

BHEL Piping Centre	Quality Assurance	Technical Delivery Conditions
Product: Plates of Alloy 617M for Advanced Ultra Super Critical (AUSC) Boiler		
Document No. TDG: 117	Rev.No.00	Effective Date: 09/05/2017
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Record of Revision:

Rev 00: 09/05/2017: Fresh Issue

Scope

This Technical Delivery Conditions pertains to manufacturing and procurement of Inconel plates for Advanced Ultra Super Critical Power Station Piping conforming to Indian Boiler Regulations. Material shall be procured only from manufacturers only (not be procured from traders/ stockists).

1. General:

Specification : ASTM B564/ASME SB564 (Latest revision on the date of Purchase Order)
Material : Alloy 617M – UNS N06617
Additional Requirement : As listed below (Supplementary to Specification)
Size and Qty. : As per Purchase order

2. Chemical Composition & process:

Material shall be produced by using vacuum induction melting (VIM) followed by vacuum arc re-melting (VAR) or Electro slag refining (ESR).

All plates shall be fully killed steel and final rolling lengthwise. Plates shall be hot rolled, solution treated and descaled.

Ladle analysis: 1 sample per cast. Product analysis: min 1 sample per plate as rolled.

Full melt analysis shall be reported in Test certificate.

Element	Cr	Fe	Mn	Mo	Co	Al	C	Cu	B	Si	S	N	Ti	Ni
Wt %	21-23	1.5 max	0.3 max	8-10	11-13	0.8-1.3	0.05-0.08	0.05 max	0.002-0.005	0.3 max	0.008 max	0.05 max	0.3-0.5	Bal.

Raw materials used in making of forged bars including incoming scrap shall be checked by supplier to ensure freedom from radioactivity.

3. Dimension Tolerances:

Size As per purchase order and relevant drawings.

Tolerances as per SA/A 480

4. Heat Treatment (as delivered condition):

UNS N06617 – solution annealed condition - 1150°C to 1175°C.

5. Mechanical Testing (on as delivered condition):

The test sample for each size/heat/HT batch; on final heat treated condition samples in transverse direction.

UNS N06617: Tensile Strength: Min 655 Mpa, Yield Strength (2% off set): Min 241 Mpa, Elongation: min 35%

Micro: Grain size ASTM 2-5 as per ASTM E112. The Grain size shall be checked on plate per thickness per melt and heat treatment basis from ingot top and bottom sides as per below table.

No of pieces of plate per thickness/ melt/ HT batch	1-3	4-6	7-9	10-12	13-15	--
No of test pieces to be tested	1	2	3	4	5	--

6. Non Destructive Testing:

UT: Testing method and acceptance shall be as per supplementary requirement in ASME SB-564

100% for all thickness > 10mm. For plates <10mm, UT shall be done on mother plate before drawing.

UT shall be done to ensure freedom from internal defects, laminations and material separations are not permissible.

7. Workmanship and Finish

The material shall be plain, uniform in quality and condition, smooth, straight or flat and free of wrinkles, overlaps, tears, cracks and injurious imperfections. No repairs/weld repairs permitted.

Plates shall be clean & shot blasted to remove scales after HT.

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8. Marking & Packing

All items shall be punched low stress stamp with 1) Specification, 2) Grade, 3) Heat No, 4) Maker's emblem and bear the 5) Inspection Authorities Seal.

The Plates are to be properly packed and despatched to avoid damage during transit.

9. Inspection & Certification: (in English only)

All items are to be Inspected at the manufacturer's works by IBR approved authorities.

Inspection certificate in IBR Form IV shall be submitted along with the Work Test Certificate (EN 10204 Type 3.2) countersigned by authorities as per IBR (if not well-known) and shall include the following (Three ink signed originals required):

1. Purchase Order No. (BHEL), TDG No. & Test certificate number.
2. Specification, Grade with applicable year of code, Heat Number, Drawing No., Quantity & Size
3. Details of ingot, Melting & rolling process, Chemistry including incidental elements - Heat wise.
4. Heat treatment details of the material, Mechanical test results with reference & acceptance standard.
5. Individual NDE reports with reference & acceptance standard on finished plates.

The following shall also be furnished:

6. Heat treatment chart
7. TC for steel shall be provided.

10. Quality Plan

Before start of production the manufacturer shall submit a Manufacturing and Inspection plan (MIP) to BHEL approval.

The MIP shall constitute of: i) melting & refining, ii) ingot weight and type, iii) rolling process iv) NDE v) preliminary heat treatment, vi) internal tests and inspection before final heat treatment, vii) test and inspections after heat treatment, viii) marking preservation and dispatch, ix) test certificate requirements.

11. Audit Checks at BHEL

BHEL reserves the right to carry out audit checks at any stage of manufacture on representative test bars or job. Supplies found defective during check or subsequent processing at BHEL are liable for rejection.

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