360/16 Specification 2016 - page 17-29

Table 17-18. Summary of SI Conversion Factors

Multiply	by:	to obtain:
inch (in.)	25.4	millimeters (mm)
foot (ft)	0.3048	meters (m)
pound-mass (lb)	0.4536	kilogram (kg)
pound-force (lbf)	4.448	newton (N)
ksi	6.895	megapascals (MPa), N/mm^2
ft-lbf	1.356	joule (J)
psf	47.88	N/m^2
plf	14.59	N/m

SI Units for Structural Steel Design

AMERICAN INSTITUTE OF STEEL CONTRUCTION, 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^2
ft-lbf	1.356	joule (J)

10^3 N.mm

10^{-3} kN.mm

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

https://en.wikipedia.org/wiki/Pound_(force)

$$
\begin{aligned}
1\,\text{lbf} &= 1\,\text{lb} \times 0.45359237\ \tfrac{\text{kg}}{\text{lb}} \times g_n \\
&= 0.45359237\,\text{kg} \times 9.80665\ \tfrac{\text{m}}{\text{s}^2} \\
&= 4.448221615260 5\,\text{N}
\end{aligned}
$$

1 Lb = 4.448 N

1 inch^2 = $(25.40)^2$ mm^2

} Fy stresses, Fult ↗

1 psi = $\frac{4.448}{(25.40)^2}$ = 6.895(10^{-3}) $\frac{N}{mm^2}$

1 ksi = $10^3(6.895)(10^{-3})$ = 6.895 $\frac{N}{mm^2}$

A36 ⇒ Fy = 36 ksi ⇒ 36(6.895) = 248.22 ≃ 250 $\frac{N}{mm^2}$

A572 ⇒ Fy = 50 ksi ⇒ 50(6.895) = 344.75 = 345 $\frac{N}{mm^2}$

A992 ⇒ Fy = 50 ksi ⇒

A529 ⇒ = 55 ksi ⇒ 379.22 $\frac{N}{mm^2}$ = 380 $\frac{N}{mm^2}$ = 345 $\frac{N}{mm^2}$

↘ N/mm^2

A913 Fu = 70 ⇒ 482.6 ⇒ 485 N/mm^2 } 80 ksi ⇒ 552 ⇒ 550 $\frac{N}{mm^2}$

Fy-Ksi	Cf	Fy ksi	Rounded	Remark
35	6.895	241.325	240	Rounded to Nearest 5
36	6.895	248.22	250	Rounded to Nearest 5
42	6.895	289.59	290	Rounded to Nearest 5
46	6.895	317.17	315	Rounded to Nearest 5
50	6.895	344.75	345	Rounded to Nearest 5
51	6.895	351.645	350	Rounded to Nearest 5
55	6.895	379.225	380	Rounded to Nearest 5
60	6.895	413.7	415	Rounded to Nearest 5
65	6.895	448.175	450	Rounded to Nearest 5
70	6.895	482.65	485	Rounded to Nearest 5
80	6.895	551.6	550	Rounded to Nearest 5
100	6.895	689.5	690	Rounded to Nearest 5
E	29000	ksi		
	6.895	199955	200000	Rounded to Nearest 1000

Units : For Force / Unit Length

Lb/Ft ⇒ 1 kN/m

1 Lb_F = 4.448 N

1 Ft = 0.3048 m

Weight of Sections

$\frac{Lb}{Ft}$ ⇒ $\frac{Ks}{m}$

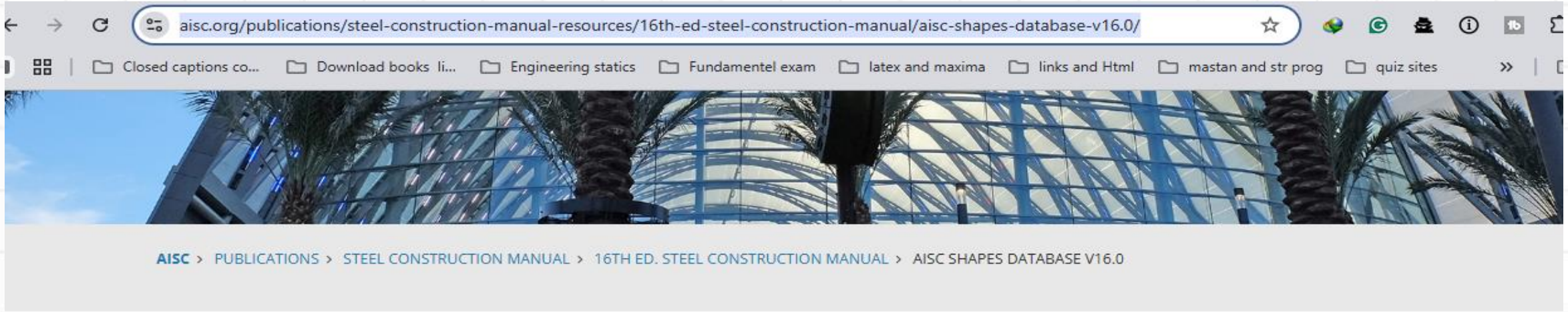
$1 \frac{Lb_F}{Ft}\left(\frac{4.448\ N}{Lb_F}\right)\left(\frac{Ft}{0.3048\ m}\right) = 14.593$

⇒ $\boxed{14.59}\ \frac{N}{m}$

Lb/FT ⇒ kg_F/m kg_F = 9.80665 N

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

https://www.aisc.org/publications/steel-construction-manual-resources/16th-ed-steel-construction-manual/aisc-shapes-database-v16.0/



IN THIS SECTION

- Manual Companion for 16th Edition
- AISC Shapes Database v16.0
- Basic Design Values Cards for 16th Edition
- Interactive Reference List for 16th Edition
- ASTM A1085

AISC Shapes Database v16.0

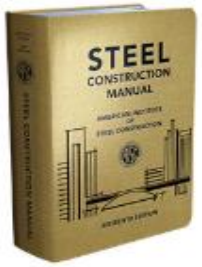
SHAPES DATABASE V16.0

The AISC Shapes Database v16.0 (Version 16.0) is a Microsoft Excel table including section dimensions and properties consistent with the AISC *Steel Construction Manual*, 16th Edition. AISC Shapes Database v16.0 replaces v15.0. U.S. customary and metric units are both included.

DOWNLOAD SHAPES DATABASE V16.0

Major improvements in v16.0 include:

- Dimensions and properties included for the 222 new shapes added to the 16th Edition AISC *Steel Construction Manual*
- A new "Readme" included in the spreadsheet that serves as the glossary of the variables and



Steel Construction Manual, 16th Ed. (Print)

MEMBER: **$250.00**

NON-MEMBER: **$500.00**

W section ⇒ Shapes data base

	A	B	C	CG	CH	CI	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU
1	Type	EDI_Std_Nomenclature	AISC_Manual_Label	EDI_Std_Nomenclature	AISC_Manual_Label	W	A	d	d_{det}	Ht	h	OD	b_f	b_{fdet}	B	b	ID	t_w
2	W	W44X408	W44X408	W1100X607	W1100X607	607	77400	1140	1140	-	-	-	409	410	-	-	-	31.0
3	W	W44X368	W44X368	W1100X548	W1100X548	548	69700	1130	1130	-	-	-	406	406	-	-	-	27.9
4	W	W44X335	W44X335	W1100X499	W1100X499	499	63500	1120	1120	-	-	-	404	406	-	-	-	26.2
5	W	W44X290	W44X290	W1100X433	W1100X433	433	55100	1110	1110	-	-	-	401	403	-	-	-	22.0
6	W	W44X262	W44X262	W1100X390	W1100X390	390	49800	1100	1100	-	-	-	401	400	-	-	-	19.9
7	W	W44X230	W44X230	W1100X343	W1100X343	343	43700	1090	1090	-	-	-	401	400	-	-	-	18.0
8	W	W40X655	W40X655	W1000X976	W1000X976	976	125000	1110	1110	-	-	-	429	429	-	-	-	50.0
9	W	W40X593	W40X593	W1000X883	W1000X883	883	112000	1090	1090	-	-	-	424	425	-	-	-	45.5
10	W	W40X503	W40X503	W1000X748	W1000X748	748	95500	1070	1070	-	-	-	417	416	-	-	-	39.1
11	W	W40X431	W40X431	W1000X642	W1000X642	642	81900	1050	1050	-	-	-	411	413	-	-	-	34.0
12	W	W40X397	W40X397	W1000X591	W1000X591	591	75500	1040	1040	-	-	-	409	410	-	-	-	31.0
13	W	W40X372	W40X372	W1000X554	W1000X554	554	71000	1030	1030	-	-	-	409	410	-	-	-	29.5
14	W	W40X362	W40X362	W1000X539	W1000X539	539	68400	1030	1030	-	-	-	406	406	-	-	-	28.4
15	W	W40X324	W40X324	W1000X483	W1000X483	483	61500	1020	1020	-	-	-	404	403	-	-	-	25.4
16	W	W40X297	W40X297	W1000X443	W1000X443	443	56300	1010	1010	-	-	-	401	403	-	-	-	23.6
17	W	W40X277	W40X277	W1000X412	W1000X412	412	52600	1010	1010	-	-	-	401	403	-	-	-	21.1
18	W	W40X249	W40X249	W1000X371	W1000X371	371	47400	1000	1000	-	-	-	401	400	-	-	-	19.1
19	W	W40X215	W40X215	W1000X321	W1000X321	321	41000	991	991	-	-	-	401	400	-	-	-	16.5
20	W	W40X199	W40X199	W1000X296	W1000X296	296	37900	983	981	-	-	-	401	400	-	-	-	16.5
21	W	W40X392	W40X392	W1000X584	W1000X584	584	74800	1060	1060	-	-	-	315	314	-	-	-	36.1
22	W	W40X331	W40X331	W1000X494	W1000X494	494	63000	1040	1040				310	308				31.0

For Correct value

I_x, I_y $(10^6) \Rightarrow mm^4$

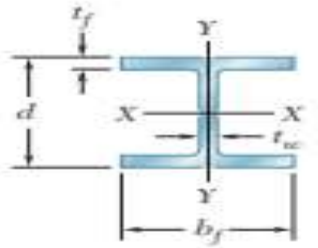
S_x, S_y $\times (10)^3 \; mm^3$

Z_x, Z_y $(10^3) \Rightarrow mm$

r_x, r_y $\Rightarrow$ Same Figure

Appendix

Mechanics of Materials



Appendix C Properties of Rolled-Steel Shapes

(SI Units)

Ferdinand BEEr 7th SI

W Shapes
(Wide-Flange Shapes)

Designation[1]	Area A, mm^2	Depth d, mm.	Flange: Width b_f mm	Flange: Thickness t_f mm	Web Thickness t_w mm	Axis X-X: I_x 10^6 mm^4	Axis X-X: S_x 10^3 mm^3	Axis X-X: r_x mm	Axis Y-Y: I_y 10^6 mm^4	Axis Y-Y: S_y 10^3 mm^3	Axis Y-Y: r_y mm
W920 × 449	57300	947	424	42.7	24.0	8780	18500	391	541	2560	97.0
201	25600	904	305	20.1	15.2	3250	7190	356	93.7	618	60.5
W840 × 299	38200	856	399	29.2	18.2	4830	11200	356	312	1560	90.4
176	22400	836	292	18.8	14.0	2460	5880	330	77.8	534	58.9
W760 × 257	32900	772	381	27.2	16.6	3430	8870	323	249	1310	86.9
147	18800	754	267	17.0	13.2	1660	4410	297	53.3	401	53.3
W690 × 217	27800	696	356	24.8	15.4	2360	6780	292	184	1040	81.3
125	16000	678	254	16.3	11.7	1190	3490	272	44.1	347	52.6
W610 × 155	19700	612	325	19.1	12.7	1290	4230	257	108	667	73.9
101	13000	602	228	14.9	10.5	762	2520	243	29.3	257	47.5
W530 × 150	19200	544	312	20.3	12.7	1010	3720	229	103	660	73.4
92	11800	533	209	15.6	10.2	554	2080	217	23.9	229	45.0
66	8390	526	165	11.4	8.89	351	1340	205	8.62	104	32.0
W460 × 158	20100	475	284	23.9	15.0	795	3340	199	91.6	646	67.6

TABLE C-A3.2
Minimum Tensile Properties of HSS Steels

Specification	Grade	F_y, ksi (MPa)	F_u, ksi (MPa)
ASTM A53/A53M	B	35 (240)	60 (415)
ASTM A500/A500M (square, rectangular, round)	B C	46 (315) 50 (345)	58 (400) 62 (425)
ASTM A501/A501M	A B	36 (250) 50 (345)	58 (400) 70 (485)
ASTM A618/A618M (round)	I and II [$t \le$ ¾ in. (19 mm)] III	50 (345) 50 (345)	70 (485) 65 (450)
ASTM A847/A847M	–	50 (345)	70 (485)
CAN/CSA-G40.20/G40.21	350W	51 (350)	65 (450)
ASTM A1085/A1085M	A	50 (345)	65 (450)
ASTM A1065/A1065M	50 50W	50 (345) 50 (345)	60 (415) 70 (480)

Nearest 5

CM #16

AISC-360-22

Nearest 10

30/10/2016 CM #15 Part-2

Table 2-4
Applicable ASTM Specifications for Various Structural Shapes

Steel Type	ASTM Designation		F_y Yield Stress[a] (ksi)	F_u Tensile Stress[a] (ksi)	Applicable Shape Series									
					W	M	S	HP	C	MC	L	HSS Rect.	HSS Round	HSS Pipe
Carbon	A36		36	58–80[b]		■	■		■	■	■			
	A53 Gr. B		35	60										■
	A500	Gr. B	42	58										
			46	58										
		Gr. C	46	62									■	
			50	62								■		
	A501	Gr. A	36	58										
		Gr. B	50	70										
	A529[c]	Gr. 50	50	65–100										
		Gr. 55	55	70–100										
	A709	36	36	58–80[b]										
	A1043[d,k]	36	36–52	58										
		50	50–65	65										
	A1085	Gr. A	50	65										

Prepared by Eng.Maged Kamel.

2016 - High strength CM # 15

Table 2-4
Applicable ASTM Specifications for Various Structural Shapes

Steel Type	ASTM Designation		F_y Yield Stress[a] (ksi)	F_u Tensile Stress[a] (ksi)	Applicable Shape Series									
					W	M	S	HP	C	MC	L	HSS Rect.	HSS Round	HSS Pipe
High-Strength Low-Alloy	A572	Gr. 42	42	60	▒	▒	▒	▒	▒	▒	▒			
		Gr. 50	50	65	▒	▒	▒	■	▒	▒	▒			
		Gr. 55	55	70	▒	▒	▒	▒	▒	▒	▒			
		Gr. 60[e]	60	75	▒	▒	▒	▒	▒	▒	▒			
		Gr. 65[e]	65	80	▒	▒	▒	▒	▒	▒	▒			
	A618[f]	Gr. Ia[k], Ib & II	50[g]	70[g]								▒	▒	
		Gr. III	50	65								▒	▒	
	A709	50	50	65	▒	▒	▒	▒	▒	▒	▒			
		50S	50–65	65	▒	▒	▒	▒	▒	▒	▒			
		50W	50	70	▒	▒	▒	▒	▒	▒	▒			
	A913	50	50[h]	65[h]	▒	▒	▒	▒	▒	▒	▒			
		60	60	75	▒	▒	▒	▒	▒	▒	▒			
		65	65	80	▒	▒	▒	▒	▒	▒	▒			
		70	70	90	▒	▒	▒	▒	▒	▒	▒			
	A992		50[i]	65[i]	■	▒	▒	▒	▒	▒	▒			
	A1065[k]	Gr. 50[l]	50	60								▒		

■ = Preferred material specification.
▒ = Other applicable material specification, the availability of which should be confirmed prior to specification.
□ = Material specification does not apply.

Prepared by Eng.Maged Kamel.

Corrosion resistance - 2016

Table 2-4 (continued)
Applicable ASTM Specifications for Various Structural Shapes

Steel Type	ASTM Designation		F_y Yield Stress[a] (ksi)	F_u Tensile Stress[a] (ksi)	Applicable Shape Series									
					W	M	S	HP	C	MC	L	HSS		
												Rect.	Round	Pipe
Corrosion Resistant High-Strength Low-Alloy	A588		50	70	■	■	■	■	■	■	■			
	A847[k]		50	70								■	■	
	A1065[k]	Gr. 50W[l]	50	70								■		

■ = Preferred material specification.
■ = Other applicable material specification, the availability of which should be confirmed prior to specification.
□ = Material specification does not apply.

Prepared by Eng.Maged Kamel.

$1'' = 25.40 \Rightarrow 10' \simeq 254\,mm$

W250 X 73 kg/m

W10 X 49 ⇒ specification

$\frac{1\,Lb}{1\,Ft}$ $(1.488)\left(\frac{Kg}{Lb}\right)\left(\frac{Ft}{m}\right)(49) = 72.91 \Rightarrow 73\ kg/m$

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

Shape in. × lb/ft	SI Equivalent mm × kg/m	Shape in. × lb/ft	SI Equivalent mm × kg/m	Shape in. × lb/ft	SI Equivalent mm × kg/m
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
×210	×313	W10×112	W250×167	×31	×46.1
×190	×283	×100	×149	W8×28	W200×41.7
×170	×253	×88	×131	×24	×35.9
×152	×226	×77	×115	W8×21	W200×31.3
×136	×202	×68	×101	×18	×26.6
×120	×179	×60	×89	W8×15	W200×22.5
×106	×158	×54	×80	×13	×19.3
×96	×143	×49	×73	×10	×15.0
×87	×129	W10×45	W250×67	W6×25	W150×37.1
×79	×117	×39	×58	×20	×29.8
×72	×107	×33	×49.1	×15	×22.5
×65	×97	W10×30	W250×44.8		
W12×58	W310×86	×26	×38.5		