

Jindal Aluminium Limited (JAL), is the largest manufacturer of aluminium extruded profiles in India. JAL offers customers the very best in aluminium extruded profiles, very intricate and sophisticated sections. With our latest CNC, EDM, Wire Cut Machines, JAL can develop dies for new sections within the shortest possible time.

JAL offers wide range of extruded profiles in different aluminium alloys - AA 6063 (63400), 6061 (65032), 6351 (64430), 64423, 6262, 6005, 6082, 6060, 2014. EC Grade alloys - E1E (19501) and E91E (63401)

JAL's assortment of 6000 different aluminium profiles, aluminium sections cater to the high quality aluminium extrusions requirements in various sectors like Building, Agriculture, Railway and Road Transport, Industrial, Electrical, Electronics, Defence and Aerospace.

About Jindal Aluminium Ltd.

Jindal Aluminium Limited (JAL), established way back in 1968, is the leading manufacturer of aluminium extruded profiles in India. Located in the serene outskirts of Bangalore city, JAL is the only aluminium company in India having 6 aluminium extrusion presses under one roof and achieving highest production in the country.

What started as a humble beginning with one 1500 ton American Press gradually expanded to a current collection of world renowned makes of six extrusion presses, each with a different capacity, PLC Controls & modern handling systems.



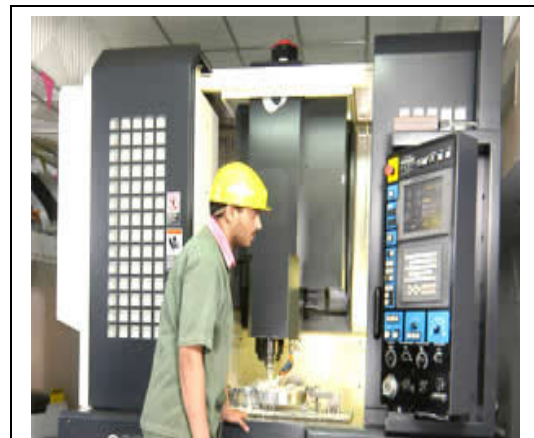
Registered Head Office

Aluminium Extrusion

JAL has 6 presses of different capacities; of these presses, 2 are of 2200 tons and one each of 750 tons, 1500 tons, 1650 tons and 4000 tons. Installed production capacity is 75,000 MT per annum. JAL has a most modern tool shop capable of producing high quality & intricate dies backed up by an international quality foundry.

JAL is a forerunner in installing several technological and modern equipments in order to obtain high quality profiles. JAL has developed an in-house foundry using Hot Top casting technology imported from USA, with most modern melting and holding furnaces equipped with automatic temperature controllers.

The adoption of such modern technology produces highly refined close grained and oxide free logs which provide a superior finish on the extruded sections.



Fully Automatic CNC Jig-Boring

JAL carries out the following steps to ensure defect free, high quality aluminium extrusions :

- The alloy is instantly analyzed using modern Direct Reading Optical Emission Spectrometer which ensures that the composition remains within close tolerance, thereby achieving the desired mechanical properties.

- The logs are homogenized prior to pre-heating them, in order to achieve superior quality, improved finish and uniform grain structure necessary for anodizing and powder coating processes.
- The dies and toolings used are manufactured by means of latest computerized equipments like Jig Boring Machines, Wire Cut Machines, Spark Erosion Machines and several other CNC equipments.
- Ageing - a thermal treatment is carried out using a high velocity air oven with precisely controlled temperature that results in uniform properties in the extruded aluminium profiles.



- The dimensions of the extruded profiles are checked and ensured by ROMIDOT automatic profile inspection & measurement system.
- The extruded aluminium profiles are finally handled by PLC controlled conveyor system till they are packed. The identification and traceability of the sections are also taken care of by imprinting the company logo on each package.
- JAL possesses in-house facilities for developmental research and innovation to pursue the fast paced advanced scientific development.

Largest Number, Widest Range

JAL provides fitting solutions for every conceivable need. With their portfolio of extruded profiles in different alloys, the requirement of every industry is catered to. Their assortment of alloys includes:

- AA 6063 (63400), 6061 (65032), 6351 64430), 64423, 6262, 6005, 6082, 6060,2014
- EC Grade alloys – E1E (19501) and E91E (63401)

JAL produces very intricate and sophisticated sections, which meets the country's needs and rest is exported to earn valuable forex.

Galaxy of Satisfied Clients

JAL is associated with some of the biggest names in the industry – L&T, Kirloskars, Godrej, Videocon, ISRO, BEL, BHEL, Siemens, TATA-BP, Cummins, GE and MICO-BOSCH to name a few. The client list also include international customers in UK, Spain, Middle East, Australia etc.

Jindal Aluminium Ltd. Quality Policy

Through continuous perseverance of Quality Assurance programme, the Company renews its commitment to ensure reliable quality at a competitive price and in turn earn the customer's satisfaction.

In order to accomplish this, the company strives:

- To detect and prevent any non-conformance during production and implement the means to prevent its recurrence.
- To upgrade technology and improve techniques, systems, procedures and to carry out continuous innovation to meet changing customers' needs.

- To create most congenial and healthy working environment for attainment of quality goals with excellence.
- To develop highly motivated and skilled human resources imbued with strong sense of values and commitment to quality.

To improve the quality of life of communities living around the company in particular and society in general by providing basic needs like health, water, education etc.

Quality – A Motto



JAL strives to accomplish and maintain the finest quality of products in the industry. To achieve this purpose, Company utilizes:

- Ultra modern microprocessor based, PLC controlled extrusion press.
- Computerized Spectrometer for instant metal analysis.
- Computer aided die manufacturing facilities.
- Well equipped physical, chemical, mechanical and metallurgical testing laboratory and sophisticated R&D Division duly recognized by the Dept. of Scientific and Industrial Research, Govt. of India.

The strict adherence to quality to make the products superior and incomparable in the market forms the guiding principle for every Jindal employee. Standing testimony to JAL's achievement is the IS/ISO 9001:2000 certification, awarded by the Bureau of Indian Standards, the first one in the Indian aluminium extrusion industry. Numerous other National and International awards have also been added to JAL's list of accomplishments.



Spectrometer

Exports

Jindal Aluminium Limited is the largest Manufacturer and Exporter of Aluminium Extruded Profiles from India, registering growth of over 35 % on quantity basis for last three consecutive years and is confident of achieving even higher growth in coming years. Jindal's unblinking focus on quality in all aspects of our operation is driving us ahead in International Market. Besides, one of the pioneer to be awarded ISO 9000 recognition in the year 1994, Jindal is the first in India to be awarded ABS (Americal Bureau of Shipping) Plant Approval, thus Jindal is now approved manufacturer to supply material for marine grade application.

Our Export department is fully equipped with latest tools of communication, skilled manpower and is committed to provide best services to all our customers. Our specially trained and committed team capable of handling Export Logistics, an vital aspects in International Trade to ensure timely shipments / deliveries of orders as per schedule agreed.

Our 4000 US Tons press imported from SMS Scholeman, Germany is state of the art technology, enabling Jindal, to manufacture and supply wide profiles as wide as 450 mm depending upon shape and size with tighter tolerances, thus meeting requirements of large sections.

Some of the other salient features of Jindal are as under:

- Annual Production capacity of 75,000MT
- Wide range of profiles to choose from - up to 450mm wide profile
- Largest aluminium extruder in India
- In-house Billet Casting and Die manufacturing facility
- Self sufficient in energy requirement through Our Wind Power Mill
- Capable of dispatching material within 2 weeks, if dies are ready



Extrusion



Log Casting

Jindal's products enjoy wide international acceptance and are renowned for their high quality and reliability. Our international presence is in over 26 countries across the globe including USA, Canada, Brazil, UK, Europe, GCC countries, South Africa, Mauritius and Australasia etc. With our consistent product quality and services, Jindal has received many awards from prestigious organizations. Jindal has been awarded silver shields for Star Performance for highest Exports of Aluminium Extrusions from India during 2006 and 2007 by Engineering Export Promotion Council, a Government of India recognised agency. Some of the other recognitions are as under:





GENERAL INFORMATION

ABOUT CATALOGUE

The sections shown in this catalogue are considered standard for which dies are available with us on the date of publication and are available to customers without die charges. We are continually adding to the range of extrusion dies. If the particular section, required by you, is not given in the Catalogue, please write to our Works/Branch Offices to meet your specific needs. To avoid confusion and delay in the processing of enquiries and execution of orders, correct and detailed information about the desired sections are required.

All the Standard Sections given in the catalogue are generally available in Alloy 63400 & Temper WP (HE9WP) corresponding to IS-733 & IS-1285. Extrusions in alloys other than these would be subject to special enquiry.

ABOUT EXTRUSION

Extrusion is the most modern and very versatile method of forming Aluminium. The aluminium logs, after casting to the specified alloy are fed into the continuous homogenizing furnace wherein it is heated to a desired temperature. The logs are then fed into hot log shear where the logs are sheared to required size billets. These are pushed under tremendous pressure, applied by a hydraulic ram, through a shaped aperture in a steel die. The die aperture may have almost any imaginable contour, thereby making it possible to produce infinite shapes and the cross sections can be sawed to the required lengths. It is possible to control the finish of the extruded sections to such a degree, during its passage through the steel die that no further finishing may be necessary, and if required, the part may be anodized straight away into attractive colours for higher consumer appeal.

PHYSICAL PROPERTIES OF ALUMINIUM

Specific Gravity - 2.70

Electrical Conductivity - 53 to 62% IACS

Co-efficient of linear expansion - 22×10^{-6} mm/mm/°C

Thermal conductivity (at 20°C) - 0.53 Cal/Sq.cm/Sec./cm/°C

Electrical Resistivity (at 20°C) - 2.850 micro-ohm (for EC-0)

Modus of Elasticity - 7×10^5 kg/cm²

PRODUCT SPECIFICATIONS

ALLOY	INDIA = 63400; AMERICA = AA6063; BRITISH - BS HE9 (NOTE: Other Alloys can be given against specific enquiries)
MECHANICAL PROPERTIES	UTS: 185 Mpa/Min); Elongation: 7% (Min); Hardness: 70 to 50 Rockwell E
EXTRUSIONS WIDTH / (CCD) LENGTH	Up to 275mm for solid sections. Up to 290mm for hollow sections As per customer's requirement
WEIGHT	The weights kg/m given in catalogue are the nominal weights. In practice, tolerance, alloy and such other factors will affect the final weight and a normal variation of + or - 10% should be expected.
DIMENSINAL TOLERANCES	Generally as per British Standard BS 755/EN12020-2 a) IS 3673 : For Round Tubes b) IS 6477 : For Hollow Sections (Other than round tubes) c) IS 3965 : For Solid Sections



METALLURGICAL AND MECHANICAL DATA AND TOLERANCES

ALLOY EQUIVALENTS TABLE

IS India (NEW)	(BS)U.K or I.S. (OLD)	(AA) U.S.A	(AICAN) Canada	DIN Germany	ASTM	(JIS) Japan	(AFNOR) France	Russia
19500	E1B	1050 or 1060	IS	Al 99.5	99.6 A	Al-1	A-5	-
19000	E1C	1100	2S	Al 99.0	99.0A	Al-3	A-4	A-2
19501	E1E	EC	CISDIA	E-Al 99.5	EC	Al-1	-	-
63401	E91E	6101	D50S	E-Al-Mg. Si-0.5	GS 10B	-	-	-
-	NE-3	3103	3S	Al Mn	-	-	3103	-
52000	NE4	5052	M57S	AlMg2	GR 20A	A2-SI	A-G3	AM
53000	NE5	5086	54S	AlMg3.5	GM 40A	-	-	-
63400	HE-9	6063	50S	AlMg Si 0.5	GS 10A	A2-S5	A-SG	-
24345	HE-15	2014	B26S	Al-Cu-Si	-	-	-	-
76528	HE-17	7075	-	AlZn5,5MgCu	7075	A7075	7075	-
65032	HE-20	6061	65S	Al Mg SiCu	GS 11A	A2-S4	-	-
64430	HE-30	6351/6082	B51S	AlMg Si1	6351	-	6081 (NP)	-
62400	-	6005	C51S	-	6005	-	-	-
64423	-	-	C62S	-	-	-	-	-
-	-	-	6262	-	AlMg1 SiPb	6262	-	-

TEMPER DESIGNATION TABLE

INDIA or U.K	U.S.A or CANADA		ISO TEMPER	Description of designation
O	O		O	Annealed
M	F		F	As fabricated, as manufactured or as cast
-	T ₃		TD	Solution heat-treated, and cold worked
W	T ₄		TB	Solution heat-treated, naturally aged and amenable to artificial aging
P	T ₅		TE	Artificially aged or precipitation heat-treated
WP	T ₆		TF	Solution heat-treated & precipitation heat-treated
	H-21	H-1	H2A H1	Strain hardened to specified strength
	H-22	H-32	H2B H3B	1/4 Hard stabilized
	H-24	H-34	H2D H3D	1/2 Hard stabilized
	H-26	H-36	H2F H3F	3/4 Hard stabilized
	H-28	H-38	H2H H3H	Fully hard, stabilized



CHEMICAL COMPOSITION OF WROUGHT ALUMINIUM & ALUMINIUM ALLOYS

Designation		Aluminium	Copper	Magnesium	Silicon	Iron	Manganese	Zinc	Ti and/or other Grain Refining Elements	Chromium	Remarks
New	Old										
19000	E1C	99.0 min	0.1	-	0.5	0.6	0.1	-	-	-	Ti+V=0.07; Total impurities=1.00
19500 19501	E1B E1E	99.5 min	0.05	-	0.3	0.4	0.05	-	-	-	Ti+V=0.07; Total impurities=0.50
52000	NE4	Remainder	0.1	1.7-2.6	0.6	0.5	0.5	0.2	0.2	0.25	Cr+Mn=0.5
53000	NE5	Remainder	0.1	2.8-4.0	0.6	0.5	0.5	0.2	0.2	0.25	Cr+Mn=0.5
63400	HE9	Remainder	0.1	0.4-0.9	0.3-0.7	0.6	0.3	0.2	0.2	0.1	
63401	E91E	Remainder	0.05	0.4-0.9	0.3-0.7	0.5	0.03	0.1	0.1	0.03	Others 0.03 each total 0.1
64430	HE30	Remainder	0.1	0.4-1.2	0.6-1.3	0.60	0.4-1.0	0.1	0.2	0.25	
65032	HE20	Remainder	0.15-0.4	0.7-1.2	0.4-0.8	0.7	0.2-0.8	0.2	0.2	0.15-0.35	Either Mn or Cr Shall be present
6061		Remainder	0.15-0.4	0.8-1.2	0.4-0.8	0.7	0.15	0.25	0.15	0.04-0.35	Others each 0.05 total 0.15
6005		Remainder	0.10	0.4-0.6	0.6-0.9	0.35	0.10	0.10	0.10	0.10	Others each 0.05 total 0.15
6060		Remainder	0.1	0.35-0.6	0.3-0.6	0.1-0.3	0.1	0.15	0.1	0.5	Others each 0.05 total 0.15
6066		Remainder	0.7-1.2	0.8-1.4	0.9-1.8	0.5	0.6-1.1	0.25	0.2	0.4	Others each 0.05 total 0.15
64423		Remainder	0.5-1.0	0.5-1.3	0.7-1.3	0.8	1.0	-	-	-	
6082		Remainder	0.10	0.6-1.2	0.7-1.3	0.50	0.40-1.0	0.20	0.10	0.25	
3103		Remainder	0.1 max	0.3 max	0.5 max	0.7 max	0.9-1.5	0.2 max	0.2 max	0.1 max	0.1 Zr+Ti
24345		Remainder	3.8-5.0	0.2-0.8	0.5-1.2	0.7 max	0.3-1.2	0.2 max	0.3 max	0.3 max	
6262		Remainder	0.15-0.4	0.8-1.2	0.4-0.8	0.7 max	0.15 max	0.25 max	0.15 max	0.04-0.14	Bi:0.4-0.7 & Pb: 0.4-0.7
7075		Remainder	1.2-2.0	2.1-2.9	0.4 max	0.5 max	0.3 max	5.1-6.1	0.2 max	0.18-0.28	0.25 Zr+Ti

Note:- 1. *Titanium and / or other grain refining elements and / or Chromium may be present at the option of the supplier provided the total content does not exceed 0.3 percent.
2. Composition limits are in percent maximum unless shown otherwise.



ALUMINIUM ALLOY SPECIFICATION & SELECTION

Mechanical Properties										
Alloy IS Specification		Condition	Size mm	0.2% proof Stress		Ultimate tensile Strength		Elongation % on 50mm G. Length minimum	Typical Brinell Hardness Number	Typical Application & Properties
				Kgf/mm ² Min	Mpa Min	Kgf/mm ² Min	Mpa Min			
Old	New									
E1B	19500	M	Upto 100	-	-	6.63	65	23	18	Used in electrical conductors, bus bars, rectangular and tubular connectors and high electrical conductivity applications.
E1C	19000	M	Upto 100	-	-	6.63	65	18	20	Used where formability is a major requirement and strength and stiffness are not. Used in chemical processing equipments, refrigeration and accessories for electrical conductors.
E1E	19501	M	Upto 100	-	-	6.12	60	25	18	Used in electrical conductors, bus bars, rectangular and tubular connectors and high electrical conductivity applications.
E91E	63401	W	-	8.2	80	14.3	140	12	-	Good for high strength, electrical bus bars, fittings conductors etc.
	Range 1	WP-1	-	17.3	170	20.4	200	10	-	
	Range 2	WP-2	Upto 75	13.8	135	17.3	170	12	-	
NE-4	52000	M	All Size	7.14	70	16.3	160	14	45	Applications requiring high fatigue strength Weld ability & good marine corrosion resistance. Used in pressure vessels, oil and hydraulic tubes, chemical industry & transportation.
NE-5	53000	M	Upto 50	10.2	100	22	215	14	60	Transport equipments marine, automobile & aircraft uses, T.V. Towers, missile components, good marine corrosion resistance, Weldability & hardness.
			50 - 150	10.2	100	20.4	200	14		



ALUMINIUM ALLOY SPECIFICATION & SELECTION

Mechanical Properties										
Alloy IS Specification Old New		Condi- tion	Size mm	0.2% proof Stress		Ultimate Tensile Strength		Elonga- tion % on 50mm G. Length minimum	Typical Brinell Hardness Number	Typical Application & Properties
				Kgf/mm ² Mpa	Mpa Min	Kgf/mm ² Min	Mpa Min			
HE-9	63400	M	All sizes	-	-	11.2	110	13	-	The best general properties Architectural sections such as windows and door frames, curtain walling, hand rail, wall facing, trimmings & mouldings, window section in transport, irrigation tubes, etc., Anodising finish is good.
		W	0-150	8.2	80	14.3	140	14	44	
		P WP	0-150	11.2 15.3	110 150	15.3 18.9	150 185	7 7	47 58	
HE-20	65032	M	All sizes	5.1	50	11.2	110	12	-	General structural & architectural applications such as railings supports, transportation components, etc. Where both surface finish & strength are important can be anodised.
		W	0-150	11.7	115	19	185	14	58	
		WP	Upto 150 150-200	24.0 20.4	235 200	28.5 24.9	280 245	7 6	87 76	
HE-30	64430	M	All sizes	8.2	80	11.2	110	12	-	Structural applications of all kinds such as road & rail transport & vehicle bridges, cranes, roof towers, marine applications, rivets etc. Good wear resistance & machinability.
		W	0-150	12.2	120	19	185	14	60	
		WP	0-5mm	26.0	255	30.0	295	7	90	
		WP	5-75	27.5	270	31.6	310	7	95	
		WP	75-150 150-200	27.5 24.4	270 240	30.0 28.5	295 280	7 6	90 87	
6061		T4	All sizes	11.2	110	18.3	180	14	-	General structural & architectural applications such as railings supports, transportation components, etc. Where both surface finish & strength are important can be anodised.
		T6	All sizes	24.5	240	26.5	260	9	82	
6005		T6	All sizes	21.9	215	26.5	260	10	82	General structural & architectural applications such as railings supports, transportation components, etc. Where both surface finish & strength are important can be anodised.
6060		T5	All sizes	10.2	100	14.8	145	8	45	The best general properties Architectural sections such as windows and door frames, curtain walling, hand rail, wall facing, trimmings & mouldings, window section in transport, irrigation tubes, etc., Anodising finish is good.
		T6	All Sizes	15.3	150	19.4	190	8	59	
6066		O	All sizes	12.8	125	20.4 (max)	200 (max)	16	-	General structural & Architectural applications. where strength & surace finish are important.
		T4	All sizes	17.3	170	28	275 (max)	14	-	
		T6	All sizes	31.62	310	35.19	345	8	-	
64423		M	All sizes	-	-	12.2	120	10	-	Structural applications and marine cranes, vehicle bridges applications.
		O	All sizes	13.0 (max)	125 (max)	22.0 (max)	215 (max)	15	-	
		W	All sizes	16.0	155	27.0	265	13	-	
		WP	All sizes	27.0	265	33.7	330	7	-	



ALUMINIUM ALLOY SPECIFICATION & SELECTION

-	31000	M	-	-	-	9.7	95	16	-	For heat exchangers, air conditioning, etc.
HE 15	24345	M	-	9.2	90	15.3	150	12		
HE 15	24345	O		17.9	175 (max)	24.5	240(max)	12		
HE 15	24345	W	0-10	23.0	225	38.3	375	10		
HE 15	24345	W	10-75	24.0	235	39.3	385	10		
HE 15	24345	W	75-150	24.0	235	39.3	385	8		
HE 15	24345	W	150-200	23.0	225	38.3	375	8		
HE 15	24345	WP	0-10	38.3	375	43.9	430	6	Applications where high strength is main criteria	
HE 15	24345	WP	10-25	40.8	400	46.9	460	6		
HE 15	24345	WP	25-75	42.8	420	49.0	480	6		
HE 15	24345	WP	75-150	41.3	405	46.9	460	6		
HE 15	24345	WP	150-200	38.8	380	43.9	430	6		
-	6262	T6	0-200	24.5	240	26.5	260	8		Free machining application
HE 17	7075	T6	0-25	49.0	480	55.1	540	5	Highly stressed structural components for air craft, military and nuclear applications	
HE 17	7075	T6	25-100	51.0	500	57.1	560	8		
HE 17	7075	T6	100-150	47.9	470	54.1	530			
HE 17	7075	T6	150-200	40.8	400	47.9	470			



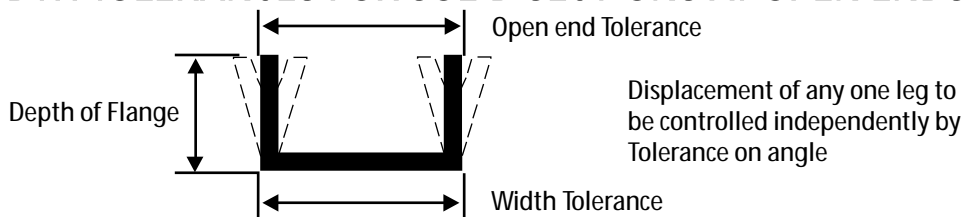
EXTRUDED SECTIONS : STANDARD MANUFACTURING TOLERANCES

THE STANDARD MANUFACTURING TOLERANCE GIVEN HERE ARE APPLICABLE TO THE AVERAGE SHAPE.
WIDER TOLERANCE MAY BE REQUIRED FOR SOME SHAPES AND CLOSER TOLERANCES MAY BE POSSIBLE FOR OTHERS.
TOLERANCE STRICTER THAN STANDARD SHALL BE SUBJECT TO SPECIAL ENQUIRY.

TABLE I		TABLE II	
Round Rod Diameter Tolerances		Tolerance on Width (Measured Across Flats) of Solid Sections. (Rectangular, Flats, Squares, Hexagons, etc.)	
Specified Diameter (mm)	Tolerance mm+/-	Width and Width Across Flats (mm)	Tolerance mm+/-
Upto 12.0	0.20	4 to 6	0.20
12.1 to 25.0	0.25	8 to 10	0.23
25.1 to 39.9	0.30	12	0.25
40.0 to 49.9	0.38	16	0.28
50.0 to 55.9	0.46	20	0.30
56.0 to 70.9	0.53	25	0.33
71.0 to 79.9	0.61	32	0.38
80 and Above	1%	40 to 50	0.46
		60	0.53
		80 to 100	0.69
		120	0.76
		160	1.02
		180	1.10

Note : For intermediate sizes, take tolerance for next higher value.

TABLE III
WIDTH TOLERANCES FOR SOLID SECTIONS AT OPEN ENDS



Specified width (mm)	Width Tolerance (mm +/-) will be as below			
	Depth of Flange or Leg (mm)			
	6.5 to 16.0	16.1 to 32.0	32.1 to 64.0	64.1 to 150.0
Upto 6.0	0.30	-	-	-
6.1 to 12.0	0.35	0.40	0.45	-
12.1 to 20.0	0.40	0.45	0.50	-
20.1 to 25.0	0.45	0.50	0.55	0.65
25.1 to 38.0	0.50	0.55	0.65	0.75
38.1 to 50.0	0.60	0.70	0.80	0.90
50.1 to 100.0	0.80	0.90	1.20	1.50

NOTE : 1. Tolerance on width at closed ends are given in Table II
2. These tolerances are applicable to channels, I beams, and other such sections where there are both open and closed ends.



TABLE IV

TOLERANCES ON THICKNESS OF REGULAR SECTIONS AND BARS
OTHER THAN ROUND RODS AND HEXAGON BARS

Nominal Thickness of Section mm	Tolerances - (mm +/-) given in columns below respective width Width of Section (mm)											
	12	16	20	25	32	40	50	60	80	100	120	
*1	-	-	-	-	-	-	-	-	-	-	-	-
*1.2	-	-	-	-	-	-	-	-	-	-	-	-
1.6	0.18	0.20	0.20	0.20	0.20	-	-	-	-	-	-	-
2	0.18	0.20	0.20	0.20	0.20	0.23	0.25	0.28	0.30	0.33	0.36	0.36
2.5	0.18	0.20	0.20	0.20	0.20	0.23	0.25	0.28	0.30	0.33	0.36	0.36
3	0.18	0.20	0.20	0.20	0.23	0.25	0.28	0.30	0.33	0.36	0.38	0.38
4	0.20	0.23	0.23	0.23	0.25	0.28	0.30	0.33	0.36	0.38	0.41	0.41
5	0.20	0.23	0.23	0.23	0.25	0.28	0.30	0.33	0.36	0.38	0.41	0.41
6	0.20	0.23	0.23	0.23	0.25	0.28	0.30	0.33	0.36	0.41	0.46	0.46
8	0.23	0.25	0.25	0.25	0.28	0.30	0.33	0.36	0.38	0.43	0.48	0.48
10	0.23	0.25	0.25	0.25	0.28	0.30	0.33	0.36	0.38	0.43	0.48	0.48
12	0.25	0.28	0.28	0.28	0.30	0.33	0.36	0.38	0.41	0.46	0.48	0.48
16	0.28	0.30	0.30	0.30	0.33	0.36	0.38	0.41	0.43	0.48	0.51	0.51
20	-	0.30	0.30	0.30	0.36	0.38	0.41	0.43	0.46	0.51	0.53	0.53

NOTE : For intermediate sizes, tolerances for the next higher value shall be taken.

* To be regarded as Special Sections.



TABLE V

TOLERANCES ON OVERALL DIMENSIONS OF HOLLOW SECTIONS

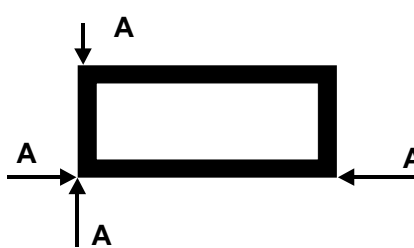
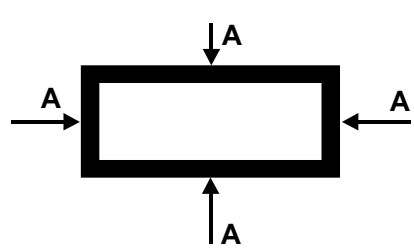
Specified width or width across flats of Hollow Sections (mm)		Tolerances - (mm+/-)	
		Allowable deviations of width or depth at corners from specified width or depth	Allowable deviations of width or depth at corners from specified width or depth
			
Over	Upto and Including	Difference between AA & Specified width or depth	Difference between AA & Specified width, depth or distance across flats.
12	19	0.30	0.51
19	25	0.35	0.51
25	32	0.40	0.56
32	40	0.46	0.66
40	50	0.51	0.64
50	63	0.60	0.71
63	80	0.70	0.80
80	100	0.80	0.89



TABLE VI

TOLERANCES ON WALL THICKNESS OF HOLLOW SECTIONS

WALL THICKNESS mm		Tolerances - (mm +/-)							
		Allowable deviation of Mean Wall Thickness from Specified Wall Thickness				Allowable deviations of Wall Thickness at any point from mean wall thickness (Eccentricity)			
		Difference between $1/2 (AA+BB)$ and Specified Wall Thickness. Overall dimensions - mm				Difference between AA and mean wall thickness. $AA - 1/2(AA+BB)$			
Over	Upto and Including	Over 12	25	32	40	50	63	80	Circumscribing Circle Diameter Under 125 mm
		Upto 25	32	40	50	63	80	100	
1	1.2	0.22	0.22	-	-	-	-	-	0.22
1.2	1.5	0.28	0.28	0.28	0.30	-	-	-	0.33
1.5	2	0.30	0.33	0.33	0.36	-	-	-	0.41
2	2.5	0.33	0.33	0.36	0.38	0.43	0.46	-	0.51
2.5	3	0.41	0.43	0.46	0.48	0.51	0.53	0.56	0.56
3	4	0.53	0.56	0.58	0.61	0.64	0.66	0.69	0.70
4	5	-	0.71	0.74	0.76	0.79	0.81	0.84	1.00
5	6	-	-	0.97	0.99	1.02	1.04	1.07	1.60



TABLE VII

TOLERANCES ON DIAMETER (INSIDE & OUTSIDE) OF EXTRUDED ROUND TUBES

SPECIFIED DIAMETER (mm)		Tolerances - (mm +/-)	
		Allowable deviation of mean diameter from specified diameter	Allowable deviation of diameter at any point from specified diameter (ovality)
Over	Upto and Including	Difference between 1/2 (AA+BB) and specified diameter	Difference between AA and specified diameter
12	22	0.25	0.50
22	36	0.30	0.60
36	45	0.40	0.80
45	50	0.45	0.90
50	63	0.50	1.00
63	80	0.60	1.30
80	150	1% of diameter	2.2% of diameter

TABLE VIII

TOLERANCES ON WALL THICKNESS OF EXTRUDED ROUND TUBES

SPECIFIED WALL THICKNESS (mm)		Tolerances - (mm +/-)		
		Allowable deviation of mean Wall Thickness from specified Wall Thickness	Allowable deviation of Wall Thickness at any point from mean Wall Thickness (Eccentricity)	
Over	Upto and Including	Difference between 1/2 (AA+BB) & specified Wall Thickness	Difference between AA & mean wall thickness as extruded AA - 1/2 (AA+BB)	
		Outside diameter - mm		
		Under 30	30 - 65	65 - 100
1	1.3	0.20	0.23	0.25
1.3	1.6	0.30	0.30	0.33
1.6	2	0.35	0.35	0.40
2	3	0.45	0.50	0.55
3	4	0.60	0.60	0.65
4	5	0.80	0.80	0.85
5	6	0.85	0.85	0.90

Plus & Minus
10% of mean wall thickness
max : +/- 1.5
min : +/- 0.25



TABLE IX

TOLERANCES FOR FLATNESS

SOLIDS		Minimum Thickness of metal forming the surface mm	HOLLOWS	
Surface Width mm.	Tolerances - mm		Tolerances - mm	
				max. allowable deviation (D)
Upto 25	+/-0.18		Width upto 25mm or any 25 mm increment of wider Surface	Width over 25mm
Over 25 Upto & including 38	0.25			
Over 38 Upto & including 50	0.30	Upto 4.5	+/-0.20	+/-0.008xW
Over 50	0.30 Plus 0.13 per each 25 mm of Width	4.5 & over	+/-0.15	+/-0.006xW

TABLE X
ANGULAR TOLERANCES FOR REGULAR SECTIONS

Minimum specified leg Thickness mm.	Allowable deviation from specified Angle
Upto and including 5	+/- 2°
Over 5 upto and including 19	+/- 1.5°
Over 19	+/- 1°

NOTE : 1. Angles should be measured at the extremities of the sections.
2. Not applicable to shapes.

TABLE XI

TOLERANCES ON TWIST

PRODUCT	Specified Width (Bar & Tubes) Circumscribing Circle diameter (Shapes) mm	Specified Thickness (Rectangular Tubes) Minimum Thickness (shapes) mm	Tolerances - Degree (+) & (-)	
			Allowable deviation from straightness	
			In any metre or less of length	In total length of piece
BAR	Upto 38	All	$\pm 2^{\circ}$	2° x length m 6° max. In full length
	38 & over	All	$1\frac{1}{2}^{\circ}$	$1\frac{1}{2}^{\circ}$ x length m 5° max. In full length
SHAPES	Upto 38	All	2°	2° x length m 6° max. In full length
	38 & over	All	$1\frac{1}{2}^{\circ}$	$1\frac{1}{2}^{\circ}$ x length m 5° max. In full length
HOLLOWS (other than Round Tubes)	Upto 38	All	2°	2° x length m 6° max. In full length
	38 & over	All	$1\frac{1}{2}^{\circ}$	$1\frac{1}{2}^{\circ}$ x length m 5° max. In full length

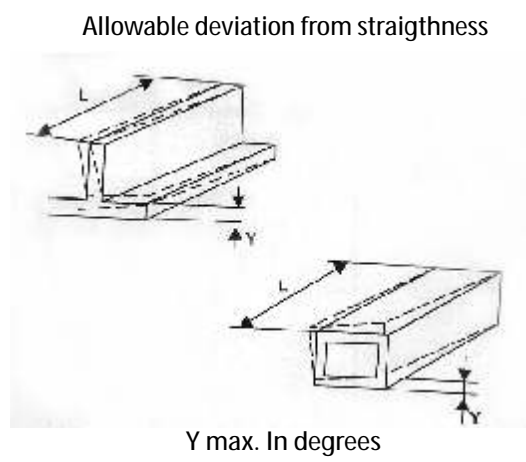




TABLE XII

TOLERANCES FOR STRAIGHTNESS (Rods, Bars, Shapes & Tubes)

PRODUCT	Specified DIA. (Rod) Specified Width (Bar) Circumscribing Circle Diameter (shapes) Specified DIA. (Tubes) mm.	Specified Thickness (Rectangles) Minimum Thickness (shapes) Specified Thickness (Tubes) mm.	Tolerances -mm	
			Allowable deviation (D) from straightness	
			In one metre length	In total length of piece
Rod & Square, Hexagonal and Octagonal Bar	All		1.7	1.7 x length m
Rectangular Bar	Upto 38	Upto 2.35	4.0	4 x length m
	38 & over	2.35 and over	1.7	1.7 x length m
Shapes	Upto 38	Upto 2.35	4.0	4 x length m
	38 & over	2.35 and over	1.7	1.7 x length m
Tubes	All	Upto 2.35	4.0	4 x length m
		2.35 and over	1.7	1.7 x length m

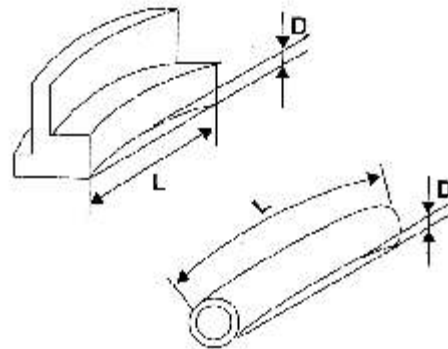


TABLE XIII
CONVERSION OF SWG TO INCHES & mm.

SWG	Inches	mm	SWG	Inches	mm	SWG	Inches	mm
6	0.192	4.877	12	0.104	2.642	18	0.048	1.219
7	0.176	4.470	13	0.092	2.337	19	0.040	1.016
8	0.160	4.064	14	0.080	2.032	20	0.036	0.914
9	0.144	3.658	15	0.072	1.829	21	0.032	0.812
10	0.128	3.251	16	0.064	1.626	22	0.028	0.711
11	0.116	2.946	17	0.056	1.422	23	0.024	0.610