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GENERAL REQUIREMENTS OF HIGH PERFORMANCE (CRITICAL)
13% Cr - 4% Ni STAINLESS STEEL CASTINGS

1.0 APPLICATION :

These requirements are in addition to those included in the purchase specification and have been especially framed for the high performance castings subjected to severe conditions of operation e.g. Spherical Valve Seals, Labyrinths for Francis Turbine, Valve Seats etc.

2.0 MATERIAL SPECIFICATION:

Stainless Steel (13%Cr-4% Ni) to the material standard mentioned in the purchase order (e.g., ASTM 743 CA 6NM , EN10283 Gr GX4CrNi13-4, AA19542). Electric Arc Furnace shall be used and the steel shall be secondary refined using VOD/ AOD process. However, if Induction furnace is used, the steel after melting shall be secondary refined by AOD & VOD processes. The casting manufacturer must have the relevant facilities in-house.

3.0 DIMENSIONS/MACHINING REQUIREMENT:

3.1 Unless otherwise specified on the drawing, following will be applicable.

3.1.1 If the drawing calls for rough machined dimensions, supplier shall supply the casting in rough machined condition to drawing dimensions.

3.1.2 If the drawing is of a finish machined casting, the supplier shall supply the casting in rough machined condition leaving 3 - 5 mm m/cing allowance on tool point on all faces marked thus



on the drawing for final machining at BHEL works.


3.1.3 Dimensions which are called with specific note for finish machining shall be supplied with finish machined dimensions no allowances to be left on such dimensions by casting suppliers.

4.0 NON DESTRUCTIVE TESTS:

4.1 Scope: All castings shall be examined by “Ultrasonic method (UT)” & “Magnetic particle inspection (MPI)” as called on the drawing.

The defects which cannot be definitely interpreted by “UT”, shall be further examined by “radiography”.

REF :	REVISIONS:03	Approved : (Dinesh Kumar) AGM (HOD) Hydro Turbine Engg.		
	DATE: 13/03/2009	Prepared :	Issued :	Rev 00 Date : 04/06/2008
		Concurred: (R.K. Seth), Consultant Metallurgist, (TSD)		

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4.2 PROCEDURE & ACCEPTANCE NORMS:

PROCEDURE			ACCEPTANCE
A.	Ultrasonic Test	ASTM- 609	ASTM Accept std 609 Level-2 for thickness upto 50mm end level -3 for thickness beyond 50mm. OR BHEL Std. AA0850104 Level-II (up to 50mm thickness & below). Level-III (above 50mm thickness)
B.	Magnetic particle test.	ASTM-E-709 OR BHEL Std. AA0850133	ASTM-E-125-63 Degree-2 with no linear inclusions or cracks. BHEL Std. AA0850134 Level-2
C.	Radiography test	ASTM-E-1030 & E 94	ASTM-E-446, E-186. E-280 (As applicable to thickness) with no cracks or hot tears.
D.	Dye Penetrant test	CCH 70.1 OR BHEL Std. AA0850131	CCH 70.1 RE 70-1 Class-2 BHEL Std. AA0850132 Level -II


5. REPAIR OF CASTING:

No major defect shall be repaired or welded without written sanction from BHEL or its representative. Defect shall be considered major if it exceeds 20% of wall thickness or 25mm whichever is smaller in depth, or that which exceeds 160sq.cm. in area. A cluster of minor defects shall be considered a major defect. All other defects shall be considered minor.

The defects must be chipped down to sound metal and tested using appropriate NDT method such as magnetic particle/dye penetrant etc. When defects have been removed the supplier shall submit a drawing detailing the nature, location, shape & size of each defect to BHEL for approval along with proposed procedure for weld repair (electrodes to be used, preheating temp., post weld heat treatment etc.).

When the repair has been completed (after consent of the purchaser), non destructive tests previously carried out shall be repeated together with any additional tests (NDT) considered necessary by the purchaser's representative.

It is preferable to carry out weld repair prior to carrying out normal heat treatment of the casting. In case the weld repair is carried out after normal heat treatment then the casting shall be re tempered. Heat treatment other than tempering after weld repairing shall be performed only when agreed upon between the manufacturer and the purchaser. Record of all weld repair (including minor repairs) shall be furnished to BHEL along with the details of post weld heat treatment & NDT.

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6. MEASUREMENT OF THICKNESS:

When direct measurement of thickness is not possible ultrasonic method will be used to measure and record the thickness as per drawing.

7. PAINTING:

Casting shall be thoroughly shot blasted and applied with primer paint as called in the drawing. Note regarding painting in clause no.3 of BHEL standard AA19542 is not applicable.

8.0 INSPECTION

8.1 Inspection shall be carried out at supplier works by BHEL inspector and/or third party inspection by Lloyds or other reputed agencies and /or customer's inspection agency as specified in enquiry/PO.

8.2 BHEL quality assurance plan wherever supplied along with PO/enquiry, shall be applicable.

9. GENERAL

In case of any contradiction between the clauses of PO, this document & material specification, QA plan or drawing, the following hierarchical order of over riding will be applicable.


1. Drawing **- most important**
2. P.O
3. HT 00252
4. QA plan
5. Material specification.

10. DEVIATION FROM SPECIFICATION:

Any deviation from the BHEL specifications shall be intimated by the supplier for approval by BHEL, Bhopal. In the absence of this, it /will be deemed that all our requirements given in the drawing and specification are acceptable to the supplier in totality.

11. TENSION TEST

Tension test for grade ASTM 743- CA6NM shall be conducted as per supplementary clause S-12 of the specification . For standards AA19542 and EN10283 Gr GX4CrNi13-4 the tests shall be conducted as per the provisions laid down in the respective standards

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12. HARDNESS TEST

Hardness test shall be conducted for all the grades (Clause S -14 for ASTM 743- CA6NM) For standards AA19542 and EN10283 Gr GX4CrNi13-4 the tests shall be conducted as per the provisions laid down in the respective standards

13. CHANGES DUE TO REVISION:

Clause 2 modified. Note added

14. ANNEXURES :

Nil

Note:

AOD - Argon Oxygen Decarburization
VOD - Vacuum Oxygen Decarburization