



**Module # 3**

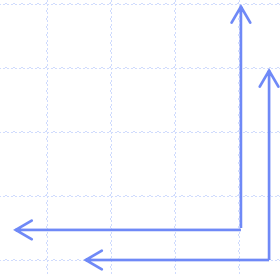
**Steel Structures**

**Prepared By: Engr. Fawad Ahmad**

**Structural Steel Shapes**



# Common structural steel shapes





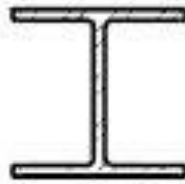
# Common structural steel shapes



S-SHAPE



W-SHAPE



HP-SHAPE



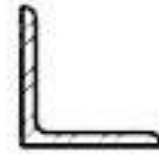
C-SHAPE



M-SHAPE



MC-SHAPE



L-SHAPE



WT-SHAPE



MT-SHAPE



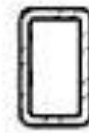
ST-SHAPE



P-SHAPE



HSS (SQ.)



HSS (RECT.)



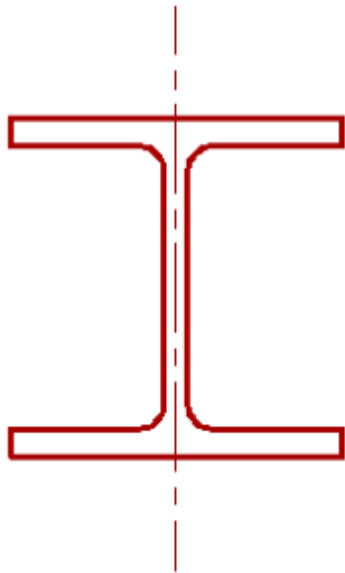
PL-SHAPE

# The W-shape



The W-shape is the most commonly used structural shape because it is the most efficient and economical to produce.

The designation W18 x 50 indicates a W-shape 18" deep and weighing 50 pounds per linear foot.



H Beam

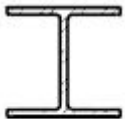


I Beam





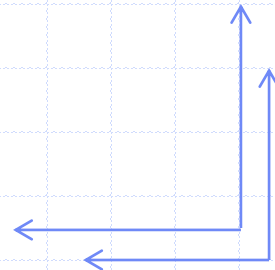
# The HP-shape



HP-SHAPE

The HP-shape is similar to the W-shape except that its webs and flanges have approximately equal thicknesses and the width of the flange is approximately equal to the overall depth.

The designation HP12 x 84 indicates a HP-shape 12" deep and weighing 84 pounds per linear foot.



# The S-shape

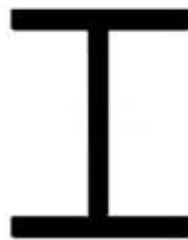


S-SHAPE

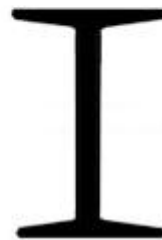
The S-shape is commonly called American Standard Beam or I-beam. They are no longer used in building construction.



H Beam



I Beam



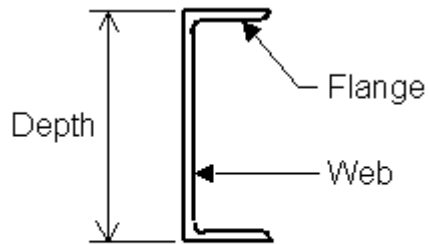
# The C-shape



C-SHAPE

The C-shape, also known as American Standard Channel, consists of a web and two tapering parallel flanges.

The designation C15 x 40 indicates a C-shape 15" deep and weighing 40 pounds per linear foot.



Steel Channel





# The M-Shape and MC-Shape



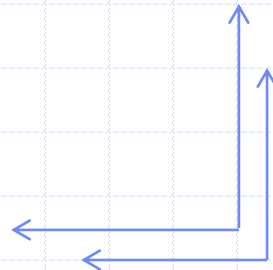
M-SHAPE

M-shapes, also known as miscellaneous I-shapes, are lightweight W-shapes.



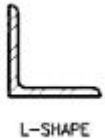
MC-SHAPE

MC-shapes are miscellaneous channel sections.



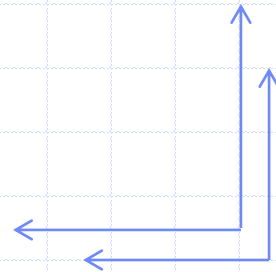
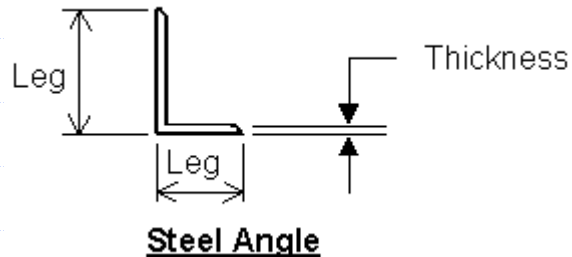


# The L-Shape



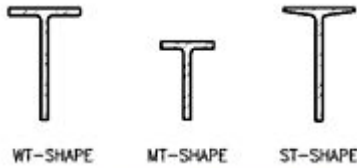
The L-shape is a rolled steel section in the shape of an angle with horizontal and vertical “legs” at right angles to each other. The legs can be equal or unequal in length.

The designation L4 x 4 x ½ indicates both legs are 4” long and ½” thick.



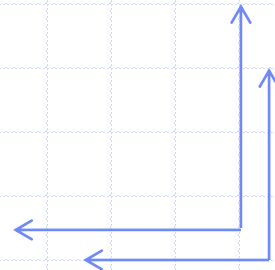


# The WT, MT, and ST-Shapes



These shapes are called structural tees and are made by splitting a W, M, or S-shape longitudinally.

The designation WT9 x 25 indicates a structural tee cut from a W18 x 50 beam.





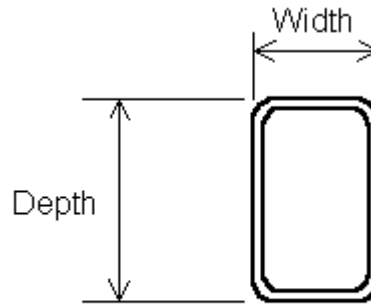
# The HSS and Pipe-Shapes



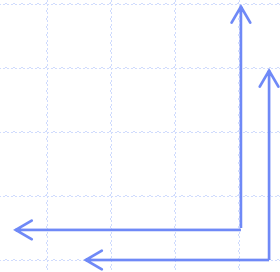
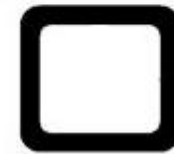
Hollow structural shapes (HSS) and pipe-shapes are hollow shapes that are round, square, or rectangular.



Steel Pipe



Tube Steel



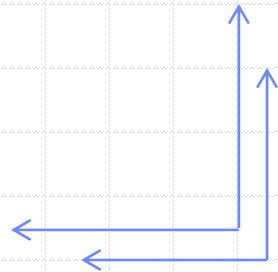


# PL-Shapes and FLT-Bars



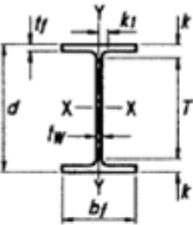
PL-SHAPE

Plates and bars are rectangular in cross section and come in many widths and thicknesses.

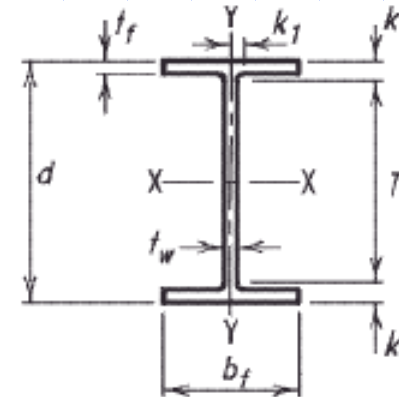


# Table 1-1

**Table 1-1 (continued)  
W Shapes  
Dimensions**

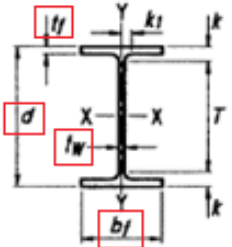


Shape	Area, A in. <sup>2</sup>	Depth, d in.	Web				Flange				Distance				Work- able Gage in.
			Thickness, t <sub>w</sub> in.		t <sub>w</sub> / 2 in.	Width, b <sub>f</sub> in.	Thickness, t <sub>f</sub> in.		k		k <sub>1</sub> in.	T in.			
			in.	in.			in.	in.	k <sub>des</sub> in.	k <sub>def</sub> in.					
W30×391 <sup>h</sup>	115	33.2	33 <sup>1</sup> / <sub>4</sub>	1.36	1 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>16</sub>	15.6	15 <sup>5</sup> / <sub>8</sub>	2.44	2 <sup>7</sup> / <sub>16</sub>	3.23	3 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>	26 <sup>1</sup> / <sub>2</sub>	5 <sup>1</sup> / <sub>2</sub>
×357 <sup>h</sup>	105	32.8	32 <sup>3</sup> / <sub>4</sub>	1.24	1 <sup>1</sup> / <sub>4</sub>	5 <sup>1</sup> / <sub>8</sub>	15.5	15 <sup>1</sup> / <sub>2</sub>	2.24	2 <sup>1</sup> / <sub>4</sub>	3.03	3 <sup>1</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>16</sub>		
×326 <sup>h</sup>	95.8	32.4	32 <sup>3</sup> / <sub>8</sub>	1.14	1 <sup>1</sup> / <sub>8</sub>	9 <sup>1</sup> / <sub>16</sub>	15.4	15 <sup>3</sup> / <sub>8</sub>	2.05	2 <sup>1</sup> / <sub>16</sub>	2.84	2 <sup>15</sup> / <sub>16</sub>	1 <sup>3</sup> / <sub>8</sub>		
×292	85.9	32.0	32	1.02	1	1 <sup>1</sup> / <sub>2</sub>	15.3	15 <sup>1</sup> / <sub>4</sub>	1.85	1 <sup>7</sup> / <sub>8</sub>	2.64	2 <sup>3</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>16</sub>		
×261	76.9	31.6	31 <sup>5</sup> / <sub>8</sub>	0.930	1 <sup>5</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>2</sub>	15.2	15 <sup>1</sup> / <sub>8</sub>	1.65	1 <sup>5</sup> / <sub>8</sub>	2.44	2 <sup>9</sup> / <sub>16</sub>	1 <sup>3</sup> / <sub>16</sub>		
×235	69.2	31.3	31 <sup>1</sup> / <sub>4</sub>	0.830	1 <sup>3</sup> / <sub>16</sub>	7 <sup>1</sup> / <sub>16</sub>	15.1	15	1.50	1 <sup>1</sup> / <sub>2</sub>	2.29	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>		
×211	62.2	30.9	31	0.775	3 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>8</sub>	15.1	15 <sup>1</sup> / <sub>8</sub>	1.32	1 <sup>3</sup> / <sub>16</sub>	2.10	2 <sup>1</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>16</sub>		
×191 <sup>c</sup>	56.3	30.7	30 <sup>5</sup> / <sub>8</sub>	0.710	1 <sup>1</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>8</sub>	15.0	15	1.19	1 <sup>3</sup> / <sub>16</sub>	1.97	2 <sup>1</sup> / <sub>16</sub>	1 <sup>3</sup> / <sub>16</sub>		
×173 <sup>c</sup>	51.0	30.4	30 <sup>1</sup> / <sub>2</sub>	0.655	5 <sup>1</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>16</sub>	15.0	15	1.07	1 <sup>1</sup> / <sub>16</sub>	1.85	2	1 <sup>1</sup> / <sub>8</sub>		

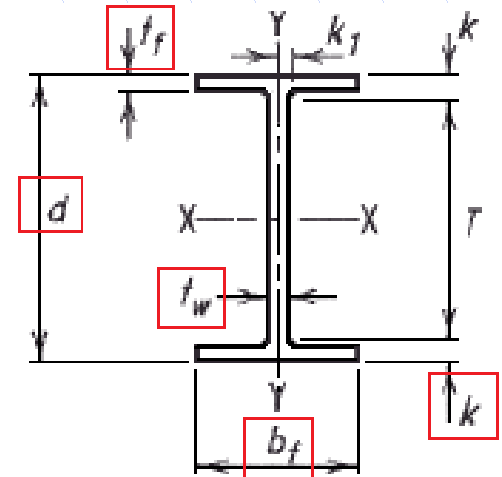


# Table 1-1

**Table 1-1 (continued)  
W Shapes  
Dimensions**



Shape	Area, A in. <sup>2</sup>	Depth, d in.		Web		Flange			Distance				Work- able Gage in.	
		in.	in.	Thickness, t <sub>w</sub> in.	$\frac{t_w}{2}$ in.	Width, b <sub>f</sub> in.	Thickness, t <sub>f</sub> in.	k		k <sub>1</sub> in.	T in.			
								k <sub>des</sub> in.	k <sub>cor</sub> in.					
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×357 <sup>h</sup>	105	32.8	32 <sup>3</sup> / <sub>4</sub>	1.24	1 <sup>1</sup> / <sub>4</sub>	5 <sup>5</sup> / <sub>8</sub>	15.5	15 <sup>1</sup> / <sub>2</sub>	2.24	2 <sup>1</sup> / <sub>4</sub>	3.03	3 <sup>1</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>16</sub>	
×326 <sup>h</sup>	95.8	32.4	32 <sup>3</sup> / <sub>8</sub>	1.14	1 <sup>1</sup> / <sub>8</sub>	9 <sup>1</sup> / <sub>16</sub>	15.4	15 <sup>3</sup> / <sub>8</sub>	2.05	2 <sup>1</sup> / <sub>16</sub>	2.84	2 <sup>15</sup> / <sub>16</sub>	1 <sup>3</sup> / <sub>8</sub>	
×292	85.9	32.0	32	1.02	1	1 <sup>1</sup> / <sub>2</sub>	15.3	15 <sup>1</sup> / <sub>4</sub>	1.85	1 <sup>7</sup> / <sub>8</sub>	2.64	2 <sup>3</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>16</sub>	
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×211	62.2	30.9	31	0.775	3 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>8</sub>	15.1	15 <sup>1</sup> / <sub>8</sub>	1.32	1 <sup>5</sup> / <sub>16</sub>	2.10	2 <sup>1</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>16</sub>	
×191 <sup>c</sup>	56.3	30.7	30 <sup>5</sup> / <sub>8</sub>	0.710	1 <sup>1</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	15.0	15	1.19	1 <sup>3</sup> / <sub>16</sub>	1.97	2 <sup>1</sup> / <sub>16</sub>	1 <sup>3</sup> / <sub>16</sub>	
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The fillet radius is equal to the  $k_{des}$  dimension