

**CORPORATE PURCHASING SPECIFICATION**

AA 197 03

Rev. No. 06

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GREY IRON CASTINGS - Gr: FG 260**1.0 GENERAL**

This specification governs the quality requirements of Grey Iron Castings having a tensile strength of 260 N/mm².

2.0 APPLICATION

Suitable for general engineering purposes.

3.0 CONDITION OF DELIVERY

As cast or cast and stress relieved or rough machined or rough machined and stress relieved as specified in BHEL order/drawing.

Castings shall not be painted.

4.0 COMPLIANCE WITH NATIONAL / INTERNATIONAL STANDARD

Castings shall comply with the following national standards and also meet the requirements of this specification.

IS: 210-1993 (RA-2004) : Grey Iron Castings
Gr: FG 260

5.0 DIMENSION AND TOLERANCES

Castings shall be true to the pattern / drawing.

Holes for machining up to and including 50mm in diameter are to be cast solid, unless otherwise stated in BHEL order / drawing.

Unless otherwise specified in BHEL order/ drawing, untoleranced dimensions for the casings shall be as per tolerance class 5 of BHEL standard AA 023 04 02.

6.0 MANUFACTURE

The castings shall be cast from the metal melted or refined in any suitable metallurgical plant other than an iron ore smelting furnace.

All castings above five tonnes shall be mould cooled. Under mould cooling process, the mould should not be disturbed until the hottest portion of the casting cools down to 300°C.

7.0 HEAT TREATMENT

Castings shall be artificially aged (stress relieving) by heating in a furnace to a temperature of 520 to 580°C (recommended), whenever specified.

Test pieces shall also be heat treated along with the castings they represent.

Revisions :

Cl: 30.5.2 of MOM of MRC-FCF+HTM

APPROVED :**INTERPLANT MATERIAL RATIONALISATION
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**8.0 FINISH**

All castings shall be properly fettled and dressed and all surfaces shall be thoroughly cleaned. Whenever specified, the machined surfaces shall have the surface finish as indicated in the drawing.

9.0 FREEDOM FROM DEFECTS

Castings shall sound, clean, free from defects such as porosity, blow holes, sand inclusions, shrinkage's, cavities, hard spots, cold shuts, cracks, etc. which may adversely affect machining and utility of castings.

10.0 CHEMICAL COMPOSITION

The composition of iron is left to the discretion of the manufacturer. (But limit of sulphur and phosphorus may be specified by BHEL, if desired).

In case of special castings, the detailed chemical composition shall be as agreed between BHEL and the manufacturer.

11.0 TEST SAMPLES:**11.1 Provision of Test Bars :**

All the test bars shall be cast separately in sand moulds and the number of test bars required shall be as specified in clause 11.2 below. They shall be cast at the same time and from the same melt as the castings they represent..

The test bar material shall be identifiable with that of the castings represented.

When castings are subjected to heat treatment and the test bars shall be heat treated together with the castings they represent.

11.2 Frequency Of Testing:

The number of tests required for each melt or batch of castings shall be as laid in table 1 below.

Table 1: Number of Tests

Group	Mass of Individual Castings	Test Requirements	Test Samples
* 1	upto 12.5 kg	One test for every 500kg of castings or part thereof.	3
* 2	over 12.5 kg and upto 50 kg	One test for every 1 tonne of castings or part thereof.	3
* 3	over 50 kg and upto 500 kg	One test for every 2 tonnes of castings or part thereof.	3
* 4	over 500 kg and upto 1 tonne	One test for every 3 tonnes of castings or part thereof.	3
5	over 1 tonne	One test for every 4 tonnes of castings or part thereof or one test for every casting weighing 4 tonnes or more.	3

* In group 1, 2, 3 & 4 all castings represented by one test shall be poured from the same ladle or same heat as the bars provided for the test.

**11.3 Size of Test Bars:**

A test bar from which the tensile test piece is machined shall be cast as a uniform cylindrical bar of 30mm diameter. The tolerance on the diameter shall be + 2mm, - 0 mm.

The minimum length of the test bar shall be 230mm.

11.4 Dimensions of Test Pieces:

Test pieces shall conform to the dimensions as per IS:210.

Note: Test bars as specified above with proper identification and representative of the castings shall be supplied along with the consignment for testing at BHEL works.

12.0 MECHANICAL PROPERTIES**12.1 Tensile:**

The test pieces prepared in accordance with clause 11 shall show a tensile strength of 260 N/mm², minimum, when tested in accordance with IS:1608.

12.2 Hardness (Brinell)

Hardness shall be measured on actual casting at three different places. The castings shall have a Brinell Hardness in the range of 180 to 230 HB, when tested in accordance with IS 1500.

13.0 OPTIONAL TESTS

If specified in the drawing/order, the following tests shall be conducted.

13.1 Non-destructive test**Magnetic Particle Inspection:**

Magnetic Particle Inspection as per BHEL standard AA 085 01 33 and norms of acceptance as per AA 085 01 34 at level 2.

13.2 Hydraulic:

Hydraulic test shall be conducted by the manufacturer. In case hydraulic testing as prescribed on the BHEL order/drawing is not carried out at the manufacturer's works, the same shall be carried out by BHEL after necessary machining. However, the manufacturer shall guarantee against any leakage when tested at BHEL's end.

Test pressure and duration of test shall be as specified in BHEL order/drawing.

14.0 RETEST

Retest shall be done as per IS:210.

15.0 REPAIR OF CASTINGS

Repair of castings shall not be carried out by the manufacturer without the prior permission of BHEL.

**16.0 SCOPE OF THIRD PARTY INSPECTION:**

Wherever, separate quality plan is not attached, the scope of third party inspection shall be as follows:

1. Review of supplier's declared chemical composition.
2. Selection of test samples for mechanical tests and witness of mechanical tests.
3. Witness of Non-destructive tests as applicable.
4. Review of HT charts.
5. Dimensional inspection.

17.0 TEST CERTIFICATES

Three copies of test certificates shall be supplied unless otherwise stated on order, preferably in the test certificate format annexed to this specification (Annexure -1).

In addition, the supplier shall ensure to enclose one copy of the test certificate along with their dispatch documents to facilitate quick clearance of the material.

The following details shall be furnished in the test certificate:

1. Dimensional inspection
2. Detail of heat treatment
3. Hardness value
4. NDT
5. Optional tests called for in the drawing/order.

18.0 PACKING AND MARKING

Castings shall be suitably packed to prevent corrosion and damage during transit. Machined surfaces shall be properly protected with anticorrosive compounds. Each package or casting (when supplied separately) shall be legibly marked with the following information.

AA 19703: Grey Iron Castings-Gr: FG 260
BHEL Order No.
Consignment/Identification No.
Melt No.
Weight
Supplier's Name

19.0 REFERRED STANDARDS (Latest Publications Including Amendments):

1. IS: 210
2. IS:1500
3. IS:1608
4. AA 023 04 02
4. AA 085 01 33
5. AA 085 01 34



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ANNEXURE 1 - RECOMMENDED TEST CERTIFICATE FORMAT FOR CASTING

SUPPLIERS'S NAME AND ADDRESS												
1. Customer :						6. Cast No. & Date :						
2. TC No. & Date :						7. Batch No. :						
3. PO No. :						8. Heat Code :						
4. Process of Melting :						9. Spec. No. :						
5. Deoxidisation Process						10. Test Bar Size						
II. CASTING COVERED BY T.C.												
Sl. No.	Drawing No. & Item No.					Description	Quantity & Weight					
12. CHEMICAL COMPOSITION (PERCENT)												
Element	C	SI	Mn	S	P							
As per Min.												
Spec. Max.												
Actual Values.												
13. HEAT TREATMENT (To be accompanied by Recorder Chart, wherever called for)												
Condition	Temp. °C				Soaking Time. Hrs..			Cooling Medium				
14. MECHANICAL PROPERTIES												
	T.S. N/mm2	Y.S. 0.5/0.2% Proof N/mm2	% E on GL 5.65 SO	% R.A. Mn	Hardness BHN Mn. 3 Values	Impact Value, Joules	Bend					
As per Min.												
Spec. Max.												
Actual Values.												
15. Surface Finish (When called for in the order/drg)												
16. DIMENSIONAL INSPECTION												
17. NON-DESTRUCTIVE TESTS												
Nature of Test	Acceptance Level	Instrument used			Range	Results	Any other details					
Ultrasonic												
Radiographic												
Dye Penetrant/ Magnetic Particle												
18. OTHER TESTS, IF ANY (MICRO- Scope, Hydraulic, Etc.)												
19. IDENTIFICATION ON CASTING AS PER CPS.												
We hereby certify that the items mentioned above have been tested and inspected in our presence and are found to be in accordance with the drawings, specifications and purchase order.												
Signature & Seal of the Inspecting Officer (Purchase Representative)						Signature and Seal of the Chief of Quality Control Chief Metallurgist of the Supplier.						
Date :						Date :						
INSTRUCTION:												
a) If steel is produced by LD or Oxygen process, Nitrogen content should be furnished and shall not exceed 0.009%												
b) Test Certificates are to be furnished as per Purchase Order and Specifications, in A4 Size transparent paper.												
c) All the entries including signature should be in black ink.												
d) If testing is done by outside agencies, the original TCs shall be furnished.												
e) The actual Test Certificate may run into more than one A4 size paper, if needed, to facilitate filling up of details.												