

(Reaffirmed 2009)

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

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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:

<i>IS No.</i>	<i>Title</i>
504 : 1963	Methods of chemical analysis of aluminium and its alloys
1599 : 1985	Method for bend test (<i>second revision</i>)
1608 : 2005	Metallic materials — Tensile testing at ambient temperature (<i>third revision</i>)
2676 : 1981	Dimensions for wrought aluminium and aluminium alloys, sheet and strip (<i>first revision</i>)
5047	Glossary of terms relating to aluminium and aluminium alloys:
(Part 1) : 1986	Unwrought and wrought metals (<i>second revision</i>)
(Part 2) : 1979	Plant and operations, thermal treatment, control and testing finishing
5052 : 1993	Aluminium and its alloys— Temper designations (<i>first revision</i>)
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 is 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 smoothed 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 (1)	Aluminium (2)	Copper (3)	Magnesium (4)	Silicon (5)	Iron (6)	Manganese (7)	Zinc (8)	Titanium (9)	Chromium (10)	Remarks (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		0.5 to 0.8 mm	Elongation on 50 mm Gauge Length, Percent, for Thickness			Bend Test, Radius of Bend
			Min	Max		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	1/2r
	H × 8	—	100	—	3	4	5	6	1r
19800	O	—	—	90	29	29	29	34	Close
	H × 4	—	90	120	5	8	7	8	1/2r
	H × 8	—	120	—	3	4	4	5	1r
19700	O	—	—	95	27	27	29	34	Close
	H × 4	—	95	120	4	5	6	7	1/2r
	H × 8	—	120	—	3	3	4	4	1r
19600	O	—	—	95	25	25	29	32	Close
	H × 4	—	95	125	4	5	6	6	1/2r
	H × 8	—	125	—	3	3	4	4	1r
19500	O	—	—	95	22	25	29	30	Close
	H × 4	—	100	135	4	5	6	6	1/2r
	H × 8	—	125	—	3	3	4	4	1r
19000	O	—	—	70	20	25	29	30	Close
	H × 2	—	90	130	5	6	8	8	Close
	H × 4	—	105	140	3	4	5	5	1/2r
	H × 6	—	125	150	2	3	4	4	1/2r
	H × 8	—	140	—	2	2	3	3	1r
	O	—	75	110	14	16	20	20	Close
24345	H × 2	—	95	130	5	6	7	7	Close
	H × 4	—	110	145	3	4	5	5	1/2r
	H × 6	—	130	165	2	3	4	4	1/2r
24530	H × 8	—	150	—	2	2	3	3	1r
	O	—	—	240	14	14	14	14	Close
	T4	240	380	—	13	14	14	14	3r
26388	T6	345	425	—	6	6	6	6	5r
	O	—	—	220	12	12	12	12	Close
	T4	275	425	—	15	15	15	15	3r
26388	T6	345	440	—	5	5	5	5	5r
	O	—	—	220	12	12	12	12	Close
	T6	250	370	—	6	6	7	8	5r

Table 2 (Continued)

Designation	Condition	0.2 Proof Stress MPa <i>Min</i>	Tensile Strength MPa		Elongation on 50 mm Gauge Length, Percent, for Thickness				Bend Test, Radius of Bend
			<i>Min</i>	<i>Max</i>	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 x 2	—	115	150	5	6	7	8	Close
	H x 4	—	130	180	3	4	5	5	Close
	H x 6	—	150	195	2	3	4	4	1r
31200	H x 8	—	170	—	2	2	3	3	3r
	O	35	95	135	20	23	24	25	Close
	H x 2	80	115	160	6	7	8	9	Close
	H x 4	115	140	180	4	4	5	6	Close
31500	H x 6	140	165	205	3	3	4	4	1r
	H x 8	165	180	—	2	2	3	3	3r
	O	—	125	165	16	16	18	20	Close
	H x 2	—	150	210	5	6	6	8	Close
31500B	H x 4	—	190	245	3	4	5	5	1/2r
	H x 6	—	215	275	2	2	3	4	1/2r
	H x 8	—	245	—	1	1	1	2	1r
	O	—	115	150	16	16	18	20	Close
40800	H x 2	—	140	200	5	5	6	8	1/2r
	H x 4	—	180	235	3	4	5	5	1r
	H x 6	—	205	260	2	2	3	4	2r
	H x 8	—	240	—	1	1	1	2	4r
51000A	O	—	85	120	20	23	25	30	Close
	H x 2	—	105	140	5	6	7	8	Close
	H x 4	—	125	160	3	4	5	5	1/2r
	H x 6	—	150	180	2	3	4	4	1r
51000B	H x 8	—	175	—	2	2	3	3	3r
	O	—	105	150	18	18	18	22	Close
	H x 2	85	120	160	3	4	5	6	Close
	H x 4	105	140	180	2	3	4	4	1/2r
51300	H x 6	125	160	200	1	2	2	2	1r
	H x 8	—	185	—	1	2	2	2	3r
	O	—	125	170	18	18	18	19	Close
	H x 2	—	155	195	3	4	5	6	1/2r
51300B	H x 4	140	175	215	2	3	4	4	1r
	H x 6	155	190	225	1	2	2	2	3r
	H x 8	—	200	—	1	2	2	2	—
	O	—	95	145	14	14	15	16	Close
51300B	H x 2	—	130	180	6	6	7	8	1/2r
	H x 4	—	150	200	4	4	5	6	1r
	H x 6	—	175	215	2	2	3	4	2r
	H x 8	—	195	—	1	1	1	2	4r

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	(10)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
52000	O	60	175	215	16	16	16	18	Close	
	H x 2	125	200	240	3	4	5	6	1/2r	
	H x 4	175	230	275	2	2	3	4	1r	
	H x 6	190	235	295	2	2	3	—	—	
52300	H x 8	215	265	—	1	2	3	—	—	
	O	75	160	210	12	14	16	18	Close	
	H x 2	140	170	220	4	5	6	7	1r	
	H x 4	180	190	250	4	4	5	5	2r	
52300B	H x 6	200	225	285	3	3	4	—	—	
	H x 8	225	250	—	2	2	3	—	—	
	O	—	160	210	12	13	14	14	Close	
	H x 2	—	190	260	4	4	5	5	2r	
53000	H x 4	—	220	280	3	3	4	4	3r	
	H x 6	—	250	300	2	2	3	3	—	
	H x 8	—	270	—	2	2	3	3	—	
	O	85	210	270	12	14	16	18	Close	
54300	H x 2	160	240	290	4	5	6	7	1r	
	H x 4	220	270	320	3	3	5	5	2r	
	H x 6	225	290	340	2	2	4	—	—	
	H x 8	235	310	—	2	2	3	—	—	
55000	O	130	265	365	12	14	16	16	1r	
	H x 2	235	315	395	5	6	7	7	2r	
	H x 4	275	355	—	4	4	5	5	3r	
64430	O	130	265	365	12	14	16	16	Close	
	H x 2	220	310	395	5	6	7	7	2r	
65028	O	—	—	175	14	16	16	17	Close	
	T4	110	200	—	12	15	15	15	2r	
	T6	250	295	—	5	5	5	6	3r	
65032	O	—	—	175	14	16	16	18	Close	
	T4	110	200	—	12	15	15	15	2r	
	T6	235	280	—	5	5	5	6	3r	
74530	O	—	—	175	14	16	16	18	Close	
	T4	175	280	—	12	15	15	15	2r	
	T6	270	315	—	6	7	9	10	5r	
					6	7	7	8	5r	

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 T6	103 330	227 400	— —	22 13	22 13	22 14	22 14	1.5t 6t
76528	O T6	— 460	— 525	275 —	10 6	10 6	11 7	11 7	1.5t 6t

NOTES

1 1 MPa = 1N/mm² = 1MN/m² = 0.102 kgf/mm² = 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

<i>ISO Designation</i> (1)	<i>IS Designation</i> (2)	<i>ISO Designation</i> (1)	<i>IS Designation</i> (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

<i>Designation</i> (1)	<i>Characteristics</i> (2)	<i>Available Forms</i> (3)	<i>Typical Uses</i> (4)
19990	Super-purity aluminium having excellent 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

<i>Designation</i>	<i>Characteristics</i>	<i>Available Forms</i>	<i>Typical Uses</i>
(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 rapidly, 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 rapidly, becoming extremely tough. Has high resistance to corrosive attack, especially in marine atmosphere	Plate, sheet and strip	In road, rail and marine transport sector

<i>Designation</i>	<i>Characteristics</i>	<i>Available Forms</i>	<i>Typical Uses</i>
(1)	(2)	(3)	(4)
52300B	Ductile in soft condition but work hardens rapidly, 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 rapidly, 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 rapidly, 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 rapidly, 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, dumptruck bodies, pressure vessels, rail coaches, etc

ANNEX C

(Foreword)

COMMITTEE COMPOSITION

Light Metals and Their Alloys Sectional Committee, MTD 7

<i>Organization</i>	<i>Representative(s)</i>
Aluminium Association of India, Bangalore	PROF K. S. S. MURTHY (<i>Chairman</i>) SHRI N. C. SUD (<i>Alternate</i>)
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Bharat Aluminium Co Ltd, Korba	SHRI A. K. SAHA SHRI NARAIN BALAKRISHNAN (<i>Alternate</i>)
CEMILAC, Bangalore DGAQA, Headquarters, New Delhi	DR P. RAGOTHAM RAO SHRI V. K. SACHDEVA SHRI AJAY SAGARYA (<i>Alternate</i>)
DGS&D, New Delhi	SHRI B. DASGUPTA SHRI M. A. KHAN (<i>Alternate</i>)
DMRL, Hyderabad	DR AMOL A. GOKHALE SHRI VIJAY SINGH (<i>Alternate</i>)
DRDL, Hyderabad	DR S. SUNDARRAJAN
HINDALCO (INDAL Division) Industries Ltd, Silvasa/Taloja	SHRI ASHOK SANGOLLI SHRI SHUBHANKAR GUPTA (<i>Alternate</i>)
HINDALCO Industries Ltd, Renukoot	SHRI V. RAMESH SHRI ABHEY AGARWAL (<i>Alternate I</i>) SHRI P. N. KOPARDE (<i>Alternate II</i>)
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Indian Institute of Science, Bangalore	PROF M. K. SURAPPA PROF SUBODH KUMAR (<i>Alternate</i>)
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J. N. Aluminium, R & D Design Centre, Nagpur	SHRI J. MUKHOPADHYAY SHRI R. N. CHAUHAN (<i>Alternate</i>)
Jindal Aluminium Ltd, Bangalore	SHRI K. R. RAGHUNATH SHRI VIPIN JAIN (<i>Alternate</i>)
Madras Aluminium Co Ltd, Distt Salem MECON Ltd, Ranchi	SHRI P. CHENNAPPAN SHRI T. K. SAHA SHRI P. R. CHANDRA (<i>Alternate</i>)
Ministry of Defence, CQA (MET), Ichapur	DEPUTY CONTROLLER ASSISTANT CONTROLLER (<i>Alternate</i>)
Ministry of Industry (O/o DC SSI), New Delhi	SHRI J. K. ARYA SHRI V. K. GUPTA (<i>Alternate</i>)
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National Aerospace Laboratory, Bangalore	DR R. V. KRISHNAN SHRI T. A. BHASKARAN (<i>Alternate</i>)

<i>Organization</i>	<i>Representative(s)</i>
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BIS Directorate General	DR (Mrs) SNEHI BHATIA, Director & Head (MTD) [Representing Director General (<i>Ex-officio</i>)]
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