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भारतीय मानक ब्यूरो

DRAFT FOR WIDE CIRCULATION

भारतीय मानक प्रारूप

Draft Indian Standard

ALUMINIUM AND ALUMINIUM ALLOYS SCRAP — REQUIREMENTS AND CONDITIONS OF DELIVERY

Ores and Feedstock for Aluminium Industry, its Metals/Alloys and Products Sectional Committee	Last date for receipt of comments is **21 Jan 2023**

FOREWORD

(Formal clauses of the foreword will be added later.)

Aluminium is the second most used metal after steel. The metal weighs about one third as much as copper or steel, is malleable and ductile, has excellent corrosion resistance and durability, and can be easily machined and cast. Some of the important uses of aluminium metal include transportation (airplanes, trucks, rail cars, marine vessels, etc), packaging (cans, foil, etc), consumer durables (appliances, cooking utensils, etc), construction (windows, doors, etc), electrical transmission cables, machinery, and several other applications. With so many uses, at the end of life these products are rejected as scrap.

Aluminium recycling is the process by which aluminium scrap can be reused in products again. Aluminium is an infinitely recyclable material, and it takes up to 95 percent less energy to recycle it than to produce primary aluminium, which also limits emissions, including that of greenhouse gases.

To support Government's agenda on circular economy and sustainable development transition to circular economy and consequent increase in demand of aluminium scrap, a need was felt to formulate a standard which prescribes grades, sampling and testing procedures for delivery of aluminium and aluminium alloys scrap. This standard has therefore been formulated.

For the purpose of deciding whether 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: 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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ALUMINIUM AND ALUMINIUM ALLOYS SCRAP — REQUIREMENTS AND CONDITIONS OF DELIVERY

1 SCOPE

This standard provides grades, sampling and testing procedures for delivery of aluminium and aluminium alloys scrap.

2 TERMINOLOGY

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

2.1 Condition of Scrap

a) *Loose Scrap* — Scrap that has not undergone any operation of compacting and from which pieces can be individually picked up.

b) *Briquetted Scrap* — Scrap that is compacted to form briquettes or bales.

2.2 Aluminium Content — Percentage weight of aluminium and aluminium alloys scrap in the inspection lot.

2.3 Metallic Foreign Material — Physically separable metals other than aluminium and aluminium alloys and free iron in scrap.

2.4 Non-metallic Foreign Material — Material other than aluminium and aluminium alloys and foreign metal present in scrap such as moisture, volatile material, rubber, plastic, dust, insulation materials, glass, asbestos, mica, etc.

2.5 Free Iron — Any physically separable ferrous metal, either magnetic or non-magnetic, present as a foreign material.

2.6 Moisture Content — Percentage weight of liquid that adheres to the scrap and can be identified in the delivered lot. Moisture pick up can be due to fabrication, usage and during storage or transport.

2.7 Volatile Material — Non-metallic foreign material (usually liquid, such as water, oils, emulsions, paint, etc) which is removable from the scrap by gasification and dedusting through appropriate thermal processes before melting or directly in specially designed melting furnaces.

2.8 Consignment — The ordered quantity of aluminium scrap sent in one or more lots, which may be contained in either one or several transport units, such as containers/truck loads, and is intended for delivery from supplier to purchaser.

2.9 Lot — The quantity of scrap indicated to be of the same grade in a consignment as given in **4.1** and offered for inspection at one time.

2.10 Sub-lot — The quantity of scrap in each of the parts into which a lot is divided for the purpose of sampling.

2.11 Increment Sample — The quantity of scrap obtained by sampling from a sub-lot.

2.12 Gross Sample — The aggregate of all the increment samples as collected from all the sub-lots.

3 ORDERING INFORMATION

While placing an order, the following are the minimum information that shall to be specified by the purchaser:

a) The gross weight of the consignment,

b) Condition of scrap as given in **2.1**,

c) The grade of the aluminium scrap as given in Table 1, and

d) Moisture and volatile material content.

4 GRADES AND REQUIREMENTS

4.1 Grades of Aluminium Scrap

The grades of aluminium scrap to be procured shall meet the requirements as given in Table 1.

Table 1 Aluminium Scrap Quality Grades

[*Clauses* 3 (c), 4.1 *and* 4.2 (b)]

Sl No.	**Grades of Aluminium Scrap**	**Minimum Aluminium Content** *percent*	**Maximum Free Iron Content** *percent*	**Maximum Metallic Foreign Material** *percent*	**Maximum Non-metallic Foreign Material** *percent*
(1)	(2)	(3)	(4)	(5)	(6)
i)	Grade 1	95	5	5	2
ii)	Grade 2	90	10	10	5
iii)	Grade 3	85	15	15	5
iv)	Grade 4	80	15	20	5
v)	Grade 5	70	15	30	5
vi)	Grade 6	60	-	-	-

4.2 Requirements

a) Volatile material and moisture content may be as agreed between supplier and purchaser and determined according to the method mentioned in **6.2**

b) The aluminium content, free iron, metallic foreign material and non-metallic foreign material content shall be as given in Table 1 and determined according to the method mentioned in **6.1**.

c) Aluminium scrap – Grade 6 is applicable to aluminium copper radiators, reinforced aluminium conductors, insulated wires, aluminium composite panels and coated/laminated or non-laminated aluminium foils only and its foreign material content shall be decided and agreed between purchaser and supplier.

4.3 Tolerances

The permissible variation from the limit specified under **4.1** shall be as mentioned in Table 2.

Table 2 Permissible Tolerances

(*Clause* 4.3)

Sl No.	**Grades of Al Scrap**	**Additional Tolerance limit for Al content (Absolute)**	**Additional Tolerance limit for Maximum Free Iron Content (Absolute)**	**Additional Tolerance limit for Metallic Foreign Material (Absolute)**	**Additional Tolerance limit for Non-metallics Foreign Material (Absolute)**
		percent	*percent*	*percent*	*Percent*
(1)	(2)	(3)	(4)	(5)	(6)
i)	Grade 1	-	+0.5	+0.5	+0.25
ii)	Grade 2	-	+1	+1	+0.5
iii)	Grade 3	-	+1	+1	+0.5
iv)	Grade 4	-	+1	+1	+0.5
v)	Grade 5	-	+1	+1	+0.5
vi)	Grade 6	-1	-	-	-

5 SAMPLING PROCEDURE

a) For the purpose of sampling, a lot shall be divided into five sub-lots of equal weight.

b) A gross sample shall be prepared by taking a minimum of three increment samples from each sub-lot of approximate equal weight and mixing it thoroughly. The total weight of the gross sample shall be 5 percent of the weight of lot.

c) The gross sample obtained shall be divided into three equal parts. One part of the sample shall be used for the determination of the aluminium content, free iron, metallic foreign

material and non-metallic foreign material as given in **6.1**. Remaining two parts of the sample shall be kept for retest as mentioned in **8**.

d) The sample shall be preserved in air-tight containers as soon as they are drawn and stored for a period till acceptance of the lot or completion of settlement in case of any discrepancies.

6 TESTING METHODS

6.1 Determination of Aluminium Content, Free Iron, Metallic Foreign Material and Non-metallic Foreign Material

a) The sample shall be sorted for separation of aluminium and aluminium alloy scrap from scraps of other metals and non-metallic foreign materials by hand sorting or any other means of separation.

b) Aluminium content, free iron, metallic foreign material, and non-metallic foreign material (including moisture and volatile material) percentage shall be measured by weight after separating aluminium and aluminium alloy, free Iron, other metallic foreign materials and non-metallic foreign materials from each other.

For example:

$$\text{Al\%} = \frac{[W_{Sample} - (W_{FI} + W_{NMFM} + W_{MFM})]}{W_{Sample}} \times 100$$

Al% = Aluminium Content in percentage,

W_{Sample} = weight of sample,

W_{FI} = weight of free iron,

W_{NMFM} = weight of non-metallic foreign material, and

W_{MFM} = weight of metallic foreign material.

6.2 Determination of Volatile Material and Moisture Content

a) *Moisture content* — Dry the sample taken as specified in **5** in an oven at approximately 105±5 °C for sufficient time to ensure complete removal of moisture. This will be ensured until approximately constant mass is obtained. Calculate the quantity of moisture present in the sample as the difference between the two weights, before and after the drying (as the percentage of the sample weight).

For example:

$$\text{Moisture\%} = \frac{W_i - W_f}{W_i} \times 100$$

Moisture% = Percentage of moisture,

W_i = Weight of sample before heating, and

W_f = Weight of sample after removal of moisture.

b) *Volatile material* — For materials containing oil or emulsion (for example, turnings), polymers, lacquers, paints, inks, epoxy, rubber, vinyls, resins, etc., heat the sample at a temperature of around 350 °C to 500 °C for sufficient time to ensure complete removal of volatile material while avoiding any degradation of scrap. Calculate the quantity of volatile material (inclusive of oil) present in the sample as the difference between the two weights, before and after the drying (as the percentage of the sample weight).

For example:

$$\text{Volatile\%} = \frac{W_i - W_f}{W_i} \times 100$$

Volatile% = percentage of volatile material,

W_i = Weight of sample before heating, and

W_f = Weight of sample after heating.

7 OTHER REQUIREMENTS

7.1 The scrap shall be free from the following:

a) Any pressurized, closed or insufficiently open containers or tubes to avoid possible closed hollow spaces,

b) Any type of arms, ammunition, mines, shells, live or used cartridges or any other explosive material in any form either used or otherwise; and

c) Any other deleterious material, such as asbestos and mica.

7.2 The limit and determination of radioactive contamination shall be checked according to the Standard Operating Procedure issued by Directorate General of Foreign Trade bearing reference no. 37/2015-2020 dated 15 November 2021 or as per its latest guidelines.

8 RETEST

If a sample selected for testing fails to meet the requirements of this standard, two additional samples shall be tested. If any of these additional samples fail to meet the requirements of the specification, the lot represented by that sample shall be rejected.

9 PACKAGING AND MARKING

9.1 The scrap shall be supplied either as loose or as briquetted scrap. Briquettes shall be bundled together as well as strapped to the pallet with sufficient bands.

9.2 Bales/briquettes of different grades shall not be stacked together and each stack shall be labelled with grade specification.

10 CERTIFICATE FOR CONSIGNMENT

The supplier of scrap shall issue the certificate for the consignment after testing and verification of each lot as per the requirements given in this standard. If supplier is not equipped with requisite infrastructure, certificate for consignment from government approved/recognised/ accredited third-party agency shall be provided.

11 ACCEPTANCE CRITERIA

Purchaser, if required to verify the consignment against the order information, shall follow sampling procedure given in **5** and testing method given in **6** for determination of minimum aluminium content, maximum free iron, maximum foreign material content, moisture content and volatile material content. If purchaser is not equipped with requisite infrastructure, certificate for consignment shall be verified from government approved/ recognised/accredited approved third-party agency. The results shall conform to the requirements laid down in this standard.