

HIGH CHROME GRINDING MEDIA BALL FOR CEMENT MILLS-SPECIFICATION

1 SCOPE

This standard covers the requirements for high chrome grinding media balls for cement mills.

2 REFERENCES

The Indian Standards listed below are necessary adjuncts to this standard:-

<i>IS No.</i>	<i>Title</i>
IS 228 : 1959	Method of chemical analysis of steel
IS 1387 : 1993	General requirements for the supply of metallurgical materials
IS 1586 : 2012	Metallic materials - Rockwell Hardness Test
IS 3343 : 1965	Specification for natural moulding sand for use in foundries
IS 6079 : 1989	Low alloy cast steel grinding media - specification

3 TERMINOLOGY

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

3.1 Lot

Ten tonnes or part thereof of high chrome grinding media balls for cement mills of one size, having similar composition and subjected to similar heat treatment.

4 SUPPLY OF MATERIALS

4.1 General requirements relating to supply of high chrome grinding media balls for cement mill shall be as laid down in IS 1387 .

5 PARTICULARS TO BE SPECIFIED WHILE ORDERING

5.1 For the benefit of the purchaser, particulars, to be specified while ordering for high chrome grinding media for cement mill are as given:

- a) Material specification;
- b) Tests required;
- c) Whether the castings are to be inspected and tested in presence of purchaser's representative;
- d) Condition of delivery;
- e) Any special requirement; and
- f) Test reports, if required.

6 RAW MATERIALS

6.1 The scraps with various compositions of chromium may be used as raw material depending on the chemical composition required.

7 MANUFACTURING

7.1 The raw materials such as scraps, if used, shall be melted and mixed by induction melting or as such other process as may be agreed to between the purchaser and the manufacturer.

7.2 Sand casting shall be used for casting the grinding media and the specification for natural sand used shall be as laid down in IS 3343.

8 WORKMANSHIP AND FINISH

8.1 Grinding media shall be accurately moulded in accordance with the sizes and tolerances specified in the standard, or as agreed between the manufacturer and purchaser.

9 CHEMICAL COMPOSITION

9.1 The ladle analysis of the melt when carried out either by the method specified in IS 228 and its relevant parts or any other established instrumental/chemical methods shall be as given in Table 1 or as may be agreed between the manufacturer and purchaser. In case of dispute the procedure given in IS 228 shall be the referee method. However, where the method is not given in IS 228, the referee method shall be as agreed between the purchaser and manufacturer.

Table 1 Chemical Composition, Percent
(Clause 9.1, 9.2)

Constituent	Composition in Percentage
Carbon	1.8-3.6
Silicon	1.0 max
Manganese	0.5-1.5
Nickel	0.5 max
Chromium	10-28
Molybdenum	3.0 max
Sulphur	0.08 max
Phosphorus	0.06 max

9.2 The manufacturer shall carry out analysis from a sample of each melt and, if so specified by the purchaser at the time of enquiry and order, shall supply a test certificate of chemical analysis of the sample for each melt.

9.3 Chemicals not specified in Table 1 shall not be ordinarily added in melt and all reasonable precautions shall be taken to prevent contamination from the scrap, etc, to keep as low as practicable.

9.3.1 Analysis and reporting of analysis in the rest certificates for residual elements shall be done only when so specified by the purchaser in the enquiry and order. However, the manufacturer shall ensure that

the residual elements are within the limits specified.

10 FREEDOM FROM DEFECTS

10.1 All grinding media shall be free from any surface or subsurface defects that affect the utility of castings. No surface conditioning, except grinding shall be permissible.

10.2 The ball sample should be checked for any surface or subsurface defects after rotating the sample in an empty test mill for 18 hours.

11 WEAR RESISTANCE

11.1 The consumption rate of balls when calculated in grams per ton of cement should be between 2.2 to 50 grams per ton of cement or as agreed to between the purchaser and the manufacturer.

12 SIZE

12.1 Grinding media shall be cast in the following sizes:

<i>Sl No.</i>	<i>Balls, Dia (mm)</i>
i)	25
ii)	17
iii)	20
iv)	22
v)	25
vi)	30
vii)	35
viii)	40
ix)	50
x)	60
xi)	65
xii)	70
xiii)	75
xiv)	80
xv)	90

12.2 Grinding media may also be cast in other sizes as agreed to between the purchaser and the manufacturer.

13 TOLERANCE ON SIZE

13.1 Variation in sizes shall not exceed the following limits:

<i>Sl no.</i>	<i>Shape and Size</i>	<i>Tolerance on Diameter, mm</i>
i)	Balls for sizes less than 25 mm	± 1.5
ii)	Balls for sizes 25 to 30 mm	± 2.5
iii)	Balls for sizes 40 to 80 mm	± 3.0
iv)	Balls for sizes 90 mm	±3.5

14 HEAT TREATMENT

14.1 All grinding media shall be suitably heat treated to obtain the required hardness and microstructure.

14.2 Grinding media larger than or equal to 60 mm shall be suitably heat tempered to increase the required toughness.

15 HARDNESS

15.1 When tested in accordance with IS 1586 the at any point across the cross section of the ball shall not be less than 53 HRC.

15.2 The purchaser may, at his discretion, agree to test the hardness of the balls on the surface instead of across the section, provided the supplier is able to demonstrate to the satisfaction of the purchaser the existence of a definite correlation between the hardness at the surface and across the section.

16 MICROSTRUCTURE

16.1 Microstructure shall be free from any carbide network.

17 SAMPLING

17.1 Methods of sampling of grinding media and the criteria for conformity shall be as given in Annex A.

18 PACKING

18.1 The material can be supplied in drums, preferably of size 1 tonne, bags of various sizes or any such other method as may be agreed between the manufacturer and purchaser.

19 MARKING

19.1 In case the material is not supplied in loose condition the container or bag shall be legibly marked with the following:

- a) Name of the manufacturer or trade mark,
- b) Name of the purchaser, and
- c) Grade, if any, and size of the grinding media.

19.2 In case the material is supplied loose, the method of identification shall be mutually agreed upon at the time of enquiry and order.

20 WASTE DISPOSAL

20.1 The sand dust produced during the moulding process shall be recycled and rest shall be collected by dust collectors and used in landfills or making bricks along with the waste bags produced, if being used for packing.

20.2 The slag produced during the manufacturing process shall be supplied to cement plants as and when demand arises.

ANNEX A

(Clause 17.1)

B-1 VISUAL AND DIMENSIONAL CHARACTERISTICS

B-1.1 The criteria for conforming to the visual and dimensional characteristics for the balls shall be as laid down in IS 6079 (B-1).

B-2 HARDNESS AND MICROSTRUCTURE

B-2.1 The criteria for conforming to the hardness and microstructure characteristics for the balls shall be as laid down in IS 6079 (B-2.1, B-2.2).

B-2.2 Notwithstanding anything stated above, if any of the individual balls in the selected sample shows a hardness less than 53 HRC or has a continuous network of carbides in an area exceeding $\frac{1}{4}$ of the area of field of view when view through a microscope at X 100 shall deemed to be not conforming to the standard and not acceptable.

B-3 RE-INSPECTION

B-3.1 The manufacturer has the right, if he so desires, to sort the balls in the rejected lot by 100 percent inspection and to put up a revised lot for reinspection.