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IS 6477 (1983): Dimensions for wrought aluminium and aluminium alloys, extruded hollow section [MTD 7: Light Metals and their Alloys]



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“Knowledge is such a treasure which cannot be stolen”

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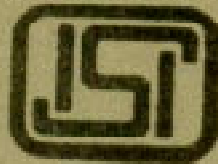


IS : 6477 -1983

Indian Standard

DIMENSIONS FOR
WROUGHT ALUMINIUM AND ALUMINIUM
ALLOYS, EXTRUDED HOLLOW SECTIONS
(*First Revision*)

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

DIMENSIONS FOR WROUGHT ALUMINIUM AND ALUMINIUM ALLOYS, EXTRUDED HOLLOW SECTIONS (*First Revision*)

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Indian Standard

DIMENSIONS FOR WROUGHT ALUMINIUM AND ALUMINIUM ALLOYS, EXTRUDED HOLLOW SECTIONS (*First Revision*)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 25 August 1983, after the draft finalized by the Light Metals and Their Alloys Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This standard was first published in 1972. In this revision, additional requirements for tolerances on straightness, flatness, length and angularity of hollow sections have been incorporated. The tolerances for extruded tubes, other than round, have also been included in this standard. This standard should be used in conjunction with IS : 1285-1975*.

0.3 The dimensional tolerances for extruded round tubes are covered in IS : 2673-1979†.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960‡. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the tolerances on width and width across flats, wall thickness, length, straightness, flatness, twist and angularity of extruded hollow sections and tubes, other than round, of aluminium and aluminium alloys.

*Specification for wrought aluminium and aluminium alloy, extruded round tube and hollow sections (for general engineering purposes) (*second revision*).

†Dimensions for wrought aluminium and aluminium alloys, extruded round tube (*first revision*).

‡Rules for rounding off numerical values (*revised*).

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 5047 (Part 1)-1979* shall apply. Some of the important definitions are reproduced below for ready reference.

2.1.1 *Hollow Section* — An extruded shape, other than tube, the cross section of which completely encloses a void or voids.

2.1.2 *Tube (Other Than Round)* — A hollow wrought product that is long in relation to its cross section, which is a regular hexagon, a regular octagon, elliptical, square or rectangular with sharp or rounded corners, and that has uniform wall thickness except as affected by corner radii.

2.1.2.1 *Extruded tube* — A hollow extrusion of uniform wall thickness not subjected to cold drawing.

3. DIMENSIONAL TOLERANCES

3.1 Dimensional tolerances of extruded hollow sections including tubes other than round, shall be as given in Tables 1, 2, 3, 4, 5, 6 and 7. These tolerances are applicable subject to the following.

3.1.1 These standard tolerances are applicable to the average shape, wider tolerances may be required for some shapes and closer tolerances may be possible for others.

3.1.2 The tolerances applicable to a dimension composed of two or more component dimensions is the sum of the tolerances of the component dimensions if all of the component dimensions are indicated.

3.1.3 When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permissible under the tolerance.

3.1.4 When outside dimensions, inside dimensions, and wall thickness are all specified, standard tolerances are applicable to any two of these dimensions, but not to all three.

3.1.5 In the case of tubes, these tolerances are not applicable in the annealed (O) temper or if wall thickness is less than 2.5 percent of the equivalent round diameter. The equivalent round diameter is the diameter of a circle having a circumference equal to the perimeter of the tube.

*Glossary of terms relating to aluminium and aluminium alloys: Part 1 Unwrought and wrought metals (*first revision*).

3.1.6 For non-heat-treatable alloys, these tolerances are applicable when wall thickness of the section is at least 1.5 mm or 1/32 of overall width whichever is greater. For heat-treatable alloys, these tolerances are applicable when wall thickness is at least 1.5 mm or 1/24 overall width, whichever is greater.

3.1.7 Tolerances measured at the centre of section includes tolerance on concavity and convexity.

3.1.8 For high magnesium non-heat-treatable alloys (that is alloy 52000, 53000, 54300, 55000) an extra tolerance of 50 percent shall be allowed.

3.1.9 The mean wall thickness is the average of two measurements taken opposite to each other at approximate centre line of the tube and perpendicular to the longitudinal axis of the cross section.

3.1.10 The circumscribing circle diameter is the diameter of the smallest circle that will completely enclose the cross section of the extruded product.

3.1.11 The wall thickness tolerance for extruded hollow section shall be as agreed to between the purchaser and the manufacturer/supplier when the nominal thickness of one wall is three times or greater than that of the opposite wall.

3.1.12 Flatness tolerance is a measure of concavity or convexity.

3.1.13 While measuring convexity the straight edge shall be balanced at the middle of the section.

3.1.14 Twist is normally measured by placing the extruded section on a flat surface and measuring the maximum distance at any point along its length between the bottom surface of the section and the flat surface. From this measurement the deviation from true straightness of the section is subtracted and the remainder is the twist. To convert the standard twist tolerance (degrees) to an equivalent linear value; the tangent of the standard tolerance in degrees is multiplied by the width of the surface of the section that is on the flat surface.

3.1.15 Twist shall be measured either in degrees or in millimetres at the extremity as indicated.

3.1.16 Angles should be measured at the extremities of the section. If the faces of the sections are convex, the angle should be measured by balancing the arms of the protector at the middle of the section.

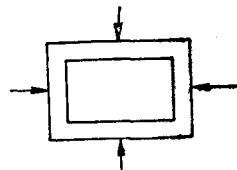
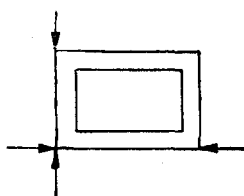
TABLE 1 TOLERANCES ON OVERALL DIMENSIONS

(All dimensions in millimetres.)

SPECIFIED WIDTH OR
WIDTH ACROSS FLATS

Over Up to and
 Including

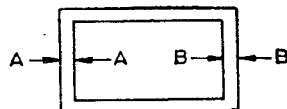
TOLERANCES

When Measured at the
Corners of the SectionWhen Measured at
the Centres of
Section

(1)	(2)	(3)	(4)
		±	±
10	20	0.30	0.46
20	30	0.38	0.55
30	40	0.45	0.65
40	50	0.52	0.80
50	60	0.60	1.00
60	80	0.70	1.20
80	100	0.80	1.40
100	120	0.90	1.65
120	140	1.00	1.90
140	160	1.14	2.20
160	180	1.27	2.45
180	200	1.40	2.70
200	225	1.52	3.00
225	250	1.65	3.30

TABLE 2 TOLERANCES ON WALL THICKNESS

(All dimensions in millimetres.)

Tolerances on Mean Wall Thickness $[\frac{1}{2} (AA + BB)]$

SPECIFIED WALL THICKNESS		OVERALL DIMENSIONS OR CIRCUMSCRIBING CIRCLE DIAMETER														
Over	Up to and Including	Over Up to and Including	10 20	20 30	30 40	40 50	50 60	60 80	80 100	100 120	120 140	140 160	160 180	180 200	200 225	225 250
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	
		±	±	±	±	±	±	±	±	±	±	±	±	±	±	
1	1.5	0.28	0.28	0.28	0.30											
1.5	2	0.30	0.33	0.33	0.36											
2	2.5	0.33	0.33	0.36	0.38	0.43	0.46									
2.5	3	0.41	0.43	0.46	0.48	0.51	0.53	0.56								
3	4	0.53	0.56	0.58	0.61	0.64	0.66	0.69	0.71	0.74						
4	5		0.71	0.74	0.76	0.79	0.81	0.84	0.86	0.89	0.91	0.94	1.02	1.02		
5	6			0.97	0.99	1.02	1.04	1.07	1.09	1.12	1.14	1.17	1.19	1.22	1.24	
6	8				1.22	1.24	1.27	1.30	1.32	1.35	1.37	1.40	1.42	1.45	1.47	
8	10					1.47	1.50	1.52	1.55	1.57	1.60	1.63	1.65	1.68	1.70	
10	12					1.73	1.75	1.78	1.80	1.83	1.85	1.88	1.90	1.93	1.96	
12	16						1.98	2.00	2.03	2.06	2.08	2.11	2.13	2.16	2.18	
16	20							2.24	2.26	2.29	2.31	2.34	2.36	2.39	2.41	
20	25								2.49	2.51	2.54	2.57	2.59	2.62	2.64	2.67

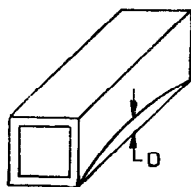
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TABLE 3 TOLERANCES ON LENGTHS

(All dimensions in millimetres.)

SPECIFIED CIRCUMSCRIBING CIRCLE DIAMETER		LENGTH				
Over	Up to and Including	Over Up to and Including	— 1 500	1 500 3 000	3 000 6 000	6 000 7 500
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			±	±	±	±
—	50		5	5	6	8
50	100		5	6	8	10
100	150		6	8	10	12
150 and above			8	10	12	14

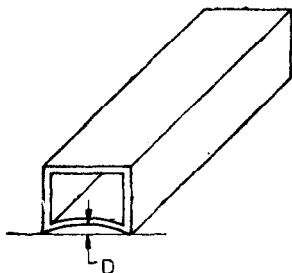
TABLE 4 TOLERANCES OF STRAIGHTNESS



SPECIFIED CIRCUMSCRIBING CIRCLE DIAMETER, mm	SPECIFIED WALL THICKNESS, mm	ALLOWABLE DEVIATION (<i>D</i>) FROM STRAIGHTNESS, mm	
		In One Metre Length	In Total Length
(1)	(2)	(3)	(4)
Up to 25	Up to 2.35	5.0	5.0 × length
	2.35 and above	1.7	1.7 × length
25 and above	All	1.7	1.7 × length

TABLE 5 TOLERANCES ON FLATNESS

(All dimensions in millimetres.)

SPECIFIED WALL
THICKNESSALLOWABLE DEVIATION (*D*)Width Up to 25 mm
or any 25 mm In-
crement of Wider
Surface

Width Over 25 mm

(1)

(2)

(3)

±

±

Up to 5

0.20

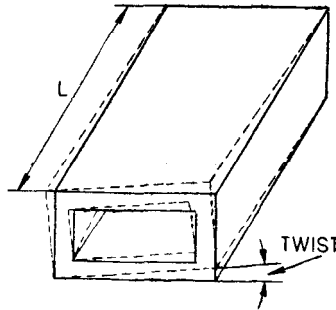
 $0.008 \times W$ (in mm)

5 and Over

0.15

 $0.006 \times W$ (in mm)

TABLE 6 TOLERANCES ON TWIST

SPECIFIED
CIRCUMSCRIBING
CIRCLE DIAMETER

PERMISSIBLE TWIST

(1)	PERMISSIBLE TWIST					
	In One Metre or Less of Length		In Total Length of Piece		Maximum Allowed for Total Length	
	Degrees At Extremity	Degrees At Extremity	Degrees At Extremity	Degrees At Extremity	Degrees At Extremity	Degrees At Extremity
(2)	(3)	(4)	(5)	(6)	(7)	
mm	mm		mm		mm	
Up to 40	3	2.1	$3 \times L$	$2.1 \times L$	7	5
Over 40 Up to 80	$1\frac{1}{2}$	2.1	$1\frac{1}{2} \times L$	$2.1 \times L$	5	7
Above 80	$\frac{3}{4}$	1.7	$\frac{3}{4} \times L$	$2.1 \times L$	3	8

(L is length in meters)

TABLE 7 TOLERANCES ON ANGULARITY

MINIMUM SPECIFIED
WALL THICKNESS
mmALLOWABLE DEVIATION FROM
SPECIFIED ANGLE, DEGREES

Over	Up to and Including	(3)
(1)	(2)	
—	5	± 2
5	20	$\pm 1\frac{1}{2}$
20 and above		± 1

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 kg.m/s ²
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m ²
Frequency	hertz	Hz	1 Hz = 1 c/s (s ⁻¹)
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m ²

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