	1.30	13.5	0.358	405
22	7.46	53.3	199	29.0	5.54	33.2	7.00	2.80	1.04	4.39	1.27	13.4	0.208	314
336	2.26	5.47	4060	483	6.41	603	1190	177	3.47	274	4.13	13.8	243	57000
305	2.45	5.98	3550	435	6.29	537	1050	159	3.42	244	4.05	13.6	185	48600
279	2.66	6.35	3110	393	6.16	481	937	143	3.38	220	4.00	13.4	143	42000
252	2.89	6.96	2720	353	6.06	428	828	127	3.34	196	3.93	13.2	108	35800
230	3.11	7.56	2420	321	5.97	386	742	115	3.31	177	3.87	13.0	83.8	31200
210	3.37	8.23	2140	292	5.89	348	664	104	3.28	159	3.81	12.8	64.7	27200
190	3.65	9.16	1890	263	5.82	311	589	93.0	3.25	143	3.77	12.7	48.8	23600
170	4.03	10.1	1650	235	5.74	275	517	82.3	3.22	126	3.70	12.4	35.6	20100
152	4.46	11.2	1430	209	5.66	243	454	72.8	3.19	111	3.66	12.3	25.8	17200
136	4.96	12.3	1240	186	5.58	214	398	64.2	3.16	98.0	3.61	12.2	18.5	14700
120	5.57	13.7	1070	163	5.51	186	345	56.0	3.13	85.4	3.56	12.0	12.9	12400
106	6.17	15.9	933	145	5.47	164	301	49.3	3.11	75.1	3.52	11.9	9.13	10700
96	6.76	17.7	833	131	5.44	147	270	44.4	3.09	67.5	3.49	11.8	6.85	9410
87	7.48	18.9	740	118	5.38	132	241	39.7	3.07	60.4	3.46	11.7	5.10	8270
79	8.22	20.7	662	107	5.34	119	216	35.8	3.05	54.3	3.43	11.7	3.84	7330
72	8.99	22.6	597	97.4	5.31	108	195	32.4	3.04	49.2	3.41	11.6	2.93	6540
65	9.92	24.9	533	87.9	5.28	96.8	174	29.1	3.02	44.1	3.38	11.5	2.18	5780

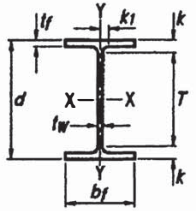


Table 1-1 (continued)
W-Shapes
Dimensions

Shape	Area, A	Depth, d		Web			Flange				Distance				
				Thickness, t_w		$\frac{t_w}{2}$	Width, b_f		Thickness, t_f		k		k_1	T	Workable Gage
											k_{des}	k_{det}			
	in.^{2}	in.		in.		in.	in.		in.		in.		in.	in.	in.
W12×58	17.0	12.2	12 1/4	0.360	3/8	3/16	10.0	10	0.640	5/8	1.24	1 1/2	15/16	9 1/4	5 1/2
×53	15.6	12.1	12	0.345	3/8	3/16	10.0	10	0.575	9/16	1.18	1 3/8	15/16	9 1/4	5 1/2
W12×50	14.6	12.2	12 1/4	0.370	3/8	3/16	8.08	8 1/8	0.640	5/8	1.14	1 1/2	15/16	9 1/4	5 1/2
×45	13.1	12.1	12	0.335	5/16	3/16	8.05	8	0.575	9/16	1.08	1 3/8	15/16	↓	↓
×40	11.7	11.9	12	0.295	5/16	3/16	8.01	8	0.515	1/2	1.02	1 3/8	7/8	↓	↓
W12×35[c]	10.3	12.5	12 1/2	0.300	5/16	3/16	6.56	6 1/2	0.520	1/2	0.820	1 3/16	3/4	10 1/8	3 1/2
×30[c]	8.79	12.3	12 3/8	0.260	1/4	1/8	6.52	6 1/2	0.440	7/16	0.740	1 1/8	3/4	↓	↓
×26[c]	7.65	12.2	12 1/4	0.230	1/4	1/8	6.49	6 1/2	0.380	3/8	0.680	1 1/16	3/4	↓	↓
W12×22[c]	6.48	12.3	12 1/4	0.260	1/4	1/8	4.03	4	0.425	7/16	0.725	15/16	5/8	10 3/8	2 1/4[g]
×19[c]	5.57	12.2	12 1/8	0.235	1/4	1/8	4.01	4	0.350	3/8	0.650	7/8	9/16	↓	↓
×16[c]	4.71	12.0	12	0.220	1/4	1/8	3.99	4	0.265	1/4	0.565	13/16	9/16	↓	↓
×14[c,v]	4.16	11.9	11 7/8	0.200	3/16	1/6	3.97	4	0.225	1/4	0.525	3/4	9/16	↓	↓
W10×112	32.9	11.4	11 3/8	0.755	3/4	3/8	10.4	10 3/8	1.25	1 1/4	1.75	1 15/16	1	7 1/2	5 1/2
×100	29.3	11.1	11 1/8	0.680	11/16	3/8	10.3	10 3/8	1.12	1 1/8	1.62	1 13/16	1	↓	↓
×88	26.0	10.8	10 7/8	0.605	5/8	5/16	10.3	10 1/4	0.990	1	1.49	1 11/16	15/16	↓	↓
×77	22.7	10.6	10 5/8	0.530	1/2	1/4	10.2	10 1/4	0.870	7/8	1.37	1 9/16	7/8	↓	↓
×68	19.9	10.4	10 3/8	0.470	1/2	1/4	10.1	10 1/8	0.770	3/4	1.27	1 7/16	7/8	↓	↓
×60	17.7	10.2	10 1/4	0.420	7/16	1/4	10.1	10 1/8	0.680	11/16	1.18	1 3/8	13/16	↓	↓
×54	15.8	10.1	10 1/8	0.370	3/8	3/16	10.0	10	0.615	5/8	1.12	1 5/16	13/16	↓	↓
×49	14.4	10.0	10	0.340	5/16	3/16	10.0	10	0.560	9/16	1.06	1 1/4	13/16	↓	↓
W10×45	13.3	10.1	10 1/8	0.350	3/8	3/16	8.02	8	0.620	5/8	1.12	1 5/16	13/16	7 1/2	5 1/2
×39	11.5	9.92	9 7/8	0.315	5/16	3/16	7.99	8	0.530	1/2	1.03	1 3/16	13/16	↓	↓
×33	9.71	9.73	9 3/4	0.290	5/16	3/16	7.96	8	0.435	7/16	0.935	1 1/8	3/4	↓	↓
W10×30	8.84	10.5	10 1/2	0.300	5/16	3/16	5.81	5 3/4	0.510	1/2	0.810	1 1/8	11/16	8 1/4	2 3/4[g]
×26	7.61	10.3	10 3/8	0.260	1/4	1/8	5.77	5 3/4	0.440	7/16	0.740	1 1/16	11/16	↓	↓
×22[c]	6.49	10.2	10 1/8	0.240	1/4	1/8	5.75	5 3/4	0.360	3/8	0.660	15/16	5/8	↓	↓
W10×19	5.62	10.2	10 1/4	0.250	1/4	1/8	4.02	4	0.395	3/8	0.695	15/16	5/8	8 3/8	2 1/4[g]
×17[c]	4.99	10.1	10 1/8	0.240	1/4	1/8	4.01	4	0.330	5/16	0.630	7/8	9/16	↓	↓
×15[c]	4.41	9.99	10	0.230	1/4	1/8	4.00	4	0.270	1/4	0.570	13/16	9/16	↓	↓
×12[c,f]	3.54	9.87	9 7/8	0.190	3/16	1/8	3.96	4	0.210	3/16	0.510	3/4	9/16	↓	↓

[c] Shape is slender for compression with $F_y = 50$ ksi.
[f] Shape exceeds compact limit for flexure with $F_y = 50$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
[v] Shape does not meet the h/t_w limit for shear in AISC *Specification* Section G2.1(a) with $F_y = 50$ ksi.

Table 1-1 (continued)
W-Shapes
Properties

W12-W10

Nominal Wt.	Compact Section Criteria		Axis X-X				Axis Y-Y				r_{ts}	h_o	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	I	S	r	Z	I	S	r	Z			J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{6}
58	7.82	27.0	475	78.0	5.28	86.4	107	21.4	2.51	32.5	2.81	11.6	2.10	3570
53	8.69	28.1	425	70.6	5.23	77.9	95.8	19.2	2.48	29.1	2.79	11.5	1.58	3160
50	6.31	26.8	391	64.2	5.18	71.9	56.3	13.9	1.96	21.3	2.25	11.6	1.71	1880
45	7.00	29.6	348	57.7	5.15	64.2	50.0	12.4	1.95	19.0	2.23	11.5	1.26	1650
40	7.77	33.6	307	51.5	5.13	57.0	44.1	11.0	1.94	16.8	2.21	11.4	0.906	1440
35	6.31	36.2	285	45.6	5.25	51.2	24.5	7.47	1.54	11.5	1.79	12.0	0.741	879
30	7.41	41.8	238	38.6	5.21	43.1	20.3	6.24	1.52	9.56	1.77	11.9	0.457	720
26	8.54	47.2	204	33.4	5.17	37.2	17.3	5.34	1.51	8.17	1.75	11.8	0.300	607
22	4.74	41.8	156	25.4	4.91	29.3	4.66	2.31	0.848	3.66	1.04	11.9	0.293	164
19	5.72	46.2	130	21.3	4.82	24.7	3.76	1.88	0.822	2.98	1.02	11.9	0.180	131
16	7.53	49.4	103	17.1	4.67	20.1	2.82	1.41	0.773	2.26	0.983	11.7	0.103	96.9
14	8.82	54.3	88.6	14.9	4.62	17.4	2.36	1.19	0.753	1.90	0.961	11.7	0.0704	80.4
112	4.17	10.4	716	126	4.66	147	236	45.3	2.68	69.2	3.08	10.2	15.1	6020
100	4.62	11.6	623	112	4.60	130	207	40.0	2.65	61.0	3.04	10.0	10.9	5150
88	5.18	13.0	534	98.5	4.54	113	179	34.8	2.63	53.1	2.99	9.81	7.53	4330
77	5.86	14.8	455	85.9	4.49	97.6	154	30.1	2.60	45.9	2.95	9.73	5.11	3630
68	6.58	16.7	394	75.7	4.44	85.3	134	26.4	2.59	40.1	2.92	9.63	3.56	3100
60	7.41	18.7	341	66.7	4.39	74.6	116	23.0	2.57	35.0	2.88	9.52	2.48	2640
54	8.15	21.2	303	60.0	4.37	66.6	103	20.6	2.56	31.3	2.85	9.49	1.82	2320
49	8.93	23.1	272	54.6	4.35	60.4	93.4	18.7	2.54	28.3	2.84	9.44	1.39	2070
45	6.47	22.5	248	49.1	4.32	54.9	53.4	13.3	2.01	20.3	2.27	9.48	1.51	1200
39	7.53	25.0	209	42.1	4.27	46.8	45.0	11.3	1.98	17.2	2.24	9.39	0.976	992
33	9.15	27.1	171	35.0	4.19	38.8	36.6	9.20	1.94	14.0	2.20	9.30	0.583	791
30	5.70	29.5	170	32.4	4.38	36.6	16.7	5.75	1.37	8.84	1.60	10.0	0.622	414
26	6.56	34.0	144	27.9	4.35	31.3	14.1	4.89	1.36	7.50	1.58	9.86	0.402	345
22	7.99	36.9	118	23.2	4.27	26.0	11.4	3.97	1.33	6.10	1.55	9.84	0.239	275
19	5.09	35.4	96.3	18.8	4.14	21.6	4.29	2.14	0.874	3.35	1.06	9.81	0.233	104
17	6.08	36.9	81.9	16.2	4.05	18.7	3.56	1.78	0.845	2.80	1.04	9.77	0.156	85.1
15	7.41	38.5	68.9	13.8	3.95	16.0	2.89	1.45	0.810	2.30	1.01	9.72	0.104	68.3
12	9.43	46.6	53.8	10.9	3.90	12.6	2.18	1.10	0.785	1.74	0.983	9.66	0.0547	50.9

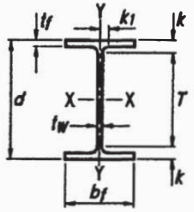


Table 1-1 (continued)
W-Shapes
Dimensions

Shape	Area, A	Depth, d		Web			Flange				Distance				
				Thickness, t_w		$\frac{t_w}{2}$	Width, b_f		Thickness, t_f		k		k_1	T	Workable Gage
											k_{des}	k_{det}			
	in.^{2}	in.		in.		in.	in.		in.		in.	in.	in.	in.	in.
W8×67	19.7	9.00	9	0.570	9/16	5/16	8.28	8 1/4	0.935	15/16	1.33	1 5/8	15/16	5 3/4	5 1/2
×58	17.1	8.75	8 3/4	0.510	1/2	1/4	8.22	8 1/4	0.810	13/16	1.20	1 1/2	7/8		
×48	14.1	8.50	8 1/2	0.400	3/8	3/16	8.11	8 1/8	0.685	11/16	1.08	1 3/8	13/16		
×40	11.7	8.25	8 1/4	0.360	3/8	3/16	8.07	8 1/8	0.560	9/16	0.954	1 1/4	13/16		
×35	10.3	8.12	8 1/8	0.310	5/16	3/16	8.02	8	0.495	1/2	0.889	1 3/16	13/16		
×31[f]	9.13	8.00	8	0.285	5/16	3/16	8.00	8	0.435	7/16	0.829	1 1/8	3/4		
W8×28	8.25	8.06	8	0.285	5/16	3/16	6.54	6 1/2	0.465	7/16	0.859	15/16	5/8	6 1/8	4
×24	7.08	7.93	7 7/8	0.245	1/4	1/8	6.50	6 1/2	0.400	3/8	0.794	7/8	9/16	6 1/8	4
W8×21	6.16	8.28	8 1/4	0.250	1/4	1/8	5.27	5 1/4	0.400	3/8	0.700	7/8	9/16	6 1/2	2 3/4[g]
×18	5.26	8.14	8 1/8	0.230	1/4	1/8	5.25	5 1/4	0.330	5/16	0.630	13/16	9/16	6 1/2	2 3/4[g]
W8×15	4.44	8.11	8 1/8	0.245	1/4	1/8	4.02	4	0.315	5/16	0.615	13/16	9/16	6 1/2	2 1/4[g]
×13	3.84	7.99	8	0.230	1/4	1/8	4.00	4	0.255	1/4	0.555	3/4	9/16		
×10[c,f]	2.96	7.89	7 7/8	0.170	3/16	1/8	3.94	4	0.205	3/16	0.505	11/16	1/2		
W6×25	7.34	6.38	6 3/8	0.320	5/16	3/16	6.08	6 1/8	0.455	7/16	0.705	15/16	9/16	4 1/2	3 1/2
×20	5.87	6.20	6 1/4	0.260	1/4	1/8	6.02	6	0.365	3/8	0.615	7/8	9/16		
×15[f]	4.43	5.99	6	0.230	1/4	1/8	5.99	6	0.260	1/4	0.510	3/4	9/16		
W6×16	4.74	6.28	6 1/4	0.260	1/4	1/8	4.03	4	0.405	3/8	0.655	7/8	9/16	4 1/2	2 1/4[g]
×12	3.55	6.03	6	0.230	1/4	1/8	4.00	4	0.280	1/4	0.530	3/4	9/16		
×9[f]	2.68	5.90	5 7/8	0.170	3/16	1/8	3.94	4	0.215	3/16	0.465	11/16	1/2		
×8.5[f]	2.52	5.83	5 7/8	0.170	3/16	1/8	3.94	4	0.195	3/16	0.445	11/16	1/2		
W5×19	5.56	5.15	5 1/8	0.270	1/4	1/8	5.03	5	0.430	7/16	0.730	13/16	7/16	3 1/2	2 3/4[g]
×16	4.71	5.01	5	0.240	1/4	1/8	5.00	5	0.360	3/8	0.660	3/4	7/16	3 1/2	2 3/4[g]
W4×13	3.83	4.16	4 1/8	0.280	1/4	1/8	4.06	4	0.345	3/8	0.595	3/4	1/2	2 5/8	2 1/4[g]

[c] Shape is slender for compression with $F_y = 50$ ksi.
[f] Shape exceeds compact limit for flexure with $F_y = 50$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.

Table 1-1 (continued)
W-Shapes
Properties

W8-W4

Nominal Wt.	Compact Section Criteria		Axis X-X				Axis Y-Y				r_{ts}	h_o	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	I	S	r	Z	I	S	r	Z			J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{6}
67	4.43	11.1	272	60.4	3.72	70.1	88.6	21.4	2.12	32.7	2.43	8.07	5.05	1440
58	5.07	12.4	228	52.0	3.65	59.8	75.1	18.3	2.10	27.9	2.39	7.94	3.33	1180
48	5.92	15.9	184	43.2	3.61	49.0	60.9	15.0	2.08	22.9	2.35	7.82	1.96	931
40	7.21	17.6	146	35.5	3.53	39.8	49.1	12.2	2.04	18.5	2.31	7.69	1.12	726
35	8.10	20.5	127	31.2	3.51	34.7	42.6	10.6	2.03	16.1	2.28	7.63	0.769	619
31	9.19	22.3	110	27.5	3.47	30.4	37.1	9.27	2.02	14.1	2.26	7.57	0.536	530
28	7.03	22.3	98.0	24.3	3.45	27.2	21.7	6.63	1.62	10.1	1.84	7.60	0.537	312
24	8.12	25.9	82.7	20.9	3.42	23.1	18.3	5.63	1.61	8.57	1.81	7.53	0.346	259
21	6.59	27.5	75.3	18.2	3.49	20.4	9.77	3.71	1.26	5.69	1.46	7.88	0.282	152
18	7.95	29.9	61.9	15.2	3.43	17.0	7.97	3.04	1.23	4.66	1.43	7.81	0.172	122
15	6.37	28.1	48.0	11.8	3.29	13.6	3.41	1.70	0.876	2.67	1.06	7.80	0.137	51.8
13	7.84	29.9	39.6	9.91	3.21	11.4	2.73	1.37	0.843	2.15	1.03	7.74	0.0871	40.8
10	9.61	40.5	30.8	7.81	3.22	8.87	2.09	1.06	0.841	1.66	1.01	7.69	0.0426	30.9
25	6.68	15.5	53.4	16.7	2.70	18.9	17.1	5.61	1.52	8.56	1.74	5.93	0.461	150
20	8.25	19.1	41.4	13.4	2.66	14.9	13.3	4.41	1.50	6.72	1.70	5.84	0.240	113
15	11.5	21.6	29.1	9.72	2.56	10.8	9.32	3.11	1.45	4.75	1.66	5.73	0.101	76.5
16	4.98	19.1	32.1	10.2	2.60	11.7	4.43	2.20	0.967	3.39	1.13	5.88	0.223	38.2
12	7.14	21.6	22.1	7.31	2.49	8.30	2.99	1.50	0.918	2.32	1.08	5.75	0.0903	24.7
9	9.16	29.2	16.4	5.56	2.47	6.23	2.20	1.11	0.905	1.72	1.06	5.69	0.0405	17.7
8.5	10.1	29.1	14.9	5.10	2.43	5.73	1.99	1.01	0.890	1.56	1.05	5.64	0.0333	15.8
19	5.85	13.7	26.3	10.2	2.17	11.6	9.13	3.63	1.28	5.53	1.45	4.72	0.316	50.9
16	6.94	15.4	21.4	8.55	2.13	9.63	7.51	3.00	1.26	4.58	1.43	4.65	0.192	40.6
13	5.88	10.6	11.3	5.46	1.72	6.28	3.86	1.90	1.00	2.92	1.16	3.82	0.151	14.0

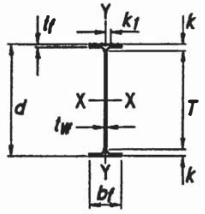


Table 1-2
M-Shapes
Dimensions

Shape	Area, A	Depth, d		Web			Flange				Distance			
				Thickness, t_w		$\frac{t_w}{2}$	Width, b_f		Thickness, t_f		k	k_1	T	Workable Gage
	in.^{2}	in.		in.		in.	in.		in.		in.	in.	in.	in.
M12.5×12.4[c,v]	3.63	12.5	12 1/2	0.155	1/8	1/16	3.75	3 3/4	0.228	1/4	9/16	3/8	11 3/8	—
×11.6[c,v]	3.40	12.5	12 1/2	0.155	1/8	1/16	3.50	3 1/2	0.211	3/16	9/16	3/8	11 3/8	—
M12×11.8[c]	3.47	12.0	12	0.177	3/16	1/8	3.07	3 1/8	0.225	1/4	9/16	3/8	10 7/8	—
×10.8[c]	3.18	12.0	12	0.160	3/16	1/8	3.07	3 1/8	0.210	3/16	9/16	3/8	10 7/8	—
M12×10[c,v]	2.95	12.0	12	0.149	1/8	1/16	3.25	3 1/4	0.180	3/16	1/2	3/8	11	—
M10×9[c]	2.65	10.0	10	0.157	3/16	1/8	2.69	2 3/4	0.206	3/16	9/16	3/8	8 7/8	—
×8[c]	2.37	9.95	10	0.141	1/8	1/16	2.69	2 3/4	0.182	3/16	9/16	3/8	8 7/8	—
M10×7.5[c,v]	2.22	9.99	10	0.130	1/8	1/16	2.69	2 3/4	0.173	3/16	7/16	5/16	9 1/8	—
M8×6.5[c]	1.92	8.00	8	0.135	1/8	1/16	2.28	2 1/4	0.189	3/16	9/16	3/8	6 7/8	—
×6.2[c]	1.82	8.00	8	0.129	1/8	1/16	2.28	2 1/4	0.177	3/16	7/16	1/4	7 1/8	—
M6×4.4[c]	1.29	6.00	6	0.114	1/8	1/16	1.84	1 7/8	0.171	3/16	3/8	1/4	5 1/4	—
×3.7[c]	1.09	5.92	5 7/8	0.0980	1/8	1/16	2.00	2	0.129	1/8	5/16	1/4	5 1/4	—
M5×18.9[t]	5.56	5.00	5	0.316	5/16	3/16	5.00	5	0.416	7/16	13/16	1/2	3 3/8	2 3/4[g]
M4×6[f]	1.75	3.80	3 3/4	0.130	1/8	1/16	3.80	3 3/4	0.160	3/16	1/2	3/8	2 3/4	—
×4.08	1.27	4.00	4	0.115	1/8	1/16	2.25	2 1/4	0.170	3/16	9/16	3/8	2 7/8	—
×3.45	1.01	4.00	4	0.0920	1/16	1/16	2.25	2 1/4	0.130	1/8	1/2	3/8	3	—
×3.2	1.01	4.00	4	0.0920	1/16	1/16	2.25	2 1/4	0.130	1/8	1/2	3/8	3	—
M3×2.9	0.914	3.00	3	0.0900	1/16	1/16	2.25	2 1/4	0.130	1/8	1/2	3/8	2	—

[c] Shape is slender for compression with $F_y = 36$ ksi.
[f] Shape exceeds compact limit for flexure with $F_y = 36$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
[t] Shape has tapered flanges while other M-shapes have parallel flange surfaces.
[v] Shape does not meet the h/t_w limit for shear in AISC *Specification* Section G2.1(b)(i) with $F_y = 36$ ksi.
— Indicates flange is too narrow to establish a workable gage.

Table 1-2 (continued)
M-Shapes
Properties

M-SHAPES

Nominal Wt.	Compact Section Criteria		Axis X-X				Axis Y-Y				r_{ts}	h_o	$\frac{J}{S_x h_o}$	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	I	S	r	Z	I	S	r	Z				J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.		in.^{4}	in.^{6}
12.4	8.22	74.8	89.3	14.2	4.96	16.5	2.01	1.07	0.744	1.68	0.933	12.3	0.000283	0.0493	76.0
11.6	8.29	74.8	80.3	12.8	4.86	15.0	1.51	0.864	0.667	1.37	0.852	12.3	0.000263	0.0414	57.1
11.8	6.81	62.5	72.2	12.0	4.56	14.3	1.09	0.709	0.559	1.15	0.731	11.8	0.000355	0.0500	37.7
10.8	7.30	69.2	66.7	11.1	4.58	13.2	1.01	0.661	0.564	1.07	0.732	11.8	0.000300	0.0393	35.0
10	9.03	74.7	61.7	10.3	4.57	12.2	1.03	0.636	0.592	1.02	0.768	11.8	0.000240	0.0292	35.9
9	6.53	58.4	39.0	7.79	3.83	9.22	0.672	0.500	0.503	0.809	0.650	9.79	0.000411	0.0314	16.1
8	7.39	65.0	34.6	6.95	3.82	8.20	0.593	0.441	0.500	0.711	0.646	9.77	0.000328	0.0224	14.2
7.5	7.77	71.0	33.0	6.60	3.85	7.77	0.562	0.418	0.503	0.670	0.646	9.82	0.000289	0.0187	13.5
6.5	6.03	53.8	18.5	4.63	3.11	5.43	0.376	0.329	0.443	0.529	0.563	7.81	0.000509	0.0184	5.73
6.2	6.44	56.5	17.6	4.39	3.10	5.15	0.352	0.308	0.439	0.495	0.560	7.82	0.000455	0.0156	5.38
4.4	5.39	47.0	7.23	2.41	2.36	2.80	0.180	0.195	0.372	0.311	0.467	5.83	0.000707	0.00990	1.53
3.7	7.75	54.7	5.96	2.01	2.34	2.33	0.173	0.173	0.398	0.273	0.499	5.79	0.000459	0.00530	1.45
18.9	6.01	11.2	24.2	9.67	2.08	11.1	8.70	3.48	1.25	5.33	1.44	4.58	0.00709	0.313	45.7
6	11.9	22.0	4.72	2.48	1.64	2.74	1.47	0.771	0.915	1.18	1.04	3.64	0.00208	0.0184	4.87
4.08	6.62	26.4	3.53	1.77	1.67	2.00	0.325	0.289	0.506	0.453	0.593	3.83	0.00218	0.0147	1.19
3.45	8.65	33.9	2.86	1.43	1.68	1.60	0.248	0.221	0.496	0.346	0.580	3.87	0.00148	0.00820	0.930
3.2	8.65	33.9	2.86	1.43	1.68	1.60	0.248	0.221	0.496	0.346	0.580	3.87	0.00148	0.00820	0.930
2.9	8.65	23.6	1.50	1.00	1.28	1.12	0.248	0.221	0.521	0.344	0.597	2.87	0.00275	0.00790	0.511

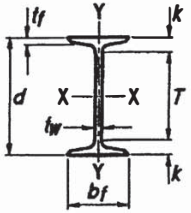


Table 1-3
S-Shapes
Dimensions

Shape	Area, A	Depth, d		Web			Flange				Distance		
				Thickness, t_w		$\frac{t_w}{2}$	Width, b_f		Thickness, t_f		k	T	Workable Gage
	in.²	in.		in.		in.	in.		in.		in.	in.	in.
S24×121	35.5	24.5	24 1/2	0.800	13/16	7/16	8.05	8	1.09	1 1/16	2	20 1/2	4
×106	31.1	24.5	24 1/2	0.620	5/8	5/16	7.87	7 7/8	1.09	1 1/16	2	20 1/2	4
S24×100	29.3	24.0	24	0.745	3/4	3/8	7.25	7 1/4	0.870	7/8	1 3/4	20 1/2	4
×90	26.5	24.0	24	0.625	5/8	5/16	7.13	7 1/8	0.870	7/8	1 3/4	20 1/2	4
×80	23.5	24.0	24	0.500	1/2	1/4	7.00	7	0.870	7/8	1 3/4	20 1/2	4
S20×96	28.2	20.3	20 1/4	0.800	13/16	7/16	7.20	7 1/4	0.920	15/16	1 3/4	16 3/4	4
×86	25.3	20.3	20 1/4	0.660	11/16	3/8	7.06	7	0.920	15/16	1 3/4	16 3/4	4
S20×75	22.0	20.0	20	0.635	5/8	5/16	6.39	6 3/8	0.795	13/16	1 5/8	16 3/4	3 1/2[g]
×66	19.4	20.0	20	0.505	1/2	1/4	6.26	6 1/4	0.795	13/16	1 5/8	16 3/4	3 1/2[g]
S18×70	20.5	18.0	18	0.711	11/16	3/8	6.25	6 1/4	0.691	11/16	1 1/2	15	3 1/2[g]
×54.7	16.0	18.0	18	0.461	7/16	1/4	6.00	6	0.691	11/16	1 1/2	15	3 1/2[g]
S15×50	14.7	15.0	15	0.550	9/16	5/16	5.64	5 5/8	0.622	5/8	1 3/8	12 1/4	3 1/2[g]
×42.9	12.6	15.0	15	0.411	7/16	1/4	5.50	5 1/2	0.622	5/8	1 3/8	12 1/4	3 1/2[g]
S12×50	14.7	12.0	12	0.687	11/16	3/8	5.48	5 1/2	0.659	11/16	1 7/16	9 1/8	3[g]
×40.8	11.9	12.0	12	0.462	7/16	1/4	5.25	5 1/4	0.659	11/16	1 7/16	9 1/8	3[g]
S12×35	10.2	12.0	12	0.428	7/16	1/4	5.08	5 1/8	0.544	9/16	1 3/16	9 5/8	3[g]
×31.8	9.31	12.0	12	0.350	3/8	3/16	5.00	5	0.544	9/16	1 3/16	9 5/8	3[g]
S10×35	10.3	10.0	10	0.594	5/8	5/16	4.94	5	0.491	1/2	1 1/8	7 3/4	2 3/4[g]
×25.4	7.45	10.0	10	0.311	5/16	3/16	4.66	4 5/8	0.491	1/2	1 1/8	7 3/4	2 3/4[g]
S8×23	6.76	8.00	8	0.441	7/16	1/4	4.17	4 1/8	0.425	7/16	1	6	2 1/4[g]
×18.4	5.40	8.00	8	0.271	1/4	1/8	4.00	4	0.425	7/16	1	6	2 1/4[g]
S6×17.25	5.05	6.00	6	0.465	7/16	1/4	3.57	3 5/8	0.359	3/8	13/16	4 3/8	—
×12.5	3.66	6.00	6	0.232	1/4	1/8	3.33	3 3/8	0.359	3/8	13/16	4 3/8	—
S5×10	2.93	5.00	5	0.214	3/16	1/8	3.00	3	0.326	5/16	3/4	3 1/2	—
S4×9.5	2.79	4.00	4	0.326	5/16	3/16	2.80	2 3/4	0.293	5/16	3/4	2 1/2	—
×7.7	2.26	4.00	4	0.193	3/16	1/8	2.66	2 5/8	0.293	5/16	3/4	2 1/2	—
S3×7.5	2.20	3.00	3	0.349	3/8	3/16	2.51	2 1/2	0.260	1/4	5/8	1 3/4	—
×5.7	1.66	3.00	3	0.170	3/16	1/8	2.33	2 3/8	0.260	1/4	5/8	1 3/4	—

[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
— Indicates flange is too narrow to establish a workable gage.

Table 1-3 (continued)
S-Shapes
Properties

S-SHAPES

Nominal Wt.	Compact Section Criteria		Axis X-X				Axis Y-Y				r_{ts}	h_o	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	I	S	r	Z	I	S	r	Z			J	C_w
lb/ft			in.⁴	in.³	in.	in.³	in.⁴	in.³	in.	in.³	in.	in.	in.⁴	in.⁶
121	3.69	25.9	3160	258	9.43	306	83.0	20.6	1.53	36.3	1.94	23.4	12.8	11400
106	3.61	33.4	2940	240	9.71	279	76.8	19.5	1.57	33.4	1.93	23.4	10.1	10500
100	4.16	27.8	2380	199	9.01	239	47.4	13.1	1.27	24.0	1.66	23.1	7.59	6350
90	4.09	33.1	2250	187	9.21	222	44.7	12.5	1.30	22.4	1.66	23.1	6.05	5980
80	4.02	41.4	2100	175	9.47	204	42.0	12.0	1.34	20.8	1.67	23.1	4.89	5620
96	3.91	21.1	1670	165	7.71	198	49.9	13.9	1.33	24.9	1.71	19.4	8.40	4690
86	3.84	25.6	1570	155	7.89	183	46.6	13.2	1.36	23.1	1.71	19.4	6.65	4370
75	4.02	26.6	1280	128	7.62	152	29.5	9.25	1.16	16.7	1.49	19.2	4.59	2720
66	3.93	33.5	1190	119	7.83	139	27.5	8.78	1.19	15.4	1.49	19.2	3.58	2530
70	4.52	21.5	923	103	6.70	124	24.0	7.69	1.08	14.3	1.42	17.3	4.10	1800
54.7	4.34	33.2	801	89.0	7.07	104	20.7	6.91	1.14	12.1	1.42	17.3	2.33	1550
50	4.53	22.7	485	64.7	5.75	77.0	15.6	5.53	1.03	10.0	1.32	14.4	2.12	805
42.9	4.42	30.4	446	59.4	5.95	69.2	14.3	5.19	1.06	9.08	1.31	14.4	1.54	737
50	4.16	13.7	303	50.6	4.55	60.9	15.6	5.69	1.03	10.3	1.32	11.3	2.77	501
40.8	3.98	20.6	270	45.1	4.76	52.7	13.5	5.13	1.06	8.86	1.30	11.3	1.69	433
35	4.67	23.1	228	38.1	4.72	44.6	9.84	3.88	0.980	6.80	1.22	11.5	1.05	323
31.8	4.60	28.3	217	36.2	4.83	41.8	9.33	3.73	1.00	6.44	1.21	11.5	0.878	306
35	5.03	13.4	147	29.4	3.78	35.4	8.30	3.36	0.899	6.19	1.16	9.51	1.29	188
25.4	4.75	25.6	123	24.6	4.07	28.3	6.73	2.89	0.950	4.99	1.14	9.51	0.603	152
23	4.91	14.1	64.7	16.2	3.09	19.2	4.27	2.05	0.795	3.67	0.999	7.58	0.550	61.2
18.4	4.71	22.9	57.5	14.4	3.26	16.5	3.69	1.84	0.827	3.18	0.985	7.58	0.335	52.9
17.25	4.97	9.67	26.2	8.74	2.28	10.5	2.29	1.28	0.673	2.35	0.859	5.64	0.371	18.2
12.5	4.64	19.4	22.0	7.34	2.45	8.45	1.80	1.08	0.702	1.86	0.831	5.64	0.167	14.3
10	4.61	16.8	12.3	4.90	2.05	5.66	1.19	0.795	0.638	1.37	0.754	4.67	0.114	6.52
9.5	4.77	8.33	6.76	3.38	1.56	4.04	0.887	0.635	0.564	1.13	0.698	3.71	0.120	3.05
7.7	4.54	14.1	6.05	3.03	1.64	3.50	0.748	0.562	0.576	0.970	0.676	3.71	0.0732	2.57
7.5	4.83	5.38	2.91	1.94	1.15	2.35	0.578	0.461	0.513	0.821	0.638	2.74	0.0896	1.08
5.7	4.48	11.0	2.50	1.67	1.23	1.94	0.447	0.383	0.518	0.656	0.605	2.74	0.0433	0.838

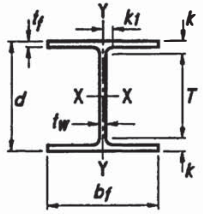


Table 1-4
HP-Shapes
Dimensions

Shape	Area, A	Depth, d		Web Thickness, t_w		$\frac{t_w}{2}$	Flange Width, b_f		Flange Thickness, t_f		Distance k	k_1	T	Workable Gage
	in.^{2}	in.		in.		in.	in.		in.		in.	in.	in.	in.
HP18×204	60.2	18.3	18 1/4	1.13	1 1/8	9/16	18.1	18 1/8	1.13	1 1/8	2 5/16	1 3/4	13 1/2	7 1/2
×181	53.2	18.0	18	1.00	1	1/2	18.0	18	1.00	1	2 3/16	1 11/16	↓	↓
×157[f]	46.2	17.7	17 3/4	0.870	7/8	7/16	17.9	17 7/8	0.870	7/8	2 1/16	1 5/8	↓	↓
×135[f]	39.9	17.5	17 1/2	0.750	3/4	3/8	17.8	17 3/4	0.750	3/4	1 15/16	1 9/16	↓	↓
HP16×183	54.1	16.5	16 1/2	1.13	1 1/8	9/16	16.3	16 1/2	1.13	1 1/8	2 5/16	1 3/4	11 3/4	5 1/2
×162	47.7	16.3	16 1/4	1.00	1	1/2	16.1	16 1/8	1.00	1	2 3/16	1 11/16	↓	↓
×141	41.7	16.0	16	0.875	7/8	7/16	16.0	16	0.875	7/8	2 1/16	1 5/8	↓	↓
×121[f]	35.8	15.8	15 3/4	0.750	3/4	3/8	15.9	15 7/8	0.750	3/4	1 15/16	1 9/16	↓	↓
×101[f]	29.9	15.5	15 1/2	0.625	5/8	5/16	15.8	15 3/4	0.625	5/8	1 13/16	1 1/2	↓	↓
×88[c,f]	25.8	15.3	15 3/8	0.540	9/16	5/16	15.7	15 11/16	0.540	9/16	1 3/4	1 7/16	↓	↓
HP14×117[f]	34.4	14.2	14 1/4	0.805	13/16	7/16	14.9	14 7/8	0.805	13/16	1 1/2	1 1/16	11 1/4	5 1/2
×102[f]	30.1	14.0	14	0.705	11/16	3/8	14.8	14 3/4	0.705	11/16	1 3/8	1	↓	↓
×89[f]	26.1	13.8	13 7/8	0.615	5/8	5/16	14.7	14 3/4	0.615	5/8	1 5/16	15/16	↓	↓
×73[c,f]	21.4	13.6	13 5/8	0.505	1/2	1/4	14.6	14 5/8	0.505	1/2	1 3/16	7/8	↓	↓
HP12×84	24.6	12.3	12 1/4	0.685	11/16	3/8	12.3	12 1/4	0.685	11/16	1 3/8	1	9 1/2	5 1/2
×74[f]	21.8	12.1	12 1/8	0.605	5/8	5/16	12.2	12 1/4	0.610	5/8	1 5/16	15/16	↓	↓
×63[f]	18.4	11.9	12	0.515	1/2	1/4	12.1	12 1/8	0.515	1/2	1 1/4	7/8	↓	↓
×53[f,c]	15.5	11.8	11 3/4	0.435	7/16	1/4	12.0	12	0.435	7/16	1 1/8	7/8	↓	↓
HP10×57	16.7	9.99	10	0.565	9/16	5/16	10.2	10 1/4	0.565	9/16	1 1/4	15/16	7 1/2	5 1/2
×42[f]	12.4	9.70	9 3/4	0.415	7/16	1/4	10.1	10 1/8	0.420	7/16	1 1/8	13/16	7 1/2	5 1/2
HP8×36[f]	10.6	8.02	8	0.445	7/16	1/4	8.16	8 1/8	0.445	7/16	1 1/8	7/8	5 3/4	5 1/2

[c] Shape is slender for compression with $F_y = 50$ ksi.
[f] Shape exceeds compact limit for flexure with $F_y = 50$ ksi.

Table 1-4 (continued)
HP-Shapes
Properties

HP-SHAPES

Nominal Wt.	Compact Section Criteria $\frac{b_f}{2t_f}$	Compact Section Criteria $\frac{h}{t_w}$	Axis X-X I	Axis X-X S	Axis X-X r	Axis X-X Z	Axis Y-Y I	Axis Y-Y S	Axis Y-Y r	Axis Y-Y Z	r_{ts}	h_o	$\frac{J}{S_x h_o}$	Torsional Properties J	Torsional Properties C_w
lb/ft			in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.		in.^{4}	in.^{6}
204	8.01	12.1	3480	380	7.60	433	1120	124	4.31	191	5.03	17.2	0.00451	29.5	82500
181	9.00	13.6	3020	336	7.53	379	974	108	4.28	167	4.96	17.0	0.00362	20.7	70400
157	10.3	15.6	2570	290	7.46	327	833	93.1	4.25	143	4.92	16.8	0.00285	13.9	59000
135	11.9	18.2	2200	251	7.43	281	706	79.3	4.21	122	4.85	16.8	0.00216	9.12	49500
183	7.21	10.5	2510	304	6.81	349	818	100	3.89	156	4.54	15.4	0.00576	26.9	48300
162	8.05	11.9	2190	269	6.78	306	697	86.6	3.82	134	4.45	15.3	0.00457	18.8	40800
141	9.14	13.6	1870	234	6.70	264	599	74.9	3.79	116	4.40	15.1	0.00365	12.9	34300
121	10.6	15.9	1590	201	6.66	226	504	63.4	3.75	97.6	4.34	15.1	0.00275	8.35	28500
101	12.6	19.0	1300	168	6.59	187	412	52.2	3.71	80.1	4.27	14.9	0.00203	5.07	22800
88	14.5	22.0	1110	145	6.56	161	349	44.5	3.68	68.2	4.21	14.8	0.00161	3.45	19000
117	9.25	14.2	1220	172	5.96	194	443	59.5	3.59	91.4	4.15	13.4	0.00348	8.02	19900
102	10.5	16.2	1050	150	5.92	169	380	51.4	3.56	78.8	4.10	13.3	0.00270	5.39	16800
89	11.9	18.5	904	131	5.88	146	326	44.3	3.53	67.7	4.05	13.2	0.00207	3.59	14200
73	14.4	22.6	729	107	5.84	118	261	35.8	3.49	54.6	4.00	13.1	0.00143	2.01	11200
84	8.97	14.2	650	106	5.14	120	213	34.6	2.94	53.2	3.41	11.6	0.00345	4.24	7140
74	10.0	16.1	569	93.8	5.11	105	186	30.4	2.92	46.6	3.38	11.5	0.00276	2.98	6160
63	11.8	18.9	472	79.1	5.06	88.3	153	25.3	2.88	38.7	3.33	11.4	0.00202	1.83	5000
53	13.8	22.3	393	66.7	5.03	74.0	127	21.1	2.86	32.2	3.29	11.4	0.00148	1.12	4080
57	9.03	13.9	294	58.8	4.18	66.5	101	19.7	2.45	30.3	2.84	9.43	0.00355	1.97	2240
42	12.0	18.9	210	43.4	4.13	48.3	71.7	14.2	2.41	21.8	2.77	9.28	0.00202	0.813	1540
36	9.16	14.2	119	29.8	3.36	33.6	40.3	9.88	1.95	15.2	2.26	7.58	0.00341	0.770	578

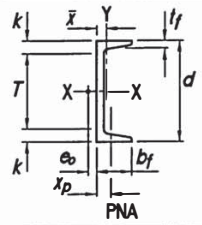


Table 1-5
C-Shapes
Dimensions

Shape	Area, A	Depth, d		Web			Flange				Distance			r_{ts}	h_o
				Thickness, t_w		$\frac{t_w}{2}$	Width, b_f		Average Thickness, t_f		k	T	Workable Gage		
	in.^{2}	in.		in.		in.	in.		in.		in.	in.	in.	in.	in.
C15×50	14.7	15.0	15	0.716	11/16	3/8	3.72	3 3/4	0.650	5/8	17/16	12 1/8	2 1/4	1.17	14.4
×40	11.8	15.0	15	0.520	1/2	1/4	3.52	3 1/2	0.650	5/8	17/16	12 1/8	2	1.15	14.4
×33.9	10.0	15.0	15	0.400	3/8	3/16	3.40	3 3/8	0.650	5/8	17/16	12 1/8	2	1.13	14.4
C12×30	8.81	12.0	12	0.510	1/2	1/4	3.17	3 1/8	0.501	1/2	1 1/8	9 3/4	1 3/4[g]	1.01	11.5
×25	7.34	12.0	12	0.387	3/8	3/16	3.05	3	0.501	1/2	1 1/8	9 3/4	1 3/4[g]	1.00	11.5
×20.7	6.08	12.0	12	0.282	5/16	3/16	2.94	3	0.501	1/2	1 1/8	9 3/4	1 3/4[g]	0.983	11.5
C10×30	8.81	10.0	10	0.673	11/16	3/8	3.03	3	0.436	7/16	1	8	1 3/4[g]	0.924	9.56
×25	7.35	10.0	10	0.526	1/2	1/4	2.89	2 7/8	0.436	7/16	1	8	1 3/4[g]	0.911	9.56
×20	5.87	10.0	10	0.379	3/8	3/16	2.74	2 3/4	0.436	7/16	1	8	1 1/2[g]	0.894	9.56
×15.3	4.48	10.0	10	0.240	1/4	1/8	2.60	2 5/8	0.436	7/16	1	8	1 1/2[g]	0.868	9.56
C9×20	5.87	9.00	9	0.448	7/16	1/4	2.65	2 5/8	0.413	7/16	1	7	1 1/2[g]	0.850	8.59
×15	4.40	9.00	9	0.285	5/16	3/16	2.49	2 1/2	0.413	7/16	1	7	1 3/8[g]	0.825	8.59
×13.4	3.94	9.00	9	0.233	1/4	1/8	2.43	2 3/8	0.413	7/16	1	7	1 3/8[g]	0.814	8.59
C8×18.75	5.51	8.00	8	0.487	1/2	1/4	2.53	2 1/2	0.390	3/8	15/16	6 1/8	1 1/2[g]	0.800	7.61
×13.75	4.03	8.00	8	0.303	5/16	3/16	2.34	2 3/8	0.390	3/8	15/16	6 1/8	1 3/8[g]	0.774	7.61
×11.5	3.37	8.00	8	0.220	1/4	1/8	2.26	2 1/4	0.390	3/8	15/16	6 1/8	1 3/8[g]	0.756	7.61
C7×14.75	4.33	7.00	7	0.419	7/16	1/4	2.30	2 1/4	0.366	3/8	7/8	5 1/4	1 1/4[g]	0.738	6.63
×12.25	3.59	7.00	7	0.314	5/16	3/16	2.19	2 1/4	0.366	3/8	7/8	5 1/4	1 1/4[g]	0.722	6.63
×9.8	2.87	7.00	7	0.210	3/16	1/8	2.09	2 1/8	0.366	3/8	7/8	5 1/4	1 1/4[g]	0.698	6.63
C6×13	3.82	6.00	6	0.437	7/16	1/4	2.16	2 1/8	0.343	5/16	13/16	4 3/8	1 3/8[g]	0.689	5.66
×10.5	3.07	6.00	6	0.314	5/16	3/16	2.03	2	0.343	5/16	13/16	4 3/8	1 1/8[g]	0.669	5.66
×8.2	2.39	6.00	6	0.200	3/16	1/8	1.92	1 7/8	0.343	5/16	13/16	4 3/8	1 1/8[g]	0.643	5.66
C5×9	2.64	5.00	5	0.325	5/16	3/16	1.89	1 7/8	0.320	5/16	3/4	3 1/2	1 1/8[g]	0.616	4.68
×6.7	1.97	5.00	5	0.190	3/16	1/8	1.75	1 3/4	0.320	5/16	3/4	3 1/2	—	0.584	4.68
C4×7.25	2.13	4.00	4	0.321	5/16	3/16	1.72	1 3/4	0.296	5/16	3/4	2 1/2	1[g]	0.563	3.70
×6.25	1.77	4.00	4	0.247	1/4	1/8	1.65	1 3/4	0.272	5/16	3/4	2 1/2	—	0.546	3.73
×5.4	1.58	4.00	4	0.184	3/16	1/8	1.58	1 5/8	0.296	5/16	3/4	2 1/2	—	0.528	3.70
×4.5	1.38	4.00	4	0.125	1/8	1/16	1.58	1 5/8	0.296	5/16	3/4	2 1/2	—	0.524	3.70
C3×6	1.76	3.00	3	0.356	3/8	3/16	1.60	1 5/8	0.273	1/4	11/16	1 5/8	—	0.519	2.73
×5	1.47	3.00	3	0.258	1/4	1/8	1.50	1 1/2	0.273	1/4	11/16	1 5/8	—	0.496	2.73
×4.1	1.20	3.00	3	0.170	3/16	1/8	1.41	1 3/8	0.273	1/4	11/16	1 5/8	—	0.469	2.73
×3.5	1.09	3.00	3	0.132	1/8	1/16	1.37	1 3/8	0.273	1/4	11/16	1 5/8	—	0.456	2.73

[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
— Indicates flange is too narrow to establish a workable gage.

Table 1-5 (continued)
C-Shapes
Properties

C-SHAPES

Nominal Wt.	Shear Ctr, e_o	Axis X-X				Axis Y-Y						Torsional Properties			
		I	S	r	Z	I	S	r	$\bar{x}$	Z	x_p	J	C_w	$\bar{r}_o$	H
lb/ft	in.	in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}	in.	in.	in.^{3}	in.	in.^{4}	in.^{6}	in.	
50	0.583	404	53.8	5.24	68.5	11.0	3.77	0.865	0.799	8.14	0.490	2.65	492	5.49	0.937
40	0.767	348	46.5	5.43	57.5	9.17	3.34	0.883	0.778	6.84	0.392	1.45	410	5.71	0.927
33.9	0.896	315	42.0	5.61	50.8	8.07	3.09	0.901	0.788	6.19	0.332	1.01	358	5.94	0.920
30	0.618	162	27.0	4.29	33.8	5.12	2.05	0.762	0.674	4.32	0.367	0.861	151	4.54	0.919
25	0.746	144	24.0	4.43	29.4	4.45	1.87	0.779	0.674	3.82	0.306	0.538	130	4.72	0.909
20.7	0.870	129	21.5	4.61	25.6	3.86	1.72	0.797	0.698	3.47	0.253	0.369	112	4.93	0.899
30	0.368	103	20.7	3.43	26.7	3.93	1.65	0.668	0.649	3.78	0.441	1.22	79.5	3.63	0.921
25	0.494	91.1	18.2	3.52	23.1	3.34	1.47	0.675	0.617	3.18	0.367	0.687	68.3	3.76	0.912
20	0.636	78.9	15.8	3.67	19.4	2.80	1.31	0.690	0.606	2.70	0.294	0.368	56.9	3.93	0.900
15.3	0.796	67.3	13.5	3.88	15.9	2.27	1.15	0.711	0.634	2.34	0.224	0.209	45.5	4.19	0.884
20	0.515	60.9	13.5	3.22	16.9	2.41	1.17	0.640	0.583	2.46	0.326	0.427	39.4	3.46	0.899
15	0.681	51.0	11.3	3.40	13.6	1.91	1.01	0.659	0.586	2.04	0.245	0.208	31.0	3.69	0.882
13.4	0.742	47.8	10.6	3.48	12.6	1.75	0.954	0.666	0.601	1.94	0.219	0.168	28.2	3.79	0.875
18.75	0.431	43.9	11.0	2.82	13.9	1.97	1.01	0.598	0.565	2.17	0.344	0.434	25.1	3.05	0.894
13.75	0.604	36.1	9.02	2.99	11.0	1.52	0.848	0.613	0.554	1.73	0.252	0.186	19.2	3.26	0.874
11.5	0.697	32.5	8.14	3.11	9.63	1.31	0.775	0.623	0.572	1.57	0.211	0.130	16.5	3.41	0.862
14.75	0.441	27.2	7.78	2.51	9.75	1.37	0.772	0.561	0.532	1.63	0.309	0.267	13.1	2.75	0.875
12.25	0.538	24.2	6.92	2.59	8.46	1.16	0.696	0.568	0.525	1.42	0.257	0.161	11.2	2.86	0.862
9.8	0.647	21.2	6.07	2.72	7.19	0.957	0.617	0.578	0.541	1.26	0.205	0.0996	9.15	3.02	0.845
13	0.380	17.3	5.78	2.13	7.29	1.05	0.638	0.524	0.514	1.35	0.318	0.237	7.19	2.37	0.858
10.5	0.486	15.1	5.04	2.22	6.18	0.860	0.561	0.529	0.500	1.14	0.256	0.128	5.91	2.48	0.842
8.2	0.599	13.1	4.35	2.34	5.16	0.687	0.488	0.536	0.512	0.987	0.199	0.0736	4.70	2.65	0.824
9	0.427	8.89	3.56	1.84	4.39	0.624	0.444	0.486	0.478	0.913	0.264	0.109	2.93	2.10	0.815
6.7	0.552	7.48	2.99	1.95	3.55	0.470	0.372	0.489	0.484	0.757	0.215	0.0549	2.22	2.26	0.790
7.25	0.386	4.58	2.29	1.47	2.84	0.425	0.337	0.447	0.459	0.695	0.266	0.0817	1.24	1.75	0.767
6.25	0.434	4.00	2.00	1.50	2.43	0.345	0.284	0.441	0.435	0.569	0.221	0.0487	1.03	1.79	0.764
5.4	0.501	3.85	1.92	1.56	2.29	0.312	0.277	0.444	0.457	0.565	0.231	0.0399	0.921	1.88	0.742
4.5	0.587	3.65	1.83	1.63	2.12	0.289	0.265	0.457	0.493	0.531	0.321	0.0322	0.871	2.01	0.710
6	0.322	2.07	1.38	1.09	1.74	0.300	0.263	0.413	0.455	0.543	0.294	0.0725	0.462	1.40	0.690
5	0.392	1.85	1.23	1.12	1.52	0.241	0.228	0.405	0.439	0.464	0.245	0.0425	0.379	1.45	0.673
4.1	0.461	1.65	1.10	1.18	1.32	0.191	0.196	0.398	0.437	0.399	0.262	0.0269	0.307	1.53	0.655
3.5	0.493	1.57	1.04	1.20	1.24	0.169	0.182	0.394	0.443	0.364	0.296	0.0226	0.276	1.57	0.646

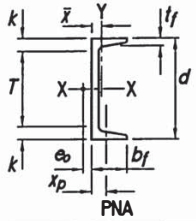


Table 1-6
MC-Shapes
Dimensions

Shape	Area, A	Depth, d		Web: Thickness, tw		Web: tw/2	Flange: Width, bf		Flange: Average Thickness, tf		Distance: k	Distance: T	Distance: Workable Gage	rts	ho
	in.²	in.		in.		in.	in.		in.		in.	in.	in.	in.	in.
MC18×58	17.1	18.0	18	0.700	11/16	3/8	4.20	4 1/4	0.625	5/8	1 7/16	15 1/8	2 1/2	1.35	17.4
×51.9	15.3	18.0	18	0.600	5/8	5/16	4.10	4 1/8	0.625	5/8	1 7/16			1.35	17.4
×45.8	13.5	18.0	18	0.500	1/2	1/4	4.00	4	0.625	5/8	1 7/16			1.34	17.4
×42.7	12.6	18.0	18	0.450	7/16	1/4	3.95	4	0.625	5/8	1 7/16			1.34	17.4
MC13×50	14.7	13.0	13	0.787	13/16	7/16	4.41	4 3/8	0.610	5/8	1 7/16	10 1/8	2 1/2	1.41	12.4
×40	11.7	13.0	13	0.560	9/16	5/16	4.19	4 1/8	0.610	5/8	1 7/16			1.38	12.4
×35	10.3	13.0	13	0.447	7/16	1/4	4.07	4 1/8	0.610	5/8	1 7/16			1.35	12.4
×31.8	9.35	13.0	13	0.375	3/8	3/16	4.00	4	0.610	5/8	1 7/16			1.34	12.4
MC12×50	14.7	12.0	12	0.835	13/16	7/16	4.14	4 1/8	0.700	11/16	1 5/16	9 3/8	2 1/2	1.37	11.3
×45	13.2	12.0	12	0.710	11/16	3/8	4.01	4	0.700	11/16	1 5/16			1.35	11.3
×40	11.8	12.0	12	0.590	9/16	5/16	3.89	3 7/8	0.700	11/16	1 5/16			1.33	11.3
×35	10.3	12.0	12	0.465	7/16	1/4	3.77	3 3/4	0.700	11/16	1 5/16			1.30	11.3
×31	9.12	12.0	12	0.370	3/8	3/16	3.67	3 5/8	0.700	11/16	1 5/16		2 1/4	1.28	11.3
MC12×14.3	4.18	12.0	12	0.250	1/4	1/8	2.12	2 1/8	0.313	5/16	3/4	10 1/2	1 1/4[g]	0.672	11.7
MC12×10.6[c]	3.10	12.0	12	0.190	3/16	1/8	1.50	1 1/2	0.309	5/16	3/4	10 1/2	—	0.478	11.7
MC10×41.1	12.1	10.0	10	0.796	13/16	7/16	4.32	4 3/8	0.575	9/16	1 5/16	7 3/8	2 1/2[g]	1.44	9.43
×33.6	9.87	10.0	10	0.575	9/16	5/16	4.10	4 1/8	0.575	9/16	1 5/16	7 3/8	2 1/2[g]	1.40	9.43
×28.5	8.37	10.0	10	0.425	7/16	1/4	3.95	4	0.575	9/16	1 5/16	7 3/8	2 1/2[g]	1.36	9.43
MC10×25	7.34	10.0	10	0.380	3/8	3/16	3.41	3 3/8	0.575	9/16	1 5/16	7 3/8	2[g]	1.17	9.43
×22	6.45	10.0	10	0.290	5/16	3/16	3.32	3 3/8	0.575	9/16	1 5/16	7 3/8	2[g]	1.14	9.43
MC10×8.4[c]	2.46	10.0	10	0.170	3/16	1/8	1.50	1 1/2	0.280	1/4	3/4	8 1/2	—	0.486	9.72
×6.5[c]	1.95	10.0	10	0.152	1/8	1/16	1.17	1 1/8	0.202	3/16	9/16	8 7/8	—	0.363	9.80
MC9×25.4	7.47	9.00	9	0.450	7/16	1/4	3.50	3 1/2	0.550	9/16	1 1/4	6 1/2	2[g]	1.20	8.45
×23.9	7.02	9.00	9	0.400	3/8	3/16	3.45	3 1/2	0.550	9/16	1 1/4	6 1/2	2[g]	1.18	8.45
MC8×22.8	6.70	8.00	8	0.427	7/16	1/4	3.50	3 1/2	0.525	1/2	1 3/16	5 5/8	2[g]	1.20	7.48
×21.4	6.28	8.00	8	0.375	3/8	3/16	3.45	3 1/2	0.525	1/2	1 3/16	5 5/8	2[g]	1.18	7.48
MC8×20	5.87	8.00	8	0.400	3/8	3/16	3.03	3	0.500	1/2	1 1/8	5 3/4	2[g]	1.03	7.50
×18.7	5.50	8.00	8	0.353	3/8	3/16	2.98	3	0.500	1/2	1 1/8	5 3/4	2[g]	1.02	7.50
MC8×8.5	2.50	8.00	8	0.179	3/16	1/8	1.87	1 7/8	0.311	5/16	13/16	6 3/8	1 1/8[g]	0.624	7.69

[c] Shape is slender for compression with $F_y = 36$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
— Indicates flange is too narrow to establish a workable gage.

Table 1-6 (continued)
MC-Shapes
Properties

MC18-MC8

Nominal Wt.	Shear Ctr, eo	Axis X-X: I	S	r	Z	Axis Y-Y: I	S	r	x̄	Z	xp	Torsional Properties: J	Cw	r̄o	H
lb/ft	in.	in.⁴	in.³	in.	in.³	in.⁴	in.³	in.	in.	in.³	in.	in.⁴	in.⁶	in.	
58	0.695	675	75.0	6.29	95.4	17.6	5.28	1.02	0.862	10.7	0.474	2.81	1070	6.56	0.944
51.9	0.797	627	69.6	6.41	87.3	16.3	5.02	1.03	0.858	9.86	0.424	2.03	985	6.70	0.939
45.8	0.909	578	64.2	6.55	79.2	14.9	4.77	1.05	0.866	9.14	0.374	1.45	897	6.87	0.933
42.7	0.969	554	61.5	6.64	75.1	14.3	4.64	1.07	0.877	8.82	0.349	1.23	852	6.97	0.930
50	0.815	314	48.3	4.62	60.8	16.4	4.77	1.06	0.974	10.2	0.566	2.96	558	5.07	0.875
40	1.03	273	41.9	4.82	51.2	13.7	4.24	1.08	0.963	8.66	0.452	1.55	462	5.32	0.859
35	1.16	252	38.8	4.95	46.5	12.3	3.97	1.09	0.980	8.04	0.396	1.13	412	5.50	0.849
31.8	1.24	239	36.7	5.05	43.4	11.4	3.79	1.10	1.00	7.69	0.360	0.937	380	5.64	0.842
50	0.741	269	44.9	4.28	56.5	17.4	5.64	1.09	1.05	10.9	0.613	3.23	411	4.77	0.859
45	0.844	251	41.9	4.36	52.0	15.8	5.30	1.09	1.04	10.1	0.550	2.33	373	4.88	0.851
40	0.952	234	39.0	4.46	47.7	14.2	4.98	1.10	1.04	9.31	0.490	1.69	336	5.01	0.842
35	1.07	216	36.0	4.59	43.2	12.6	4.64	1.11	1.05	8.62	0.428	1.24	297	5.18	0.831
31	1.17	202	33.7	4.71	39.7	11.3	4.37	1.11	1.08	8.15	0.425	1.00	267	5.34	0.822
14.3	0.435	76.1	12.7	4.27	15.9	1.00	0.574	0.489	0.377	1.21	0.174	0.117	32.8	4.37	0.965
10.6	0.284	55.3	9.22	4.22	11.6	0.378	0.307	0.349	0.269	0.635	0.129	0.0596	11.7	4.27	0.983
41.1	0.864	157	31.5	3.61	39.3	15.7	4.85	1.14	1.09	9.49	0.604	2.26	269	4.26	0.790
33.6	1.06	139	27.8	3.75	33.7	13.1	4.35	1.15	1.09	8.28	0.494	1.20	224	4.47	0.770
28.5	1.21	126	25.3	3.89	30.0	11.3	3.99	1.16	1.12	7.59	0.419	0.791	193	4.68	0.752
25	1.03	110	22.0	3.87	26.2	7.25	2.96	0.993	0.953	5.65	0.367	0.638	124	4.46	0.803
22	1.12	102	20.5	3.99	23.9	6.40	2.75	0.997	0.990	5.29	0.467	0.510	110	4.62	0.791
8.4	0.332	31.9	6.39	3.61	7.92	0.326	0.268	0.364	0.284	0.548	0.123	0.0413	7.00	3.68	0.972
6.5	0.182	22.9	4.59	3.43	5.90	0.133	0.137	0.262	0.194	0.284	0.0975	0.0191	2.76	3.46	0.988
25.4	0.986	87.9	19.5	3.43	23.5	7.57	2.99	1.01	0.970	5.70	0.415	0.691	104	4.08	0.770
23.9	1.04	84.9	18.9	3.48	22.5	7.14	2.89	1.01	0.981	5.51	0.390	0.599	98.0	4.15	0.763
22.8	1.04	63.8	15.9	3.09	19.1	7.01	2.81	1.02	1.01	5.37	0.419	0.572	75.2	3.84	0.715
21.4	1.09	61.5	15.4	3.13	18.2	6.58	2.71	1.02	1.02	5.18	0.452	0.495	70.8	3.91	0.707
20	0.843	54.4	13.6	3.04	16.4	4.42	2.02	0.867	0.840	3.86	0.367	0.441	47.8	3.58	0.779
18.7	0.889	52.4	13.1	3.09	15.6	4.15	1.95	0.868	0.849	3.72	0.344	0.380	45.0	3.65	0.773
8.5	0.542	23.3	5.82	3.05	6.95	0.624	0.431	0.500	0.428	0.875	0.156	0.0587	8.21	3.24	0.910

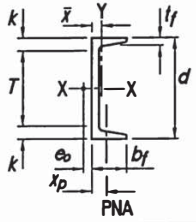


Table 1-6 (continued)
MC-Shapes
Dimensions

Shape	Area, A	Depth, d		Web Thickness, t_w		$\frac{t_w}{2}$	Flange Width, b_f		Flange Average Thickness, t_f		Distance k	Distance T	Distance Workable Gage	r_{ts}	h_o
	in.^{2}	in.		in.		in.	in.		in.		in.	in.	in.	in.	in.
MC7×22.7	6.67	7.00	7	0.503	1/2	1/4	3.60	3 5/8	0.500	1/2	1 1/8	4 3/4	2[g]	1.23	6.50
×19.1	5.61	7.00	7	0.352	3/8	3/16	3.45	3 1/2	0.500	1/2	1 1/8	4 3/4	2[g]	1.19	6.50
MC6×18	5.29	6.00	6	0.379	3/8	3/16	3.50	3 1/2	0.475	1/2	1 1/16	3 7/8	2[g]	1.20	5.53
×15.3	4.49	6.00	6	0.340	5/16	3/16	3.50	3 1/2	0.385	3/8	7/8	4 1/4	2[g]	1.20	5.62
MC6×16.3	4.79	6.00	6	0.375	3/8	3/16	3.00	3	0.475	1/2	1 1/16	3 7/8	1 3/4[g]	1.03	5.53
×15.1	4.44	6.00	6	0.316	5/16	3/16	2.94	3	0.475	1/2	1 1/16	3 7/8	1 3/4[g]	1.01	5.53
MC6×12	3.53	6.00	6	0.310	5/16	3/16	2.50	2 1/2	0.375	3/8	7/8	4 1/4	1 1/2[g]	0.856	5.63
MC6×7	2.09	6.00	6	0.179	3/16	1/8	1.88	1 7/8	0.291	5/16	3/4	4 1/2	—	0.638	5.71
×6.5	1.95	6.00	6	0.155	1/8	1/16	1.85	1 7/8	0.291	5/16	3/4	4 1/2	—	0.631	5.71
MC4×13.8	4.03	4.00	4	0.500	1/2	1/4	2.50	2 1/2	0.500	1/2	1	2	—	0.851	3.50
MC3×7.1	2.11	3.00	3	0.312	5/16	3/16	1.94	2	0.351	3/8	13/16	1 3/8	—	0.657	2.65

[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
— Indicates flange is too narrow to establish a workable gage.

Table 1-6 (continued)
MC-Shapes
Properties

MC7-MC3

Nominal Wt.	Shear Ctr, e_o	Axis X-X I	Axis X-X S	Axis X-X r	Axis X-X Z	Axis Y-Y I	Axis Y-Y S	Axis Y-Y r	Axis Y-Y $\bar{x}$	Axis Y-Y Z	Axis Y-Y x_p	Torsional Properties J	Torsional Properties C_w	Torsional Properties $\bar{r}_o$	Torsional Properties H
lb/ft	in.	in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}	in.	in.	in.^{3}	in.	in.^{4}	in.^{6}	in.	
22.7	1.01	47.4	13.5	2.67	16.4	7.24	2.83	1.04	1.04	5.38	0.477	0.625	58.3	3.53	0.659
19.1	1.15	43.1	12.3	2.77	14.5	6.06	2.55	1.04	1.08	4.85	0.579	0.407	49.3	3.70	0.638
18	1.17	29.7	9.89	2.37	11.7	5.88	2.47	1.05	1.12	4.68	0.644	0.379	34.6	3.46	0.563
15.3	1.16	25.3	8.44	2.38	9.91	4.91	2.01	1.05	1.05	3.85	0.511	0.223	30.0	3.41	0.579
16.3	0.930	26.0	8.66	2.33	10.4	3.77	1.82	0.887	0.927	3.47	0.465	0.336	22.1	3.11	0.643
15.1	0.982	24.9	8.30	2.37	9.83	3.46	1.73	0.883	0.940	3.30	0.543	0.285	20.5	3.18	0.634
12	0.725	18.7	6.24	2.30	7.47	1.85	1.03	0.724	0.704	1.97	0.294	0.155	11.3	2.80	0.740
7	0.583	11.4	3.81	2.34	4.50	0.603	0.439	0.537	0.501	0.865	0.174	0.0464	4.00	2.63	0.830
6.5	0.612	11.0	3.66	2.38	4.28	0.565	0.422	0.539	0.513	0.836	0.191	0.0412	3.75	2.68	0.824
13.8	0.643	8.85	4.43	1.48	5.53	2.13	1.29	0.727	0.849	2.40	0.508	0.373	4.84	2.23	0.550
7.1	0.574	2.72	1.81	1.14	2.24	0.666	0.518	0.562	0.653	0.998	0.414	0.0928	0.915	1.76	0.516

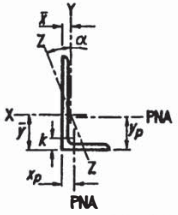


Table 1-7
Angles
Properties

Shape	k	Wt.	Area, A	Axis X-X						Flexural-Torsional Properties		
				I	S	r	$\bar{y}$	Z	y_p	J	C_w	$\bar{r}_o$
	in.	lb/ft	in.^{2}	in.^{4}	in.^{3}	in.	in.	in.^{3}	in.	in.^{4}	in.^{6}	in.
L8×8×1 1/8	1 3/4	56.9	16.8	98.1	17.5	2.41	2.40	31.6	1.05	7.13	32.5	4.29
×1	1 5/8	51.0	15.1	89.1	15.8	2.43	2.36	28.5	0.944	5.08	23.4	4.32
×7/8	1 1/2	45.0	13.3	79.7	14.0	2.45	2.31	25.3	0.831	3.46	16.1	4.36
×3/4	1 3/8	38.9	11.5	69.9	12.2	2.46	2.26	22.0	0.719	2.21	10.4	4.39
×5/8	1 1/4	32.7	9.69	59.6	10.3	2.48	2.21	18.6	0.606	1.30	6.16	4.42
×9/16	1 3/16	29.6	8.77	54.2	9.33	2.49	2.19	16.8	0.548	0.961	4.55	4.43
×1/2	1 1/8	26.4	7.84	48.8	8.36	2.49	2.17	15.1	0.490	0.683	3.23	4.45
L8×6×1	1 1/2	44.2	13.1	80.9	15.1	2.49	2.65	27.3	1.45	4.34	16.3	3.88
×7/8	1 3/8	39.1	11.5	72.4	13.4	2.50	2.60	24.3	1.43	2.96	11.3	3.92
×3/4	1 1/4	33.8	9.99	63.5	11.7	2.52	2.55	21.1	1.34	1.90	7.28	3.95
×5/8	1 1/8	28.5	8.41	54.2	9.86	2.54	2.50	17.9	1.27	1.12	4.33	3.98
×9/16	1 1/16	25.7	7.61	49.4	8.94	2.55	2.48	16.2	1.24	0.823	3.20	3.99
×1/2	1	23.0	6.80	44.4	8.01	2.55	2.46	14.6	1.20	0.584	2.28	4.01
×7/16	15/16	20.2	5.99	39.3	7.06	2.56	2.43	12.9	1.15	0.396	1.55	4.02
L8×4×1	1 1/2	37.4	11.1	69.7	14.0	2.51	3.03	24.3	2.45	3.68	12.9	3.75
×7/8	1 3/8	33.1	9.79	62.6	12.5	2.53	2.99	21.7	2.41	2.51	8.89	3.78
×3/4	1 1/4	28.7	8.49	55.0	10.9	2.55	2.94	18.9	2.34	1.61	5.75	3.80
×5/8	1 1/8	24.2	7.16	47.0	9.20	2.56	2.89	16.1	2.27	0.955	3.42	3.83
×9/16	1 1/16	21.9	6.49	42.9	8.34	2.57	2.86	14.6	2.23	0.704	2.53	3.84
×1/2	1	19.6	5.80	38.6	7.48	2.58	2.84	13.1	2.20	0.501	1.80	3.86
×7/16	15/16	17.2	5.11	34.2	6.59	2.59	2.81	11.6	2.16	0.340	1.22	3.87
L7×4×3/4	1 1/4	26.2	7.74	37.8	8.39	2.21	2.50	14.8	1.84	1.47	3.97	3.31
×5/8	1 1/8	22.1	6.50	32.4	7.12	2.23	2.45	12.5	1.80	0.868	2.37	3.34
×1/2	1	17.9	5.26	26.6	5.79	2.25	2.40	10.2	1.74	0.456	1.25	3.37
×7/16	15/16	15.7	4.63	23.6	5.11	2.26	2.38	9.03	1.71	0.310	0.851	3.38
×3/8	7/8	13.6	4.00	20.5	4.42	2.27	2.35	7.81	1.67	0.198	0.544	3.40
L6×6×1	1 1/2	37.4	11.0	35.4	8.55	1.79	1.86	15.4	0.917	3.68	9.24	3.18
×7/8	1 3/8	33.1	9.75	31.9	7.61	1.81	1.81	13.7	0.813	2.51	6.41	3.21
×3/4	1 1/4	28.7	8.46	28.1	6.64	1.82	1.77	11.9	0.705	1.61	4.17	3.24
×5/8	1 1/8	24.2	7.13	24.1	5.64	1.84	1.72	10.1	0.594	0.955	2.50	3.28
×9/16	1 1/16	21.9	6.45	22.0	5.12	1.85	1.70	9.18	0.538	0.704	1.85	3.29
×1/2	1	19.6	5.77	19.9	4.59	1.86	1.67	8.22	0.481	0.501	1.32	3.31
×7/16	15/16	17.2	5.08	17.6	4.06	1.86	1.65	7.25	0.423	0.340	0.899	3.32
×3/8	7/8	14.9	4.38	15.4	3.51	1.87	1.62	6.27	0.365	0.218	0.575	3.34
×5/16	13/16	12.4	3.67	13.0	2.95	1.88	1.60	5.26	0.306	0.129	0.338	3.35

Note: For workable gages, refer to Table 1-7A. For compactness criteria, refer to Table 1-7B.

Table 1-7 (continued)
Angles
Properties

L8-L6

Shape	Axis Y-Y						Axis Z-Z				Q_s
	I	S	r	$\bar{x}$	Z	x_p	I	S	r	Tan α	F_y=36 ksi
	in.^{4}	in.^{3}	in.	in.	in.^{3}	in.	in.^{4}	in.^{3}	in.		
L8×8×1 1/8	98.1	17.5	2.41	2.40	31.6	1.05	40.9	12.0	1.56	1.00	1.00
×1	89.1	15.8	2.43	2.36	28.5	0.944	36.8	11.0	1.56	1.00	1.00
×7/8	79.7	14.0	2.45	2.31	25.3	0.831	32.7	10.0	1.57	1.00	1.00
×3/4	69.9	12.2	2.46	2.26	22.0	0.719	28.5	8.90	1.57	1.00	1.00
×5/8	59.6	10.3	2.48	2.21	18.6	0.606	24.2	7.72	1.58	1.00	0.997
×9/16	54.2	9.33	2.49	2.19	16.8	0.548	22.0	7.09	1.58	1.00	0.959
×1/2	48.8	8.36	2.49	2.17	15.1	0.490	19.7	6.44	1.59	1.00	0.912
L8×6×1	38.8	8.92	1.72	1.65	16.2	0.819	21.3	7.60	1.28	0.542	1.00
×7/8	34.9	7.94	1.74	1.60	14.4	0.719	18.9	6.71	1.28	0.546	1.00
×3/4	30.8	6.92	1.75	1.56	12.5	0.624	16.5	5.82	1.29	0.550	1.00
×5/8	26.4	5.88	1.77	1.51	10.5	0.526	14.1	4.91	1.29	0.554	0.997
×9/16	24.1	5.34	1.78	1.49	9.52	0.476	12.8	4.45	1.30	0.556	0.959
×1/2	21.7	4.79	1.79	1.46	8.52	0.425	11.5	3.98	1.30	0.557	0.912
×7/16	19.3	4.23	1.80	1.44	7.50	0.374	10.2	3.51	1.31	0.559	0.850
L8×4×1	11.6	3.94	1.03	1.04	7.73	0.694	7.87	3.48	0.844	0.247	1.00
×7/8	10.5	3.51	1.04	0.997	6.77	0.612	7.01	3.06	0.846	0.252	1.00
×3/4	9.37	3.07	1.05	0.949	5.82	0.531	6.13	2.65	0.850	0.257	1.00
×5/8	8.11	2.62	1.06	0.902	4.86	0.448	5.24	2.24	0.856	0.262	0.997
×9/16	7.44	2.38	1.07	0.878	4.39	0.406	4.79	2.03	0.859	0.264	0.959
×1/2	6.75	2.15	1.08	0.854	3.91	0.363	4.32	1.82	0.863	0.266	0.912
×7/16	6.03	1.90	1.09	0.829	3.42	0.319	3.84	1.61	0.867	0.268	0.850
L7×4×3/4	9.00	3.01	1.08	1.00	5.60	0.553	5.64	2.57	0.855	0.324	1.00
×5/8	7.79	2.56	1.10	0.958	4.69	0.464	4.80	2.16	0.860	0.329	1.00
×1/2	6.48	2.10	1.11	0.910	3.77	0.376	3.95	1.76	0.866	0.334	0.965
×7/16	5.79	1.86	1.12	0.886	3.31	0.331	3.50	1.55	0.869	0.337	0.912
×3/8	5.06	1.61	1.12	0.861	2.84	0.286	3.05	1.34	0.873	0.339	0.840
L6×6×1	35.4	8.55	1.79	1.86	15.4	0.917	15.0	5.70	1.17	1.00	1.00
×7/8	31.9	7.61	1.81	1.81	13.7	0.813	13.3	5.18	1.17	1.00	1.00
×3/4	28.1	6.64	1.82	1.77	11.9	0.705	11.6	4.63	1.17	1.00	1.00
×5/8	24.1	5.64	1.84	1.72	10.1	0.594	9.83	4.04	1.17	1.00	1.00
×9/16	22.0	5.12	1.85	1.70	9.18	0.538	8.94	3.73	1.18	1.00	1.00
×1/2	19.9	4.59	1.86	1.67	8.22	0.481	8.04	3.40	1.18	1.00	1.00
×7/16	17.6	4.06	1.86	1.65	7.25	0.423	7.11	3.05	1.18	1.00	0.973
×3/8	15.4	3.51	1.87	1.62	6.27	0.365	6.17	2.69	1.19	1.00	0.912
×5/16	13.0	2.95	1.88	1.60	5.26	0.306	5.20	2.30	1.19	1.00	0.826

Note: For workable gages, refer to Table 1-7A. For compactness criteria, refer to Table 1-7B.

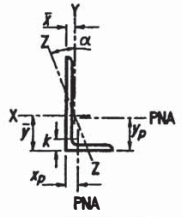


Table 1-7 (continued)
Angles
Properties

Shape	k	Wt.	Area, A	Axis X-X						Flexural-Torsional Properties		
				I	S	r	ȳ	Z	y_p	J	C_w	$\bar{r}_o$
	in.	lb/ft	in.²	in.⁴	in.³	in.	in.	in.³	in.	in.⁴	in.⁶	in.
L6×4×7/8	1 3/8	27.2	8.00	27.7	7.13	1.86	2.12	12.7	1.43	2.03	4.04	2.82
×3/4	1 1/4	23.6	6.94	24.5	6.23	1.88	2.07	11.1	1.37	1.31	2.64	2.85
×5/8	1 1/8	20.0	5.86	21.0	5.29	1.89	2.03	9.44	1.31	0.775	1.59	2.88
×9/16	1 1/16	18.1	5.31	19.2	4.81	1.90	2.00	8.59	1.28	0.572	1.18	2.90
×1/2	1	16.2	4.75	17.3	4.31	1.91	1.98	7.71	1.25	0.407	0.843	2.91
×7/16	15/16	14.3	4.18	15.4	3.81	1.92	1.95	6.81	1.22	0.276	0.575	2.93
×3/8	7/8	12.3	3.61	13.4	3.30	1.93	1.93	5.89	1.19	0.177	0.369	2.94
×5/16	13/16	10.3	3.03	11.4	2.77	1.94	1.90	4.96	1.15	0.104	0.217	2.96
L6×3 1/2×1/2	1	15.3	4.50	16.6	4.23	1.92	2.07	7.49	1.50	0.386	0.779	2.88
×3/8	7/8	11.7	3.44	12.9	3.23	1.93	2.02	5.74	1.41	0.168	0.341	2.90
×5/16	13/16	9.80	2.89	10.9	2.72	1.94	2.00	4.84	1.38	0.0990	0.201	2.92
L5×5×7/8	1 3/8	27.2	8.00	17.8	5.16	1.49	1.56	9.31	0.800	2.07	3.53	2.64
×3/4	1 1/4	23.6	6.98	15.7	4.52	1.50	1.52	8.14	0.698	1.33	2.32	2.67
×5/8	1 1/8	20.0	5.90	13.6	3.85	1.52	1.47	6.93	0.590	0.792	1.40	2.70
×1/2	1	16.2	4.79	11.3	3.15	1.53	1.42	5.66	0.479	0.417	0.744	2.73
×7/16	15/16	14.3	4.22	10.0	2.78	1.54	1.40	5.00	0.422	0.284	0.508	2.74
×3/8	7/8	12.3	3.65	8.76	2.41	1.55	1.37	4.33	0.365	0.183	0.327	2.76
×5/16	13/16	10.3	3.07	7.44	2.04	1.56	1.35	3.65	0.307	0.108	0.193	2.77
L5×3 1/2×3/4	13/16	19.8	5.85	13.9	4.26	1.55	1.74	7.60	1.10	1.09	1.52	2.36
×5/8	1 1/16	16.8	4.93	12.0	3.63	1.56	1.69	6.50	1.06	0.651	0.918	2.39
×1/2	15/16	13.6	4.00	10.0	2.97	1.58	1.65	5.33	1.00	0.343	0.491	2.42
×3/8	13/16	10.4	3.05	7.75	2.28	1.59	1.60	4.09	0.933	0.150	0.217	2.45
×5/16	3/4	8.70	2.56	6.58	1.92	1.60	1.57	3.45	0.904	0.0883	0.128	2.47
×1/4	11/16	7.00	2.07	5.36	1.55	1.61	1.55	2.78	0.860	0.0464	0.0670	2.48
L5×3×1/2	15/16	12.8	3.75	9.43	2.89	1.58	1.74	5.12	1.25	0.322	0.444	2.38
×7/16	7/8	11.3	3.31	8.41	2.56	1.59	1.72	4.53	1.22	0.220	0.304	2.39
×3/8	13/16	9.80	2.86	7.35	2.22	1.60	1.69	3.93	1.19	0.141	0.196	2.41
×5/16	3/4	8.20	2.41	6.24	1.87	1.61	1.67	3.32	1.14	0.0832	0.116	2.42
×1/4	11/16	6.60	1.94	5.09	1.51	1.62	1.64	2.68	1.12	0.0438	0.0606	2.43
L4×4×3/4	1 1/8	18.5	5.44	7.62	2.79	1.18	1.27	5.02	0.680	1.02	1.12	2.10
×5/8	1	15.7	4.61	6.62	2.38	1.20	1.22	4.28	0.576	0.610	0.680	2.13
×1/2	7/8	12.8	3.75	5.52	1.96	1.21	1.18	3.50	0.469	0.322	0.366	2.16
×7/16	13/16	11.3	3.30	4.93	1.73	1.22	1.15	3.10	0.413	0.220	0.252	2.18
×3/8	3/4	9.80	2.86	4.32	1.50	1.23	1.13	2.69	0.358	0.141	0.162	2.19
×5/16	11/16	8.20	2.40	3.67	1.27	1.24	1.11	2.26	0.300	0.0832	0.0963	2.21
×1/4	5/8	6.60	1.93	3.00	1.03	1.25	1.08	1.82	0.241	0.0438	0.0505	2.22

Note: For workable gages, refer to Table 1-7A. For compactness criteria, refer to Table 1-7B.

Table 1-7 (continued)
Angles
Properties

L6-L4

Shape	Axis Y-Y						Axis Z-Z			Tan α	Q_s
	I	S	r	$\bar{x}$	Z	x_p	I	S	r		F_y = 36 ksi
	in.⁴	in.³	in.	in.	in.³	in.	in.⁴	in.³	in.		
L6×4×7/8	9.70	3.37	1.10	1.12	6.26	0.667	5.82	2.91	0.854	0.421	1.00
×3/4	8.63	2.95	1.12	1.07	5.42	0.578	5.08	2.51	0.856	0.428	1.00
×5/8	7.48	2.52	1.13	1.03	4.56	0.488	4.32	2.12	0.859	0.435	1.00
×9/16	6.86	2.29	1.14	1.00	4.13	0.443	3.94	1.92	0.861	0.438	1.00
×1/2	6.22	2.06	1.14	0.981	3.69	0.396	3.55	1.72	0.864	0.440	1.00
×7/16	5.56	1.83	1.15	0.957	3.24	0.348	3.14	1.51	0.867	0.443	0.973
×3/8	4.86	1.58	1.16	0.933	2.79	0.301	2.73	1.31	0.870	0.446	0.912
×5/16	4.13	1.34	1.17	0.908	2.33	0.253	2.31	1.10	0.874	0.449	0.826
L6×3 1/2×1/2	4.24	1.59	0.968	0.829	2.88	0.375	2.58	1.34	0.756	0.343	1.00
×3/8	3.33	1.22	0.984	0.781	2.18	0.287	2.00	1.02	0.763	0.349	0.912
×5/16	2.84	1.03	0.991	0.756	1.82	0.241	1.70	0.859	0.767	0.352	0.826
L5×5×7/8	17.8	5.16	1.49	1.56	9.31	0.800	7.56	3.43	0.971	1.00	1.00
×3/4	15.7	4.52	1.50	1.52	8.14	0.698	6.59	3.08	0.972	1.00	1.00
×5/8	13.6	3.85	1.52	1.47	6.93	0.590	5.61	2.70	0.975	1.00	1.00
×1/2	11.3	3.15	1.53	1.42	5.66	0.479	4.60	2.29	0.980	1.00	1.00
×7/16	10.0	2.78	1.54	1.40	5.00	0.422	4.08	2.06	0.983	1.00	1.00
×3/8	8.76	2.41	1.55	1.37	4.33	0.365	3.55	1.83	0.986	1.00	0.983
×5/16	7.44	2.04	1.56	1.35	3.65	0.307	3.01	1.58	0.990	1.00	0.912
L5×3 1/2×3/4	5.52	2.20	0.974	0.993	4.07	0.585	3.22	1.90	0.744	0.464	1.00
×5/8	4.80	1.88	0.987	0.947	3.43	0.493	2.74	1.60	0.746	0.472	1.00
×1/2	4.02	1.55	1.00	0.901	2.79	0.400	2.25	1.29	0.750	0.479	1.00
×3/8	3.15	1.19	1.02	0.854	2.12	0.305	1.74	0.985	0.755	0.485	0.983
×5/16	2.69	1.01	1.02	0.829	1.77	0.256	1.47	0.827	0.758	0.489	0.912
×1/4	2.20	0.816	1.03	0.804	1.42	0.207	1.19	0.667	0.761	0.491	0.804
L5×3×1/2	2.55	1.13	0.824	0.746	2.08	0.375	1.55	0.953	0.642	0.357	1.00
×7/16	2.29	1.00	0.831	0.722	1.82	0.331	1.37	0.840	0.644	0.361	1.00
×3/8	2.01	0.874	0.838	0.698	1.57	0.286	1.20	0.726	0.646	0.364	0.983
×5/16	1.72	0.739	0.846	0.673	1.31	0.241	1.01	0.610	0.649	0.368	0.912
×1/4	1.41	0.600	0.853	0.648	1.05	0.194	0.825	0.491	0.652	0.371	0.804
L4×4×3/4	7.62	2.79	1.18	1.27	5.02	0.680	3.25	1.81	0.774	1.00	1.00
×5/8	6.62	2.38	1.20	1.22	4.28	0.576	2.76	1.59	0.774	1.00	1.00
×1/2	5.52	1.96	1.21	1.18	3.50	0.469	2.25	1.35	0.776	1.00	1.00
×7/16	4.93	1.73	1.22	1.15	3.10	0.413	2.00	1.22	0.777	1.00	1.00
×3/8	4.32	1.50	1.23	1.13	2.69	0.358	1.73	1.08	0.779	1.00	1.00
×5/16	3.67	1.27	1.24	1.11	2.26	0.300	1.46	0.936	0.781	1.00	0.997
×1/4	3.00	1.03	1.25	1.08	1.82	0.241	1.18	0.776	0.783	1.00	0.912

Note: For workable gages, refer to Table 1-7A. For compactness criteria, refer to Table 1-7B.

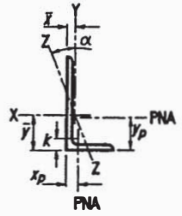


Table 1-7 (continued)
Angles
Properties

Shape	k	Wt.	Area, A	Axis X-X						Flexural-Torsional Properties		
				I	S	r	ȳ	Z	y_p	J	C_w	$\bar{r}_o$
	in.	lb/ft	in.²	in.⁴	in.³	in.	in.	in.³	in.	in.⁴	in.⁶	in.
L4×3½×½	⅞	11.9	3.50	5.30	1.92	1.23	1.24	3.46	0.500	0.301	0.302	2.03
×⅜	¾	9.10	2.68	4.15	1.48	1.25	1.20	2.66	0.427	0.132	0.134	2.06
×5/16	11/16	7.70	2.25	3.53	1.25	1.25	1.17	2.24	0.400	0.0782	0.0798	2.08
×¼	⅝	6.20	1.82	2.89	1.01	1.26	1.14	1.81	0.360	0.0412	0.0419	2.09
L4×3×⅝	1	13.6	3.99	6.01	2.28	1.23	1.37	4.08	0.808	0.529	0.472	1.91
×½	⅞	11.1	3.25	5.02	1.87	1.24	1.32	3.36	0.750	0.281	0.255	1.94
×⅜	¾	8.50	2.49	3.94	1.44	1.26	1.27	2.60	0.680	0.123	0.114	1.97
×5/16	11/16	7.20	2.09	3.36	1.22	1.27	1.25	2.19	0.656	0.0731	0.0676	1.98
×¼	⅝	5.80	1.69	2.75	0.988	1.27	1.22	1.77	0.620	0.0386	0.0356	1.99
L3½×3½×½	⅞	11.1	3.25	3.63	1.48	1.05	1.05	2.66	0.464	0.281	0.238	1.87
×7/16	13/16	9.80	2.89	3.25	1.32	1.06	1.03	2.36	0.413	0.192	0.164	1.89
×⅜	¾	8.50	2.50	2.86	1.15	1.07	1.00	2.06	0.357	0.123	0.106	1.90
×5/16	11/16	7.20	2.10	2.44	0.969	1.08	0.979	1.74	0.300	0.0731	0.0634	1.92
×¼	⅝	5.80	1.70	2.00	0.787	1.09	0.954	1.41	0.243	0.0386	0.0334	1.93
L3½×3×½	⅞	10.2	3.02	3.45	1.45	1.07	1.12	2.61	0.480	0.260	0.191	1.75
×7/16	13/16	9.10	2.67	3.10	1.29	1.08	1.09	2.32	0.449	0.178	0.132	1.76
×⅜	¾	7.90	2.32	2.73	1.12	1.09	1.07	2.03	0.407	0.114	0.0858	1.78
×5/16	11/16	6.60	1.95	2.33	0.951	1.09	1.05	1.72	0.380	0.0680	0.0512	1.79
×¼	⅝	5.40	1.58	1.92	0.773	1.10	1.02	1.39	0.340	0.0360	0.0270	1.80
L3½×2½×½	⅞	9.40	2.77	3.24	1.41	1.08	1.20	2.52	0.730	0.234	0.159	1.66
×⅜	¾	7.20	2.12	2.56	1.09	1.10	1.15	1.96	0.673	0.103	0.0714	1.69
×5/16	11/16	6.10	1.79	2.20	0.925	1.11	1.13	1.67	0.636	0.0611	0.0426	1.71
×¼	⅝	4.90	1.45	1.81	0.753	1.12	1.10	1.36	0.600	0.0322	0.0225	1.72
L3×3×½	⅞	9.40	2.76	2.20	1.06	0.895	0.929	1.91	0.460	0.230	0.144	1.59
×7/16	13/16	8.30	2.43	1.98	0.946	0.903	0.907	1.70	0.405	0.157	0.100	1.60
×⅜	¾	7.20	2.11	1.75	0.825	0.910	0.884	1.48	0.352	0.101	0.0652	1.62
×5/16	11/16	6.10	1.78	1.50	0.699	0.918	0.860	1.26	0.297	0.0597	0.0390	1.64
×¼	⅝	4.90	1.44	1.23	0.569	0.926	0.836	1.02	0.240	0.0313	0.0206	1.65
×3/16	9/16	3.71	1.09	0.948	0.433	0.933	0.812	0.774	0.182	0.0136	0.00899	1.67
L3×2½×½	⅞	8.50	2.50	2.07	1.03	0.910	0.995	1.86	0.500	0.213	0.112	1.46
×7/16	13/16	7.60	2.22	1.87	0.921	0.917	0.972	1.66	0.463	0.146	0.0777	1.48
×⅜	¾	6.60	1.93	1.65	0.803	0.924	0.949	1.45	0.427	0.0943	0.0507	1.49
×5/16	11/16	5.60	1.63	1.41	0.681	0.932	0.925	1.23	0.392	0.0560	0.0304	1.51
×¼	⅝	4.50	1.32	1.16	0.555	0.940	0.900	1.000	0.360	0.0296	0.0161	1.52
×3/16	9/16	3.39	1.00	0.899	0.423	0.947	0.874	0.761	0.333	0.0130	0.00705	1.54

Note: For workable gages, refer to Table 1-7A. For compactness criteria, refer to Table 1-7B.

Table 1-7 (continued)
Angles
Properties

L4-L3

Shape	Axis Y-Y						Axis Z-Z				Q_s
	I	S	r	x̄	Z	x_p	I	S	r	Tan α	F_y=36 ksi
	in.⁴	in.³	in.	in.	in.³	in.	in.⁴	in.³	in.		
L4×3½×½	3.76	1.50	1.04	0.994	2.69	0.438	1.80	1.17	0.716	0.750	1.00
×⅜	2.96	1.16	1.05	0.947	2.06	0.335	1.38	0.938	0.719	0.755	1.00
×5/16	2.52	0.980	1.06	0.923	1.74	0.281	1.17	0.811	0.721	0.757	0.997
×¼	2.07	0.794	1.07	0.897	1.40	0.228	0.950	0.653	0.723	0.759	0.912
L4×3×⅝	2.85	1.34	0.845	0.867	2.45	0.499	1.59	1.13	0.631	0.534	1.00
×½	2.40	1.10	0.858	0.822	1.99	0.406	1.30	0.927	0.633	0.542	1.00
×⅜	1.89	0.851	0.873	0.775	1.52	0.311	1.01	0.705	0.636	0.551	1.00
×5/16	1.62	0.721	0.880	0.750	1.28	0.261	0.851	0.591	0.638	0.554	0.997
×¼	1.33	0.585	0.887	0.725	1.03	0.211	0.691	0.476	0.639	0.558	0.912
L3½×3½×½	3.63	1.48	1.05	1.05	2.66	0.464	1.51	1.01	0.679	1.00	1.00
×7/16	3.25	1.32	1.06	1.03	2.36	0.413	1.34	0.920	0.681	1.00	1.00
×⅜	2.86	1.15	1.07	1.00	2.06	0.357	1.17	0.821	0.683	1.00	1.00
×5/16	2.44	0.969	1.08	0.979	1.74	0.300	0.989	0.714	0.685	1.00	1.00
×¼	2.00	0.787	1.09	0.954	1.41	0.243	0.807	0.598	0.688	1.00	0.965
L3½×3×½	2.32	1.09	0.877	0.869	1.97	0.431	1.15	0.851	0.618	0.713	1.00
×7/16	2.09	0.971	0.885	0.846	1.75	0.381	1.03	0.774	0.620	0.717	1.00
×⅜	1.84	0.847	0.892	0.823	1.52	0.331	0.895	0.692	0.622	0.720	1.00
×5/16	1.58	0.718	0.900	0.798	1.28	0.279	0.761	0.602	0.624	0.722	1.00
×¼	1.30	0.585	0.908	0.773	1.04	0.226	0.623	0.487	0.628	0.725	0.965
L3½×2½×½	1.36	0.756	0.701	0.701	1.39	0.396	0.782	0.649	0.532	0.485	1.00
×⅜	1.09	0.589	0.716	0.655	1.07	0.303	0.608	0.496	0.535	0.495	1.00
×5/16	0.937	0.501	0.723	0.632	0.900	0.256	0.518	0.419	0.538	0.500	1.00
×¼	0.775	0.410	0.731	0.607	0.728	0.207	0.425	0.340	0.541	0.504	0.965
L3×3×½	2.20	1.06	0.895	0.929	1.91	0.460	0.924	0.703	0.580	1.00	1.00
×7/16	1.98	0.946	0.903	0.907	1.70	0.405	0.819	0.639	0.580	1.00	1.00
×⅜	1.75	0.825	0.910	0.884	1.48	0.352	0.712	0.570	0.581	1.00	1.00
×5/16	1.50	0.699	0.918	0.860	1.26	0.297	0.603	0.496	0.583	1.00	1.00
×¼	1.23	0.569	0.926	0.836	1.02	0.240	0.491	0.415	0.585	1.00	1.00
×3/16	0.948	0.433	0.933	0.812	0.774	0.182	0.374	0.326	0.586	1.00	0.912
L3×2½×½	1.29	0.736	0.718	0.746	1.34	0.417	0.666	0.568	0.516	0.666	1.00
×7/16	1.17	0.656	0.724	0.724	1.19	0.370	0.591	0.517	0.516	0.671	1.00
×⅜	1.03	0.573	0.731	0.701	1.03	0.322	0.514	0.463	0.517	0.675	1.00
×5/16	0.888	0.487	0.739	0.677	0.873	0.272	0.437	0.404	0.518	0.679	1.00
×¼	0.734	0.397	0.746	0.653	0.707	0.220	0.356	0.327	0.520	0.683	1.00
×3/16	0.568	0.303	0.753	0.627	0.536	0.167	0.272	0.247	0.521	0.687	0.912

Note: For workable gages, refer to Table 1-7A. For compactness criteria, refer to Table 1-7B.

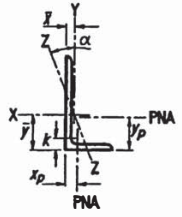
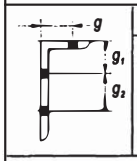


Table 1-7 (continued)
Angles
Properties

Shape	k	Wt.	Area, A	Axis X-X						Flexural-Torsional Properties		
				I	S	r	ȳ	Z	y_p	J	C_w	$\bar{r}_o$
	in.	lb/ft	in.²	in.⁴	in.³	in.	in.	in.³	in.	in.⁴	in.⁶	in.
L3×2×1/2	13/16	7.70	2.26	1.92	1.00	0.922	1.08	1.78	0.740	0.192	0.0908	1.39
×3/8	11/16	5.90	1.75	1.54	0.779	0.937	1.03	1.39	0.667	0.0855	0.0413	1.42
×5/16	5/8	5.00	1.48	1.32	0.662	0.945	1.01	1.19	0.632	0.0510	0.0248	1.43
×1/4	9/16	4.10	1.20	1.09	0.541	0.953	0.980	0.969	0.600	0.0270	0.0132	1.45
×3/16	1/2	3.07	0.917	0.847	0.414	0.961	0.952	0.743	0.555	0.0119	0.00576	1.46
L2 1/2×2 1/2×1/2	3/4	7.70	2.26	1.22	0.716	0.735	0.803	1.29	0.452	0.188	0.0791	1.30
×3/8	5/8	5.90	1.73	0.972	0.558	0.749	0.758	1.01	0.346	0.0833	0.0362	1.33
×5/16	9/16	5.00	1.46	0.837	0.474	0.756	0.735	0.853	0.292	0.0495	0.0218	1.35
×1/4	1/2	4.10	1.19	0.692	0.387	0.764	0.711	0.695	0.238	0.0261	0.0116	1.36
×3/16	7/16	3.07	0.901	0.535	0.295	0.771	0.687	0.529	0.180	0.0114	0.00510	1.38
L2 1/2×2×3/8	5/8	5.30	1.55	0.914	0.546	0.766	0.826	0.982	0.433	0.0746	0.0268	1.22
×5/16	9/16	4.50	1.32	0.790	0.465	0.774	0.803	0.839	0.388	0.0444	0.0162	1.23
×1/4	1/2	3.62	1.07	0.656	0.381	0.782	0.779	0.688	0.360	0.0235	0.00868	1.25
×3/16	7/16	2.75	0.818	0.511	0.293	0.790	0.754	0.529	0.319	0.0103	0.00382	1.26
L2 1/2×1 1/2×1/4	1/2	3.19	0.947	0.594	0.364	0.792	0.866	0.644	0.606	0.0209	0.00694	1.19
×3/16	7/16	2.44	0.724	0.464	0.280	0.801	0.839	0.497	0.569	0.00921	0.00306	1.20
L2×2×3/8	5/8	4.70	1.37	0.476	0.348	0.591	0.632	0.629	0.343	0.0658	0.0174	1.05
×5/16	9/16	3.92	1.16	0.414	0.298	0.598	0.609	0.537	0.290	0.0393	0.0106	1.06
×1/4	1/2	3.19	0.944	0.346	0.244	0.605	0.586	0.440	0.236	0.0209	0.00572	1.08
×3/16	7/16	2.44	0.722	0.271	0.188	0.612	0.561	0.338	0.181	0.00921	0.00254	1.09
×1/8	3/8	1.65	0.491	0.189	0.129	0.620	0.534	0.230	0.123	0.00293	0.000789	1.10

Table 1-7A
Workable Gages in Angle Legs, in.



Leg	8	7	6	5	4	3 1/2	3	2 1/2	2	1 3/4	1 1/2	1 3/8	1 1/4	1
g	4 1/2	4	3 1/2	3	2 1/2	2	1 3/4	1 3/8	1 1/8	1	7/8	7/8	3/4	5/8
g_1	3	2 1/2	2 1/4	2										
g_2	3	3	2 1/2	1 3/4										

Note: Other gages are permitted to suit specific requirements subject to clearances and edge distance limitations.

Table 1-7 (continued)
Angles
Properties

L3-L2

Shape	Axis Y-Y						Axis Z-Z			Q_s	
	I	S	r	$\bar{x}$	Z	x_p	I	S	r	Tan α	F_y = 36 ksi
	in.⁴	in.³	in.	in.	in.³	in.	in.⁴	in.³	in.		
L3×2×1/2	0.667	0.470	0.543	0.580	0.887	0.377	0.409	0.411	0.425	0.413	1.00
×3/8	0.539	0.368	0.555	0.535	0.679	0.292	0.318	0.313	0.426	0.426	1.00
×5/16	0.467	0.314	0.562	0.511	0.572	0.247	0.271	0.264	0.428	0.432	1.00
×1/4	0.390	0.258	0.569	0.487	0.463	0.200	0.223	0.214	0.431	0.437	1.00
×3/16	0.305	0.198	0.577	0.462	0.351	0.153	0.173	0.163	0.435	0.442	0.912
L2 1/2×2 1/2×1/2	1.22	0.716	0.735	0.803	1.29	0.452	0.521	0.459	0.481	1.00	1.00
×3/8	0.972	0.558	0.749	0.758	1.01	0.346	0.400	0.373	0.481	1.00	1.00
×5/16	0.837	0.474	0.756	0.735	0.853	0.292	0.339	0.326	0.481	1.00	1.00
×1/4	0.692	0.387	0.764	0.711	0.695	0.238	0.275	0.274	0.482	1.00	1.00
×3/16	0.535	0.295	0.771	0.687	0.529	0.180	0.210	0.216	0.482	1.00	0.983
L2 1/2×2×3/8	0.513	0.361	0.574	0.578	0.657	0.310	0.273	0.295	0.419	0.612	1.00
×5/16	0.446	0.309	0.581	0.555	0.557	0.264	0.233	0.260	0.420	0.618	1.00
×1/4	0.372	0.253	0.589	0.532	0.454	0.214	0.191	0.213	0.423	0.624	1.00
×3/16	0.292	0.195	0.597	0.508	0.347	0.164	0.149	0.163	0.426	0.628	0.983
L2 1/2×1 1/2×1/4	0.160	0.142	0.411	0.372	0.261	0.189	0.0975	0.119	0.321	0.354	1.00
×3/16	0.126	0.110	0.418	0.347	0.198	0.145	0.0760	0.0914	0.324	0.360	0.983
L2×2×3/8	0.476	0.348	0.591	0.632	0.629	0.343	0.203	0.227	0.386	1.00	1.00
×5/16	0.414	0.298	0.598	0.609	0.537	0.290	0.173	0.200	0.386	1.00	1.00
×1/4	0.346	0.244	0.605	0.586	0.440	0.236	0.141	0.171	0.387	1.00	1.00
×3/16	0.271	0.188	0.612	0.561	0.338	0.181	0.109	0.137	0.389	1.00	1.00
×1/8	0.189	0.129	0.620	0.534	0.230	0.123	0.0751	0.0994	0.391	1.00	0.912

Table 1-7B
Compactness Criteria for Angles

t	Compression	Flexure		t	Compression	Flexure	
	nonslender up to	compact up to	noncompact up to		nonslender up to	compact up to	noncompact up to
	Width of angle leg, in.				Width of angle leg, in.		
1 1/8	8	8	—	7/16	5	6	8
1	↓	↓	—	3/8	4	5	8
7/8	↓	↓	—	5/16	4	4	8
3/4	↓	↓	—	1/4	3	3 1/2	6
5/8	↓	↓	—	3/16	2	2 1/2	4
9/16	7	↓	—	1/8	1 1/2	1 1/2	3
1/2	6	7	8				

Note: Compactness criteria given for F_y = 36 ksi. C_y = 1.0 for all angles.

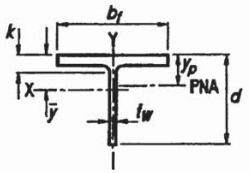


Table 1-8
WT-Shapes
Dimensions

Shape	Area, A	Depth, d		Stem			Flange				Distance		
				Thickness, t_w		$\frac{t_w}{2}$	Area	Width, b_f		Thickness, t_f		k		Workable Gage
												k_{des}	k_{det}	
	in.^{2}	in.		in.		in.	in.^{2}	in.		in.		in.	in.	in.
WT22×167.5[c]	49.2	22.0	22	1.03	1	1/2	22.6	15.9	16	1.77	1 3/4	2.56	2 5/8	5 1/2
×145[c]	42.6	21.8	21 3/4	0.865	7/8	7/16	18.9	15.8	15 7/8	1.58	1 9/16	2.36	2 7/16	
×131[c]	38.5	21.7	21 5/8	0.785	13/16	7/16	17.0	15.8	15 3/4	1.42	1 7/16	2.20	2 1/4	
×115[c,v]	33.9	21.5	21 1/2	0.710	11/16	3/8	15.2	15.8	15 3/4	1.22	1 1/4	2.01	2 1/16	
WT20×296.5[h]	87.2	21.5	21 1/2	1.79	1 13/16	15/16	38.5	16.7	16 3/4	3.23	3 1/4	4.41	4 1/2	7 1/2
×251.5[h]	74.0	21.0	21	1.54	1 9/16	13/16	32.3	16.4	16 3/8	2.76	2 3/4	3.94	4	
×215.5[h]	63.3	20.6	20 5/8	1.34	1 5/16	11/16	27.6	16.2	16 1/4	2.36	2 3/8	3.54	3 5/8	
×198.5[h]	58.3	20.5	20 1/2	1.22	1 1/4	5/8	25.0	16.1	16 1/8	2.20	2 3/16	3.38	3 1/2	
×186[h]	54.7	20.3	20 3/8	1.16	1 3/16	5/8	23.6	16.1	16 1/8	2.05	2 1/16	3.23	3 5/16	
×181[c,h]	53.2	20.3	20 1/4	1.12	1 1/8	9/16	22.7	16.0	16	2.01	2	3.19	3 1/4	
×162[c]	47.7	20.1	20 1/8	1.00	1	1/2	20.1	15.9	15 7/8	1.81	1 13/16	2.99	3 1/16	
×148.5[c]	43.6	19.9	19 7/8	0.930	15/16	1/2	18.5	15.8	15 7/8	1.65	1 5/8	2.83	2 15/16	
×138.5[c]	40.7	19.8	19 7/8	0.830	13/16	7/16	16.5	15.8	15 7/8	1.58	1 9/16	2.76	2 7/8	
×124.5[c]	36.7	19.7	19 3/4	0.750	3/4	3/8	14.8	15.8	15 3/4	1.42	1 7/16	2.60	2 11/16	
×107.5[c,v]	31.8	19.5	19 1/2	0.650	5/8	5/16	12.7	15.8	15 3/4	1.22	1 1/4	2.40	2 1/2	
×99.5[c,v]	29.2	19.3	19 3/8	0.650	5/8	5/16	12.6	15.8	15 3/4	1.07	1 1/16	2.25	2 5/16	
WT20×196[h]	57.8	20.8	20 3/4	1.42	1 7/16	3/4	29.4	12.4	12 3/8	2.52	2 1/2	3.70	3 13/16	7 1/2
×165.5[h]	48.8	20.4	20 3/8	1.22	1 1/4	5/8	24.9	12.2	12 1/8	2.13	2 1/8	3.31	3 3/8	
×163.5[h]	47.9	20.4	20 3/8	1.18	1 3/16	5/8	24.1	12.1	12 1/8	2.13	2 1/8	3.31	3 3/8	
×147[c]	43.1	20.2	20 1/4	1.06	1 1/16	9/16	21.4	12.0	12	1.93	1 15/16	3.11	3 3/16	
×139[c]	41.0	20.1	20 1/8	1.03	1	1/2	20.6	12.0	12	1.81	1 13/16	2.99	3 1/16	
×132[c]	38.7	20.0	20	0.960	15/16	1/2	19.2	11.9	11 7/8	1.73	1 3/4	2.91	3	
×117.5[c]	34.6	19.8	19 7/8	0.830	13/16	7/16	16.5	11.9	11 7/8	1.58	1 9/16	2.76	2 7/8	
×105.5[c]	31.1	19.7	19 5/8	0.750	3/4	3/8	14.8	11.8	11 3/4	1.42	1 7/16	2.60	2 11/16	
×91.5[c,v]	26.7	19.5	19 1/2	0.650	5/8	5/16	12.7	11.8	11 3/4	1.20	1 3/16	2.38	2 1/2	
×83.5[c,v]	24.5	19.3	19 1/4	0.650	5/8	5/16	12.5	11.8	11 3/4	1.03	1	2.21	2 5/16	
×74.5[c,v]	21.9	19.1	19 1/8	0.630	5/8	5/16	12.0	11.8	11 3/4	0.830	13/16	2.01	2 1/8	

[c] Shape is slender for compression with $F_y = 50$ ksi.
[h] Flange thickness greater than 2 in. Special requirements may apply per AISC *Specification* Section A3.1c.
[v] Shear strength controlled by buckling effects ($C_v < 1.0$) with $F_y = 50$ ksi.

Table 1-8 (continued)
WT-Shapes
Properties

WT22-WT20

Nominal Wt.	Compact Section Criteria		Axis X-X						Axis Y-Y				Q_s	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{d}{t_w}$	I	S	r	$\bar{y}$	Z	y_p	I	S	r	Z	$F_y = 50$ ksi	J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.	in.^{3}	in.	in.^{4}	in.^{3}	in.	in.^{3}		in.^{4}	in.^{6}
167.5	4.50	21.4	2170	131	6.63	5.53	234	1.54	600	75.2	3.49	118	0.824	37.2	438
145	5.02	25.2	1830	111	6.54	5.26	196	1.35	521	65.9	3.49	102	0.630	25.4	275
131	5.57	27.6	1640	99.4	6.53	5.19	176	1.22	462	58.6	3.47	90.9	0.525	18.6	200
115	6.45	30.3	1440	88.6	6.53	5.17	157	1.07	398	50.5	3.43	78.3	0.436	12.4	139
296.5	2.58	12.0	3310	209	6.16	5.66	379	2.61	1260	151	3.80	240	1.00	221	2340
251.5	2.98	13.6	2730	174	6.07	5.38	314	2.25	1020	124	3.72	197	1.00	138	1400
215.5	3.44	15.4	2290	148	6.01	5.18	266	1.95	843	104	3.65	164	1.00	88.2	881
198.5	3.66	16.8	2070	134	5.96	5.03	240	1.81	771	95.7	3.63	150	1.00	70.6	677
186	3.93	17.5	1930	126	5.95	4.98	225	1.70	709	88.3	3.60	138	1.00	57.7	558
181	3.99	18.1	1870	122	5.92	4.91	217	1.66	691	86.3	3.60	135	0.991	54.2	511
162	4.40	20.1	1650	108	5.88	4.77	192	1.50	609	76.6	3.57	119	0.890	39.6	362
148.5	4.80	21.4	1500	98.9	5.87	4.71	176	1.38	546	69.0	3.54	107	0.824	30.5	279
138.5	5.03	23.9	1360	88.6	5.78	4.50	157	1.29	522	65.9	3.58	102	0.697	25.7	218
124.5	5.55	26.3	1210	79.4	5.75	4.41	140	1.16	463	58.8	3.55	90.8	0.579	19.0	158
107.5	6.45	30.0	1030	68.0	5.71	4.28	120	1.01	398	50.5	3.54	77.8	0.445	12.4	101
99.5	7.39	29.7	988	66.5	5.81	4.47	117	0.929	347	44.1	3.45	68.2	0.454	9.12	83.5
196	2.45	14.6	2270	153	6.27	5.94	275	2.33	401	64.9	2.64	106	1.00	85.4	796
165.5	2.86	16.7	1880	128	6.21	5.74	231	2.00	322	52.9	2.57	85.7	1.00	52.5	484
163.5	2.85	17.3	1840	125	6.19	5.66	224	1.98	320	52.7	2.58	85.0	1.00	51.4	449
147	3.11	19.1	1630	111	6.14	5.51	199	1.80	281	46.7	2.55	75.0	0.940	38.2	322
139	3.31	19.5	1550	106	6.14	5.51	191	1.71	261	43.5	2.52	69.9	0.920	32.4	282
132	3.45	20.8	1450	99.2	6.11	5.41	178	1.63	246	41.3	2.52	66.0	0.854	27.9	233
117.5	3.77	23.9	1260	85.7	6.04	5.17	153	1.45	222	37.3	2.54	59.0	0.697	20.6	156
105.5	4.17	26.3	1120	76.7	6.01	5.08	137	1.31	195	33.0	2.51	52.1	0.579	15.2	113
91.5	4.92	30.0	955	65.7	5.98	4.97	117	1.13	165	28.0	2.49	44.0	0.445	9.65	71.2
83.5	5.76	29.7	899	63.7	6.05	5.19	115	1.10	141	23.9	2.40	37.8	0.454	6.99	62.9
74.5	7.11	30.3	815	59.7	6.10	5.45	108	1.72	114	19.4	2.29	30.9	0.436	4.66	51.9

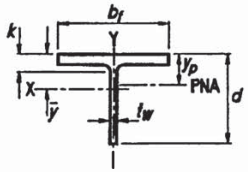


Table 1-8 (continued)
WT-Shapes
Dimensions

Shape	Area, A	Depth, d		Stem				Flange				Distance		
				Thickness, t_w		$\frac{t_w}{2}$	Area	Width, b_f		Thickness, t_f		k		Workable Gage
												k_{des}	k_{det}	
	in.^{2}	in.		in.		in.	in.^{2}	in.		in.		in.	in.	in.
WT18×326[h]	96.2	20.5	20 1/2	1.97	2	1	40.4	17.6	17 5/8	3.54	3 9/16	4.49	4 13/16	7 1/2
×264.5[h]	77.8	19.9	19 7/8	1.61	1 5/8	13/16	32.0	17.2	17 1/4	2.91	2 15/16	3.86	4 3/16	
×243.5[h]	71.7	19.7	19 5/8	1.50	1 1/2	3/4	29.5	17.1	17 1/8	2.68	2 11/16	3.63	4	
×220.5[h]	64.9	19.4	19 3/8	1.36	1 3/8	11/16	26.4	17.0	17	2.44	2 7/16	3.39	3 3/4	
×197.5[h]	58.1	19.2	19 1/4	1.22	1 1/4	5/8	23.4	16.8	16 7/8	2.20	2 3/16	3.15	3 7/16	
×180.5[h]	53.0	19.0	19	1.12	1 1/8	9/16	21.3	16.7	16 3/4	2.01	2	2.96	3 5/16	
×165[c]	48.4	18.8	18 7/8	1.02	1	1/2	19.2	16.6	16 5/8	1.85	1 7/8	2.80	3 1/8	
×151[c]	44.5	18.7	18 5/8	0.945	15/16	1/2	17.6	16.7	16 5/8	1.68	1 11/16	2.63	3	
×141[c]	41.5	18.6	18 1/2	0.885	7/8	7/16	16.4	16.6	16 5/8	1.57	1 9/16	2.52	2 7/8	
×131[c]	38.5	18.4	18 3/8	0.840	13/16	7/16	15.5	16.6	16 1/2	1.44	1 7/16	2.39	2 3/4	
×123.5[c]	36.3	18.3	18 3/8	0.800	13/16	7/16	14.7	16.5	16 1/2	1.35	1 3/8	2.30	2 5/8	
×115.5[c]	34.1	18.2	18 1/4	0.760	3/4	3/8	13.9	16.5	16 1/2	1.26	1 1/4	2.21	2 9/16	
WT18×128[c]	37.6	18.7	18 3/4	0.960	15/16	1/2	18.0	12.2	12 1/4	1.73	1 3/4	2.48	2 5/8	5 1/2
×116[c]	34.0	18.6	18 1/2	0.870	7/8	7/16	16.1	12.1	12 1/8	1.57	1 9/16	2.32	2 7/16	
×105[c]	30.9	18.3	18 3/8	0.830	13/16	7/16	15.2	12.2	12 1/8	1.36	1 3/8	2.11	2 5/16	
×97[c]	28.5	18.2	18 1/4	0.765	3/4	3/8	14.0	12.1	12 1/8	1.26	1 1/4	2.01	2 3/16	
×91[c]	26.8	18.2	18 1/8	0.725	3/4	3/8	13.2	12.1	12 1/8	1.18	1 3/16	1.93	2 1/8	
×85[c]	25.0	18.1	18 1/8	0.680	11/16	3/8	12.3	12.0	12	1.10	1 1/8	1.85	2	
×80[c]	23.5	18.0	18	0.650	5/8	5/16	11.7	12.0	12	1.02	1	1.77	1 15/16	
×75[c]	22.1	17.9	17 7/8	0.625	5/8	5/16	11.2	12.0	12	0.940	15/16	1.69	1 7/8	
×67.5[c,v]	19.9	17.8	17 3/4	0.600	5/8	5/16	10.7	12.0	12	0.790	13/16	1.54	1 11/16	
WT16.5×193.5[h]	57.0	18.0	18	1.26	1 1/4	5/8	22.6	16.2	16 1/4	2.28	2 1/4	3.07	3 3/16	5 1/2
×177[h]	52.1	17.8	17 3/4	1.16	1 3/16	5/8	20.6	16.1	16 1/8	2.09	2 1/16	2.88	2 15/16	
×159	46.8	17.6	17 5/8	1.04	1 1/16	9/16	18.3	16.0	16	1.89	1 7/8	2.68	2 3/4	
×145.5[c]	42.8	17.4	17 3/8	0.960	15/16	1/2	16.7	15.9	15 7/8	1.73	1 3/4	2.52	2 5/8	
×131.5[c]	38.7	17.3	17 1/4	0.870	7/8	7/16	15.0	15.8	15 3/4	1.57	1 9/16	2.36	2 7/16	
×120.5[c]	35.6	17.1	17 1/8	0.830	13/16	7/16	14.2	15.9	15 7/8	1.40	1 3/8	2.19	2 1/4	
×110.5[c]	32.6	17.0	17	0.775	3/4	3/8	13.1	15.8	15 3/4	1.28	1 1/4	2.06	2 1/8	
×100.5[c]	29.7	16.8	16 7/8	0.715	11/16	3/8	12.0	15.7	15 3/4	1.15	1 1/8	1.94	2	

[c] Shape is slender for compression with $F_y = 50$ ksi.
[h] Flange thickness greater than 2 in. Special requirements may apply per AISC *Specification* Section A3.1c.
[v] Shear strength controlled by buckling effects ($C_v < 1.0$) with $F_y = 50$ ksi.

Table 1-8 (continued)
WT-Shapes
Properties

WT18-WT16.5

Nominal Wt.	Compact Section Criteria		Axis X-X						Axis Y-Y				Q_s	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{d}{t_w}$	I	S	r	$\bar{y}$	Z	y_p	I	S	r	Z	$F_y = 50$ ksi	J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.	in.^{3}	in.	in.^{4}	in.^{3}	in.	in.^{3}		in.^{4}	in.^{6}
326	2.48	10.4	3160	208	5.74	5.35	383	2.73	1610	184	4.10	290	1.00	295	3070
264.5	2.96	12.4	2440	164	5.60	4.96	298	2.26	1240	145	4.00	227	1.00	163	1600
243.5	3.19	13.1	2220	150	5.57	4.84	272	2.10	1120	131	3.96	206	1.00	128	1250
220.5	3.48	14.3	1980	134	5.52	4.69	242	1.91	997	117	3.92	184	1.00	96.6	914
197.5	3.83	15.7	1740	119	5.47	4.53	213	1.73	877	104	3.88	162	1.00	70.7	652
180.5	4.16	17.0	1570	107	5.43	4.42	192	1.59	786	94.0	3.85	146	1.00	54.1	491
165	4.49	18.4	1410	97.0	5.39	4.30	173	1.46	711	85.5	3.83	132	0.976	42.0	372
151	4.96	19.8	1280	88.8	5.37	4.22	158	1.33	648	77.8	3.82	120	0.905	32.1	285
141	5.29	21.0	1190	82.6	5.36	4.16	146	1.25	599	72.2	3.80	112	0.844	26.3	231
131	5.75	21.9	1110	77.5	5.36	4.14	137	1.16	545	65.8	3.76	102	0.799	20.8	185
123.5	6.11	22.9	1040	73.3	5.36	4.12	129	1.10	507	61.4	3.74	94.8	0.748	17.3	155
115.5	6.54	23.9	978	69.1	5.36	4.10	122	1.03	470	57.0	3.71	88.0	0.697	14.3	129
128	3.53	19.5	1210	87.4	5.66	4.92	156	1.54	264	43.2	2.65	68.5	0.920	26.4	205
116	3.86	21.4	1080	78.5	5.63	4.82	140	1.40	234	38.6	2.62	60.9	0.824	19.7	151
105	4.48	22.0	985	73.1	5.65	4.87	131	1.27	206	33.8	2.58	53.4	0.794	13.9	119
97	4.81	23.8	901	67.0	5.62	4.80	120	1.18	187	30.9	2.56	48.8	0.702	11.1	92.7
91	5.12	25.1	845	63.1	5.62	4.77	113	1.11	174	28.8	2.55	45.3	0.635	9.20	77.6
85	5.47	26.6	786	58.9	5.61	4.73	105	1.04	160	26.6	2.53	41.8	0.566	7.51	63.2
80	5.88	27.7	740	55.8	5.61	4.74	100	0.980	147	24.6	2.50	38.6	0.522	6.17	53.6
75	6.37	28.6	698	53.1	5.62	4.78	95.5	0.923	135	22.5	2.47	35.4	0.489	5.04	46.0
67.5	7.56	29.7	637	49.7	5.66	4.96	90.1	1.23	113	18.9	2.38	29.8	0.454	3.48	37.3
193.5	3.55	14.3	1460	107	5.07	4.27	193	1.76	810	100	3.77	156	1.00	73.9	615
177	3.85	15.3	1320	96.8	5.03	4.15	174	1.62	729	90.6	3.74	141	1.00	57.1	468
159	4.23	16.9	1160	85.8	4.99	4.02	154	1.46	645	80.7	3.71	125	1.00	42.1	335
145.5	4.60	18.1	1060	78.3	4.96	3.93	140	1.35	581	73.1	3.68	113	0.991	32.5	256
131.5	5.03	19.9	943	70.2	4.93	3.83	125	1.23	517	65.5	3.65	101	0.900	24.3	188
120.5	5.66	20.6	872	65.8	4.96	3.84	116	1.12	466	58.8	3.62	90.8	0.864	18.0	146
110.5	6.20	21.9	799	60.8	4.95	3.81	107	1.03	420	53.2	3.59	82.1	0.799	13.9	113
100.5	6.85	23.5	725	55.5	4.95	3.77	97.8	0.940	375	47.6	3.56	73.3	0.718	10.4	84.9

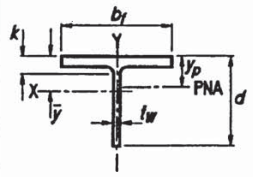


Table 1-8 (continued)
WT-Shapes
Dimensions

Shape	Area, A	Depth, d		Stem				Flange				Distance		
				Thickness, t_w		$\frac{t_w}{2}$	Area	Width, b_f		Thickness, t_f		k		Work-able Gage
												k_{des}	k_{det}	
	in.^{2}	in.		in.		in.	in.^{2}	in.		in.		in.	in.	in.
WT16.5×84.5[c]	24.7	16.9	16 7/8	0.670	11/16	3/8	11.3	11.5	11 1/2	1.22	1 1/4	1.92	2 1/8	5 1/2
×76[c]	22.5	16.7	16 3/4	0.635	5/8	5/16	10.6	11.6	11 5/8	1.06	1 1/16	1.76	1 15/16	
×70.5[c]	20.7	16.7	16 5/8	0.605	5/8	5/16	10.1	11.5	11 1/2	0.960	15/16	1.66	1 13/16	
×65[c]	19.1	16.5	16 1/2	0.580	9/16	5/16	9.60	11.5	11 1/2	0.855	7/8	1.56	1 3/4	
×59[c,v]	17.4	16.4	16 3/8	0.550	9/16	5/16	9.04	11.5	11 1/2	0.740	3/4	1.44	1 5/8	
WT15×195.5[h]	57.6	16.6	16 5/8	1.36	1 3/8	11/16	22.6	15.6	15 5/8	2.44	2 7/16	3.23	3 3/8	5 1/2
×178.5[h]	52.5	16.4	16 3/8	1.24	1 1/4	5/8	20.3	15.5	15 1/2	2.24	2 1/4	3.03	3 1/8	
×163[h]	48.0	16.2	16 1/4	1.14	1 1/8	9/16	18.5	15.4	15 3/8	2.05	2 1/16	2.84	2 15/16	
×146	43.0	16.0	16	1.02	1	1/2	16.3	15.3	15 1/4	1.85	1 7/8	2.64	2 3/4	
×130.5	38.5	15.8	15 3/4	0.930	15/16	1/2	14.7	15.2	15 1/8	1.65	1 5/8	2.44	2 9/16	
×117.5[c]	34.7	15.7	15 5/8	0.830	13/16	7/16	13.0	15.1	15	1.50	1 1/2	2.29	2 3/8	
×105.5[c]	31.1	15.5	15 1/2	0.775	3/4	3/8	12.0	15.1	15 1/8	1.32	1 5/16	2.10	2 1/4	
×95.5[c]	28.0	15.3	15 3/8	0.710	11/16	3/8	10.9	15.0	15	1.19	1 3/16	1.97	2 1/16	
×86.5[c]	25.4	15.2	15 1/4	0.655	5/8	5/16	10.0	15.0	15	1.07	1 1/16	1.85	2	
WT15×74[c]	21.8	15.3	15 3/8	0.650	5/8	5/16	10.0	10.5	10 1/2	1.18	1 3/16	1.83	2 1/16	5 1/2
×66[c]	19.5	15.2	15 1/8	0.615	5/8	5/16	9.32	10.5	10 1/2	1.00	1	1.65	1 7/8	
×62[c]	18.2	15.1	15 1/8	0.585	9/16	5/16	8.82	10.5	10 1/2	0.930	15/16	1.58	1 13/16	
×58[c]	17.1	15.0	15	0.565	9/16	5/16	8.48	10.5	10 1/2	0.850	7/8	1.50	1 3/4	
×54[c]	15.9	14.9	14 7/8	0.545	9/16	5/16	8.13	10.5	10 1/2	0.760	3/4	1.41	1 11/16	
×49.5[c]	14.5	14.8	14 7/8	0.520	1/2	1/4	7.71	10.5	10 1/2	0.670	11/16	1.32	1 9/16	
×45[c,v]	13.2	14.8	14 3/4	0.470	1/2	1/4	6.94	10.4	10 3/8	0.610	5/8	1.26	1 1/2	
WT13.5×269.5[h]	79.3	16.3	16 1/4	1.97	2	1	32.0	15.3	15 1/4	3.54	3 9/16	4.33	4 7/16	5 1/2[g]
×184[h]	54.2	15.2	15 1/4	1.38	1 3/8	11/16	21.0	14.7	14 5/8	2.48	2 1/2	3.27	3 3/8	5 1/2
×168[h]	49.5	15.0	15	1.26	1 1/4	5/8	18.9	14.6	14 1/2	2.28	2 1/4	3.07	3 3/16	
×153.5[h]	45.2	14.8	14 3/4	1.16	1 3/16	5/8	17.2	14.4	14 1/2	2.09	2 1/16	2.88	3	
×140.5	41.5	14.6	14 5/8	1.06	1 1/16	9/16	15.5	14.4	14 3/8	1.93	1 15/16	2.72	2 13/16	
×129	38.1	14.5	14 1/2	0.980	1	1/2	14.2	14.3	14 1/4	1.77	1 3/4	2.56	2 11/16	
×117.5	34.7	14.3	14 3/8	0.910	15/16	1/2	13.0	14.2	14 1/4	1.61	1 5/8	2.40	2 1/2	
×108.5	32.0	14.2	14 1/4	0.830	13/16	7/16	11.8	14.1	14 1/8	1.50	1 1/2	2.29	2 3/8	
×97[c]	28.6	14.1	14	0.750	3/4	3/8	10.5	14.0	14	1.34	1 5/16	2.13	2 1/4	
×89[c]	26.3	13.9	13 7/8	0.725	3/4	3/8	10.1	14.1	14 1/8	1.19	1 3/16	1.98	2 1/16	
×80.5[c]	23.8	13.8	13 3/4	0.660	11/16	3/8	9.10	14.0	14	1.08	1 1/16	1.87	2	
×73[c]	21.6	13.7	13 3/4	0.605	5/8	5/16	8.28	14.0	14	0.975	1	1.76	1 7/8	

[c] Shape is slender for compression with $F_y = 50$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
[h] Flange thickness greater than 2 in. Special requirements may apply per AISC *Specification* Section A3.1c.
[v] Shear strength controlled by buckling effects ($C_v < 1.0$) with $F_y = 50$ ksi.

Table 1-8 (continued)
WT-Shapes
Properties

WT16.5-WT13.5

Nominal Wt.	Compact Section Criteria		Axis X-X						Axis Y-Y				Q_s	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{d}{t_w}$	I	S	r	$\bar{y}$	Z	y_p	I	S	r	Z	$F_y = 50$ ksi	J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.	in.^{3}	in.	in.^{4}	in.^{3}	in.	in.^{3}		in.^{4}	in.^{6}
84.5	4.71	25.2	649	51.1	5.12	4.21	90.8	1.08	155	27.0	2.50	42.1	0.630	8.81	55.4
76	5.48	26.3	592	47.4	5.14	4.26	84.5	0.967	136	23.6	2.47	36.9	0.579	6.16	43.0
70.5	6.01	27.6	552	44.7	5.15	4.29	79.8	0.901	123	21.3	2.43	33.4	0.525	4.84	35.4
65	6.73	28.4	513	42.1	5.18	4.36	75.6	0.832	109	18.9	2.38	29.7	0.496	3.67	29.3
59	7.76	29.8	469	39.2	5.20	4.47	70.8	0.862	93.5	16.3	2.32	25.6	0.451	2.64	23.4
195.5	3.19	12.2	1220	96.9	4.61	4.00	177	1.85	774	99.2	3.67	155	1.00	86.3	636
178.5	3.45	13.2	1090	87.2	4.56	3.87	159	1.70	693	89.6	3.64	140	1.00	66.6	478
163	3.75	14.2	981	78.8	4.52	3.76	143	1.56	622	81.0	3.60	126	1.00	51.2	361
146	4.12	15.7	861	69.6	4.48	3.62	125	1.41	549	71.9	3.58	111	1.00	37.5	257
130.5	4.59	17.0	765	62.4	4.46	3.54	112	1.27	480	63.3	3.53	97.9	1.00	26.9	184
117.5	5.02	18.9	674	55.1	4.41	3.41	98.2	1.15	427	56.8	3.51	87.5	0.951	20.1	133
105.5	5.74	20.0	610	50.5	4.43	3.39	89.5	1.03	378	50.1	3.49	77.2	0.895	14.1	96.4
95.5	6.35	21.5	549	45.7	4.42	3.34	80.8	0.935	336	44.7	3.46	68.9	0.819	10.5	71.2
86.5	7.01	23.2	497	41.7	4.42	3.31	73.5	0.851	299	39.9	3.42	61.4	0.733	7.78	53.0
74	4.44	23.5	466	40.6	4.63	3.84	72.2	1.04	114	21.7	2.28	33.9	0.718	7.24	37.6
66	5.27	24.7	421	37.4	4.66	3.90	66.8	0.921	98.0	18.6	2.25	29.2	0.657	4.85	28.5
62	5.65	25.8	396	35.3	4.66	3.90	63.1	0.867	90.4	17.2	2.23	27.0	0.601	3.98	23.9
58	6.17	26.5	373	33.7	4.67	3.94	60.4	0.815	82.1	15.6	2.19	24.6	0.570	3.21	20.5
54	6.89	27.3	349	32.0	4.69	4.01	57.7	0.757	73.0	13.9	2.15	21.9	0.537	2.49	17.3
49.5	7.80	28.5	322	30.0	4.71	4.09	54.4	0.912	63.9	12.2	2.10	19.3	0.493	1.88	14.3
45	8.52	31.5	290	27.1	4.69	4.04	49.0	0.835	57.3	11.0	2.09	17.3	0.403	1.41	10.5
269.5	2.15	8.30	1530	128	4.39	4.34	242	2.60	1060	138	3.65	218	1.00	247	1740
184	2.96	11.0	939	81.7	4.16	3.71	151	1.85	655	89.3	3.48	140	1.00	84.5	532
168	3.19	11.9	839	73.4	4.12	3.58	135	1.70	587	80.8	3.45	126	1.00	65.4	401
153.5	3.46	12.8	753	66.4	4.08	3.47	121	1.56	527	72.9	3.41	113	1.00	50.5	304
140.5	3.72	13.8	677	59.9	4.04	3.35	109	1.44	477	66.4	3.39	103	1.00	39.6	232
129	4.03	14.8	613	54.7	4.02	3.27	98.9	1.33	430	60.2	3.36	93.3	1.00	30.7	178
117.5	4.41	15.7	556	50.0	4.00	3.20	89.9	1.22	384	54.2	3.33	83.8	1.00	23.4	135
108.5	4.71	17.1	502	45.2	3.96	3.10	81.1	1.13	352	49.9	3.32	77.0	1.00	18.8	105
97	5.24	18.8	444	40.3	3.94	3.02	71.8	1.02	309	44.1	3.29	67.8	0.956	13.5	74.3
89	5.92	19.2	414	38.2	3.97	3.04	67.7	0.932	278	39.4	3.25	60.8	0.935	10.0	57.7
80.5	6.49	20.9	372	34.4	3.95	2.98	60.8	0.849	248	35.4	3.23	54.5	0.849	7.53	42.7
73	7.16	22.6	336	31.2	3.95	2.94	55.0	0.772	222	31.7	3.20	48.8	0.763	5.62	31.7

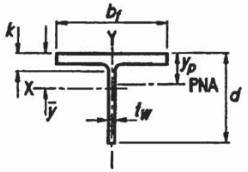


Table 1-8 (continued)
WT-Shapes
Dimensions

Shape	Area, A	Depth, d	Stem			Flange				Distance		
			Thickness, t_w		$\frac{t_w}{2}$	Area	Width, b_f		Thickness, t_f		k		Work-able Gage
											k_{des}	k_{det}	
	in.^{2}	in.	in.		in.	in.^{2}	in.		in.		in.	in.	in.
WT13.5×64.5[c]	18.9	13.8	13 7/8	0.610	5/8	5/16	8.43	10.0	10	1.10	1 1/8	1.70	2	5 1/2
×57[c]	16.8	13.6	13 5/8	0.570	9/16	5/16	7.78	10.1	10 1/8	0.930	15/16	1.53	1 13/16	
×51[c]	15.0	13.5	13 1/2	0.515	1/2	1/4	6.98	10.0	10	0.830	13/16	1.43	1 3/4	
×47[c]	13.8	13.5	13 1/2	0.490	1/2	1/4	6.60	10.0	10	0.745	3/4	1.34	1 5/8	
×42[c]	12.4	13.4	13 3/8	0.460	7/16	1/4	6.14	10.0	10	0.640	5/8	1.24	1 9/16	
WT12×185[h]	54.5	14.0	14	1.52	1 1/2	3/4	21.3	13.7	13 5/8	2.72	2 3/4	3.22	3 5/8	5 1/2
×167.5[h]	49.1	13.8	13 3/4	1.38	1 3/8	11/16	19.0	13.5	13 1/2	2.48	2 1/2	2.98	3 3/8	
×153[h]	44.9	13.6	13 5/8	1.26	1 1/4	5/8	17.1	13.4	13 3/8	2.28	2 1/4	2.78	3 3/16	
×139.5[h]	41.0	13.4	13 3/8	1.16	1 3/16	5/8	15.5	13.3	13 1/4	2.09	2 1/16	2.59	3	
×125	36.8	13.2	13 1/8	1.04	1 1/16	9/16	13.7	13.2	13 1/8	1.89	1 7/8	2.39	2 13/16	
×114.5	33.6	13.0	13	0.960	15/16	1/2	12.5	13.1	13 1/8	1.73	1 3/4	2.23	2 5/8	
×103.5	30.3	12.9	12 7/8	0.870	7/8	7/16	11.2	13.0	13	1.57	1 9/16	2.07	2 1/2	
×96	28.2	12.7	12 3/4	0.810	13/16	7/16	10.3	13.0	13	1.46	1 7/16	1.96	2 3/8	
×88	25.8	12.6	12 5/8	0.750	3/4	3/8	9.47	12.9	12 7/8	1.34	1 5/16	1.84	2 1/4	
×81	23.9	12.5	12 1/2	0.705	11/16	3/8	8.81	13.0	13	1.22	1 1/4	1.72	2 1/8	
×73[c]	21.5	12.4	12 3/8	0.650	5/8	5/16	8.04	12.9	12 7/8	1.09	1 1/16	1.59	2	
×65.5[c]	19.3	12.2	12 1/4	0.605	5/8	5/16	7.41	12.9	12 7/8	0.960	15/16	1.46	1 7/8	
×58.5[c]	17.2	12.1	12 1/8	0.550	9/16	5/16	6.67	12.8	12 3/4	0.850	7/8	1.35	1 3/4	
×52[c]	15.3	12.0	12	0.500	1/2	1/4	6.02	12.8	12 3/4	0.750	3/4	1.25	1 5/8	
WT12×51.5[c]	15.1	12.3	12 1/4	0.550	9/16	5/16	6.75	9.00	9	0.980	1	1.48	1 7/8	5 1/2
×47[c]	13.8	12.2	12 1/8	0.515	1/2	1/4	6.26	9.07	9 1/8	0.875	7/8	1.38	1 3/4	
×42[c]	12.4	12.1	12	0.470	1/2	1/4	5.66	9.02	9	0.770	3/4	1.27	1 11/16	
×38[c]	11.2	12.0	12	0.440	7/16	1/4	5.26	8.99	9	0.680	11/16	1.18	1 9/16	5 1/2[g]
×34[c]	10.0	11.9	11 7/8	0.415	7/16	1/4	4.92	8.97	9	0.585	9/16	1.09	1 1/2	5 1/2[g]
WT12×31[c]	9.11	11.9	11 7/8	0.430	7/16	1/4	5.10	7.04	7	0.590	9/16	1.09	1 1/2	3 1/2
×27.5[c,v]	8.10	11.8	11 3/4	0.395	3/8	3/16	4.66	7.01	7	0.505	1/2	1.01	1 7/16	3 1/2

[c] Shape is slender for compression with $F_y = 50$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
[h] Flange thickness greater than 2 in. Special requirements may apply per AISC *Specification* Section A3.1c.
[v] Shear strength controlled by buckling effects ($C_v < 1.0$) with $F_y = 50$ ksi.

Table 1-8 (continued)
WT-Shapes
Properties

WT13.5-WT12

Nominal Wt.	Compact Section Criteria		Axis X-X						Axis Y-Y				Q_s	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{d}{t_w}$	I	S	r	$\bar{y}$	Z	y_p	I	S	r	Z	$F_y = 50$ ksi	J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.	in.^{3}	in.	in.^{4}	in.^{3}	in.	in.^{3}		in.^{4}	in.^{6}
64.5	4.55	22.6	323	31.0	4.13	3.39	55.1	0.945	92.2	18.4	2.21	28.8	0.763	5.55	24.0
57	5.41	23.9	289	28.3	4.15	3.42	50.4	0.832	79.3	15.8	2.18	24.6	0.697	3.65	17.5
51	6.03	26.2	258	25.3	4.14	3.37	45.0	0.750	69.6	13.9	2.15	21.7	0.583	2.63	12.6
47	6.70	27.6	239	23.8	4.16	3.41	42.4	0.692	62.0	12.4	2.12	19.4	0.525	2.01	10.2
42	7.78	29.1	216	21.9	4.18	3.48	39.2	0.621	52.8	10.6	2.07	16.6	0.473	1.40	7.79
185	2.51	9.20	779	74.7	3.78	3.57	140	1.99	581	85.1	3.27	133	1.00	100	553
167.5	2.73	10.0	686	66.3	3.73	3.42	123	1.82	513	75.9	3.23	119	1.00	75.6	405
153	2.94	10.8	611	59.4	3.69	3.29	110	1.67	460	68.6	3.20	107	1.00	58.4	305
139.5	3.18	11.6	546	53.6	3.65	3.18	98.8	1.54	412	61.9	3.17	96.3	1.00	45.1	230
125	3.49	12.7	478	47.2	3.61	3.05	86.5	1.39	362	54.9	3.14	85.2	1.00	33.2	165
114.5	3.79	13.5	431	42.9	3.58	2.96	78.1	1.28	326	49.7	3.11	77.0	1.00	25.5	125
103.5	4.14	14.8	382	38.3	3.55	2.87	69.3	1.17	289	44.4	3.08	68.6	1.00	19.1	91.3
96	4.43	15.7	350	35.2	3.53	2.80	63.5	1.09	265	40.9	3.07	63.1	1.00	15.3	72.5
88	4.81	16.8	319	32.2	3.51	2.74	57.8	1.00	240	37.2	3.04	57.3	1.00	11.9	55.8
81	5.31	17.7	293	29.9	3.50	2.70	53.3	0.921	221	34.2	3.05	52.6	1.00	9.22	43.8
73	5.92	19.1	264	27.2	3.50	2.66	48.2	0.833	195	30.3	3.01	46.6	0.940	6.70	31.9
65.5	6.70	20.2	238	24.8	3.52	2.65	43.9	0.750	170	26.5	2.97	40.7	0.885	4.74	23.1
58.5	7.53	22.0	212	22.3	3.51	2.62	39.2	0.672	149	23.2	2.94	35.7	0.794	3.35	16.4
52	8.50	24.0	189	20.0	3.51	2.59	35.1	0.600	130	20.3	2.91	31.2	0.692	2.35	11.6
51.5	4.59	22.4	204	22.0	3.67	3.01	39.2	0.841	59.7	13.3	1.99	20.7	0.773	3.53	12.3
47	5.18	23.7	186	20.3	3.67	2.99	36.1	0.764	54.5	12.0	1.98	18.7	0.707	2.62	9.57
42	5.86	25.7	166	18.3	3.67	2.97	32.5	0.685	47.2	10.5	1.95	16.3	0.606	1.84	6.90
38	6.61	27.3	151	16.9	3.68	3.00	30.1	0.622	41.3	9.18	1.92	14.3	0.537	1.34	5.30
34	7.66	28.7	137	15.6	3.70	3.06	27.9	0.560	35.2	7.85	1.87	12.3	0.486	0.932	4.08
31	5.97	27.7	131	15.6	3.79	3.46	28.4	1.28	17.2	4.90	1.38	7.85	0.522	0.850	3.92
27.5	6.94	29.9	117	14.1	3.80	3.50	25.6	1.53	14.5	4.15	1.34	6.65	0.448	0.588	2.93

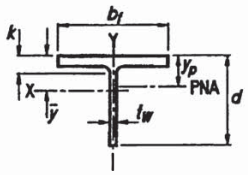
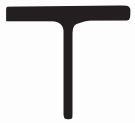


Table 1-8 (continued)
WT-Shapes
Dimensions

Shape	Area, A	Depth, d	Stem			Flange			Distance		
			Thickness, t_w		$\frac{t_w}{2}$	Area	Width, b_f		Thickness, t_f		k		Workable Gage
											k_{des}	k_{det}	
	in.^{2}	in.	in.		in.	in.^{2}	in.		in.		in.	in.	in.
WT10.5×100.5	29.6	11.5	0.910	15/16	1/2	10.5	12.6	12 5/8	1.63	1 5/8	2.13	2 1/2	5 1/2
×91	26.8	11.4	0.830	13/16	7/16	9.43	12.5	12 1/2	1.48	1 1/2	1.98	2 3/8	
×83	24.4	11.2	0.750	3/4	3/8	8.43	12.4	12 3/8	1.36	1 3/8	1.86	2 1/4	
×73.5	21.6	11.0	0.720	3/4	3/8	7.94	12.5	12 1/2	1.15	1 1/8	1.65	2	
×66	19.4	10.9	0.650	5/8	5/16	7.09	12.4	12 1/2	1.04	1 1/16	1.54	1 15/16	
×61	17.9	10.8	0.600	5/8	5/16	6.50	12.4	12 3/8	0.960	15/16	1.46	1 13/16	
×55.5[c]	16.3	10.8	0.550	9/16	5/16	5.92	12.3	12 3/8	0.875	7/8	1.38	1 3/4	
×50.5[c]	14.9	10.7	0.500	1/2	1/4	5.34	12.3	12 1/4	0.800	13/16	1.30	1 11/16	
WT10.5×46.5[c]	13.7	10.8	0.580	9/16	5/16	6.27	8.42	8 3/8	0.930	15/16	1.43	1 5/8	5 1/2
×41.5[c]	12.2	10.7	0.515	1/2	1/4	5.52	8.36	8 3/8	0.835	13/16	1.34	1 1/2	
×36.5[c]	10.7	10.6	0.455	7/16	1/4	4.83	8.30	8 1/4	0.740	3/4	1.24	1 7/16	
×34[c]	10.0	10.6	0.430	7/16	1/4	4.54	8.27	8 1/4	0.685	11/16	1.19	1 3/8	
×31[c]	9.13	10.5	0.400	3/8	3/16	4.20	8.24	8 1/4	0.615	5/8	1.12	1 5/16	
×27.5[c]	8.10	10.4	0.375	3/8	3/16	3.90	8.22	8 1/4	0.522	1/2	1.02	1 3/16	
×24[c,f,v]	7.07	10.3	0.350	3/8	3/16	3.61	8.14	8 1/8	0.430	7/16	0.930	1 1/8	
WT10.5×28.5[c]	8.37	10.5	0.405	3/8	3/16	4.26	6.56	6 1/2	0.650	5/8	1.15	1 5/16	3 1/2
×25[c]	7.36	10.4	0.380	3/8	3/16	3.96	6.53	6 1/2	0.535	9/16	1.04	1 1/4	3 1/2[g]
×22[c,v]	6.49	10.3	0.350	3/8	3/16	3.62	6.50	6 1/2	0.450	7/16	0.950	1 1/8	3 1/2[g]
WT9×155.5[h]	45.8	11.2	1.52	1 1/2	3/4	17.0	12.0	12	2.74	2 3/4	3.24	3 7/16	5 1/2
×141.5[h]	41.7	10.9	1.40	1 3/8	11/16	15.3	11.9	11 7/8	2.50	2 1/2	3.00	3 3/16	
×129[h]	38.0	10.7	1.28	1 1/4	5/8	13.7	11.8	11 3/4	2.30	2 5/16	2.70	3	
×117[h]	34.3	10.5	1.16	1 3/16	5/8	12.2	11.7	11 5/8	2.11	2 1/8	2.51	2 3/4	
×105.5	31.2	10.3	1.06	1 1/16	9/16	11.0	11.6	11 1/2	1.91	1 15/16	2.31	2 9/16	
×96	28.1	10.2	0.960	15/16	1/2	9.77	11.5	11 1/2	1.75	1 3/4	2.15	2 7/16	
×87.5	25.7	10.0	0.890	7/8	7/16	8.92	11.4	11 3/8	1.59	1 9/16	1.99	2 7/16	
×79	23.2	9.86	0.810	13/16	7/16	7.99	11.3	11 1/4	1.44	1 7/16	1.84	2 3/8	
×71.5	21.0	9.75	0.730	3/4	3/8	7.11	11.2	11 1/4	1.32	1 5/16	1.72	2 3/16	
×65	19.2	9.63	0.670	11/16	3/8	6.45	11.2	11 1/8	1.20	1 3/16	1.60	2 1/16	
×59.5	17.6	9.49	0.655	5/8	5/16	6.21	11.3	11 1/4	1.06	1 1/16	1.46	1 15/16	
×53	15.6	9.37	0.590	9/16	5/16	5.53	11.2	11 1/4	0.940	15/16	1.34	1 13/16	
×48.5	14.2	9.30	0.535	9/16	5/16	4.97	11.1	11 1/8	0.870	7/8	1.27	1 3/4	
×43[c]	12.7	9.20	0.480	1/2	1/4	4.41	11.1	11 1/8	0.770	3/4	1.17	1 5/8	
×38[c]	11.1	9.11	0.425	7/16	1/4	3.87	11.0	11	0.680	11/16	1.08	1 9/16	

[c] Shape is slender for compression with $F_y = 50$ ksi.
[f] Shape exceeds compact limit for flexure with $F_y = 50$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
[h] Flange thickness greater than 2 in. Special requirements may apply per AISC *Specification* Section A3.1c.
[v] Shear strength controlled by buckling effects ($C_v < 1.0$) with $F_y = 50$ ksi.

Table 1-8 (continued)
WT-Shapes
Properties



WT10.5-WT9

Nominal Wt.	Compact Section Criteria		Axis X-X						Axis Y-Y				Q_s	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{d}{t_w}$	I	S	r	$\bar{y}$	Z	y_p	I	S	r	Z	$F_y = 50$ ksi	J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.	in.^{3}	in.	in.^{4}	in.^{3}	in.	in.^{3}		in.^{4}	in.^{6}
100.5	3.86	12.6	285	31.9	3.10	2.57	58.6	1.18	271	43.1	3.02	66.5	1.00	20.4	85.4
91	4.22	13.7	253	28.5	3.07	2.48	52.1	1.07	241	38.6	3.00	59.5	1.00	15.3	63.0
83	4.57	14.9	226	25.5	3.04	2.39	46.3	0.983	217	35.0	2.99	53.9	1.00	11.8	47.3
73.5	5.44	15.3	204	23.7	3.08	2.39	42.4	0.864	188	30.0	2.95	46.3	1.00	7.69	32.5
66	6.01	16.8	181	21.1	3.06	2.33	37.6	0.780	166	26.7	2.93	41.1	1.00	5.62	23.4
61	6.45	18.0	166	19.3	3.04	2.28	34.3	0.724	152	24.6	2.91	37.8	1.00	4.47	18.4
55.5	7.05	19.6	150	17.5	3.03	2.23	31.0	0.662	137	22.2	2.90	34.1	0.915	3.40	13.8
50.5	7.68	21.4	135	15.8	3.01	2.18	27.9	0.605	124	20.2	2.89	30.8	0.824	2.60	10.4
46.5	4.53	18.6	144	17.9	3.25	2.74	31.8	0.812	46.4	11.0	1.84	17.3	0.966	3.01	9.33
41.5	5.00	20.8	127	15.7	3.22	2.66	28.0	0.728	40.7	9.74	1.83	15.2	0.854	2.16	6.50
36.5	5.60	23.3	110	13.8	3.21	2.60	24.4	0.647	35.3	8.51	1.81	13.3	0.728	1.51	4.42
34	6.04	24.7	103	12.9	3.20	2.59	22.9	0.606	32.4	7.83	1.80	12.2	0.657	1.22	3.62
31	6.70	26.3	93.8	11.9	3.21	2.58	21.1	0.554	28.7	6.97	1.77	10.9	0.579	0.913	2.78
27.5	7.87	27.7	84.4	10.9	3.23	2.64	19.4	0.493	24.2	5.89	1.73	9.18	0.522	0.617	2.08
24	9.47	29.4	74.9	9.90	3.26	2.74	17.8	0.459	19.4	4.76	1.66	7.44	0.463	0.400	1.52
28.5	5.04	25.9	90.4	11.8	3.29	2.85	21.2	0.638	15.3	4.67	1.35	7.40	0.597	0.884	2.50
25	6.10	27.4	80.3	10.7	3.30	2.93	19.4	0.771	12.5	3.82	1.30	6.08	0.533	0.570	1.89
22	7.22	29.4	71.1	9.68	3.31	2.98	17.6	1.06	10.3	3.18	1.26	5.07	0.463	0.383	1.40
155.5	2.19	7.37	383	46.6	2.89	2.93	90.6	1.91	398	66.2	2.95	104	1.00	87.2	339
141.5	2.38	7.79	337	41.5	2.85	2.80	80.2	1.75	352	59.2	2.91	92.5	1.00	66.5	251
129	2.56	8.36	298	37.0	2.80	2.68	71.0	1.61	314	53.4	2.88	83.1	1.00	51.1	189
117	2.76	9.05	261	32.7	2.75	2.55	62.4	1.48	279	47.9	2.85	74.4	1.00	39.1	140
105.5	3.02	9.72	229	29.1	2.72	2.44	55.0	1.34	246	42.7	2.82	66.1	1.00	29.1	102
96	3.27	10.6	202	25.8	2.68	2.34	48.5	1.23	220	38.4	2.79	59.4	1.00	22.3	75.7
87.5	3.58	11.2	181	23.4	2.66	2.26	43.6	1.13	196	34.4	2.76	53.1	1.00	16.8	56.5
79	3.92	12.2	160	20.8	2.63	2.17	38.5	1.02	174	30.7	2.74	47.4	1.00	12.5	41.2
71.5	4.25	13.4	142	18.5	2.60	2.09	34.0	0.937	156	27.7	2.72	42.7	1.00	9.58	30.7
65	4.65	14.4	127	16.7	2.58	2.02	30.5	0.856	139	24.9	2.70	38.3	1.00	7.23	22.8
59.5	5.31	14.5	119	15.9	2.60	2.03	28.7	0.778	126	22.5	2.69	34.5	1.00	5.30	17.4
53	5.96	15.9	104	14.1	2.59	1.97	25.2	0.695	110	19.7	2.66	30.2	1.00	3.73	12.1
48.5	6.41	17.4	93.8	12.7	2.56	1.91	22.6	0.640	100	18.0	2.65	27.6	1.00	2.92	9.29
43	7.20	19.2	82.4	11.2	2.55	1.86	19.9	0.570	87.6	15.8	2.63	24.2	0.935	2.04	6.42
38	8.11	21.4	71.8	9.83	2.54	1.80	17.3	0.505	76.2	13.8	2.61	21.1	0.824	1.41	4.37

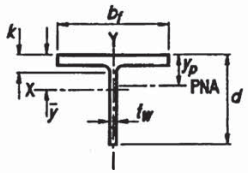


Table 1-8 (continued)
WT-Shapes
Dimensions

Shape	Area, A	Depth, d		Stem: Thickness, t_w		$\frac{t_w}{2}$	Stem: Area	Flange: Width, b_f		Flange: Thickness, t_f		Distance: k k_{des}	Distance: k k_{det}	Workable Gage
	in.^{2}	in.		in.		in.	in.^{2}	in.		in.		in.	in.	in.
WT9×35.5[c]	10.4	9.24	9 1/4	0.495	1/2	1/4	4.57	7.64	7 5/8	0.810	13/16	1.21	1 1/2	3 1/2[g]
×32.5[c]	9.55	9.18	9 1/8	0.450	7/16	1/4	4.13	7.59	7 5/8	0.750	3/4	1.15	1 7/16	
×30[c]	8.82	9.12	9 1/8	0.415	7/16	1/4	3.78	7.56	7 1/2	0.695	11/16	1.10	1 3/8	
×27.5[c]	8.10	9.06	9	0.390	3/8	3/16	3.53	7.53	7 1/2	0.630	5/8	1.03	1 5/16	
×25[c]	7.34	9.00	9	0.355	3/8	3/16	3.19	7.50	7 1/2	0.570	9/16	0.972	1 1/4	
WT9×23[c]	6.77	9.03	9	0.360	3/8	3/16	3.25	6.06	6	0.605	5/8	1.01	1 1/4	3 1/2[g]
×20[c]	5.88	8.95	9	0.315	5/16	3/16	2.82	6.02	6	0.525	1/2	0.927	1 3/16	
×17.5[c,v]	5.15	8.85	8 7/8	0.300	5/16	3/16	2.66	6.00	6	0.425	7/16	0.827	1 1/8	
WT8×50	14.7	8.49	8 1/2	0.585	9/16	5/16	4.96	10.4	10 3/8	0.985	1	1.39	1 7/8	5 1/2
×44.5	13.1	8.38	8 3/8	0.525	1/2	1/4	4.40	10.4	10 3/8	0.875	7/8	1.28	1 3/4	
×38.5[c]	11.3	8.26	8 1/4	0.455	7/16	1/4	3.76	10.3	10 1/4	0.760	3/4	1.16	1 5/8	
×33.5[c]	9.81	8.17	8 1/8	0.395	3/8	3/16	3.23	10.2	10 1/4	0.665	11/16	1.07	1 9/16	
WT8×28.5[c]	8.39	8.22	8 1/4	0.430	7/16	1/4	3.53	7.12	7 1/8	0.715	11/16	1.12	1 3/8	3 1/2[g]
×25[c]	7.37	8.13	8 1/8	0.380	3/8	3/16	3.09	7.07	7 1/8	0.630	5/8	1.03	1 5/16	
×22.5[c]	6.63	8.07	8 1/8	0.345	3/8	3/16	2.78	7.04	7	0.565	9/16	0.967	1 1/4	
×20[c]	5.89	8.01	8	0.305	5/16	3/16	2.44	7.00	7	0.505	1/2	0.907	1 3/16	3 1/2
×18[c]	5.29	7.93	7 7/8	0.295	5/16	3/16	2.34	6.99	7	0.430	7/16	0.832	1 1/8	3 1/2
WT8×15.5[c]	4.56	7.94	8	0.275	1/4	1/8	2.18	5.53	5 1/2	0.440	7/16	0.842	1 1/8	3 1/2
×13[c,v]	3.84	7.85	7 7/8	0.250	1/4	1/8	1.96	5.50	5 1/2	0.345	3/8	0.747	1 1/16	3 1/2

[c] Shape is slender for compression with $F_y = 50$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
[v] Shear strength controlled by buckling effects ($C_v < 1.0$) with $F_y = 50$ ksi.

Table 1-8 (continued)
WT-Shapes
Properties


WT9-WT8

Nominal Wt.	Compact Section Criteria: $\frac{b_f}{2t_f}$	Compact Section Criteria: $\frac{d}{t_w}$	Axis X-X: I	Axis X-X: S	Axis X-X: r	Axis X-X: $\bar{y}$	Axis X-X: Z	Axis X-X: y_p	Axis Y-Y: I	Axis Y-Y: S	Axis Y-Y: r	Axis Y-Y: Z	Q_s $F_y = 50$ ksi	Torsional Properties: J	Torsional Properties: C_w
lb/ft			in.^{4}	in.^{3}	in.	in.	in.^{3}	in.	in.^{4}	in.^{3}	in.	in.^{3}		in.^{4}	in.^{6}
35.5	4.71	18.7	78.2	11.2	2.74	2.26	20.0	0.683	30.1	7.89	1.70	12.3	0.961	1.74	3.96
32.5	5.06	20.4	70.7	10.1	2.72	2.20	18.0	0.629	27.4	7.22	1.69	11.2	0.875	1.36	3.01
30	5.44	22.0	64.7	9.29	2.71	2.16	16.5	0.583	25.0	6.63	1.68	10.3	0.794	1.08	2.35
27.5	5.98	23.2	59.5	8.63	2.71	2.16	15.3	0.538	22.5	5.97	1.67	9.26	0.733	0.830	1.84
25	6.57	25.4	53.5	7.79	2.70	2.12	13.8	0.489	20.0	5.35	1.65	8.28	0.620	0.619	1.36
23	5.01	25.1	52.1	7.77	2.77	2.33	13.9	0.558	11.3	3.71	1.29	5.84	0.635	0.609	1.20
20	5.73	28.4	44.8	6.73	2.76	2.29	12.0	0.489	9.55	3.17	1.27	4.97	0.496	0.404	0.788
17.5	7.06	29.5	40.1	6.21	2.79	2.39	11.2	0.450	7.67	2.56	1.22	4.02	0.460	0.252	0.598
50	5.29	14.5	76.8	11.4	2.28	1.76	20.7	0.706	93.1	17.9	2.51	27.4	1.00	3.85	10.4
44.5	5.92	16.0	67.2	10.1	2.27	1.70	18.1	0.631	81.3	15.7	2.49	24.0	1.00	2.72	7.19
38.5	6.77	18.2	56.9	8.59	2.24	1.63	15.3	0.549	69.2	13.4	2.47	20.5	0.986	1.78	4.61
33.5	7.70	20.7	48.6	7.36	2.22	1.56	13.0	0.481	59.5	11.6	2.46	17.7	0.859	1.19	3.01
28.5	4.98	19.1	48.7	7.77	2.41	1.94	13.8	0.589	21.6	6.06	1.60	9.42	0.940	1.10	1.99
25	5.61	21.4	42.3	6.78	2.40	1.89	12.0	0.521	18.6	5.26	1.59	8.15	0.824	0.760	1.34
22.5	6.23	23.4	37.8	6.10	2.39	1.86	10.8	0.471	16.4	4.67	1.57	7.22	0.723	0.555	0.974
20	6.93	26.3	33.1	5.35	2.37	1.81	9.43	0.421	14.4	4.12	1.56	6.36	0.579	0.396	0.673
18	8.12	26.9	30.6	5.05	2.41	1.88	8.93	0.378	12.2	3.50	1.52	5.42	0.553	0.272	0.516
15.5	6.28	28.9	27.5	4.64	2.45	2.02	8.27	0.413	6.20	2.24	1.17	3.51	0.479	0.230	0.366
13	7.97	31.4	23.5	4.09	2.47	2.09	7.36	0.372	4.79	1.74	1.12	2.73	0.406	0.130	0.243

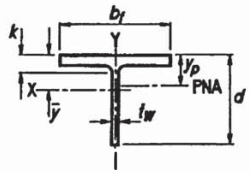


Table 1-8 (continued)
WT-Shapes
Dimensions

Shape	Area, A	Depth, d	Stem			Flange				Distance		
			Thickness, t_w		$\frac{t_w}{2}$	Area	Width, b_f		Thickness, t_f		k		Workable Gage
											k_{des}	k_{det}	
	in.^{2}	in.	in.		in.	in.^{2}	in.		in.		in.	in.	in.
WT7×365[h]	107	11.2	11 1/4	3.07	3 1/16	1 9/16	34.4	17.9	17 7/8	4.91	4 15/16	5.51	6 3/16	7 1/2[g]
×332.5[h]	97.8	10.8	10 7/8	2.83	2 13/16	1 7/16	30.6	17.7	17 5/8	4.52	4 1/2	5.12	5 13/16	7 1/2[g]
×302.5[h]	89.0	10.5	10 1/2	2.60	2 5/8	1 5/16	27.1	17.4	17 3/8	4.16	4 3/16	4.76	5 7/16	7 1/2
×275[h]	80.9	10.1	10 1/8	2.38	2 3/8	1 3/16	24.1	17.2	17 1/4	3.82	3 13/16	4.42	5 1/8	
×250[h]	73.5	9.80	9 3/4	2.19	2 3/16	1 1/8	21.5	17.0	17	3.50	3 1/2	4.10	4 13/16	
×227.5[h]	66.9	9.51	9 1/2	2.02	2	1	19.2	16.8	16 7/8	3.21	3 3/16	3.81	4 1/2	
×213[h]	62.7	9.34	9 3/8	1.88	1 7/8	15/16	17.5	16.7	16 3/4	3.04	3 1/16	3.63	4 5/16	
×199[h]	58.4	9.15	9 1/8	1.77	1 3/4	7/8	16.2	16.6	16 5/8	2.85	2 7/8	3.44	4 1/8	
×185[h]	54.4	8.96	9	1.66	1 11/16	13/16	14.8	16.5	16 1/2	2.66	2 11/16	3.26	3 15/16	
×171[h]	50.3	8.77	8 3/4	1.54	1 9/16	13/16	13.5	16.4	16 3/8	2.47	2 1/2	3.07	3 3/4	
×155.5[h]	45.7	8.56	8 1/2	1.41	1 7/16	3/4	12.1	16.2	16 1/4	2.26	2 1/4	2.86	3 9/16	
×141.5[h]	41.6	8.37	8 3/8	1.29	1 5/16	11/16	10.8	16.1	16 1/8	2.07	2 1/16	2.67	3 3/8	
×128.5	37.8	8.19	8 1/4	1.18	1 3/16	5/8	9.62	16.0	16	1.89	1 7/8	2.49	3 3/16	
×116.5	34.2	8.02	8	1.07	1 1/16	9/16	8.58	15.9	15 7/8	1.72	1 3/4	2.32	3	
×105.5	31.0	7.86	7 7/8	0.980	1	1/2	7.70	15.8	15 3/4	1.56	1 9/16	2.16	2 7/8	
×96.5	28.4	7.74	7 3/4	0.890	7/8	7/16	6.89	15.7	15 3/4	1.44	1 7/16	2.04	2 3/4	
×88	25.9	7.61	7 5/8	0.830	13/16	7/16	6.32	15.7	15 5/8	1.31	1 5/16	1.91	2 5/8	
×79.5	23.4	7.49	7 1/2	0.745	3/4	3/8	5.58	15.6	15 5/8	1.19	1 3/16	1.79	2 1/2	
×72.5	21.3	7.39	7 3/8	0.680	11/16	3/8	5.03	15.5	15 1/2	1.09	1 1/16	1.69	2 3/8	
WT7×66	19.4	7.33	7 3/8	0.645	5/8	5/16	4.73	14.7	14 3/4	1.03	1	1.63	2 5/16	5 1/2
×60	17.7	7.24	7 1/4	0.590	9/16	5/16	4.27	14.7	14 5/8	0.940	15/16	1.54	2 1/4	
×54.5	16.0	7.16	7 1/8	0.525	1/2	1/4	3.76	14.6	14 5/8	0.860	7/8	1.46	2 3/16	
×49.5[f]	14.6	7.08	7 1/8	0.485	1/2	1/4	3.43	14.6	14 5/8	0.780	3/4	1.38	2 1/16	
×45[f]	13.2	7.01	7	0.440	7/16	1/4	3.08	14.5	14 1/2	0.710	11/16	1.31	2	
WT7×41	12.0	7.16	7 1/8	0.510	1/2	1/4	3.65	10.1	10 1/8	0.855	7/8	1.45	1 11/16	5 1/2
×37	10.9	7.09	7 1/8	0.450	7/16	1/4	3.19	10.1	10 1/8	0.785	13/16	1.38	1 5/8	
×34	10.0	7.02	7	0.415	7/16	1/4	2.91	10.0	10	0.720	3/4	1.31	1 9/16	
×30.5[c]	8.96	6.95	7	0.375	3/8	3/16	2.60	10.0	10	0.645	5/8	1.24	1 1/2	
WT7×26.5[c]	7.80	6.96	7	0.370	3/8	3/16	2.58	8.06	8	0.660	11/16	1.25	1 1/2	5 1/2
×24[c]	7.07	6.90	6 7/8	0.340	5/16	3/16	2.34	8.03	8	0.595	5/8	1.19	1 7/16	
×21.5[c]	6.31	6.83	6 7/8	0.305	5/16	3/16	2.08	8.00	8	0.530	1/2	1.12	1 3/8	

[c] Shape is slender for compression with $F_y = 50$ ksi.
[f] Shape exceeds compact limit for flexure with $F_y = 50$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
[h] Flange thickness greater than 2 in. Special requirements may apply per AISC *Specification* Section A3.1c.

Table 1-8 (continued)
WT-Shapes
Properties

Nominal Wt.	Compact Section Criteria		Axis X-X						Axis Y-Y				Q_s	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{d}{t_w}$	I	S	r	$\bar{y}$	Z	y_p	I	S	r	Z	$F_y = 50$ ksi	J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.	in.^{3}	in.	in.^{4}	in.^{3}	in.	in.^{3}		in.^{4}	in.^{6}
365	1.82	3.65	739	95.4	2.62	3.47	211	3.00	2360	264	4.69	408	1.00	714	5250
332.5	1.95	3.82	622	82.1	2.52	3.25	182	2.77	2080	236	4.62	365	1.00	555	3920
302.5	2.09	4.04	524	70.6	2.43	3.05	157	2.55	1840	211	4.55	326	1.00	430	2930
275	2.25	4.24	442	60.9	2.34	2.85	136	2.35	1630	189	4.49	292	1.00	331	2180
250	2.43	4.47	375	52.7	2.26	2.67	117	2.16	1440	169	4.43	261	1.00	254	1620
227.5	2.62	4.71	321	45.9	2.19	2.51	102	1.99	1280	152	4.38	234	1.00	196	1210
213	2.75	4.97	287	41.4	2.14	2.40	91.7	1.88	1180	141	4.34	217	1.00	164	991
199	2.92	5.17	257	37.6	2.10	2.30	82.9	1.76	1090	131	4.31	201	1.00	135	801
185	3.10	5.40	229	33.9	2.05	2.19	74.4	1.65	994	121	4.27	185	1.00	110	640
171	3.31	5.69	203	30.4	2.01	2.09	66.2	1.54	903	110	4.24	169	1.00	88.3	502
155.5	3.59	6.07	176	26.7	1.96	1.97	57.7	1.41	807	99.4	4.20	152	1.00	67.5	375
141.5	3.89	6.49	153	23.5	1.92	1.86	50.4	1.29	722	89.7	4.17	137	1.00	51.8	281
128.5	4.23	6.94	133	20.7	1.88	1.75	43.9	1.18	645	80.7	4.13	123	1.00	39.3	209
116.5	4.62	7.50	116	18.2	1.84	1.65	38.2	1.08	576	72.5	4.10	110	1.00	29.6	154
105.5	5.06	8.02	102	16.2	1.81	1.57	33.4	0.980	513	65.0	4.07	98.9	1.00	22.2	113
96.5	5.45	8.70	89.8	14.4	1.78	1.49	29.4	0.903	466	59.3	4.05	90.1	1.00	17.3	87.2
88	5.97	9.17	80.5	13.0	1.76	1.43	26.3	0.827	419	53.5	4.02	81.3	1.00	13.2	65.2
79.5	6.54	10.1	70.2	11.4	1.73	1.35	22.8	0.751	374	48.1	4.00	73.0	1.00	9.84	47.9
72.5	7.11	10.9	62.5	10.2	1.71	1.29	20.2	0.688	338	43.7	3.98	66.2	1.00	7.56	36.3
66	7.15	11.4	57.8	9.57	1.73	1.29	18.6	0.658	274	37.2	3.76	56.5	1.00	6.13	26.6
60	7.80	12.3	51.7	8.61	1.71	1.24	16.5	0.602	247	33.7	3.74	51.2	1.00	4.67	20.0
54.5	8.49	13.6	45.3	7.56	1.68	1.17	14.4	0.548	223	30.6	3.73	46.3	1.00	3.55	15.0
49.5	9.34	14.6	40.9	6.88	1.67	1.14	12.9	0.500	201	27.6	3.71	41.8	1.00	2.68	11.1
45	10.2	15.9	36.5	6.16	1.66	1.09	11.5	0.456	181	25.0	3.70	37.8	1.00	2.03	8.31
41	5.92	14.0	41.2	7.14	1.85	1.39	13.2	0.593	74.1	14.6	2.48	22.4	1.00	2.53	5.63
37	6.41	15.8	36.0	6.25	1.82	1.32	11.5	0.541	66.9	13.3	2.48	20.2	1.00	1.93	4.19
34	6.97	16.9	32.6	5.69	1.81	1.29	10.4	0.498	60.7	12.1	2.46	18.4	1.00	1.50	3.21
30.5	7.75	18.5	28.9	5.07	1.80	1.25	9.15	0.448	53.7	10.7	2.45	16.4	0.971	1.09	2.29
26.5	6.11	18.8	27.6	4.94	1.88	1.38	8.87	0.484	28.8	7.15	1.92	11.0	0.956	0.967	1.46
24	6.75	20.3	24.9	4.49	1.88	1.35	8.00	0.440	25.7	6.40	1.91	9.80	0.880	0.723	1.07
21.5	7.54	22.4	21.9	3.98	1.86	1.31	7.05	0.395	22.6	5.65	1.89	8.64	0.773	0.522	0.751

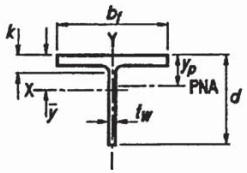


Table 1-8 (continued)
WT-Shapes
Dimensions

Shape	Area, A	Depth, d		Stem				Flange				Distance		
				Thickness, t_w		$\frac{t_w}{2}$	Area	Width, b_f		Thickness, t_f		k		Workable Gage
												k_{des}	k_{det}	
	in.^{2}	in.		in.		in.	in.^{2}	in.		in.		in.	in.	in.
WT7×19[c]	5.58	7.05	7	0.310	5/16	3/16	2.19	6.77	6 3/4	0.515	1/2	0.915	1 1/4	3 1/2[g]
×17[c]	5.00	6.99	7	0.285	5/16	3/16	1.99	6.75	6 3/4	0.455	7/16	0.855	1 3/16	3 1/2
×15[c]	4.42	6.92	6 7/8	0.270	1/4	1/8	1.87	6.73	6 3/4	0.385	3/8	0.785	1 1/8	3 1/2
WT7×13[c]	3.85	6.96	7	0.255	1/4	1/8	1.77	5.03	5	0.420	7/16	0.820	1 1/8	2 3/4[g]
×11[c,v]	3.25	6.87	6 7/8	0.230	1/4	1/8	1.58	5.00	5	0.335	5/16	0.735	1 1/16	2 3/4[g]
WT6×168[h]	49.5	8.41	8 3/8	1.78	1 3/4	7/8	14.9	13.4	13 3/8	2.96	2 15/16	3.55	3 7/8	5 1/2
×152.5[h]	44.7	8.16	8 1/8	1.63	1 5/8	13/16	13.3	13.2	13 1/4	2.71	2 11/16	3.30	3 5/8	
×139.5[h]	41.0	7.93	7 7/8	1.53	1 1/2	3/4	12.1	13.1	13 1/8	2.47	2 1/2	3.07	3 3/8	
×126[h]	37.1	7.71	7 3/4	1.40	1 3/8	11/16	10.7	13.0	13	2.25	2 1/4	2.85	3 1/8	
×115[h]	33.8	7.53	7 1/2	1.29	1 5/16	11/16	9.67	12.9	12 7/8	2.07	2 1/16	2.67	2 15/16	
×105	30.9	7.36	7 3/8	1.18	1 3/16	5/8	8.68	12.8	12 3/4	1.90	1 7/8	2.50	2 13/16	
×95	28.0	7.19	7 1/4	1.06	1 1/16	9/16	7.62	12.7	12 5/8	1.74	1 3/4	2.33	2 5/8	
×85	25.0	7.02	7	0.960	15/16	1/2	6.73	12.6	12 5/8	1.56	1 9/16	2.16	2 7/16	
×76	22.4	6.86	6 7/8	0.870	7/8	7/16	5.96	12.5	12 1/2	1.40	1 3/8	2.00	2 5/16	
×68	20.0	6.71	6 3/4	0.790	13/16	7/16	5.30	12.4	12 3/8	1.25	1 1/4	1.85	2 1/8	
×60	17.6	6.56	6 1/2	0.710	11/16	3/8	4.66	12.3	12 3/8	1.11	1 1/8	1.70	2	
×53	15.6	6.45	6 1/2	0.610	5/8	5/16	3.93	12.2	12 1/4	0.990	1	1.59	1 7/8	
×48	14.1	6.36	6 3/8	0.550	9/16	5/16	3.50	12.2	12 1/8	0.900	7/8	1.50	1 13/16	
×43.5	12.8	6.27	6 1/4	0.515	1/2	1/4	3.23	12.1	12 1/8	0.810	13/16	1.41	1 11/16	
×39.5	11.6	6.19	6 1/4	0.470	1/2	1/4	2.91	12.1	12 1/8	0.735	3/4	1.33	1 5/8	
×36	10.6	6.13	6 1/8	0.430	7/16	1/4	2.63	12.0	12	0.670	11/16	1.27	1 9/16	
×32.5[f]	9.54	6.06	6	0.390	3/8	3/16	2.36	12.0	12	0.605	5/8	1.20	1 1/2	
WT6×29	8.52	6.10	6 1/8	0.360	3/8	3/16	2.19	10.0	10	0.640	5/8	1.24	1 1/2	5 1/2
×26.5	7.78	6.03	6	0.345	3/8	3/16	2.08	10.0	10	0.575	9/16	1.18	1 3/8	5 1/2
WT6×25	7.30	6.10	6 1/8	0.370	3/8	3/16	2.26	8.08	8 1/8	0.640	5/8	1.14	1 1/2	5 1/2
×22.5	6.56	6.03	6	0.335	5/16	3/16	2.02	8.05	8	0.575	9/16	1.08	1 3/8	
×20[c]	5.84	5.97	6	0.295	5/16	3/16	1.76	8.01	8	0.515	1/2	1.02	1 3/8	
WT6×17.5[c]	5.17	6.25	6 1/4	0.300	5/16	3/16	1.88	6.56	6 1/2	0.520	1/2	0.820	1 3/16	3 1/2
×15[c]	4.40	6.17	6 1/8	0.260	1/4	1/8	1.60	6.52	6 1/2	0.440	7/16	0.740	1 1/8	
×13[c]	3.82	6.11	6 1/8	0.230	1/4	1/8	1.41	6.49	6 1/2	0.380	3/8	0.680	1 1/16	

[c] Shape is slender for compression with $F_y = 50$ ksi.
[f] Shape exceeds compact limit for flexure with $F_y = 50$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
[h] Flange thickness greater than 2 in. Special requirements may apply per AISC *Specification* Section A3.1c.
[v] Shear strength controlled by buckling effects ($C_v < 1.0$) with $F_y = 50$ ksi.

Table 1-8 (continued)
WT-Shapes
Properties

WT7-WT6

Nominal Wt.	Compact Section Criteria		Axis X-X						Axis Y-Y				Q_s	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{d}{t_w}$	I	S	r	$\bar{y}$	Z	y_p	I	S	r	Z	$F_y = 50$ ksi	J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.	in.^{3}	in.	in.^{4}	in.^{3}	in.	in.^{3}		in.^{4}	in.^{6}
19	6.57	22.7	23.3	4.22	2.04	1.54	7.45	0.412	13.3	3.94	1.55	6.07	0.758	0.398	0.554
17	7.41	24.5	20.9	3.83	2.04	1.53	6.74	0.371	11.6	3.45	1.53	5.32	0.667	0.284	0.400
15	8.74	25.6	19.0	3.55	2.07	1.58	6.25	0.329	9.79	2.91	1.49	4.49	0.611	0.190	0.287
13	5.98	27.3	17.3	3.31	2.12	1.72	5.89	0.383	4.45	1.77	1.08	2.76	0.537	0.179	0.207
11	7.46	29.9	14.8	2.91	2.14	1.76	5.20	0.325	3.50	1.40	1.04	2.19	0.448	0.104	0.134
168	2.26	4.72	190	31.2	1.96	2.31	68.4	1.84	593	88.6	3.47	137	1.00	120	481
152.5	2.45	5.01	162	27.0	1.90	2.16	59.1	1.69	525	79.3	3.42	122	1.00	92.0	356
139.5	2.66	5.18	141	24.1	1.86	2.05	51.9	1.56	469	71.3	3.38	110	1.00	70.9	267
126	2.89	5.51	121	20.9	1.81	1.92	44.8	1.42	414	63.6	3.34	97.9	1.00	53.5	195
115	3.11	5.84	106	18.5	1.77	1.82	39.4	1.31	371	57.5	3.31	88.4	1.00	41.6	148
105	3.37	6.24	92.1	16.4	1.73	1.72	34.5	1.21	332	51.9	3.28	79.7	1.00	32.1	112
95	3.65	6.78	79.0	14.2	1.68	1.62	29.8	1.10	295	46.5	3.25	71.2	1.00	24.3	82.1
85	4.03	7.31	67.8	12.3	1.65	1.52	25.6	0.994	259	41.2	3.22	62.9	1.00	17.7	58.3
76	4.46	7.89	58.5	10.8	1.62	1.43	22.0	0.896	227	36.4	3.19	55.6	1.00	12.8	41.3
68	4.96	8.49	50.6	9.46	1.59	1.35	19.0	0.805	199	32.1	3.16	48.9	1.00	9.21	28.9
60	5.57	9.24	43.4	8.22	1.57	1.28	16.2	0.716	172	28.0	3.13	42.7	1.00	6.42	19.7
53	6.17	10.6	36.3	6.92	1.53	1.19	13.6	0.637	151	24.7	3.11	37.5	1.00	4.55	13.6
48	6.76	11.6	32.0	6.12	1.51	1.13	11.9	0.580	135	22.2	3.09	33.7	1.00	3.42	10.1
43.5	7.48	12.2	28.9	5.60	1.50	1.10	10.7	0.527	120	19.9	3.07	30.2	1.00	2.54	7.34
39.5	8.22	13.2	25.8	5.03	1.49	1.06	9.49	0.480	108	17.9	3.05	27.1	1.00	1.91	5.43
36	8.99	14.3	23.2	4.54	1.48	1.02	8.48	0.439	97.5	16.2	3.04	24.6	1.00	1.46	4.07
32.5	9.92	15.5	20.6	4.06	1.47	0.985	7.50	0.398	87.2	14.5	3.02	22.0	1.00	1.09	2.97
29	7.82	16.9	19.1	3.76	1.50	1.03	6.97	0.426	53.5	10.7	2.51	16.2	1.00	1.05	2.08
26.5	8.69	17.5	17.7	3.54	1.51	1.02	6.46	0.389	47.9	9.58	2.48	14.5	1.00	0.788	1.53
25	6.31	16.5	18.7	3.79	1.60	1.17	6.88	0.452	28.2	6.97	1.96	10.6	1.00	0.855	1.23
22.5	7.00	18.0	16.6	3.39	1.59	1.13	6.10	0.408	25.0	6.21	1.95	9.47	1.00	0.627	0.885
20	7.77	20.2	14.4	2.95	1.57	1.09	5.28	0.365	22.0	5.50	1.94	8.38	0.885	0.452	0.620
17.5	6.31	20.8	16.0	3.23	1.76	1.30	5.71	0.394	12.2	3.73	1.54	5.73	0.854	0.369	0.437
15	7.41	23.7	13.5	2.75	1.75	1.27	4.83	0.337	10.2	3.12	1.52	4.78	0.707	0.228	0.267
13	8.54	26.6	11.7	2.40	1.75	1.25	4.20	0.295	8.66	2.67	1.51	4.08	0.566	0.150	0.174

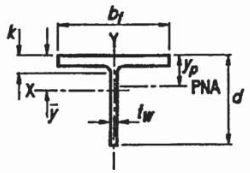


Table 1-8 (continued)
WT-Shapes
Dimensions

Shape	Area, A	Depth, d		Stem			Flange				Distance		
				Thickness, t_w		$\frac{t_w}{2}$	Area	Width, b_f		Thickness, t_f		k		Work-able Gage
												k_{des}	k_{det}	
	in.^{2}	in.		in.		in.	in.^{2}	in.		in.		in.	in.	in.
WT6×11[c]	3.24	6.16	6 1/8	0.260	1/4	1/8	1.60	4.03	4	0.425	7/16	0.725	15/16	2 1/4[g]
×9.5[c]	2.79	6.08	6 1/8	0.235	1/4	1/8	1.43	4.01	4	0.350	3/8	0.650	7/8	↓
×8[c]	2.36	6.00	6	0.220	1/4	1/8	1.32	3.99	4	0.265	1/4	0.565	13/16	
×7[c,v]	2.08	5.96	6	0.200	3/16	1/8	1.19	3.97	4	0.225	1/4	0.525	3/4	
WT5×56	16.5	5.68	5 5/8	0.755	3/4	3/8	4.29	10.4	10 3/8	1.25	1 1/4	1.75	1 15/16	5 1/2
×50	14.7	5.55	5 1/2	0.680	11/16	3/8	3.77	10.3	10 3/8	1.12	1 1/8	1.62	1 13/16	↓
×44	13.0	5.42	5 3/8	0.605	5/8	5/16	3.28	10.3	10 1/4	0.990	1	1.49	1 11/16	
×38.5	11.3	5.30	5 1/4	0.530	1/2	1/4	2.81	10.2	10 1/4	0.870	7/8	1.37	1 9/16	
×34	10.0	5.20	5 1/4	0.470	1/2	1/4	2.44	10.1	10 1/8	0.770	3/4	1.27	1 7/16	
×30	8.84	5.11	5 1/8	0.420	7/16	1/4	2.15	10.1	10 1/8	0.680	11/16	1.18	1 3/8	
×27	7.90	5.05	5	0.370	3/8	3/16	1.87	10.0	10	0.615	5/8	1.12	1 5/16	
×24.5	7.21	4.99	5	0.340	5/16	3/16	1.70	10.0	10	0.560	9/16	1.06	1 1/4	
WT5×22.5	6.63	5.05	5	0.350	3/8	3/16	1.77	8.02	8	0.620	5/8	1.12	1 5/16	
×19.5	5.73	4.96	5	0.315	5/16	3/16	1.56	7.99	8	0.530	1/2	1.03	1 3/16	
×16.5	4.85	4.87	4 7/8	0.290	5/16	3/16	1.41	7.96	8	0.435	7/16	0.935	1 1/8	↓
WT5×15	4.42	5.24	5 1/4	0.300	5/16	3/16	1.57	5.81	5 3/4	0.510	1/2	0.810	1 1/8	2 3/4[g]
×13[c]	3.81	5.17	5 1/8	0.260	1/4	1/8	1.34	5.77	5 3/4	0.440	7/16	0.740	1 1/16	↓
×11[c]	3.24	5.09	5 1/8	0.240	1/4	1/8	1.22	5.75	5 3/4	0.360	3/8	0.660	15/16	
WT5×9.5[c]	2.81	5.12	5 1/8	0.250	1/4	1/8	1.28	4.02	4	0.395	3/8	0.695	15/16	2 1/4[g]
×8.5[c]	2.50	5.06	5	0.240	1/4	1/8	1.21	4.01	4	0.330	5/16	0.630	7/8	↓
×7.5[c]	2.21	5.00	5	0.230	1/4	1/8	1.15	4.00	4	0.270	1/4	0.570	13/16	
×6[c,f]	1.77	4.94	4 7/8	0.190	3/16	1/8	0.938	3.96	4	0.210	3/16	0.510	3/4	
WT4×33.5	9.84	4.50	4 1/2	0.570	9/16	5/16	2.57	8.28	8 1/4	0.935	15/16	1.33	1 5/8	5 1/2
×29	8.54	4.38	4 3/8	0.510	1/2	1/4	2.23	8.22	8 1/4	0.810	13/16	1.20	1 1/2	↓
×24	7.05	4.25	4 1/4	0.400	3/8	3/16	1.70	8.11	8 1/8	0.685	11/16	1.08	1 3/8	
×20	5.87	4.13	4 1/8	0.360	3/8	3/16	1.49	8.07	8 1/8	0.560	9/16	0.954	1 1/4	
×17.5	5.14	4.06	4	0.310	5/16	3/16	1.26	8.02	8	0.495	1/2	0.889	1 3/16	
×15.5[f]	4.56	4.00	4	0.285	5/16	3/16	1.14	8.00	8	0.435	7/16	0.829	1 1/8	
WT4×14	4.12	4.03	4	0.285	5/16	3/16	1.15	6.54	6 1/2	0.465	7/16	0.859	15/16	3 1/2
×12	3.54	3.97	4	0.245	1/4	1/8	0.971	6.50	6 1/2	0.400	3/8	0.794	7/8	3 1/2

[c] Shape is slender for compression with $F_y = 50$ ksi.
[f] Shape exceeds compact limit for flexure with $F_y = 50$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
[v] Shear strength controlled by buckling effects ($C_v < 1.0$) with $F_y = 50$ ksi.

Table 1-8 (continued)
WT-Shapes
Properties

WT6-WT4

Nominal Wt.	Compact Section Criteria		Axis X-X						Axis Y-Y				Q_s	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{d}{t_w}$	I	S	r	$\bar{y}$	Z	y_p	I	S	r	Z	$F_y = 50$ ksi	J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.	in.^{3}	in.	in.^{4}	in.^{3}	in.	in.^{3}		in.^{4}	in.^{6}
11	4.74	23.7	11.7	2.59	1.90	1.63	4.63	0.402	2.33	1.15	0.847	1.83	0.707	0.146	0.137
9.5	5.72	25.9	10.1	2.28	1.90	1.65	4.11	0.348	1.88	0.939	0.821	1.49	0.597	0.0899	0.0934
8	7.53	27.3	8.70	2.04	1.92	1.74	3.72	0.639	1.41	0.706	0.773	1.13	0.537	0.0511	0.0678
7	8.82	29.8	7.67	1.83	1.92	1.76	3.32	0.760	1.18	0.593	0.753	0.947	0.451	0.0350	0.0493
56	4.17	7.52	28.6	6.40	1.32	1.21	13.4	0.791	118	22.6	2.67	34.6	1.00	7.50	16.9
50	4.62	8.16	24.5	5.56	1.29	1.13	11.4	0.711	103	20.0	2.65	30.5	1.00	5.41	11.9
44	5.18	8.96	20.8	4.77	1.27	1.06	9.65	0.631	89.3	17.4	2.63	26.5	1.00	3.75	8.02
38.5	5.86	10.0	17.4	4.05	1.24	0.990	8.06	0.555	76.8	15.1	2.60	22.9	1.00	2.55	5.31
34	6.58	11.1	14.9	3.49	1.22	0.932	6.85	0.493	66.7	13.2	2.58	20.0	1.00	1.78	3.62
30	7.41	12.2	12.9	3.04	1.21	0.884	5.87	0.438	58.1	11.5	2.57	17.5	1.00	1.23	2.46
27	8.15	13.6	11.1	2.64	1.19	0.836	5.05	0.395	51.7	10.3	2.56	15.6	1.00	0.909	1.78
24.5	8.93	14.7	10.0	2.39	1.18	0.807	4.52	0.361	46.7	9.34	2.54	14.1	1.00	0.693	1.33
22.5	6.47	14.4	10.2	2.47	1.24	0.907	4.65	0.413	26.7	6.65	2.01	10.1	1.00	0.753	0.981
19.5	7.53	15.7	8.84	2.16	1.24	0.876	3.99	0.359	22.5	5.64	1.98	8.57	1.00	0.487	0.616
16.5	9.15	16.8	7.71	1.93	1.26	0.869	3.48	0.305	18.3	4.60	1.94	7.00	1.00	0.291	0.356
15	5.70	17.5	9.28	2.24	1.45	1.10	4.01	0.380	8.35	2.87	1.37	4.41	1.00	0.310	0.273
13	6.56	19.9	7.86	1.91	1.44	1.06	3.39	0.330	7.05	2.44	1.36	3.75	0.900	0.201	0.173
11	7.99	21.2	6.88	1.72	1.46	1.07	3.02	0.282	5.71	1.99	1.33	3.05	0.834	0.119	0.107
9.5	5.09	20.5	6.68	1.74	1.54	1.28	3.10	0.349	2.15	1.07	0.874	1.67	0.870	0.116	0.0796
8.5	6.08	21.1	6.06	1.62	1.56	1.32	2.90	0.311	1.78	0.887	0.844	1.40	0.839	0.0776	0.0610
7.5	7.41	21.7	5.45	1.50	1.57	1.37	2.71	0.305	1.45	0.723	0.810	1.15	0.809	0.0518	0.0475
6	9.43	26.0	4.35	1.22	1.57	1.36	2.20	0.322	1.09	0.551	0.785	0.869	0.592	0.0272	0.0255
33.5	4.43	7.89	10.9	3.05	1.05	0.936	6.29	0.594	44.3	10.7	2.12	16.3	1.00	2.51	3.56
29	5.07	8.59	9.12	2.61	1.03	0.874	5.25	0.520	37.5	9.13	2.10	13.9	1.00	1.66	2.28
24	5.92	10.6	6.85	1.97	0.986	0.777	3.94	0.435	30.5	7.51	2.08	11.4	1.00	0.977	1.30
20	7.21	11.5	5.73	1.69	0.988	0.735	3.25	0.364	24.5	6.08	2.04	9.24	1.00	0.558	0.715
17.5	8.10	13.1	4.82	1.43	0.968	0.688	2.71	0.321	21.3	5.31	2.03	8.05	1.00	0.384	0.480
15.5	9.19	14.0	4.28	1.28	0.969	0.668	2.39	0.285	18.5	4.64	2.02	7.03	1.00	0.267	0.327
14	7.03	14.1	4.23	1.28	1.01	0.734	2.38	0.315	10.8	3.31	1.62	5.04	1.00	0.268	0.230
12	8.12	16.2	3.53	1.08	0.999	0.695	1.98	0.272	9.14	2.81	1.61	4.28	1.00	0.173	0.144

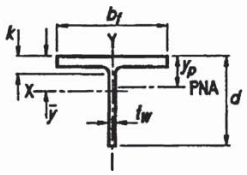


Table 1-8 (continued)
WT-Shapes
Dimensions

Shape	Area, A	Depth, d		Stem				Flange				Distance		
				Thickness, t_w		$\frac{t_w}{2}$	Area	Width, b_f		Thickness, t_f		k		Workable Gage
												k_{des}	k_{det}	
	in.^{2}	in.		in.		in.	in.^{2}	in.		in.		in.	in.	in.
WT4×10.5	3.08	4.14	4 1/8	0.250	1/4	1/8	1.04	5.27	5 1/4	0.400	3/8	0.700	7/8	2 3/4[g]
×9	2.63	4.07	4 1/8	0.230	1/4	1/8	0.936	5.25	5 1/4	0.330	5/16	0.630	13/16	2 3/4[g]
WT4×7.5	2.22	4.06	4	0.245	1/4	1/8	0.993	4.02	4	0.315	5/16	0.615	13/16	2 1/4[g]
×6.5	1.92	4.00	4	0.230	1/4	1/8	0.919	4.00	4	0.255	1/4	0.555	3/4	↓
×5[c,f]	1.48	3.95	4	0.170	3/16	1/8	0.671	3.94	4	0.205	3/16	0.505	11/16	↓
WT3×12.5	3.67	3.19	3 1/4	0.320	5/16	3/16	1.02	6.08	6 1/8	0.455	7/16	0.705	15/16	3 1/2
×10	2.94	3.10	3 1/8	0.260	1/4	1/8	0.806	6.02	6	0.365	3/8	0.615	7/8	↓
×7.5[f]	2.21	3.00	3	0.230	1/4	1/8	0.689	5.99	6	0.260	1/4	0.510	3/4	↓
WT3×8	2.37	3.14	3 1/8	0.260	1/4	1/8	0.816	4.03	4	0.405	3/8	0.655	7/8	2 1/4[g]
×6	1.78	3.02	3	0.230	1/4	1/8	0.693	4.00	4	0.280	1/4	0.530	3/4	↓
×4.5[f]	1.34	2.95	3	0.170	3/16	1/8	0.502	3.94	4	0.215	3/16	0.465	11/16	↓
×4.25[f]	1.26	2.92	2 7/8	0.170	3/16	1/8	0.496	3.94	4	0.195	3/16	0.445	11/16	↓
WT2.5×9.5	2.78	2.58	2 5/8	0.270	1/4	1/8	0.695	5.03	5	0.430	7/16	0.730	13/16	2 3/4
×8	2.35	2.51	2 1/2	0.240	1/4	1/8	0.601	5.00	5	0.360	3/8	0.660	3/4	2 3/4
WT2×6.5	1.91	2.08	2 1/8	0.280	1/4	1/8	0.582	4.06	4	0.345	3/8	0.595	3/4	2 1/4

[c] Shape is slender for compression with $F_y = 50$ ksi.
[f] Shape exceeds compact limit for flexure with $F_y = 50$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.

Table 1-8 (continued)
WT-Shapes
Properties


WT4-WT2

Nominal Wt.	Compact Section Criteria		Axis X-X						Axis Y-Y				Q_s	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{d}{t_w}$	I	S	r	$\bar{y}$	Z	y_p	I	S	r	Z	$F_y = 50$ ksi	J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.	in.^{3}	in.	in.^{4}	in.^{3}	in.	in.^{3}		in.^{4}	in.^{6}
10.5	6.59	16.6	3.90	1.18	1.12	0.831	2.11	0.292	4.88	1.85	1.26	2.84	1.00	0.141	0.0916
9	7.95	17.7	3.41	1.05	1.14	0.834	1.86	0.251	3.98	1.52	1.23	2.33	1.00	0.0855	0.0562
7.5	6.37	16.6	3.28	1.07	1.22	0.998	1.91	0.276	1.70	0.849	0.876	1.33	1.00	0.0679	0.0382
6.5	7.84	17.4	2.89	0.974	1.23	1.03	1.74	0.240	1.36	0.682	0.843	1.07	1.00	0.0433	0.0269
5	9.61	23.2	2.15	0.717	1.20	0.953	1.27	0.188	1.05	0.531	0.840	0.826	0.733	0.0212	0.0114
12.5	6.68	10.0	2.29	0.886	0.789	0.610	1.68	0.302	8.53	2.81	1.52	4.28	1.00	0.229	0.171
10	8.25	11.9	1.76	0.693	0.774	0.560	1.29	0.244	6.64	2.21	1.50	3.36	1.00	0.120	0.0858
7.5	11.5	13.0	1.41	0.577	0.797	0.558	1.03	0.185	4.66	1.56	1.45	2.37	1.00	0.0504	0.0342
8	4.98	12.1	1.69	0.685	0.844	0.676	1.25	0.294	2.21	1.10	0.966	1.69	1.00	0.111	0.0426
6	7.14	13.1	1.32	0.564	0.862	0.677	1.01	0.222	1.50	0.748	0.918	1.16	1.00	0.0449	0.0178
4.5	9.16	17.4	0.950	0.408	0.842	0.623	0.720	0.170	1.10	0.557	0.905	0.856	1.00	0.0202	0.00736
4.25	10.1	17.2	0.905	0.397	0.848	0.637	0.700	0.160	0.995	0.505	0.890	0.778	1.00	0.0166	0.00620
9.5	5.85	9.56	1.01	0.485	0.604	0.487	0.970	0.276	4.56	1.81	1.28	2.76	1.00	0.157	0.0775
8	6.94	10.5	0.845	0.413	0.599	0.458	0.801	0.235	3.75	1.50	1.26	2.28	1.00	0.0958	0.0453
6.5	5.88	7.43	0.526	0.321	0.524	0.440	0.616	0.236	1.93	0.950	1.00	1.46	1.00	0.0750	0.0233

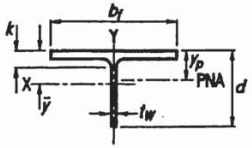


Table 1-9
MT-Shapes
Dimensions

Shape	Area, A	Depth, d		Stem				Flange				Distance	
				Thickness, t_w		$\frac{t_w}{2}$	Area	Width, b_f		Thickness, t_f		k	Workable Gage
	in.^{2}	in.		in.		in.	in.^{2}	in.		in.		in.	in.
MT6.25×6.2[c,v]	1.82	6.27	6 1/4	0.155	1/8	1/16	0.971	3.75	3 3/4	0.228	1/4	9/16	—
×5.8[c,v]	1.70	6.25	6 1/4	0.155	1/8	1/16	0.969	3.50	3 1/2	0.211	3/16	9/16	
MT6×5.9[c]	1.74	6.00	6	0.177	3/16	1/8	1.06	3.07	3 1/8	0.225	1/4	9/16	—
×5.4[c,v]	1.59	5.99	6	0.160	3/16	1/8	0.958	3.07	3 1/8	0.210	3/16	9/16	—
×5[c,v]	1.48	5.99	6	0.149	1/8	1/16	0.892	3.25	3 1/4	0.180	3/16	1/2	—
MT5×4.5[c]	1.33	5.00	5	0.157	3/16	1/8	0.785	2.69	2 3/4	0.206	3/16	9/16	—
×4[c]	1.19	4.98	5	0.141	1/8	1/16	0.701	2.69	2 3/4	0.182	3/16	9/16	—
MT5×3.75[c,v]	1.11	5.00	5	0.130	1/8	1/16	0.649	2.69	2 3/4	0.173	3/16	7/16	—
MT4×3.25[c,v]	0.959	4.00	4	0.135	1/8	1/16	0.540	2.28	2 1/4	0.189	3/16	9/16	—
×3.1[c]	0.911	4.00	4	0.129	1/8	1/16	0.516	2.28	2 1/4	0.177	3/16	7/16	—
MT3×2.2[c]	0.647	3.00	3	0.114	1/8	1/16	0.342	1.84	1 7/8	0.171	3/16	3/8	—
×1.85[c]	0.545	2.96	3	0.0980	1/8	1/16	0.290	2.00	2	0.129	1/8	5/16	—
MT2.5×9.45[t]	2.78	2.50	2 1/2	0.316	5/16	3/16	0.790	5.00	5	0.416	7/16	13/16	2 3/4[g]
MT2×3[f]	0.875	1.90	1 7/8	0.130	1/8	1/16	0.247	3.80	3 3/4	0.160	3/16	1/2	—

[c] Shape is slender for compression with $F_y = 36$ ksi.
[f] Shape exceeds compact limit for flexure with $F_y = 36$ ksi.
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
[t] This shape has tapered flanges while all other MT-shapes have parallel flange surfaces.
[v] Shape does not meet the h/t_w limit for shear in AISC *Specification* Section G2.1(a) with $F_y = 36$ ksi.
— Indicates flange is too narrow to establish a workable gage.

Table 1-9 (continued)
MT-Shapes
Properties

Nominal Wt.	Compact Section Criteria		Axis X-X						Axis Y-Y				Q_s	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{d}{t_w}$	I	S	r	$\bar{y}$	Z	y_p	I	S	r	Z	$F_y = 36$ ksi	J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.	in.^{3}	in.	in.^{4}	in.^{3}	in.	in.^{3}		in.^{4}	in.^{6}
6.2	8.22	40.4	7.29	1.61	2.01	1.74	2.92	0.372	1.00	0.536	0.746	0.839	0.341	0.0246	0.0284
5.8	8.29	40.3	6.94	1.57	2.03	1.84	2.86	0.808	0.756	0.432	0.669	0.684	0.342	0.0206	0.0268
5.9	6.82	33.9	6.61	1.61	1.96	1.89	2.89	1.13	0.543	0.354	0.561	0.575	0.484	0.0249	0.0337
5.4	7.31	37.4	6.03	1.46	1.95	1.86	2.63	1.05	0.506	0.330	0.566	0.532	0.397	0.0196	0.0250
5	9.03	40.2	5.62	1.36	1.96	1.86	2.45	1.08	0.517	0.318	0.594	0.509	0.344	0.0145	0.0202
4.5	6.53	31.8	3.47	1.00	1.62	1.54	1.81	0.808	0.336	0.250	0.505	0.403	0.550	0.0156	0.0138
4	7.39	35.3	3.08	0.894	1.62	1.52	1.61	0.809	0.296	0.220	0.502	0.354	0.446	0.0112	0.00989
3.75	7.77	38.4	2.91	0.836	1.63	1.51	1.51	0.759	0.281	0.209	0.505	0.334	0.377	0.00932	0.00792
3.25	6.03	29.6	1.57	0.558	1.29	1.18	1.01	0.472	0.188	0.165	0.444	0.264	0.634	0.00917	0.00463
3.1	6.44	31.0	1.50	0.533	1.29	1.18	0.967	0.497	0.176	0.154	0.441	0.247	0.578	0.00778	0.00403
2.2	5.38	26.3	0.579	0.268	0.949	0.841	0.483	0.190	0.0897	0.0973	0.374	0.155	0.778	0.00494	0.00124
1.85	7.75	30.2	0.483	0.226	0.945	0.827	0.409	0.174	0.0863	0.0863	0.400	0.136	0.609	0.00265	0.000754
9.45	6.01	7.91	1.05	0.528	0.617	0.512	1.03	0.276	4.35	1.74	1.26	2.66	1.00	0.156	0.0732
3	11.9	14.6	0.208	0.133	0.493	0.341	0.241	0.112	0.732	0.385	0.926	0.588	1.00	0.00919	0.00193

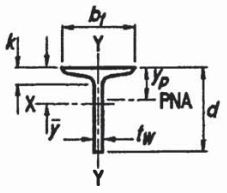


Table 1-10
ST-Shapes
Dimensions

Shape	Area, A	Depth, d		Stem				Flange				Distance	
				Thickness, t_w		$\frac{t_w}{2}$	Area	Width, b_f		Thickness, t_f		k	Workable Gage
	in.^{2}	in.		in.		in.	in.^{2}	in.		in.		in.	in.
ST12×60.5	17.8	12.3	12 1/4	0.800	13/16	7/16	9.80	8.05	8	1.09	1 1/16	2	4
×53	15.6	12.3	12 1/4	0.620	5/8	5/16	7.60	7.87	7 7/8	1.09	1 1/16	2	4
ST12×50	14.7	12.0	12	0.745	3/4	3/8	8.94	7.25	7 1/4	0.870	7/8	1 3/4	4
×45	13.2	12.0	12	0.625	5/8	5/16	7.50	7.13	7 1/8	0.870	7/8	1 3/4	4
×40[c]	11.7	12.0	12	0.500	1/2	1/4	6.00	7.00	7	0.870	7/8	1 3/4	4
ST10×48	14.1	10.2	10 1/8	0.800	13/16	7/16	8.12	7.20	7 1/4	0.920	15/16	1 3/4	4
×43	12.7	10.2	10 1/8	0.660	11/16	3/8	6.70	7.06	7	0.920	15/16	1 3/4	4
ST10×37.5	11.0	10.0	10	0.635	5/8	5/16	6.35	6.39	6 3/8	0.795	13/16	1 5/8	3 1/2[g]
×33	9.70	10.0	10	0.505	1/2	1/4	5.05	6.26	6 1/4	0.795	13/16	1 5/8	3 1/2[g]
ST9×35	10.3	9.00	9	0.711	11/16	3/8	6.40	6.25	6 1/4	0.691	11/16	1 1/2	3 1/2[g]
×27.35	8.02	9.00	9	0.461	7/16	1/4	4.15	6.00	6	0.691	11/16	1 1/2	3 1/2[g]
ST7.5×25	7.34	7.50	7 1/2	0.550	9/16	5/16	4.13	5.64	5 5/8	0.622	5/8	1 3/8	3 1/2[g]
×21.45	6.30	7.50	7 1/2	0.411	7/16	1/4	3.08	5.50	5 1/2	0.622	5/8	1 3/8	3 1/2[g]
ST6×25	7.33	6.00	6	0.687	11/16	3/8	4.12	5.48	5 1/2	0.659	11/16	1 7/16	3[g]
×20.4	5.96	6.00	6	0.462	7/16	1/4	2.77	5.25	5 1/4	0.659	11/16	1 7/16	3[g]
ST6×17.5	5.12	6.00	6	0.428	7/16	1/4	2.57	5.08	5 1/8	0.544	9/16	1 3/16	3[g]
×15.9	4.65	6.00	6	0.350	3/8	3/16	2.10	5.00	5	0.544	9/16	1 3/16	3[g]
ST5×17.5	5.14	5.00	5	0.594	5/8	5/16	2.97	4.94	5	0.491	1/2	1 1/8	2 3/4[g]
×12.7	3.72	5.00	5	0.311	5/16	3/16	1.56	4.66	4 5/8	0.491	1/2	1 1/8	2 3/4[g]
ST4×11.5	3.38	4.00	4	0.441	7/16	1/4	1.76	4.17	4 1/8	0.425	7/16	1	2 1/4[g]
×9.2	2.70	4.00	4	0.271	1/4	1/8	1.08	4.00	4	0.425	7/16	1	2 1/4[g]
ST3×8.6	2.53	3.00	3	0.465	7/16	1/4	1.40	3.57	3 5/8	0.359	3/8	13/16	—
×6.25	1.83	3.00	3	0.232	1/4	1/8	0.696	3.33	3 3/8	0.359	3/8	13/16	—
ST2.5×5	1.46	2.50	2 1/2	0.214	3/16	1/8	0.535	3.00	3	0.326	5/16	3/4	—
ST2×4.75	1.40	2.00	2	0.326	5/16	3/16	0.652	2.80	2 3/4	0.293	5/16	3/4	—
×3.85	1.13	2.00	2	0.193	3/16	1/8	0.386	2.66	2 5/8	0.293	5/16	3/4	—
ST1.5×3.75	1.10	1.50	1 1/2	0.349	3/8	3/16	0.524	2.51	2 1/2	0.260	1/4	5/8	—
×2.85	0.830	1.50	1 1/2	0.170	3/16	1/8	0.255	2.33	2 3/8	0.260	1/4	5/8	—

[c] Shape is slender for compression with $F_y = 36$ ksi
[g] The actual size, combination and orientation of fastener components should be compared with the geometry of the cross section to ensure compatibility.
— Indicates flange is too narrow to establish a workable gage.

Table 1-10 (continued)
ST-Shapes
Properties

ST-SHAPES

Nominal Wt.	Compact Section Criteria		Axis X-X						Axis Y-Y				Q_s	Torsional Properties	
	$\frac{b_f}{2t_f}$	$\frac{d}{t_w}$	I	S	r	$\bar{y}$	Z	y_p	I	S	r	Z	$F_y = 36$ ksi	J	C_w
lb/ft			in.^{4}	in.^{3}	in.	in.	in.^{3}	in.	in.^{4}	in.^{3}	in.	in.^{3}		in.^{4}	in.
60.5	3.69	15.4	259	30.1	3.82	3.63	54.5	1.26	41.5	10.3	1.53	18.1	1.00	6.38	27.5
53	3.61	19.8	216	24.1	3.72	3.28	43.3	1.02	38.4	9.76	1.57	16.7	1.00	5.05	15.0
50	4.17	16.1	215	26.3	3.83	3.84	47.5	2.16	23.7	6.55	1.27	12.0	1.00	3.76	19.5
45	4.10	19.2	190	22.6	3.79	3.60	41.1	1.42	22.3	6.27	1.30	11.2	1.00	3.01	12.1
40	4.02	24.0	162	18.6	3.72	3.30	33.6	0.909	21.0	6.00	1.34	10.4	0.876	2.44	6.94
48	3.91	12.7	143	20.3	3.18	3.13	36.9	1.35	25.0	6.93	1.33	12.5	1.00	4.16	15.0
43	3.84	15.4	124	17.2	3.13	2.91	31.1	0.972	23.3	6.59	1.36	11.6	1.00	3.30	9.17
37.5	4.02	15.7	109	15.8	3.15	3.07	28.6	1.34	14.8	4.62	1.16	8.36	1.00	2.28	7.21
33	3.94	19.8	92.9	12.9	3.10	2.81	23.4	0.841	13.7	4.39	1.19	7.70	1.00	1.78	4.02
35	4.52	12.7	84.5	14.0	2.87	2.94	25.1	1.78	12.0	3.84	1.08	7.17	1.00	2.02	7.03
27.35	4.34	19.5	62.3	9.60	2.79	2.51	17.3	0.737	10.4	3.45	1.14	6.06	1.00	1.16	2.26
25	4.53	13.6	40.5	7.72	2.35	2.25	14.0	0.826	7.79	2.76	1.03	4.99	1.00	1.05	2.02
21.45	4.42	18.2	32.9	5.99	2.29	2.01	10.8	0.605	7.13	2.59	1.06	4.54	1.00	0.765	0.995
25	4.17	8.73	25.1	6.04	1.85	1.84	11.0	0.758	7.79	2.84	1.03	5.16	1.00	1.36	1.97
20.4	3.98	13.0	18.9	4.27	1.78	1.58	7.71	0.577	6.74	2.57	1.06	4.43	1.00	0.842	0.787
17.5	4.67	14.0	17.2	3.95	1.83	1.65	7.12	0.543	4.92	1.94	0.980	3.40	1.00	0.524	0.556
15.9	4.60	17.1	14.8	3.30	1.78	1.51	5.94	0.480	4.66	1.87	1.00	3.22	1.00	0.438	0.364
17.5	5.03	8.42	12.5	3.62	1.56	1.56	6.58	0.673	4.15	1.68	0.899	3.10	1.00	0.633	0.725
12.7	4.75	16.1	7.79	2.05	1.45	1.20	3.70	0.403	3.36	1.44	0.950	2.49	1.00	0.300	0.173
11.5	4.91	9.07	5.00	1.76	1.22	1.15	3.19	0.439	2.13	1.02	0.795	1.84	1.00	0.271	0.168
9.2	4.71	14.8	3.49	1.14	1.14	0.942	2.07	0.336	1.84	0.922	0.827	1.59	1.00	0.167	0.0642
8.6	4.97	6.45	2.12	1.02	0.915	0.915	1.85	0.394	1.14	0.642	0.673	1.17	1.00	0.181	0.0772
6.25	4.64	12.9	1.26	0.547	0.831	0.692	1.01	0.271	0.901	0.541	0.702	0.930	1.00	0.0830	0.0197
5	4.60	11.7	0.671	0.348	0.677	0.570	0.650	0.239	0.597	0.398	0.638	0.686	1.00	0.0568	0.01000
4.75	4.78	6.13	0.462	0.319	0.575	0.553	0.592	0.250	0.444	0.317	0.564	0.565	1.00	0.0590	0.00995
3.85	4.54	10.4	0.307	0.198	0.522	0.448	0.381	0.204	0.374	0.281	0.576	0.485	1.00	0.0364	0.00457
3.75	4.83	4.30	0.200	0.187	0.426	0.432	0.351	0.219	0.289	0.230	0.513	0.411	1.00	0.0432	0.00496
2.85	4.48	8.82	0.114	0.0970	0.370	0.329	0.196	0.171	0.223	0.192	0.518	0.328	1.00	0.0216	0.00189

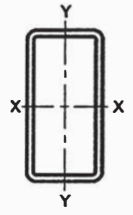
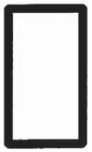


Table 1-11
Rectangular HSS
Dimensions and Properties

Shape	Design Wall Thickness, *t*	Nominal Wt.	Area, *A*	*b/t*	*h/t*	Axis X-X			
						I	*S*	*r*	*Z*
	in.	lb/ft	in.^{2}			in.^{4}	in.^{3}	in.	in.^{3}
HSS20×12×5/8	0.581	127.37	35.0	17.7	31.4	1880	188	7.33	230
×1/2	0.465	103.30	28.3	22.8	40.0	1550	155	7.39	188
×3/8	0.349	78.52	21.5	31.4	54.3	1200	120	7.45	144
×5/16	0.291	65.87	18.1	38.2	65.7	1010	101	7.48	122
HSS20×8×5/8	0.581	110.36	30.3	10.8	31.4	1440	144	6.89	185
×1/2	0.465	89.68	24.6	14.2	40.0	1190	119	6.96	152
×3/8	0.349	68.31	18.7	19.9	54.3	926	92.6	7.03	117
×5/16	0.291	57.36	15.7	24.5	65.7	786	78.6	7.07	98.6
HSS20×4×1/2	0.465	76.07	20.9	5.60	40.0	838	83.8	6.33	115
×3/8	0.349	58.10	16.0	8.46	54.3	657	65.7	6.42	89.3
×5/16	0.291	48.86	13.4	10.7	65.7	560	56.0	6.46	75.6
×1/4	0.233	39.43	10.8	14.2	82.8	458	45.8	6.50	61.5
HSS18×6×5/8	0.581	93.34	25.7	7.33	28.0	923	103	6.00	135
×1/2	0.465	76.07	20.9	9.90	35.7	770	85.6	6.07	112
×3/8	0.349	58.10	16.0	14.2	48.6	602	66.9	6.15	86.4
×5/16	0.291	48.86	13.4	17.6	58.9	513	57.0	6.18	73.1
×1/4	0.233	39.43	10.8	22.8	74.3	419	46.5	6.22	59.4
HSS16×12×5/8	0.581	110.36	30.3	17.7	24.5	1090	136	6.00	165
×1/2	0.465	89.68	24.6	22.8	31.4	904	113	6.06	135
×3/8	0.349	68.31	18.7	31.4	42.8	702	87.7	6.12	104
×5/16	0.291	57.36	15.7	38.2	52.0	595	74.4	6.15	87.7
HSS16×8×5/8	0.581	93.34	25.7	10.8	24.5	815	102	5.64	129
×1/2	0.465	76.07	20.9	14.2	31.4	679	84.9	5.70	106
×3/8	0.349	58.10	16.0	19.9	42.8	531	66.3	5.77	82.1
×5/16	0.291	48.86	13.4	24.5	52.0	451	56.4	5.80	69.4
×1/4	0.233	39.43	10.8	31.3	65.7	368	46.1	5.83	56.4
HSS16×4×5/8	0.581	76.33	21.0	3.88	24.5	539	67.3	5.06	92.9
×1/2	0.465	62.46	17.2	5.60	31.4	455	56.9	5.15	77.3
×3/8	0.349	47.90	13.2	8.46	42.8	360	45.0	5.23	60.2
×5/16	0.291	40.35	11.1	10.7	52.0	308	38.5	5.27	51.1
×1/4	0.233	32.63	8.96	14.2	65.7	253	31.6	5.31	41.7
×3/16	0.174	24.73	6.76	20.0	89.0	193	24.2	5.35	31.7

Note: For compactness criteria, refer to Table 1-12A.

Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties



HSS20-HSS16

Shape	Axis Y-Y				Workable Flat		Torsion		Surface Area
	I	*S*	*r*	*Z*	Depth	Width	*J*	*C*	
	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{3}	ft^2/ft
HSS20×12×5/8	851	142	4.930	162	17 3/16	9 3/16	1890	257	5.17
×1/2	705	117	4.99	132	17 3/4	9 3/4	1540	209	5.20
×3/8	547	91.1	5.04	102	18 5/16	10 5/16	1180	160	5.23
×5/16	464	77.3	5.07	85.8	18 5/8	10 5/8	997	134	5.25
HSS20×8×5/8	338	84.6	3.34	96.4	17 3/16	5 3/16	916	167	4.50
×1/2	283	70.8	3.39	79.5	17 3/4	5 3/4	757	137	4.53
×3/8	222	55.6	3.44	61.5	18 5/16	6 5/16	586	105	4.57
×5/16	189	47.4	3.47	52.0	18 5/8	6 5/8	496	88.3	4.58
HSS20×4×1/2	58.7	29.3	1.68	34.0	17 3/4	—	195	63.8	3.87
×3/8	47.6	23.8	1.73	26.8	18 5/16	2 5/16	156	49.9	3.90
×5/16	41.2	20.6	1.75	22.9	18 5/8	2 5/8	134	42.4	3.92
×1/4	34.3	17.1	1.78	18.7	18 7/8	2 7/8	111	34.7	3.93
HSS18×6×5/8	158	52.7	2.48	61.0	15 3/16	3 3/16	462	109	3.83
×1/2	134	44.6	2.53	50.7	15 3/4	3 3/4	387	89.9	3.87
×3/8	106	35.5	2.58	39.5	16 5/16	4 5/16	302	69.5	3.90
×5/16	91.3	30.4	2.61	33.5	16 9/16	4 9/16	257	58.7	3.92
×1/4	75.1	25.0	2.63	27.3	16 7/8	4 7/8	210	47.7	3.93
HSS16×12×5/8	700	117	4.80	135	13 3/16	9 3/16	1370	204	4.50
×1/2	581	96.8	4.86	111	13 3/4	9 3/4	1120	166	4.53
×3/8	452	75.3	4.91	85.5	14 5/16	10 5/16	862	127	4.57
×5/16	384	64.0	4.94	72.2	14 5/8	10 5/8	727	107	4.58
HSS16×8×5/8	274	68.6	3.27	79.2	13 3/16	5 3/16	681	132	3.83
×1/2	230	57.6	3.32	65.5	13 3/4	5 3/4	563	108	3.87
×3/8	181	45.3	3.37	50.8	14 5/16	6 5/16	436	83.4	3.90
×5/16	155	38.7	3.40	43.0	14 5/8	6 5/8	369	70.4	3.92
×1/4	127	31.7	3.42	35.0	14 7/8	6 7/8	300	57.0	3.93
HSS16×4×5/8	54.1	27.0	1.60	32.5	13 3/16	—	174	60.5	3.17
×1/2	47.0	23.5	1.65	27.4	13 3/4	—	150	50.7	3.20
×3/8	38.3	19.1	1.71	21.7	14 5/16	2 5/16	120	39.7	3.23
×5/16	33.2	16.6	1.73	18.5	14 5/8	2 5/8	103	33.8	3.25
×1/4	27.7	13.8	1.76	15.2	14 7/8	2 7/8	85.2	27.6	3.27
×3/16	21.5	10.8	1.78	11.7	15 3/16	3 3/16	65.5	21.1	3.28

— Indicates flat depth or width is too small to establish a workable flat.

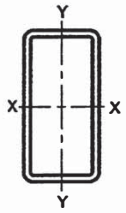


Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties

Shape	Design Wall Thickness, t	Nominal Wt.	Area, A	b/t	h/t	Axis X-X			
						I	S	r	Z
	in.	lb/ft	in.^{2}			in.^{4}	in.^{3}	in.	in.^{3}
HSS14×10×5/8	0.581	93.34	25.7	14.2	21.1	687	98.2	5.17	120
×1/2	0.465	76.07	20.9	18.5	27.1	573	81.8	5.23	98.8
×3/8	0.349	58.10	16.0	25.7	37.1	447	63.9	5.29	76.3
×5/16	0.291	48.86	13.4	31.4	45.1	380	54.3	5.32	64.6
×1/4	0.233	39.43	10.8	39.9	57.1	310	44.3	5.35	52.4
HSS14×6×5/8	0.581	76.33	21.0	7.33	21.1	478	68.3	4.77	88.7
×1/2	0.465	62.46	17.2	9.90	27.1	402	57.4	4.84	73.6
×3/8	0.349	47.90	13.2	14.2	37.1	317	45.3	4.91	57.3
×5/16	0.291	40.35	11.1	17.6	45.1	271	38.7	4.94	48.6
×1/4	0.233	32.63	8.96	22.8	57.1	222	31.7	4.98	39.6
×3/16	0.174	24.73	6.76	31.5	77.5	170	24.3	5.01	30.1
HSS14×4×5/8	0.581	67.82	18.7	3.88	21.1	373	53.3	4.47	73.1
×1/2	0.465	55.66	15.3	5.60	27.1	317	45.3	4.55	61.0
×3/8	0.349	42.79	11.8	8.46	37.1	252	36.0	4.63	47.8
×5/16	0.291	36.10	9.92	10.7	45.1	216	30.9	4.67	40.6
×1/4	0.233	29.23	8.03	14.2	57.1	178	25.4	4.71	33.2
×3/16	0.174	22.18	6.06	20.0	77.5	137	19.5	4.74	25.3
HSS12×10×1/2	0.465	69.27	19.0	18.5	22.8	395	65.9	4.56	78.8
×3/8	0.349	53.00	14.6	25.7	31.4	310	51.6	4.61	61.1
×5/16	0.291	44.60	12.2	31.4	38.2	264	44.0	4.64	51.7
×1/4	0.233	36.03	9.90	39.9	48.5	216	36.0	4.67	42.1
HSS12×8×5/8	0.581	76.33	21.0	10.8	17.7	397	66.1	4.34	82.1
×1/2	0.465	62.46	17.2	14.2	22.8	333	55.6	4.41	68.1
×3/8	0.349	47.90	13.2	19.9	31.4	262	43.7	4.47	53.0
×5/16	0.291	40.35	11.1	24.5	38.2	224	37.4	4.50	44.9
×1/4	0.233	32.63	8.96	31.3	48.5	184	30.6	4.53	36.6
×3/16	0.174	24.73	6.76	43.0	66.0	140	23.4	4.56	27.8
HSS12×6×5/8	0.581	67.82	18.7	7.33	17.7	321	53.4	4.14	68.8
×1/2	0.465	55.66	15.3	9.90	22.8	271	45.2	4.21	57.4
×3/8	0.349	42.79	11.8	14.2	31.4	215	35.9	4.28	44.8
×5/16	0.291	36.10	9.92	17.6	38.2	184	30.7	4.31	38.1
×1/4	0.233	29.23	8.03	22.8	48.5	151	25.2	4.34	31.1
×3/16	0.174	22.18	6.06	31.5	66.0	116	19.4	4.38	23.7

Note: For compactness criteria, refer to Table 1-12A.

Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties

HSS14-HSS12

Shape	Axis Y-Y				Workable Flat		Torsion		Surface Area
	I	S	r	Z	Depth	Width	J	C	
	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{3}	ft^2/ft
HSS14×10×5/8	407	81.5	3.98	95.1	11 3/16	7 3/16	832	146	3.83
×1/2	341	68.1	4.04	78.5	11 3/4	7 3/4	685	120	3.87
×3/8	267	53.4	4.09	60.7	12 5/16	8 5/16	528	91.8	3.90
×5/16	227	45.5	4.12	51.4	12 9/16	8 9/16	446	77.4	3.92
×1/4	186	37.2	4.14	41.8	12 7/8	8 7/8	362	62.6	3.93
HSS14×6×5/8	124	41.2	2.43	48.4	11 3/16	3 3/16	334	83.7	3.17
×1/2	105	35.1	2.48	40.4	11 3/4	3 3/4	279	69.3	3.20
×3/8	84.1	28.0	2.53	31.6	12 5/16	4 5/16	219	53.7	3.23
×5/16	72.3	24.1	2.55	26.9	12 9/16	4 9/16	186	45.5	3.25
×1/4	59.6	19.9	2.58	22.0	12 7/8	4 7/8	152	36.9	3.27
×3/16	45.9	15.3	2.61	16.7	13 3/16	5 3/16	116	28.0	3.28
HSS14×4×5/8	47.2	23.6	1.59	28.5	11 1/4	—	148	52.6	2.83
×1/2	41.2	20.6	1.64	24.1	11 3/4	—	127	44.1	2.87
×3/8	33.6	16.8	1.69	19.1	12 1/4	2 1/4	102	34.6	2.90
×5/16	29.2	14.6	1.72	16.4	12 5/8	2 5/8	87.7	29.5	2.92
×1/4	24.4	12.2	1.74	13.5	12 7/8	2 7/8	72.4	24.1	2.93
×3/16	19.0	9.48	1.77	10.3	13 1/8	3 1/8	55.8	18.4	2.95
HSS12×10×1/2	298	59.7	3.96	69.6	9 3/4	7 3/4	545	102	3.53
×3/8	234	46.9	4.01	54.0	10 5/16	8 5/16	421	78.3	3.57
×5/16	200	40.0	4.04	45.7	10 9/16	8 9/16	356	66.1	3.58
×1/4	164	32.7	4.07	37.2	10 7/8	8 7/8	289	53.5	3.60
HSS12×8×5/8	210	52.5	3.16	61.9	9 3/16	5 3/16	454	97.7	3.17
×1/2	178	44.4	3.21	51.5	9 3/4	5 3/4	377	80.4	3.20
×3/8	140	35.1	3.27	40.1	10 5/16	6 5/16	293	62.1	3.23
×5/16	120	30.1	3.29	34.1	10 9/16	6 9/16	248	52.4	3.25
×1/4	98.8	24.7	3.32	27.8	10 7/8	6 7/8	202	42.5	3.27
×3/16	75.7	18.9	3.35	21.1	11 1/8	7 1/8	153	32.2	3.28
HSS12×6×5/8	107	35.5	2.39	42.1	9 3/16	3 3/16	271	71.1	2.83
×1/2	91.1	30.4	2.44	35.2	9 3/4	3 3/4	227	59.0	2.87
×3/8	72.9	24.3	2.49	27.7	10 5/16	4 5/16	178	45.8	2.90
×5/16	62.8	20.9	2.52	23.6	10 9/16	4 9/16	152	38.8	2.92
×1/4	51.9	17.3	2.54	19.3	10 7/8	4 7/8	124	31.6	2.93
×3/16	40.0	13.3	2.57	14.7	11 3/16	5 3/16	94.6	24.0	2.95

— Indicates flat depth or width is too small to establish a workable flat.

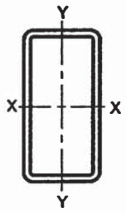


Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties

Shape	Design Wall Thickness, *t*	Nominal Wt.	Area, *A*	*b/t*	*h/t*	Axis X-X			
						I	*S*	*r*	*Z*
	in.	lb/ft	in.^{2}			in.^{4}	in.^{3}	in.	in.^{3}
HSS12×4×5/8	0.581	59.32	16.4	3.88	17.7	245	40.8	3.87	55.5
×1/2	0.465	48.85	13.5	5.60	22.8	210	34.9	3.95	46.7
×3/8	0.349	37.69	10.4	8.46	31.4	168	28.0	4.02	36.7
×5/16	0.291	31.84	8.76	10.7	38.2	144	24.1	4.06	31.3
×1/4	0.233	25.82	7.10	14.2	48.5	119	19.9	4.10	25.6
×3/16	0.174	19.63	5.37	20.0	66.0	91.8	15.3	4.13	19.6
HSS12×3 1/2×3/8	0.349	36.41	10.0	7.03	31.4	156	26.0	3.94	34.7
×5/16	0.291	30.78	8.46	9.03	38.2	134	22.4	3.98	29.6
HSS12×3×5/16	0.291	29.72	8.17	7.31	38.2	124	20.7	3.90	27.9
×1/4	0.233	24.12	6.63	9.88	48.5	103	17.2	3.94	22.9
×3/16	0.174	18.35	5.02	14.2	66.0	79.6	13.3	3.98	17.5
HSS12×2×5/16	0.291	27.59	7.59	3.87	38.2	104	17.4	3.71	24.5
×1/4	0.233	22.42	6.17	5.58	48.5	86.9	14.5	3.75	20.1
×3/16	0.174	17.08	4.67	8.49	66.0	67.4	11.2	3.80	15.5
HSS10×8×5/8	0.581	67.82	18.7	10.8	14.2	253	50.5	3.68	62.2
×1/2	0.465	55.66	15.3	14.2	18.5	214	42.7	3.73	51.9
×3/8	0.349	42.79	11.8	19.9	25.7	169	33.9	3.79	40.5
×5/16	0.291	36.10	9.92	24.5	31.4	145	29.0	3.82	34.4
×1/4	0.233	29.23	8.03	31.3	39.9	119	23.8	3.85	28.1
×3/16	0.174	22.18	6.06	43.0	54.5	91.4	18.3	3.88	21.4
HSS10×6×5/8	0.581	59.32	16.4	7.33	14.2	201	40.2	3.50	51.3
×1/2	0.465	48.85	13.5	9.90	18.5	171	34.3	3.57	43.0
×3/8	0.349	37.69	10.4	14.2	25.7	137	27.4	3.63	33.8
×5/16	0.291	31.84	8.76	17.6	31.4	118	23.5	3.66	28.8
×1/4	0.233	25.82	7.10	22.8	39.9	96.9	19.4	3.69	23.6
×3/16	0.174	19.63	5.37	31.5	54.5	74.6	14.9	3.73	18.0
HSS10×5×3/8	0.349	35.13	9.67	11.3	25.7	120	24.1	3.53	30.4
×5/16	0.291	29.72	8.17	14.2	31.4	104	20.8	3.56	26.0
×1/4	0.233	24.12	6.63	18.5	39.9	85.8	17.2	3.60	21.3
×3/16	0.174	18.35	5.02	25.7	54.5	66.2	13.2	3.63	16.3

Note: For compactness criteria, refer to Table 1-12A.

Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties

HSS12-HSS10

Shape	Axis Y-Y				Workable Flat		Torsion		Surface Area
	I	*S*	*r*	*Z*	Depth	Width	*J*	*C*	
	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{3}	ft^2/ft
HSS12×4×5/8	40.4	20.2	1.57	24.5	9 3/16	—	122	44.6	2.50
×1/2	35.3	17.7	1.62	20.9	9 3/4	—	105	37.5	2.53
×3/8	28.9	14.5	1.67	16.6	10 5/16	2 5/16	84.1	29.5	2.57
×5/16	25.2	12.6	1.70	14.2	10 5/8	2 5/8	72.4	25.2	2.58
×1/4	21.0	10.5	1.72	11.7	10 7/8	2 7/8	59.8	20.6	2.60
×3/16	16.4	8.20	1.75	9.00	11 3/16	3 3/16	46.1	15.7	2.62
HSS12×3 1/2×3/8	21.3	12.2	1.46	14.0	10 5/16	—	64.7	25.5	2.48
×5/16	18.6	10.6	1.48	12.1	10 5/8	—	56.0	21.8	2.50
HSS12×3×5/16	13.1	8.73	1.27	10.0	10 5/8	—	41.3	18.4	2.42
×1/4	11.1	7.38	1.29	8.28	10 7/8	—	34.5	15.1	2.43
×3/16	8.72	5.81	1.32	6.40	11 3/16	2 3/16	26.8	11.6	2.45
HSS12×2×5/16	5.10	5.10	0.820	6.05	10 5/8	—	17.6	11.6	2.25
×1/4	4.41	4.41	0.845	5.08	10 7/8	—	15.1	9.64	2.27
×3/16	3.55	3.55	0.872	3.97	11 3/16	—	12.0	7.49	2.28
HSS10×8×5/8	178	44.5	3.09	53.3	7 3/16	5 3/16	346	80.4	2.83
×1/2	151	37.8	3.14	44.5	7 3/4	5 3/4	288	66.4	2.87
×3/8	120	30.0	3.19	34.8	8 5/16	6 5/16	224	51.4	2.90
×5/16	103	25.7	3.22	29.6	8 5/8	6 5/8	190	43.5	2.92
×1/4	84.7	21.2	3.25	24.2	8 7/8	6 7/8	155	35.3	2.93
×3/16	65.1	16.3	3.28	18.4	9 3/16	7 3/16	118	26.7	2.95
HSS10×6×5/8	89.4	29.8	2.34	35.8	7 3/16	3 3/16	209	58.6	2.50
×1/2	76.8	25.6	2.39	30.1	7 3/4	3 3/4	176	48.7	2.53
×3/8	61.8	20.6	2.44	23.7	8 5/16	4 5/16	139	37.9	2.57
×5/16	53.3	17.8	2.47	20.2	8 5/8	4 5/8	118	32.2	2.58
×1/4	44.1	14.7	2.49	16.6	8 7/8	4 7/8	96.7	26.2	2.60
×3/16	34.1	11.4	2.52	12.7	9 3/16	5 3/16	73.8	19.9	2.62
HSS10×5×3/8	40.6	16.2	2.05	18.7	8 5/16	3 5/16	100	31.2	2.40
×5/16	35.2	14.1	2.07	16.0	8 5/8	3 5/8	86.0	26.5	2.42
×1/4	29.3	11.7	2.10	13.2	8 7/8	3 7/8	70.7	21.6	2.43
×3/16	22.7	9.09	2.13	10.1	9 3/16	4 3/16	54.1	16.5	2.45

— Indicates flat depth or width is too small to establish a workable flat.

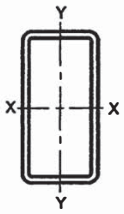


Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties

Shape	Design Wall Thick-ness, *t*	Nominal Wt.	Area, *A*	*b/t*	*h/t*	Axis X-X			
						I	*S*	*r*	*Z*
	in.	lb/ft	in.^{2}			in.^{4}	in.^{3}	in.	in.^{3}
HSS10×4×5/8	0.581	50.81	14.0	3.88	14.2	149	29.9	3.26	40.3
×1/2	0.465	42.05	11.6	5.60	18.5	129	25.8	3.34	34.1
×3/8	0.349	32.58	8.97	8.46	25.7	104	20.8	3.41	27.0
×5/16	0.291	27.59	7.59	10.7	31.4	90.1	18.0	3.44	23.1
×1/4	0.233	22.42	6.17	14.2	39.9	74.7	14.9	3.48	19.0
×3/16	0.174	17.08	4.67	20.0	54.5	57.8	11.6	3.52	14.6
×1/8	0.116	11.56	3.16	31.5	83.2	39.8	7.97	3.55	10.0
HSS10×3 1/2×1/2	0.465	40.34	11.1	4.53	18.5	118	23.7	3.26	31.9
×3/8	0.349	31.31	8.62	7.03	25.7	96.1	19.2	3.34	25.3
×5/16	0.291	26.53	7.30	9.03	31.4	83.2	16.6	3.38	21.7
×1/4	0.233	21.57	5.93	12.0	39.9	69.1	13.8	3.41	17.9
×3/16	0.174	16.44	4.50	17.1	54.5	53.6	10.7	3.45	13.7
×1/8	0.116	11.13	3.04	27.2	83.2	37.0	7.40	3.49	9.37
HSS10×3×3/8	0.349	30.03	8.27	5.60	25.7	88.0	17.6	3.26	23.7
×5/16	0.291	25.46	7.01	7.31	31.4	76.3	15.3	3.30	20.3
×1/4	0.233	20.72	5.70	9.88	39.9	63.6	12.7	3.34	16.7
×3/16	0.174	15.80	4.32	14.2	54.5	49.4	9.87	3.38	12.8
×1/8	0.116	10.71	2.93	22.9	83.2	34.2	6.83	3.42	8.80
HSS10×2×3/8	0.349	27.48	7.58	2.73	25.7	71.7	14.3	3.08	20.3
×5/16	0.291	23.34	6.43	3.87	31.4	62.6	12.5	3.12	17.5
×1/4	0.233	19.02	5.24	5.58	39.9	52.5	10.5	3.17	14.4
×3/16	0.174	14.53	3.98	8.49	54.5	41.0	8.19	3.21	11.1
×1/8	0.116	9.86	2.70	14.2	83.2	28.5	5.70	3.25	7.65
HSS9×7×5/8	0.581	59.32	16.4	9.05	12.5	174	38.7	3.26	48.3
×1/2	0.465	48.85	13.5	12.1	16.4	149	33.0	3.32	40.5
×3/8	0.349	37.69	10.4	17.1	22.8	119	26.4	3.38	31.8
×5/16	0.291	31.84	8.76	21.1	27.9	102	22.6	3.41	27.1
×1/4	0.233	25.82	7.10	27.0	35.6	84.1	18.7	3.44	22.2
×3/16	0.174	19.63	5.37	37.2	48.7	64.7	14.4	3.47	16.9

Note: For compactness criteria, refer to Table 1-12A.

Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties

HSS10-HSS9

Shape	Axis Y-Y				Workable Flat		Torsion		Surface Area
	I	*S*	*r*	*Z*	Depth	Width	*J*	*C*	
	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{3}	ft^2/ft
HSS10×4×5/8	33.5	16.8	1.54	20.6	7 3/16	—	95.7	36.7	2.17
×1/2	29.5	14.7	1.59	17.6	7 3/4	—	82.6	31.0	2.20
×3/8	24.3	12.1	1.64	14.0	8 5/16	2 5/16	66.5	24.4	2.23
×5/16	21.2	10.6	1.67	12.1	8 5/8	2 5/8	57.3	20.9	2.25
×1/4	17.7	8.87	1.70	10.0	8 7/8	2 7/8	47.4	17.1	2.27
×3/16	13.9	6.93	1.72	7.66	9 3/16	3 3/16	36.5	13.1	2.28
×1/8	9.65	4.83	1.75	5.26	9 7/16	3 7/16	25.1	8.90	2.30
HSS10×3 1/2×1/2	21.4	12.2	1.39	14.7	7 3/4	—	63.2	26.5	2.12
×3/8	17.8	10.2	1.44	11.8	8 5/16	—	51.5	21.1	2.15
×5/16	15.6	8.92	1.46	10.2	8 5/8	—	44.6	18.0	2.17
×1/4	13.1	7.51	1.49	8.45	8 7/8	—	37.0	14.8	2.18
×3/16	10.3	5.89	1.51	6.52	9 3/16	2 11/16	28.6	11.4	2.20
×1/8	7.22	4.12	1.54	4.48	9 7/16	2 15/16	19.8	7.75	2.22
HSS10×3×3/8	12.4	8.28	1.22	9.73	8 5/16	—	37.8	17.7	2.07
×5/16	11.0	7.30	1.25	8.42	8 5/8	—	33.0	15.2	2.08
×1/4	9.28	6.19	1.28	6.99	8 7/8	—	27.6	12.5	2.10
×3/16	7.33	4.89	1.30	5.41	9 3/16	2 3/16	21.5	9.64	2.12
×1/8	5.16	3.44	1.33	3.74	9 7/16	2 7/16	14.9	6.61	2.13
HSS10×2×3/8	4.70	4.70	0.787	5.76	8 5/16	—	15.9	11.0	1.90
×5/16	4.24	4.24	0.812	5.06	8 5/8	—	14.2	9.56	1.92
×1/4	3.67	3.67	0.838	4.26	8 7/8	—	12.2	7.99	1.93
×3/16	2.97	2.97	0.864	3.34	9 3/16	—	9.74	6.22	1.95
×1/8	2.14	2.14	0.890	2.33	9 7/16	—	6.90	4.31	1.97
HSS9×7×5/8	117	33.5	2.68	40.5	6 3/16	4 3/16	235	62.0	2.50
×1/2	100	28.7	2.73	34.0	6 3/4	4 3/4	197	51.5	2.53
×3/8	80.4	23.0	2.78	26.7	7 5/16	5 5/16	154	40.0	2.57
×5/16	69.2	19.8	2.81	22.8	7 5/8	5 5/8	131	33.9	2.58
×1/4	57.2	16.3	2.84	18.7	7 7/8	5 7/8	107	27.6	2.60
×3/16	44.1	12.6	2.87	14.3	8 3/16	6 3/16	81.7	20.9	2.62

— Indicates flat depth or width is too small to establish a workable flat.

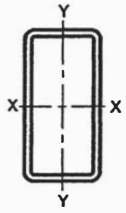


Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties

Shape	Design Wall Thickness, t	Nominal Wt.	Area, A	b/t	h/t	Axis X-X			
						I	S	r	Z
	in.	lb/ft	in.^{2}			in.^{4}	in.^{3}	in.	in.^{3}
HSS9×5×5/8	0.581	50.81	14.0	5.61	12.5	133	29.6	3.08	38.5
×1/2	0.465	42.05	11.6	7.75	16.4	115	25.5	3.14	32.5
×3/8	0.349	32.58	8.97	11.3	22.8	92.5	20.5	3.21	25.7
×5/16	0.291	27.59	7.59	14.2	27.9	79.8	17.7	3.24	22.0
×1/4	0.233	22.42	6.17	18.5	35.6	66.1	14.7	3.27	18.1
×3/16	0.174	17.08	4.67	25.7	48.7	51.1	11.4	3.31	13.8
HSS9×3×1/2	0.465	35.24	9.74	3.45	16.4	80.8	18.0	2.88	24.6
×3/8	0.349	27.48	7.58	5.60	22.8	66.3	14.7	2.96	19.7
×5/16	0.291	23.34	6.43	7.31	27.9	57.7	12.8	3.00	16.9
×1/4	0.233	19.02	5.24	9.88	35.6	48.2	10.7	3.04	14.0
×3/16	0.174	14.53	3.98	14.2	48.7	37.6	8.35	3.07	10.8
HSS8×6×5/8	0.581	50.81	14.0	7.33	10.8	114	28.5	2.85	36.1
×1/2	0.465	42.05	11.6	9.90	14.2	98.2	24.6	2.91	30.5
×3/8	0.349	32.58	8.97	14.2	19.9	79.1	19.8	2.97	24.1
×5/16	0.291	27.59	7.59	17.6	24.5	68.3	17.1	3.00	20.6
×1/4	0.233	22.42	6.17	22.8	31.3	56.6	14.2	3.03	16.9
×3/16	0.174	17.08	4.67	31.5	43.0	43.7	10.9	3.06	13.0
HSS8×4×5/8	0.581	42.30	11.7	3.88	10.8	82.0	20.5	2.64	27.4
×1/2	0.465	35.24	9.74	5.60	14.2	71.8	17.9	2.71	23.5
×3/8	0.349	27.48	7.58	8.46	19.9	58.7	14.7	2.78	18.8
×5/16	0.291	23.34	6.43	10.7	24.5	51.0	12.8	2.82	16.1
×1/4	0.233	19.02	5.24	14.2	31.3	42.5	10.6	2.85	13.3
×3/16	0.174	14.53	3.98	20.0	43.0	33.1	8.27	2.88	10.2
×1/8	0.116	9.86	2.70	31.5	66.0	22.9	5.73	2.92	7.02
HSS8×3×1/2	0.465	31.84	8.81	3.45	14.2	58.6	14.6	2.58	20.0
×3/8	0.349	24.93	6.88	5.60	19.9	48.5	12.1	2.65	16.1
×5/16	0.291	21.21	5.85	7.31	24.5	42.4	10.6	2.69	13.9
×1/4	0.233	17.32	4.77	9.88	31.3	35.5	8.88	2.73	11.5
×3/16	0.174	13.25	3.63	14.2	43.0	27.8	6.94	2.77	8.87
×1/8	0.116	9.01	2.46	22.9	66.0	19.3	4.83	2.80	6.11

Note: For compactness criteria, refer to Table 1-12A.

Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties

HSS9-HSS8

Shape	Axis Y-Y				Workable Flat		Torsion		Surface Area
	I	S	r	Z	Depth	Width	J	C	
	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{3}	ft^2/ft
HSS9×5×5/8	52.0	20.8	1.92	25.3	6 3/16	2 3/16	128	42.5	2.17
×1/2	45.2	18.1	1.97	21.5	6 3/4	2 3/4	109	35.6	2.20
×3/8	36.8	14.7	2.03	17.1	7 5/16	3 5/16	86.9	27.9	2.23
×5/16	32.0	12.8	2.05	14.6	7 5/8	3 5/8	74.4	23.8	2.25
×1/4	26.6	10.6	2.08	12.0	7 7/8	3 7/8	61.2	19.4	2.27
×3/16	20.7	8.28	2.10	9.25	8 3/16	4 3/16	46.9	14.8	2.28
HSS9×3×1/2	13.2	8.81	1.17	10.8	6 3/4	—	40.0	19.7	1.87
×3/8	11.2	7.45	1.21	8.80	7 5/16	—	33.1	15.8	1.90
×5/16	9.88	6.59	1.24	7.63	7 5/8	—	28.9	13.6	1.92
×1/4	8.38	5.59	1.27	6.35	7 7/8	—	24.2	11.3	1.93
×3/16	6.64	4.42	1.29	4.92	8 3/16	2 3/16	18.9	8.66	1.95
HSS8×6×5/8	72.3	24.1	2.27	29.5	5 3/16	3 3/16	150	46.0	2.17
×1/2	62.5	20.8	2.32	24.9	5 3/4	3 3/4	127	38.4	2.20
×3/8	50.6	16.9	2.38	19.8	6 5/16	4 5/16	100	30.0	2.23
×5/16	43.8	14.6	2.40	16.9	6 5/8	4 5/8	85.8	25.5	2.25
×1/4	36.4	12.1	2.43	13.9	6 7/8	4 7/8	70.3	20.8	2.27
×3/16	28.2	9.39	2.46	10.7	7 3/16	5 3/16	53.7	15.8	2.28
HSS8×4×5/8	26.6	13.3	1.51	16.6	5 3/16	—	70.3	28.7	1.83
×1/2	23.6	11.8	1.56	14.3	5 3/4	—	61.1	24.4	1.87
×3/8	19.6	9.80	1.61	11.5	6 5/16	2 5/16	49.3	19.3	1.90
×5/16	17.2	8.58	1.63	9.91	6 5/8	2 5/8	42.6	16.5	1.92
×1/4	14.4	7.21	1.66	8.20	6 7/8	2 7/8	35.3	13.6	1.93
×3/16	11.3	5.65	1.69	6.33	7 3/16	3 3/16	27.2	10.4	1.95
×1/8	7.90	3.95	1.71	4.36	7 7/16	3 7/16	18.7	7.10	1.97
HSS8×3×1/2	11.7	7.81	1.15	9.64	5 3/4	—	34.3	17.4	1.70
×3/8	10.0	6.63	1.20	7.88	6 5/16	—	28.5	14.0	1.73
×5/16	8.81	5.87	1.23	6.84	6 5/8	—	24.9	12.1	1.75
×1/4	7.49	4.99	1.25	5.70	6 7/8	—	20.8	10.0	1.77
×3/16	5.94	3.96	1.28	4.43	7 3/16	2 3/16	16.2	7.68	1.78
×1/8	4.20	2.80	1.31	3.07	7 7/16	2 7/16	11.3	5.27	1.80

— Indicates flat depth or width is too small to establish a workable flat.

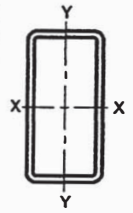


Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties

Shape	Design Wall Thick-ness, *t*	Nominal Wt.	Area, *A*	*b/t*	*h/t*	Axis X-X			
						I	*S*	*r*	*Z*
	in.	lb/ft	in.^{2}			in.^{4}	in.^{3}	in.	in.^{3}
HSS8×2×3/8	0.349	22.37	6.18	2.73	19.9	38.2	9.56	2.49	13.4
×5/16	0.291	19.08	5.26	3.87	24.5	33.7	8.43	2.53	11.6
×1/4	0.233	15.62	4.30	5.58	31.3	28.5	7.12	2.57	9.68
×3/16	0.174	11.97	3.28	8.49	43.0	22.4	5.61	2.61	7.51
×1/8	0.116	8.16	2.23	14.2	66.0	15.7	3.93	2.65	5.19
HSS7×5×1/2	0.465	35.24	9.74	7.75	12.1	60.6	17.3	2.50	21.9
×3/8	0.349	27.48	7.58	11.3	17.1	49.5	14.1	2.56	17.5
×5/16	0.291	23.34	6.43	14.2	21.1	43.0	12.3	2.59	15.0
×1/4	0.233	19.02	5.24	18.5	27.0	35.9	10.2	2.62	12.4
×3/16	0.174	14.53	3.98	25.7	37.2	27.9	7.96	2.65	9.52
×1/8	0.116	9.86	2.70	40.1	57.3	19.3	5.52	2.68	6.53
HSS7×4×1/2	0.465	31.84	8.81	5.60	12.1	50.7	14.5	2.40	18.8
×3/8	0.349	24.93	6.88	8.46	17.1	41.8	11.9	2.46	15.1
×5/16	0.291	21.21	5.85	10.7	21.1	36.5	10.4	2.50	13.1
×1/4	0.233	17.32	4.77	14.2	27.0	30.5	8.72	2.53	10.8
×3/16	0.174	13.25	3.63	20.0	37.2	23.8	6.81	2.56	8.33
×1/8	0.116	9.01	2.46	31.5	57.3	16.6	4.73	2.59	5.73
HSS7×3×1/2	0.465	28.43	7.88	3.45	12.1	40.7	11.6	2.27	15.8
×3/8	0.349	22.37	6.18	5.60	17.1	34.1	9.73	2.35	12.8
×5/16	0.291	19.08	5.26	7.31	21.1	29.9	8.54	2.38	11.1
×1/4	0.233	15.62	4.30	9.88	27.0	25.2	7.19	2.42	9.22
×3/16	0.174	11.97	3.28	14.2	37.2	19.8	5.65	2.45	7.14
×1/8	0.116	8.16	2.23	22.9	57.3	13.8	3.95	2.49	4.93
HSS7×2×1/4	0.233	13.91	3.84	5.58	27.0	19.8	5.67	2.27	7.64
×3/16	0.174	10.70	2.93	8.49	37.2	15.7	4.49	2.31	5.95
×1/8	0.116	7.31	2.00	14.2	57.3	11.1	3.16	2.35	4.13
HSS6×5×1/2	0.465	31.84	8.81	7.75	9.90	41.1	13.7	2.16	17.2
×3/8	0.349	24.93	6.88	11.3	14.2	33.9	11.3	2.22	13.8
×5/16	0.291	21.21	5.85	14.2	17.6	29.6	9.85	2.25	11.9
×1/4	0.233	17.32	4.77	18.5	22.8	24.7	8.25	2.28	9.87
×3/16	0.174	13.25	3.63	25.7	31.5	19.3	6.44	2.31	7.62
×1/8	0.116	9.01	2.46	40.1	48.7	13.4	4.48	2.34	5.24

Note: For compactness criteria, refer to Table 1-12A.

Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties

HSS8-HSS6

Shape	Axis Y-Y				Workable Flat		Torsion		Surface Area
	I	*S*	*r*	*Z*	Depth	Width	*J*	*C*	
	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{3}	ft^2/ft
HSS8×2×3/8	3.73	3.73	0.777	4.61	6 5/16	—	12.1	8.65	1.57
×5/16	3.38	3.38	0.802	4.06	6 5/8	—	10.9	7.57	1.58
×1/4	2.94	2.94	0.827	3.43	6 7/8	—	9.36	6.35	1.60
×3/16	2.39	2.39	0.853	2.70	7 3/16	—	7.48	4.95	1.62
×1/8	1.72	1.72	0.879	1.90	7 7/16	—	5.30	3.44	1.63
HSS7×5×1/2	35.6	14.2	1.91	17.3	4 3/4	2 3/4	75.8	27.2	1.87
×3/8	29.3	11.7	1.97	13.8	5 5/16	3 5/16	60.6	21.4	1.90
×5/16	25.5	10.2	1.99	11.9	5 5/8	3 5/8	52.1	18.3	1.92
×1/4	21.3	8.53	2.02	9.83	5 7/8	3 7/8	42.9	15.0	1.93
×3/16	16.6	6.65	2.05	7.57	6 3/16	4 3/16	32.9	11.4	1.95
×1/8	11.6	4.63	2.07	5.20	6 7/16	4 7/16	22.5	7.79	1.97
HSS7×4×1/2	20.7	10.4	1.53	12.6	4 3/4	—	50.5	21.1	1.70
×3/8	17.3	8.63	1.58	10.2	5 5/16	2 5/16	41.0	16.8	1.73
×5/16	15.2	7.58	1.61	8.83	5 5/8	2 5/8	35.4	14.4	1.75
×1/4	12.8	6.38	1.64	7.33	5 7/8	2 7/8	29.3	11.8	1.77
×3/16	10.0	5.02	1.66	5.67	6 1/8	3 1/8	22.7	9.07	1.78
×1/8	7.03	3.51	1.69	3.91	6 7/16	3 7/16	15.6	6.20	1.80
HSS7×3×1/2	10.2	6.80	1.14	8.46	4 3/4	—	28.6	15.0	1.53
×3/8	8.71	5.81	1.19	6.95	5 5/16	—	23.9	12.1	1.57
×5/16	7.74	5.16	1.21	6.05	5 5/8	—	20.9	10.5	1.58
×1/4	6.60	4.40	1.24	5.06	5 7/8	—	17.5	8.68	1.60
×3/16	5.24	3.50	1.26	3.94	6 3/16	2 3/16	13.7	6.69	1.62
×1/8	3.71	2.48	1.29	2.73	6 7/16	2 7/16	9.48	4.60	1.63
HSS7×2×1/4	2.58	2.58	0.819	3.02	5 7/8	—	7.95	5.52	1.43
×3/16	2.10	2.10	0.845	2.39	6 3/16	—	6.35	4.32	1.45
×1/8	1.52	1.52	0.871	1.68	6 7/16	—	4.51	3.00	1.47
HSS6×5×1/2	30.8	12.3	1.87	15.2	3 3/4	2 3/4	59.8	23.0	1.70
×3/8	25.5	10.2	1.92	12.2	4 5/16	3 5/16	48.1	18.2	1.73
×5/16	22.3	8.91	1.95	10.5	4 5/8	3 5/8	41.4	15.6	1.75
×1/4	18.7	7.47	1.98	8.72	4 7/8	3 7/8	34.2	12.8	1.77
×3/16	14.6	5.84	2.01	6.73	5 3/16	4 3/16	26.3	9.76	1.78
×1/8	10.2	4.07	2.03	4.63	5 7/16	4 7/16	18.0	6.66	1.80

— Indicates flat depth or width is too small to establish a workable flat.

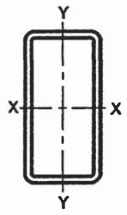


Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties

Shape	Design Wall Thick-ness, *t*	Nominal Wt.	Area, *A*	*b/t*	*h/t*	Axis X-X			
						I	*S*	*r*	*Z*
	in.	lb/ft	in.^{2}			in.^{4}	in.^{3}	in.	in.^{3}
HSS6×4×1/2	0.465	28.43	7.88	5.60	9.90	34.0	11.3	2.08	14.6
×3/8	0.349	22.37	6.18	8.46	14.2	28.3	9.43	2.14	11.9
×5/16	0.291	19.08	5.26	10.7	17.6	24.8	8.27	2.17	10.3
×1/4	0.233	15.62	4.30	14.2	22.8	20.9	6.96	2.20	8.53
×3/16	0.174	11.97	3.28	20.0	31.5	16.4	5.46	2.23	6.60
×1/8	0.116	8.16	2.23	31.5	48.7	11.4	3.81	2.26	4.56
HSS6×3×1/2	0.465	25.03	6.95	3.45	9.90	26.8	8.95	1.97	12.1
×3/8	0.349	19.82	5.48	5.60	14.2	22.7	7.57	2.04	9.90
×5/16	0.291	16.96	4.68	7.31	17.6	20.1	6.69	2.07	8.61
×1/4	0.233	13.91	3.84	9.88	22.8	17.0	5.66	2.10	7.19
×3/16	0.174	10.70	2.93	14.2	31.5	13.4	4.47	2.14	5.59
×1/8	0.116	7.31	2.00	22.9	48.7	9.43	3.14	2.17	3.87
HSS6×2×3/8	0.349	17.27	4.78	2.73	14.2	17.1	5.71	1.89	7.93
×5/16	0.291	14.83	4.10	3.87	17.6	15.3	5.11	1.93	6.95
×1/4	0.233	12.21	3.37	5.58	22.8	13.1	4.37	1.97	5.84
×3/16	0.174	9.42	2.58	8.49	31.5	10.5	3.49	2.01	4.58
×1/8	0.116	6.46	1.77	14.2	48.7	7.42	2.47	2.05	3.19
HSS5×4×1/2	0.465	25.03	6.95	5.60	7.75	21.2	8.49	1.75	10.9
×3/8	0.349	19.82	5.48	8.46	11.3	17.9	7.17	1.81	8.96
×5/16	0.291	16.96	4.68	10.7	14.2	15.8	6.32	1.84	7.79
×1/4	0.233	13.91	3.84	14.2	18.5	13.4	5.35	1.87	6.49
×3/16	0.174	10.70	2.93	20.0	25.7	10.6	4.22	1.90	5.05
×1/8	0.116	7.31	2.00	31.5	40.1	7.42	2.97	1.93	3.50
HSS5×3×1/2	0.465	21.63	6.02	3.45	7.75	16.4	6.57	1.65	8.83
×3/8	0.349	17.27	4.78	5.60	11.3	14.1	5.65	1.72	7.34
×5/16	0.291	14.83	4.10	7.31	14.2	12.6	5.03	1.75	6.42
×1/4	0.233	12.21	3.37	9.88	18.5	10.7	4.29	1.78	5.38
×3/16	0.174	9.42	2.58	14.2	25.7	8.53	3.41	1.82	4.21
×1/8	0.116	6.46	1.77	22.9	40.1	6.03	2.41	1.85	2.93

Note: For compactness criteria, refer to Table 1-12A.

Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties

HSS6-HSS5

Shape	Axis Y-Y				Workable Flat		Torsion		Surface Area
	I	*S*	*r*	*Z*	Depth	Width	*J*	*C*	
	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{3}	ft^2/ft
HSS6×4×1/2	17.8	8.89	1.50	11.0	3 3/4	—	40.3	17.8	1.53
×3/8	14.9	7.47	1.55	8.94	4 5/16	2 5/16	32.8	14.2	1.57
×5/16	13.2	6.58	1.58	7.75	4 5/8	2 5/8	28.4	12.2	1.58
×1/4	11.1	5.56	1.61	6.45	4 7/8	2 7/8	23.6	10.1	1.60
×3/16	8.76	4.38	1.63	5.00	5 3/16	3 3/16	18.2	7.74	1.62
×1/8	6.15	3.08	1.66	3.46	5 7/16	3 7/16	12.6	5.30	1.63
HSS6×3×1/2	8.69	5.79	1.12	7.28	3 3/4	—	23.1	12.7	1.37
×3/8	7.48	4.99	1.17	6.03	4 5/16	—	19.3	10.3	1.40
×5/16	6.67	4.45	1.19	5.27	4 5/8	—	16.9	8.91	1.42
×1/4	5.70	3.80	1.22	4.41	4 7/8	—	14.2	7.39	1.43
×3/16	4.55	3.03	1.25	3.45	5 3/16	2 3/16	11.1	5.71	1.45
×1/8	3.23	2.15	1.27	2.40	5 7/16	2 7/16	7.73	3.93	1.47
HSS6×2×3/8	2.77	2.77	0.760	3.46	4 5/16	—	8.42	6.35	1.23
×5/16	2.52	2.52	0.785	3.07	4 5/8	—	7.60	5.58	1.25
×1/4	2.21	2.21	0.810	2.61	4 7/8	—	6.55	4.70	1.27
×3/16	1.80	1.80	0.836	2.07	5 3/16	—	5.24	3.68	1.28
×1/8	1.31	1.31	0.861	1.46	5 7/16	—	3.72	2.57	1.30
HSS5×4×1/2	14.9	7.43	1.46	9.35	2 3/4	—	30.3	14.5	1.37
×3/8	12.6	6.30	1.52	7.67	3 5/16	2 5/16	24.9	11.7	1.40
×5/16	11.1	5.57	1.54	6.67	3 5/8	2 5/8	21.7	10.1	1.42
×1/4	9.46	4.73	1.57	5.57	3 7/8	2 7/8	18.0	8.32	1.43
×3/16	7.48	3.74	1.60	4.34	4 3/16	3 3/16	14.0	6.41	1.45
×1/8	5.27	2.64	1.62	3.01	4 7/16	3 7/16	9.66	4.39	1.47
HSS5×3×1/2	7.18	4.78	1.09	6.10	2 3/4	—	17.6	10.3	1.20
×3/8	6.25	4.16	1.14	5.10	3 5/16	—	14.9	8.44	1.23
×5/16	5.60	3.73	1.17	4.48	3 5/8	—	13.1	7.33	1.25
×1/4	4.81	3.21	1.19	3.77	3 7/8	—	11.0	6.10	1.27
×3/16	3.85	2.57	1.22	2.96	4 3/16	2 3/16	8.64	4.73	1.28
×1/8	2.75	1.83	1.25	2.07	4 7/16	2 7/16	6.02	3.26	1.30

— Indicates flat depth or width is too small to establish a workable flat.

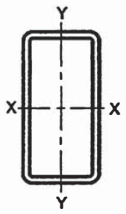


Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties

Shape	Design Wall Thick-ness, *t*	Nominal Wt.	Area, *A*	*b/t*	*h/t*	Axis X-X			
						I	*S*	*r*	*Z*
	in.	lb/ft	in.^{2}			in.^{4}	in.^{3}	in.	in.^{3}
HSS5×2½×¼	0.233	11.36	3.14	7.73	18.5	9.40	3.76	1.73	4.83
×3/16	0.174	8.78	2.41	11.4	25.7	7.51	3.01	1.77	3.79
×⅛	0.116	6.03	1.65	18.6	40.1	5.34	2.14	1.80	2.65
HSS5×2×3/8	0.349	14.72	4.09	2.73	11.3	10.4	4.14	1.59	5.71
×5/16	0.291	12.70	3.52	3.87	14.2	9.35	3.74	1.63	5.05
×¼	0.233	10.51	2.91	5.58	18.5	8.08	3.23	1.67	4.27
×3/16	0.174	8.15	2.24	8.49	25.7	6.50	2.60	1.70	3.37
×⅛	0.116	5.61	1.54	14.2	40.1	4.65	1.86	1.74	2.37
HSS4×3×3/8	0.349	14.72	4.09	5.60	8.46	7.93	3.97	1.39	5.12
×5/16	0.291	12.70	3.52	7.31	10.7	7.14	3.57	1.42	4.51
×¼	0.233	10.51	2.91	9.88	14.2	6.15	3.07	1.45	3.81
×3/16	0.174	8.15	2.24	14.2	20.0	4.93	2.47	1.49	3.00
×⅛	0.116	5.61	1.54	22.9	31.5	3.52	1.76	1.52	2.11
HSS4×2½×3/8	0.349	13.44	3.74	4.16	8.46	6.77	3.38	1.35	4.48
×5/16	0.291	11.64	3.23	5.59	10.7	6.13	3.07	1.38	3.97
×¼	0.233	9.66	2.67	7.73	14.2	5.32	2.66	1.41	3.38
×3/16	0.174	7.51	2.06	11.4	20.0	4.30	2.15	1.44	2.67
×⅛	0.116	5.18	1.42	18.6	31.5	3.09	1.54	1.47	1.88
HSS4×2×3/8	0.349	12.17	3.39	2.73	8.46	5.60	2.80	1.29	3.84
×5/16	0.291	10.58	2.94	3.87	10.7	5.13	2.56	1.32	3.43
×¼	0.233	8.81	2.44	5.58	14.2	4.49	2.25	1.36	2.94
×3/16	0.174	6.87	1.89	8.49	20.0	3.66	1.83	1.39	2.34
×⅛	0.116	4.75	1.30	14.2	31.5	2.65	1.32	1.43	1.66
HSS3½×2½×3/8	0.349	12.17	3.39	4.16	7.03	4.75	2.72	1.18	3.59
×5/16	0.291	10.58	2.94	5.59	9.03	4.34	2.48	1.22	3.20
×¼	0.233	8.81	2.44	7.73	12.0	3.79	2.17	1.25	2.74
×3/16	0.174	6.87	1.89	11.4	17.1	3.09	1.76	1.28	2.18
×⅛	0.116	4.75	1.30	18.6	27.2	2.23	1.28	1.31	1.54
HSS3½×2×¼	0.233	7.96	2.21	5.58	12.0	3.17	1.81	1.20	2.36
×3/16	0.174	6.23	1.71	8.49	17.1	2.61	1.49	1.23	1.89
×⅛	0.116	4.33	1.19	14.2	27.2	1.90	1.09	1.27	1.34

Note: For compactness criteria, refer to Table 1-12A.

Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties

HSS5-HSS3½

Shape	Axis Y-Y				Workable Flat		Torsion		Surface Area
	I	*S*	*r*	*Z*	Depth	Width	*J*	*C*	
	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{3}	ft^2/ft
HSS5×2½×¼	3.13	2.50	0.999	2.95	3/8	—	7.93	4.99	1.18
×3/16	2.53	2.03	1.02	2.33	4 3/16	—	6.26	3.89	1.20
×⅛	1.82	1.46	1.05	1.64	4 7/16	—	4.40	2.70	1.22
HSS5×2×3/8	2.28	2.28	0.748	2.88	3 5/16	—	6.61	5.20	1.07
×5/16	2.10	2.10	0.772	2.57	3 5/8	—	5.99	4.59	1.08
×¼	1.84	1.84	0.797	2.20	3 7/8	—	5.17	3.88	1.10
×3/16	1.51	1.51	0.823	1.75	4 3/16	—	4.15	3.05	1.12
×⅛	1.10	1.10	0.848	1.24	4 7/16	—	2.95	2.13	1.13
HSS4×3×3/8	5.01	3.34	1.11	4.18	2 5/16	—	10.6	6.59	1.07
×5/16	4.52	3.02	1.13	3.69	2 5/8	—	9.41	5.75	1.08
×¼	3.91	2.61	1.16	3.12	2 7/8	—	7.96	4.81	1.10
×3/16	3.16	2.10	1.19	2.46	3 3/16	—	6.26	3.74	1.12
×⅛	2.27	1.51	1.21	1.73	3 7/16	—	4.38	2.59	1.13
HSS4×2½×3/8	3.17	2.54	0.922	3.20	2 5/16	—	7.57	5.32	0.983
×5/16	2.89	2.32	0.947	2.85	2 5/8	—	6.77	4.67	1.00
×¼	2.53	2.02	0.973	2.43	2 7/8	—	5.78	3.93	1.02
×3/16	2.06	1.65	0.999	1.93	3 1/8	—	4.59	3.08	1.03
×⅛	1.49	1.19	1.03	1.36	3 7/16	—	3.23	2.14	1.05
HSS4×2×3/8	1.80	1.80	0.729	2.31	2 5/16	—	4.83	4.04	0.900
×5/16	1.67	1.67	0.754	2.08	2 5/8	—	4.40	3.59	0.917
×¼	1.48	1.48	0.779	1.79	2 7/8	—	3.82	3.05	0.933
×3/16	1.22	1.22	0.804	1.43	3 3/16	—	3.08	2.41	0.950
×⅛	0.898	0.898	0.830	1.02	3 7/16	—	2.20	1.69	0.967
HSS3½×2½×3/8	2.77	2.21	0.904	2.82	—	—	6.16	4.57	0.900
×5/16	2.54	2.03	0.930	2.52	2 1/8	—	5.53	4.03	0.917
×¼	2.23	1.78	0.956	2.16	2 3/8	—	4.75	3.40	0.933
×3/16	1.82	1.46	0.983	1.72	2 11/16	—	3.78	2.67	0.950
×⅛	1.33	1.06	1.01	1.22	2 15/16	—	2.67	1.87	0.967
HSS3½×2×¼	1.30	1.30	0.766	1.58	2 3/8	—	3.16	2.64	0.850
×3/16	1.08	1.08	0.792	1.27	2 11/16	—	2.55	2.09	0.867
×⅛	0.795	0.795	0.818	0.912	2 15/16	—	1.83	1.47	0.883

—Indicates flat depth or width is too small to establish a workable flat.

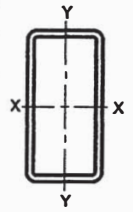


Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties

Shape	Design Wall Thick-ness, *t*	Nominal Wt.	Area, *A*	*b/t*	*h/t*	Axis X-X			
						I	*S*	*r*	*Z*
	in.	lb/ft	in.^{2}			in.^{4}	in.^{3}	in.	in.^{3}
HSS3½×1½×¼	0.233	7.11	1.97	3.44	12.0	2.55	1.46	1.14	1.98
×3/16	0.174	5.59	1.54	5.62	17.1	2.12	1.21	1.17	1.60
×⅛	0.116	3.90	1.07	9.93	27.2	1.57	0.896	1.21	1.15
HSS3×2½×5/16	0.291	9.51	2.64	5.59	7.31	2.92	1.94	1.05	2.51
×¼	0.233	7.96	2.21	7.73	9.88	2.57	1.72	1.08	2.16
×3/16	0.174	6.23	1.71	11.4	14.2	2.11	1.41	1.11	1.73
×⅛	0.116	4.33	1.19	18.6	22.9	1.54	1.03	1.14	1.23
HSS3×2×5/16	0.291	8.45	2.35	3.87	7.31	2.38	1.59	1.01	2.11
×¼	0.233	7.11	1.97	5.58	9.88	2.13	1.42	1.04	1.83
×3/16	0.174	5.59	1.54	8.49	14.2	1.77	1.18	1.07	1.48
×⅛	0.116	3.90	1.07	14.2	22.9	1.30	0.867	1.10	1.06
HSS3×1½×¼	0.233	6.26	1.74	3.44	9.88	1.68	1.12	0.982	1.51
×3/16	0.174	4.96	1.37	5.62	14.2	1.42	0.945	1.02	1.24
×⅛	0.116	3.48	0.956	9.93	22.9	1.06	0.706	1.05	0.895
HSS3×1×3/16	0.174	4.32	1.19	2.75	14.2	1.07	0.713	0.947	0.989
×⅛	0.116	3.05	0.840	5.62	22.9	0.817	0.545	0.987	0.728
HSS2½×2×¼	0.233	6.26	1.74	5.58	7.73	1.33	1.06	0.874	1.37
×3/16	0.174	4.96	1.37	8.49	11.4	1.12	0.894	0.904	1.12
×⅛	0.116	3.48	0.956	14.2	18.6	0.833	0.667	0.934	0.809
HSS2½×1½×¼	0.233	5.41	1.51	3.44	7.73	1.03	0.822	0.826	1.11
×3/16	0.174	4.32	1.19	5.62	11.4	0.882	0.705	0.860	0.915
×⅛	0.116	3.05	0.840	9.93	18.6	0.668	0.535	0.892	0.671
HSS2½×1×3/16	0.174	3.68	1.02	2.75	11.4	0.646	0.517	0.796	0.713
×⅛	0.116	2.63	0.724	5.62	18.6	0.503	0.403	0.834	0.532
HSS2¼×2×3/16	0.174	4.64	1.28	8.49	9.93	0.859	0.764	0.819	0.952
×⅛	0.116	3.27	0.898	14.2	16.4	0.646	0.574	0.848	0.693
HSS2×1½×3/16	0.174	3.68	1.02	5.62	8.49	0.495	0.495	0.697	0.639
×⅛	0.116	2.63	0.724	9.93	14.2	0.383	0.383	0.728	0.475
HSS2×1×3/16	0.174	3.04	0.845	2.75	8.49	0.350	0.350	0.643	0.480
×⅛	0.116	2.20	0.608	5.62	14.2	0.280	0.280	0.679	0.366

Note: For compactness criteria, refer to Table 1-12A.

Table 1-11 (continued)
Rectangular HSS
Dimensions and Properties

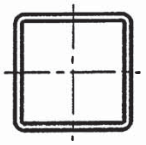
HSS3½-HSS2

Shape	Axis Y-Y				Workable Flat		Torsion		Surface Area
	I	*S*	*r*	*Z*	Depth	Width	*J*	*C*	
	in.^{4}	in.^{3}	in.	in.^{3}	in.	in.	in.^{4}	in.^{3}	ft^2/ft
HSS3½×1½×¼	0.638	0.851	0.569	1.06	2⅜	—	1.79	1.88	0.767
×3/16	0.544	0.725	0.594	0.867	2 11/16	—	1.49	1.51	0.784
×⅛	0.411	0.548	0.619	0.630	2 15/16	—	1.09	1.08	0.800
HSS3×2½×5/16	2.18	1.74	0.908	2.20	—	—	4.34	3.39	0.833
×¼	1.93	1.54	0.935	1.90	—	—	3.74	2.87	0.850
×3/16	1.59	1.27	0.963	1.52	2 3/16	—	3.00	2.27	0.867
×⅛	1.16	0.931	0.990	1.09	2 7/16	—	2.13	1.59	0.883
HSS3×2×5/16	1.24	1.24	0.725	1.58	—	—	2.87	2.60	0.750
×¼	1.11	1.11	0.751	1.38	—	—	2.52	2.23	0.767
×3/16	0.932	0.932	0.778	1.12	2 3/16	—	2.05	1.78	0.784
×⅛	0.692	0.692	0.804	0.803	2 7/16	—	1.47	1.25	0.800
HSS3×1½×¼	0.543	0.725	0.559	0.911	1⅞	—	1.44	1.58	0.683
×3/16	0.467	0.622	0.584	0.752	2 3/16	—	1.21	1.28	0.700
×⅛	0.355	0.474	0.610	0.550	2 7/16	—	0.886	0.920	0.717
HSS3×1×3/16	0.173	0.345	0.380	0.432	2 3/16	—	0.526	0.792	0.617
×⅛	0.138	0.276	0.405	0.325	2 7/16	—	0.408	0.585	0.633
HSS2½×2×¼	0.930	0.930	0.731	1.17	—	—	1.90	1.82	0.683
×3/16	0.786	0.786	0.758	0.956	—	—	1.55	1.46	0.700
×⅛	0.589	0.589	0.785	0.694	—	—	1.12	1.04	0.717
HSS2½×1½×¼	0.449	0.599	0.546	0.764	—	—	1.10	1.29	0.600
×3/16	0.390	0.520	0.572	0.636	—	—	0.929	1.05	0.617
×⅛	0.300	0.399	0.597	0.469	—	—	0.687	0.759	0.633
HSS2½×1×3/16	0.143	0.285	0.374	0.360	—	—	0.412	0.648	0.534
×⅛	0.115	0.230	0.399	0.274	—	—	0.322	0.483	0.550
HSS2¼×2×3/16	0.713	0.713	0.747	0.877	—	—	1.32	1.30	0.659
×⅛	0.538	0.538	0.774	0.639	—	—	0.957	0.927	0.675
HSS2×1½×3/16	0.313	0.417	0.554	0.521	—	—	0.664	0.822	0.534
×⅛	0.244	0.325	0.581	0.389	—	—	0.496	0.599	0.550
HSS2×1×3/16	0.112	0.225	0.365	0.288	—	—	0.301	0.505	0.450
×⅛	0.0922	0.184	0.390	0.223	—	—	0.238	0.380	0.467

— Indicates flat depth or width is too small to establish a workable flat.

HSS16-HSS8

Table 1-12
Square HSS
Dimensions and Properties



Shape	Design Wall Thickness, *t*	Nominal Wt.	Area, *A*	*b/t*	*h/t*	*I*	*S*	*r*	*Z*	Workable Flat	Torsion		Surface Area
											J	*C*	
	in.	lb/ft	in.^{2}			in.^{4}	in.^{3}	in.	in.^{3}	in.	in.^{4}	in.^{3}	ft^2/ft
HSS16×16×5/8	0.581	127.37	35.0	24.5	24.5	1370	171	6.25	200	13 3/16	2170	276	5.17
×1/2	0.465	103.30	28.3	31.4	31.4	1130	141	6.31	164	13 3/4	1770	224	5.20
×3/8	0.349	78.52	21.5	42.8	42.8	873	109	6.37	126	14 5/16	1350	171	5.23
×5/16	0.291	65.87	18.1	52.0	52.0	739	92.3	6.39	106	14 5/8	1140	144	5.25
HSS14×14×5/8	0.581	110.36	30.3	21.1	21.1	897	128	5.44	151	11 3/16	1430	208	4.50
×1/2	0.465	89.68	24.6	27.1	27.1	743	106	5.49	124	11 3/4	1170	170	4.53
×3/8	0.349	68.31	18.7	37.1	37.1	577	82.5	5.55	95.4	12 5/16	900	130	4.57
×5/16	0.291	57.36	15.7	45.1	45.1	490	69.9	5.58	80.5	12 5/8	759	109	4.58
HSS12×12×5/8	0.581	93.34	25.7	17.7	17.7	548	91.4	4.62	109	9 3/16	885	151	3.83
×1/2	0.465	76.07	20.9	22.8	22.8	457	76.2	4.68	89.6	9 3/4	728	123	3.87
×3/8	0.349	58.10	16.0	31.4	31.4	357	59.5	4.73	69.2	10 5/16	561	94.6	3.90
×5/16	0.291	48.86	13.4	38.2	38.2	304	50.7	4.76	58.6	10 5/8	474	79.7	3.92
×1/4	0.233	39.43	10.8	48.5	48.5	248	41.4	4.79	47.6	10 7/8	384	64.5	3.93
×3/16	0.174	29.84	8.15	66.0	66.0	189	31.5	4.82	36.0	11 3/16	290	48.6	3.95
HSS10×10×5/8	0.581	76.33	21.0	14.2	14.2	304	60.8	3.80	73.2	7 3/16	498	102	3.17
×1/2	0.465	62.46	17.2	18.5	18.5	256	51.2	3.86	60.7	7 3/4	412	84.2	3.20
×3/8	0.349	47.90	13.2	25.7	25.7	202	40.4	3.92	47.2	8 5/16	320	64.8	3.23
×5/16	0.291	40.35	11.1	31.4	31.4	172	34.5	3.94	40.1	8 5/8	271	54.8	3.25
×1/4	0.233	32.63	8.96	39.9	39.9	141	28.3	3.97	32.7	8 7/8	220	44.4	3.27
×3/16	0.174	24.73	6.76	54.5	54.5	108	21.6	4.00	24.8	9 3/16	167	33.6	3.28
HSS9×9×5/8	0.581	67.82	18.7	12.5	12.5	216	47.9	3.40	58.1	6 3/16	356	81.6	2.83
×1/2	0.465	55.66	15.3	16.4	16.4	183	40.6	3.45	48.4	6 3/4	296	67.4	2.87
×3/8	0.349	42.79	11.8	22.8	22.8	145	32.2	3.51	37.8	7 5/16	231	52.1	2.90
×5/16	0.291	36.10	9.92	27.9	27.9	124	27.6	3.54	32.1	7 5/8	196	44.0	2.92
×1/4	0.233	29.23	8.03	35.6	35.6	102	22.7	3.56	26.2	7 7/8	159	35.8	2.93
×3/16	0.174	22.18	6.06	48.7	48.7	78.2	17.4	3.59	20.0	8 3/16	121	27.1	2.95
×1/8	0.116	14.96	4.09	74.6	74.6	53.5	11.9	3.62	13.6	8 7/16	82.0	18.3	2.97
HSS8×8×5/8	0.581	59.32	16.4	10.8	10.8	146	36.5	2.99	44.7	5 3/16	244	63.2	2.50
×1/2	0.465	48.85	13.5	14.2	14.2	125	31.2	3.04	37.5	5 3/4	204	52.4	2.53
×3/8	0.349	37.69	10.4	19.9	19.9	100	24.9	3.10	29.4	6 5/16	160	40.7	2.57
×5/16	0.291	31.84	8.76	24.5	24.5	85.6	21.4	3.13	25.1	6 5/8	136	34.5	2.58
×1/4	0.233	25.82	7.10	31.3	31.3	70.7	17.7	3.15	20.5	6 7/8	111	28.1	2.60
×3/16	0.174	19.63	5.37	43.0	43.0	54.4	13.6	3.18	15.7	7 3/16	84.5	21.3	2.62
×1/8	0.116	13.26	3.62	66.0	66.0	37.4	9.34	3.21	10.7	7 7/16	57.3	14.4	2.63

Note: For compactness criteria, refer to Table 1-12A.

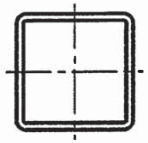
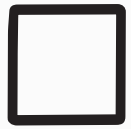


Table 1-12 (continued)
Square HSS
Dimensions and Properties

HSS7-HSS4 1/2

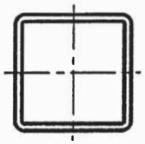
Shape	Design Wall Thickness, *t*	Nominal Wt.	Area, *A*	*b/t*	*h/t*	*I*	*S*	*r*	*Z*	Workable Flat	Torsion		Surface Area
											J	*C*	
	in.	lb/ft	in.^{2}			in.^{4}	in.^{3}	in.	in.^{3}	in.	in.^{4}	in.^{3}	ft^2/ft
HSS7×7×5/8	0.581	50.81	14.0	9.05	9.05	93.4	26.7	2.58	33.1	4 3/16	158	47.1	2.17
×1/2	0.465	42.05	11.6	12.1	12.1	80.5	23.0	2.63	27.9	4 3/4	133	39.3	2.20
×3/8	0.349	32.58	8.97	17.1	17.1	65.0	18.6	2.69	22.1	5 5/16	105	30.7	2.23
×5/16	0.291	27.59	7.59	21.1	21.1	56.1	16.0	2.72	18.9	5 5/8	89.7	26.1	2.25
×1/4	0.233	22.42	6.17	27.0	27.0	46.5	13.3	2.75	15.5	5 7/8	73.5	21.3	2.27
×3/16	0.174	17.08	4.67	37.2	37.2	36.0	10.3	2.77	11.9	6 3/16	56.1	16.2	2.28
×1/8	0.116	11.56	3.16	57.3	57.3	24.8	7.09	2.80	8.13	6 7/16	38.2	11.0	2.30
HSS6×6×5/8	0.581	42.30	11.7	7.33	7.33	55.2	18.4	2.17	23.2	3 3/16	94.9	33.4	1.83
×1/2	0.465	35.24	9.74	9.90	9.90	48.3	16.1	2.23	19.8	3 3/4	81.1	28.1	1.87
×3/8	0.349	27.48	7.58	14.2	14.2	39.5	13.2	2.28	15.8	4 5/16	64.6	22.1	1.90
×5/16	0.291	23.34	6.43	17.6	17.6	34.3	11.4	2.31	13.6	4 5/8	55.4	18.9	1.92
×1/4	0.233	19.02	5.24	22.8	22.8	28.6	9.54	2.34	11.2	4 7/8	45.6	15.4	1.93
×3/16	0.174	14.53	3.98	31.5	31.5	22.3	7.42	2.37	8.63	5 3/16	35.0	11.8	1.95
×1/8	0.116	9.86	2.70	48.7	48.7	15.5	5.15	2.39	5.92	5 7/16	23.9	8.03	1.97
HSS5 1/2×5 1/2×3/8	0.349	24.93	6.88	12.8	12.8	29.7	10.8	2.08	13.1	3 13/16	49.0	18.4	1.73
×5/16	0.291	21.21	5.85	15.9	15.9	25.9	9.43	2.11	11.3	4 1/8	42.2	15.7	1.75
×1/4	0.233	17.32	4.77	20.6	20.6	21.7	7.90	2.13	9.32	4 3/8	34.8	12.9	1.77
×3/16	0.174	13.25	3.63	28.6	28.6	17.0	6.17	2.16	7.19	4 11/16	26.7	9.85	1.78
×1/8	0.116	9.01	2.46	44.4	44.4	11.8	4.30	2.19	4.95	4 15/16	18.3	6.72	1.80
HSS5×5×1/2	0.465	28.43	7.88	7.75	7.75	26.0	10.4	1.82	13.1	2 3/4	44.6	18.7	1.53
×3/8	0.349	22.37	6.18	11.3	11.3	21.7	8.68	1.87	10.6	3 5/16	36.1	14.9	1.57
×5/16	0.291	19.08	5.26	14.2	14.2	19.0	7.62	1.90	9.16	3 5/8	31.2	12.8	1.58
×1/4	0.233	15.62	4.30	18.5	18.5	16.0	6.41	1.93	7.61	3 7/8	25.8	10.5	1.60
×3/16	0.174	11.97	3.28	25.7	25.7	12.6	5.03	1.96	5.89	4 3/16	19.9	8.08	1.62
×1/8	0.116	8.16	2.23	40.1	40.1	8.80	3.52	1.99	4.07	4 7/16	13.7	5.53	1.63
HSS4 1/2×4 1/2×1/2	0.465	25.03	6.95	6.68	6.68	18.1	8.03	1.61	10.2	2 1/4	31.3	14.8	1.37
×3/8	0.349	19.82	5.48	9.89	9.89	15.3	6.79	1.67	8.36	2 13/16	25.7	11.9	1.40
×5/16	0.291	16.96	4.68	12.5	12.5	13.5	6.00	1.70	7.27	3 1/8	22.3	10.2	1.42
×1/4	0.233	13.91	3.84	16.3	16.3	11.4	5.08	1.73	6.06	3 3/8	18.5	8.44	1.43
×3/16	0.174	10.70	2.93	22.9	22.9	9.02	4.01	1.75	4.71	3 11/16	14.4	6.49	1.45
×1/8	0.116	7.31	2.00	35.8	35.8	6.35	2.82	1.78	3.27	3 15/16	9.92	4.45	1.47

Note: For compactness criteria, refer to Table 1-12A.



HSS4-HSS2

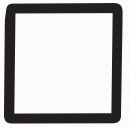
Table 1-12 (continued)
Square HSS
Dimensions and Properties



Shape	Design Wall Thickness, t	Nominal Wt.	Area, A	b/t	h/t	I	S	r	Z	Workable Flat	Torsion		Surface Area
											J	C	
	in.	lb/ft	in.^{2}			in.^{4}	in.^{3}	in.	in.^{3}	in.	in.^{4}	in.^{3}	ft^2/ft
HSS4×4×1/2	0.465	21.63	6.02	5.60	5.60	11.9	5.97	1.41	7.70	—	21.0	11.2	1.20
×3/8	0.349	17.27	4.78	8.46	8.46	10.3	5.13	1.47	6.39	2 5/16	17.5	9.14	1.23
×5/16	0.291	14.83	4.10	10.7	10.7	9.14	4.57	1.49	5.59	2 5/8	15.3	7.91	1.25
×1/4	0.233	12.21	3.37	14.2	14.2	7.80	3.90	1.52	4.69	2 7/8	12.8	6.56	1.27
×3/16	0.174	9.42	2.58	20.0	20.0	6.21	3.10	1.55	3.67	3 3/16	10.0	5.07	1.28
×1/8	0.116	6.46	1.77	31.5	31.5	4.40	2.20	1.58	2.56	3 7/16	6.91	3.49	1.30
HSS3 1/2×3 1/2×3/8	0.349	14.72	4.09	7.03	7.03	6.49	3.71	1.26	4.69	—	11.2	6.77	1.07
×5/16	0.291	12.70	3.52	9.03	9.03	5.84	3.34	1.29	4.14	2 1/8	9.89	5.90	1.08
×1/4	0.233	10.51	2.91	12.0	12.0	5.04	2.88	1.32	3.50	2 3/8	8.35	4.92	1.10
×3/16	0.174	8.15	2.24	17.1	17.1	4.05	2.31	1.35	2.76	2 11/16	6.56	3.83	1.12
×1/8	0.116	5.61	1.54	27.2	27.2	2.90	1.66	1.37	1.93	2 15/16	4.58	2.65	1.13
HSS3×3×3/8	0.349	12.17	3.39	5.60	5.60	3.78	2.52	1.06	3.25	—	6.64	4.74	0.900
×5/16	0.291	10.58	2.94	7.31	7.31	3.45	2.30	1.08	2.90	—	5.94	4.18	0.917
×1/4	0.233	8.81	2.44	9.88	9.88	3.02	2.01	1.11	2.48	—	5.08	3.52	0.933
×3/16	0.174	6.87	1.89	14.2	14.2	2.46	1.64	1.14	1.97	2 3/16	4.03	2.76	0.950
×1/8	0.116	4.75	1.30	22.9	22.9	1.78	1.19	1.17	1.40	2 7/16	2.84	1.92	0.967
HSS2 1/2×2 1/2×5/16	0.291	8.45	2.35	5.59	5.59	1.82	1.46	0.880	1.88	—	3.20	2.74	0.750
×1/4	0.233	7.11	1.97	7.73	7.73	1.63	1.30	0.908	1.63	—	2.79	2.35	0.767
×3/16	0.174	5.59	1.54	11.4	11.4	1.35	1.08	0.937	1.32	—	2.25	1.86	0.784
×1/8	0.116	3.90	1.07	18.6	18.6	0.998	0.799	0.965	0.947	—	1.61	1.31	0.800
HSS2 1/4×2 1/4×1/4	0.233	6.26	1.74	6.66	6.66	1.13	1.01	0.806	1.28	—	1.96	1.85	0.683
×3/16	0.174	4.96	1.37	9.93	9.93	0.953	0.847	0.835	1.04	—	1.60	1.48	0.700
×1/8	0.116	3.48	0.956	16.4	16.4	0.712	0.633	0.863	0.755	—	1.15	1.05	0.717
HSS2×2×1/4	0.233	5.41	1.51	5.58	5.58	0.747	0.747	0.704	0.964	—	1.31	1.41	0.600
×3/16	0.174	4.32	1.19	8.49	8.49	0.641	0.641	0.733	0.797	—	1.09	1.14	0.617
×1/8	0.116	3.05	0.840	14.2	14.2	0.486	0.486	0.761	0.584	—	0.796	0.817	0.633

Note: For compactness criteria, refer to Table 1-12A.
— Indicates flat depth or width is too small to establish a workable flat.

Table 1-12A
Rectangular and Square HSS
Compactness Criteria



Nominal Wall Thickness, in.	Compactness Criteria for Rectangular and Square HSS			
	Compression	Flexure		Shear
	nonslender up to	compact up to	compact up to	$C_v = 1.0$ up to
	Flange Width, in.	Flange Width, in.	Web Height, in.	Web Height, in.
5/8	20	18	20	20
1/2	16	14	20	20
3/8	12	10	20	20
5/16	10	9	18	18
1/4	8	7	14	14
3/16	6	5	10	10
1/8	4	3 1/2	7	7

Note: Compactness criteria given for $F_y = 46$ ksi.

HSS20-HSS10

Table 1-13
Round HSS
Dimensions and Properties

Shape	Design Wall Thick-ness, *t*	Nom-inal Wt.	Area, *A*	*D/t*	*I*	*S*	*r*	*Z*	Torsion	
									J	*C*
	in.	lb/ft	in.^{2}		in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}
HSS20×0.500	0.465	104.00	28.5	43.0	1360	136	6.91	177	2720	272
×0.375[f]	0.349	78.67	21.5	57.3	1040	104	6.95	135	2080	208
HSS18×0.500	0.465	93.54	25.6	38.7	985	109	6.20	143	1970	219
×0.375[f]	0.349	70.66	19.4	51.6	754	83.8	6.24	109	1510	168
HSS16×0.625	0.581	103.00	28.1	27.5	838	105	5.46	138	1680	209
×0.500	0.465	82.85	22.7	34.4	685	85.7	5.49	112	1370	171
×0.438	0.407	72.87	19.9	39.3	606	75.8	5.51	99.0	1210	152
×0.375	0.349	62.64	17.2	45.8	526	65.7	5.53	85.5	1050	131
×0.312[f]	0.291	52.32	14.4	55.0	443	55.4	5.55	71.8	886	111
×0.250[f]	0.233	42.09	11.5	68.7	359	44.8	5.58	57.9	717	89.7
HSS14×0.625	0.581	89.36	24.5	24.1	552	78.9	4.75	105	1100	158
×0.500	0.465	72.16	19.8	30.1	453	64.8	4.79	85.2	907	130
×0.375	0.349	54.62	15.0	40.1	349	49.8	4.83	65.1	698	100
×0.312	0.291	45.65	12.5	48.1	295	42.1	4.85	54.7	589	84.2
×0.250[f]	0.233	36.75	10.1	60.1	239	34.1	4.87	44.2	478	68.2
HSS12.750×0.500	0.465	65.48	17.9	27.4	339	53.2	4.35	70.2	678	106
×0.375	0.349	49.61	13.6	36.5	262	41.0	4.39	53.7	523	82.1
×0.250[f]	0.233	33.41	9.16	54.7	180	28.2	4.43	36.5	359	56.3
HSS10.750×0.500	0.465	54.79	15.0	23.1	199	37.0	3.64	49.2	398	74.1
×0.375	0.349	41.59	11.4	30.8	154	28.7	3.68	37.8	309	57.4
×0.250	0.233	28.06	7.70	46.1	106	19.8	3.72	25.8	213	39.6
HSS10×0.625	0.581	62.64	17.2	17.2	191	38.3	3.34	51.6	383	76.6
×0.500	0.465	50.78	13.9	21.5	159	31.7	3.38	42.3	317	63.5
×0.375	0.349	38.58	10.6	28.7	123	24.7	3.41	32.5	247	49.3
×0.312	0.291	32.31	8.88	34.4	105	20.9	3.43	27.4	209	41.9
×0.250	0.233	26.06	7.15	42.9	85.3	17.1	3.45	22.2	171	34.1
×0.188[f]	0.174	19.72	5.37	57.5	64.8	13.0	3.47	16.8	130	25.9

[f] Shape exceeds compact limit for flexure with $F_y = 42$ ksi.

Table 1-13 (continued)
Round HSS
Dimensions and Properties

HSS9.625-HSS6.875

Shape	Design Wall Thick-ness, *t*	Nom-inal Wt.	Area, *A*	*D/t*	*I*	*S*	*r*	*Z*	Torsion	
									J	*C*
	in.	lb/ft	in.^{2}		in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}
HSS9.625×0.500	0.465	48.77	13.4	20.7	141	29.2	3.24	39.0	281	58.5
×0.375	0.349	37.08	10.2	27.6	110	22.8	3.28	30.0	219	45.5
×0.312	0.291	31.06	8.53	33.1	93.0	19.3	3.30	25.4	186	38.7
×0.250	0.233	25.06	6.87	41.3	75.9	15.8	3.32	20.6	152	31.5
×0.188[f]	0.174	18.97	5.17	55.3	57.7	12.0	3.34	15.5	115	24.0
HSS8.625×0.625	0.581	53.45	14.7	14.8	119	27.7	2.85	37.7	239	55.4
×0.500	0.465	43.43	11.9	18.5	100	23.1	2.89	31.0	199	46.2
×0.375	0.349	33.07	9.07	24.7	77.8	18.0	2.93	23.9	156	36.1
×0.322	0.300	28.58	7.85	28.8	68.1	15.8	2.95	20.8	136	31.6
×0.250	0.233	22.38	6.14	37.0	54.1	12.5	2.97	16.4	108	25.1
×0.188[f]	0.174	16.96	4.62	49.6	41.3	9.57	2.99	12.4	82.5	19.1
HSS7.625×0.375	0.349	29.06	7.98	21.8	52.9	13.9	2.58	18.5	106	27.8
×0.328	0.305	25.59	7.01	25.0	47.1	12.3	2.59	16.4	94.1	24.7
HSS7.500×0.500	0.465	37.42	10.3	16.1	63.9	17.0	2.49	23.0	128	34.1
×0.375	0.349	28.56	7.84	21.5	50.2	13.4	2.53	17.9	100	26.8
×0.312	0.291	23.97	6.59	25.8	42.9	11.4	2.55	15.1	85.8	22.9
×0.250	0.233	19.38	5.32	32.2	35.2	9.37	2.57	12.3	70.3	18.7
×0.188	0.174	14.70	4.00	43.1	26.9	7.17	2.59	9.34	53.8	14.3
HSS7×0.500	0.465	34.74	9.55	15.1	51.2	14.6	2.32	19.9	102	29.3
×0.375	0.349	26.56	7.29	20.1	40.4	11.6	2.35	15.5	80.9	23.1
×0.312	0.291	22.31	6.13	24.1	34.6	9.88	2.37	13.1	69.1	19.8
×0.250	0.233	18.04	4.95	30.0	28.4	8.11	2.39	10.7	56.8	16.2
×0.188	0.174	13.69	3.73	40.2	21.7	6.21	2.41	8.11	43.5	12.4
×0.125[f]	0.116	9.19	2.51	60.3	14.9	4.25	2.43	5.50	29.7	8.49
HSS6.875×0.500	0.465	34.07	9.36	14.8	48.3	14.1	2.27	19.1	96.7	28.1
×0.375	0.349	26.06	7.16	19.7	38.2	11.1	2.31	14.9	76.4	22.2
×0.312	0.291	21.89	6.02	23.6	32.7	9.51	2.33	12.6	65.4	19.0
×0.250	0.233	17.71	4.86	29.5	26.8	7.81	2.35	10.3	53.7	15.6
×0.188	0.174	13.44	3.66	39.5	20.6	5.99	2.37	7.81	41.1	12.0

[f] Shape exceeds compact limit for flexure with $F_y = 42$ ksi.

HSS6.625-HSS5

Table 1-13 (continued)
Round HSS
Dimensions and Properties

Shape	Design Wall Thick-ness, *t*	Nom-inal Wt.	Area, *A*	*D/t*	*I*	*S*	*r*	*Z*	Torsion	
									J	*C*
	in.	lb/ft	in.^{2}		in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}
HSS6.625×0.500	0.465	32.74	9.00	14.2	42.9	13.0	2.18	17.7	85.9	25.9
×0.432	0.402	28.60	7.86	16.5	38.2	11.5	2.20	15.6	76.4	23.1
×0.375	0.349	25.06	6.88	19.0	34.0	10.3	2.22	13.8	68.0	20.5
×0.312	0.291	21.06	5.79	22.8	29.1	8.79	2.24	11.7	58.2	17.6
×0.280	0.260	18.99	5.20	25.5	26.4	7.96	2.25	10.5	52.7	15.9
×0.250	0.233	17.04	4.68	28.4	23.9	7.22	2.26	9.52	47.9	14.4
×0.188	0.174	12.94	3.53	38.1	18.4	5.54	2.28	7.24	36.7	11.1
×0.125[f]	0.116	8.69	2.37	57.1	12.6	3.79	2.30	4.92	25.1	7.59
HSS6×0.500	0.465	29.40	8.09	12.9	31.2	10.4	1.96	14.3	62.4	20.8
×0.375	0.349	22.55	6.20	17.2	24.8	8.28	2.00	11.2	49.7	16.6
×0.312	0.291	18.97	5.22	20.6	21.3	7.11	2.02	9.49	42.6	14.2
×0.280	0.260	17.12	4.69	23.1	19.3	6.45	2.03	8.57	38.7	12.9
×0.250	0.233	15.37	4.22	25.8	17.6	5.86	2.04	7.75	35.2	11.7
×0.188	0.174	11.68	3.18	34.5	13.5	4.51	2.06	5.91	27.0	9.02
×0.125[f]	0.116	7.85	2.14	51.7	9.28	3.09	2.08	4.02	18.6	6.19
HSS5.563×0.500	0.465	27.06	7.45	12.0	24.4	8.77	1.81	12.1	48.8	17.5
×0.375	0.349	20.80	5.72	15.9	19.5	7.02	1.85	9.50	39.0	14.0
×0.258	0.240	14.63	4.01	23.2	14.2	5.12	1.88	6.80	28.5	10.2
×0.188	0.174	10.80	2.95	32.0	10.7	3.85	1.91	5.05	21.4	7.70
×0.134	0.124	7.78	2.12	44.9	7.84	2.82	1.92	3.67	15.7	5.64
HSS5.500×0.500	0.465	26.73	7.36	11.8	23.5	8.55	1.79	11.8	47.0	17.1
×0.375	0.349	20.55	5.65	15.8	18.8	6.84	1.83	9.27	37.6	13.7
×0.258	0.240	14.46	3.97	22.9	13.7	5.00	1.86	6.64	27.5	10.0
HSS5×0.500	0.465	24.05	6.62	10.8	17.2	6.88	1.61	9.60	34.4	13.8
×0.375	0.349	18.54	5.10	14.3	13.9	5.55	1.65	7.56	27.7	11.1
×0.312	0.291	15.64	4.30	17.2	12.0	4.79	1.67	6.46	24.0	9.58
×0.258	0.240	13.08	3.59	20.8	10.2	4.08	1.69	5.44	20.4	8.15
×0.250	0.233	12.69	3.49	21.5	9.94	3.97	1.69	5.30	19.9	7.95
×0.188	0.174	9.67	2.64	28.7	7.69	3.08	1.71	4.05	15.4	6.15
×0.125	0.116	6.51	1.78	43.1	5.31	2.12	1.73	2.77	10.6	4.25

[f] Shape exceeds compact limit for flexure with $F_y = 42$ ksi.

Table 1-13 (continued)
Round HSS
Dimensions and Properties

HSS4.500-HSS2.500

Shape	Design Wall Thick-ness, *t*	Nom-inal Wt.	Area, *A*	*D/t*	*I*	*S*	*r*	*Z*	Torsion	
									J	*C*
	in.	lb/ft	in.^{2}		in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}
HSS4.500×0.375	0.349	16.54	4.55	12.9	9.87	4.39	1.47	6.03	19.7	8.78
×0.337	0.313	15.00	4.12	14.4	9.07	4.03	1.48	5.50	18.1	8.06
×0.237	0.220	10.80	2.96	20.5	6.79	3.02	1.52	4.03	13.6	6.04
×0.188	0.174	8.67	2.36	25.9	5.54	2.46	1.53	3.26	11.1	4.93
×0.125	0.116	5.85	1.60	38.8	3.84	1.71	1.55	2.23	7.68	3.41
HSS4×0.313	0.291	12.34	3.39	13.7	5.87	2.93	1.32	4.01	11.7	5.87
×0.250	0.233	10.00	2.76	17.2	4.91	2.45	1.33	3.31	9.82	4.91
×0.237	0.220	9.53	2.61	18.2	4.68	2.34	1.34	3.15	9.36	4.68
×0.226	0.210	9.12	2.50	19.0	4.50	2.25	1.34	3.02	9.01	4.50
×0.220	0.205	8.89	2.44	19.5	4.41	2.21	1.34	2.96	8.83	4.41
×0.188	0.174	7.66	2.09	23.0	3.83	1.92	1.35	2.55	7.67	3.83
×0.125	0.116	5.18	1.42	34.5	2.67	1.34	1.37	1.75	5.34	2.67
HSS3.500×0.313	0.291	10.66	2.93	12.0	3.81	2.18	1.14	3.00	7.61	4.35
×0.300	0.279	10.26	2.82	12.5	3.69	2.11	1.14	2.90	7.38	4.22
×0.250	0.233	8.69	2.39	15.0	3.21	1.83	1.16	2.49	6.41	3.66
×0.216	0.201	7.58	2.08	17.4	2.84	1.63	1.17	2.19	5.69	3.25
×0.203	0.189	7.15	1.97	18.5	2.70	1.54	1.17	2.07	5.41	3.09
×0.188	0.174	6.66	1.82	20.1	2.52	1.44	1.18	1.93	5.04	2.88
×0.125	0.116	4.51	1.23	30.2	1.77	1.01	1.20	1.33	3.53	2.02
HSS3×0.250	0.233	7.35	2.03	12.9	1.95	1.30	0.982	1.79	3.90	2.60
×0.216	0.201	6.43	1.77	14.9	1.74	1.16	0.992	1.58	3.48	2.32
×0.203	0.189	6.07	1.67	15.9	1.66	1.10	0.996	1.50	3.31	2.21
×0.188	0.174	5.65	1.54	17.2	1.55	1.03	1.00	1.39	3.10	2.06
×0.152	0.141	4.63	1.27	21.3	1.30	0.865	1.01	1.15	2.59	1.73
×0.134	0.124	4.11	1.12	24.2	1.16	0.774	1.02	1.03	2.32	1.55
×0.125	0.116	3.84	1.05	25.9	1.09	0.730	1.02	0.965	2.19	1.46
HSS2.875×0.250	0.233	7.02	1.93	12.3	1.70	1.18	0.938	1.63	3.40	2.37
×0.203	0.189	5.80	1.59	15.2	1.45	1.01	0.952	1.37	2.89	2.01
×0.188	0.174	5.40	1.48	16.5	1.35	0.941	0.957	1.27	2.70	1.88
×0.125	0.116	3.67	1.01	24.8	0.958	0.667	0.976	0.884	1.92	1.33
HSS2.500×0.250	0.233	6.01	1.66	10.7	1.08	0.862	0.806	1.20	2.15	1.72
×0.188	0.174	4.65	1.27	14.4	0.865	0.692	0.825	0.943	1.73	1.38
×0.125	0.116	3.17	0.869	21.6	0.619	0.495	0.844	0.660	1.24	0.990

HSS2.375-
HSS1.660

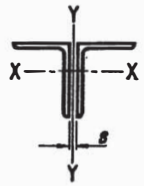
Table 1-13 (continued)
Round HSS
Dimensions and Properties

Shape	Design Wall Thickness, *t*	Nominal Wt.	Area, *A*	*D/t*	*I*	*S*	*r*	*Z*	Torsion	
									J	*C*
	in.	lb/ft	in.^{2}		in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}
HSS2.375×0.250	0.233	5.68	1.57	10.2	0.910	0.766	0.762	1.07	1.82	1.53
×0.218	0.203	5.03	1.39	11.7	0.824	0.694	0.771	0.960	1.65	1.39
×0.188	0.174	4.40	1.20	13.6	0.733	0.617	0.781	0.845	1.47	1.23
×0.154	0.143	3.66	1.00	16.6	0.627	0.528	0.791	0.713	1.25	1.06
×0.125	0.116	3.01	0.823	20.5	0.527	0.443	0.800	0.592	1.05	0.887
HSS1.900×0.188	0.174	3.44	0.943	10.9	0.355	0.374	0.613	0.520	0.710	0.747
×0.145	0.135	2.72	0.749	14.1	0.293	0.309	0.626	0.421	0.586	0.617
×0.120	0.111	2.28	0.624	17.1	0.251	0.264	0.634	0.356	0.501	0.527
HSS1.660×0.140	0.130	2.27	0.625	12.8	0.184	0.222	0.543	0.305	0.368	0.444

Table 1-14
Pipe
Dimensions and Properties

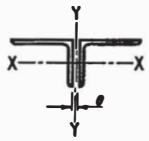
PIPE

Shape	Nominal Wt.	Dimensions		Nominal Wall Thickness	Design Wall Thickness	Area	*D/t*	*I*	*S*	*r*	*J*	*Z*
		Outside Diameter	Inside Diameter									
	lb/ft	in.	in.	in.	in.	in.^{2}		in.^{4}	in.^{3}	in.	in.^{4}	in.^{3}
Standard Weight (Std.)												
Pipe 12 Std.	49.6	12.8	12.0	0.375	0.349	13.7	36.5	262	41.0	4.39	523	53.7
Pipe 10 Std.	40.5	10.8	10.0	0.365	0.340	11.5	31.6	151	28.1	3.68	302	36.9
Pipe 8 Std.	28.6	8.63	7.98	0.322	0.300	7.85	28.8	68.1	15.8	2.95	136	20.8
Pipe 6 Std.	19.0	6.63	6.07	0.280	0.261	5.20	25.4	26.5	7.99	2.25	52.9	10.6
Pipe 5 Std.	14.6	5.56	5.05	0.258	0.241	4.01	23.1	14.3	5.14	1.88	28.6	6.83
Pipe 4 Std.	10.8	4.50	4.03	0.237	0.221	2.96	20.4	6.82	3.03	1.51	13.6	4.05
Pipe 3 1/2 Std.	9.12	4.00	3.55	0.226	0.211	2.50	19.0	4.52	2.26	1.34	9.04	3.03
Pipe 3 Std.	7.58	3.50	3.07	0.216	0.201	2.07	17.4	2.85	1.63	1.17	5.69	2.19
Pipe 2 1/2 Std.	5.80	2.88	2.47	0.203	0.189	1.61	15.2	1.45	1.01	0.952	2.89	1.37
Pipe 2 Std.	3.66	2.38	2.07	0.154	0.143	1.02	16.6	0.627	0.528	0.791	1.25	0.713
Pipe 1 1/2 Std.	2.72	1.90	1.61	0.145	0.135	0.749	14.1	0.293	0.309	0.626	0.586	0.421
Pipe 1 1/4 Std.	2.27	1.66	1.38	0.140	0.130	0.625	12.8	0.184	0.222	0.543	0.368	0.305
Pipe 1 Std.	1.68	1.32	1.05	0.133	0.124	0.469	10.6	0.0830	0.126	0.423	0.166	0.177
Pipe 3/4 Std.	1.13	1.05	0.824	0.113	0.105	0.312	10.0	0.0350	0.0671	0.336	0.0700	0.0942
Pipe 1/2 Std.	0.850	0.840	0.622	0.109	0.101	0.234	8.32	0.0160	0.0388	0.264	0.0320	0.0555
Extra Strong (x-Strong)												
Pipe 12 x-Strong	65.5	12.8	11.8	0.500	0.465	17.5	27.4	339	53.2	4.35	678	70.2
Pipe 10 x-Strong	54.8	10.8	9.75	0.500	0.465	15.1	23.1	199	37.0	3.64	398	49.2
Pipe 8 x-Strong	43.4	8.63	7.63	0.500	0.465	11.9	18.5	100	23.1	2.89	199	31.0
Pipe 6 x-Strong	28.6	6.63	5.76	0.432	0.403	7.83	16.4	38.3	11.6	2.20	76.6	15.6
Pipe 5 x-Strong	20.8	5.56	4.81	0.375	0.349	5.73	15.9	19.5	7.02	1.85	39.0	9.50
Pipe 4 x-Strong	15.0	4.50	3.83	0.337	0.315	4.14	14.3	9.12	4.05	1.48	18.2	5.53
Pipe 3 1/2 x-Strong	12.5	4.00	3.36	0.318	0.296	3.43	13.5	5.94	2.97	1.31	11.9	4.07
Pipe 3 x-Strong	10.3	3.50	2.90	0.300	0.280	2.83	12.5	3.70	2.11	1.14	7.40	2.91
Pipe 2 1/2 x-Strong	7.67	2.88	2.32	0.276	0.257	2.10	11.2	1.83	1.27	0.930	3.66	1.77
Pipe 2 x-Strong	5.03	2.38	1.94	0.218	0.204	1.40	11.7	0.827	0.696	0.771	1.65	0.964
Pipe 1 1/2 x-Strong	3.63	1.90	1.50	0.200	0.186	1.00	10.2	0.372	0.392	0.610	0.744	0.549
Pipe 1 1/4 x-Strong	3.00	1.66	1.28	0.191	0.178	0.837	9.33	0.231	0.278	0.528	0.462	0.393
Pipe 1 x-Strong	2.17	1.32	0.957	0.179	0.166	0.602	7.92	0.101	0.154	0.410	0.202	0.221
Pipe 3/4 x-Strong	1.48	1.05	0.742	0.154	0.143	0.407	7.34	0.0430	0.0818	0.325	0.0860	0.119
Pipe 1/2 x-Strong	1.09	0.840	0.546	0.147	0.137	0.303	6.13	0.0190	0.0462	0.253	0.0380	0.0686
Double-Extra Strong (xx-Strong)												
Pipe 8 xx-Strong	72.5	8.63	6.88	0.875	0.816	20.0	10.6	154	35.8	2.78	308	49.9
Pipe 6 xx-Strong	53.2	6.63	4.90	0.864	0.805	14.7	8.23	63.5	19.2	2.08	127	27.4
Pipe 5 xx-Strong	38.6	5.56	4.06	0.750	0.699	10.7	7.96	32.2	11.6	1.74	64.4	16.7
Pipe 4 xx-Strong	27.6	4.50	3.15	0.674	0.628	7.66	7.17	14.7	6.53	1.39	29.4	9.50
Pipe 3 xx-Strong	18.6	3.50	2.30	0.600	0.559	5.17	6.26	5.79	3.31	1.06	11.6	4.89
Pipe 2 1/2 xx-Strong	13.7	2.88	1.77	0.552	0.514	3.83	5.59	2.78	1.94	0.854	5.56	2.91
Pipe 2 xx-Strong	9.04	2.38	1.50	0.436	0.406	2.51	5.85	1.27	1.07	0.711	2.54	1.60



LLBB

Table 1-15
Double Angles
Properties



SLBB

Shape	Area	Axis Y-Y Radius of Gyration LLBB Separation, s, in. 0	3/8	3/4	Axis Y-Y Radius of Gyration SLBB Separation, s, in. 0	3/8	3/4	LLBB Q_s Angles in Contact	Angles Separated	LLBB r_x	SLBB Q_s Angles in Contact	Angles Separated	SLBB r_x
	in.²									in.			in.
2L8×8×1 1/8	33.6	3.41	3.54	3.68	3.41	3.54	3.68	1.00	1.00	2.41	1.00	1.00	2.41
×1	30.2	3.39	3.52	3.66	3.39	3.52	3.66	1.00	1.00	2.43	1.00	1.00	2.43
×7/8	26.6	3.36	3.50	3.63	3.36	3.50	3.63	1.00	1.00	2.45	1.00	1.00	2.45
×3/4	23.0	3.34	3.47	3.61	3.34	3.47	3.61	1.00	1.00	2.46	1.00	1.00	2.46
×5/8	19.4	3.32	3.45	3.58	3.32	3.45	3.58	1.00	0.997	2.48	1.00	0.997	2.48
×9/16	17.5	3.31	3.44	3.57	3.31	3.44	3.57	1.00	0.959	2.49	1.00	0.959	2.49
×1/2	15.7	3.30	3.43	3.56	3.30	3.43	3.56	0.998	0.912	2.49	0.998	0.912	2.49
2L8×6×1	26.2	2.39	2.52	2.66	3.63	3.77	3.91	1.00	1.00	2.49	1.00	1.00	1.72
×7/8	23.0	2.37	2.50	2.63	3.61	3.75	3.89	1.00	1.00	2.50	1.00	1.00	1.74
×3/4	20.0	2.35	2.47	2.61	3.59	3.72	3.86	1.00	1.00	2.52	1.00	1.00	1.75
×5/8	16.8	2.33	2.45	2.59	3.57	3.70	3.84	1.00	0.997	2.54	1.00	0.997	1.77
×9/16	15.2	2.32	2.44	2.58	3.55	3.69	3.83	1.00	0.959	2.55	1.00	0.959	1.78
×1/2	13.6	2.31	2.43	2.56	3.54	3.68	3.81	1.00	0.912	2.55	0.998	0.912	1.79
×7/16	12.0	2.30	2.42	2.55	3.53	3.66	3.80	1.00	0.850	2.56	0.938	0.850	1.80
2L8×4×1	22.2	1.46	1.60	1.75	3.94	4.08	4.23	1.00	1.00	2.51	1.00	1.00	1.03
×7/8	19.6	1.44	1.57	1.72	3.91	4.06	4.21	1.00	1.00	2.53	1.00	1.00	1.04
×3/4	17.0	1.42	1.55	1.69	3.89	4.03	4.18	1.00	1.00	2.55	1.00	1.00	1.05
×5/8	14.3	1.39	1.52	1.66	3.86	4.00	4.15	1.00	0.997	2.56	1.00	0.997	1.06
×9/16	13.0	1.38	1.51	1.65	3.85	3.99	4.13	1.00	0.959	2.57	1.00	0.959	1.07
×1/2	11.6	1.38	1.50	1.63	3.83	3.97	4.12	1.00	0.912	2.58	0.998	0.912	1.08
×7/16	10.2	1.37	1.49	1.62	3.82	3.96	4.10	1.00	0.850	2.59	0.938	0.850	1.09
2L7×4×3/4	15.5	1.48	1.61	1.75	3.34	3.48	3.63	1.00	1.00	2.21	1.00	1.00	1.08
×5/8	13.0	1.45	1.58	1.73	3.31	3.46	3.60	1.00	1.00	2.23	1.00	1.00	1.10
×1/2	10.5	1.44	1.56	1.70	3.29	3.43	3.57	1.00	0.965	2.25	1.00	0.965	1.11
×7/16	9.26	1.43	1.55	1.68	3.28	3.42	3.56	1.00	0.912	2.26	0.998	0.912	1.12
×3/8	8.00	1.42	1.54	1.67	3.26	3.40	3.54	1.00	0.840	2.27	0.928	0.840	1.12
2L6×6×1	22.0	2.58	2.72	2.86	2.58	2.72	2.86	1.00	1.00	1.79	1.00	1.00	1.79
×7/8	19.5	2.56	2.70	2.84	2.56	2.70	2.84	1.00	1.00	1.81	1.00	1.00	1.81
×3/4	16.9	2.54	2.67	2.81	2.54	2.67	2.81	1.00	1.00	1.82	1.00	1.00	1.82
×5/8	14.3	2.52	2.65	2.79	2.52	2.65	2.79	1.00	1.00	1.84	1.00	1.00	1.84
×9/16	12.9	2.51	2.64	2.78	2.51	2.64	2.78	1.00	1.00	1.85	1.00	1.00	1.85
×1/2	11.5	2.50	2.63	2.76	2.50	2.63	2.76	1.00	1.00	1.86	1.00	1.00	1.86
×7/16	10.2	2.49	2.62	2.75	2.49	2.62	2.75	1.00	0.973	1.86	1.00	0.973	1.86
×3/8	8.76	2.48	2.60	2.74	2.48	2.60	2.74	0.998	0.912	1.87	0.998	0.912	1.87
×5/16	7.34	2.47	2.59	2.72	2.47	2.59	2.72	0.914	0.826	1.88	0.914	0.826	1.88

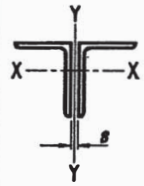
Note: For compactness criteria, refer to Table 1-7B.

Table 1-15 (continued)
Double Angles
Properties

2L8-2L6

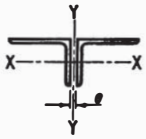
Shape	Flexural-Torsional Properties Long Legs Vertical Back to Back of Angles, in. 0 $\bar{r}_o$	H	3/8 $\bar{r}_o$	H	3/4 $\bar{r}_o$	H	Short Legs Vertical Back to Back of Angles, in. 0 $\bar{r}_o$	H	3/8 $\bar{r}_o$	H	3/4 $\bar{r}_o$	H	Single Angle Properties Area, A	r_z
													in.²	in.
2L8×8×1 1/8	4.56	0.837	4.66	0.844	4.77	0.851	4.56	0.837	4.66	0.844	4.77	0.851	16.8	1.56
×1	4.56	0.834	4.66	0.841	4.77	0.848	4.56	0.834	4.66	0.841	4.77	0.848	15.1	1.56
×7/8	4.56	0.831	4.66	0.838	4.76	0.845	4.56	0.831	4.66	0.838	4.76	0.845	13.3	1.57
×3/4	4.56	0.829	4.66	0.836	4.76	0.843	4.56	0.829	4.66	0.836	4.76	0.843	11.5	1.57
×5/8	4.56	0.826	4.66	0.833	4.76	0.840	4.56	0.826	4.66	0.833	4.76	0.840	9.69	1.58
×9/16	4.56	0.825	4.65	0.832	4.75	0.839	4.56	0.825	4.65	0.832	4.75	0.839	8.77	1.58
×1/2	4.56	0.824	4.65	0.831	4.75	0.837	4.56	0.824	4.65	0.831	4.75	0.837	7.84	1.59
2L8×6×1	4.06	0.721	4.14	0.732	4.23	0.742	4.18	0.924	4.30	0.929	4.43	0.933	13.1	1.28
×7/8	4.07	0.718	4.14	0.728	4.23	0.739	4.17	0.922	4.29	0.926	4.42	0.930	11.5	1.28
×3/4	4.07	0.714	4.15	0.725	4.23	0.735	4.17	0.919	4.28	0.924	4.40	0.928	9.99	1.29
×5/8	4.08	0.712	4.16	0.722	4.24	0.732	4.16	0.917	4.27	0.921	4.39	0.926	8.41	1.29
×9/16	4.09	0.710	4.16	0.720	4.24	0.731	4.15	0.916	4.27	0.920	4.39	0.924	7.61	1.30
×1/2	4.09	0.709	4.16	0.719	4.24	0.729	4.15	0.915	4.26	0.919	4.38	0.923	6.80	1.30
×7/16	4.09	0.708	4.16	0.718	4.24	0.728	4.15	0.913	4.26	0.918	4.38	0.922	5.99	1.31
2L8×4×1	3.86	0.568	3.91	0.580	3.97	0.594	4.11	0.983	4.25	0.984	4.39	0.985	11.1	0.844
×7/8	3.87	0.566	3.92	0.577	3.98	0.590	4.09	0.981	4.22	0.982	4.37	0.984	9.79	0.846
×3/4	3.88	0.564	3.93	0.575	3.99	0.587	4.07	0.980	4.20	0.981	4.35	0.983	8.49	0.850
×5/8	3.89	0.562	3.94	0.573	3.99	0.585	4.05	0.979	4.18	0.980	4.32	0.981	7.16	0.856
×9/16	3.90	0.562	3.94	0.572	4.00	0.584	4.04	0.978	4.17	0.980	4.31	0.981	6.49	0.859
×1/2	3.90	0.561	3.95	0.571	4.00	0.583	4.03	0.978	4.16	0.979	4.30	0.980	5.80	0.863
×7/16	3.91	0.561	3.95	0.571	4.00	0.582	4.02	0.977	4.15	0.978	4.29	0.980	5.11	0.867
2L7×4×3/4	3.41	0.611	3.47	0.624	3.53	0.639	3.57	0.969	3.70	0.971	3.84	0.973	7.74	0.855
×5/8	3.42	0.608	3.47	0.621	3.54	0.635	3.55	0.967	3.68	0.969	3.82	0.971	6.50	0.860
×1/2	3.43	0.606	3.48	0.618	3.55	0.632	3.53	0.965	3.66	0.968	3.80	0.970	5.26	0.866
×7/16	3.43	0.605	3.49	0.617	3.55	0.630	3.53	0.964	3.66	0.967	3.79	0.969	4.63	0.869
×3/8	3.44	0.605	3.49	0.616	3.55	0.629	3.52	0.963	3.65	0.966	3.78	0.968	4.00	0.873
2L6×6×1	3.42	0.843	3.53	0.852	3.64	0.861	3.42	0.843	3.53	0.852	3.64	0.861	11.0	1.17
×7/8	3.42	0.839	3.53	0.848	3.63	0.857	3.42	0.839	3.53	0.848	3.63	0.857	9.75	1.17
×3/4	3.42	0.835	3.52	0.844	3.63	0.853	3.42	0.835	3.52	0.844	3.63	0.853	8.46	1.17
×5/8	3.42	0.831	3.52	0.840	3.62	0.849	3.42	0.831	3.52	0.840	3.62	0.849	7.13	1.17
×9/16	3.42	0.829	3.52	0.838	3.62	0.847	3.42	0.829	3.52	0.838	3.62	0.847	6.45	1.18
×1/2	3.42	0.827	3.52	0.836	3.62	0.846	3.42	0.827	3.52	0.836	3.62	0.846	5.77	1.18
×7/16	3.42	0.826	3.52	0.835	3.62	0.844	3.42	0.826	3.52	0.835	3.62	0.844	5.08	1.18
×3/8	3.42	0.824	3.51	0.833	3.61	0.842	3.42	0.824	3.51	0.833	3.61	0.842	4.38	1.19
×5/16	3.42	0.823	3.51	0.832	3.61	0.841	3.42	0.823	3.51	0.832	3.61	0.841	3.67	1.19

Note: For compactness criteria, refer to Table 1-7B.



LLBB

Table 1-15 (continued)
Double Angles
Properties



SLBB

Shape	Area	Axis Y-Y Radius of Gyration LLBB Separation, s, in. 0	3/8	3/4	SLBB Separation, s, in. 0	3/8	3/4	LLBB Q_s Angles in Contact	Angles Separated	r_x	SLBB Q_s Angles in Contact	Angles Separated	r_x
	in.²									in.			in.
2L6×4×7/8	16.0	1.57	1.71	1.86	2.82	2.96	3.11	1.00	1.00	1.86	1.00	1.00	1.10
×3/4	13.9	1.55	1.68	1.83	2.80	2.94	3.08	1.00	1.00	1.88	1.00	1.00	1.12
×5/8	11.7	1.53	1.66	1.80	2.77	2.91	3.06	1.00	1.00	1.89	1.00	1.00	1.13
×9/16	10.6	1.52	1.65	1.79	2.76	2.90	3.04	1.00	1.00	1.90	1.00	1.00	1.14
×1/2	9.50	1.51	1.64	1.77	2.75	2.89	3.03	1.00	1.00	1.91	1.00	1.00	1.14
×7/16	8.36	1.50	1.62	1.76	2.74	2.88	3.02	1.00	0.973	1.92	1.00	0.973	1.15
×3/8	7.22	1.49	1.61	1.75	2.73	2.86	3.00	1.00	0.912	1.93	0.998	0.912	1.16
×5/16	6.06	1.48	1.60	1.74	2.72	2.85	2.99	1.00	0.826	1.94	0.914	0.826	1.17
2L6×3 1/2×1/2	9.00	1.27	1.40	1.54	2.82	2.96	3.11	1.00	1.00	1.92	1.00	1.00	0.968
×3/8	6.88	1.26	1.38	1.52	2.80	2.94	3.08	1.00	0.912	1.93	0.998	0.912	0.984
×5/16	5.78	1.25	1.37	1.50	2.78	2.92	3.06	1.00	0.826	1.94	0.914	0.826	0.991
2L5×5×7/8	16.0	2.16	2.30	2.44	2.16	2.30	2.44	1.00	1.00	1.49	1.00	1.00	1.49
×3/4	14.0	2.13	2.27	2.41	2.13	2.27	2.41	1.00	1.00	1.50	1.00	1.00	1.50
×5/8	11.8	2.11	2.25	2.39	2.11	2.25	2.39	1.00	1.00	1.52	1.00	1.00	1.52
×1/2	9.58	2.09	2.22	2.36	2.09	2.22	2.36	1.00	1.00	1.53	1.00	1.00	1.53
×7/16	8.44	2.08	2.21	2.35	2.08	2.21	2.35	1.00	1.00	1.54	1.00	1.00	1.54
×3/8	7.30	2.07	2.20	2.34	2.07	2.20	2.34	1.00	0.983	1.55	1.00	0.983	1.55
×5/16	6.14	2.06	2.19	2.32	2.06	2.19	2.32	0.998	0.912	1.56	0.998	0.912	1.56
2L5×3 1/2×3/4	11.7	1.39	1.53	1.68	2.33	2.47	2.62	1.00	1.00	1.55	1.00	1.00	0.974
×5/8	9.86	1.37	1.50	1.65	2.30	2.45	2.59	1.00	1.00	1.56	1.00	1.00	0.987
×1/2	8.00	1.35	1.48	1.62	2.28	2.42	2.57	1.00	1.00	1.58	1.00	1.00	1.00
×3/8	6.10	1.33	1.46	1.59	2.26	2.39	2.54	1.00	0.983	1.59	1.00	0.983	1.02
×5/16	5.12	1.32	1.44	1.58	2.25	2.38	2.52	1.00	0.912	1.60	0.998	0.912	1.02
×1/4	4.14	1.31	1.43	1.57	2.23	2.37	2.51	1.00	0.804	1.61	0.894	0.804	1.03
2L5×3×1/2	7.50	1.11	1.24	1.39	2.35	2.50	2.64	1.00	1.00	1.58	1.00	1.00	0.824
×7/16	6.62	1.10	1.23	1.38	2.34	2.48	2.63	1.00	1.00	1.59	1.00	1.00	0.831
×3/8	5.72	1.09	1.22	1.36	2.33	2.47	2.62	1.00	0.983	1.60	1.00	0.983	0.838
×5/16	4.82	1.08	1.21	1.35	2.32	2.46	2.60	1.00	0.912	1.61	0.998	0.912	0.846
×1/4	3.88	1.07	1.19	1.33	2.30	2.44	2.58	1.00	0.804	1.62	0.894	0.804	0.853

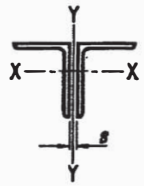
Note: For compactness criteria, refer to Table 1-7B.

Table 1-15 (continued)
Double Angles
Properties

2L6-2L5

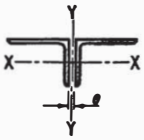
Shape	Flexural-Torsional Properties Long Legs Vertical Back to Back of Angles, in. 0 $\bar{r}_o$	H	3/8 $\bar{r}_o$	H	3/4 $\bar{r}_o$	H	Short Legs Vertical Back to Back of Angles, in. 0 $\bar{r}_o$	H	3/8 $\bar{r}_o$	H	3/4 $\bar{r}_o$	H	Single Angle Properties Area, A	r_z
													in.²	in.
2L6×4×7/8	2.96	0.678	3.04	0.694	3.12	0.710	3.10	0.952	3.23	0.956	3.37	0.959	8.00	0.854
×3/4	2.97	0.673	3.04	0.688	3.12	0.705	3.09	0.949	3.22	0.953	3.35	0.957	6.94	0.856
×5/8	2.98	0.669	3.05	0.684	3.13	0.700	3.08	0.946	3.21	0.950	3.34	0.954	5.86	0.859
×9/16	2.98	0.667	3.05	0.682	3.13	0.697	3.07	0.945	3.20	0.949	3.33	0.953	5.31	0.861
×1/2	2.99	0.665	3.05	0.679	3.13	0.695	3.07	0.943	3.19	0.948	3.32	0.952	4.75	0.864
×7/16	2.99	0.663	3.06	0.678	3.13	0.693	3.06	0.942	3.19	0.946	3.31	0.950	4.18	0.867
×3/8	2.99	0.662	3.06	0.676	3.13	0.691	3.06	0.940	3.18	0.945	3.31	0.949	3.61	0.870
×5/16	3.00	0.661	3.06	0.674	3.13	0.689	3.05	0.939	3.17	0.944	3.30	0.948	3.03	0.874
2L6×3 1/2×1/2	2.94	0.615	2.99	0.630	3.06	0.646	3.04	0.964	3.17	0.967	3.31	0.969	4.50	0.756
×3/8	2.95	0.613	3.00	0.627	3.07	0.642	3.02	0.962	3.15	0.965	3.29	0.967	3.44	0.763
×5/16	2.95	0.612	3.00	0.625	3.07	0.641	3.02	0.960	3.14	0.964	3.28	0.966	2.89	0.767
2L5×5×7/8	2.85	0.845	2.96	0.856	3.07	0.866	2.85	0.845	2.96	0.856	3.07	0.866	8.00	0.971
×3/4	2.85	0.840	2.95	0.851	3.06	0.861	2.85	0.840	2.95	0.851	3.06	0.861	6.98	0.972
×5/8	2.85	0.835	2.95	0.846	3.06	0.857	2.85	0.835	2.95	0.846	3.06	0.857	5.90	0.975
×1/2	2.85	0.830	2.94	0.842	3.05	0.852	2.85	0.830	2.94	0.842	3.05	0.852	4.79	0.980
×7/16	2.85	0.828	2.94	0.839	3.05	0.850	2.85	0.828	2.94	0.839	3.05	0.850	4.22	0.983
×3/8	2.84	0.826	2.94	0.838	3.04	0.848	2.84	0.826	2.94	0.838	3.04	0.848	3.65	0.986
×5/16	2.84	0.825	2.94	0.836	3.04	0.847	2.84	0.825	2.94	0.836	3.04	0.847	3.07	0.990
2L5×3 1/2×3/4	2.49	0.699	2.57	0.717	2.66	0.736	2.60	0.943	2.73	0.949	2.86	0.953	5.85	0.744
×5/8	2.49	0.693	2.57	0.711	2.66	0.730	2.59	0.940	2.71	0.945	2.85	0.950	4.93	0.746
×1/2	2.50	0.688	2.58	0.705	2.66	0.724	2.58	0.936	2.70	0.942	2.83	0.947	4.00	0.750
×3/8	2.51	0.683	2.58	0.700	2.66	0.718	2.56	0.933	2.69	0.938	2.81	0.944	3.05	0.755
×5/16	2.51	0.682	2.58	0.698	2.66	0.716	2.56	0.931	2.68	0.937	2.81	0.942	2.56	0.758
×1/4	2.52	0.680	2.58	0.696	2.66	0.714	2.55	0.929	2.67	0.935	2.80	0.941	2.07	0.761
2L5×3×1/2	2.44	0.628	2.51	0.646	2.58	0.667	2.54	0.962	2.68	0.966	2.81	0.969	3.75	0.642
×7/16	2.45	0.626	2.51	0.644	2.58	0.664	2.54	0.961	2.67	0.964	2.80	0.968	3.31	0.644
×3/8	2.45	0.624	2.51	0.642	2.59	0.661	2.53	0.959	2.66	0.963	2.79	0.967	2.86	0.646
×5/16	2.46	0.623	2.52	0.640	2.59	0.659	2.52	0.958	2.65	0.962	2.78	0.965	2.41	0.649
×1/4	2.46	0.622	2.52	0.638	2.59	0.657	2.51	0.957	2.64	0.961	2.77	0.964	1.94	0.652

Note: For compactness criteria, refer to Table 1-7B.



LLBB

Table 1-15 (continued)
Double Angles
Properties



SLBB

Shape	Area	Axis Y-Y Radius of Gyration LLBB Separation, s, in. 0	3/8	3/4	Axis Y-Y Radius of Gyration SLBB Separation, s, in. 0	3/8	3/4	LLBB Q_s Angles in Contact	Angles Separated	LLBB r_x	SLBB Q_s Angles in Contact	Angles Separated	SLBB r_x
	in.²									in.			in.
2L4×4×3/4	10.9	1.73	1.88	2.03	1.73	1.88	2.03	1.00	1.00	1.18	1.00	1.00	1.18
×5/8	9.22	1.71	1.85	2.00	1.71	1.85	2.00	1.00	1.00	1.20	1.00	1.00	1.20
×1/2	7.50	1.69	1.83	1.97	1.69	1.83	1.97	1.00	1.00	1.21	1.00	1.00	1.21
×7/16	6.60	1.68	1.81	1.96	1.68	1.81	1.96	1.00	1.00	1.22	1.00	1.00	1.22
×3/8	5.72	1.67	1.80	1.94	1.67	1.80	1.94	1.00	1.00	1.23	1.00	1.00	1.23
×5/16	4.80	1.66	1.79	1.93	1.66	1.79	1.93	1.00	0.997	1.24	1.00	0.997	1.24
×1/4	3.86	1.65	1.78	1.91	1.65	1.78	1.91	0.998	0.912	1.25	0.998	0.912	1.25
2L4×3 1/2×1/2	7.00	1.44	1.57	1.72	1.75	1.89	2.03	1.00	1.00	1.23	1.00	1.00	1.04
×3/8	5.36	1.42	1.55	1.69	1.73	1.86	2.00	1.00	1.00	1.25	1.00	1.00	1.05
×5/16	4.50	1.40	1.53	1.68	1.72	1.85	1.99	1.00	0.997	1.25	1.00	0.997	1.06
×1/4	3.64	1.39	1.52	1.66	1.70	1.83	1.97	1.00	0.912	1.26	0.998	0.912	1.07
2L4×3×5/8	7.98	1.21	1.35	1.50	1.84	1.98	2.13	1.00	1.00	1.23	1.00	1.00	0.845
×1/2	6.50	1.19	1.32	1.47	1.81	1.95	2.10	1.00	1.00	1.24	1.00	1.00	0.858
×3/8	4.98	1.17	1.30	1.44	1.79	1.93	2.07	1.00	1.00	1.26	1.00	1.00	0.873
×5/16	4.18	1.16	1.29	1.43	1.78	1.91	2.06	1.00	0.997	1.27	1.00	0.997	0.880
×1/4	3.38	1.15	1.27	1.41	1.76	1.90	2.04	1.00	0.912	1.27	0.998	0.912	0.887
2L3 1/2×3 1/2×1/2	6.50	1.49	1.63	1.77	1.49	1.63	1.77	1.00	1.00	1.05	1.00	1.00	1.05
×7/16	5.78	1.48	1.61	1.76	1.48	1.61	1.76	1.00	1.00	1.06	1.00	1.00	1.06
×3/8	5.00	1.47	1.60	1.74	1.47	1.60	1.74	1.00	1.00	1.07	1.00	1.00	1.07
×5/16	4.20	1.46	1.59	1.73	1.46	1.59	1.73	1.00	1.00	1.08	1.00	1.00	1.08
×1/4	3.40	1.44	1.57	1.72	1.44	1.57	1.72	1.00	0.965	1.09	1.00	0.965	1.09
2L3 1/2×3×1/2	6.04	1.23	1.37	1.52	1.55	1.69	1.84	1.00	1.00	1.07	1.00	1.00	0.877
×7/16	5.34	1.22	1.36	1.51	1.54	1.67	1.82	1.00	1.00	1.08	1.00	1.00	0.885
×3/8	4.64	1.21	1.35	1.49	1.52	1.66	1.81	1.00	1.00	1.09	1.00	1.00	0.892
×5/16	3.90	1.20	1.33	1.48	1.51	1.65	1.79	1.00	1.00	1.09	1.00	1.00	0.900
×1/4	3.16	1.19	1.32	1.46	1.50	1.63	1.78	1.00	0.965	1.10	1.00	0.965	0.908
2L3 1/2×2 1/2×1/2	5.54	0.992	1.13	1.28	1.62	1.76	1.91	1.00	1.00	1.08	1.00	1.00	0.701
×3/8	4.24	0.970	1.11	1.25	1.59	1.73	1.88	1.00	1.00	1.10	1.00	1.00	0.716
×5/16	3.58	0.960	1.09	1.24	1.58	1.72	1.87	1.00	1.00	1.11	1.00	1.00	0.723
×1/4	2.90	0.950	1.08	1.22	1.57	1.70	1.85	1.00	0.965	1.12	1.00	0.965	0.731

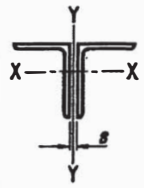
Note: For compactness criteria, refer to Table 1-7B.

Table 1-15 (continued)
Double Angles
Properties

2L4-2L3 1/2

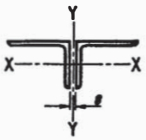
Shape	Flexural-Torsional Properties: Long Legs Vertical, Back to Back of Angles, in. 0 $\bar{r}_o$	0 H	3/8 $\bar{r}_o$	3/8 H	3/4 $\bar{r}_o$	3/4 H	Short Legs Vertical, Back to Back of Angles, in. 0 $\bar{r}_o$	0 H	3/8 $\bar{r}_o$	3/8 H	3/4 $\bar{r}_o$	3/4 H	Single Angle Properties: Area, A	r_z
													in.²	in.
2L4×4×3/4	2.28	0.847	2.39	0.861	2.51	0.874	2.28	0.847	2.39	0.861	2.51	0.874	5.44	0.774
×5/8	2.28	0.841	2.39	0.854	2.50	0.868	2.28	0.841	2.39	0.854	2.50	0.868	4.61	0.774
×1/2	2.28	0.834	2.38	0.848	2.49	0.862	2.28	0.834	2.38	0.848	2.49	0.862	3.75	0.776
×7/16	2.28	0.832	2.38	0.846	2.49	0.859	2.28	0.832	2.38	0.846	2.49	0.859	3.30	0.777
×3/8	2.28	0.829	2.38	0.843	2.49	0.856	2.28	0.829	2.38	0.843	2.49	0.856	2.86	0.779
×5/16	2.28	0.826	2.37	0.840	2.48	0.854	2.28	0.826	2.37	0.840	2.48	0.854	2.40	0.781
×1/4	2.28	0.824	2.37	0.838	2.48	0.851	2.28	0.824	2.37	0.838	2.48	0.851	1.93	0.783
2L4×3 1/2×1/2	2.14	0.784	2.23	0.802	2.33	0.819	2.16	0.882	2.28	0.893	2.40	0.904	3.50	0.716
×3/8	2.14	0.778	2.23	0.795	2.33	0.813	2.16	0.876	2.27	0.888	2.39	0.899	2.68	0.719
×5/16	2.14	0.775	2.23	0.792	2.33	0.810	2.16	0.874	2.26	0.885	2.38	0.896	2.25	0.721
×1/4	2.14	0.773	2.22	0.790	2.32	0.807	2.15	0.871	2.26	0.883	2.37	0.894	1.82	0.723
2L4×3×5/8	2.02	0.728	2.11	0.750	2.21	0.773	2.10	0.930	2.22	0.938	2.36	0.945	3.99	0.631
×1/2	2.02	0.721	2.11	0.743	2.20	0.765	2.09	0.925	2.21	0.933	2.34	0.940	3.25	0.633
×3/8	2.03	0.715	2.11	0.736	2.20	0.757	2.08	0.920	2.20	0.928	2.32	0.936	2.49	0.636
×5/16	2.03	0.712	2.11	0.733	2.20	0.754	2.07	0.918	2.19	0.926	2.32	0.934	2.09	0.638
×1/4	2.03	0.710	2.11	0.730	2.20	0.751	2.06	0.915	2.18	0.924	2.31	0.932	1.69	0.639
2L3 1/2×3 1/2×1/2	1.99	0.838	2.10	0.854	2.21	0.869	1.99	0.838	2.10	0.854	2.21	0.869	3.25	0.679
×7/16	1.99	0.835	2.09	0.851	2.21	0.866	1.99	0.835	2.09	0.851	2.21	0.866	2.89	0.681
×3/8	1.99	0.832	2.09	0.848	2.20	0.863	1.99	0.832	2.09	0.848	2.20	0.863	2.50	0.683
×5/16	1.99	0.829	2.09	0.845	2.20	0.860	1.99	0.829	2.09	0.845	2.20	0.860	2.10	0.685
×1/4	1.99	0.826	2.08	0.842	2.19	0.857	1.99	0.826	2.08	0.842	2.19	0.857	1.70	0.688
2L3 1/2×3×1/2	1.85	0.780	1.94	0.801	2.05	0.822	1.88	0.892	2.00	0.904	2.13	0.915	3.02	0.618
×7/16	1.85	0.776	1.94	0.797	2.05	0.818	1.88	0.889	1.99	0.901	2.12	0.912	2.67	0.620
×3/8	1.85	0.773	1.94	0.794	2.05	0.814	1.88	0.885	1.99	0.898	2.11	0.910	2.32	0.622
×5/16	1.85	0.770	1.94	0.790	2.04	0.811	1.87	0.883	1.98	0.895	2.11	0.907	1.95	0.624
×1/4	1.85	0.767	1.94	0.787	2.04	0.807	1.87	0.880	1.98	0.893	2.10	0.905	1.58	0.628
2L3 1/2×2 1/2×1/2	1.75	0.706	1.83	0.732	1.93	0.759	1.82	0.938	1.95	0.946	2.08	0.953	2.77	0.532
×3/8	1.75	0.698	1.83	0.724	1.93	0.750	1.81	0.933	1.93	0.941	2.07	0.949	2.12	0.535
×5/16	1.76	0.695	1.83	0.720	1.92	0.746	1.80	0.930	1.92	0.939	2.06	0.947	1.79	0.538
×1/4	1.76	0.693	1.83	0.717	1.92	0.742	1.80	0.928	1.92	0.937	2.05	0.944	1.45	0.541

Note: For compactness criteria, refer to Table 1-7B.



LLBB

Table 1-15 (continued)
Double Angles
Properties



SLBB

Shape	Area	Axis Y-Y						LLBB			SLBB		
		Radius of Gyration						Q_s		r_x	Q_s		r_x
		LLBB			SLBB			Angles in Contact	Angles Separated		Angles in Contact	Angles Separated	
		Separation, s, in.			Separation, s, in.								
	in.^{2}	0	3/8	3/4	0	3/8	3/4			in.			in.
2L3×3×1/2	5.52	1.29	1.43	1.58	1.29	1.43	1.58	1.00	1.00	0.895	1.00	1.00	0.895
×7/16	4.86	1.28	1.42	1.57	1.28	1.42	1.57	1.00	1.00	0.903	1.00	1.00	0.903
×3/8	4.22	1.27	1.41	1.55	1.27	1.41	1.55	1.00	1.00	0.910	1.00	1.00	0.910
×5/16	3.56	1.26	1.39	1.54	1.26	1.39	1.54	1.00	1.00	0.918	1.00	1.00	0.918
×1/4	2.88	1.25	1.38	1.52	1.25	1.38	1.52	1.00	1.00	0.926	1.00	1.00	0.926
×3/16	2.18	1.24	1.37	1.51	1.24	1.37	1.51	0.998	0.912	0.933	0.998	0.912	0.933
2L3×2 1/2×1/2	5.00	1.04	1.18	1.33	1.35	1.49	1.64	1.00	1.00	0.910	1.00	1.00	0.718
×7/16	4.44	1.02	1.16	1.32	1.34	1.48	1.63	1.00	1.00	0.917	1.00	1.00	0.724
×3/8	3.86	1.01	1.15	1.30	1.32	1.46	1.61	1.00	1.00	0.924	1.00	1.00	0.731
×5/16	3.26	1.00	1.14	1.29	1.31	1.45	1.60	1.00	1.00	0.932	1.00	1.00	0.739
×1/4	2.64	0.991	1.12	1.27	1.30	1.44	1.58	1.00	1.00	0.940	1.00	1.00	0.746
×3/16	2.00	0.980	1.11	1.25	1.29	1.42	1.57	1.00	0.912	0.947	0.998	0.912	0.753
2L3×2×1/2	4.52	0.795	0.940	1.10	1.42	1.56	1.72	1.00	1.00	0.922	1.00	1.00	0.543
×3/8	3.50	0.771	0.911	1.07	1.39	1.54	1.69	1.00	1.00	0.937	1.00	1.00	0.555
×5/16	2.96	0.760	0.897	1.05	1.38	1.52	1.67	1.00	1.00	0.945	1.00	1.00	0.562
×1/4	2.40	0.749	0.883	1.03	1.37	1.51	1.66	1.00	1.00	0.953	1.00	1.00	0.569
×3/16	1.83	0.739	0.869	1.02	1.35	1.49	1.64	1.00	0.912	0.961	0.998	0.912	0.577
2L2 1/2×2 1/2×1/2	4.52	1.09	1.23	1.39	1.09	1.23	1.39	1.00	1.00	0.735	1.00	1.00	0.735
×3/8	3.46	1.07	1.21	1.36	1.07	1.21	1.36	1.00	1.00	0.749	1.00	1.00	0.749
×5/16	2.92	1.05	1.19	1.34	1.05	1.19	1.34	1.00	1.00	0.756	1.00	1.00	0.756
×1/4	2.38	1.04	1.18	1.33	1.04	1.18	1.33	1.00	1.00	0.764	1.00	1.00	0.764
×3/16	1.80	1.03	1.17	1.31	1.03	1.17	1.31	1.00	0.983	0.771	1.00	0.983	0.771
2L2 1/2×2×3/8	3.10	0.815	0.957	1.11	1.13	1.27	1.42	1.00	1.00	0.766	1.00	1.00	0.574
×5/16	2.64	0.804	0.943	1.10	1.12	1.26	1.41	1.00	1.00	0.774	1.00	1.00	0.581
×1/4	2.14	0.794	0.930	1.08	1.10	1.24	1.39	1.00	1.00	0.782	1.00	1.00	0.589
×3/16	1.64	0.784	0.916	1.07	1.09	1.23	1.38	1.00	0.983	0.790	1.00	0.983	0.597
2L2 1/2×1 1/2×1/4	1.89	0.554	0.694	0.852	1.17	1.32	1.47	1.00	1.00	0.792	1.00	1.00	0.411
×3/16	1.45	0.543	0.679	0.834	1.16	1.30	1.45	1.00	0.983	0.801	1.00	0.983	0.418
2L2×2×3/8	2.74	0.865	1.01	1.17	0.865	1.01	1.17	1.00	1.00	0.591	1.00	1.00	0.591
×5/16	2.32	0.853	0.996	1.15	0.853	0.996	1.15	1.00	1.00	0.598	1.00	1.00	0.598
×1/4	1.89	0.842	0.982	1.14	0.842	0.982	1.14	1.00	1.00	0.605	1.00	1.00	0.605
×3/16	1.44	0.831	0.967	1.12	0.831	0.967	1.12	1.00	1.00	0.612	1.00	1.00	0.612
×1/8	0.982	0.818	0.951	1.10	0.818	0.951	1.10	0.998	0.912	0.620	0.998	0.912	0.620

Note: For compactness criteria, refer to Table 1-7B.

Table 1-15 (continued)
Double Angles
Properties

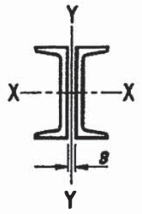
2L3-2L2

Shape	Flexural-Torsional Properties												Single Angle Properties	
	Long Legs Vertical						Short Legs Vertical							
	Back to Back of Angles, in.						Back to Back of Angles, in.							
	0		3/8		3/4		0		3/8		3/4		Area, A	r_z
	$\bar{r}_o$	H	$\bar{r}_o$	H	$\bar{r}_o$	H	$\bar{r}_o$	H	$\bar{r}_o$	H	$\bar{r}_o$	H	in.^{2}	in.
2L3×3×1/2	1.71	0.842	1.82	0.861	1.94	0.878	1.71	0.842	1.82	0.861	1.94	0.878	2.76	0.580
×7/16	1.71	0.838	1.82	0.857	1.94	0.874	1.71	0.838	1.82	0.857	1.94	0.874	2.43	0.580
×3/8	1.71	0.834	1.81	0.853	1.93	0.870	1.71	0.834	1.81	0.853	1.93	0.870	2.11	0.581
×5/16	1.71	0.830	1.81	0.849	1.93	0.866	1.71	0.830	1.81	0.849	1.93	0.866	1.78	0.583
×1/4	1.71	0.827	1.81	0.845	1.92	0.863	1.71	0.827	1.81	0.845	1.92	0.863	1.44	0.585
×3/16	1.71	0.823	1.80	0.842	1.91	0.859	1.71	0.823	1.80	0.842	1.91	0.859	1.09	0.586
2L3×2 1/2×1/2	1.57	0.774	1.66	0.800	1.78	0.824	1.61	0.905	1.73	0.918	1.86	0.929	2.50	0.516
×7/16	1.57	0.769	1.66	0.795	1.77	0.819	1.60	0.901	1.72	0.914	1.85	0.926	2.22	0.516
×3/8	1.57	0.764	1.66	0.790	1.77	0.815	1.60	0.897	1.72	0.911	1.85	0.923	1.93	0.517
×5/16	1.57	0.760	1.66	0.785	1.76	0.810	1.59	0.893	1.71	0.907	1.84	0.920	1.63	0.518
×1/4	1.57	0.756	1.66	0.781	1.76	0.806	1.59	0.890	1.70	0.904	1.83	0.917	1.32	0.520
×3/16	1.57	0.753	1.65	0.778	1.75	0.802	1.58	0.887	1.70	0.901	1.82	0.914	1.00	0.521
2L3×2×1/2	1.47	0.684	1.55	0.717	1.66	0.751	1.55	0.955	1.69	0.962	1.83	0.968	2.26	0.425
×3/8	1.48	0.675	1.55	0.707	1.65	0.739	1.54	0.949	1.67	0.957	1.81	0.963	1.75	0.426
×5/16	1.48	0.671	1.56	0.702	1.65	0.734	1.53	0.946	1.66	0.954	1.80	0.961	1.48	0.428
×1/4	1.48	0.668	1.56	0.698	1.65	0.730	1.52	0.944	1.65	0.952	1.79	0.959	1.20	0.431
×3/16	1.49	0.666	1.55	0.695	1.64	0.726	1.52	0.941	1.64	0.950	1.78	0.957	0.917	0.435
2L2 1/2×2 1/2×1/2	1.43	0.850	1.54	0.871	1.67	0.890	1.43	0.850	1.54	0.871	1.67	0.890	2.26	0.481
×3/8	1.42	0.839	1.53	0.861	1.65	0.881	1.42	0.839	1.53	0.861	1.65	0.881	1.73	0.481
×5/16	1.42	0.834	1.53	0.856	1.65	0.876	1.42	0.834	1.53	0.856	1.65	0.876	1.46	0.481
×1/4	1.42	0.829	1.52	0.852	1.64	0.872	1.42	0.829	1.52	0.852	1.64	0.872	1.19	0.482
×3/16	1.42	0.825	1.52	0.847	1.63	0.868	1.42	0.825	1.52	0.847	1.63	0.868	0.901	0.482
2L2 1/2×2×3/8	1.29	0.754	1.38	0.786	1.49	0.817	1.32	0.913	1.45	0.927	1.59	0.939	1.55	0.419
×5/16	1.29	0.748	1.38	0.781	1.49	0.812	1.32	0.909	1.44	0.923	1.58	0.936	1.32	0.420
×1/4	1.29	0.744	1.38	0.775	1.49	0.806	1.32	0.904	1.43	0.920	1.57	0.933	1.07	0.423
×3/16	1.29	0.740	1.38	0.771	1.48	0.801	1.31	0.901	1.43	0.916	1.56	0.929	0.818	0.426
2L2 1/2×1 1/2×1/4	1.22	0.630	1.29	0.669	1.38	0.712	1.27	0.962	1.40	0.969	1.55	0.975	0.947	0.321
×3/16	1.22	0.627	1.29	0.665	1.38	0.706	1.26	0.959	1.39	0.967	1.53	0.973	0.724	0.324
2L2×2×3/8	1.14	0.847	1.25	0.874	1.38	0.897	1.14	0.847	1.25	0.874	1.38	0.897	1.37	0.386
×5/16	1.14	0.841	1.25	0.868	1.37	0.891	1.14	0.841	1.25	0.868	1.37	0.891	1.16	0.386
×1/4	1.13	0.835	1.24	0.862	1.37	0.886	1.13	0.835	1.24	0.862	1.37	0.886	0.944	0.387
×3/16	1.13	0.830	1.24	0.857	1.36	0.882	1.13	0.830	1.24	0.857	1.36	0.882	0.722	0.389
×1/8	1.13	0.826	1.23	0.853	1.35	0.877	1.13	0.826	1.23	0.853	1.35	0.877	0.491	0.391

Note: For compactness criteria, refer to Table 1-7B.

2C-SHAPES

Table 1-16
2C-Shapes
Properties



Shape	Area, A	Axis Y-Y Separation, s, in. 0				3/8				3/4				Axis X-X
		I	S	r	Z	I	S	r	Z	I	S	r	Z	r_x
	in.^{2}	in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}	in.	in.^{3}	in.
2C15×50	29.4	40.7	11.0	1.18	23.5	50.5	12.9	1.31	29.0	62.4	15.3	1.46	34.5	5.24
×40	23.6	32.6	9.25	1.18	18.4	40.2	10.9	1.31	22.8	49.6	12.7	1.45	27.2	5.43
×33.9	20.0	28.5	8.38	1.20	15.8	35.1	9.78	1.33	19.5	43.1	11.4	1.47	23.3	5.61
2C12×30	17.6	18.2	5.75	1.02	11.9	23.3	6.94	1.15	15.2	29.6	8.36	1.30	18.5	4.29
×25	14.7	15.6	5.11	1.03	9.89	19.8	6.12	1.16	12.6	25.0	7.32	1.31	15.4	4.43
×20.7	12.2	13.6	4.64	1.06	8.49	17.2	5.51	1.19	10.8	21.7	6.55	1.34	13.0	4.61
2C10×30	17.6	15.3	5.04	0.931	11.4	20.2	6.27	1.07	14.7	26.3	7.73	1.22	18.0	3.43
×25	14.7	12.3	4.25	0.914	9.06	16.2	5.27	1.05	11.8	21.1	6.48	1.20	14.6	3.52
×20	11.7	9.91	3.62	0.918	7.11	13.0	4.44	1.05	9.32	16.9	5.43	1.20	11.5	3.67
×15.3	8.96	8.14	3.13	0.953	5.68	10.6	3.80	1.09	7.36	13.7	4.59	1.23	9.04	3.88
2C9×20	11.7	8.80	3.32	0.866	6.84	11.8	4.15	1.00	9.05	15.6	5.15	1.15	11.2	3.22
×15	8.80	6.86	2.76	0.882	5.17	9.10	3.41	1.02	6.82	12.0	4.19	1.17	8.48	3.40
×13.4	7.88	6.34	2.61	0.897	4.74	8.39	3.20	1.03	6.21	11.0	3.92	1.18	7.69	3.48
2C8×18.75	11.0	7.46	2.95	0.823	6.23	10.2	3.75	0.962	8.29	13.7	4.71	1.11	10.4	2.82
×13.75	8.06	5.51	2.35	0.826	4.48	7.47	2.95	0.962	5.99	10.0	3.68	1.11	7.51	2.99
×11.5	6.74	4.82	2.13	0.846	3.86	6.50	2.66	0.982	5.12	8.66	3.29	1.13	6.38	3.11
2C7×14.75	8.66	5.18	2.25	0.773	4.61	7.21	2.90	0.912	6.23	9.85	3.68	1.07	7.85	2.51
×12.25	7.18	4.30	1.96	0.773	3.78	5.97	2.51	0.911	5.13	8.14	3.17	1.06	6.48	2.59
×9.8	5.74	3.59	1.72	0.791	3.11	4.95	2.17	0.929	4.18	6.72	2.73	1.08	5.26	2.72
2C6×13	7.64	4.11	1.91	0.734	3.92	5.85	2.50	0.876	5.35	8.13	3.21	1.03	6.77	2.13
×10.5	6.14	3.26	1.60	0.728	3.08	4.63	2.08	0.867	4.24	6.43	2.67	1.02	5.39	2.22
×8.2	4.78	2.63	1.37	0.741	2.45	3.72	1.76	0.881	3.34	5.14	2.24	1.04	4.24	2.34
2C5×9	5.28	2.45	1.30	0.682	2.52	3.59	1.73	0.824	3.51	5.09	2.25	0.982	4.50	1.84
×6.7	3.94	1.86	1.06	0.688	1.91	2.71	1.40	0.831	2.65	3.84	1.81	0.989	3.83	1.95
2C4×7.25	4.26	1.75	1.02	0.641	1.96	2.63	1.38	0.786	2.75	3.81	1.82	0.946	3.55	1.47
×6.25	3.54	1.36	0.824	0.620	1.54	2.06	1.12	0.763	2.20	3.01	1.49	0.922	2.87	1.50
×5.4	3.16	1.29	0.812	0.637	1.44	1.94	1.10	0.783	2.04	2.82	1.44	0.943	2.63	1.56
×4.5	2.76	1.25	0.789	0.673	1.36	1.86	1.05	0.820	1.88	2.66	1.36	0.981	2.40	1.63
2C3×6	3.52	1.33	0.833	0.614	1.60	2.06	1.15	0.764	2.26	3.03	1.54	0.927	2.92	1.09
×5	2.94	1.05	0.699	0.597	1.29	1.63	0.969	0.746	1.84	2.43	1.30	0.909	2.39	1.12
×4.1	2.40	0.842	0.597	0.591	1.05	1.32	0.827	0.741	1.50	1.97	1.10	0.905	1.95	1.18
×3.5	2.18	0.766	0.558	0.593	0.966	1.20	0.772	0.743	1.37	1.80	1.03	0.908	1.78	1.20

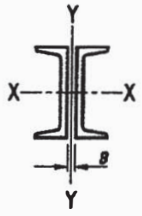


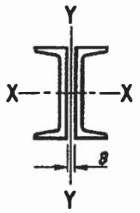
Table 1-17
2MC-Shapes
Properties

2MC18-2MC7

Shape	Area, A	Axis Y-Y Separation, s, in. 0				3/8				3/4				Axis X-X
		I	S	r	Z	I	S	r	Z	I	S	r	Z	r_x
	in.^{2}	in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}	in.	in.^{3}	in.^{4}	in.^{3}	in.	in.^{3}	in.
2MC18×58	34.2	60.6	14.4	1.33	29.5	72.8	16.6	1.46	35.9	87.5	19.1	1.60	42.3	6.29
×51.9	30.6	55.0	13.4	1.34	26.3	65.9	15.4	1.47	32.0	79.0	17.6	1.61	37.7	6.41
×45.8	27.0	50.1	12.5	1.36	23.4	59.8	14.3	1.49	28.4	71.4	16.3	1.63	33.5	6.55
×42.7	25.2	47.8	12.1	1.38	22.1	57.0	13.8	1.51	26.8	67.9	15.7	1.64	31.6	6.64
2MC13×50	29.4	60.7	13.8	1.44	28.6	72.5	15.8	1.57	34.1	86.3	18.0	1.71	39.7	4.62
×40	23.4	49.1	11.7	1.45	22.7	58.4	13.4	1.58	27.2	69.4	15.2	1.72	31.6	4.82
×35	20.6	44.3	10.9	1.47	20.2	52.6	12.3	1.60	24.1	62.3	14.0	1.74	27.9	4.95
×31.8	18.7	41.5	10.4	1.49	18.7	49.2	11.7	1.62	22.2	58.2	13.3	1.76	25.7	5.05
2MC12×50	29.4	67.2	16.2	1.51	30.9	79.8	18.5	1.65	36.4	94.5	20.9	1.79	41.9	4.28
×45	26.4	59.9	14.9	1.51	27.5	71.1	16.9	1.64	32.4	84.1	19.2	1.79	37.4	4.36
×40	23.6	53.7	13.8	1.51	24.5	63.7	15.6	1.65	29.0	75.3	17.7	1.79	33.4	4.46
×35	20.6	48.0	12.7	1.53	21.6	56.8	14.4	1.66	25.5	67.1	16.2	1.81	29.4	4.59
×31	18.2	44.0	12.0	1.55	19.7	52.1	13.5	1.69	23.1	61.4	15.2	1.83	26.5	4.71
2MC12×14.3	8.36	3.19	1.50	0.618	3.15	4.66	2.02	0.747	4.72	6.73	2.70	0.897	6.29	4.27
2MC12×10.6[c]	6.20	1.21	0.804	0.441	1.67	2.05	1.21	0.575	2.83	3.33	1.78	0.733	3.99	4.22
2MC10×41.1	24.2	60.0	13.9	1.58	26.4	70.7	15.7	1.71	30.9	83.1	17.7	1.85	35.5	3.61
×33.6	19.7	49.5	12.1	1.58	21.5	58.2	13.6	1.72	25.2	68.3	15.3	1.86	28.9	3.75
×28.5	16.7	43.5	11.0	1.61	18.7	51.1	12.3	1.75	21.9	59.8	13.8	1.89	25.0	3.89
2MC10×25	14.7	27.8	8.18	1.38	14.0	33.6	9.36	1.51	16.8	40.4	10.7	1.66	19.5	3.87
×22	12.9	25.4	7.67	1.40	12.8	30.7	8.76	1.54	15.2	36.8	10.0	1.69	17.6	3.99
2MC10×8.4[c]	4.92	1.05	0.700	0.462	1.40	1.75	1.03	0.596	2.32	2.79	1.49	0.753	3.24	3.61
×6.5[c]	3.90	0.414	0.354	0.326	0.757	0.835	0.615	0.463	1.49	1.53	0.990	0.626	2.22	3.43
2MC9×25.4	14.9	29.2	8.34	1.40	14.5	35.2	9.53	1.53	17.3	42.2	10.9	1.68	20.1	3.43
×23.9	14.0	27.8	8.05	1.41	13.8	33.4	9.19	1.54	16.4	40.1	10.5	1.69	19.0	3.48
2MC8×22.8	13.4	27.7	7.91	1.44	13.5	33.2	9.01	1.58	16.0	39.7	10.2	1.72	18.6	3.09
×21.4	12.6	26.3	7.63	1.45	12.8	31.6	8.68	1.59	15.2	37.7	9.86	1.73	17.5	3.13
2MC8×20	11.7	17.1	5.66	1.21	9.88	21.2	6.61	1.34	12.1	26.2	7.70	1.49	14.3	3.04
×18.7	11.0	16.2	5.45	1.21	9.34	20.1	6.35	1.35	11.4	24.8	7.39	1.50	13.5	3.09
2MC8×8.5	5.00	2.16	1.15	0.658	2.14	3.14	1.52	0.793	3.08	4.47	1.99	0.946	4.02	3.05
2MC7×22.7	13.3	29.0	8.06	1.47	13.9	34.7	9.16	1.61	16.4	41.3	10.4	1.76	18.9	2.67
×19.1	11.2	25.1	7.27	1.50	12.1	30.0	8.25	1.64	14.2	35.7	9.34	1.78	16.3	2.77

[c] Shape is slender for compression with $F_y = 36$ ksi.

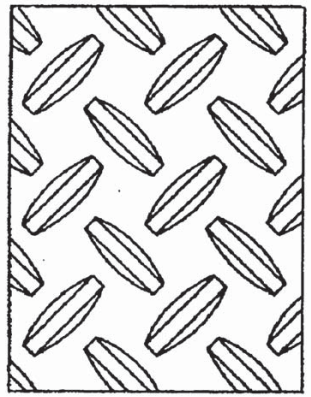
Table 1-17 (continued)
2MC-Shapes
Properties



2MC6-2MC3

Shape	Area, A	Axis Y-Y, Separation, s, in.												Axis X-X
		0				3/8				3/4				r_x
		I	S	r	Z	I	S	r	Z	I	S	r	Z	
	in.²	in.⁴	in.³	in.	in.³	in.⁴	in.³	in.	in.³	in.⁴	in.³	in.	in.³	in.
2MC6×18	10.6	25.0	7.13	1.54	11.8	29.8	8.07	1.68	13.8	35.3	9.11	1.83	15.8	2.37
×15.3	8.98	19.7	5.63	1.48	9.43	23.6	6.39	1.62	11.1	28.1	7.24	1.77	12.8	2.38
2MC6×16.3	9.58	15.8	5.26	1.28	8.88	19.4	6.10	1.42	10.7	23.8	7.05	1.58	12.5	2.33
×15.1	8.88	14.8	5.02	1.29	8.35	18.2	5.82	1.43	10.0	22.3	6.71	1.58	11.7	2.37
2MC6×12	7.06	7.21	2.89	1.01	4.97	9.32	3.47	1.15	6.29	11.9	4.15	1.30	7.62	2.30
2MC6×7	4.18	2.25	1.20	0.734	2.09	3.19	1.55	0.873	2.88	4.41	1.96	1.03	3.66	2.34
×6.5	3.90	2.15	1.16	0.744	2.00	3.04	1.49	0.883	2.73	4.20	1.89	1.04	3.46	2.38
2MC4×13.8	8.06	10.1	4.03	1.12	6.84	12.9	4.81	1.27	8.35	16.3	5.68	1.42	9.87	1.48
2MC3×7.1	4.22	3.13	1.62	0.862	2.76	4.31	2.03	1.01	3.55	5.79	2.50	1.17	4.34	1.14

Table 1-18
Weights of Raised-Pattern Floor Plates



Gauge No.	Wt., lb/ft²	Nominal Thickness, in.	Wt., lb/ft²	Nominal Thickness, in.	Wt., lb/ft²
18	2.40	1/8	6.16	1/2	21.5
16	3.00	3/16	8.71	9/16	24.0
14	3.75	1/4	11.3	5/8	26.6
13	4.50	5/16	13.8	3/4	31.7
12	5.25	3/8	16.4	7/8	36.8
		7/16	18.9	1	41.9

Note: Thickness is measured near the edge of the plate, exclusive of raised pattern.

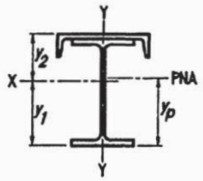


Table 1-19
W-Shapes with Cap Channels
Properties

W-Shape	Channel	Total Wt.	Total Area	Axis X-X			
				I	$S_1 = \frac{I}{y_1}$	$S_2 = \frac{I}{y_2}$	r
		lb/ft	in.^{2}	in.^{4}	in.^{3}	in.^{3}	in.
W36×150	MC18×42.7	193	56.8	12000	553	831	14.6
	C15×33.9	184	54.2	11500	546	764	14.6
W33×141	MC18×42.7	184	54.1	10000	490	750	13.6
	C15×33.9	175	51.5	9580	484	689	13.6
W33×118	MC18×42.7	161	47.2	8280	400	656	13.2
	C15×33.9	152	44.6	7900	395	596	13.3
W30×116	MC18×42.7	159	46.8	6900	365	598	12.1
	C15×33.9	150	44.1	6590	360	544	12.2
W30×99	MC18×42.7	142	41.6	5830	304	533	11.8
	C15×33.9	133	39.0	5550	300	481	11.9
W27×94	C15×33.9	128	37.6	4530	268	435	11.0
W27×84	C15×33.9	118	34.7	4050	237	403	10.8
W24×84	C15×33.9	118	34.7	3340	217	367	9.82
	C12×20.7	105	30.8	3030	211	302	9.92
W24×68	C15×33.9	102	30.0	2710	173	321	9.51
	C12×20.7	88.7	26.1	2440	168	258	9.67
W21×68	C15×33.9	102	30.0	2180	156	287	8.52
	C12×20.7	88.7	26.1	1970	152	232	8.67
W21×62	C15×33.9	95.9	28.2	2000	142	272	8.41
	C12×20.7	82.7	24.3	1800	138	218	8.59
W18×50	C15×33.9	83.9	24.6	1250	100	211	7.12
	C12×20.7	70.7	20.7	1120	97.3	166	7.35
W16×36	C15×33.9	69.9	20.5	748	64.5	160	6.04
	C12×20.7	56.7	16.6	670	62.8	123	6.34
W14×30	C12×20.7	50.7	14.9	447	46.7	98.1	5.47
	C10×15.3	45.3	13.3	420	46.0	84.5	5.61
W12×26	C12×20.7	46.7	13.7	318	36.8	82.1	4.81
	C10×15.3	41.3	12.1	299	36.3	70.5	4.96

Note: Compactness criteria not addressed in this table.

Table 1-19 (continued)
W-Shapes with Cap Channels
Properties

W-Shape	Channel	Axis X-X				Axis Y-Y			
		y_1	y_2	Z	y_p	I	S	r	Z
		in.	in.	in.^{3}	in.	in.^{4}	in.^{3}	in.	in.^{3}
W36×150	MC18×42.7	21.8	14.5	738	28.0	824	91.5	3.81	146
	C15×33.9	21.1	15.1	716	25.9	584	77.9	3.28	122
W33×141	MC18×42.7	20.4	13.3	652	27.0	800	88.9	3.85	142
	C15×33.9	19.8	13.9	635	24.9	561	74.8	3.30	118
W33×118	MC18×42.7	20.7	12.6	544	27.8	741	82.3	3.96	126
	C15×33.9	20.0	13.3	529	25.5	502	66.9	3.35	102
W30×116	MC18×42.7	18.9	11.5	492	26.1	718	79.8	3.92	124
	C15×33.9	18.3	12.1	480	23.8	479	63.8	3.29	100
W30×99	MC18×42.7	19.2	10.9	412	26.4	682	75.8	4.05	114
	C15×33.9	18.5	11.5	408	24.4	442	59.0	3.37	89.4
W27×94	C15×33.9	16.9	10.4	357	23.6	439	58.5	3.41	89.6
W27×84	C15×33.9	17.1	10.0	316	23.9	420	56.0	3.48	83.9
W24×84	C15×33.9	15.4	9.10	286	21.6	409	54.5	3.43	83.4
	C12×20.7	14.3	10.0	275	18.5	223	37.2	2.69	58.2
W24×68	C15×33.9	15.7	8.46	232	21.7	385	51.3	3.58	75.3
	C12×20.7	14.5	9.49	224	19.2	199	33.2	2.76	50.1
W21×68	C15×33.9	13.9	7.59	207	19.3	379	50.6	3.56	75.1
	C12×20.7	12.9	8.49	200	17.6	194	32.3	2.72	50.0
W21×62	C15×33.9	14.1	7.33	189	19.4	372	49.6	3.63	72.5
	C12×20.7	13.0	8.26	183	18.1	186	31.1	2.77	47.3
W18×50	C15×33.9	12.5	5.92	133	16.9	354	47.3	3.79	67.3
	C12×20.7	11.5	6.76	127	16.1	169	28.2	2.85	42.2
W16×36	C15×33.9	11.6	4.67	86.8	15.2	339	45.2	4.06	61.6
	C12×20.7	10.7	5.47	83.2	14.6	153	25.6	3.04	36.4
W14×30	C12×20.7	9.57	4.55	62.0	12.9	149	24.8	3.16	34.6
	C10×15.3	9.11	4.97	60.3	12.6	86.8	17.4	2.55	24.9
W12×26	C12×20.7	8.63	3.87	48.2	11.6	146	24.4	3.27	33.7
	C10×15.3	8.22	4.24	47.0	11.3	84.5	16.9	2.64	24.1

Note: Compactness criteria not addressed in this table.

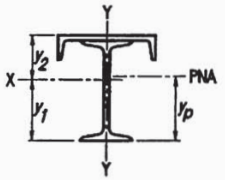


Table 1-20
S-Shapes with Cap Channels
Properties

S-Shape	Channel	Total Wt.	Total Area	Axis X-X			
				I	$S_1 = \frac{I}{y_1}$	$S_2 = \frac{I}{y_2}$	r
		lb/ft	in.^{2}	in.^{4}	in.^{3}	in.^{3}	in.
S24×80	C12×20.7	101	29.5	2750	191	278	9.66
	C10×15.3	95.3	27.9	2610	188	252	9.67
S20×66	C12×20.7	86.7	25.5	1620	132	202	7.97
	C10×15.3	81.3	23.9	1530	129	181	8.00
S15×42.9	C10×15.3	58.2	17.1	615	65.7	105	6.00
	C8×11.5	54.4	16.0	583	64.7	93.9	6.04
S12×31.8	C10×15.3	47.1	13.8	314	40.2	71.2	4.77
	C8×11.5	43.3	12.7	297	39.6	63.0	4.84
S10×25.4	C10×15.3	40.7	11.9	185	27.5	52.7	3.94
	C8×11.5	36.9	10.8	175	27.1	46.3	4.02

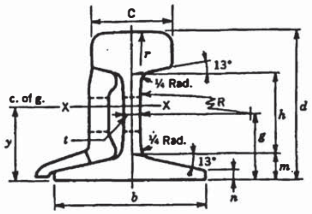
Note: Compactness criteria not addressed in this table.

Table 1-20 (continued)
S-Shapes with Cap Channels
Properties

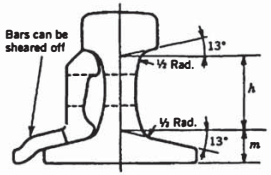
S-Shape	Channel	Axis X-X				Axis Y-Y			
		y_1	y_2	Z	y_p	I	S	r	Z
		in.	in.	in.^{3}	in.	in.^{4}	in.^{3}	in.	in.^{3}
S24×80	C12×20.7	14.4	9.90	256	18.1	171	28.5	2.41	46.4
	C10×15.3	13.9	10.4	246	16.5	109	21.8	1.98	36.8
S20×66	C12×20.7	12.3	7.99	180	16.0	156	26.1	2.48	41.0
	C10×15.3	11.8	8.44	173	14.4	94.7	18.9	1.99	31.3
S15×42.9	C10×15.3	9.37	5.87	87.6	12.8	81.5	16.3	2.18	25.0
	C8×11.5	9.01	6.21	86.5	11.6	46.8	11.7	1.71	18.7
S12×31.8	C10×15.3	7.82	4.42	54.0	10.6	76.5	15.3	2.36	22.3
	C8×11.5	7.50	4.72	52.4	10.3	41.8	10.5	1.82	16.1
S10×25.4	C10×15.3	6.73	3.51	37.2	9.03	73.9	14.8	2.49	20.9
	C8×11.5	6.45	3.77	36.1	8.82	39.2	9.81	1.90	14.6

Note: Compactness criteria not addressed in this table.

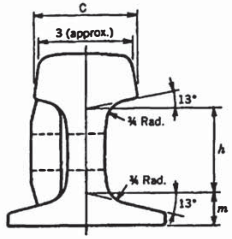
Table 1-21
Crane Rails
Dimensions and Properties



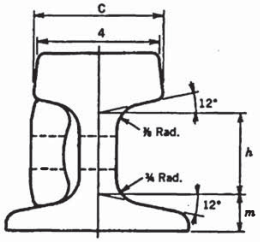
ASCE CRANE RAILS



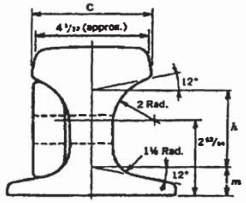
ASTM PROFILE 104



ASTM PROFILE 135



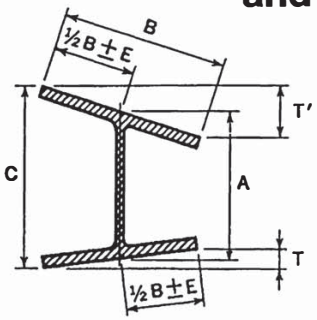
ASTM PROFILE 171

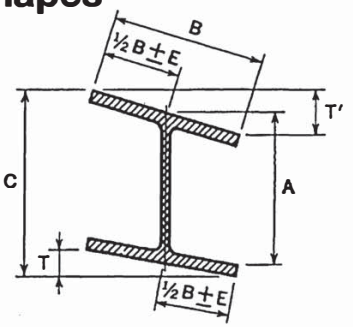


ASTM PROFILE 175

TYPE	Classification	Wt.	Depth, *d*	Gage, *g*	Base			Head		Web			Axis X-X				
					b	*m*	*n*	*c*	*r*	*t*	*h*	*R*	Area	*I*	*S*		*y*
															Head	Base	
		lb/yd	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.^{2}	in.^{4}	in.^{3}	in.^{3}	in.
ASCE	Light	30	3 1/8	1 25/64	3 1/8	17/32	11/64	1 11/16	12	21/64	1 23/32	12	3.00	4.10	2.55	—	—
		40	3 1/2	1 71/128	3 1/2	5/8	7/32	1 7/8	12	25/64	1 55/64	12	3.94	6.54	3.59	3.89	1.68
		50	3 7/8	1 23/32	3 7/8	11/16	1/4	2 1/8	12	7/16	2 1/16	12	4.90	10.1	5.10	—	1.88
		60	4 1/4	1 115/128	4 1/4	49/64	9/32	2 3/8	12	31/64	2 17/64	12	5.93	14.6	6.64	7.12	2.05
	—	70	4 5/8	2 3/64	4 5/8	13/16	9/32	2 7/16	12	33/64	2 15/32	12	6.81	19.7	8.19	8.87	2.22
		80	5	2 3/16	5	7/8	19/64	2 1/2	12	35/64	2 5/8	12	7.86	26.4	10.1	11.1	2.38
	Std.	85	5 3/16	2 17/64	5 3/16	57/64	19/64	2 9/16	12	9/16	2 3/4	12	8.33	30.1	11.1	12.2	2.47
		100	5 3/4	2 65/128	5 3/4	31/32	5/16	2 3/4	12	9/16	2 9/64	12	9.84	44.0	14.6	16.1	2.73
ASTM A759	Crane	104	5	2 7/16	5	1 1/16	1/2	2 1/2	12	1	2 7/16	3 1/2	10.3	29.8	10.7	13.5	2.21
		135	5 3/4	2 15/32	5 3/16	1 1/16	15/32	3 7/16	14	1 1/4	2 13/16	12	13.3	50.8	17.3	18.1	2.81
		171	6	2 5/8	6	1 1/4	5/8	4.3	Flat	1 1/4	2 3/4	Vert.	16.8	73.4	24.5	24.4	3.01
		175	6	2 21/32	6	1 9/64	1/2	4 1/4	18	1 1/2	3 7/64	Vert.	17.1	70.5	23.4	23.6	2.98

Table 1-22
ASTM A6 Tolerances for W-Shapes and HP-Shapes





Permissible Cross-Sectional Variations

Nominal Depth, in.	*A* Depth at Web Centerline, in.		*B* Flange Width, in.		*T* + *T′* Flanges Out of Square, Max. in.	*E*[a] Web Off Center, in.	*C*, Max. Depth at any Cross-Section over Theoretical Depth, in.
	Over	Under	Over	Under			
To 12, incl.	1/8	1/8	1/4	3/16	1/4	3/16	1/4
Over 12	1/8	1/8	1/4	3/16	5/16	3/16	1/4

Permissible Variations in Length

Nominal Depth[b], in.	Variations from Specified Length for Lengths Given, in.			
	30 ft and Under		Over 30 ft	
	Over	Under	Over	Under
Beams 24 in. and under	3/8	3/8	3/8 plus 1/16 for each additional 5 ft or fraction thereof	3/8
Beams over 24 in. All columns	1/2	1/2	1/2 plus 1/16 for each additional 5 ft or fraction thereof	1/2

Mill Straightness Tolerances[c]

Sizes	Length	Permissible Variation in Straightness, in.	
		Camber	Sweep
Flange width equal to or greater than 6 in.	All	$\frac{1}{8}$ in. × $\frac{\text{(total length, ft)}}{10}$	
Flange width less than 6 in.	All	$\frac{1}{8}$ in. × $\frac{\text{(total length, ft)}}{10}$	$\frac{1}{8}$ in. × $\frac{\text{(total length, ft)}}{5}$
Certain sections with a flange width approx. equal to depth & specified on order as columns[d]	45 ft and under	$\frac{1}{8}$ in. × $\frac{\text{(total length, ft)}}{10}$ with 3/8 in. max.	
	Over 45 ft	$\frac{3}{8}$ in. + $\left[\frac{1}{8}\text{ in.} \times \frac{\text{(total length, ft} - 45)}{10}\right]$	

Other Permissible Rolling Variations

Area and Weight	–2.5 to +3.0% from the theoretical cross-sectional area or the specified nominal weight[e]
Ends Out of Square	1/64 in., per in. of depth, or of flange width if it is greater than the depth

[a] Variation of 5/16 in. max. for sections over 426 lb/ft.
[b] For shapes specified in the order for use as bearing piles, the permitted variations are plus 5 in. and minus 0 in.
[c] The tolerances herein are taken from ASTM A6 and apply to the straightness of members received from the rolling mill, measured as illustrated in Figure 1-1.
[d] Applies only to W8×31and heavier, W10×49 and heavier, W12×65 and heavier, W14×90 and heavier, HP8×36, HP10×57, HP12×74 and heavier, and HP14×102 and heavier. If other sections are specified on the order as columns, the tolerance will be subject to negotiation with the manufacturer.
[e] For shapes with a nominal weight ≥ 100 lb/ft, the permitted variation is ±2.5% from the theoretical or specified amount.

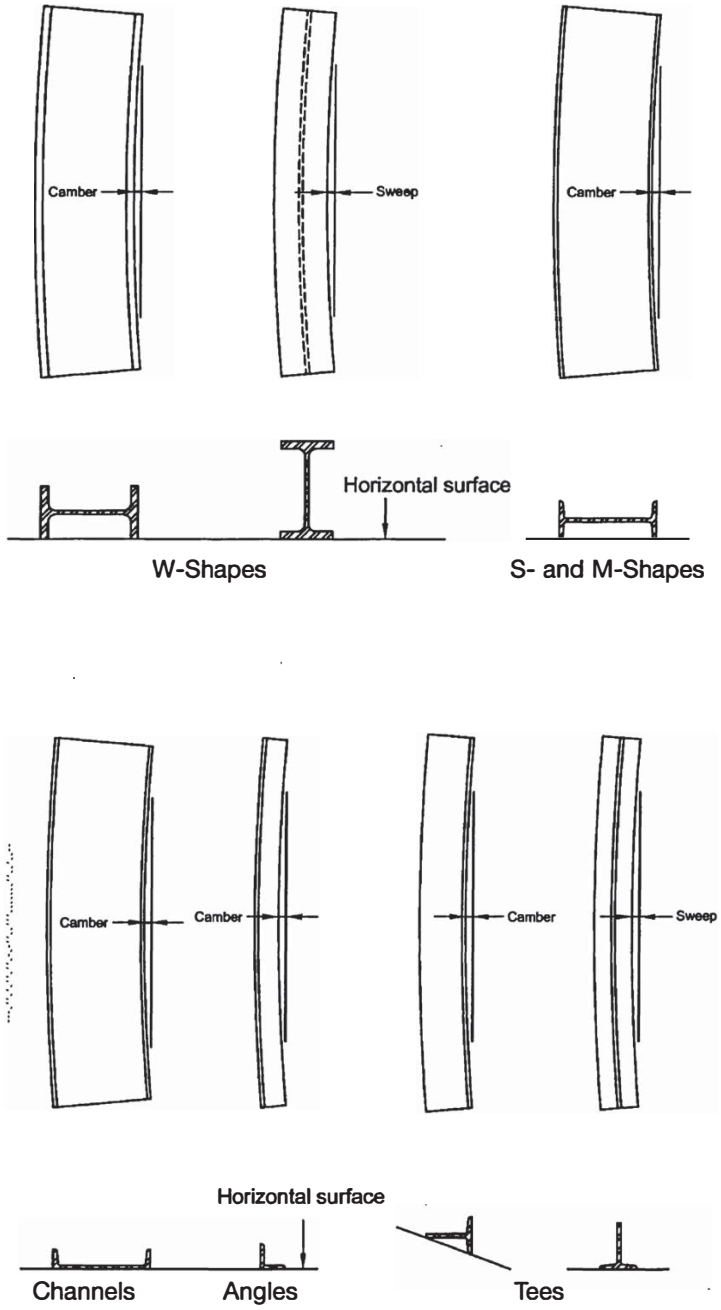
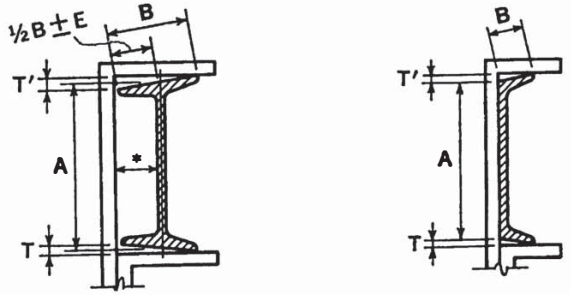


Fig. 1-1. Positions for measuring straightness.

Table 1-23
ASTM A6 Tolerances for S-Shapes, M-Shapes and Channels



*Back of square and centerline of web to be parallel when measuring "out-of-square"

Permissible Cross-Sectional Variations

Shape	Nominal Depth, in.	*A*[a] Depth, in. Over	*A*[a] Depth, in. Under	*B* Flange Width, in. Over	*B* Flange Width, in. Under	*T* + *T*′[b] Flanges Out of Square, per in. of *B*, in.	*E* Web Off Center, in.
S shapes and M shapes	3 to 7, incl.	3/32	1/16	1/8	1/8	1/32	3/16
	Over 7 to 14, incl.	1/8	3/32	5/32	5/32		
	Over 14 to 24, incl.	3/16	1/8	3/16	3/16		
Channels	3 to 7, incl.	3/32	1/16	1/8	1/8	1/32	—
	Over 7 to 14, incl.	1/8	3/32	1/8	5/32		
	Over 14	3/16	1/8	1/8	3/16		

Permissible Variations in Length

Shape	Variations from Specified Length for Lengths Given[c], in. 5 to 10 ft, excl.	10 to 20 ft, excl.	20 to 30 ft, incl.	Over 30 to 40 ft, incl.	Over 40 to 65 ft, incl.	Over 65 ft
All	1	1 1/2	1 3/4	2 1/4	2 3/4	—

Mill Straightness Tolerances[d]

Camber	$\frac{1}{8}$ in. × $\frac{\text{(total length, ft)}}{5}$
Sweep	Due to the extreme variations in flexibility of these shapes, permitted variations for sweep are subject to negotiation between the manufacturer and purchaser for the individual sections involved.

Other Permissible Rolling Variations

Area and Weight	–2.5 to +3.0% from the theoretical cross-sectional area or the specified nominal weight[e]
Ends Out of Square	S-Shapes, M-Shapes and Channels 1/64 in., per in. of depth

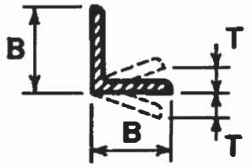
— Indicates that there is no requirement.
[a] *A* is measured at center line of web for S-shapes and M-shapes and at back of web for channels.
[b] *T* + *T*′ applies when flanges of channels are toed in or out.
[c] The permitted variation under the specified length is 0 in. for all lengths. There are no requirements for lengths over 65 ft.
[d] The tolerances herein are taken from ASTM A6 and apply to the straightness of members received from the rolling mill, measured as illustrated in Figure 1-1.
[e] For shapes with a nominal weight ≥ 100 lb/ft, the permitted variation is ±2.5% from the theoretical or specified amount.

Table 1-24
ASTM A6 Tolerances for WT-, MT- and ST-Shapes

Permissible Variations in Depth	
Dimension A may be approximately one-half beam depth or any dimension resulting from off-center splitting or splitting on two lines, as specified in the order.	
Specified Depth, *A*, in.	**Variations in Depth *A*, Over and Under**
To 6, excl.	1/8
6 to 16, excl.	3/16
16 to 20, excl.	1/4
20 to 24, excl.	5/16
24 and over	3/8
The above variations in depths of tees include the permissible variations in depth for the beams before splitting	
Mill Straightness Tolerances[a]	
Camber and Sweep	$\frac{1}{8}$ in. $\times \frac{\text{(total length, ft)}}{5}$
Other Permissible Rolling Variations	
Other permissible variations in cross section as well as permissible variations in length, area, weight, ends out-of-square, and sweep for WTs will correspond to those of the beam before splitting.	

— Indicates that there is no requirement.
[a] The tolerances herein are taken from ASTM A6 and apply to the straightness of members received from the rolling mill, measured as illustrated in Figure 1-1. For tolerance on induced camber and sweep, see AISC *Code of Standard Practice* Section 6.4.4.

Table 1-25
ASTM A6 Tolerances for Angles, 3 in. and Larger



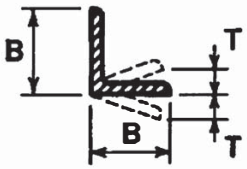
Permissible Cross-Sectional Variations				
Shape	**Nominal Leg Size[a], in.**	***B* Leg Size, in.**		***T* Out of Square per in. of *B*, in.**
		Over	**Under**	
Angles	3 to 4, incl.	1/8	3/32	3/128[b]
	Over 4 to 6, incl.	1/8	1/8	
	Over 6	3/16	1/8	

Permissible Variations in Length				
Variations Over Specified Length for Lengths Given[c], in.				
5 to 10 ft, excl.	**10 to 20 ft, excl.**	**20 to 30 ft, incl.**	**Over 30 to 40 ft, incl.**	**Over 40 to 65 ft, incl.**
1	1 1/2	1 3/4	2 1/4	2 3/4

Mill Straightness Tolerances[d]	
Camber	$\frac{1}{8}$ in. $\times \frac{\text{(total length, ft)}}{5}$, applied to either leg
Sweep	Due to the extreme variations in flexibility of these shapes, permitted variations for sweep are subject to negotiation between the manufacturer and purchaser for the individual sections involved.
Other Permissible Rolling Variations	
Area and Weight	–2.5 to +3.0% from the theoretical cross-sectional area or the specified nominal weight
Ends Out of Square	3/128 in. per in. of leg length, or 1 1/2°. Variations based on the longer leg of unequal angle.

[a] For unequal leg angles, longer leg determines classification.
[b] 3/128 in. per in. = 1 1/2°
[c] The permitted variation under the specified length is 0 in. for all lengths. There are no requirements for lengths over 65 ft.
[d] The tolerances herein are taken from ASTM A6 and apply to the straightness of members received from the rolling mill, measured as illustrated in Figure 1-1.

Table 1-26
ASTM A6 Tolerances for Angles, < 3 in.



Permissible Cross-Sectional Variations					
Specified Leg Size[a], in.	Variations in Thickness for Thicknesses Given, Over and Under, in.			*B* Leg Size, Over and Under, in.	*T* Out of Square per Inch of *B*, in.
	3/16 and Under	Over 3/16 to 3/8 incl.	Over 3/8		
1 and Under	0.008	0.010	—	1/32	3/128[b]
Over 1 to 2, incl.	0.010	0.010	0.012	3/64	
Over 2 to 3, excl.	0.012	0.015	0.015	1/16	

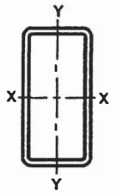
Permissible Variations in Length					
Section	Variations Over Specified Length for Lengths Given[c], in.				
	5 to 10 ft, excl.	10 to 20 ft, excl.	20 to 30 ft, incl.	Over 30 to 40 ft, incl.	40 to 65 ft, incl.
All bar-size angles	5/8	1	1 1/2	2	2 1/2

Mill Straightness Tolerances[d]	
Camber	1/4 in. in any 5 ft, or 1/4 in. $\times \frac{\text{(total length, ft)}}{5}$, applied to either leg
Sweep	Due to the extreme variations in flexibility of these shapes, permitted variations for sweep are subject to negotiation between the manufacturer and purchaser for the individual sections involved.

Other Permissible Rolling Variations	
Ends Out of Square	3/128 in. per in. of leg length, or 1 1/2°. Variations based on the longer leg of unequal angle.

— Indicates that there is no requirement.
[a] For unequal angles, longer leg determines classification.
[b] 3/128 in. per in. = 1 1/2°
[c] The permitted variation under the specified length is 0 in. for all lengths. There are no requirements for lengths over 65 ft.
[d] The tolerances herein are taken from ASTM A6 and apply to the straightness of members received from the rolling mill, measured as illustrated in Figure 1-1.

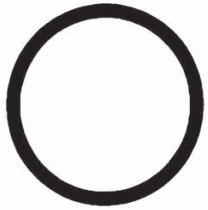
Table 1-27
Tolerances for Rectangular and Square HSS



ASTM A500, ASTM A501, ASTM A618 and ASTM A847		
Outside Dimensions	The outside dimensions, measured across the flats at positions at least 2 in. from either end, shall not vary from the specified dimensions by more than the applicable amount given in the following table:	
	Largest Outside Dimension Across Flats, in.	Permissible Variation Over and Under Specified Dimensions[a,b], in.
	2 1/2 and under	0.020
	Over 2 1/2 to 3 1/2, incl.	0.025
	Over 3 1/2 to 5 1/2, incl.	0.030
	Over 5 1/2	1%[c]
Length	HSS are commonly produced in random lengths, in multiple lengths, and in specific lengths. When specific lengths are ordered for HSS, the length tolerances shall be in accordance with the following table:	
	Length tolerance for specific lengths, in.	
	22 ft and under	Over 22 ft[f]
	Over: 1/2 — Under: 1/4	Over: 3/4 — Under: 1/4
Wall Thickness	ASTM A500 and ASTM A847 only: The tolerance for wall thickness exclusive of the weld area shall be plus and minus 10% of the nominal wall thickness specified. The wall thickness is to be measured at the center of the flat.	
Weight	ASTM A501 only: The weight of HSS, as specified in ASTM A501 Tables 3 and 4, shall not be less than the specified value by more than 3.5%.	
Mass	ASTM A618 only: The mass shall not be less than the specified value by more than 3.5%.	
Straightness	The permissible variation for straightness shall be 1/8 in. times the number of ft of total length divided by 5.	
Squareness of Sides	Adjacent sides may deviate from 90° by a tolerance of ± 2° maximum.	
Radius of Corners	The radius of any outside corner of the section shall not exceed 3 times the specified wall thickness[d].	
Twist	The tolerances for twist with respect to axial alignment of the section shall be as shown in the following table:	
	Specified Dimension of Longer Side, in.	Maximum Twist per 3 ft of length, in.
	1 1/2 and under	0.050
	Over 1 1/2 to 2 1/2, incl.	0.062
	Over 2 1/2 to 4, incl.	0.075
	Over 4 to 6, incl.	0.087
	Over 6 to 8, incl.	0.100
	Over 8	0.112
	Twist shall be determined by holding one end of the HSS down on a flat surface plate, measuring the height that each corner on the bottom side of the tubing extends above the surface plate near the opposite end of the HSS, and calculating the difference in the measured heights of such corners[e].	

[a] The respective outside dimension tolerances include the allowances for convexity and concavity.
[b] ASTM A500 and ASTM A847 HSS only: The tolerances given are for the large flat dimension only. For HSS having a ratio of outside large to small flat dimension less than 1.5, the tolerance on the small flat dimesion shall be identical to those given. For HSS having a ratio of outside large to small flat dimension in the range of 1.5 to 3.0 inclusive, the tolerance on the small flat dimesion shall be 1.5 times those given. For HSS having a ratio of outside large to small flat dimension greater than 3.0, the tolerance on the small flat dimension shall be 2.0 times those given.
[c] This value is 0.01 times the large flat dimension. ASTM A501 only: Over 5 1/2 to 10 incl., this value is 0.01 times large flat dimension; over 10, this value is 0.02 times the large flat dimension.
[d] ASTM A501 HSS only: The radius of any outside corner must not exceed 3 times the calculated nominal wall thickness.
[e] ASTM A500, ASTM A501, and ASTM A847 HSS only: For heavier sections it shall be permissible to use a suitable measuring device to determine twist. Twist measurements shall not be taken within 2 in. of the ends of the HSS.
[f] ASTM A501 and A618: The upper limit on specific length is 44 ft.

Table 1-28
Tolerances for Round HSS and Pipe



ASTM A53	
Weight	The weight as specified in ASTM A53 Table X2.2 and Table X2.3 or as calculated from the relevant equation in ASME B36.10M shall not vary by more than ± 10%. Note that the weight tolerance is determined from the weights of the customary lifts of pipe as produced for shipment by the mill, divided by the number of ft of pipe in the lift. On pipe sizes over 4 in. where individual lengths may be weighed, the weight tolerance is applicable to the individual length.
Diameter	For pipe 2 in. and over in nominal diameter, the outside diameter shall not vary more than ± 1% from the outside diameter specified.
Thickness	The minimum wall thickness at any point shall not be more than 12.5% under the nominal wall thickness specified.
ASTM A500 and ASTM A847	
Diameter[a]	For HSS 1.900 in. and under in specified diameter, the outside diameter shall not vary more than ± 0.5%, rounded to the nearest 0.005 in., from the specified diameter. For HSS 2.000 in. and over in specified diameter, the outside diameter shall not vary more than ± 0.75%, rounded to the nearest 0.005 in., from the specified diameter.
Thickness	The wall thickness at any point, excluding the weld seam of welded tubing, shall not be more than 10% under or over the specified wall thickness.
ASTM A501 and ASTM A618	
Outside Dimensions	For HSS 1 1/2 in. and under in nominal size, the outside diameter shall not vary more than 1/64 in. over nor more than 1/32 in. under the specified diameter. For round hot-formed HSS 2 in. and over in nominal size, the outside diameter shall not vary more than ± 1% from the specified diameter.
Weight (A501 only)	The weight of HSS, as specified in ASTM A501 Table 5, shall not be less than the specified value by more than 3.5%.
Mass (A618 only)	The mass of HSS shall not be less than the specified value by more than 3.5%. The mass tolerance shall be determined from individual lengths or, for HSS 4 1/2 in. and under in outside diameter, shall be determined from masses of customary lifts produced by the mill.
ASTM A500, ASTM A501, ASTM A618 and ASTM A847	
Length	HSS are commonly produced in random mill lengths, in multiple lengths, and in specific lengths. When specific lengths are ordered for HSS, the length tolerances shall be in accordance with the following table:

Length tolerance for specific cut lengths, in.			
22 ft and under		Over 22 ft[b]	
Over	Under	Over	Under
1/2	1/4	3/4	1/4

Straightness	The permissible variation for straightness of HSS shall be 1/8 in. times the number of ft of total length divided by 5.

[a] The outside diameter measurements shall be taken at least 2 in. from the end of the HSS.
[b] ASTM A501 and A618: The upper limit and specific length is 44 ft.

Table 1-29
Rectangular Plates

Permissible Variations from Flatness(Carbon Steel Only)

Specified Thickness, in.	Variations from Flatness for Specified Widths, in.							
	To 36, excl.	36 to 48, excl.	48 to 60, excl.	60 to 72, excl.	72 to 84, excl.	84 to 96, excl.	96 to 108, excl.	108 to 120, excl.
To 1/4, excl.	9/16	3/4	15/16	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4
1/4 to 3/8, excl.	1/2	5/8	3/4	15/16	1 1/8	1 1/4	1 3/8	1 1/2
3/8 to 1/2, excl.	1/2	9/16	5/8	5/8	3/4	7/8	1	1 1/8
1/2 to 3/4, excl.	7/16	1/2	9/16	5/8	5/8	3/4	1	1
3/4 to 1, excl.	7/16	1/2	9/16	5/8	5/8	5/8	3/4	7/8
1 to 2, excl.	3/8	1/2	1/2	9/16	9/16	5/8	5/8	5/8
2 to 4, excl.	5/16	3/8	7/16	1/2	1/2	1/2	1/2	9/16
4 to 6, excl.	3/8	7/16	1/2	1/2	9/16	9/16	5/8	3/4
6 to 8, excl.	7/16	1/2	1/2	5/8	11/16	3/4	7/8	7/8

Notes:
1. The longer dimension specified is considered the length, and permissible variations in flatness along the length shall not exceed the tabular amount for the specified width for plates up to 12 ft in length, or in any 12 ft for longer plates.
2. The flatness variations across the width shall not exceed the tabular amount for the specified width.
3. When the longer dimension is under 36 in., the permissible variation shall not exceed 1/4 in. When the longer dimension is from 36 to 72 in., inclusive, the permissible variation should not exceed 75% of the tabular amount for the specified width, but in no case less than 1/4 in.
4. These variations apply to plates which have a specified minimum tensile strength of not more than 60 ksi or comparable chemistry or hardness. The limits in the table are increased 50% for plates specified to a higher minimum tensile strength or comparable chemistry or hardness.
5. For plates 8 in. and over in thickness or 120 in. and over in width, see ASTM A6 Table 13.
6. Plates must be in a horizontal position on a flat surface when flatness is measured.

Permissible Variations in Camber[a] for Carbon Steel Sheared and Gas Cut Rectangular Plates

$$\text{Maximum permissible camber, in. (all thicknesses)} = \tfrac{1}{8}\text{ in.} \times \frac{\text{(total length, ft)}}{5}$$

Permissible Variations in in Camber[a] for High-Strength Low-Alloy and Alloy Steel Sheared, Special-Cut, or Gas-Cut Rectangular Plates

Specified Dimension, in.		Permitted Camber, in.
Thickness	Width	
To 2, incl.	All	$\frac{1}{8}$ in. $\times \frac{\text{(total length, ft)}}{5}$
Over 2 to 15, incl.	To 30, incl.	$\frac{3}{16}$ in. $\times \frac{\text{(total length, ft)}}{5}$
	Over 30 to 60, incl.	$\frac{1}{4}$ in. $\times \frac{\text{(total length, ft)}}{5}$

[a] Camber as it relates to plates is the horizontal edge curvature in the length, measured over the entire length of the plate in the flat position.