

Annexure-PQR

Item	Material Code	Drawing No	Specification No	Weight
I. P. Rotor	W95310201262	11020130999, Rev 01	HW19468 Rev.07 (including all cross-referred standards)	36353 Kg

Technical Pre - Qualification Requirements for IP Rotor:

1. Minimum Experience* Requirement:

- a) Vendor must have successfully manufactured and supplied minimum 3 HP / IP Rotor shafts forging for steam turbine in material grade X12CrMoWVNbN1011 / X12CrMoWVNbN1011(B) meeting the following requirements on enquiry issue date:
- Must have delivered three rotors out of which at least one rotor must be of weight ≥ 27 T, barrel diameter ≥ 800 mm and rotor length ≥ 4500 mm.
 - Must have delivered at least one rotor forging of weight ≥ 27 Tons in last 10 years from date of issue of enquiry

In support of above, the vendor has to furnish following details of at least 3 latest supplies in the format given below:

Sl. No	Purchase Order Number / Customer Details	Material Grade	Dimension: Diameter(max)/ Rotor Length	Delivered weight (kg)	Date of supply
1					
2					
3					

* Rotors supplied with heat treatment, axial core trepanning, non-destructive testing, Heat stability and residual stress measurement will only be considered for experience.

- b) Following documents are to be submitted in support of above:
- I. Test certificate of one rotor of delivered weight ≥ 27 T, barrel diameter ≥ 800 mm and rotor length ≥ 4500 mm. Test certificates shall cover Chemical, Mechanical including axial core result, thermal stability, NDT & dimension report to clear establish rotor weight, barrel diameter & rotor length.
 - II. Test Certificates / Dispatch documents for one rotor forging of weight ≥ 27 Tons supplied in last 10 years.

Alternatively, vendor may submit documentary evidence that they are approved supplier of Steam Turbine Rotor Forging of weight ≥ 27 Tons in material grade X12CrMoWVNbN1011/ X12CrMoWVNbN1011(B) of Steam Turbine OEM for Power Plant application.

2. Creep Rupture Data:

- a) Vendor to submit successful Creep Rupture data ≥ 1000 hours at temperature 600°C and Stress 220MPa or equivalent stress & temperature parameter for material grade X12CrMoWVNbN1011.

Alternatively, vendor to provide certificate of their approval as an established / approved forging supplier for HP/IP Rotor of material grade X12CrMoWVNbN1011 for Steam Turbine OEM for Power Plant application.

- b) Creep Rupture test requirement will be reviewed by BHEL based on submitted experience and documents by vendor. BHEL may ask vendor to carry out Creep Rupture test at 600°C ; Stress: 220MPa for minimum 1000hrs, in case of order. Samples for Creep rupture test shall be taken from manufactured rotor against BHEL purchase order. Creep testing on duly identified samples by BHEL/BHEL nominated inspection agency, shall be carried out at any reputed Creep testing lab duly accredited by National / International accreditation agency. Final dispatch clearance of rotor shall be subjected to successful completion of Creep Rupture Test. **Vendor to agree and confirm.**

3. Manufacturing & Testing Facility Requirements:

- a. Vendor must have in-house forging and vertical heat treatment facilities to manufacture Rotor Shaft as per enquiry drawing and specification (including cross referred standards). **Outsourcing of above activities are not allowed.**

- b. Vendor to submit details of in-house steel melting and refining facility required for manufacturing enquiry item.

In case in-house facility is not available, vendor to inform their sub supplier with details of steel melting & refining facility for present enquiry. Vendor must have experience of supplying rotor forging using ingots from this sub supplier. Creep rupture data or OEM Certificate, as applicable as per clause 2 to be submitted for rotor manufactured using ingot from this source. This report must be correlated with the test certificates submitted as per Clause 1.

- c. Vendor to submit details of Axial Core trepanning and Machining facility available in house as per enquiry drawing and specification. In case of outsourcing of any of these activity (axial core trepanning / machining), vendor to inform their source with details of their facility.

- d. Vendor to submit details of testing facility available in house as per the requirement of enquiry drawing and specification (including all cross-referred standards).

In case of outsourcing of any test, vendor to inform details of tests outsourced as well their source details.

- e. Vendor has to submit filled Annexure 1 for manufacturing and testing facilities required as per enquiry drawing and specification. In case of outsourcing of any operation, details of their sub supplier to be submitted.

4. Vendor to confirm that they have reviewed the enquiry drawing and specification (with all cross-referred standards) in totality and confirm that they will manufacture and supply enquired Rotor forging as per enquiry drawing and specification with all cross-referred standards mentioned therein.

Note for vendor:

BHEL may ask additional clarification related to the above points. BHEL may also visit works of vendor to establish vendor's credentials.

Vendor to submit details of manufacturing and testing facilities as per format below:

1) STEEL MELTING & REFINING FACILITIES:

Melting Furnaces details (Type, Capacity etc.)	
Refining facility details (Vacuum Degassing/ESR etc – Type and Capacity to be submitted)	
maximum ingot size (Weight & dimension)	

2.) FORGING FACILITY:

Press capacity in kN	
Maximum Forging weight in MT	
Manipulator Capacity (maximum) for forging	

3) Heat Treatment Facilities

1. Vertical Heat treatment facility - Maximum diameter, length and weight of shaft which can be heat treated - Temperature monitoring facility as per BHEL specification requirement	
2. Quenching type & medium	

4) Machining Facilities:

1. Facility for Axial Core Trepanning • Minimum & Maximum diameter of the core which can be trepanned • Maximum length of axial core that can be trepanned	
2. Surface finish of axial bore (refer drawing requirement)	
3. Concentricity, Cylindricity and Parallility, refer drawing requirement	

5) Testing Facilities:

1. Chemical Testing 2. Mechanical Testing (Tensile & Impact) 3. Thermal Stability Facility (maximum temperature) 4. NDT Facilities – UT, MPI, Boroscopic, Residual Stress Measurement	
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6) Handling Facilities:

1. Crane capacity	
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Note: In case of outsourcing of any operation, vendor to submit details of their sub supplier

(Signature & Seal of Vendor)