

BHEL Piping Centre	Quality Assurance	Technical Delivery Conditions
Product: Nickel Alloy Rods/bars of UNS N06617 for Advanced Ultra Super Critical (AUSC) Boiler		
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Record of Revision:

Rev 00: 09/05/2017: Fresh Issue

Rev 01: 06/07/2017: Heading modified. Cl 1 – Specification SB/B166 added. Cl 1,2,3,5,6,8 & 9 modified to add clarity

Scope

This Technical Delivery Conditions pertains to manufacturing and procurement of Nickel Alloy rods/bar for Advanced Ultra Super Critical Power Station Piping conforming to Indian Boiler Regulations. Material shall be procured from manufacturers.

1. General:

Specification : ASTM B166/ASME SB166 (or) ASTM B564/ASME SB564
(Latest revision on the date of Purchase Order)
Material : Nickel Alloy UNS N06617
Additional Requirement : As listed below (Supplementary to Specification)
Size and Qty. : As per Purchase order
Rolled rods/bars shall be restricted to dia $\leq 114.3\text{mm}$.

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).

Bars shall be **hot rolled**, solution treated and descaled.

Ladle analysis: 1 sample per cast. Product analysis: min 1 sample per heat 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 shall be checked by supplier to ensure freedom from radioactivity.

3. Dimension Tolerances:

Size As per purchase order. Tolerances as per SB166.

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.

6. Non Destructive Testing:

UT: 100% for all dia $\geq 40\text{mm}$. Testing method as per A388 and acceptance shall be ASME Sec VIII Div. 2 Cl 3.3.4.

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.

Rods/Bars shall be clean & shot blasted to remove scales after HT.

8. Marking & Packing

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

The Rods/bars are to be properly packed and despatched to avoid damage during transit.

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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 rods/bar.

The following shall also be furnished:

6. Heat treatment chart
7. TC for *raw material* 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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