

# STRUCTURAL STEELS

## General

Canadian structural steels are covered by two standards prepared by the Canadian Standards Association Technical Committee on Structural Steel, G40. These are CSA G40.20 and CSA G40.21. The information provided in this section is based on the current 2013 editions of both standards, and on the SI metric values, in keeping with Canadian design standards for steel structures.

CSA G40.20, “General Requirements for Rolled or Welded Structural Quality Steel” sets out the general requirements governing the delivery of structural quality steels. These requirements include: Definitions, Chemical Composition, Variations in Dimensions, Methods of Testing, Frequency of Testing, Heat Treatment, Repairs of Defects, Marking, etc.

CSA G40.21, “Structural Quality Steel” governs the chemical and mechanical properties of 7 types and 9 strength levels of structural steels for general construction and engineering purposes. All strength levels are not available in all types, and selection of the proper grade (type and strength level) is important for a particular application. G40.21-350A and G40.21-350AT are atmospheric corrosion-resistant steels normally used in bridge construction. For HSS sections, 350W is the normal grade used when produced to G40.21.

The 7 types covered in G40.21 are:

(a) **Type W – Weldable Steel.** Steels of this type meet specified strength requirements and are suitable for general welded construction where notch toughness at low temperatures is not a design requirement. Applications include buildings, compression members of bridges, etc. Steels within this type meeting more restrictive chemical and mechanical requirements<sup>1</sup> shall be designated WM. This designation meets the requirements of ASTM A992/A992M.

(b) **Type WT – Weldable Notch-Tough Steel.** Steels of this type meet specified strength and Charpy V-notch impact requirements and are suitable for welded construction where notch toughness at low temperature is a design requirement. The purchaser, in addition to specifying the grade, specifies the required category of steel that establishes the Charpy V-notch test temperature and energy level. Applications include primary tension members in bridges and similar elements. Steels within this type meeting more restrictive chemical and mechanical requirements<sup>1</sup> shall be designated WMT. This designation meets the requirements of ASTM A992/A992M with Charpy V-notch toughness.

(c) **Type R – Atmospheric Corrosion-Resistant Steel.** Steels of this type meet specified strength requirements. The atmospheric corrosion resistance of these steels in most environments is substantially better than that of carbon structural steels with or without a copper addition<sup>2</sup>. These steels are welded readily up to the maximum thickness covered by the G40.21 standard. Applications include unpainted siding, unpainted light structural members, etc., where notch toughness at low temperature is not a design requirement.

(d) **Type A – Atmospheric Corrosion-Resistant Weldable Steel.** Steels of this type meet specified strength requirements. The atmospheric corrosion resistance of these steels in most environments is substantially better than that of carbon structural steels with or without a copper addition<sup>2</sup>. These steels are suitable for welded construction where notch toughness at low temperature is not a design requirement. Applications include those similar to type W steel.

(e) **Type AT – Atmospheric Corrosion-Resistant Weldable Notch-Tough Steel.** Steels of this type meet specified strength and Charpy V-notch impact requirements. The atmospheric corrosion resistance of these steels in most environments is substantially better than that of carbon structural steels with or without a copper addition<sup>2</sup>. These steels are suitable for welded construction where notch toughness at low temperature is a design requirement. The purchaser, in addition to specifying the grade, specifies the required category of steel that establishes the Charpy V-notch test temperature and energy level. Applications include primary tension members in bridges and similar elements.

(f) **Type Q – Quenched and Tempered Low-Alloy Steel Plate.** Steels of this type meet specified strength requirements. While these steels are weldable, the welding and fabrication techniques are of fundamental importance to the properties of the plate, especially the heat-affected zone. Applications include bridges and similar structures.

(g) **Type QT – Quenched and Tempered Low-Alloy Notch-Tough Steel Plate.** Steels of this type meet specified strength and Charpy V-notch impact requirements. They provide good resistance to brittle fracture and are suitable for structures where notch toughness at low temperature is a design requirement. The purchaser, in addition to specifying the grade, specifies the required category of steel that establishes the Charpy V-notch test temperature and energy level. While these steels are weldable, the welding and fabrication techniques are of fundamental importance to the properties of the plate, especially the heat-affected zone. Applications include primary tension members in bridges and similar elements.

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*1 See CSA G40.21 Tables 3, 6 and Clause 7.7.*

*2 For methods of estimating the atmospheric corrosion resistance of low-alloy steels, see CSA G40.21 Clause 7.6. When properly exposed to the atmosphere, these steels can be used bare (unpainted) for many applications.*

## Tables

Table 6-1, “Grades, Types, Strength Levels”, gives the grade designation of the various types and strength levels of structural steels according to the requirements of CSA G40.21.

Availability of any grade and shape combination should be kept in mind when designing to ensure overall economy, since a specified product may not always be available in the tonnage and time frame contemplated. Local availability should always be checked.

Table 6-2, “Shape Size Groupings for Tensile Property Classification”, summarizes the size groupings for C, MC and L shapes. Table 6-3, “Mechanical Properties Summary”, summarizes the various grades, tensile strengths and yield strengths for plates, bars, welded shapes, rolled shapes, sheet piling, and hollow structural sections based on CSA G40.21.

Table 6-4, “Chemical Composition”, summarizes the chemical requirements of various grades of steel covered by CSA G40.21. Table 6-5 specifies the “Steel Marking Colour Code” for material identification. Table 6-6 specifies the “Standard Impact Energy and Test Temperature” for the various grades, strength levels and categories of notch-tough steels.

The particular standards, CSA G40.20 and CSA G40.21, should be consulted for more details. Similar information about steel covered by ASTM standards should be consulted when appropriate.

## Historical Remarks

When confronted with an unidentified structural steel, Clause 5.2.2 of CSA S16-14 requires that  $F_y$  be taken as 210 MPa and  $F_u$  as 380 MPa. This provides a minimum in the

place of more precise information, such as coupon testing. The following tables list selected dates of publication and data from various CSA and ASTM structural steel standards and specifications, many of which preceded current standards.

For more information on ASTM specifications and properties and dimensions of iron and steel beams previously produced in the USA, consult the "AISC Rehabilitation and Retrofit Guide: A Reference for Historic Shapes and Specifications" published by the American Institute of Steel Construction. In that publication, the first date listed for both ASTM A7 and A9 is the year 1900. Between 1900 and 1909, medium steel in A7 and A9 had a tensile strength 5 ksi higher than that adopted in 1914. For CSA standards, consult original documents.

## Historical Listing of Selected Structural Steels

### CSA Standards

Designation	Date Published	Yield Strength		Tensile Strength ( $F_u$ )	
		ksi	MPa	ksi	MPa
<b>A16</b>	1924	$\frac{1}{2} F_u$	$\frac{1}{2} F_u$	55-65	380-450
<b>S39</b>	1935	30	210	55-65	380-450
<b>S40</b>	1935	33	230	60-72	410-500
<b>G40.4</b>	1950	33	230	60-72	410-500
<b>G40.5</b>	1950	33	230	60-72	410-500
<b>G40.6</b>	1950	45 <sup>1</sup>	310	80-95	550-650
<b>G40.8</b>	1960	40 <sup>2</sup>	280	65-85	450-590
<b>G40.12</b>	1964	44 <sup>3</sup>	300	65	450
<b>G40.21</b>	1973	Replaced all previous Standards, see CISC Handbook			

<sup>1</sup> Silicon steel

<sup>2</sup> Yield reduces when thickness exceeds  $\frac{5}{8}$  inches (16 mm).

<sup>3</sup> Yield reduces when thickness exceeds 1½ inches (40 mm).

### Rivet Steel

Designation	Date Published	Yield Strength		Tensile Strength ( $F_u$ )	
		ksi	MPa	ksi	MPa
<b>G40.2</b>	1950	28	190	52 - 62	360 - 430

### ASTM Specifications

Designation	Date Published	Yield Strength		Tensile Strength ( $F_u$ )	
		ksi	MPa	ksi	MPa
<b>A7 (bridges) A9 (buildings)</b>	1914*	$\frac{1}{2} F_u$	$\frac{1}{2} F_u$	55-65	380-450
	1924	$\frac{1}{2} F_u \geq 30$	$\frac{1}{2} F_u \geq 210$	55-65	380-450
	1934	$\frac{1}{2} F_u \geq 33$	$\frac{1}{2} F_u \geq 230$	60-72	410-500
<b>A373</b>	1954	32	220	58-75	400-520
<b>A242</b>	1955	50 <sup>1</sup>	350	70 <sup>1</sup>	480
<b>A36</b>	1960	36	250	60-80	410-550
<b>A440</b>	1959	50 <sup>1</sup>	350	70 <sup>1</sup>	480
<b>A441</b>	1960	50 <sup>1</sup>	350	70 <sup>1</sup>	480
<b>A572 grade 50</b>	1966	50	345	65	450
<b>A588</b>	1968	50 <sup>1</sup>	345	70 <sup>1</sup>	485
<b>A992</b>	1998	50 min. to 65 max.	345 min. to 450 max.	65	450

\* See text, Historical Remarks, above.

<sup>1</sup> Reduces with increasing thickness

# GRADES, TYPES, STRENGTH LEVELS\*

Table 6-1

Type	Nominal Yield Strength, MPa								
	260	300	345 - 350	380	400	450	480	550	700
<b>W</b>	260W	300W	345WM, 350W	380W**	400W	450W	480W	550W	—
<b>WT</b>	260WT	300WT	345WMT, 350WT	380WT***	400WT	450WT	480WT	550WT	—
<b>R</b>	—	—	350R	—	—	—	—	—	—
<b>A</b>	—	—	350A	—	400A	—	480A	550A	—
<b>AT</b>	—	—	350AT	—	400AT	—	480AT	550AT	—
<b>Q</b>	—	—	—	—	—	—	—	—	700Q
<b>QT</b>	—	—	—	—	—	—	—	—	700QT

\* See CSA G40.20/G40.21

\*\* This grade is available in Hollow Structural Sections, angles and bars only.

\*\*\* This grade is available in Hollow Structural Sections only.

# SHAPE SIZE GROUPINGS FOR TENSILE PROPERTY CLASSIFICATION\*

Table 6-2

Shape Type	Group 1	Group 2	Group 3
C Shapes	To 30.8 kg/m	Over 30.8 kg/m	—
MC Shapes	To 42.4 kg/m	Over 42.4 kg/m	—
L Shapes	To 13 mm	Over 13 to 19 mm	Over 19 mm

\* See CSA G40.20/G40.21

Table 6-3

## MECHANICAL PROPERTIES SUMMARY

CSA G40.20 / G40.21		Tensile Strength	Plates, Floor Plates, Bars, Sheet and Welded Shapes		Rolled Shapes and Sheet Piling		Hollow Structural Sections
		F <sub>u</sub> (MPa)	F <sub>y</sub> (MPa) min.		Common Available Shape Size Group	F <sub>y</sub> (MPa) min.	F <sub>y</sub> (MPa) min.
Type	Grade		Thickness t ≤ 65 mm	Thickness <sup>4</sup> t > 65 mm		Groups 1 to 3	
W	260W	410-590	260	250	3	260	—
	300W	440-620 <sup>1</sup>	300	280	3	300	300
	345WM <sup>5</sup>	≥ 450	345-450	345-450	2	345-450	—
	350W	450-650 <sup>2</sup>	350	320	2	350	350
	380W <sup>3</sup>	480-650	380	350	2	380	380
	400W	520-690	400	370	1	400	400
	450W	550-725	450	420	—	—	—
	480W	590-790	480	450	1	480	480
	550W	620-860	550	520	—	—	550
WT	260WT	410-590	260	250	3	260	—
	300WT	440-620 <sup>6</sup>	300	280	3	300	—
	345WMT <sup>5</sup>	≥ 450	345-450	345-450	3	345-450	—
	350WT	450-650 <sup>2,7</sup>	350	320	3	350	350
	380WT	480-650	—	—	—	—	380
	400WT	520-690	400	370	2	400	400
	450WT	550-725	450	420	—	—	—
	480WT	590-790	480	450	1	480	480
	550WT	620-860	550	520	—	—	550
R	350R	480-650	350	—	1	350	—
A	350A	480-650	350	350	3	350	350
	400A	520-690	400	—	2	400	400
	480A	590-790	480	—	—	—	480
	550A	620-860	550	—	—	—	550
AT	350AT	480-650	350	350	3	350	350
	400AT	520-690	400	—	2	400	400
	480AT	590-790	480	—	—	—	480
	550AT	620-860	550	—	—	—	550
Q	700Q	760-895	700	620	—	—	—
QT	700QT	760-895	700	620	—	—	—

<sup>1</sup> 410-590 MPa for HSS<sup>2</sup> 450-620 MPa for HSS<sup>3</sup> Available in angles and bars only<sup>4</sup> For thickness t > 100 mm, see CSA G40.21<sup>5</sup> The maximum yield strength is 450 MPa, and the maximum yield-to-tensile strength ratio is 0.85.

For structural shapes that are required to be tested from the web location, a maximum yield strength of 480 MPa and a maximum yield-to-tensile strength ratio of 0.87 are permitted.

<sup>6</sup> 450-620 MPa for rolled shapes and sheet piling<sup>7</sup> 480-650 MPa for rolled shapes and sheet piling

CSA G40.21 Grade	Chemical Composition (Heat Analysis) Percent <sup>2</sup>								
	All percentages are maxima unless otherwise indicated.								
	C	Mn <sup>3</sup>	P	S	Si <sup>4,5</sup>	Other <sup>6</sup>	Cr	Ni	Cu <sup>7</sup>
260W	0.20 <sup>10</sup>	0.50-1.50	0.04	0.05	0.40	0.15	—	—	—
300W <sup>8</sup>	0.22 <sup>10</sup>	0.50-1.50	0.04	0.05	0.40	0.15	—	—	—
345WM	0.23 <sup>18</sup>	0.50-1.60	0.035	0.045	0.10-0.40	0.15 <sup>19</sup>	0.35	0.45	0.60
350W	0.23	0.50-1.50	0.04	0.05	0.40	0.15	—	—	—
380W <sup>9</sup>	0.23	0.50-1.50	0.04	0.05	0.40	0.15	—	—	—
400W	0.23 <sup>11</sup>	0.50-1.50	0.04	0.05	0.40	0.15	—	—	—
450W	0.23	0.50-1.50	0.04	0.05	0.40	0.15	—	—	—
480W	0.26 <sup>11</sup>	0.50-1.50	0.04	0.05	0.40	0.15 <sup>15</sup>	—	—	—
550W	0.15	1.75 <sup>12</sup>	0.04	0.05	0.40	0.15	—	—	—
260WT	0.20 <sup>10</sup>	0.80-1.50	0.03	0.04	0.15-0.40	0.15	—	—	—
300WT	0.22 <sup>10</sup>	0.80-1.50	0.03	0.04	0.15-0.40	0.15	—	—	—
345WMT	0.23 <sup>18</sup>	0.80-1.50 <sup>12</sup>	0.035	0.045	0.10-0.40	0.15 <sup>19</sup>	0.35	0.45	0.60
350WT	0.22 <sup>10</sup>	0.80-1.50 <sup>12</sup>	0.03	0.04	0.15-0.40	0.15	—	—	—
380WT <sup>9</sup>	0.22	0.80-1.50	0.03	0.04	0.15-0.40	0.15	—	—	—
400WT	0.22 <sup>11</sup>	0.80-1.60	0.03	0.04 <sup>14</sup>	0.15-0.40	0.15	—	—	—
450WT	0.22	0.80-1.50 <sup>12</sup>	0.03	0.04	0.15-0.40	0.15	—	—	—
480WT	0.26 <sup>11</sup>	0.80-1.50 <sup>12</sup>	0.03	0.04 <sup>14</sup>	0.15-0.40	0.15 <sup>15</sup>	—	—	—
550WT	0.15	1.75 <sup>12</sup>	0.03	0.04 <sup>14</sup>	0.15-0.40	0.15	—	—	—
350R	0.16	0.75	0.05-0.15	0.04	0.75	0.15	0.30-1.25 <sup>16</sup>	0.90 <sup>16</sup>	0.20-0.60 <sup>16</sup>
350A	0.20	0.75-1.35 <sup>12</sup>	0.03	0.04	0.15-0.50	0.15	0.70 <sup>17</sup>	0.90 <sup>17</sup>	0.20-0.60
400A	0.20	0.75-1.35 <sup>12</sup>	0.03	0.04 <sup>14</sup>	0.15-0.50	0.15	0.70 <sup>17</sup>	0.90 <sup>17</sup>	0.20-0.60
480A	0.20	1.00-1.60	0.025 <sup>13</sup>	0.035 <sup>14</sup>	0.15-0.50	0.15 <sup>15</sup>	0.70 <sup>17</sup>	0.25-0.50 <sup>17</sup>	0.20-0.60
550A	0.15	1.75 <sup>12</sup>	0.025 <sup>13</sup>	0.035 <sup>14</sup>	0.15-0.50	0.15	0.70 <sup>17</sup>	0.25-0.50 <sup>17</sup>	0.20-0.60
350AT	0.20	0.75-1.35 <sup>12</sup>	0.03	0.04	0.15-0.50	0.15	0.70 <sup>17</sup>	0.90 <sup>17</sup>	0.20-0.60
400AT	0.20	0.75-1.35 <sup>12</sup>	0.03	0.04 <sup>14</sup>	0.15-0.50	0.15	0.70 <sup>17</sup>	0.90 <sup>17</sup>	0.20-0.60
480AT	0.20	1.00-1.60	0.025 <sup>13</sup>	0.035 <sup>14</sup>	0.15-0.50	0.15 <sup>15</sup>	0.70 <sup>17</sup>	0.25-0.50 <sup>17</sup>	0.20-0.60
550AT	0.15	1.75 <sup>12</sup>	0.025 <sup>13</sup>	0.035 <sup>14</sup>	0.15-0.50	0.15	0.70 <sup>17</sup>	0.25-0.50 <sup>17</sup>	0.20-0.60
700Q	0.20	1.50	0.03	0.04	0.15-0.40	—	Boron 0.0005-0.005		—
700QT	0.20	1.50	0.03	0.04	0.15-0.40	—	Boron 0.0005-0.005		—

## Notes:

- Consult CSA G40.20/G40.21 for full details. Usual deoxidation for all grades is fully killed.
- Additional alloying elements may be used when approved.
- For HSS Mn 0.50 - 1.50% for 350WT and 380WT, 1.65% for 400 yield, 1.75% for 480 yield and 1.85% for 550 yield steels. For HSS minimum limit for Mn shall be 0.30% provided that the ratio of Mn to C is not less than 2 to 1 and the ratio of Mn to S is not less than 20 to 1.
- Si content of 0.15% to 0.40% is required for type W steel over 40 mm thickness, HSS of A or AT steel, or bar diameter except as required by Note 5.
- By purchaser's request or producer's option, no minimum Si content is required provided that 0.015% acid-soluble Al or 0.02% total Al is used.
- Includes grain-refining elements Cb, V, Al. Elements Cb and V may be used singly or in combination. See G40.20/G40.21 for qualifications. Al, when used, is not included in the summation. For HSS with 300 - 400 yield, 0.10%.
- Copper content of 0.20% minimum may be specified.
- For HSS 0.26% C and 0.30-1.20% Mn.
- Only angles, bars, and HSS in 380W grade, and only HSS in 380WT grade.
- For thicknesses over 100 mm, C may be 0.22% for 260W and 260WT grades, and 0.23% for 300W, 300WT and 350WT grades.
- For HSS 0.20% C.
- Mn may be increased. See G40.20/G40.21 for qualifications.
- For HSS 0.03% P.
- For HSS 0.03% S.
- For HSS 0.12%
- Cr + Ni + Cu ≥ 1.00%
- Cr + Ni ≥ 0.40% and for HSS, 0.90% Ni max.
- Carbon equivalent ≤ 0.47% for shapes with flange thickness > 50 mm and 0.45% for other shapes.
- When steel is aluminum-killed, total aluminum ≥ 0.015%.  
N ≤ 0.015%. V ≤ 0.15%, Nb ≤ 0.05%, V + Nb ≤ 0.15%, Mo ≤ 0.15%. Consult CSA G40.20/G40.21 for full details.

Table 6-5

## STEEL MARKING COLOUR CODE

Steel Grade	Primary Colour	Secondary Colour
260W	White	Green
300W	Green	Green
350W	Blue	Green
380W	Brown	Green
400W	Black	Green
480W	Yellow	Green
550W	Pink	Green
260WT	White	White
300WT	Green	White
350WT	Blue	White
380WT	Brown	White
400WT	Black	White
480WT	Yellow	White
550WT	Pink	White
350R	Blue	Blue
350A	Blue	Yellow
400A	Black	Yellow
480A	Yellow	Yellow
550A	Pink	Yellow
350AT	Blue	Brown
400AT	Black	Brown
480AT	Yellow	Brown
550AT	Pink	Brown
700Q	Red	Red
700QT	Red	Purple

In this Code, the following colour system applies:

Strength Level	Primary Colour	Type	Secondary Colour
260	White	W	Green
300	Green	WT	White
350	Blue	R	Blue
380	Brown	A	Yellow
400	Black	AT	Brown
480	Yellow	Q	Red
550	Pink	QT	Purple
700	Red		

# STANDARD IMPACT ENERGY AND TEST TEMPERATURE FOR NOTCH-TOUGH STEELS

**TABLE 6-6**

Type	Grade	Category				
		1	2	3	4	5
WT	260, 300	20 J, 0° C	20 J, -20° C	20 J, -30° C	20 J, -45° C	Both energy and test temperature are specified by the purchaser.
	350, 380, 400, 450, 480, 550	27 J, 0° C	27 J, -20° C	27 J, -30° C	27 J, -45° C	
WMT	345	27 J, 0° C	27 J, -20° C	27 J, -30° C	27 J, -45° C	
AT	350, 400, 480, 550	27 J, 0° C	27 J, -20° C	27 J, -30° C	27 J, -45° C	
QT	700	34 J, 0° C	34 J, -20° C	34 J, -30° C	34 J, -45° C	

Units: Impact energy in Joules (1 J  $\approx$  0.738 ft·lb) and test temperature in degrees Celsius.

Notes: Charpy V-Notch, longitudinal specimens. See CSA G40.21-13 Clause 8.2.2.  
See CSA S16-14 Annex L "Design to Prevent Brittle Fracture" for information on test and service temperatures.



# MECHANICAL PROPERTIES

Table 6-7

## Of Selected ASTM Steel Grades

Steel Grade		F <sub>y</sub> (MPa)	F <sub>u</sub> (MPa)
Rolled Shapes and HSS	Plates and Bars		
A36 <sup>1</sup>	A36 <sup>2</sup>	250	400 - 550
A500 Gr. C - Round		317 <sup>3</sup>	427 <sup>3</sup>
A500 Gr. C - Square and Rectangular		345	427 <sup>3</sup>
A572 Gr. 50 (345) A913 Gr. 50 (345)	A572 Gr. 50 (345) <sup>6</sup>	345	450
A709M Gr. 345S <b>A992</b>		<b>345 - 450<sup>4</sup></b>	<b>450<sup>4</sup></b>
A1085 <sup>5</sup>		345 - 485	450
A588	A709M Grades 345W <sup>6</sup> , HPS 345W <sup>6</sup>	345	485
A913 Gr. 65 (450)		450	550
	A709M Gr. HPS 485W <sup>6</sup>	485	585 - 760
A913 Gr. 70 (485)		485	620

<sup>1</sup> Flange thickness ≤ 75 mm

<sup>2</sup> Plate thickness ≤ 200 mm

<sup>3</sup> Soft-converted from imperial units

<sup>4</sup> F<sub>y</sub> / F<sub>u</sub> ≤ 0.85

<sup>5</sup> Heat treatment available as supplementary requirement S1

<sup>6</sup> Plate thickness ≤ 100 mm

# STEEL GRADES FOR BUILDING CONSTRUCTION

Table 6-8

## Relative Availability

Steel Grade		F <sub>y</sub>  MPa	Steel Shapes					
			W	C	L	HSS		HP
						Square, Rectangular	Round	
CSA	G40.21 350W	350		West of Quebec *				
	G40.21 300W	300						
ASTM	A992	345						
	A572 Gr. 50	345						
	A913 Gr. 65	450	Heavy Sections					
	A500 Gr. C	345						East of Ontario
	A500 Gr. C	317						

	Grade preferred for relative availability
	Other grades

\* G40.21 350W Class C

# CHEMICAL COMPOSITION<sup>1</sup> OF SELECTED ASTM STEEL GRADES

Table 6-9

ASTM Steel Grade	Chemical Composition (Heat Analysis) Percent								
	All percentages are maxima unless otherwise indicated.								
	C	Mn	P	S	Si	Other	Cr	Ni	Cu
A36 Shapes <sup>2</sup>	0.26	— <sup>3</sup>	0.04	0.05	0.40 <sup>4</sup>	—	—	—	0.20 <sup>6</sup>
A500 Gr. C	0.23 <sup>5</sup>	1.35 <sup>5</sup>	0.035	0.035	—	—	—	—	0.20 <sup>6</sup>
A572 Gr. 50 (345) <sup>7</sup>	0.23 <sup>8</sup>	1.35 <sup>9</sup>	0.04	0.05	0.40 <sup>10</sup>	—	—	—	— <sup>6</sup>
A913 Gr. 50 (345)	0.12	1.60	0.04	0.03	0.40	(11)	0.25	0.25	0.45
A913 Gr. 65 (450)	0.16	1.60	0.03	0.03	0.40	(11)	0.25	0.25	0.35
A913 Gr. 70 (485)	0.16	1.60	0.04	0.03	0.40	(11)	0.25	0.25	0.45
A992 <sup>12</sup>	0.23	0.50-1.60 <sup>13</sup>	0.035	0.045	0.40	(14)	0.35	0.45	0.60
A709M Gr. 345S <sup>12</sup>	0.23	0.50-1.60 <sup>13</sup>	0.035	0.045	0.40	(14)	0.35	0.45	0.60
A588 Gr. A	0.19 <sup>5</sup>	0.80-1.25 <sup>5</sup>	0.04	0.05	0.30-0.65	V 0.02-0.10	0.40-0.65	0.40	0.25-0.40
A709M Gr. 345W <sup>15</sup> Type A	0.19 <sup>5</sup>	0.80-1.25 <sup>5</sup>	0.04	0.05	0.30-0.65	V 0.02-0.10	0.40-0.65	0.40	0.25-0.40
A588 Gr. B	0.20 <sup>5</sup>	0.75-1.35 <sup>5</sup>	0.04	0.05	0.15-0.50	V 0.01-0.10	0.40-0.70	0.50	0.20-0.40
A709M Gr. 345W <sup>15</sup> Type B	0.20 <sup>5</sup>	0.75-1.35 <sup>5</sup>	0.04	0.05	0.15-0.50	V 0.01-0.10	0.40-0.70	0.50	0.20-0.40
A709M Gr. HPS 345W	0.11	1.10-1.35 <sup>16</sup>	0.02	0.006 <sup>17</sup>	0.30-0.50	(18)	0.45-0.70	0.25-0.40	0.25-0.40
A709M Gr. HPS 485W	0.11	1.10-1.35 <sup>16</sup>	0.02	0.006 <sup>17</sup>	0.30-0.50	(18)	0.45-0.70	0.25-0.40	0.25-0.40
A1085	0.26 <sup>5</sup>	1.35 <sup>5</sup>	0.035	0.035	0.04	(19)	—	—	—

Notes:

Where “—” appears in this table, there is no requirement.

- Consult ASTM standards for full details.
- For A36 plates and bars, refer to the A36 standard.
- Mn content of 0.85-1.35% is required for shapes with flange thickness over 75 mm.
- Si content of 0.15-0.40% is required for shapes with flange thickness over 75 mm.
- For each reduction of 0.01 percentage point below the specified maximum for C, an increase of 0.06 percentage point above the specified maximum for Mn is permitted, up to a maximum of 1.50% by heat analysis.
- Cu when specified shall have a minimum content of 0.20% by heat analysis.
- Round bars up to and including 275 mm in diameter are permitted.
- For each reduction of 0.01 percentage point below the specified maximum for C, an increase of 0.06 percentage point above the specified maximum for Mn is permitted, up to a maximum of 1.60% by heat analysis.
- Mn, minimum, by heat analysis of 0.80% shall be required for all plates > 10 mm thick; a minimum of 0.50% shall be required for plates ≤ 10 mm thick, and for all other products. The Mn to C ratio shall not be less than 2 to 1.
- Plates ≤ 40 mm thick, shapes with flange or leg thickness ≤ 75 mm, sheet piling, bars, zees, and rolled tees. Plates > 40 mm thick and shapes with flange thickness > 75 mm shall have a Si content of 0.15-0.40%. Bars > 40 mm in diameter, thickness, or distance between parallel faces shall be made by a killed steel practice.
- Mo 0.07%; Nb 0.05%; V 0.06% gr. 50, 0.08% gr. 65, 0.09% gr. 70. Consult ASTM standard for full details.
- In addition to the elements listed, test reports shall include, for information, the chemical analysis for tin. Where the amount of tin is < 0.02%, it shall be permissible for the analysis to be reported as “< 0.02%”.
- Provided that the ratio of Mn to S is ≥ 20 to 1, the minimum limit for Mn for shapes with flange or leg thickness ≤ 25 mm shall be 0.30%.
- Mo 0.15%, Nb 0.05%, V 0.15%. Nb + V ≤ 0.15%. Consult ASTM standard for full details.
- Types A and B for A709M Gr. 345W steel are equivalent to A588/A588M, Grades A and B, respectively.
- Mn content for plates and bars ≤ 65 mm. Mn content of 1.10-1.50% is required for plates and bars > 65 mm.
- The steel shall be calcium treated for sulfide shape control.
- Mo 0.02-0.08%, Al 0.01-0.04%, V 0.04-0.08%, N 0.015%.
- Acid soluble Al 0.015% minimum or total Al content 0.02% minimum.

# STANDARD MILL PRACTICE

## General

Rolled structural shapes are produced by passing hot blooms, billets or slabs of steel through a series of grooved rolls. Wear on the rolls can cause the dimensions of the finished product to vary slightly from the theoretical, published dimensions. Standard rolling tolerances have been established to make allowance for roll wear and other factors. These tolerances are contained in CSA Standard G40.20, "General Requirements for Rolled or Welded Structural Quality Steel".

Letter symbols for dimensions on sketches shown in this section are in accordance with CSA G40.20, ASTM A6, and mill catalogs.

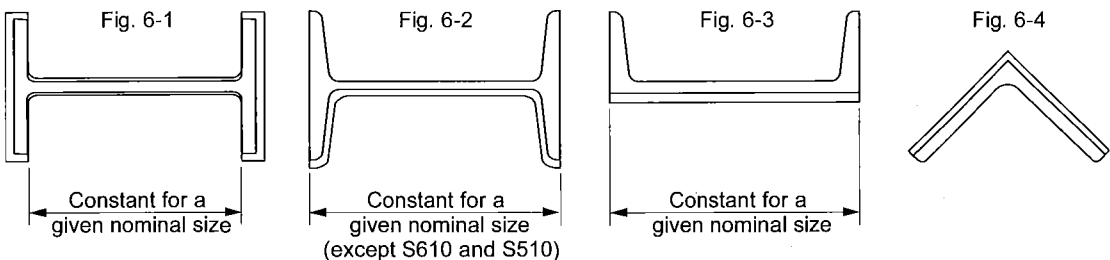
## Methods of increasing area and mass by spreading rolls

Most nominal size groups of rolled shapes contain several specific shapes, each of which is slightly different in mass, area and properties from other shapes in the same size group. Methods used to increase the area and mass, from the minimum nominal size, by spreading the rolls are described below:

For W Shapes (Fig. 6-1), the thickness of both flange and web is increased, resulting in an increase to the overall beam depth and flange width, with the distance between inside faces of flanges being unchanged.

For S Shapes and Channels (Fig. 6-2 and 6-3), the web thickness and flange width are increased by equal amounts, all other dimensions remaining unchanged.

For angles (Fig. 6-4) the thickness of each leg is increased an equal amount, resulting in a corresponding increase in leg length.



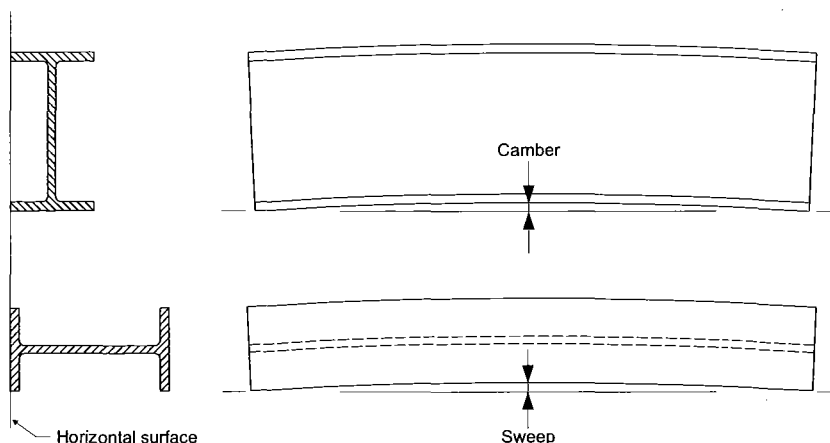
## Tolerances

Tolerances are the permissible variations in the mass, cross-sectional area, length, depth, flange width, camber, sweep and other geometric properties of a rolled or welded section. A summary of the basic manufacturing tolerances, taken from CSA G40.20, are provided in the following tables. While these tables are provided for convenience, the actual Standard should be referred to for complete information.

## Camber and Sweep

After a section is rolled, it is cold-straightened to meet the specified sweep and camber tolerances.

Camber is a deflection, approximating a simple regular curve, measured along the depth of a section. It is usually measured halfway between two specified points. The length for purposes of determining the "maximum permissible variation" is the distance between the two specified points.



### Positions for measuring camber and sweep

Sweep is a deflection, similar to camber, measured along the width of the section.

The following table lists Permissible Variations in Straightness.

#### PERMISSIBLE VARIATIONS IN STRAIGHTNESS

Shape	Maximum Permissible Variation in Straightness, mm
W and HP shapes with flange width $\geq 150$ mm <sup>1</sup> (camber and sweep)  Welded beams or girders where there is no specified camber or sweep	$L / 1000$
W and HP shapes with flange width $< 150$ mm <sup>1</sup> (sweep)  Welded beams or girders with specified camber	$L / 500$  $6 + L / 4000$
W and HP shapes specified as columns, with flange width approximately equal to depth <sup>1,2</sup> (camber and sweep)  Welded columns and compression members in trusses	$L \leq 14\,000$ mm: $L / 1000 \leq 10$ mm $L > 14\,000$ mm: $10 + (L - 14\,000) / 1000$
S, M, C, MC, L, T shapes <sup>1</sup> (greatest cross-sectional dimension $\geq 75$ mm)	Camber: $L / 500$  Sweep: Negotiable
Bars <sup>1,3</sup>	6 mm in any 1500 mm and $L / 250$ <sup>(4)</sup>
S, M, C, MC, L, T bar-size shapes <sup>1</sup> (greatest cross-sectional dimension $< 75$ mm)	Camber: $L / 250$  Sweep: Negotiable

Notes:

<sup>1</sup> See ASTM A6 / A6M

<sup>2</sup> Applies only to: 200 mm-deep sections – 46 kg/m and heavier, 250 mm-deep sections – 73 kg/m and heavier, 310 mm-deep sections – 97 kg/m and heavier, and 360 mm-deep sections – 116 kg/m and heavier. For other sections specified as columns, tolerances are negotiable.

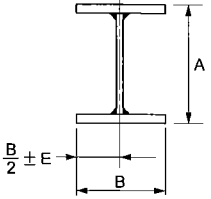
<sup>3</sup> Permitted variations do not apply to hot-rolled bars if any subsequent heating operation has been performed.

<sup>4</sup> Round to the nearest whole millimetre.

## Sectional Dimensions

The permissible variations in sectional dimensions for welded shapes and rolled shapes are given in the following tables.

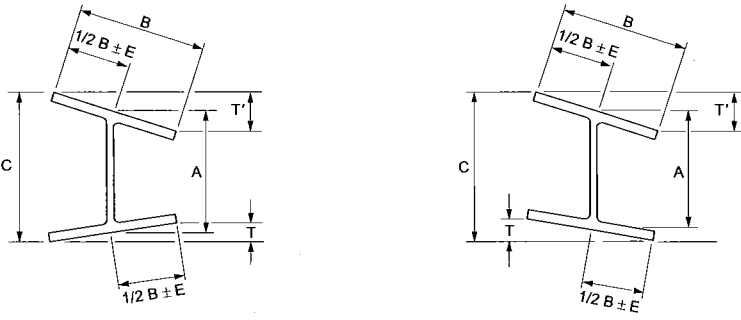
### PERMISSIBLE VARIATIONS IN SECTIONAL DIMENSIONS OF WELDED STRUCTURAL SHAPES

Nominal Depth, mm	Depth, A, mm		Width of flange, B, mm		Combined warpage and tilt,* mm	Web off-centre, E, mm	Web flatness **	Diagram
	Over	Under	Over	Under	Maximum	Maximum	Maximum	
900 and under	5	3	6	5	Greater of B / 100 or 6	6	A / 150	
Over 900 to 2000 incl.	5	5	6	5		6	A / 150	

\* The combined warpage and tilt of the flange is measured from the toe of the flange to a line normal to the plane of the web through the intersection of the centreline of the web with the outside surface of the flange plate.

\*\* The deviation from flatness of the web is measured in any length of the web equal to the total depth of the beam.

### PERMISSIBLE VARIATIONS IN SECTIONAL DIMENSIONS OF W AND HP SHAPES

							
Nominal Depth, mm	Depth A, mm		Width of flange B, mm		Out-of-square T+T', mm	Web off-centre, E, mm	Max. overall depth at any cross-section, C, mm
	Over	Under	Over	Under	Not over	Not over	Over nominal
310 and under	4	3	6	5	6	5	6
Over 310	4	3	6	5	8	5 *	6

"A" is measured at the centreline of the web, "B" parallel to the flange, and "C" parallel to the web.

\* Web off-centre tolerance is 8 mm for sections over 634 kg/m. See ASTM A6 / A6M.

### PERMISSIBLE VARIATIONS IN LENGTH FOR W AND HP SHAPES

Nominal Depth, mm	Variations from Specified Length for Lengths Given, mm			
	9000 and under		Over 9000	
	Over	Under	Over	Under
Beams 610 mm and under	10	10	10 plus 1 for each additional 1000 mm or fraction thereof	10
Beams over 610 mm and all columns	13	13	13 plus 1 for each additional 1000 mm or fraction thereof	13

Notes: For W and HP shapes used as bearing piles, the length tolerance is +125 mm, -0 mm.

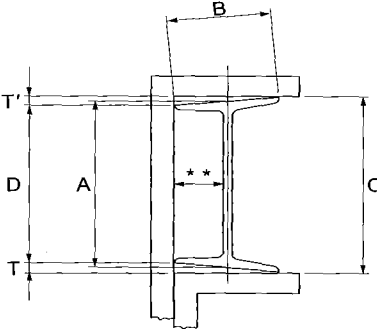
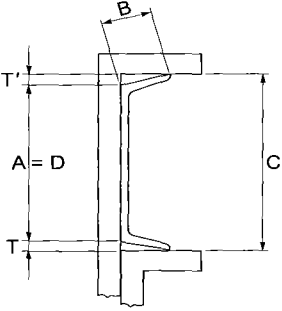
The permitted variations in end out-of-square for W and HP shapes shall be 0.016 mm per mm of depth, or per mm of flange width if the flange width is larger than the depth, rounded to the nearest mm. See ASTM A6 / A6M.

## PERMISSIBLE VARIATIONS IN LENGTH FOR S, M, C, MC, L, AND T SHAPES

Nominal Size, mm  (Greatest Cross-sectional Dimension)	Variations from Specified Length for Lengths Given, mm											
	1500 to 3000 excl.		3000 to 6000 excl.		6000 to 9000 incl.		Over 9000 to 12 000 incl.		Over 12 000 to 20 000 incl.		Over 20 000	
	Over	Under	Over	Under	Over	Under	Over	Under	Over	Under	Over	Under
Under 75	16	0	25	0	38	0	51	0	64	0	—	—
75 and over	25	0	38	0	45	0	57	0	70	0	—	—

Note: Where "—" appears in this table, there is no requirement. See ASTM A6 / A6M.

## PERMISSIBLE VARIATIONS IN SECTION DIMENSIONS FOR S, M, C AND MC SHAPES

<div style="display: flex; justify-content: space-around; align-items: center;">   </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <span>(S Shape)</span> <span>(C Shape)</span> </div>							
Shapes	Nominal Size, mm	Depth, A, mm		Flange Width, B, mm		Out-of-Square $\frac{T + T'}{B}$ , mm/mm	Out-of-parallel $\frac{C - D}{B}$ , mm/mm
		Over	Under	Over	Under		
S, M *	75 – 180 incl.	2	2	3	3	0.03	—
	Over 180 – 360 incl.	3	2	4	4	0.03	—
	Over 360 – 610 incl.	5	3	5	5	0.03	—
Channels (C and MC)	75 – 180 incl.	3	2	3	3	0.03	0.03
	Over 180 – 360 incl.	3	3	3	4	0.03	0.03
	Over 360	5	4	3	5	0.03	0.03

\* Web off-centre tolerance is 5 mm.

\*\* Back of square and centreline of web to be parallel when measuring out-of-square.

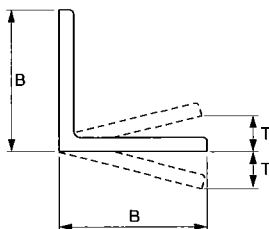
"A" is measured at centreline of web for beams and at back of web for channels.

### Mass and Area Tolerances

Structural-size shapes – cross-sectional area or mass:  $\pm 2.5\%$  from theoretical.

## Tolerances for Angles

Permissible variations for cross-sectional dimensions of bar-size angles (defined as rolled angles having maximum cross-sectional dimensions less than 75 mm), differ from structural size angles, and both variations are given in the following table (see ASTM A6 / A6M).



Structural Size Angles				Bar-Size Angles**				
Specified Size*, mm	Length of Leg, B, mm		Out-of-Square T/B	Specified Size*, mm	Variations from Thickness Given, mm			Variations from Length of Leg Over and Under, mm
	Over	Under			5 and under	Over 5 to 10 incl.	Over 10	
Over 64 to 102 incl.	3	2	0.026	25 and Under	0.2	0.2	—	1
Over 102 to 152 incl.	3	3	0.026	Over 25 to 51 incl.	0.2	0.2	0.3	1
Over 152 to 203 incl.	5	3	0.026	Over 51 to 64 incl.	0.3	0.4	0.4	2
Over 203 to 254 incl.	6	6	0.026	Note: Where "—" appears in this table, there is no requirement. * For unequal-leg angles, longer leg determines classification. ** Permissible out-of-square in either direction is 1.5 degrees.				
Over 254	6	10	0.026					

# HOLLOW STRUCTURAL SECTIONS (HSS)

## General

Production information and tolerances given below correspond to HSS produced in accordance with CSA G40.20/G40.21, unless noted otherwise.

## Class

Class H means hollow sections made by:

(i) A seamless or furnace-butt-welded (continuous-welded) or automatic electric welding process hot-formed to final shape; or

(ii) A seamless or automatic electric welding process producing a continuous weld, and cold-formed to final shape, subsequently stress-relieved by heating to a temperature of 450°C or higher, followed by cooling in air.

Class C means HSS that are cold-formed from a section produced by a seamless process or by an automatic electric welding process producing a continuous weld.

## Cross-Sectional Dimensions

Outside dimensions measured across the flats or diameter at positions at least 50 mm from either end of a piece, including an allowance for convexity or concavity, shall not vary from the specified dimensions of the section by more than the prescribed tolerances.

Largest Outside Dimension Across Flats or Diameter, mm	Tolerance*, mm
To 65	± 0.5
Over 65 - 90 incl.	± 0.8
Over 90 - 140 incl.	± 1.0
Over 140	± 1%

\* Tolerance includes allowance for convexity or concavity. Tolerance may be increased by 50 percent when applied to the smaller dimension of rectangular sections whose ratio of cross-sectional dimensions is between 1.5 and 3, and by 100 percent when this ratio exceeds 3.

## Corner Squareness

For rectangular sections, corners shall be square (90°) within ± 1° for hot-formed sections and ± 2° for cold-formed sections, with the average slope of the sides being the basis for determination.

## Straightness Variation

Deviation from straightness in millimetres shall not exceed the total length in millimetres divided by 500.

## Permissible Twist

Twist of a rectangular section, measured by holding down the side of one end of the section on a flat surface and noting the height above the surface of either corner at the opposite end of that side, shall not exceed the prescribed tolerances:



Largest Outside Dimension, mm	Maximum Twist per 1000 mm of Length, mm
To 40 incl.	1.3
Over 40 - 65 incl.	1.7
Over 65 - 105 incl.	2.1
Over 105 - 155 incl.	2.4
Over 155 - 205 incl.	2.8
Over 205	3.1

### Cutting Tolerances

Tolerances on ordered cold-cut lengths are:

- + 12 and - 6 millimetres for lengths 7500 mm and under;
- + 18 and - 6 millimetres for lengths over 7500 mm.

Tolerances on ordered hot-cut lengths of hot rolled sections are:

- ± 25 millimetres for lengths 7500 mm and under;
- ± 50 millimetres for lengths over 7500 mm.

### Mass Variation – CSA G40.20, ASTM A1085, and ASTM A500

For HSS produced to CSA G40.20 and to ASTM A1085 and based on a mass density of 7850 kg/m<sup>3</sup>, the actual mass shall not deviate from the published mass by more than - 3.5 % or + 10 %. For HSS produced to ASTM A500, there is no restriction on mass variation.

### Wall Thickness – CSA G40.20, ASTM A1085 and ASTM A500

For HSS produced to CSA G40.20 and to ASTM A1085, the tolerance on the wall thickness is not more than - 5 % or + 10 % from the nominal specified wall thickness, except for the weld seam. For ASTM A500, the tolerance is not more than ± 10 % from the nominal wall thickness, except for the weld seam.

### Outside Corner Radius Tolerances for Square and Rectangular HSS

#### CSA G40.20

Wall Thickness mm	Maximum Outside Corner Radii, mm	
	Perimeter to 700 mm Incl.	Perimeter Over 700 mm
To 3 incl.	6	—
Over 3 - 4 incl.	8	—
Over 4 - 5 incl.	15	—
Over 5 - 6 incl.	18	18
Over 6 - 8 incl.	21	24
Over 8 - 10 incl.	27	30
Over 10 - 13 incl.	36	39
Over 13	—	3 x wall thickness

For HSS produced to ASTM A500, the radius of outside corners shall not exceed three times the specified wall thickness. For ASTM A1085, the outside corner radius shall meet the following requirements, where  $t$  is the wall thickness:

$$t \leq 10.2 \text{ mm, } 1.6t \leq \text{corner radius} \leq 3.0t$$

$$t > 10.2 \text{ mm, } 1.8t \leq \text{corner radius} \leq 3.0t$$

# PRINCIPAL SOURCES OF STRUCTURAL STEEL SECTIONS

## General

Standard Canadian and North American sections can be supplied by a number of steel mills in Canada and elsewhere. Principal sources for the various section sizes listed in this Handbook are indicated below.

In 2010, Essar Steel Algoma Inc. withdrew from the production of welded wide-flange (WWF) sections.

## W-Shapes

In 1999, Algoma Steel Inc. (Essar Steel Algoma Inc.), the sole Canadian producer of W and HP-shapes for three decades, announced its withdrawal from the rolled shape market. W-shapes most commonly used in North America today are ASTM A992 products. Some of the very heavy sections are produced to ASTM A913.

## Channel and Angle Sections

Most channels and angles listed in Part 6 are available from Canadian mills. Imported sizes are identified by an asterisk (\*) in tables of Properties and Dimensions. In general, all sizes should be specified to the CSA G40.20/G40.21 material standards. Gerdau operates several North American mills that typically produce channels and angles certified to multiple grades, including CSA G40.21-350W and 300W, and ASTM 572 Grade 50.

## Hollow Structural Sections

Both CSA G40.20/G40.21 and ASTM A500 HSS are produced in Canada. Jumbo HSS are the exceptions; they are identified as imports by an asterisk (\*) in tables of Properties and Dimensions. A500 products are not a direct substitute for G40.21-350W HSS. In the section entitled *Hollow Structural Sections*, the text preceding the tables of Properties and Dimensions highlights the differences between these two products.

## Principal Sources

Some of the more common sources (for Canada) of structural sections and other products are listed below. Producers' catalogs should be consulted for more information and details about other products produced. This list is a general guide and is not necessarily complete.

ArcelorMittal Canada (bars, sheet steel)  
ArcelorMittal International Canada \* (shapes, plate, bars, HSS)  
Atlas Tube Canada ULC (HSS)  
Essar Steel Algoma Inc. (plate, checkered floor plate, coil)  
Evraz North America \* (pipe, plate, coil)  
Gerdau (angles, channels, bars)  
Gerdau - Texas Steel Mill \* (shapes)  
Nucor Corporation \* (plate, bars, sheet steel)  
Nucor-Yamato Steel Company \* (shapes)  
SSAB Central Inc. (sheet steel, plate)  
Steel Dynamics Inc. \* (shapes, sheet steel)  
Welded Tube of Canada (HSS, pipe)

*\* non-Canadian sources*

*Note: Since not all of the above are members of CISC, please visit the CISC website ([www.cisc-icca.ca](http://www.cisc-icca.ca)) to view the current list of CISC mill and steel service centre members.*

## Availability

Section sizes are generally produced according to production (rolling) schedules. Steel producers and service centres carry various inventories, usually of the more commonly used sections, and serve as a buffer between production cycles to provide ready availability of material. The designer should consider material availability when specifying section sizes, particularly for the heavier mass per metre sizes in a nominal size range and for small quantities of the less commonly used sizes.

Because regional availability of steel products varies, information on the availability of particular sizes can be obtained from local steel fabricators, producers, and service centres. In order to provide approximate guidance on general availability, this Handbook adopts the following convention:

- I-shapes (all W, HP, S and M sections are imported): readily available sizes are highlighted in yellow.
- Other sections (the majority of channels, angles and HSS are produced in Canada): imported sizes are labelled with an asterisk (\*).

Table 6-8 shows the primary and secondary grades for common steel shapes in terms of general availability and usage.

# METRIC AND IMPERIAL SHAPES

## General

In Canada, the official size designation for structural steel sections for purposes of design, detailing and ordering material is the metric (SI) designation. Canadian and North American sections may also be defined using imperial designations; however, all tables of properties and dimensions, and all design tables included elsewhere in this Handbook generally provide only metric properties and metric design information.

General requirements for rolled and welded shapes are specified in CSA Standard G40.20/21, which refers mostly to ASTM A6/A6M for the designation and dimensions of rolled shapes. Tables on the following pages list metric (SI) designations and corresponding imperial designations.

## W, HP, S, M, C and MC Shapes

The metric designation is the nominal depth in millimetres times the nominal mass in kilograms per metre, and the corresponding imperial designation is expressed in inches  $\times$  lb/ft.

## Angles (L)

The metric size description given in this Handbook is expressed as leg lengths in whole millimetres and thickness in millimetres to two significant figures, while the imperial description is expressed as leg lengths in inches and thickness in fractional inches.

## Hollow Structural Sections (HSS)

The metric size description of square, rectangular and round hollow structural sections is expressed as the outside dimensions in whole millimetres times the nominal wall thickness in millimetres to two significant figures. The imperial description consists of the outside dimensions in inches and the nominal wall thickness in decimal inches.

## Welded Sections

Welded wide-flange (WWF) and welded reduced-flange (WRF) sections must be produced to CSA Standard G40.20/21, whereas welded three-plate sections are generally fabricated to the requirements of CSA Standard W59. The major producer of WWF and WRF sections discontinued production in 2010. Data for these sections are no longer provided in this Handbook.

## METRIC SHAPES

Metric (SI) designations for rolled shapes in this Handbook generally comply with ASTM A6/A6M except for sections also listed in CSA Standard G312.3-M92 "Metric Dimensions for Structural Steel Shapes and Hollow Structural Sections". For a number of section sizes, the respective metric designations in the two standards are slightly different. In many cases, the principal difference involves a decimal digit in the nominal mass based on A6. These sections are listed in the comparison table below, with the imperial designation also provided for reference purposes. For other sections not listed, metric designations given in this Handbook are the same as in A6/A6M.

In the case of angles, the only difference between the respective metric size descriptions involves a decimal digit in the nominal leg thickness based on A6 for thicknesses greater than 9.5 mm. Since the leg widths are identical according to both standards, only the thicknesses are listed.

Handbook	A6/A6M	
Metric	Metric	Imperial
<b>W Shapes</b>		
W410x74	W410x75	W16x50
W410x54	W410x53	W16x36
W410x46	W410x46.1	W16x31
W410x39	W410x38.8	W16x26
W360x57	W360x58	W14x38
W360x45	W360x44.6	W14x30
W360x39	W360x39.0	W14x26
W360x33	W360x32.9	W14x22
W310x118	W310x117	W12x79
W310x45	W310x44.5	W12x30
W310x39	W310x38.7	W12x26
W310x33	W310x32.7	W12x22
W310x28	W310x28.3	W12x19
W310x24	W310x23.8	W12x16
W310x21	W310x21.0	W12x14
W250x49	W250x49.1	W10x33
W250x45	W250x44.8	W10x30
W250x39	W250x38.5	W10x26
W250x33	W250x32.7	W10x22
W250x28	W250x28.4	W10x19
W250x25	W250x25.3	W10x17
W250x22	W250x22.3	W10x15
W250x18	W250x17.9	W10x12

Handbook	A6/A6M	
Metric	Metric	Imperial
<b>W Shapes (Cont'd)</b>		
W200x46	W200x46.1	W8x31
W200x42	W200x41.7	W8x28
W200x36	W200x35.9	W8x24
W200x31	W200x31.3	W8x21
W200x27	W200x26.6	W8x18
W200x22	W200x22.5	W8x15
W200x19	W200x19.3	W8x13
W200x15	W200x15.0	W8x10
W150x37	W150x37.1	W6x25
W150x30	W150x29.8	W6x20
W150x24	W150x24.0	W6x16
W150x22	W150x22.5	W6x15
W150x18	W150x18.0	W6x12
W150x14	W150x13.5	W6x9
W150x13	W150x13.0	W6x8.5
W130x28	W130x28.1	W5x19
W130x24	W130x23.8	W5x16
W100x19	W100x19.3	W4x13

## METRIC SHAPES (Cont'd)

Handbook	A6/A6M	
Metric	Metric	Imperial
<b>HP Shapes</b>		
HP310x94	HP310x93	HP12x63
HP200x54	HP200x53	HP8x36
<b>S Shapes</b>		
S510x98.2	S510x98	S20x66
S310x47	S310x47.3	S12x31.8
S250x38	S250x37.8	S10x25.4
S200x27	S200x27.4	S8x18.4
S150x26	S150x25.7	S6x17.25
S150x19	S150x18.6	S6x12.5
S100x11	S100x11.5	S4x7.7
S75x11	S75x11.2	S3x7.5
S75x8	S75x8.5	S3x5.7
<b>C Shapes</b>		
C380x50	C380x50.4	C15x33.9
C310x31	C310x30.8	C12x20.7
C250x23	C250x22.8	C10x15.3
C230x20	C230x19.9	C9x13.4
C200x28	C200x27.9	C8x18.75
C200x21	C200x20.5	C8x13.75
C200x17	C200x17.1	C8x11.5
C180x18	C180x18.2	C7x12.25
C180x15	C180x14.6	C7x9.8
C150x19	C150x19.3	C6x13
C150x16	C150x15.6	C6x10.5
C150x12	C150x12.2	C6x8.2
C130x10	C130x10.4	C5x6.7
C100x11	C100x10.8	C4x7.25
C100x9	C100x9.3	C4x6.25
C100x7	C100x6.7	C4x4.5
C75x9	C75x8.9	C3x6
C75x7	C75x7.4	C3x5
C75x6	C75x6.1	C3x4.1
C75x5	C75x5.2	C3x3.5

Handbook	A6/A6M	
mm	mm	in.
<b>L Shapes - Leg Thicknesses &gt; 9.5 mm</b>		
35	34.9	1 <sup>3</sup> / <sub>8</sub>
32	31.8	1 <sup>1</sup> / <sub>4</sub>
29	28.6	1 <sup>1</sup> / <sub>8</sub>
25	25.4	1
22	22.2	<sup>7</sup> / <sub>8</sub>
19	19.1/19.0	<sup>3</sup> / <sub>4</sub>
16	15.9	<sup>5</sup> / <sub>8</sub>
14	14.3	<sup>9</sup> / <sub>16</sub>
13	12.7	<sup>1</sup> / <sub>2</sub>
11	11.1	<sup>7</sup> / <sub>16</sub>

# DESIGNATION TABLE FOR W SHAPES

Canadian (SI) Designation (mm x kg/m)	Imperial Designation (in. x lb./ft.)	Canadian (SI) Designation (mm x kg/m)	Imperial Designation (in. x lb./ft.)	Canadian (SI) Designation (mm x kg/m)	Imperial Designation (in. x lb./ft.)
W1100x499	W44x335	W840x576	W33x387	W610x551	W24x370
x433	x290	x527	x354	x498	x335
x390	x262	x473	x318	x455	x306
x343	x230	x433	x291	x415	x279
		x392	x263	x372	x250
W1000x976	W40x655	x359	x241	x341	x229
x883	x593	x329	x221	x307	x207
x748	x503	x299	x201	x285	x192
x642	x431			x262	x176
x591	x397	W840x251	W33x169	x241	x162
x554	x372	x226	x152	x217	x146
x539	x362	x210	x141	x195	x131
x483	x324	x193	x130	x174	x117
x443	x297	x176	x118	x155	x104
x412	x277				
x371	x249	W760x582	W30x391	W610x153	W24x103
x321	x215	x531	x357	x140	x94
x296	x199	x484	x326	x125	x84
		x434	x292	x113	x76
W1000x584	W40x392	x389	x261	x101	x68
x494	x331	x350	x235		
x486	x327	x314	x211	W610x92	W24x62
x438	x294	x284	x191	x82	x55
x415	x278	x257	x173		
x393	x264			W530x409	W21x275
x350	x235	W760x220	W30x148	x369	x248
x314	x211	x196	x132	x332	x223
x272	x183	x185	x124	x300	x201
x249	x167	x173	x116	x272	x182
x222	x149	x161	x108	x248	x166
		x147	x99	x219	x147
W920x1377	W36x925	x134	x90	x196	x132
x1269	x853			x182	x122
x1194	x802	W690x802	W27x539	x165	x111
x1077	x723	x548	x368	x150	x101
x970	x652	x500	x336		
x787	x529	x457	x307	W530x138	W21x93
x725	x487	x419	x281	x123	x83
x656	x441	x384	x258	x109	x73
x588	x395	x350	x235	x101	x68
x537	x361	x323	x217	x92	x62
x491	x330	x289	x194	x82	x55
x449	x302	x265	x178	x72	x48
x420	x282	x240	x161		
x390	x262	x217	x146	W530x85	W21x57
x368	x247			x74	x50
x344	x231	W690x192	W27x129	x66	x44
		x170	x114		
W920x381	W36x256	x152	x102		
x345	x232	x140	x94		
x313	x210	x125	x84		
x289	x194				
x271	x182				
x253	x170				
x238	x160				
x223	x150				
x201	x135				

# DESIGNATION TABLE FOR W SHAPES

Canadian (SI) Designation (mm x kg/m)	Imperial Designation (in. x lb./ft.)	Canadian (SI) Designation (mm x kg/m)	Imperial Designation (in. x lb./ft.)	Canadian (SI) Designation (mm x kg/m)	Imperial Designation (in. x lb./ft.)
W460x464	W18x311	W360x196	W14x132	W250x167	W10x112
x421	x283	x179	x120	x149	x100
x384	x258	x162	x109	x131	x88
x349	x234	x147	x99	x115	x77
x315	x211	x134	x90	x101	x68
x286	x192			x89	x60
x260	x175	W360x122	W14x82	x80	x54
x235	x158	x110	x74	x73	x49
x213	x143	x101	x68		
x193	x130	x91	x61	W250x67	W10x45
x177	x119			x58	x39
x158	x106	W360x79	W14x53	x49	x33
x144	x97	x72	x48		
x128	x86	x64	x43	W250x45	W10x30
x113	x76			x39	x26
		W360x57	W14x38	x33	x22
W460x106	W18x71	x51	x34		
x97	x65	x45	x30	W250x28	W10x19
x89	x60			x25	x17
x82	x55	W360x39	W14x26	x22	x15
x74	x50	x33	x22	x18	x12
W460x68	W18x46	W310x500	W12x336	W200x100	W8x67
x60	x40	x454	x305	x86	x58
x52	x35	x415	x279	x71	x48
		x375	x252	x59	x40
W410x149	W16x100	x342	x230	x52	x35
x132	x89	x313	x210	x46	x31
x114	x77	x283	x190		
x100	x67	x253	x170	W200x42	W8x28
		x226	x152	x36	x24
W410x85	W16x57	x202	x136		
x74	x50	x179	x120	W200x31	W8x21
x67	x45	x158	x106	x27	x18
x60	x40	x143	x96		
x54	x36	x129	x87	W200x22	W8x15
		x118	x79	x19	x13
W410x46	W16x31	x107	x72	x15	x10
x39	x26	x97	x65		
				W150x37	W6x25
W360x1299	W14x873	W310x86	W12x58	x30	x20
x1202	x808	x79	x53	x22	x15
x1086	x730				
x990	x665	W310x74	W12x50	W150x24	W6x16
x900	x605	x67	x45	x18	x12
x818	x550	x60	x40	x14	x9
x744	x500			x13	x8.5
x677	x455	W310x52	W12x35		
x634	x426	x45	x30	W130x28	W5x19
x592	x398	x39	x26	x24	x16
x551	x370				
x509	x342	W310x33	W12x22	W100x19	W4x13
x463	x311	x28	x19		
x421	x283	x24	x16		
x382	x257	x21	x14		
x347	x233				
x314	x211				
x287	x193				
x262	x176				
x237	x159				
x216	x145				



# DESIGNATION TABLE FOR HP, M, S, C, MC SHAPES

Canadian (SI) Designation (mm x kg/m)	Imperial Designation (in. x lb./ft.)	Canadian (SI) Designation (mm x kg/m)	Imperial Designation (in. x lb./ft.)	Canadian (SI) Designation (mm x kg/m)	Imperial Designation (in. x lb./ft.)
HP460x304 x269 x234 x202	HP18x204 x181 x157 x135	S460x104 x81.4	S18x70 x54.7	C75x9 x7 x6 x5	C3x6 x5 x4.1 x3.5
HP410x272 x242 x211 x181 x151 x131	HP16x183 x162 x141 x121 x101 x88	S380x74 x64	S15x50 x42.9	MC460x86 x77.2 x68.2 x63.5	MC18x58 x51.9 x45.8 x42.7
HP360x174 x152 x132 x108	HP14x117 x102 x89 x73	S310x74 x60.7	S12x50 x40.8	MC330x74 x60 x52 x47.3	MC13x50 x40 x35 x31.8
HP310x132 x125 x110 x94 x79	HP12x89 x84 x74 x63 x53	S250x52 x38	S10x35 x25.4	MC310x74 x67 x60 x52 x46	MC12x50 x45 x40 x35 x31
HP250x85 x62	HP10x57 x42	S200x34 x27	S8x23 x18.4	MC310x21.3	MC12x14.3
HP200x54	HP8x36	S150x26 x19	S6x17.25 x12.5	MC310x15.8	MC12x10.6
M318x18.5 x17.3	M12.5x12.4 x11.6	S130x15	S5x10	MC250x61.2 x50 x42.4	MC10x41.1 x33.6 x28.5
M310x17.6 x16.1 x14.9	M12x11.8 x10.8 x10.0	S100x14.1 x11	S4x9.5 x7.7	MC250x37 x33	MC10x25 x22
M250x13.4 x11.9 x11.2	M10x9.0 x8.0 x7.5	S75x11 x8	S3x7.5 x5.7	MC250x12.5 x9.7	MC10x8.4 x6.5
M200x9.7 x9.2	M8x6.5 x6.2	C380x74 x60 x50	C15x50 x40 x33.9	MC230x37.8 x35.6	MC9x25.4 x23.9
M150x6.6 x5.5	M6x4.4 x3.7	C310x45 x37 x31	C12x30 x25 x20.7	MC200x33.9 x31.8	MC8x22.8 x21.4
M130x28.1	M5x18.9	C250x45 x37 x30 x23	C10x30 x25 x20 x15.3	MC200x29.8 x27.8	MC8x20 x18.7
M100x8.9 x6.1	M4x6.0 x4.08	C230x30 x22 x20	C9x20 x15 x13.4	MC200x12.6	MC8x8.5
M75x4.3	M3x2.9	C200x28 x21 x17	C8x18.75 x13.75 x11.5	MC180x33.8 x28.4	MC7x22.7 x19.1
S610x180 x158	S24x121 x106	C180x22 x18 x15	C7x14.75 x12.25 x9.8	MC150x26.8 x22.8	MC6x18 x15.3
S610x149 x134 x119	S24x100 x90 x80	C150x19 x16 x12	C6x13 x10.5 x8.2	MC150x24.3 x22.5	MC6x16.3 x15.1
S510x143 x128	S20x96 x86	C130x13 x10	C5x9 x6.7	MC150x17.9	MC6x12
S510x112 x98.2	S20x75 x66	C100x11 x9 x8 x7	C4x7.25 x6.25 x5.4 x4.5	MC150x10.4 x9.7	MC6x7.0 x6.5
				MC100x20.5	MC4x13.8
				MC75x10.6	MC3x7.1

# ANGLES

Canadian (SI) Section (mm x mm x mm)	Imperial Section (in. x in. x in.)	Canadian (SI) Section (mm x mm x mm)	Imperial Section (in. x in. x in.)	Canadian (SI) Section (mm x mm x mm)	Imperial Section (in. x in. x in.)
L254x 254x 32 x 29 x 25 x 22 x 19	L10x 10x 1 <sup>1</sup> / <sub>4</sub> x 1 <sup>1</sup> / <sub>8</sub> x 1 x 7 <sub>8</sub> x 3 <sub>4</sub>	L127x 89x 19 x 16 x 13 x 9.5 x 7.9 x 6.4	L5x 3 <sup>1</sup> / <sub>2</sub> x 3 <sub>4</sub> x 5 <sub>8</sub> x 1 <sub>2</sub> x 3 <sub>8</sub> x 5 <sub>16</sub> x 1 <sub>4</sub>	L76x 51x 13 x 9.5 x 7.9 x 6.4 x 4.8	L3x 2x 1 <sub>2</sub> x 3 <sub>8</sub> x 5 <sub>16</sub> x 1 <sub>4</sub> x 3 <sub>16</sub>
L203x 203x 29 x 25 x 22 x 19 x 16 x 14 x 13	L8x 8x 1 <sup>1</sup> / <sub>8</sub> x 1 x 7 <sub>8</sub> x 3 <sub>4</sub> x 5 <sub>8</sub> x 9 <sub>16</sub> x 1 <sub>2</sub>	L127x 76x 13 x 11 x 9.5 x 7.9 x 6.4	L5x 3x 1 <sub>2</sub> x 7 <sub>16</sub> x 3 <sub>8</sub> x 5 <sub>16</sub> x 1 <sub>4</sub>	L64x 64x 13 x 9.5 x 7.9 x 6.4 x 4.8	L2 <sup>1</sup> / <sub>2</sub> x 2 <sup>1</sup> / <sub>2</sub> x 1 <sub>2</sub> x 3 <sub>8</sub> x 5 <sub>16</sub> x 1 <sub>4</sub> x 3 <sub>16</sub>
L203x 152x 25 x 22 x 19 x 16 x 14 x 13 x 11	L8x 6x 1 x 7 <sub>8</sub> x 3 <sub>4</sub> x 5 <sub>8</sub> x 9 <sub>16</sub> x 1 <sub>2</sub> x 7 <sub>16</sub>	L102x 102x 19 x 16 x 13 x 11 x 9.5 x 7.9 x 6.4	L4x 4x 3 <sub>4</sub> x 5 <sub>8</sub> x 1 <sub>2</sub> x 7 <sub>16</sub> x 3 <sub>8</sub> x 5 <sub>16</sub> x 1 <sub>4</sub>	L64x 51x 9.5 x 7.9 x 6.4 x 4.8	L2 <sup>1</sup> / <sub>2</sub> x 2x 3 <sub>8</sub> x 5 <sub>16</sub> x 1 <sub>4</sub> x 3 <sub>16</sub>
L203x 102x 25 x 22 x 19 x 16 x 14 x 13	L8x 4x 1 x 7 <sub>8</sub> x 3 <sub>4</sub> x 5 <sub>8</sub> x 9 <sub>16</sub> x 1 <sub>2</sub>	L102x 89x 13 x 9.5 x 7.9 x 6.4	L4x 3 <sup>1</sup> / <sub>2</sub> x 1 <sub>2</sub> x 5 <sub>8</sub> x 3 <sub>16</sub> x 5 <sub>16</sub> x 1 <sub>4</sub>	L51x 51x 9.5 x 7.9 x 6.4 x 4.8 x 3.2	L2x 2x 3 <sub>8</sub> x 5 <sub>16</sub> x 1 <sub>4</sub> x 3 <sub>16</sub> x 1 <sub>8</sub>
L178x 102x 19 x 16 x 13 x 11 x 9.5	L7x 4x 3 <sub>4</sub> x 5 <sub>8</sub> x 1 <sub>2</sub> x 7 <sub>16</sub> x 3 <sub>8</sub>	L89x 89x 13 x 11 x 9.5 x 7.9 x 6.4	L3 <sup>1</sup> / <sub>2</sub> x 3 <sup>1</sup> / <sub>2</sub> x 1 <sub>2</sub> x 7 <sub>16</sub> x 3 <sub>8</sub> x 5 <sub>16</sub> x 1 <sub>4</sub>	L44x 44x 6.4 x 4.8 x 3.2	L1 <sup>3</sup> / <sub>4</sub> x 1 <sup>3</sup> / <sub>4</sub> x 1 <sub>4</sub> x 3 <sub>16</sub> x 1 <sub>8</sub>
L152x 152x 25 x 22 x 19 x 16 x 14 x 13 x 11 x 9.5 x 7.9	L6x 6x 1 x 7 <sub>8</sub> x 3 <sub>4</sub> x 5 <sub>8</sub> x 9 <sub>16</sub> x 1 <sub>2</sub> x 7 <sub>16</sub> x 3 <sub>8</sub> x 5 <sub>16</sub>	L89x 76x 13 x 11 x 9.5 x 7.9 x 6.4	L3 <sup>1</sup> / <sub>2</sub> x 3x 1 <sub>2</sub> x 7 <sub>16</sub> x 3 <sub>8</sub> x 5 <sub>16</sub> x 1 <sub>4</sub>	L38x 38x 6.4 x 4.8 x 3.2	L1 <sup>1</sup> / <sub>2</sub> x 1 <sup>1</sup> / <sub>2</sub> x 1 <sub>4</sub> x 3 <sub>16</sub> x 1 <sub>8</sub>
L152x 102x 19 x 16 x 14 x 13 x 11 x 9.5 x 7.9	L6x 4x 3 <sub>4</sub> x 5 <sub>8</sub> x 9 <sub>16</sub> x 1 <sub>2</sub> x 7 <sub>16</sub> x 3 <sub>8</sub> x 5 <sub>16</sub>	L89x 64x 13 x 9.5 x 7.9 x 6.4	L3 <sup>1</sup> / <sub>2</sub> x 2 <sup>1</sup> / <sub>2</sub> x 1 <sub>2</sub> x 3 <sub>8</sub> x 5 <sub>16</sub> x 1 <sub>4</sub>	L32x 32x 6.4 x 4.8 x 3.2	L1 <sup>1</sup> / <sub>4</sub> x 1 <sup>1</sup> / <sub>4</sub> x 1 <sub>4</sub> x 3 <sub>16</sub> x 1 <sub>8</sub>
L152x 89x 13 x 9.5 x 7.9	L6x 3 <sup>1</sup> / <sub>2</sub> x 1 <sub>2</sub> x 3 <sub>8</sub> x 5 <sub>16</sub>	L76x 76x 13 x 11 x 9.5 x 7.9 x 6.4 x 4.8	L3x 3x 1 <sub>2</sub> x 7 <sub>16</sub> x 3 <sub>8</sub> x 5 <sub>16</sub> x 1 <sub>4</sub> x 3 <sub>16</sub>	L25x 25x 6.4 x 4.8 x 3.2	L1x 1x 1 <sub>4</sub> x 3 <sub>16</sub> x 1 <sub>8</sub>
L127x 127x 22 x 19 x 16 x 13 x 11 x 9.5 x 7.9	L5x 5x 7 <sub>8</sub> x 3 <sub>4</sub> x 5 <sub>8</sub> x 1 <sub>2</sub> x 7 <sub>16</sub> x 3 <sub>8</sub> x 5 <sub>16</sub>	L76x 64x 13 x 11 x 9.5 x 7.9 x 6.4 x 4.8	L3x 2 <sup>1</sup> / <sub>2</sub> x 1 <sub>2</sub> x 7 <sub>16</sub> x 3 <sub>8</sub> x 5 <sub>16</sub> x 1 <sub>4</sub> x 3 <sub>16</sub>	L19x 19x 3.2	L <sup>3</sup> / <sub>4</sub> x 3 <sub>4</sub> x 1 <sub>8</sub>

# SQUARE HSS

Canadian (SI) Section (mm x mm x mm)	Imperial Section (in. x in. x in.)	CSA G40.21	ASTM A500
559x 559x 19	22x 22x 0.750	✓	
508x 508x 22	20x 20x 0.875	✓	
x 19	x 0.750	✓	
x 16	x 0.625	✓	
x 13	x 0.500	✓	
457x 457x 22	18x 18x 0.875	✓	
x 19	x 0.750	✓	
x 16	x 0.625	✓	
x 13	x 0.500	✓	
406x 406x 22	16x 16x 0.875	✓	
x 19	x 0.750	✓	
x 16	x 0.625	✓	✓
x 13	x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
356x 356x 16	14x 14x 0.625	✓	✓
x 13	x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
305x 305x 16	12x 12x 0.625	✓	✓
x 13	x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
254x 254x 16	10x 10x 0.625	✓	✓
x 13	x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
203x 203x 16	8x 8x 0.625	✓	✓
x 13	x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
178x 178x 16	7x 7x 0.625	✓	✓
x 13	x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
152x 152x 13	6x 6x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
127x 127x 13	5x 5x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓

Canadian (SI) Section (mm x mm x mm)	Imperial Section (in. x in. x in.)	CSA G40.21	ASTM A500
102x 102x 13	4x 4x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓
89x 89x 9.5	3.5x 3.5x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
76x 76x 9.5	3x 3x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓
64x 64x 6.4	2.5x 2.5x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓
51x 51x 6.4	2x 2x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓
38x 38x 4.8	1.5x 1.5x 0.188	✓	✓
x 3.2	x 0.125	✓	✓

# RECTANGULAR HSS

Canadian (SI) Section (mm x mm x mm)	Imperial Section (in. x in. x in.)	CSA G40.21	ASTM A500
305x 203x 16	12x 8x 0.625	✓	✓
x 13	x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
305x 152x 16	12x 6x 0.625	✓	✓
x 13	x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
254x 203x 16	10x 8x 0.625	✓	✓
x 13	x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
254x 152x 16	10x 6x 0.625	✓	✓
x 13	x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
203x 152x 16	8x 6x 0.625	✓	✓
x 13	x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
203x 102x 13	8x 4x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
178x 127x 13	7x 5x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
152x 102x 13	6x 4x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓
152x 76x 13	6x 3x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓

Canadian (SI) Section (mm x mm x mm)	Imperial Section (in. x in. x in.)	CSA G40.21	ASTM A500
127x 76x 13	5x 3x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓
102x 76x 9.5	4x 3x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓
102x 51x 9.5	4x 2x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓
89x 64x 6.4	3.5x 2.5x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
76x 51x 7.9	3x 2x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓
76x 38x 6.4	3x 1.5x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓
64x 38x 6.4	2.5x 1.5x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓
51x 25x 4.8	2x 1x 0.188	✓	✓
x 3.2	x 0.125	✓	✓

# ROUND HSS

Canadian (SI) Section (mm x mm x mm)	Imperial Section (in. x in. x in.)	CSA G40.21	ASTM A500
508x 13	20x 0.500		✓
x 9.5	x 0.375		✓
x 6.4	x 0.250		✓
457x 13	18x 0.500		✓
x 9.5	x 0.375		✓
x 6.4	x 0.250		✓
406x 16	16x 0.625	✓	✓
x 13	x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 6.4	x 0.250	✓	✓
356x 13	14x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 6.4	x 0.250	✓	✓
324x 13	12.75x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 6.4	x 0.250	✓	✓
273x 13	10.75x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 7.9	x 0.313	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
245x 9.5	9.625x 0.375	✓	✓
x 6.4	x 0.250	✓	✓
219x 13	8.625x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
178x 13	7x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
168x 13	6.625x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 6.4	x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
141x 13	5.563x 0.500	✓	✓
x 9.5	x 0.375	✓	✓
x 6.4	x 0.250	✓	✓
127x 9.5	5x 0.375	✓	✓
x 6.4	x 0.250	✓	✓
89x 6.4	3.5x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓
76x 6.4	3x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓
73x 6.4	2.875x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓

Canadian (SI) Section (mm x mm x mm)	Imperial Section (in. x in. x in.)	CSA G40.21	ASTM A500
64x 6.4	2.5x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓
60x 6.4	2.376x 0.250	✓	✓
x 4.8	x 0.188	✓	✓
x 3.2	x 0.125	✓	✓
48x 4.8	1.9x 0.188	✓	✓
x 3.2	x 0.125	✓	✓
42x 3.2	1.66x 0.125		✓

# ROLLED STRUCTURAL SHAPES

## General

The majority of rolled shapes available in Canada are produced either to ASTM A992, ASTM A572 grade 50, or CSA Standard G40.21-350W. These grades have similar, but not identical, specified minimum values of yield. For more information on steel grades, tolerances, and mill practice, see *Grades, Types, Strength Levels* and *Standard Mill Practice* in Part 6.

The tables of properties and dimensions on the following pages include most of the rolled shapes used in construction. See *Principal Sources of Structural Sections* in Part 6 for information regarding Canadian and non-Canadian sections.

Special shapes, such as rolled Tees, Zees, bulb angles, car-building and shipbuilding channels are produced by some mills. These shapes are generally rolled only at irregular intervals and usually by special arrangement. Their use should, therefore, be avoided unless the quantity of any one size can warrant a rolling. Properties and dimensions of these shapes may be obtained from the appropriate mill catalogs.

## Properties and Dimensions

The basic metric dimensions used to compute properties of the rolled steel shapes were originally taken from CSA Standard G312.3-M92 "Metric Dimensions for Structural Steel Shapes and Hollow Structural Sections". General requirements for rolled shapes are specified in CSA Standard G40.20/21, which refers mostly to ASTM A6 for the designation and dimensions of rolled shapes.

Section properties for hot-rolled shapes (except angles) are calculated using the smallest theoretical web-to-flange fillet radius, while dimensions for detailing are adjusted for the largest theoretical fillet radius. Due to differences in fillet radii among steel producers, actual properties may vary slightly from the tabulated values.

Most W and HP shapes are produced in the U.S. W-shapes available in Canada have essentially parallel flanges. HP shapes are essentially square (equal flange width and overall depth) with parallel flange surfaces, and with flanges and web of equal thickness. S-shapes and standard channels (C-shapes) have tapered flanges with the inside face sloping at approximately 16 $\frac{3}{4}$ % (2 in 12). The tabulated thickness is the mean thickness. All C-shapes listed in the tables are produced in Canada, except for sections denoted with an asterisk (\*), although no information is given regarding availability. S-shapes are not available from any Canadian producer.

M and MC-shapes are essentially shapes that cannot be classified as W, HP, S or C-shapes. They are not rolled in Canada and are usually only produced by a single mill. Availability should be checked before specifying their use. These shapes may be produced with parallel flanges or with tapered flanges of various slopes. Dimensions and properties provided in this Handbook should be suitable for general use, in spite of possible variations in actual dimensions.

## Availability of W-Shapes

Currently, structural steel is widely available and as such makes an excellent choice as a structural material. While there are thousands of sections listed at any one time, the availability of a specific section in a particular region of the country for a specific project and time frame may result in the fabricator requesting a substitution. Some sections are almost always available due to a constant demand for them. It is important to remember that the least-cost solution is not always the least-weight alternative.

W-shapes are not produced by Canadian mills. Their availability is indicated in this Handbook by means of yellow shading. The highlighted sections are the commonly used sizes which are generally readily available.

## Angles

Properties and dimensions are provided for hot-rolled equal-leg and unequal-leg angles. The tables include properties and dimensions for single angles and for two equal-leg angles back-to-back, two unequal-leg angles with short legs back-to-back, and two unequal-leg angles with long legs back-to-back. Section properties of hot-rolled angles are based on flat rectangular legs, excluding the fillet and roundings.

All angles listed in the tables are produced in Canada, except for sections denoted with an asterisk (\*), although no information is given regarding availability.

The properties of hot-rolled L254 angles produced by Arcelor-Mittal may be up to 3% less than the tabulated values due to the presence of a rounded heel. In general, the properties of angles produced by cold-forming may be up to 7% less than the properties of hot-rolled angles of similar size due to the rounded heel. Designers encountering cold-formed angles should consult the manufacturer's catalog for the exact dimensions and properties. Cold-formed members are generally designed according to CSA Standard S136.

The tables of properties and dimensions for single angles include both equal-leg and unequal-leg angles. Since equal-leg angles are the more commonly available of the two types, their properties about axis Y-Y (which are identical to those about axis X-X) have been omitted to help identify them more readily.

For the definition of torsional properties  $x_o$ ,  $y_o$ ,  $\bar{r}_o$  and  $\Omega$  given in the tables, see CSA S16-14 Clause 13.3.2. The y-axis of symmetry of equal-leg angles as defined in this Clause corresponds to X'-X' in the tables.

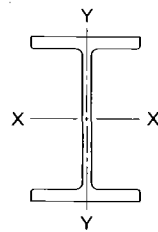
## Tees Cut from W-Shapes

Properties and dimensions of Tees are based on W-shapes assuming a depth of the Tee equal to one-half the depth of the corresponding W-shape. Tees are not rolled and are usually fabricated from W-shapes by splitting the web using either rotary shears or flame cutting, and subsequently straightening to meet published tolerances.

For the definition of torsional properties  $y_o$ ,  $\bar{r}_o$  and  $\Omega$ , see CSA S16-14 Clause 13.3.2.

# W SHAPES

## W1100 - W1000



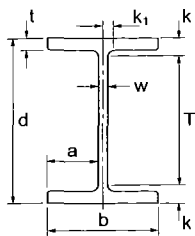
### PROPERTIES

Designation	Dead Load kN/m	Area mm <sup>2</sup>	Axis X-X				Axis Y-Y				Torsional Constant J	Warping Constant C <sub>w</sub>
			I <sub>x</sub>	S <sub>x</sub>	r <sub>x</sub>	Z <sub>x</sub>	I <sub>y</sub>	S <sub>y</sub>	r <sub>y</sub>	Z <sub>y</sub>	J	C <sub>w</sub>
			10 <sup>6</sup> mm <sup>4</sup>	10 <sup>3</sup> mm <sup>3</sup>	mm	10 <sup>3</sup> mm <sup>3</sup>	10 <sup>6</sup> mm <sup>4</sup>	10 <sup>3</sup> mm <sup>3</sup>	mm	10 <sup>3</sup> mm <sup>3</sup>		
<b>W1100</b>												
x499	4.89	63 500	12 900	23 100	451	26 600	500	2 470	88.7	3 870	31 100	144 000
x433	4.24	55 100	11 300	20 300	452	23 200	434	2 160	88.7	3 360	21 200	124 000
x390	3.83	49 700	10 100	18 300	450	20 800	385	1 920	88.0	2 990	15 600	109 000
x343	3.36	43 600	8 670	15 900	446	18 100	331	1 660	87.1	2 570	10 300	92 900
<b>W1000</b>												
x976	9.56	124 300	23 500	42 400	435	50 300	1 190	5 540	97.7	8 840	244 000	307 000
x883	8.66	112 500	21 000	38 400	432	45 300	1 050	4 950	96.6	7 870	185 000	268 000
x748	7.34	95 300	17 300	32 400	426	37 900	851	4 080	94.5	6 460	116 000	212 000
x642	6.29	81 800	14 500	27 700	421	32 100	703	3 410	92.7	5 380	73 800	172 000
x591	5.79	75 300	13 300	25 600	421	29 500	640	3 130	92.2	4 920	59 000	155 000
x554	5.43	70 600	12 300	23 900	418	27 500	591	2 900	91.5	4 550	48 300	142 000
x539	5.29	68 700	12 000	23 400	418	26 800	576	2 830	91.6	4 440	45 300	138 000
x483	4.74	61 500	10 700	20 900	417	23 900	507	2 510	90.8	3 920	33 100	120 000
x443	4.34	56 400	9 670	19 100	414	21 800	455	2 260	89.8	3 530	25 400	107 000
x412	4.04	52 500	9 100	18 100	416	20 500	434	2 160	90.9	3 350	21 400	102 000
x371	3.64	47 300	8 140	16 300	415	18 400	386	1 930	90.3	2 980	15 900	89 600
x321	3.15	40 800	6 960	14 100	413	15 800	331	1 660	90.0	2 550	10 300	76 100
x296	2.91	37 700	6 200	12 600	405	14 300	290	1 450	87.6	2 240	7 640	66 000
<b>W1000</b>												
x584	5.73	74 400	12 500	23 600	409	28 000	334	2 130	67.0	3 470	71 500	82 200
x494	4.84	62 900	10 300	19 800	404	23 400	268	1 740	65.3	2 820	44 000	64 700
x486	4.77	61 900	10 200	19 700	406	23 200	266	1 730	65.5	2 790	42 900	64 100
x438	4.28	55 600	9 090	17 700	404	20 700	234	1 530	64.8	2 460	31 800	55 700
x415	4.07	52 800	8 530	16 700	402	19 600	217	1 430	64.1	2 300	27 000	51 500
x393	3.85	50 100	8 080	15 900	402	18 500	205	1 350	64.0	2 170	23 300	48 400
x350	3.43	44 600	7 230	14 300	403	16 600	185	1 220	64.4	1 940	17 200	43 200
x314	3.08	40 000	6 440	12 900	401	14 900	162	1 080	63.7	1 710	12 600	37 700
x272	2.67	34 600	5 540	11 200	400	12 800	140	933	63.5	1 470	8 350	32 200
x249	2.44	31 700	4 810	9 820	390	11 300	118	783	60.9	1 240	5 820	26 700
x222	2.18	28 200	4 080	8 410	380	9 800	95.4	636	58.1	1 020	3 900	21 500



# W SHAPES

## W1100 - W1000

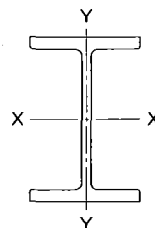


### DIMENSIONS AND SURFACE AREAS

Nominal Mass	Theoretical Mass	Depth d	Flange Width b	Flange Thickness t	Web Thickness w	Distances					Surface Area (m <sup>2</sup> ) per metre of length		Imperial Designation
						a	T	k	k <sub>1</sub>	d - 2t	Total	Minus Top of Top Flange	
kg/m	kg/m	mm	mm	mm	mm	mm	mm	mm	mm	mm			
499	498.6	1 118	405	45.0	26.0	190	965	77	43	1 028	3.80	3.40	W44x335
433	432.7	1 108	402	40.0	22.0	190	965	72	41	1 028	3.78	3.38	W44x290
390	390.2	1 100	400	36.0	20.0	190	965	68	40	1 028	3.76	3.36	W44x262
343	342.6	1 090	400	31.0	18.0	191	965	63	39	1 028	3.74	3.34	W44x230
976	974.5	1 108	428	89.9	50.0	189	865	121	55	928	3.83	3.40	W40x655
883	883.4	1 092	424	82.0	45.5	189	865	114	53	928	3.79	3.37	W40x593
748	748.5	1 068	417	70.0	39.0	189	865	102	50	928	3.73	3.31	W40x503
642	641.9	1 048	412	60.0	34.0	189	865	92	47	928	3.68	3.26	W40x431
591	590.9	1 040	409	55.9	31.0	189	865	87	46	928	3.65	3.25	W40x397
554	554.1	1 032	408	52.0	29.5	189	865	84	45	928	3.64	3.23	W40x372
539	539.4	1 030	407	51.1	28.4	189	865	83	44	928	3.63	3.22	W40x362
483	482.9	1 020	404	46.0	25.4	189	865	78	43	928	3.61	3.20	W40x324
443	442.5	1 012	402	41.9	23.6	189	865	73	42	928	3.58	3.18	W40x297
412	412.2	1 008	402	40.0	21.1	190	865	72	41	928	3.58	3.18	W40x277
371	371.2	1 000	400	36.1	19.0	191	865	68	40	928	3.56	3.16	W40x249
321	320.9	990	400	31.0	16.5	192	865	63	38	928	3.55	3.15	W40x215
296	296.4	982	400	27.1	16.5	192	865	59	38	928	3.53	3.13	W40x199
584	583.8	1 056	314	64.0	36.0	139	865	96	48	928	3.30	2.98	W40x392
494	493.9	1 036	309	54.0	31.0	139	865	86	46	928	3.25	2.94	W40x331
486	486.2	1 036	308	54.1	30.0	139	865	86	45	928	3.24	2.94	W40x327
438	436.7	1 026	305	49.0	26.9	139	865	81	43	928	3.22	2.91	W40x294
415	415.0	1 020	304	46.0	26.0	139	865	78	43	928	3.20	2.90	W40x278
393	392.7	1 016	303	43.9	24.4	139	865	75	42	928	3.20	2.89	W40x264
350	349.4	1 008	302	40.0	21.1	140	865	72	41	928	3.18	2.88	W40x235
314	314.3	1 000	300	35.9	19.1	140	865	67	40	928	3.16	2.86	W40x211
272	272.3	990	300	31.0	16.5	142	865	63	38	928	3.15	2.85	W40x183
249	248.7	980	300	26.0	16.5	142	865	58	38	928	3.13	2.83	W40x167
222	222.0	970	300	21.1	16.0	142	865	53	38	928	3.11	2.81	W40x149

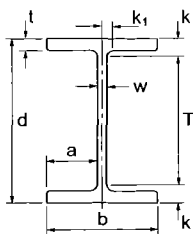
# W SHAPES

## W920 - W840



### PROPERTIES

Designation	Dead Load kN/m	Area mm <sup>2</sup>	Axis X-X				Axis Y-Y				Torsional Constant J	Warping Constant C <sub>w</sub>
			I <sub>x</sub>	S <sub>x</sub>	r <sub>x</sub>	Z <sub>x</sub>	I <sub>y</sub>	S <sub>y</sub>	r <sub>y</sub>	Z <sub>y</sub>	10 <sup>3</sup> mm <sup>4</sup>	10 <sup>9</sup> mm <sup>6</sup>
			10 <sup>6</sup> mm <sup>4</sup>	10 <sup>3</sup> mm <sup>3</sup>	mm	10 <sup>3</sup> mm <sup>3</sup>	10 <sup>6</sup> mm <sup>4</sup>	10 <sup>3</sup> mm <sup>3</sup>	mm	10 <sup>3</sup> mm <sup>3</sup>		
<b>W920</b>												
x1377	13.5	175 400	30 300	55 500	416	67 600	2 060	8 720	108	14 200	596 000	493 000
x1269	12.4	161 700	29 000	53 000	423	63 900	1 900	8 240	108	13 100	514 000	454 000
x1194	11.7	152 200	26 900	49 800	421	59 800	1 750	7 660	107	12 200	435 000	413 000
x1077	10.6	137 200	23 800	44 800	416	53 400	1 530	6 770	106	10 700	326 000	353 000
x970	9.52	123 700	21 000	40 300	412	47 700	1 340	6 000	104	9 490	243 000	304 000
x787	7.71	100 400	16 500	32 600	405	38 000	1 030	4 730	102	7 420	134 000	227 000
x725	7.10	92 400	14 900	29 900	402	34 700	932	4 290	100	6 730	106 000	202 000
x656	6.43	83 700	13 400	27 100	400	31 300	830	3 850	99.7	6 020	79 500	178 000
x588	5.76	75 000	11 800	24 200	397	27 800	728	3 410	98.6	5 310	58 100	154 000
x537	5.25	68 500	10 700	22 100	395	25 300	656	3 080	98.0	4 790	44 500	137 000
x491	4.80	62 600	9 660	20 200	394	23 000	590	2 800	97.3	4 340	34 400	122 000
x449	4.40	57 600	8 750	18 500	391	20 900	540	2 550	97.2	3 950	26 300	111 000
x420	4.11	53 500	8 130	17 300	390	19 500	501	2 370	96.8	3 670	21 500	102 000
x390	3.81	49 700	7 420	15 800	387	17 900	453	2 160	95.7	3 330	16 900	91 500
x368	3.58	46 800	6 920	14 900	386	16 800	421	2 010	95.1	3 100	14 100	84 700
x344	3.37	43 900	6 450	13 900	384	15 700	390	1 870	94.5	2 880	11 600	78 100
<b>W920</b>												
x381	3.74	48 600	6 960	14 600	379	17 000	219	1 410	67.2	2 240	21 800	45 100
x345	3.38	44 000	6 250	13 300	377	15 300	195	1 270	66.7	2 000	16 400	39 800
x313	3.06	39 900	5 480	11 800	371	13 600	170	1 100	65.4	1 750	11 500	34 300
x289	2.83	36 800	5 040	10 900	370	12 500	156	1 020	65.3	1 600	9 160	31 300
x271	2.66	34 600	4 710	10 200	369	11 800	145	946	64.8	1 490	7 630	28 900
x253	2.48	32 300	4 370	9 510	368	10 900	134	874	64.3	1 370	6 210	26 500
x238	2.33	30 300	4 060	8 870	366	10 200	123	806	63.7	1 270	5 100	24 300
x223	2.20	28 500	3 760	8 260	363	9 520	112	738	62.7	1 160	4 180	22 100
x201	1.97	25 600	3 250	7 190	356	8 340	94.4	621	60.7	982	2 880	18 400
<b>W840</b>												
x576	5.65	73 500	10 100	22 200	371	25 600	672	3 270	95.7	5 100	61 700	123 000
x527	5.18	67 200	9 150	20 300	369	23 300	607	2 970	95.0	4 620	47 800	110 000
x473	4.65	60 300	8 130	18 200	367	20 800	537	2 640	94.3	4 100	35 100	95 800
x433	4.25	55 200	7 360	16 600	365	18 900	484	2 390	93.5	3 710	27 000	85 500
x392	3.85	49 900	6 600	15 000	363	17 000	430	2 140	92.7	3 310	20 300	75 300
x359	3.53	45 700	5 920	13 600	359	15 400	389	1 930	92.1	2 980	15 100	67 400
x329	3.24	41 900	5 360	12 400	357	14 000	349	1 740	91.1	2 690	11 600	60 000
x299	2.94	38 100	4 800	11 200	355	12 700	312	1 560	90.4	2 410	8 660	53 200
<b>W840</b>												
x251	2.46	31 900	3 860	9 000	348	10 300	129	884	63.6	1 380	7 350	22 100
x226	2.22	28 800	3 400	7 990	343	9 160	114	774	62.8	1 210	5 140	19 300
x210	2.07	26 800	3 110	7 340	340	8 430	103	700	61.8	1 100	4 050	17 300
x193	1.90	24 700	2 780	6 630	336	7 620	90.3	618	60.5	971	3 050	15 100
x176	1.73	22 400	2 460	5 900	331	6 810	78.2	536	59.1	844	2 220	13 000



# W SHAPES

## W920 - W840

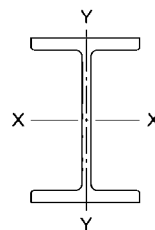
### DIMENSIONS AND SURFACE AREAS

Nominal Mass	Theo-retical Mass	Depth d	Flange Width b	Flange Thick-ness t	Web Thick-ness w	Distances					Surface Area (m <sup>2</sup> ) per metre of length		Imperial Designation
						a	T	k	k <sub>1</sub>	d - 2t	Total	Minus Top of Top Flange	
kg/m	kg/m	mm	mm	mm	mm	mm	mm	mm	mm	mm			
1 377	1 376.7	1 093	473	115.1	76.7	198	800	147	68	863	3.92	3.45	W36x925
1 269	1 269.0	1 093	461	115.1	64.0	199	800	147	62	863	3.90	3.44	W36x853
1 194	1 194.4	1 081	457	109.0	60.5	198	800	141	60	863	3.87	3.41	W36x802
1 077	1 076.6	1 061	451	99.1	55.0	198	800	131	58	863	3.82	3.37	W36x723
970	970.7	1 043	446	89.9	50.0	198	800	121	55	863	3.77	3.32	W36x652
787	786.6	1 011	437	73.9	40.9	198	800	105	50	863	3.69	3.25	W36x529
725	724.5	999	434	68.1	38.1	198	800	100	49	863	3.66	3.22	W36x487
656	655.7	987	431	62.0	34.5	198	800	94	47	863	3.63	3.20	W36x441
588	587.2	975	427	55.9	31.0	198	800	87	46	863	3.60	3.17	W36x395
537	535.8	965	425	51.1	28.4	198	800	83	44	863	3.57	3.15	W36x361
491	489.3	957	422	47.0	25.9	198	800	79	43	863	3.55	3.13	W36x330
449	448.5	948	423	42.7	24.0	200	800	74	42	863	3.54	3.12	W36x302
420	419.2	943	422	39.9	22.5	200	800	71	41	863	3.53	3.11	W36x282
390	388.0	936	420	36.6	21.3	199	800	68	41	863	3.51	3.09	W36x262
368	365.5	931	419	34.3	20.3	199	799	66	40	862	3.50	3.08	W36x247
344	343.2	927	418	32.0	19.3	199	800	64	40	863	3.49	3.07	W36x231
381	381.1	951	310	43.9	24.4	143	800	75	42	863	3.09	2.78	W36x256
345	344.8	943	308	39.9	22.1	143	800	71	41	863	3.07	2.77	W36x232
313	312.4	932	309	34.5	21.1	144	800	66	41	863	3.06	2.75	W36x210
289	288.3	927	308	32.0	19.4	144	800	64	40	863	3.05	2.74	W36x194
271	271.4	923	307	30.0	18.4	144	800	62	39	863	3.04	2.73	W36x182
253	253.4	919	306	27.9	17.3	144	800	59	39	863	3.03	2.72	W36x170
238	238.0	915	305	25.9	16.5	144	800	57	38	863	3.02	2.71	W36x160
223	223.9	911	304	23.9	15.9	144	800	55	38	863	3.01	2.70	W36x150
201	201.0	903	304	20.1	15.2	144	800	52	38	863	2.99	2.69	W36x135
576	576.6	913	411	57.9	32.0	190	734	89	46	797	3.41	3.00	W33x387
527	528.2	903	409	53.1	29.5	190	734	85	45	797	3.38	2.97	W33x354
473	473.8	893	406	48.0	26.4	190	734	80	43	797	3.36	2.95	W33x318
433	433.8	885	404	43.9	24.4	190	734	75	42	797	3.34	2.93	W33x291
392	392.2	877	401	39.9	22.1	189	734	71	41	797	3.31	2.91	W33x263
359	359.9	868	403	35.6	21.1	191	734	67	41	797	3.31	2.90	W33x241
329	330.0	862	401	32.4	19.7	191	734	64	40	797	3.29	2.89	W33x221
299	299.9	855	400	29.2	18.2	191	734	61	39	797	3.27	2.87	W33x201
251	250.6	859	292	31.0	17.0	138	734	63	39	797	2.85	2.56	W33x169
226	226.6	851	294	26.8	16.1	139	734	58	38	797	2.85	2.55	W33x152
210	210.8	846	293	24.4	15.4	139	734	56	38	797	2.83	2.54	W33x141
193	193.5	840	292	21.7	14.7	139	734	53	37	797	2.82	2.53	W33x130
176	176.0	835	292	18.8	14.0	139	734	50	37	797	2.81	2.52	W33x118

Sections highlighted in yellow are commonly used sizes and are generally readily available.

# W SHAPES

## W760 - W690

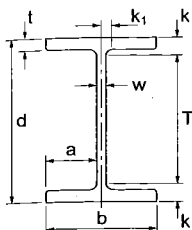


### PROPERTIES

Designation	Dead Load kN/m	Area mm <sup>2</sup>	Axis X-X				Axis Y-Y				Torsional Constant J	Warping Constant C <sub>w</sub>
			I <sub>x</sub>	S <sub>x</sub>	r <sub>x</sub>	Z <sub>x</sub>	I <sub>y</sub>	S <sub>y</sub>	r <sub>y</sub>	Z <sub>y</sub>		
			10 <sup>6</sup> mm <sup>4</sup>	10 <sup>3</sup> mm <sup>3</sup>	mm	10 <sup>3</sup> mm <sup>3</sup>	10 <sup>6</sup> mm <sup>4</sup>	10 <sup>3</sup> mm <sup>3</sup>	mm	10 <sup>3</sup> mm <sup>3</sup>		
<b>W760</b>												
x582	5.72	74 200	8 620	20 400	341	23 800	644	3 250	93.2	5 080	72 200	98 300
x531	5.21	67 600	7 770	18 600	339	21 600	578	2 940	92.4	4 580	55 600	87 000
x484	4.76	61 700	6 990	17 000	336	19 500	517	2 650	91.4	4 120	42 800	76 800
x434	4.26	55 300	6 190	15 200	334	17 400	455	2 350	90.7	3 650	31 300	66 800
x389	3.82	49 500	5 450	13 600	332	15 500	399	2 070	89.8	3 210	22 500	57 800
x350	3.43	44 500	4 870	12 200	330	13 900	355	1 860	89.1	2 870	16 800	50 800
x314	3.09	40 000	4 290	10 900	327	12 300	316	1 640	88.7	2 540	11 800	44 700
x284	2.79	36 200	3 830	9 820	325	11 100	280	1 470	87.9	2 260	8 750	39 300
x257	2.53	32 800	3 430	8 880	323	9 970	250	1 310	87.2	2 020	6 510	34 800
<b>W760</b>												
x220	2.16	28 100	2 780	7 140	315	8 190	94.4	710	58.0	1 110	6 050	13 200
x196	1.93	25 100	2 400	6 240	309	7 170	81.7	610	57.1	959	4 040	11 300
x185	1.81	23 500	2 230	5 820	308	6 690	75.1	563	56.5	884	3 330	10 300
x173	1.70	22 100	2 060	5 400	305	6 210	68.7	515	55.7	810	2 690	9 420
x161	1.57	20 500	1 860	4 900	302	5 660	60.7	457	54.5	720	2 070	8 280
x147	1.44	18 800	1 660	4 410	298	5 100	52.9	399	53.1	631	1 560	7 160
x134	1.31	17 000	1 500	4 010	297	4 630	47.7	361	53.0	568	1 180	6 430
<b>W690</b>												
x802	7.86	102 200	10 600	25 700	322	30 900	875	4 520	92.6	7 140	203 000	119 000
x548	5.38	69 800	6 730	17 400	310	20 400	543	2 920	88.1	4 570	70 700	68 200
x500	4.91	63 700	6 060	15 900	308	18 500	487	2 640	87.4	4 110	54 600	60 300
x457	4.49	58 200	5 470	14 500	306	16 800	439	2 390	86.7	3 720	42 300	53 600
x419	4.11	53 300	4 950	13 300	305	15 300	395	2 170	86.0	3 370	33 000	47 700
x384	3.77	48 900	4 490	12 200	303	14 000	357	1 970	85.3	3 050	25 700	42 600
x350	3.44	44 600	4 030	11 100	300	12 600	319	1 770	84.4	2 740	19 500	37 600
x323	3.18	41 100	3 710	10 300	300	11 700	294	1 640	84.4	2 530	15 700	34 400
x289	2.83	36 800	3 260	9 140	298	10 300	256	1 440	83.4	2 220	11 200	29 600
x265	2.61	33 700	2 920	8 270	294	9 330	231	1 290	82.7	1 990	8 340	26 400
x240	2.36	30 600	2 630	7 490	292	8 430	206	1 160	82.0	1 790	6 270	23 400
x217	2.15	27 700	2 360	6 790	291	7 610	185	1 040	81.5	1 610	4 720	20 800
<b>W690</b>												
x192	1.88	24 400	1 980	5 640	285	6 460	76.4	602	56.0	941	4 610	8 680
x170	1.67	21 600	1 700	4 900	280	5 620	66.2	517	55.3	809	3 040	7 410
x152	1.49	19 400	1 510	4 380	279	5 000	57.8	455	54.6	710	2 200	6 420
x140	1.37	17 900	1 360	3 980	276	4 550	51.7	407	53.9	636	1 670	5 720
x125	1.23	16 000	1 180	3 500	272	4 010	44.1	349	52.5	546	1 170	4 830

# W SHAPES

## W760 - W690



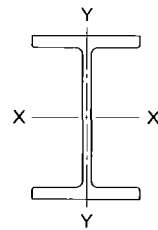
### DIMENSIONS AND SURFACE AREAS

Nominal Mass	Theoretical Mass	Depth d	Flange Width b	Flange Thickness t	Web Thickness w	Distances					Surface Area (m <sup>2</sup> ) per metre of length		Imperial Designation
						a	T	k	k <sub>1</sub>	d - 2t	Total	Minus Top of Top Flange	
kg/m	kg/m	mm	mm	mm	mm	mm	mm	mm	mm	mm			
582	582.9	843	396	62.0	34.5	181	656	94	47	719	3.20	2.81	W30x391
531	531.6	833	393	56.9	31.5	181	656	88	46	719	3.18	2.78	W30x357
484	485.3	823	390	52.1	29.0	181	656	84	45	719	3.15	2.76	W30x326
434	434.4	813	387	47.0	25.9	181	656	79	43	719	3.12	2.74	W30x292
389	389.2	803	385	41.9	23.6	181	656	73	42	719	3.10	2.71	W30x261
350	350.3	795	382	38.1	21.1	180	656	70	41	719	3.08	2.69	W30x235
314	315.3	786	384	33.4	19.7	182	656	65	40	719	3.07	2.68	W30x211
284	284.8	779	382	30.1	18.0	182	656	62	39	719	3.05	2.67	W30x191
257	258.5	773	381	27.1	16.6	182	656	59	38	719	3.04	2.66	W30x173
220	220.2	779	266	30.0	16.5	125	656	62	38	719	2.59	2.32	W30x148
196	196.8	770	268	25.4	15.6	126	656	57	38	719	2.58	2.31	W30x132
185	184.8	766	267	23.6	14.9	126	656	55	37	719	2.57	2.30	W30x124
173	173.6	762	267	21.6	14.4	126	656	53	37	719	2.56	2.30	W30x116
161	160.4	758	266	19.3	13.8	126	656	51	37	719	2.55	2.29	W30x108
147	147.1	753	265	17.0	13.2	126	656	49	37	719	2.54	2.27	W30x99
134	133.2	750	264	15.5	11.9	126	656	47	36	719	2.53	2.27	W30x90
802	801.4	826	387	89.9	50.0	169	583	121	55	646	3.10	2.71	W27x539
548	548.6	772	372	63.0	35.1	168	583	95	48	646	2.96	2.59	W27x368
500	500.5	762	369	57.9	32.0	169	583	89	46	646	2.94	2.57	W27x336
457	458.2	752	367	53.1	29.5	169	583	85	45	646	2.91	2.55	W27x307
419	419.1	744	364	49.0	26.9	169	583	81	43	646	2.89	2.53	W27x281
384	384.7	736	362	45.0	24.9	169	583	77	42	646	2.87	2.51	W27x258
350	351.0	728	360	40.9	23.1	168	583	72	42	646	2.85	2.49	W27x235
323	324.4	722	359	38.1	21.1	169	583	70	41	646	2.84	2.48	W27x217
289	289.1	714	356	34.0	19.0	169	583	66	40	646	2.81	2.46	W27x194
265	265.7	706	358	30.2	18.4	170	583	62	39	646	2.81	2.45	W27x178
240	241.1	701	356	27.4	16.8	170	583	59	38	646	2.79	2.44	W27x161
217	218.9	695	355	24.8	15.4	170	582	56	38	645	2.78	2.42	W27x146
192	191.4	702	254	27.9	15.5	119	583	59	38	646	2.39	2.14	W27x129
170	169.9	693	256	23.6	14.5	121	583	55	37	646	2.38	2.13	W27x114
152	152.1	688	254	21.1	13.1	120	583	53	37	646	2.37	2.11	W27x102
140	139.8	684	254	18.9	12.4	121	583	50	36	646	2.36	2.11	W27x94
125	125.5	678	253	16.3	11.7	121	582	48	36	645	2.34	2.09	W27x84

Sections highlighted in yellow are commonly used sizes and are generally readily available.

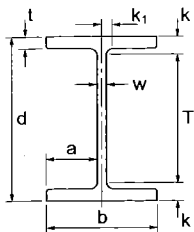
# W SHAPES

## W610 - W530



### PROPERTIES

Designation	Dead Load	Area	Axis X-X				Axis Y-Y				Torsional Constant	Warping Constant
			$I_x$	$S_x$	$r_x$	$Z_x$	$I_y$	$S_y$	$r_y$	$Z_y$		
			$10^6 \text{ mm}^4$	$10^3 \text{ mm}^3$	mm	$10^3 \text{ mm}^3$	$10^6 \text{ mm}^4$	$10^3 \text{ mm}^3$	mm	$10^3 \text{ mm}^3$		
<b>W610</b>												
x551	5.40	70 200	5 570	15 700	282	18 600	484	2 790	83.0	4 380	83 800	49 900
x498	4.89	63 500	4 950	14 200	279	16 700	426	2 480	81.9	3 890	63 200	43 100
x455	4.45	57 900	4 440	12 900	277	15 100	381	2 240	81.1	3 500	48 800	37 900
x415	4.07	52 900	4 000	11 800	275	13 700	343	2 030	80.5	3 160	37 700	33 600
x372	3.65	47 400	3 530	10 600	273	12 200	302	1 800	79.8	2 800	27 700	29 100
x341	3.34	43 400	3 180	9 630	271	11 100	271	1 630	79.0	2 520	21 300	25 800
x307	3.01	39 100	2 840	8 690	269	9 930	240	1 450	78.2	2 240	15 900	22 500
x285	2.80	36 100	2 610	8 060	268	9 170	221	1 340	77.9	2 070	12 800	20 500
x262	2.56	33 300	2 360	7 360	266	8 350	198	1 210	77.2	1 870	9 900	18 300
x241	2.37	30 800	2 150	6 780	264	7 670	184	1 120	77.4	1 730	7 700	16 800
x217	2.14	27 700	1 910	6 070	262	6 850	163	995	76.7	1 530	5 600	14 700
x195	1.92	24 800	1 680	5 400	260	6 070	142	871	75.6	1 340	3 970	12 700
x174	1.71	22 200	1 470	4 780	257	5 360	124	761	74.7	1 170	2 800	10 900
x155	1.52	19 700	1 290	4 220	256	4 730	108	666	73.9	1 020	1 950	9 450
<b>W610</b>												
x153	1.51	19 600	1 250	4 020	253	4 600	50.0	437	50.5	682	2 950	4 470
x140	1.37	17 900	1 120	3 630	250	4 150	45.1	392	50.3	613	2 180	3 990
x125	1.23	15 900	985	3 220	249	3 670	39.3	343	49.7	535	1 540	3 450
x113	1.11	14 500	875	2 880	246	3 290	34.3	300	48.7	469	1 120	2 990
x101	0.997	13 000	764	2 530	243	2 900	29.5	259	47.7	404	781	2 550
<b>W610</b>												
x92	0.905	11 700	646	2 140	234	2 510	14.4	161	35.0	258	710	1 250
x82	0.803	10 500	560	1 870	232	2 200	12.1	136	34.0	218	488	1 040
<b>W530</b>												
x409	4.01	52 200	3 170	10 300	247	12 100	325	1 990	79.1	3 100	41 300	25 300
x369	3.61	47 000	2 810	9 310	245	10 800	287	1 770	78.3	2 750	30 800	21 900
x332	3.25	42 300	2 480	8 350	242	9 660	254	1 580	77.6	2 440	22 600	19 000
x300	2.94	38 200	2 210	7 550	241	8 670	225	1 410	76.7	2 180	17 000	16 600
x272	2.66	34 600	1 970	6 820	239	7 790	200	1 260	76.1	1 950	12 800	14 600
x248	2.42	31 500	1 770	6 220	238	7 060	180	1 140	75.7	1 760	9 770	13 000
x219	2.15	27 900	1 510	5 390	233	6 110	157	986	75.0	1 520	6 420	11 000
x196	1.93	25 000	1 340	4 840	231	5 460	139	877	74.4	1 350	4 700	9 640
x182	1.78	23 200	1 240	4 480	231	5 040	127	808	74.2	1 240	3 740	8 820
x165	1.62	21 100	1 110	4 060	230	4 550	114	726	73.4	1 110	2 830	7 790
x150	1.48	19 200	1 010	3 710	229	4 150	103	659	73.2	1 010	2 160	7 030
<b>W530</b>												
x138	1.36	17 600	861	3 140	221	3 610	38.7	362	46.9	569	2 500	2 670
x123	1.21	15 700	761	2 800	220	3 210	33.8	319	46.4	499	1 800	2 310
x109	1.07	13 900	667	2 480	219	2 830	29.5	280	46.1	437	1 260	2 000
x101	0.995	12 900	617	2 300	219	2 620	26.9	256	45.6	400	1 020	1 820
x92	0.907	11 800	552	2 070	217	2 360	23.8	228	44.9	355	762	1 590
x82	0.805	10 500	477	1 810	213	2 060	20.3	194	44.0	303	518	1 340
x72	0.706	9 180	401	1 530	209	1 760	16.2	156	42.0	245	338	1 060



# W SHAPES

## W610 - W530

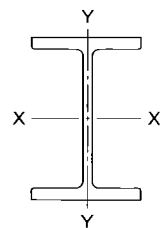
### DIMENSIONS AND SURFACE AREAS

Nominal Mass	Theoretical Mass	Depth d	Flange Width b	Flange Thickness t	Web Thickness w	Distances					Surface Area (m <sup>2</sup> ) per metre of length		Imperial Designation
						a	T	k	k <sub>1</sub>	d - 2t	Total	Minus Top of Top Flange	
kg/m	kg/m	mm	mm	mm	mm	mm	mm	mm	mm	mm			
551	551.1	711	347	69.1	38.6	154	510	101	49	573	2.73	2.39	W24x370
498	498.2	699	343	63.0	35.1	154	510	95	48	573	2.70	2.36	W24x335
455	454.1	689	340	57.9	32.0	154	510	89	46	573	2.67	2.33	W24x306
415	415.5	679	338	53.1	29.5	154	510	85	45	573	2.65	2.31	W24x279
372	372.3	669	335	48.0	26.4	154	510	80	43	573	2.63	2.29	W24x250
341	340.4	661	333	43.9	24.4	154	510	75	42	573	2.61	2.27	W24x229
307	307.3	653	330	39.9	22.1	154	510	71	41	573	2.58	2.25	W24x207
285	285.3	647	329	37.1	20.6	154	510	69	40	573	2.57	2.24	W24x192
262	261.1	641	327	34.0	19.0	154	510	66	40	573	2.55	2.23	W24x176
241	241.7	635	329	31.0	17.9	156	510	63	39	573	2.55	2.22	W24x162
217	217.9	628	328	27.7	16.5	156	510	59	38	573	2.54	2.21	W24x146
195	195.6	622	327	24.4	15.4	156	510	56	38	573	2.52	2.19	W24x131
174	174.3	616	325	21.6	14.0	156	510	53	37	573	2.50	2.18	W24x117
155	154.9	611	324	19.0	12.7	156	510	51	36	573	2.49	2.17	W24x104
153	153.6	623	229	24.9	14.0	108	510	56	37	573	2.13	1.91	W24x103
140	140.1	617	230	22.2	13.1	108	510	54	37	573	2.13	1.90	W24x94
125	125.1	612	229	19.6	11.9	109	510	51	36	573	2.12	1.89	W24x84
113	113.4	608	228	17.3	11.2	108	510	49	36	573	2.11	1.88	W24x76
101	101.7	603	228	14.9	10.5	109	510	46	35	573	2.10	1.87	W24x68
92	92.3	603	179	15.0	10.9	84	528	38	26	573	1.90	1.72	W24x62
82	81.9	599	178	12.8	10.0	84	528	35	26	573	1.89	1.71	W24x55
409	408.6	613	327	55.6	31.0	148	439	87	46	502	2.47	2.15	W21x275
369	367.9	603	324	50.5	27.9	148	439	82	44	502	2.45	2.12	W21x248
332	331.2	593	322	45.5	25.4	148	439	77	43	502	2.42	2.10	W21x223
300	299.5	585	319	41.4	23.1	148	439	73	42	502	2.40	2.08	W21x201
272	271.3	577	317	37.6	21.1	148	439	69	41	502	2.38	2.06	W21x182
248	246.6	571	315	34.5	19.0	148	439	66	40	502	2.36	2.05	W21x166
219	218.9	560	318	29.2	18.3	150	439	61	39	502	2.36	2.04	W21x147
196	196.5	554	316	26.3	16.5	150	438	58	38	501	2.34	2.02	W21x132
182	181.7	551	315	24.4	15.2	150	439	56	38	502	2.33	2.02	W21x122
165	165.3	546	313	22.2	14.0	150	439	54	37	502	2.32	2.00	W21x111
150	150.6	543	312	20.3	12.7	150	439	52	36	502	2.31	2.00	W21x101
138	138.3	549	214	23.6	14.7	100	461	44	26	502	1.92	1.71	W21x93
123	123.2	544	212	21.2	13.1	99	461	42	26	502	1.91	1.70	W21x83
109	109.0	539	211	18.8	11.6	100	460	39	25	501	1.90	1.69	W21x73
101	101.4	537	210	17.4	10.9	100	461	38	24	502	1.89	1.68	W21x68
92	92.5	533	209	15.6	10.2	99	461	36	24	502	1.88	1.67	W21x62
82	82.1	528	209	13.3	9.5	100	460	34	24	501	1.87	1.66	W21x55
72	72.0	524	207	10.9	9.0	99	461	31	24	502	1.86	1.65	W21x48

Sections highlighted in yellow are commonly used sizes and are generally readily available.

# W SHAPES

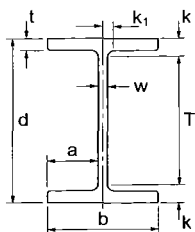
## W530 - W410



### PROPERTIES

Designation	Dead Load kN/m	Area mm <sup>2</sup>	Axis X-X				Axis Y-Y				Torsional Constant J 10 <sup>3</sup> mm <sup>4</sup>	Warping Constant C <sub>w</sub> 10 <sup>9</sup> mm <sup>6</sup>
			I <sub>x</sub>	S <sub>x</sub>	r <sub>x</sub>	Z <sub>x</sub>	I <sub>y</sub>	S <sub>y</sub>	r <sub>y</sub>	Z <sub>y</sub>		
			10 <sup>6</sup> mm <sup>4</sup>	10 <sup>3</sup> mm <sup>3</sup>	mm	10 <sup>3</sup> mm <sup>3</sup>	10 <sup>6</sup> mm <sup>4</sup>	10 <sup>3</sup> mm <sup>3</sup>	mm	10 <sup>3</sup> mm <sup>3</sup>		
<b>W530</b>												
x85	0.830	10 800	485	1 810	212	2 100	12.6	152	34.2	242	737	849
x74	0.733	9 480	411	1 550	208	1 810	10.4	125	33.1	200	480	692
x66	0.644	8 390	351	1 340	205	1 560	8.57	104	32.0	166	320	565
<b>W460</b>												
x464	4.55	59 100	2 900	10 200	222	12 400	331	2 170	74.9	3 400	73 100	20 500
x421	4.14	53 700	2 570	9 250	219	11 100	293	1 940	73.9	3 030	55 700	17 700
x384	3.77	49 000	2 290	8 420	217	10 000	261	1 750	73.1	2 730	42 700	15 500
x349	3.42	44 400	2 040	7 640	214	9 010	233	1 570	72.3	2 440	32 800	13 500
x315	3.08	40 100	1 800	6 850	212	8 020	204	1 390	71.4	2 160	24 300	11 600
x286	2.80	36 400	1 610	6 230	210	7 240	183	1 260	70.9	1 940	18 600	10 200
x260	2.55	33 100	1 440	5 650	208	6 530	163	1 130	70.1	1 740	14 100	8 950
x235	2.30	29 900	1 270	5 080	206	5 840	145	1 010	69.5	1 550	10 500	7 790
x213	2.09	27 100	1 140	4 620	205	5 270	129	909	69.1	1 400	7 970	6 890
x193	1.90	24 700	1 020	4 190	204	4 750	115	816	68.5	1 250	6 030	6 060
x177	1.74	22 600	910	3 780	201	4 280	105	735	68.2	1 130	4 400	5 440
x158	1.55	20 100	796	3 350	199	3 770	91.4	643	67.4	989	3 110	4 670
x144	1.42	18 400	726	3 080	199	3 450	83.6	591	67.4	906	2 440	4 230
x128	1.26	16 300	637	2 730	197	3 050	73.3	520	67.0	796	1 710	3 670
x113	1.11	14 400	556	2 400	196	2 670	63.3	452	66.3	691	1 180	3 150
<b>W460</b>												
x106	1.04	13 400	488	2 080	190	2 390	25.1	259	43.2	405	1 460	1 260
x97	0.947	12 300	445	1 910	190	2 180	22.8	237	43.1	368	1 130	1 140
x89	0.875	11 400	409	1 770	190	2 010	20.9	218	42.9	339	905	1 040
x82	0.803	10 500	370	1 610	188	1 830	18.6	195	42.2	303	690	918
x74	0.727	9 480	332	1 460	188	1 650	16.6	175	41.9	271	516	813
<b>W460</b>												
x68	0.672	8 710	297	1 290	184	1 490	9.40	122	32.8	192	508	463
x60	0.584	7 610	255	1 120	183	1 280	7.96	104	32.4	163	334	388
x52	0.510	6 650	212	942	179	1 090	6.34	83.4	30.9	131	209	306
<b>W410</b>												
x149	1.46	19 000	618	2 870	180	3 250	77.7	586	63.9	900	3 210	3 200
x132	1.30	16 900	538	2 530	179	2 850	67.4	512	63.3	785	2 250	2 730
x114	1.12	14 600	461	2 200	178	2 460	57.2	439	62.7	671	1 480	2 300
x100	0.977	12 700	398	1 920	177	2 130	49.5	381	62.5	581	993	1 960
<b>W410</b>												
x85	0.833	10 800	315	1 510	171	1 720	18.0	199	40.8	310	924	717
x74	0.735	9 480	275	1 330	170	1 510	15.6	173	40.4	269	636	614
x67	0.662	8 580	245	1 200	169	1 360	13.8	154	40.1	239	468	540
x60	0.583	7 610	216	1 060	169	1 190	12.0	135	39.9	209	327	468
x54	0.524	6 840	186	923	165	1 050	10.1	114	38.5	177	225	388
<b>W410</b>												
x46	0.453	5 880	156	772	163	884	5.14	73.4	29.5	115	192	197
x39	0.384	4 950	126	634	159	730	4.04	57.6	28.4	90.6	110	154





# W SHAPES

## W530 - W410

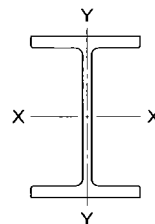
### DIMENSIONS AND SURFACE AREAS

Nominal Mass	Theoretical Mass	Depth d	Flange Width b	Flange Thickness t	Web Thickness w	Distances					Surface Area (m <sup>2</sup> ) per metre of length		Imperial Designation
						a	T	k	k <sub>1</sub>	d - 2t	Total	Minus Top of Top Flange	
kg/m	kg/m	mm	mm	mm	mm	mm	mm	mm	mm	mm			
85	84.7	535	166	16.5	10.3	78	461	37	24	502	1.71	1.55	W21x57
74	74.7	529	166	13.6	9.7	78	461	34	24	502	1.70	1.54	W21x50
66	65.7	525	165	11.4	8.9	78	461	32	23	502	1.69	1.53	W21x44
464	464.0	567	305	69.6	38.6	133	385	91	39	428	2.28	1.97	W18x311
421	421.8	555	302	63.5	35.6	133	385	85	38	428	2.25	1.94	W18x283
384	384.1	545	299	58.4	32.5	133	385	80	36	428	2.22	1.92	W18x258
349	348.9	535	296	53.6	29.5	133	385	75	35	428	2.20	1.90	W18x234
315	314.2	525	293	48.5	26.9	133	385	70	33	428	2.17	1.88	W18x211
286	285.6	517	291	44.4	24.4	133	385	66	32	428	2.15	1.86	W18x192
260	259.9	509	289	40.4	22.6	133	385	62	32	428	2.13	1.84	W18x175
235	234.8	501	287	36.6	20.6	133	384	58	31	428	2.11	1.82	W18x158
213	212.7	495	285	33.5	18.5	133	384	55	30	428	2.09	1.81	W18x143
193	193.3	489	283	30.5	17.0	133	384	52	29	428	2.08	1.79	W18x130
177	177.3	482	286	26.9	16.6	135	385	49	29	428	2.07	1.79	W18x119
158	157.7	476	284	23.9	15.0	135	385	46	28	428	2.06	1.77	W18x106
144	144.5	472	283	22.1	13.6	135	384	44	27	428	2.05	1.77	W18x97
128	128.4	467	282	19.6	12.2	135	384	41	26	428	2.04	1.76	W18x86
113	113.0	463	280	17.3	10.8	135	385	39	26	428	2.02	1.74	W18x76
106	105.7	469	194	20.6	12.6	91	391	39	23	428	1.69	1.49	W18x71
97	96.5	466	193	19.0	11.4	91	391	38	23	428	1.68	1.49	W18x65
89	89.3	463	192	17.7	10.5	91	391	36	22	428	1.67	1.48	W18x60
82	81.9	460	191	16.0	9.9	91	391	35	22	428	1.66	1.47	W18x55
74	74.2	457	190	14.5	9.0	91	391	33	22	428	1.66	1.47	W18x50
68	68.5	459	154	15.4	9.1	72	391	34	22	428	1.52	1.36	W18x46
60	59.5	455	153	13.3	8.0	73	391	32	21	428	1.51	1.35	W18x40
52	52.0	450	152	10.8	7.6	72	391	29	21	428	1.49	1.34	W18x35
149	149.3	431	265	25.0	14.9	125	337	47	28	381	1.89	1.63	W16x100
132	132.1	425	263	22.2	13.3	125	337	44	27	381	1.88	1.61	W16x89
114	114.5	420	261	19.3	11.6	125	338	41	26	381	1.86	1.60	W16x77
100	99.6	415	260	16.9	10.0	125	338	39	25	381	1.85	1.59	W16x67
85	85.0	417	181	18.2	10.9	85	340	39	24	381	1.54	1.36	W16x57
74	74.9	413	180	16.0	9.7	85	340	37	24	381	1.53	1.35	W16x50
67	67.5	410	179	14.4	8.8	85	340	35	23	381	1.52	1.34	W16x45
60	59.5	407	178	12.8	7.7	85	340	33	23	381	1.51	1.33	W16x40
54	53.4	403	177	10.9	7.5	85	340	31	23	381	1.50	1.32	W16x36
46	46.2	403	140	11.2	7.0	67	344	30	21	381	1.35	1.21	W16x31
39	39.2	399	140	8.8	6.4	67	344	27	20	381	1.35	1.21	W16x26

Sections highlighted in yellow are commonly used sizes and are generally readily available.

# W SHAPES

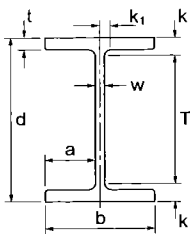
## W360



### PROPERTIES

Designation	Dead Load kN/m	Area mm <sup>2</sup>	Axis X-X				Axis Y-Y				Torsional Constant J 10 <sup>3</sup> mm <sup>4</sup>	Warping Constant C <sub>w</sub> 10 <sup>9</sup> mm <sup>6</sup>
			I <sub>x</sub>	S <sub>x</sub>	r <sub>x</sub>	Z <sub>x</sub>	I <sub>y</sub>	S <sub>y</sub>	r <sub>y</sub>	Z <sub>y</sub>		
			10 <sup>6</sup> mm <sup>4</sup>	10 <sup>3</sup> mm <sup>3</sup>	mm	10 <sup>3</sup> mm <sup>3</sup>	10 <sup>6</sup> mm <sup>4</sup>	10 <sup>3</sup> mm <sup>3</sup>	mm	10 <sup>3</sup> mm <sup>3</sup>		
<b>W360</b>												
x1299	12.7	165 000	7 550	25 200	214	33 200	2 540	10 700	124	16 700	944 000	135 000
x1202	11.8	153 000	6 640	22 900	208	30 000	2 290	9 710	122	15 200	762 000	116 000
x1086	10.7	139 000	5 960	20 900	207	27 200	1 960	8 650	119	13 400	605 000	96 700
x990	9.72	126 000	5 190	18 900	203	24 300	1 730	7 740	117	12 000	469 000	82 000
x900	8.85	115 000	4 500	17 000	198	21 600	1 530	6 940	116	10 700	364 000	69 200
x818	8.03	105 000	3 920	15 300	194	19 300	1 360	6 200	114	9 560	278 000	58 900
x744	7.30	94 800	3 420	13 700	190	17 200	1 200	5 550	112	8 550	214 000	50 200
x677	6.65	86 500	2 990	12 400	186	15 300	1 070	4 990	111	7 680	164 000	43 100
x634	6.22	80 600	2 740	11 600	184	14 200	983	4 630	110	7 120	138 000	38 700
x592	5.81	75 500	2 500	10 800	182	13 100	902	4 280	109	6 570	114 000	34 800
x551	5.40	70 300	2 260	9 940	180	12 100	825	3 950	108	6 050	92 500	31 000
x509	5.00	65 200	2 050	9 170	178	11 000	754	3 630	108	5 550	73 900	27 700
x463	4.54	59 000	1 800	8 280	175	9 880	670	3 250	107	4 980	56 500	23 900
x421	4.13	53 700	1 600	7 510	172	8 880	601	2 940	106	4 490	43 400	20 800
x382	3.75	48 800	1 410	6 790	170	7 960	536	2 640	105	4 030	32 800	18 200
x347	3.40	44 200	1 250	6 140	168	7 140	481	2 380	104	3 630	24 800	15 900
x314	3.07	40 000	1 100	5 530	166	6 370	426	2 120	103	3 240	18 500	13 800
x287	2.82	36 600	997	5 070	165	5 810	388	1 940	103	2 960	14 500	12 300
x262	2.58	33 400	894	4 620	163	5 260	350	1 760	102	2 680	11 000	11 000
x237	2.32	30 100	788	4 150	162	4 690	310	1 570	102	2 390	8 180	9 500
x216	2.12	27 500	711	3 790	161	4 260	283	1 430	101	2 180	6 320	8 520
<b>W360</b>												
x196	1.93	25 000	636	3 420	159	3 840	229	1 220	95.6	1 860	5 130	6 830
x179	1.76	22 800	574	3 120	159	3 480	207	1 110	95.2	1 680	3 910	6 120
x162	1.59	20 600	515	2 830	158	3 140	186	1 000	94.9	1 520	2 940	5 430
x147	1.45	18 800	463	2 570	157	2 840	167	904	94.3	1 370	2 230	4 840
x134	1.31	17 100	415	2 330	156	2 560	151	817	94.0	1 240	1 680	4 310
<b>W360</b>												
x122	1.19	15 500	365	2 010	154	2 270	61.5	478	63.0	732	2 110	1 790
x110	1.08	14 100	331	1 840	154	2 060	55.7	435	63.0	664	1 600	1 610
x101	0.992	12 900	301	1 690	153	1 880	50.6	397	62.7	605	1 250	1 450
x91	0.890	11 500	267	1 510	152	1 680	44.8	353	62.3	538	914	1 270
<b>W360</b>												
x79	0.777	10 100	226	1 280	150	1 430	24.2	236	48.9	362	811	687
x72	0.701	9 100	201	1 150	149	1 280	21.4	210	48.5	322	601	600
x64	0.626	8 130	178	1 030	148	1 140	18.8	186	48.1	284	436	524

☐ When subject to tension, bolted connections are preferred for these sections.



# W SHAPES

## W360

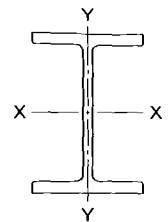
### DIMENSIONS AND SURFACE AREAS

Nominal Mass	Theoretical Mass	Depth d	Flange Width b	Flange Thickness t	Web Thickness w	Distances					Surface Area (m <sup>2</sup> ) per metre of length		Imperial Designation
						a	T	k	k <sub>1</sub>	d - 2t	Total	Minus Top of Top Flange	
kg/m	kg/m	mm	mm	mm	mm	mm	mm	mm	mm	mm			
1 299	1 299.0	600	476	140.0	100.0	188	257	172	80	320	2.90	2.43	W14x873
1 202	1 201.5	580	471	130.0	95.0	188	257	162	78	320	2.85	2.38	W14x808
1 086	1 087.8	569	454	125.0	78.0	188	256	157	69	319	2.80	2.34	W14x730
990	991.0	550	448	115.0	71.9	188	257	147	66	320	2.75	2.30	W14x665
900	902.1	531	442	106.0	65.9	188	256	138	63	319	2.70	2.26	W14x605
818	819.0	514	437	97.0	60.5	188	257	129	60	320	2.66	2.22	W14x550
744	744.2	498	432	88.9	55.6	188	257	120	58	320	2.61	2.18	W14x500
677	677.8	483	428	81.5	51.2	188	257	113	56	320	2.58	2.15	W14x455
634	634.3	474	424	77.1	47.6	188	257	109	54	320	2.55	2.12	W14x426
592	592.6	465	421	72.3	45.0	188	257	104	53	320	2.52	2.10	W14x398
551	550.6	455	418	67.6	42.0	188	257	99	51	320	2.50	2.08	W14x370
509	509.4	446	416	62.7	39.1	188	258	94	50	321	2.48	2.06	W14x342
463	462.8	435	412	57.4	35.8	188	257	89	48	320	2.45	2.03	W14x311
421	421.6	425	409	52.6	32.8	188	257	84	46	320	2.42	2.01	W14x283
382	382.3	416	406	48.0	29.8	188	257	80	45	320	2.40	1.99	W14x257
347	346.9	407	404	43.7	27.2	188	257	75	44	320	2.38	1.97	W14x233
314	313.3	399	401	39.6	24.9	188	257	71	42	320	2.35	1.95	W14x211
287	287.5	393	399	36.6	22.6	188	257	68	41	320	2.34	1.94	W14x193
262	262.7	387	398	33.3	21.1	188	257	65	41	320	2.32	1.93	W14x176
237	236.2	380	395	30.2	18.9	188	257	62	39	320	2.30	1.91	W14x159
216	216.3	375	394	27.7	17.3	188	257	59	39	320	2.29	1.90	W14x145
196	196.5	372	374	26.2	16.4	179	257	58	38	320	2.21	1.83	W14x132
179	179.2	368	373	23.9	15.0	179	257	55	38	320	2.20	1.83	W14x120
162	161.9	364	371	21.8	13.3	179	257	53	37	320	2.19	1.81	W14x109
147	147.5	360	370	19.8	12.3	179	257	51	36	320	2.18	1.81	W14x99
134	133.9	356	369	18.0	11.2	179	257	50	36	320	2.17	1.80	W14x90
122	121.7	363	257	21.7	13.0	122	276	44	27	320	1.73	1.47	W14x82
110	110.2	360	256	19.9	11.4	122	277	42	26	320	1.72	1.47	W14x74
101	101.2	357	255	18.3	10.5	122	277	40	26	320	1.71	1.46	W14x68
91	90.8	353	254	16.4	9.5	122	277	38	25	320	1.70	1.45	W14x61
79	79.2	354	205	16.8	9.4	98	277	39	25	320	1.51	1.30	W14x53
72	71.5	350	204	15.1	8.6	98	276	37	25	320	1.50	1.29	W14x48
64	63.9	347	203	13.5	7.7	98	276	35	24	320	1.49	1.29	W14x43

Sections highlighted in yellow are commonly used sizes and are generally readily available.

# W SHAPES

## W360 - W310



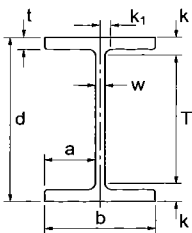
### PROPERTIES

Designation	Dead Load	Area	Axis X-X				Axis Y-Y				Torsional Constant	Warping Constant
			$I_x$	$S_x$	$r_x$	$Z_x$	$I_y$	$S_y$	$r_y$	$Z_y$		
			$10^6 \text{ mm}^4$	$10^3 \text{ mm}^3$	mm	$10^3 \text{ mm}^3$	$10^6 \text{ mm}^4$	$10^3 \text{ mm}^3$	mm	$10^3 \text{ mm}^3$		
<b>W360</b>												
x57	0.555	7 230	160	896	149	1 010	11.1	129	39.3	199	333	331
x51	0.496	6 450	141	796	148	893	9.68	113	38.8	174	237	285
x45	0.441	5 710	122	691	146	778	8.18	95.7	37.8	148	159	239
<b>W360</b>												
x39	0.383	4 960	102	580	143	662	3.75	58.6	27.4	91.6	150	110
x33	0.321	4 190	82.6	473	141	541	2.91	45.8	26.4	71.8	85.3	84.3
<b>W310</b>												
x500	4.91	63 700	1 690	7 910	163	9 880	494	2 910	88.0	4 490	101 000	15 300
x454	4.45	57 800	1 480	7 130	160	8 820	436	2 600	86.8	4 000	77 200	13 100
x415	4.07	52 800	1 300	6 450	157	7 900	391	2 340	86.0	3 610	59 500	11 300
x375	3.68	47 800	1 130	5 770	154	7 000	344	2 080	84.8	3 210	44 900	9 570
x342	3.37	43 700	1 010	5 260	152	6 330	310	1 890	84.2	2 910	34 900	8 420
x313	3.07	39 900	896	4 790	150	5 720	277	1 700	83.3	2 620	27 000	7 350
x283	2.77	36 000	787	4 310	148	5 100	246	1 530	82.6	2 340	20 300	6 330
x253	2.48	32 300	682	3 830	146	4 490	215	1 350	81.6	2 060	14 800	5 370
x226	2.22	28 800	596	3 420	144	3 970	189	1 190	81.0	1 830	10 800	4 620
x202	1.99	25 700	520	3 050	142	3 510	166	1 050	80.2	1 610	7 730	3 960
x179	1.75	22 800	445	2 670	140	3 050	144	919	79.5	1 400	5 370	3 340
x158	1.54	20 100	386	2 360	139	2 670	125	805	78.9	1 220	3 770	2 840
x143	1.40	18 200	348	2 150	138	2 420	113	729	78.6	1 110	2 860	2 540
x129	1.27	16 500	308	1 940	137	2 160	100	652	78.0	991	2 130	2 220
x118	1.15	15 000	275	1 750	136	1 950	90.2	588	77.6	893	1 600	1 970
x107	1.05	13 600	248	1 590	135	1 760	81.2	531	77.2	806	1 210	1 760
x97	0.949	12 300	222	1 440	134	1 590	72.9	478	76.9	725	909	1 560
<b>W310</b>												
x86	0.847	11 000	198	1 280	134	1 420	44.5	351	63.6	533	874	961
x79	0.773	10 100	177	1 150	133	1 280	39.9	314	63.0	478	655	847
<b>W310</b>												
x74	0.726	9 480	164	1 060	132	1 180	23.4	229	49.9	350	718	505
x67	0.650	8 520	144	942	131	1 050	20.7	203	49.5	310	522	439
x60	0.580	7 610	128	842	130	933	18.3	180	49.3	275	378	384
<b>W310</b>												
x52	0.513	6 650	118	747	133	837	10.3	123	39.2	189	308	237
x45	0.438	5 670	99.2	634	132	708	8.55	103	38.8	158	191	195
x39	0.380	4 940	85.1	549	131	610	7.27	88.1	38.4	135	126	164
<b>W310</b>												
x33	0.321	4 180	65.0	415	125	480	1.92	37.6	21.4	59.6	122	43.8
x28	0.278	3 590	54.3	351	123	407	1.58	31.0	20.9	49.2	75.7	35.6
x24	0.234	3 040	42.7	280	119	328	1.16	22.9	19.5	36.7	42.5	25.7
x21	0.207	2 680	37.0	244	117	287	0.983	19.5	19.1	31.2	29.4	21.7

☐ When subject to tension, bolted connections are preferred for these sections.

# W SHAPES

## W360 - W310



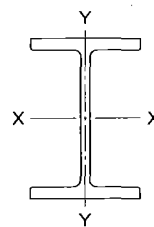
### DIMENSIONS AND SURFACE AREAS

Nominal Mass	Theoretical Mass	Depth d	Flange Width b	Flange Thickness t	Web Thickness w	Distances					Surface Area (m <sup>2</sup> ) per metre of length		Imperial Designation
						a	T	k	k <sub>1</sub>	d - 2t	Total	Minus Top of Top Flange	
kg/m	kg/m	mm	mm	mm	mm	mm	mm	mm	mm	mm			
57	56.6	358	172	13.1	7.9	82	295	31	21	332	1.39	1.22	W14x38
51	50.6	355	171	11.6	7.2	82	295	30	20	332	1.38	1.21	W14x34
45	45.0	352	171	9.8	6.9	82	296	28	20	332	1.37	1.20	W14x30
39	39.1	353	128	10.7	6.5	61	295	29	20	332	1.21	1.08	W14x26
33	32.7	349	127	8.5	5.8	61	296	27	20	332	1.19	1.07	W14x22
500	500.4	427	340	75.1	45.1	147	233	97	43	277	2.12	1.78	W12x336
454	454.0	415	336	68.7	41.3	147	234	91	41	278	2.09	1.76	W12x305
415	415.1	403	334	62.7	38.9	148	234	85	40	278	2.06	1.73	W12x279
375	374.8	391	330	57.2	35.4	147	233	79	38	277	2.03	1.70	W12x252
342	343.2	382	328	52.6	32.6	148	233	74	37	277	2.01	1.68	W12x230
313	313.3	374	325	48.3	30.0	148	234	70	35	277	1.99	1.66	W12x210
283	282.9	365	322	44.1	26.9	148	233	66	34	277	1.96	1.64	W12x190
253	252.9	356	319	39.6	24.4	147	233	61	33	277	1.94	1.62	W12x170
226	226.7	348	317	35.6	22.1	147	233	57	31	277	1.92	1.60	W12x152
202	202.6	341	315	31.8	20.1	147	234	54	30	277	1.90	1.59	W12x136
179	178.7	333	313	28.1	18.0	148	233	50	29	277	1.88	1.57	W12x120
158	157.4	327	310	25.1	15.5	147	233	47	28	277	1.86	1.55	W12x106
143	143.1	323	309	22.9	14.0	148	234	45	27	277	1.85	1.55	W12x96
129	129.6	318	308	20.6	13.1	147	233	42	27	277	1.84	1.53	W12x87
118	117.5	314	307	18.7	11.9	148	233	41	26	277	1.83	1.53	W12x79
107	106.9	311	306	17.0	10.9	148	233	39	26	277	1.82	1.52	W12x72
97	96.8	308	305	15.4	9.9	148	234	37	25	277	1.82	1.51	W12x65
86	86.3	310	254	16.3	9.1	122	234	38	25	277	1.62	1.36	W12x58
79	78.9	306	254	14.6	8.8	123	234	36	24	277	1.61	1.36	W12x53
74	74.0	310	205	16.3	9.4	98	234	38	25	277	1.42	1.22	W12x50
67	66.3	306	204	14.6	8.5	98	234	36	24	277	1.41	1.21	W12x45
60	59.1	303	203	13.1	7.5	98	234	35	24	277	1.40	1.20	W12x40
52	52.3	317	167	13.2	7.6	80	256	31	20	291	1.29	1.12	W12x35
45	44.6	313	166	11.2	6.6	80	256	29	19	291	1.28	1.11	W12x30
39	38.7	310	165	9.7	5.8	80	256	27	19	291	1.27	1.10	W12x26
33	32.8	313	102	10.8	6.6	48	264	24	15	291	1.02	0.919	W12x22
28	28.4	309	102	8.9	6.0	48	264	22	15	291	1.01	0.912	W12x19
24	23.8	305	101	6.7	5.6	48	265	20	15	292	1.00	0.902	W12x16
21	21.1	303	101	5.7	5.1	48	265	19	15	292	1.00	0.899	W12x14

Sections highlighted in yellow are commonly used sizes and are generally readily available.

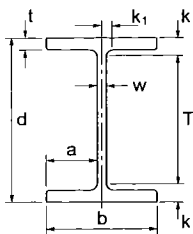
# W SHAPES

## W250 - W200



### PROPERTIES

Designation	Dead Load kN/m	Area mm <sup>2</sup>	Axis X-X				Axis Y-Y				Torsional Constant J	Warping Constant C <sub>w</sub>
			I <sub>x</sub>	S <sub>x</sub>	r <sub>x</sub>	Z <sub>x</sub>	I <sub>y</sub>	S <sub>y</sub>	r <sub>y</sub>	Z <sub>y</sub>	10 <sup>3</sup> mm <sup>4</sup>	10 <sup>9</sup> mm <sup>6</sup>
			10 <sup>6</sup> mm <sup>4</sup>	10 <sup>3</sup> mm <sup>3</sup>	mm	10 <sup>3</sup> mm <sup>3</sup>	10 <sup>6</sup> mm <sup>4</sup>	10 <sup>3</sup> mm <sup>3</sup>	mm	10 <sup>3</sup> mm <sup>3</sup>		
<b>W250</b>												
x167	1.64	21 200	300	2 080	119	2 430	98.8	746	68.1	1 140	6 310	1 630
x149	1.46	19 000	259	1 840	117	2 130	86.2	656	67.4	1 000	4 510	1 390
x131	1.29	16 700	221	1 610	115	1 850	74.5	571	66.8	870	3 120	1 160
x115	1.13	14 600	189	1 410	114	1 600	64.1	495	66.2	753	2 130	976
x101	0.992	12 900	164	1 240	113	1 400	55.5	432	65.6	656	1 490	829
x89	0.878	11 400	143	1 100	112	1 230	48.4	378	65.1	574	1 040	713
x80	0.786	10 200	126	982	111	1 090	43.1	338	65.0	513	757	623
x73	0.715	9 290	113	891	110	985	38.8	306	64.6	463	575	553
<b>W250</b>												
x67	0.658	8 580	104	806	110	901	22.2	218	51.0	332	625	324
x58	0.571	7 420	87.3	693	108	770	18.8	186	50.4	283	409	268
x49	0.481	6 260	70.6	572	106	633	15.1	150	49.2	228	241	211
<b>W250</b>												
x45	0.440	5 700	71.1	534	111	602	7.03	95.1	35.1	146	261	113
x39	0.379	4 910	60.1	459	110	513	5.94	80.8	34.7	124	169	93.4
x33	0.321	4 190	48.9	379	108	424	4.73	64.7	33.7	99.5	98.5	73.2
<b>W250</b>												
x28	0.279	3 630	40.0	307	105	353	1.78	34.8	22.1	54.7	96.7	27.7
x25	0.249	3 220	34.2	266	103	307	1.49	29.2	21.5	46.2	65.2	23.0
x22	0.219	2 850	28.9	227	101	263	1.23	24.0	20.7	38.1	43.4	18.7
x18	0.175	2 280	22.4	179	99.3	207	0.913	18.1	20.0	28.6	22.4	13.8
<b>W200</b>												
x100	0.976	12 700	113	989	94.5	1 150	36.6	349	53.8	533	2 090	386
x86	0.850	11 000	94.7	853	92.6	981	31.4	300	53.3	458	1 390	318
x71	0.701	9 100	76.6	709	91.7	803	25.4	246	52.8	375	817	250
x59	0.582	7 550	61.1	582	89.9	653	20.4	199	52.0	303	463	196
x52	0.512	6 650	52.7	512	89.0	569	17.8	175	51.8	266	323	167
x46	0.451	5 890	45.4	448	88.1	495	15.3	151	51.2	229	220	141
<b>W200</b>												
x42	0.409	5 320	40.9	399	87.7	445	9.00	108	41.2	165	222	84.0
x36	0.352	4 570	34.4	342	86.7	379	7.64	92.6	40.9	141	145	69.6
<b>W200</b>												
x31	0.308	3 970	31.4	299	88.6	335	4.10	61.1	32.0	93.8	119	40.9
x27	0.261	3 390	25.8	249	87.3	279	3.30	49.6	31.2	76.1	71.3	32.5
<b>W200</b>												
x22	0.220	2 860	20.0	194	83.6	222	1.42	27.8	22.3	43.7	56.6	13.9
x19	0.191	2 480	16.6	163	81.7	187	1.15	22.6	21.6	35.6	36.2	11.1
x15	0.147	1 910	12.7	127	81.8	145	0.869	17.4	21.4	27.1	17.6	8.24



# W SHAPES

## W250 - W200

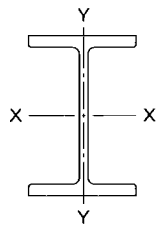
### DIMENSIONS AND SURFACE AREAS

Nominal Mass	Theo-retical Mass	Depth d	Flange Width b	Flange Thick-ness t	Web Thick-ness w	Distances					Surface Area (m <sup>2</sup> ) per metre of length		Imperial Designation
						a	T	k	k <sub>1</sub>	d - 2t	Total	Minus Top of Top Flange	
kg/m	kg/m	mm	mm	mm	mm	mm	mm	mm	mm	mm			
167	167.4	289	265	31.8	19.2	123	184	52	29	225	1.60	1.33	W10x112
149	148.9	282	263	28.4	17.3	123	184	49	28	225	1.58	1.32	W10x100
131	131.1	275	261	25.1	15.4	123	184	46	27	225	1.56	1.30	W10x88
115	114.8	269	259	22.1	13.5	123	184	43	26	225	1.55	1.29	W10x77
101	101.2	264	257	19.6	11.9	123	184	40	25	225	1.53	1.28	W10x68
89	89.6	260	256	17.3	10.7	123	184	38	24	225	1.52	1.27	W10x60
80	80.1	256	255	15.6	9.4	123	184	36	24	225	1.51	1.26	W10x54
73	72.9	253	254	14.2	8.6	123	184	35	23	225	1.50	1.25	W10x49
67	67.1	257	204	15.7	8.9	98	185	36	23	226	1.31	1.11	W10x45
58	58.2	252	203	13.5	8.0	98	184	34	23	225	1.30	1.10	W10x39
49	49.0	247	202	11.0	7.4	97	184	32	23	225	1.29	1.09	W10x33
45	44.9	266	148	13.0	7.6	70	209	29	18	240	1.11	0.961	W10x30
39	38.7	262	147	11.2	6.6	70	209	27	17	240	1.10	0.952	W10x26
33	32.7	258	146	9.1	6.1	70	211	24	16	240	1.09	0.942	W10x22
28	28.5	260	102	10.0	6.4	48	213	24	15	240	0.915	0.813	W10x19
25	25.3	257	102	8.4	6.1	48	213	22	15	240	0.910	0.808	W10x17
22	22.4	254	102	6.9	5.8	48	213	20	15	240	0.904	0.802	W10x15
18	17.9	251	101	5.3	4.8	48	213	19	14	240	0.896	0.795	W10x12
100	99.5	229	210	23.7	14.5	98	148	40	22	182	1.27	1.06	W8x67
86	86.7	222	209	20.6	13.0	98	147	37	22	181	1.25	1.04	W8x58
71	71.5	216	206	17.4	10.2	98	148	34	20	181	1.24	1.03	W8x48
59	59.3	210	205	14.2	9.1	98	148	31	20	182	1.22	1.02	W8x40
52	52.2	206	204	12.6	7.9	98	147	29	19	181	1.21	1.01	W8x35
46	46.0	203	203	11.0	7.2	98	148	28	19	181	1.20	1.00	W8x31
42	41.7	205	166	11.8	7.2	79	152	26	17	181	1.06	0.894	W8x28
36	35.9	201	165	10.2	6.2	79	152	25	16	181	1.05	0.885	W8x24
31	31.4	210	134	10.2	6.4	64	166	22	14	190	0.943	0.809	W8x21
27	26.6	207	133	8.4	5.8	64	167	20	13	190	0.934	0.801	W8x18
22	22.4	206	102	8.0	6.2	48	166	20	13	190	0.808	0.706	W8x15
19	19.4	203	102	6.5	5.8	48	165	19	14	190	0.802	0.700	W8x13
15	15.0	200	100	5.2	4.3	48	165	18	13	190	0.791	0.691	W8x10

Sections highlighted in yellow are commonly used sizes and are generally readily available.

# W SHAPES

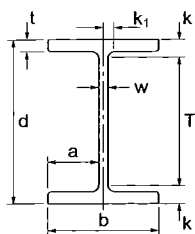
## W150 - W100



### PROPERTIES

Designation	Dead Load	Area	Axis X-X				Axis Y-Y				Torsional Constant	Warping Constant
			$I_x$	$S_x$	$r_x$	$Z_x$	$I_y$	$S_y$	$r_y$	$Z_y$		
			$10^6 \text{ mm}^4$	$10^3 \text{ mm}^3$	mm	$10^3 \text{ mm}^3$	$10^6 \text{ mm}^4$	$10^3 \text{ mm}^3$	mm	$10^3 \text{ mm}^3$		
<b>W150</b>												
x37	0.364	4 740	22.2	274	68.5	310	7.07	91.8	38.7	140	192	40.0
x30	0.292	3 790	17.1	218	67.3	244	5.56	72.6	38.3	111	100	30.3
x22	0.219	2 860	12.0	159	65.1	176	3.87	50.9	36.9	77.5	41.5	20.4
<b>W150</b>												
x24	0.235	3 060	13.4	168	66.3	191	1.83	35.8	24.5	55.2	92.3	10.2
x18	0.176	2 290	9.15	120	63.3	136	1.26	24.7	23.5	38.2	36.9	6.70
x14	0.133	1 730	6.85	91.3	63.0	102	0.918	18.4	23.0	28.3	16.8	4.79
x13	0.124	1 630	6.13	82.8	61.7	93.0	0.818	16.4	22.5	25.3	13.6	4.19
<b>W130</b>												
x28	0.275	3 590	10.9	167	55.3	190	3.81	59.6	32.7	90.7	127	13.8
x24	0.231	3 040	8.79	138	54.1	156	3.11	49.0	32.2	74.5	76.2	10.8
<b>W100</b>												
x19	0.190	2 470	4.76	89.8	43.9	103	1.61	31.2	25.5	47.9	62.9	3.79





# W SHAPES

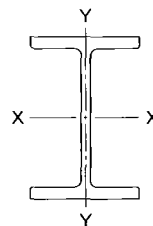
## W150 - W100

### DIMENSIONS AND SURFACE AREAS

Nominal Mass	Theoretical Mass	Depth d	Flange Width b	Flange Thickness t	Web Thickness w	Distances					Surface Area (m <sup>2</sup> ) per metre of length		Imperial Designation
						a	T	k	k <sub>1</sub>	d - 2t	Total	Minus Top of Top Flange	
kg/m	kg/m	mm	mm	mm	mm	mm	mm	mm	mm	mm			
37	37.1	162	154	11.6	8.1	73	114	24	15	139	0.924	0.770	W6x25
30	29.8	157	153	9.3	6.6	73	113	22	14	138	0.913	0.760	W6x20
22	22.3	152	152	6.6	5.8	73	114	19	14	139	0.900	0.748	W6x15
24	24.0	160	102	10.3	6.6	48	116	22	14	139	0.715	0.613	W6x16
18	17.9	153	102	7.1	5.8	48	115	19	13	139	0.702	0.600	W6x12
14	13.6	150	100	5.5	4.3	48	115	17	12	139	0.691	0.591	W6x9
13	12.6	148	100	4.9	4.3	48	115	17	12	138	0.687	0.587	W6x8.5
28	28.1	131	128	10.9	6.9	61	86	23	14	109	0.760	0.632	W5x19
24	23.6	127	127	9.1	6.1	60	85	21	13	109	0.750	0.623	W5x16
19	19.4	106	103	8.8	7.1	48	65	21	14	88	0.610	0.507	W4x13

Sections highlighted in yellow are commonly used sizes and are generally readily available.

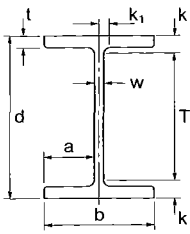
# HP SHAPES



## PROPERTIES

Designation	Dead Load	Area	Axis X-X				Axis Y-Y				Torsional Constant	Warping Constant
			$I_x$	$S_x$	$r_x$	$Z_x$	$I_y$	$S_y$	$r_y$	$Z_y$	J	$C_w$
	kN/m	mm <sup>2</sup>	10 <sup>6</sup> mm <sup>4</sup>	10 <sup>3</sup> mm <sup>3</sup>	mm	10 <sup>3</sup> mm <sup>3</sup>	10 <sup>6</sup> mm <sup>4</sup>	10 <sup>3</sup> mm <sup>3</sup>	mm	10 <sup>3</sup> mm <sup>3</sup>	10 <sup>3</sup> mm <sup>4</sup>	10 <sup>9</sup> mm <sup>6</sup>
<b>HP460</b>												
x304	2.98	38 700	1 440	6 200	193	7 060	465	2 020	110	3 130	12 200	22 000
x269	2.64	34 300	1 250	5 490	191	6 210	405	1 770	109	2 730	8 600	18 900
x234	2.30	29 800	1 080	4 780	190	5 370	345	1 520	108	2 340	5 770	15 900
x202	1.98	25 700	919	4 130	189	4 610	292	1 300	107	1 990	3 820	13 300
<b>HP410</b>												
x272	2.67	34 700	1 040	4 950	173	5 680	337	1 630	98.5	2 530	11 100	12 800
x242	2.37	30 800	907	4 390	172	5 000	293	1 430	97.5	2 210	7 850	11 000
x211	2.07	26 900	775	3 820	170	4 320	248	1 220	96.2	1 890	5 330	9 140
x181	1.78	23 000	658	3 290	169	3 690	209	1 040	95.1	1 600	3 490	7 570
x151	1.48	19 200	541	2 750	168	3 060	170	849	93.9	1 310	2 120	6 070
x131	1.28	16 700	462	2 370	167	2 630	144	724	93.1	1 110	1 430	5 080
<b>HP360</b>												
x174	1.70	22 200	508	2 820	152	3 180	184	973	91.1	1 490	3 310	5 330
x152	1.49	19 400	439	2 460	150	2 760	159	845	90.5	1 290	2 240	4 540
x132	1.29	16 800	375	2 140	149	2 380	135	724	89.6	1 110	1 490	3 800
x108	1.06	13 800	303	1 750	148	1 940	108	585	88.6	891	830	3 000
<b>HP310</b>												
x132	1.29	16 900	287	1 830	131	2 070	93.7	599	74.8	922	2 050	2 050
x125	1.22	15 900	270	1 730	130	1 960	88.2	566	74.6	870	1 760	1 910
x110	1.08	14 100	237	1 540	130	1 730	77.1	497	74.0	763	1 240	1 650
x94	0.915	11 900	196	1 300	129	1 450	63.9	415	73.3	635	762	1 340
x79	0.768	10 000	163	1 090	128	1 210	52.6	344	72.6	525	459	1 090
<b>HP250</b>												
x85	0.837	10 800	123	968	106	1 090	42.3	325	62.3	500	829	606
x62	0.614	8 000	87.5	711	105	792	30.0	234	61.3	358	339	415
<b>HP200</b>												
x54	0.525	6 840	49.8	488	85.5	551	16.7	162	49.6	249	319	155

Note: These sections are not available from Canadian mills.



# HP SHAPES

## DIMENSIONS AND SURFACE AREAS

Nominal Mass kg/m	Theo- retical Mass kg/m	Depth d mm	Flange Width b mm	Flange Thick- ness t mm	Web Thick- ness w mm	Distances					Surface Area (m <sup>2</sup> ) per metre of length		Imperial Designation
						a	T	k	k <sub>1</sub>	d-2t	Total	Minus Top of Top Flange	
304	303.9	464	460	28.6	28.6	216	344	60	44	407	2.71	2.25	HP18x204
269	269.3	457	457	25.4	25.4	216	343	57	43	406	2.69	2.23	HP18x181
234	234.2	451	454	22.1	22.1	216	344	54	41	407	2.67	2.22	HP18x157
202	202.3	445	451	19.1	19.1	216	344	51	40	407	2.66	2.20	HP18x135
272	272.7	419	413	28.6	28.6	192	299	60	44	362	2.43	2.02	HP16x183
242	241.8	413	410	25.4	25.4	192	299	57	43	362	2.42	2.01	HP16x162
211	210.6	406	406	22.2	22.2	192	299	54	41	362	2.39	1.99	HP16x141
181	181.2	400	403	19.1	19.1	192	299	51	40	362	2.37	1.97	HP16x121
151	151.1	394	400	15.9	15.9	192	299	47	38	362	2.36	1.96	HP16x101
131	130.6	389	398	13.7	13.7	192	299	45	37	362	2.34	1.94	HP16x88
174	173.9	361	378	20.4	20.4	179	257	52	40	320	2.19	1.82	HP14x117
152	152.2	356	376	17.9	17.9	179	257	49	39	320	2.18	1.80	HP14x102
132	132.0	351	373	15.6	15.6	179	257	47	38	320	2.16	1.79	HP14x89
108	108.1	346	370	12.8	12.8	179	257	44	36	320	2.15	1.78	HP14x73
132	131.3	314	313	18.3	18.3	147	234	40	29	277	1.84	1.53	HP12x89
125	124.6	312	312	17.4	17.4	147	234	39	29	277	1.84	1.53	HP12x84
110	110.4	308	310	15.5	15.4	147	234	37	28	277	1.83	1.52	HP12x74
94	93.3	303	308	13.1	13.1	147	234	35	27	277	1.81	1.50	HP12x63
79	78.3	299	306	11.0	11.0	148	234	33	26	277	1.80	1.49	HP12x53
85	85.3	254	260	14.4	14.4	123	184	35	26	225	1.52	1.26	HP10x57
62	62.6	246	256	10.7	10.5	123	184	31	24	225	1.50	1.24	HP10x42
54	53.5	204	207	11.3	11.3	98	148	28	21	181	1.21	1.01	HP8x36