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Indian Standard
SPECIFICATION FOR
WROUGHT ALUMINIUM AND
ALUMINIUM ALLOY RIVET STOCK FOR
GENERAL ENGINEERING PURPOSES
(*Second Revision*)

Second Reprint SEPTEMBER 1993

UDC 669.71-131:621.884

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

Indian Standard

SPECIFICATION FOR WROUGHT ALUMINIUM AND ALUMINIUM ALLOY RIVET STOCK FOR GENERAL ENGINEERING PURPOSES

(Second Revision)

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Indian Standard

SPECIFICATION FOR WROUGHT ALUMINIUM AND ALUMINIUM ALLOY RIVET STOCK FOR GENERAL ENGINEERING PURPOSES

(Second Revision)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Indian Standards Institution on 24 June 1977, 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 issued in 1956 and subsequently revised in 1966. Further revision became necessary as the chemical composition and the mechanical properties of a number of alloys had to be reviewed and modified. The main modifications which have been made in this revision are as follows:

- a) Heat-treatable aluminium alloy 65032 (HR 20) has been added.
- b) Chemical composition limits of alloys 53000 (NR 5), 55000 (NR 6) and 64430 (HR 30) have been modified. The mechanical properties of different alloys have been reviewed and modified wherever necessary.
- c) Code designations given in IS : 6051-1970* have been adopted in this standard; the old designations being included in parentheses for ready reference.

0.3 Some characteristics and typical uses of the alloys specified in the standard have been listed in Appendix A.

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.

*Code for designation of aluminium and its alloys.

†Rules for rounding off numerical values (revised).

1. SCOPE

1.1 This standard covers requirements for wrought aluminium and aluminium alloys rivet stock for general engineering purposes.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 **Rivet Stock** — Round bar or wire suitable for the manufacture of rivets.

2.2 **Heat Treatment Batch** — A quantity of material of one alloy of the same dimensions and produced in the same way, solution-treated in one furnace load, or such material as solution-treated and subsequently precipitation-treated in one furnace load. More than one heat-treatment batch may comprise a furnace load.

3. CONDITION

3.1 The material shall be supplied in the condition as specified by the purchaser. While specifying the condition, the temper designations as laid down in IS : 5052-1969* shall be followed.

4. CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES

4.1 The chemical composition and mechanical properties of the material shall be as specified in Table 1 and Table 2 respectively.

4.2 The chemical analysis of the material shall be carried out in accordance with IS : 504-1963† or by spectrochemical method.

5. SUPPLY OF MATERIAL

5.1 General requirements for the supply of material shall conform to IS : 1387-1967‡.

6. FREEDOM FROM DEFECTS

6.1 The material shall be sound and free from harmful defects.

7. DIMENSIONS AND TOLERANCES

7.1 The diameters of the rivet stock and their tolerances shall be as given in IS : 3577-1967§.

*Temper designations of aluminium and its alloys.

†Methods of chemical analysis of aluminium and its alloys (revised).

‡General requirements for the supply of metallurgical materials (first revision).

§Diameters of wrought aluminium and aluminium alloys, rivet, bolt and screw stock.

TABLE 1 CHEMICAL COMPOSITION OF WROUGHT ALUMINIUM AND ALUMINIUM ALLOY RIVET STOCK FOR GENERAL ENGINEERING PURPOSES

(Clause 4.1)

(Composition limits are in percent maximum unless shown otherwise)

DESIGNATION		ALUMINIUM	COPPER	MAGNE- SIUM	SILICON	IRON	MANGA- NESE	ZINC	TITANIUM AND/OR OTHER GRAIN REFINING ELEMENTS	CHRO- MIUM	REMARKS
New	Old										
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
19000	RIC	99.0 <i>Min</i>	0.1	0.2	0.5	0.7	0.1	0.1	—	—	Cu+Mg+Si+Fe +Mn+Zn = 1.0
24345	HR 15	Remainder	3.8-5.0	0.2-0.8	0.5-1.2	0.5	0.3-1.2	0.2	0.3*	0.3*	
53000	NR 5	Remainder	0.1	2.8-4.0	0.6	0.5	0.5	0.2	0.2	0.25	Cr+Mn = 0.5
55000	NR 6	Remainder	0.1	4.5-5.5	0.6	0.5	0.5	0.2	0.2	0.25	Cr+Mn = 0.5
64430	HR 30	Remainder	0.1	0.4-1.2	0.6-1.3	0.6	0.4-1.0	0.1	0.2	0.25	
65032	HR 20	Remainder	0.15-0.4	0.7-1.2	0.4-0.8	0.6	0.2-0.8	0.2	0.2	0.15-0.35	Either Mn or Cr shall be present

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

*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 RIVET STOCK FOR
GENERAL ENGINEERING PURPOSES**

(Clause 4.1)

DESIGNATION		CONDITION	SIZE (DIAMETER) OF MATERIAL		TENSILE STRENGTH <i>Min</i>
New	Old				
(1)	(2)	(3)	(4)	(5)	
			mm		N/mm ² (kgf/mm ²)
19000	RIC	H2	Up to and including 12.0	110 (11.0)	
24345	HR 15	W*	,, 12.0	390 (39.5)	
53000	NR 5	O or M	,, 25.0	215 (22.0)	
		OD†	,, 25.0	245 (25.0)	
55000	NR 6	O or M	,, 25.0	245 (25.0)	
		OD†	,, 25.0	280 (28.5)	
61000	HR 20	W*	,, 25.0	300 (30.5)	

NOTE — N/mm² (newton per square millimetre) = 0.102 kgf/mm².

*Wire supplied in OD condition but tested in W condition.

†10 to 20 percent reduction in cross-sectional area after drawing.

8. SELECTION OF TEST SAMPLES

8.1 Rivet stocks of the same diameter, produced in the same way and of the same grade shall be grouped in lots weighing up to 250 kg, and one test sample shall be cut from a coil or length selected from each lot.

8.2 In the case of heat-treatable alloys one test sample shall be taken from each heat-treatment batch.

8.2.1 Before any of the test samples are cut off, they shall be marked to identify them with the lot or heat-treatment batch they represent.

8.3 In the case of aluminium and nonheat-treatable aluminium alloys, the test samples shall be taken from the material as supplied and shall not be annealed or mechanically worked (except for straightening and machining to the shape of the test piece) before they are tested.

8.3.1 In the case of heat-treatable aluminium alloys for materials supplied in the M or O condition, the test samples shall be heat-treated and tested in the W or WP condition, as specified by the purchaser except that in case of alloy 24345 (HR 15) the head-forming test shall be made on test sample not more than 2 hours after solution treatment. The test samples after heat treatment shall not be mechanically worked (except for straightening and machining to the shape of the test piece) before they are tested.

8.3.2 Material supplied in the OD condition may be expected to develop the mechanical properties of the W or WP conditions on appropriate heat treatment.

8.3.3 For material supplied in the W condition, the test samples shall be tested in the condition as supplied, unless the purchaser has specified that he requires the test sample to be tested in the WP condition. The test samples shall not be mechanically worked (except by straightening and machining to the shape of the test piece) before they are tested.

9. MECHANICAL TEST

9.1 Tensile Test — The tensile test shall be carried out in accordance with IS : 1816-1961*.

9.2 Head-Forming Test (Applicable only to Rivet Stock of 1.6 mm Diameter and Above) — For rivet stock of 1.6 mm to 6.5 mm diameter, a length of rivet stock equal to the diameter shall be flattened cold in an axial direction until the diameter of the flattened part is equal to twice the original diameter. For diameters greater than 6.5 mm, the diameter of the flattened part shall be equal to 1.8 times the original diameter.

10. RETESTS

10.1 Should any one of the test pieces first selected fail to conform to the mechanical tests, two further samples from the same lot shall be selected for testing, one of which shall be from the rivet stock from which the original test sample was taken unless that rivet stock has been withdrawn by the supplier.

10.1.1 For heat-treatable alloys, the supplier shall have the right if he so desires, to reheat-treat the material before the two further samples are selected.

10.2 Should the test pieces from both these additional samples conform to values prescribed, the lot represented by the test samples shall be deemed to comply with the requirements of mechanical properties. Should the test pieces from either of these additional samples fail, the lot represented by the test samples shall be liable to rejection.

11. MARKING

11.1 Rivet stock shall be suitably marked for identification with the name of the manufacturer, material designation, and condition of the material. If required by the purchaser, the supplier shall furnish a certificate that the material supplied complies with the requirements of this specification.

*Method for tensile test for light metals and their alloys.

11.1.1 The material may also be marked with the Standard Mark.

The supplier's certification (*see 11.1*) shall be implied if the material is certified under the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

APPENDIX A

(Clause 0.3)

CHARACTERISTICS AND TYPICAL USES OF RIVET STOCK

DESIGNATION		CHARACTERISTICS	AVAILABLE FORMS	TYPICAL USES
New	Old			
19000	RIC	Commercially pure aluminium. Very ductile in annealed or extruded condition. Excellent resistant to corrosion	Sheet, plate, extrusion, tube, wire and forgings	Rivets used in equipments for food, chemical, brewing and processing, cooking utensils, architectural and builders' hardwares and in aircraft manufacture
24345	HR 15	Combines high strength with fair ductility in the solution-treated condition when forming can be done and parts subsequently aged	Sheet, plate, extrusion, tube, wire and forgings	Rivets used in structures where high mechanical properties are of utmost importance, aircraft structures
53000	NR 5	Ductile in soft condition but work hardens rapidly becoming extremely tough. Has high resistance to corrosion in marine atmosphere	Sheet, plate, extrusion, tube, wire and forgings	Rivets used in ship building, pressure vessels and other processing tanks and in aircraft manufacture
55000	NR 6	do	do	Rivets used in ship building, aircraft manufacture and other applications demanding moderately high strength with good corrosion resistance
64430	HR 30	Medium strength alloy with good mechanical properties, corrosion resistance and weldability	Sheet, plate, extrusion, tube, wire and forgings	Rivets used in structures of all kinds, such as road and rail transport vehicles, bridges, cranes, roof trusses, cargo containers, flooring
65032	HR 20	Medium strength, very good forming characteristics in the O and W condition. Good corrosion resistance	Sheet, plate, extrusion, tube, wire and forgings	Structural applications of all kinds such as road and rail transport vehicles, bridges, cranes, roof trusses, rivets, etc. Cargo containers, milk containers, deep drawn containers and flooring

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