IS 737 (2008): Wrought aluminium and aluminium alloy sheet and strip for general engineering purposes [MTD 7: Light Metals and their Alloys]

BLANK PAGE

भारतीय मानक

सामान्य इंजीनियरी प्रयोजनों के लिए पिटवाँ एल्यूमिनियम एवं एल्यूमिनियम मिश्र धातु की चादर एवं पत्ती — विशिष्टि

(चौथा पुनरीक्षण)

Indian Standard

WROUGHT ALUMINIUM AND ALUMINIUM ALLOY SHEET AND STRIP FOR GENERAL ENGINEERING PURPOSES — SPECIFICATION

(Fourth Revision)

ICS 77.150.10

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

September 2008

Price Group 6

FOREWORD

This Indian Standard (Fourth Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Light Metals and Their Alloys Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1956 and revised in 1965, 1974 and 1986. While reviewing this standard, in the light of experience gained during these years, the Committee decided to revise it to bring in line with the present practices being followed by the Indian industry.

In the present revision, following modifications have been made:

a) Ten new Grades 19002, 24530, 26388, 31200, 31500B, 52300, 52300B, 65028, 74538 and 76528 have been added.

b) A new clause on references has been incorporated.

c) Temper designations have been modified.

d) A comparison of IS and ISO designations has been given in Annex A for information for meeting domestic and export requirements.

Characteristics and typical uses of various alloys have been given in Annex B for information.

The composition of the Committee responsible for the formulation of this standard is given in Annex C.

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 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

WROUGHT ALUMINIUM AND ALUMINIUM ALLOY SHEET AND STRIP FOR GENERAL ENGINEERING PURPOSES — SPECIFICATION

(Fourth Revision)

1 SCOPE

This standard covers the requirements for wrought aluminium and aluminium alloy sheet and strip for general engineering purposes.

2 REFERENCES

The standards given below contain provisions which through reference in this text, constitute provisions of this standard. At time of the publication, the editions indicated were valid. All standards are subject to revision and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
504 : 1963	Methods of chemical analysis of aluminium and its alloys
1599 : 1985	Method for bend test (*second revision*)
1608 : 2005	Metallic materials — Tensile testing at ambient temperature (*third revision*)
2676 : 1981	Dimensions for wrought aluminium and aluminium alloys, sheet and strip (*first revision*)
5047	Glossary of terms relating to aluminium and aluminium alloys:
(Part 1) : 1986	Unwrought and wrought metals (*second revision*)
(Part 2) : 1979	Plant and operations, thermal treatment, control and testing finishing
5052 : 1993	Aluminium and its alloys— Temper designations (*first revision*)
10259 : 1982	General conditions for delivery and inspection of aluminium and aluminium alloy products

3 TERMINOLOGY

For the purpose of this standard the definition as given in IS 5047 (Part 1) and IS 5047 (Part 2) and the following shall apply.

3.1 Heat Treatment Batch — A quantity of material of one alloy of the same dimension and produced in the same way, solution treated and subsequently precipitation treated in one furnace load. More than one heat treatment batch may comprise a furnace load.

3.2 Sheet/Strip — Hot or cold rolled product of rectangular section, over 0.15 mm but less than 6.0 mm thick. It may be either in straight length or in coil form.

4 SUPPLY OF MATERIAL

General requirements relating to the supply of aluminium and aluminium alloy sheet and strip shall conform to IS 10259.

5 FREEDOM FROM DEFECTS

The material shall be sound and free from harmful defects for the intended application.

6 CHEMICAL COMPOSITION

The material when analyzed as per IS 504 or any other instrumental/chemical method shall conform to the requirements as given in Table 1. In case of dispute, the procedure given in IS 504 shall be the referee method. However, when the method is not given in IS 504 the referee method shall be as agreed to between the purchaser and the manufacturer.

7 MECHANICAL PROPERTIES

7.1 Tensile Test

The material when tested in accordance with IS 1608 shall conform to the values given in Table 2.

7.1.1 The tensile test piece shall be rectangular section and conform to the dimension as given in IS 1608 with a gauge length of 50 mm. The test piece shall be cut transverse to the direction of rolling for sheet and strip 300 mm wide and over and parallel to the direction of rolling for sheet and strip under 300 mm wide. When the width of the material to be tested in insufficient to permit preparation of the standard tensile test piece, a piece of the full width of the material may be used.

7.2 Bend Test (for Material 2.6 mm and Thinner)

Unless otherwise stated, the bend test piece shall be not less than 15 mm wide, of convenient length, and cut with its longer axis transverse to the direction of rolling. The longer edges shall be carefully rounded and smoothened longitudinally so that the cross-section of the test piece has approximately semi-circular ends.

7.2.1 The test piece may be bent by hand to a U-form, and the piece thus obtained shall subsequently be closed in a vice until the inner surfaces of the test piece are twice the specified radius apart (or are in general contact, if the test piece is to be closed flat).

7.2.2 When tested in accordance with **7.2.1**, the outer surface of the bend shall not show any visible crack (*see* IS 1599).

8 CONDITION

The material shall be supplied in the condition as specified by the purchaser, while specifying the condition, the temper designation as laid down in IS 5052 shall be followed.

9 DIMENSIONS AND TOLERANCES

The dimensions and tolerances of sheet and strip shall be as given in IS 2676.

10 SELECTION OF TEST SAMPLES

10.1 Sheet and Strip of Aluminium or Non-heat Treatable Aluminium Alloy

Material of the same thickness, produced in the same way, and of the same nominal composition shall be grouped into batches of not more than 4 000 kg. However, if a sheet or strip in a single coil exceeds 4 000 kg in weight, it shall be deemed to represent one batch.

10.1.1 Mechanical tests shall be carried out on each batch for determining conformity of the material to this standard.

10.1.2 Before the test samples are cut off, they shall be marked to identify them with the batch they represent. The test sample shall be taken from the material as supplied and shall not be further annealed or mechanically worked. The test samples may be cut and prepared from the margins of the material before cutting it to size.

10.2 Sheet and Strip of Heat-Treatable Aluminium Alloys

One test sample shall be cut from a sheet or strip selected from each heat treatment batch. Before the test samples are cut off, they shall be marked to identify with the heat treatment batch they represent.

10.2.1 Unless otherwise agreed, the test samples shall be tested in the O, T4 or T6 conditions (that is in the same condition in which the material is to be supplied). The test sample, after heat treatment, shall not be mechanically worked before being tested.

10.2.2 Material in the 'O' condition, when heat-treated, may have properties of the order of 15 MPa less than the specified properties for the T4 or T6 conditions as appropriate.

10.2.2.1 Unless otherwise agreed, the tests shall be carried out either in T4 or in T6 condition. The test samples shall not be further heat-treated or mechanically worked (except for making the test piece) before being tested. The test samples may be cut from the margins of the material before cutting it to size.

11 RE-TESTS

11.1 If a test does not give the specified results, two additional samples from the same batch shall be selected for testing, one of which shall be from the sheet or strip from which the original test sample was taken, unless that sheet or strip has been withdrawn by the supplier. Both retests shall conform to the requirements of this standard, otherwise, the lot shall be rejected.

11.2 Unless otherwise agreed, the supplier shall have the discretion to re-heat treat the material (heat-treatable alloys), not exceeding 2 re-heat treatments, before the two further samples are selected.

11.2.1 If a test does not give the specified results, two additional samples from the same batch shall be selected for testing. Both retests shall conform to the requirements of this standard, otherwise, the lot shall be rejected.

12 MARKING

12.1 Each package/coil of sheet(s) and strip(s) may be suitably marked for identification, with the name of the manufacturer, grade, condition of the material and batch number. The supplier shall furnish a certificate that the material supplied complies with the requirements of this standard.

12.1.1 *BIS Certification Marking*

The material may also be marked with the Standard Mark.

12.1.1.1 The use of the Standard Mark is governed by the provision of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of the conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Table 1 Chemical Composition of Wrought Aluminium and Aluminium Alloy Sheet and Strip

(*Clause* 6)

Designation	Aluminium	Copper	Magnesium	Silicon	Iron	Manganese	Zinc	Titanium	Chromium	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
19990	99.99, *Min*	—	—	—	—	—	—	—	—	Cu+Si+Fe = 0.01
19800	99.8, *Min*	0.03	—	0.15	0.15	0.03	0.06	—	—	Cu+Si+Fe+Mn+Zn = 0.2
19700	99.7, *Min*	0.03	—	0.2	0.25	0.03	0.06	—	—	Cu+Si+Fe+Mn+Zn = 0.3
19600	99.6, *Min*	0.05	—	0.25	0.35	0.03	0.06	—	—	Cu+Si+Fe+Mn+Zn = 0.4
19500	99.5, *Min*	0.05	—	0.3	0.4	0.05	0.05	—	—	Cu+Si+Fe+Mn+Zn = 0.5
19002	99.0, *Min*	0.05-0.2	0.05	Fe+Si-0.95		0.05	0.1	—	—	
19000	99.0, *Min*	0.1	0.2	0.5	0.7	0.1	0.1	—	—	Cu+Mg+Si+Fe+Mn+Zn = 1.0
24345	Remainder	3.8-5.0	0.2-0.8	0.5-1.2	0.7	0.3-1.2	0.2	0.3[1)]	0.3[1)]	
24530	Remainder	3.8-4.9	1.2-1.8	0.5	0.5	0.3-0.9	0.25	0.15	0.1	
26388	Remainder	5.8-6.8	0.02	0.2	0.3	0.2-0.4	0.1	0.02-0.10	—	Zr = 0.10-0.25
31000	Remainder	0.1	0.1	0.6	0.7	0.8-1.5	0.2	0.2	0.2	
31200	Remainder	0.05-0.2	0.1	0.6	0.7	1.0-1.5	0.1	—	—	
31500	Remainder	0.2	0.6-1.3	0.4	0.7	1.0-1.5	0.2	0.2	—	
31500B	Remainder	0.1	0.2-0.8	0.4	0.7	0.3-0.8	0.2	—	0.1	
40800	98.0, *Min*	0.2	0.1	0.6-0.95	0.6-0.95	0.1	0.2	0.2	—	
51000A	Remainder	0.2	0.5-1.1	0.6	0.7	0.2	0.25	—	0.1	
51000B	Remainder	0.2	1.1-1.8	0.6	0.7	0.2	0.25	—	0.1	
51300	Remainder	0.3	0.2-0.9	0.6	0.9	0.2-0.7	0.4	0.2	0.2	
52000	Remainder	0.1	1.7-2.6	0.6	0.7	0.5	0.2	0.2	0.25	Cr+Mn = 0.5
52300	Remainder	0.2	1.5-2.4	0.8	0.9	0.5-1.0	0.4	0.2	0.2	
52300B	Remainder	0.2	1.3-1.7	0.6	0.4-0.7	1.1-1.5	0.4	0.2	0.2	
53000	Remainder	0.1	2.8-4.0	0.6	0.7	0.5	0.2	0.2	0.25	Cr+Mn = 0.5
54300	Remainder	0.1	4.0-4.9	0.4	0.7	0.5-1.0	0.2	0.2	0.25	
55000	Remainder	0.1	4.5-5.5	0.6	0.7	0.5	0.2	0.2	0.25	Cr+Mn = 0.5
64430	Remainder	0.1	0.4-1.2	0.6-1.3	0.6	0.4-1.0	0.1	0.2	0.25	
65028	Remainder	0.15-0.4	0.7-1.2	0.4-0.8	0.7	0.2	0.2	0.2	0.15-0.35	
65032	Remainder	0.15-0.4	0.7-1.2	0.4-0.8	0.7	0.2-0.8	0.2	0.2	0.1	
74530	Remainder	0.2	1.0-1.5	0.4	0.7	0.2-0.7	4.0-5.0	0.2	0.2	
74538	Remainder	0.1	2.3-3.3	0.3	0.4	0.1-0.4	3.5-4.5	0.1	0.15-0.25	
76528	Remainder	1.2-2.0	2.1-2.9	0.4	0.5	0.3	5.1-6.1	0.2	0.18-0.28	

NOTE — It is the responsibility of the supplier to ensure that any element not specially limited is not present in an amount such as is generally accepted as having an adverse effect on the product. If a purchaser's requirements necessitate limits for any element not specified, it should be agreed between the purchaser and the supplier.

[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.

Table 2 Mechanical Properties of Wrought Aluminium and Aluminium Alloy Sheet and Strip

(Clauses 7.1 and 7.2)

Designation	Condition	0.2 Proof Stress MPa *Min*	Tensile Strength MPa		Elongation on 50 mm Gauge Length, Percent, for Thickness				Bend Test, Radius of Bend
			Min	*Max*	0.5 to 0.8 mm	Over 0.8 Up to and Including 1.3	Over 1.3 Up to and Including 2.6	Over 2.6 Up to and Including 6.3	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
19990	O	—	—	65	30	35	40	45	Close
	H × 4	—	80	100	7	6	10	12	1/2*t*
	H × 8	—	100	—	3	4	5	6	1*t*
19800	O	—	—	90	29	29	29	34	Close
	H × 4	—	90	120	5	8	7	8	1/2*t*
	H × 8	—	120	—	3	4	4	5	1*t*
19700	O	—	—	95	27	27	29	34	Close
	H × 4	—	95	120	4	5	6	7	1/2*t*
	H × 8	—	120	—	3	3	4	4	1*t*
19600	O	—	—	95	25	25	29	32	Close
	H × 4	—	95	125	4	5	6	6	1/2*t*
	H × 8	—	125	—	3	3	4	4	1*t*
19500	O	—	55	95	22	25	29	30	Close
	H × 4	—	100	135	4	5	6	6	1/2*t*
	H × 8	—	125	—	3	3	4	4	1*t*
19000	O	—	70	110	20	25	29	30	Close
	H × 2	—	90	130	5	6	8	8	Close
	H × 4	—	105	140	3	4	5	5	1/2*t*
	H × 6	—	125	150	2	3	4	4	1/2*t*
	H × 8	—	140	—	2	2	3	3	1*t*
19002	O	—	75	110	14	16	20	20	Close
	H × 2	—	95	130	5	6	7	7	Close
	H × 4	—	110	145	3	4	5	5	1/2*t*
	H × 6	—	130	165	2	3	4	4	1/2*t*
	H × 8	—	150	—	2	2	3	3	1*t*
24345	O	—	—	240	14	14	14	14	Close
	T4	240	380	—	13	14	14	14	3*t*
	T6	345	425	—	6	6	6	6	5*t*
24530	O	—	—	220	12	12	12	12	Close
	T4	275	425	—	15	15	15	15	3*t*
	T6	345	440	—	5	5	5	5	5*t*
26388	O	—	—	220	12	12	12	12	Close
	T6	250	370	—	6	6	7	8	5 *t*

Table 2 (*Continued*)

Designation	Condition	0.2 Proof Stress MPa *Min*	Tensile Strength MPa		Elongation on 50 mm Gauge Length, Percent, for Thickness				Bend Test, Radius of Bend
			Min	*Max*	0.5 to 0.8 mm	Over 0.8 Up to and Including 1.3	Over 1.3 Up to and Including 2.6	Over 2.6 Up to and Including 6.3	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
31000	O	—	90	130	20	23	24	24	Close
	H × 2	—	115	150	5	6	7	8	Close
	H × 4	—	130	180	3	4	5	5	1/2*t*
	H × 6	—	150	195	2	3	4	4	1*t*
	H × 8	—	170	—	2	2	3	3	3*t*
31200	O	35	95	135	20	23	24	25	Close
	H × 2	80	115	160	6	7	8	9	Close
	H × 4	115	140	180	4	4	5	6	1/2 *t*
	H × 6	140	165	205	3	3	4	4	1*t*
	H × 8	165	180		2	2	3	3	3*t*
31500	O	—	125	165	16	16	18	20	Close
	H × 2	—	150	210	5	5	6	8	Close
	H × 4	—	190	245	3	4	5	5	1/2*t*
	H × 6	—	215	275	2	2	3	4	1/2*t*
	H × 8	—	245		1	1	1	2	1*t*
31500B	O	—	115	150	16	16	18	20	Close
	H × 2	—	140	200	5	5	6	8	1/2*t*
	H × 4	—	180	235	3	4	5	5	1*t*
	H × 6	—	205	260	2	2	3	4	2*t*
	H × 8	—	240	—	1	1	1	2	4*t*
40800	O	—	85	120	20	23	25	30	Close
	H × 2	—	105	140	5	6	7	8	Close
	H × 4	—	125	160	3	4	5	5	1/2*t*
	H × 6	—	150	180	2	3	4	4	1*t*
	H × 8	—	175	—	2	2	3	3	3*t*
51000A	O	—	105	150	18	18	18	22	Close
	H × 2	85	120	160	3	4	5	6	Close
	H × 4	105	140	180	2	3	4	4	1/2*t*
	H × 6	125	160	200	1	2	2	2	1*t*
	H × 8	—	185	—	1	2	2	2	3*t*
51000B	O	—	125	170	18	18	18	19	Close
	H × 2	110	155	195	3	4	5	6	1/2*t*
	H × 4	140	175	215	2	3	4	4	1*t*
	H × 6	155	190	225	1	2	2	2	3*t*
	H × 8	—	200	—	1	2	2	2	—
51300	O	—	95	145	14	14	15	16	Close
	H × 2	—	130	180	6	6	7	8	1/2*t*
	H × 4	—	150	200	4	4	5	6	1*t*
	H × 6	—	175	215	2	2	3	4	2*t*
	H × 8	—	195	—	1	1	1	2	4*t*

Table 2 (*Continued*)

Designation	Condition	0.2 Proof Stress MPa *Min*	Tensile Strength MPa		Elongation on 50 mm Gauge Length, Percent, for Thickness				Bend Test, Radius of Bend
			Min	*Max*	0.5 to 0.8 mm	Over 0.8 Up to and Including 1.3	Over 1.3 Up to and Including 2.6	Over 2.6 Up to and Including 6.3	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
52000	O	60	175	215	16	16	16	18	Close
	H × 2	125	200	240	3	4	5	6	½*t*
	H × 4	175	230	275	2	2	3	4	1*t*
	H × 6	190	235	295	2	2	3	—	—
	H × 8	215	265	—	1	2	3	—	—
52300	O	75	160	210	12	14	16	18	Close
	H × 2	140	170	220	4	5	6	7	1*t*
	H × 4	180	190	250	4	4	5	5	2*t*
	H × 6	200	225	285	3	3	4	—	—
	H × 8	225	250	—	2	2	3	—	—
52300B	O	—	160	210	12	13	14	14	Close
	H × 2	—	190	260	4	4	5	5	2*t*
	H × 4	—	220	280	3	3	4	4	3*t*
	H × 6	—	250	300	2	2	3	3	—
	H × 8	—	270	—	2	2	3	3	—
53000	O	85	210	270	12	14	16	18	Close
	H × 2	160	240	290	4	5	6	7	1*t*
	H × 4	220	270	320	3	3	5	5	2*t*
	H × 6	225	290	340	2	2	4	—	—
	H × 8	235	310	—	2	2	3	—	—
54300	O	130	265	365	12	14	16	16	1*t*
	H × 2	235	315	395	5	6	7	7	2*t*
	H × 4	275	355	—	4	4	5	5	3*t*
55000	O	130	265	365	12	14	16	16	Close
	H × 2	220	310	395	5	6	7	7	2*t*
64430	O	—	—	175	14	16	16	17	Close
	T4	115	200	—	12	15	15	15	2*t*
	T6	250	295	—	5	5	5	6	3*t*
65028	O	—	—	175	14	16	16	18	Close
	T4	110	200	—	12	15	15	15	2*t*
	T6	235	280	—	5	5	5	6	3*t*
65032	O	—	—	175	14	16	16	18	Close
	T4	110	200	—	12	15	15	15	2*t*
	T6	235	280	—	5	5	5	6	3*t*
74530	T4	175	280	—	8	9	9	10	5*t*
	T6	270	315	—	6	7	7	8	5*t*

Table 2 (*Concluded*)

Designation	Condition	0.2 Proof Stress MPa *Min*	Tensile Strength MPa		Elongation on 50 mm Gauge Length, Percent, for Thickness				Bend Test, Radius of Bend
			Min	*Max*	0.5 to 0.8 mm	Over 0.8 Up to and Including 1.3	Over 1.3 Up to and Including 2.6	Over 2.6 Up to and Including 6.3	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
74538	O	103	227	—	22	22	22	22	1.5t
	T6	330	400	—	13	13	14	14	6t
76528	O	—	—	275	10	10	11	11	1.5t
	T6	460	525	—	6	6	7	7	6t

NOTES

1 1 MPa = $1N/mm^2 = 1MN/m^2 = 0.102\ kgf/mm^2 = 144.4$ psi.

2 t is the thickness of the test piece.

3 For thickness 2.6 mm and less, elongation values are for guidance only and not guaranteed. For this purpose bend test as specified in 7.2 may be carried out.

ANNEX A

(Foreword)

COMPARISON OF ISO AND IS DESIGNATIONS

ISO Designation (1)	*IS Designation* (2)	*ISO Designation* (1)	*IS Designation* (2)
1190	19990	5005	51000A
1080	19800	5050	51000B
1070	19700	5010	51300
1060	19600	5251	52000
1050	19500	5049	52300
1100	19002	5154A	53000
1200	19000	5083	54300
2014	24345	5056	55000
2024	24530	6531	64430
2219	26388	6061	65028
3103	31000	6261	65032
3003	31200	7005	74530
3004	31500	7039	74538
3105	31500B	7075	76528
8011	40800		

ANNEX B

(Foreword)

CHARACTERISTICS AND TYPICAL USES OF ALLOYS

Designation	*Characteristics*	*Available Forms*	*Typical Uses*
(1)	(2)	(3)	(4)
19990	Super-purity aluminium having excellent reflectivity, thermal and electrical conductivity	Sheet and strip	Electrolytic capacitors, decorative hollowware's, trims and other applications requiring high degree of finish
19800 and 19700	High purity aluminium having good corrosion resistance	Sheet, plate and wire	Jewellery, decorative and novelty anodized items, auto trim, reflectors, breweries and some chemical plants and metallizing
19600 and 19500	High purity aluminium more resistant to corrosion than other grades	Sheet, plate, extrusion, tube, wire, rolled rod and forging	Corrosion resistant cladding on stronger alloys, impact extruded container; food, chemical brewing and processing equipments, tanks and pipes, marine fittings, reflectors, pressed and anodized utility items, jewellery, cable sheathing, pre-sensitized plates and cable wrap
19000	Commercially pure aluminium. Very ductile in annealed or extruded condition. Excellent resistant to corrosion	Sheet, plate, extrusion, tube, wire and forgings	Paneling and moulding; refrigeration tubing equipment for chemical, food and brewing industries; packaging; cooking utensils. Sheet metal work, architectural and builder's hardware, spun/pressed hollowware, deep drawn parts, cladding welding wire and electrical appliances
24345	Combines high strength with	Sheet, plate,	Heavy duty forgings, structures where

Designation	*Characteristics*	*Available Forms*	*Typical Uses*
(1)	(2)	(3)	(4)
	fair ductility in the solution-treated condition, when forming can be done and parts subsequently aged	extrusion, tube, wire and forgings	high mechanical properties are of utmost importance, aircraft application of clad sheets, extrusions and armaments
31000	Stronger and harder than 19000 but has good workability, weldability and corrosion resistance	Sheet, plate, extrusion, wire, tube and forgings	General purpose alloy for moderate strength applications, pressure vessels, irrigation tubing, heat exchangers, utensils and presser cookers, roofing sheets, pilfer proof and detonator caps, air-conditioning ducting fan blades and vehicle paneling
31500	Strength between alloys 31000 and 52000. It has good formability, weldability and corrosion resistance	Sheet and strip	General purpose sheet, roofing and siding, utensils, sheet metal work, vehicle paneling, pressure vessels and lamp caps
31500B	Strength between alloys 31000 and 52000. It has good formability, weldability and corrosion resistance	Sheet and strip	Painted sheets, closer stock, bus body, fan blade sheet, tread plate
40800	Strength comparable to alloy 31000 and ductility comparable to alloy 19000. This alloy is fine grained and has excellent drawability	Sheet, strip and plate	Vehicle paneling, fan blades and other applications same as of alloys 19000 and 31000 except those for bright anodizing purposes, detonators, utensils/hollowware containers, closures and cable wrap
51000A	Stronger than alloy 31000, and has excellent finishing characteristics. It can be readily shaped by pressing and forming	Sheet, strip and plate	Appliances and utensils, architectural trims, consumer durables with attractive anodized finishes
51000B	Strength greater than 51000A	Sheet, strip and plate	Architectural applications; high anodizing quality kitchenware and cooking utensils, consumer durables; bathroom fittings, auto rim, air conditioner and TV housing; chemical equipment, marine applications and refrigerator item
51300	Stronger and harder than alloy 19000. Strength between alloys 31000 and 31500. It has good weldability	Corrugated sheet, sheet and strip	General purpose alloy which can be used for most of the applications of alloys 31000 and 19000
52000	Ductile in soft condition but work hardens rapidity, becoming extremely tough. Has high resistance to corrosive attack, especially in marine atmosphere	Sheet, plate, extrusion, tube, wire and forgings	Paneling and structures, sheet metal work and domestic appliances
52300	Ductile in soft condition but work hardens rapidity, becoming extremely tough. Has high resistance to corrosive attack, especially in marine atmosphere	Plate, sheet and strip	In road, rail and marine transport sector

Designation	*Characteristics*	*Available Forms*	*Typical Uses*
(1)	(2)	(3)	(4)
52300B	Ductile in soft condition but work hardens rapidity, becoming extremely tough. Has high resistance to corrosive attack, especially in marine atmosphere	Plate, sheet and strip	In road, rail and marine transport sector
53000	Ductile in soft condition but work hardens rapidity, becoming extremely tough. Has high resistance to corrosive attack, especially in marine atmosphere	Sheet, extrusion, tube, wire and rolled rod	Shipbuilding, rivets; pressure vessels and other processing tanks; cryogenics and welded structures
54300	Ductile in soft condition but work hardens rapidity, becoming extremely tough. Has high resistance to corrosive attack, especially in marine atmosphere	Sheet, plate, extrusion and forgings	Welded structures, cryogenic applications; structural marine applications, rail and road tank cars, rivets, missile components and railway freight wagon
55000	Ductile in soft condition but work hardens rapidity, becoming extremely tough. Has high resistance to corrosive attack, especially in marine atmosphere	Sheet, plate, wire and forgings	Shipbuilding and other applications demanding moderately high strength with good corrosion resistance; rivets, zippers, welding wire, etc.
64430	A medium strength alloy with good mechanical properties, corrosion resistance and weldability	Sheet, plate, extrusion, tube, wire and forgings	Structural application of all kinds, such as road and rail transport vehicles, bridges, cranes, roof trusses, rivets, etc. Cargo containers, milk containers and flooring
65028	Medium strength, heat treatable alloy with good weldability and corrosion resistance	Sheets, plates, forgings and extruded sections	Rail-road transport, towers, furniture, pipelines, structural applications and gas cylinders including for LPG
65032	Medium strength: very good forming characteristics in the O and W condition. Good corrosion resistance	Sheet, plate, extrusion, tube, wire and forgings	Structural application of all kinds, such as road and rail transport vehicles, bridges, cranes, roof trusses, rivets, etc. Cargo containers, milk containers and flooring
74530	Medium strength: self-ageing weldable alloy. It does not require heat treatment after hot working or welding. Excellent welding characteristics and good formability. Good corrosion resistance when compared with other high strength aluminium zinc alloys	Sheet, plate, extrusion and forgings	Stressed structural applications requiring welding, such as bridges, chequered plates, dumptrack bodies, pressure vessels, rail coaches, etc

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Light Metals and Their Alloys Sectional Committee, MTD 7

Organization	*Representative(s)*
Aluminium Association of India, Bangalore	Prof K. S. S. Murthy (***Chairman***) Shri N. C. Sud (*Alternate*)
Aeronautical Development Estt, Bangalore	Shrimati Chhaya Rajput
Bhabha Atomic Research Centre, Mumbai	Dr M. Sundersanan Shri M. M. Ramanamurthi (*Alternate*)
Bharat Aluminium Co Ltd, Korba	Shri A. K. Saha Shri Narain Balakrishnan (*Alternate*)
CEMILAC, Bangalore	Dr P. Ragotham Rao
DGAQA, Headquarters, New Delhi	Shri V. K. Sachdeva Shri Ajay Sagarya (*Alternate*)
DGS&D, New Delhi	Shri B. Dasgupta Shri M. A. Khan (*Alternate*)
DMRL, Hyderabad	Dr Amol A. Gokhale Shri Vijay Singh (*Alternate*)
DRDL, Hyderabad	Dr S. Sundarrajan
HINDALCO (INDAL Division) Industries Ltd, Silvasa/Taloja	Shri Ashok Sangolli Shri Shubhankar Gupta (*Alternate*)
HINDALCO Industries Ltd, Renukoot	Shri V. Ramesh Shri Abhey Agarwal (*Alternate* I) Shri P. N. Koparde (*Alternate* II)
Hindustan Aeronautics Ltd, Bangalore	Dr R. R. Bhatt
Gulf Oil Corporation, Hyderabad	Shri B. N. Acharya Shri N. Rajesh Chandra (*Alternate*)
Indian Institute of Science, Bangalore	Prof M. K. Surappa Prof Subodh Kumar (*Alternate*)
Indian Space Research Organization, Bangalore	Shri T. S. Nanjunda Swamy Shri Rajendra Hulyal (*Alternate*)
Institute of Indian Foundrymen, New Delhi	Shri K. S. Satyanarayana Shri A. K. Anand (*Alternate*)
J. N. Aluminium, R & D Design Centre, Nagpur	Shri J. Mukhopadhyay Shri R. N. Chauhan (*Alternate*)
Jindal Aluminium Ltd, Bangalore	Shri K. R. Raghunath Shri Vipin Jain (*Alternate*)
Madras Aluminium Co Ltd, Distt Salem	Shri P. Chennappan
MECON Ltd, Ranchi	Shri T. K. Saha Shri P. R. Chandra (*Alternate*)
Ministry of Defence, CQA (MET), Ichapur	Deputy Controller Assistant Controller (*Alternate*)
Ministry of Industry (O/o DC SSI), New Delhi	Shri J. K. Arya Shri V. K. Gupta (*Alternate*)
Mishra Dhatu Nigam Ltd, Hyderabad	Dr M. Krishnamurthy Shri R. P. Tiwari (*Alternate*)
Multimetals Ltd, Mumbai	Shri Rajesh Damani Shri D. C. Jain (*Alternate*)
National Aerospace Laboratory, Bangalore	Dr R. V. Krishnan Shri T. A. Bhaskaran (*Alternate*)

Organization	*Representative(s)*
National Aluminium Co Ltd, Bhubneshwar	SHRI B. S. PANI SHRI M. K. B. NAIR (*Alternate*)
National Metallurgical Laboratory, Jamshedpur	DR K. L. SAHOO DR K. VENKATESHWARLU (*Alternate*)
National Test House, Ghaziabad	SHRI B. M. SOOD SHRI P. MAJUMDAR (*Alternate*)
Ordance Factory, Ambernath	SHRI R. R. YADAV SHRI T. B. DESHMUKH (*Alternate*)
RDSO (M&C Directorate), Lucknow	JOINT DIRECTOR
Regional Research Laboratory, Thiruvananthapuram	DR K. G. SATYANARAYAN
SALCO Extrusions (P) Ltd, Mumbai	SHRI GOPAL M. PAI
Shri Ram Institute for Industrial Research, Delhi	DR P. K. KAICKER SHRIMATI LAXMI RAWAT (*Alternate* I) SHRI B. GOVINDAN (*Alternate* II)
BIS Directorate General	DR (MRS) SNEH BHATIA, Director & Head (MTD) [Representing Director General (*Ex-officio*)]

Member Secretary
SHRI DEEPAK JAIN
Scientist 'E' (MTD), BIS

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. MTD 7 (4614).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters :

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002
Telephones : 2323 0131, 2323 3375, 2323 9402

Telegrams : Manaksanstha
(Common to all offices)

Regional Offices :		Telephone
Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110 002	2323 7617, 2323 3841
Eastern	: 1/14 C.I.T. Scheme VII M, V. I. P. Road, Kankurgachi, KOLKATA 700 054	2337 8499, 2337 8561, 2337 8626, 2337 9120
Northern	: SCO 335-336, Sector 34-A, CHANDIGARH 160 022	260 3843, 260 9285
Southern	: C.I.T. Campus, IV Cross Road, CHENNAI 600 113	2254 1216, 2254 1442, 2254 2519, 2254 2315
Western	: Manakalaya, E9 MIDC, Marol, Andheri (East), MUMBAI 400 093	2832 9295, 2832 7858, 2832 7891, 2832 7892

Branches : AHMEDABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. PARWANOO. PATNA. PUNE. RAJKOT. THIRUVANANTHAPURAM. VISAKHAPATNAM.

Printed by Sunshine Graphics