

# Fy & Fult For the different steel section

sections

Shape	Steel Type		
	ASTM Designation	F <sub>y</sub> , ksi	F <sub>u</sub> , ksi
Wide flanged beams	A992	50-65	65
Miscellaneous beams	A36	36	58-80
Standard beams	A36	36	58-80
Bearing piles	A572 Gr. 50	50	65
Standard channels	A36	36	58-80
Miscellaneous channels	A36	36	58-80
Angles	A36	36	58-80
Ts cut from W-shapes	A992	50-65	65
Ts cut from M-shapes	A36	36	58-80
Ts cut from S-shapes	A36	36	58-80
Hollow structural sections, rectangular	A500 Gr. B	46	58
Hollow structural sections, square	A500 Gr. B	46	58
Hollow structural sections, round	A500 Gr. B	42	58
Pipe	A53 Gr. B	35	60

→ W  
→ M  
→ S  
→ HP  
Mc

E = stress/strain  
= 29,000 ksi

MT

L  
W  
T

S  
T

□ HS  
□ HS  
Pipe

Note: F<sub>y</sub> = specified minimum yield stress; F<sub>u</sub> = specified minimum tensile strength

TABLE 1.2 Type of Steel Used

Prepared by Eng. Maged Kamel.

# Steel shapes *symbols*



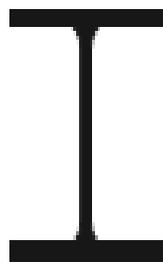
W-Shapes



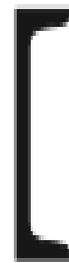
M-Shapes



S-Shapes



HP-Shapes



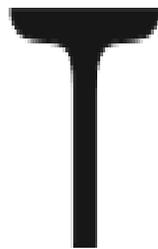
C-Shapes



L-Shapes



WT-Shapes



ST-Shapes



HSS-Shapes



Pipe

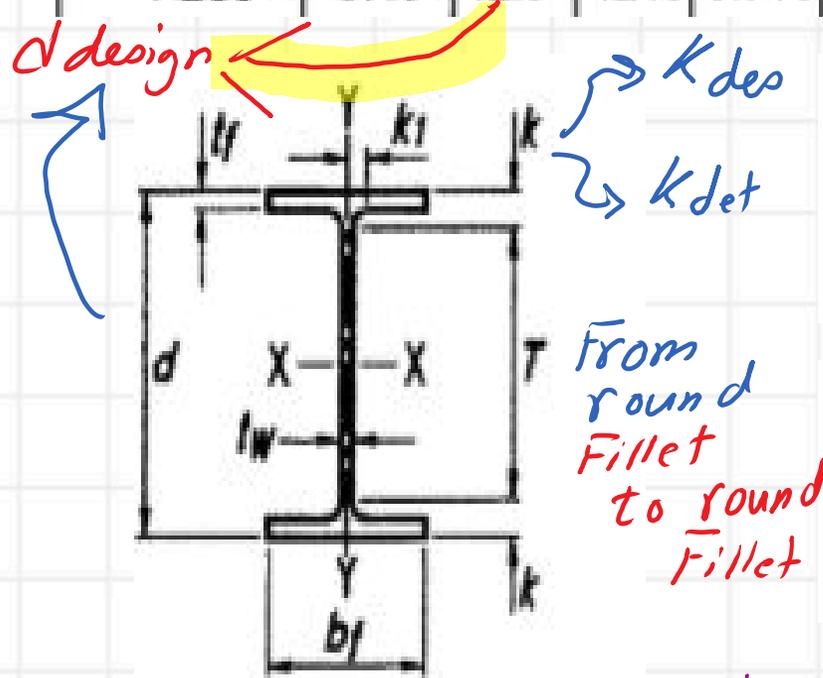
Shape	Designation
Wide flanged beams	W
Miscellaneous beams	M
Standard beams	S
Bearing piles	HP
Standard channels	C
Miscellaneous channels	MC
Angles	L
Tees cut from W-shapes	WT
Tees cut from M-shapes	MT
Tees cut from S-shapes	ST
Rectangular hollow structural sections	HSS
Square hollow structural sections	HSS
Round hollow structural sections	HSS
Pipe	Pipe

Prepared by Eng.Maged Kamel.

# W-Shapes

# Values For design

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.	in.	in.
W44x335 <sup>c</sup>	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
x290 <sup>c</sup>	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	↓	↓
x262 <sup>c</sup>	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	↓	↓
x230 <sup>c,v</sup>	67.8	42.9	42 7/8	0.710	1 1/16	3/8	15.8	15 3/4	1.22	1 1/4	2.01	2 1/16	1 3/16	↓	↓



The most commonly used structural shape is the wide-flange or W shape. This is a doubly symmetrical (symmetrical about both the  $x$  and  $y$  axes) shape consisting of two rectangular-shaped flanges connected by a rectangular web plate. The flange faces are essentially parallel with the inner flange distance for most of the groups, with a constant dimension.† There is some variation due to roll wear and other factors, but the distance is held constant within ASTM tolerances. The shape is produced as illustrated in Fig. 1-1.

$k_{des}$ : value for design

$k_{det}$ : value for detailing

X-axis Major axis Prepared by Eng. Maged Kamel.

# SI Units for Structural Steel Design

AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.

Multiply	by:	to obtain:
inch (in.)	25.4	millimeters (mm)
foot (ft)	305	millimeters (mm)
pound-mass (lb)	0.454	kilogram (kg)
pound-force (lbf)	4.448	newton (N)
ksi	6.895	N / mm <sup>2</sup>
ft-lbf	1.356	joule (J)



$$\begin{aligned}
 1 \text{ lbf} &= 1 \text{ lb} \times g_n \\
 &= 1 \text{ lb} \times 9.80665 \frac{\text{m}}{\text{s}^2} / 0.3048 \frac{\text{m}}{\text{ft}} \\
 &\approx 1 \text{ lb} \times 32.174049 \frac{\text{ft}}{\text{s}^2} \\
 &\approx 32.174049 \frac{\text{ft}\cdot\text{lb}}{\text{s}^2}
 \end{aligned}$$

[https://en.wikipedia.org/wiki/Pound\\_\(force\)](https://en.wikipedia.org/wiki/Pound_(force))

$$\begin{aligned}
 1 \text{ lbf} &= 1 \text{ lb} \times 0.45359237 \frac{\text{kg}}{\text{lb}} \times g_n \\
 &= 0.45359237 \text{ kg} \times 9.80665 \frac{\text{m}}{\text{s}^2} \\
 &= 4.4482216152605 \text{ N}
 \end{aligned}$$

# Units : For Force / Unit Length

$$Lb / Ft \Rightarrow 1 \text{ KN/m}$$

$$1 Lb_f = 4.448 \text{ N}$$

$$1 Ft = 0.3048 \text{ m}$$

$$1 \frac{Lb_f}{Ft} \left( \frac{4.448 \text{ N}}{Lb} \right) \left( \frac{Ft}{0.3048 \text{ m}} \right) = 14.593 \Rightarrow \boxed{14.59} \frac{N}{m}$$

$$Lb / Ft \Rightarrow \text{kg}_f / m \quad \text{kg}_f = 9.80665 \text{ N}$$

$$1 \frac{Lb}{Ft} (14.593) \frac{N}{m} \left( \frac{\text{kg}_f}{9.80665 \text{ N}} \right) = 1.488 \text{ kg/m}$$

$$1 \frac{\text{Lb}}{\text{Ft}} = 1.488 \text{ kg/m}$$

Table 17-1  
**SI Equivalents of Standard U.S.  
 Shape Profiles**  
**W-Shapes**

Why W44x335  
 is Equivalent  
 $E_0 \Rightarrow W1100 \times 499$   
 Nominal depth  $\leftarrow \times \frac{\text{wt}}{\text{unit Length}}$

Shape	SI Equivalent	Shape	SI Equivalent	Shape	SI Equivalent
in. x lb/ft	mm x kg/m	in. x lb/ft	mm x kg/m	in. x lb/ft	mm x kg/m
W44x335	W1100x499	W36x256	W920x381	W27x539	W690x802
x290	x433	x232	x345	x368	x548
x262	x390	x210	x313	x336	x500
x230	x343	x194	x289	x307	x457

$$44'' \Rightarrow 44 \left( \frac{\text{inch}}{\text{inch}} \right) (25.40) = 1117.60 \text{ mm} \Rightarrow 1100 \text{ mm}$$

$$335 \frac{\text{Lb}}{\text{Ft}} \Rightarrow 335 \frac{\text{Lb}}{\text{Ft}} \left( \frac{\text{Ft}}{1 \text{ Lb}} \right) 1.488 \frac{\text{kg}}{\text{m}} = 498.48 = 499 \text{ kg/m}$$

**PART 17**

**MISCELLANEOUS DATA AND MATHEMATICAL INFORMATION**

SI EQUIVALENTS OF STANDARD U.S. SHAPE PROFILES ..... 17-3

    Table 17-1. W-Shapes ..... 17-3

    Table 17-2. M-, S- and HP-Shapes ..... 17-6

    Table 17-3. Channels ..... 17-7

    Table 17-4. Angles ..... 17-8

    Table 17-5. WT-Shapes ..... 17-10

    Table 17-6. MT- and ST-Shapes ..... 17-13

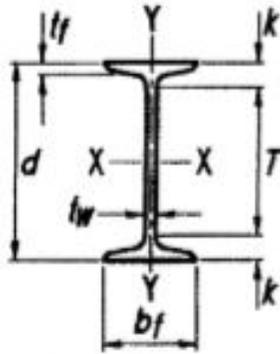
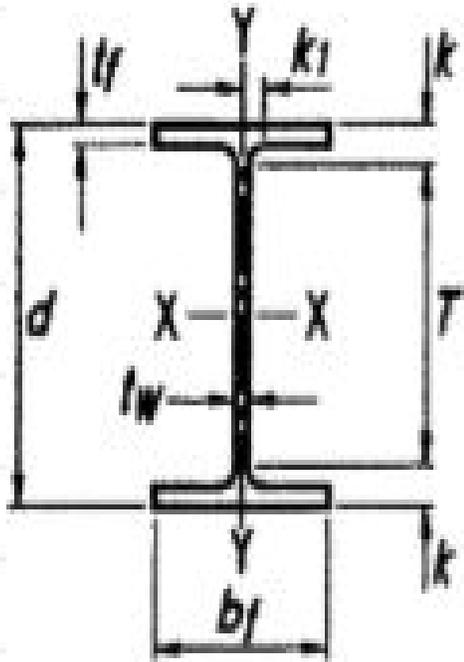
    Table 17-7. Rectangular HSS ..... 17-14

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**Table 17-1**  
**SI Equivalents of Standard U.S.**  
**Shape Profiles**  
**W-Shapes**

<b>Shape</b>	<b>SI Equivalent</b>	<b>Shape</b>	<b>SI Equivalent</b>	<b>Shape</b>	<b>SI Equivalent</b>
<b>in. × lb/ft</b>	<b>mm × kg/m</b>	<b>in. × lb/ft</b>	<b>mm × kg/m</b>	<b>in. × lb/ft</b>	<b>mm × kg/m</b>
W44×335	W1100×499	W36×925	W920×1377	W30×391	W760×582
×290	×433	×853	×1269	×357	×531
×262	×390	×802	×1194	×326	×484
×230	×343	×723	×1077	×292	×434
		×652	×970	×261	×389
W40×655	W1000×976	×529	×787	×235	×350
×593	×883	×487	×725	×211	×314
×503	×748	×441	×656	×191	×284
×431	×642	×395	×588	×173	×257
×397	×591	...	...		



**Table 1-3  
S-Shapes  
Dimensions**

Shape	Area, A	Depth, d		Web			Flange			Distance			
				Thickness, $t_w$		Width, $b_f$	Thickness, $t_f$		k	T	Workable Gage		
				in.	in.		in.	in.				in.	in.
S24x121	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
x106	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
S24x100	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
x90	26.5	24.0	24	0.625	5/8	5/16	7.13	7 7/8	0.870	7/8	1 3/4	20 1/2	4
x80	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

*Difference between W, S*

1. The flange width of the S shape is less.
2. The inner face of the flange has a slope of approximately 16.7°.
3. The theoretical depth is the same as the nominal depth. An S510 × 111.6 is a shape of nominal depth 510 mm × 111.6 kg/m (S20 × 75).

*Table 17-2*

**Prepared by Eng. Maged Kamel.**

M shape

⇒ 18 sections

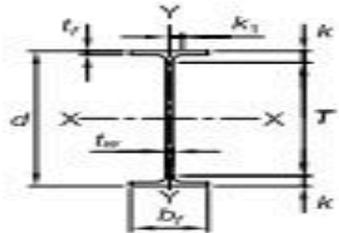


Table 1-2  
M-Shapes  
Dimensions

Shape	Area, A		Depth, d		Web			Flange			Distance			Workable Gage
	in. <sup>2</sup>		in.		Thickness, t <sub>w</sub>	t <sub>w</sub> /2	Width, b <sub>f</sub>	Thickness, t <sub>f</sub>	k	k <sub>1</sub>	T	in.		
					in.	in.	in.	in.	in.	in.	in.	in.		
M12.5×12.4 <sup>C.V</sup> ×11.6 <sup>C.V</sup>	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	—
	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 <sup>C</sup> ×10.8 <sup>C.V</sup>	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	—
	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 <sup>C.V</sup>	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 <sup>C</sup> ×8 <sup>C.V</sup>	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	—
	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 <sup>C.V</sup>	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 <sup>C</sup> ×6.2 <sup>C</sup>	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	—
	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 <sup>C</sup> ×3.7 <sup>C</sup>	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	—
	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 <sup>t</sup>	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 <sup>a</sup>
M4×6 <sup>t</sup> ×4.08 ×3.45 ×3.2	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	—
	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	—
	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	—
	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	—

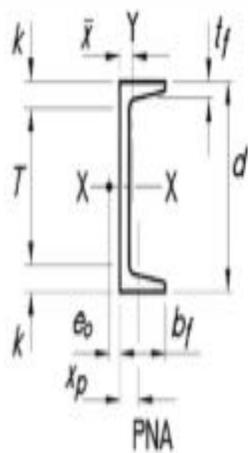
Largest size  
M<sup>in</sup> 12.5 × 12.40 Lb/Ft

↓  
Metric Designation

M 318 × 18.5  
mm Kg/m

Table 17-2

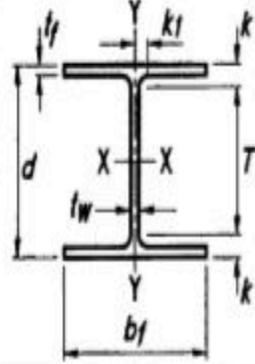
# C Channel



**Table 1-5  
C-Shapes  
Dimensions**

Shape	Area, A	Depth, d	Web		Flange		Distance			r <sub>ts</sub>	h <sub>o</sub>				
			Thickness, t <sub>w</sub>	t <sub>w</sub> /2	Width, b <sub>f</sub>	Average Thickness, t <sub>f</sub>	k	T	Workable Gage						
												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	1 7/16	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	1 7/16	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	1 7/16	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 <sup>Ⓢ</sup>	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 <sup>Ⓢ</sup>	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 <sup>Ⓢ</sup>	0.983	11.5

# HP - Bearing Plate



**Table 1-4  
HP-Shapes  
Dimensions**

Shape	Area, A	Depth, d	Web		Flange		Distance							
			Thickness, t <sub>w</sub>	t <sub>w</sub> /2	Width, b <sub>f</sub>	Thickness, t <sub>f</sub>	k	k <sub>1</sub>	T	Workable Gage				
											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 <sup>f</sup>	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 <sup>f</sup>	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 <sup>f</sup>	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 <sup>f</sup>	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 <sup>c,f</sup>	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	↓	↓

Table 1-6 (continued)  
**MC-Shapes**  
 Properties



MC18-MC8

Nom- inal 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. <sup>4</sup>	in. <sup>3</sup>	in.	in. <sup>3</sup>	in. <sup>4</sup>	in. <sup>3</sup>	in.	in.	in. <sup>3</sup>	in.	in. <sup>4</sup>	in. <sup>6</sup>	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

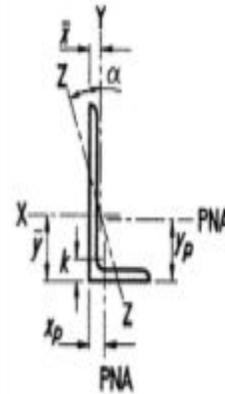
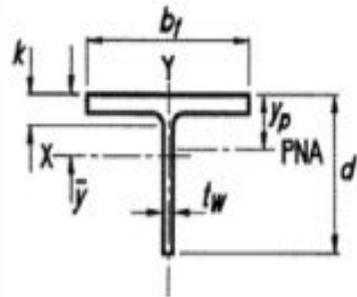


Table 1-7  
**Angles**  
 Properties

Shape	$k$	Wt.	Area, $A$	Axis X-X						Flexural-Torsional Properties		
				$I$	$S$	$r$	$\bar{y}$	$Z$	$y_p$	$J$	$C_w$	$\bar{r}_o$
L8x8x1/8	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	8.26	2.49	2.17	15.1	0.499	0.682	3.22	4.45

### MC-Shapes

*MC-shapes* are miscellaneous channels that cannot be classified as C-shapes. Their designations follow the same rules as the previous shapes, with a typical shape being an MC6×18. *Manual* Table 1-6 lists 40 MC-shapes, and their sizes fall into the same overall range as the C-shapes.



**Table 1-8  
WT-Shapes  
Dimensions**

Shape	Area, A		Depth, d	Stem			Flange				Distance		Workable Gage	
	in. <sup>2</sup>	in.		Thickness, t <sub>w</sub>	t <sub>w</sub> /2	Area	Width, b <sub>f</sub>	Thickness, t <sub>f</sub>	k		in.			
									k <sub>des</sub>	k <sub>det</sub>				
WT22×167.5 <sup>c</sup>	49.2	22.0	22	1.03	1	1/2	22.6	15.9	16	1.77	1 <sup>3</sup> / <sub>4</sub>	2.56	2 <sup>5</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>2</sub>
×145 <sup>c</sup>	42.6	21.8	21 <sup>3</sup> / <sub>4</sub>	0.865	7/8	7/16	18.9	15.8	15 <sup>7</sup> / <sub>8</sub>	1.58	1 <sup>9</sup> / <sub>16</sub>	2.36	2 <sup>7</sup> / <sub>16</sub>	↓
×131 <sup>c</sup>	38.5	21.7	21 <sup>5</sup> / <sub>8</sub>	0.785	1 <sup>3</sup> / <sub>16</sub>	7/16	17.0	15.8	15 <sup>3</sup> / <sub>4</sub>	1.42	1 <sup>7</sup> / <sub>16</sub>	2.20	2 <sup>1</sup> / <sub>4</sub>	↓
×115 <sup>GV</sup>	33.9	21.5	21 <sup>1</sup> / <sub>2</sub>	0.710	1 <sup>1</sup> / <sub>16</sub>	3/8	15.2	15.8	15 <sup>3</sup> / <sub>4</sub>	1.22	1 <sup>1</sup> / <sub>4</sub>	2.01	2 <sup>1</sup> / <sub>16</sub>	↓

**Table 17-5  
SI Equivalents of Standard U.S.  
Shape Profiles  
WT-Shapes**

Shape	SI Equivalent	Shape	SI Equivalent	Shape	SI Equivalent
in. × lb/ft	mm × kg/m	in. × lb/ft	mm × kg/m	in. × lb/ft	mm × kg/m
WT22×167.5	WT550×249.5	WT18×128	WT460×190.5	WT13.5×269.5	WT345×401
×145	×216.5	×116	×172.5	×184	×274
×131	×195	×105	×156.5	×168	×250
×115	×171.5	×97	×144.5	×153.5	×228.5
		×91	×135.5	×140.5	×209.5
WT20×296.5	WT500×441.5	×85	×126.5	×129	×192
×251.5	×374	×80	×119	×117.5	×175
×215.5	×321	×75	×111.5	×108.5	×161.5
×198.5	×295.5	×67.5	×100.5	×97	×144.5

A WT205 × 29.8 is a structural tee with a nominal depth of 205 mm and mass of 29.8 kg/m and is obtained by splitting the W410 × 59.5 section (from W16 × 40).

Prepared by Eng. Maged Kamel.

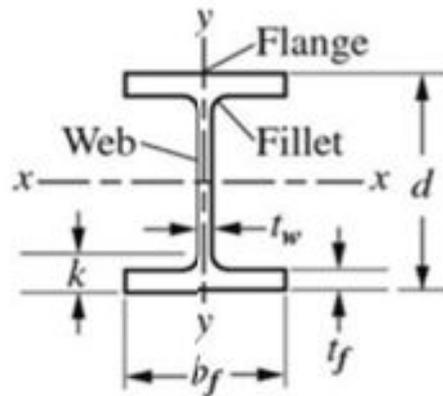
# The differences between WT & MT and ST-shapes

## WT-Shapes

*WT-shapes* are tees that have been cut from W-shapes. They are also called split tees because that is how they are produced – by splitting a W-shape. These shapes are designated as WT5×56, where both numbers are one-half of the corresponding numbers of the parent W-shape they were cut from. Dimensions and properties for WT-shapes are given in *Manual* Table 1-8.

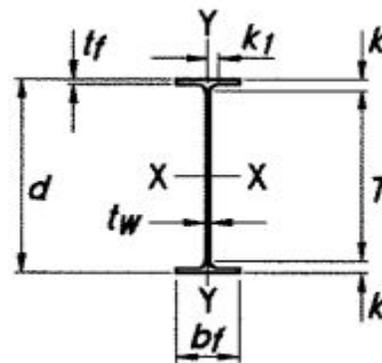
## MT-Shapes and ST-Shapes

*MT-shapes* and *ST-shapes* are tees that have been cut from parent M- and S-shapes. The properties and dimensions for these shapes are found in *Manual* Tables 1-9 and 1-10.



(a) W-shapes

Parent of WT



M-shape  
Parent of MT



(d) S-shapes

Parent of ST

*↑ approximate*

1. A  $W27 \times 114$  is a  $W$  section approximately 27 in deep, weighing 114 lb/ft.
2. An  $S12 \times 35$  is an  $S$  section 12 in deep, weighing 35 lb/ft.
3. An  $HP12 \times 74$  is a bearing pile section approximately 12 in deep, weighing 74 lb/ft. Bearing piles are made with the regular  $W$  rolls, but with thicker webs to provide better resistance to the impact of pile driving. The width and depth of these sections are approximately equal, and the flanges and webs have equal or almost equal thickness.
4. An  $M8 \times 6.5$  is a miscellaneous section 8 in deep, weighing 6.5 lb/ft. It is one of a group of doubly symmetrical  $H$ -shaped members that cannot by dimensions be classified as a  $W$ ,  $S$ , or  $HP$  section, as the slope of their inner flanges is other than  $16 \frac{2}{3}$  percent.

**Prepared by Eng.Maged Kamel.**

# Cold Formed shapes

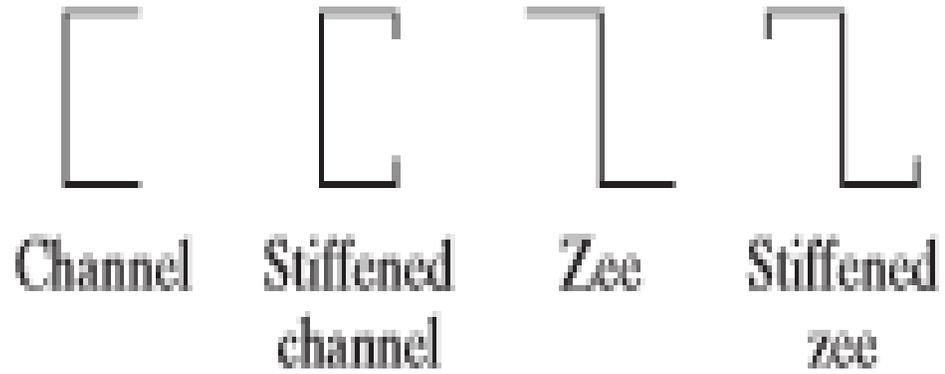
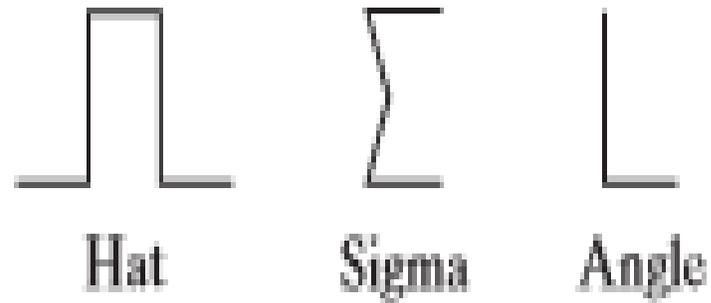


FIGURE 1.2

Cold-formed shapes.



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