

**Technical Pre-qualification Requirements(PQR) for Pinion Blank Forging Suppliers for
procurement of Forgings as per specification TM10581 [Rev.02]**

Dated: 21.05.2024

Enquiry No.:

Vendor Name:

1.0 General: a) The pre-qualification requirements mentioned in this specification are applicable for the procurement of pinion blank forgings in normalised condition.

b) The technical requirements mentioned below should be met by the supplier and details of its compliance should be submitted along with the offer. If the supplier is not complying the requirements of this specification, his offer will not be considered for the supply of pinion blank forgings. If at any stage it is found that the information furnished by the supplier is wrong, suitable action will be taken against supplier as deemed fit by BHEL.

2.0 Compliance with Documents:

Sl. No.	Item Description	Criteria	Compliance of document (Yes/No)
2.1	Drawing no. as mentioned in the enquiry.	Compliance of drawing.	
2.2	Specification TM10581 (latest revision).	Compliance of specification & submission of material TC from inhouse lab/NABL approved lab along with consignment.	

3.0 Forging & Heat treatment facilities for Manufacturing of pinion blank forgings:

Sl. No.	Item Description	Criteria	Photographs of facility (machine along with rating plate & make) and other details (Make, Model , Year of Installation, Specification of plant and machinery.)
3.1	Forging facilities	Power hammer of capacity min. 5 Tons or hydraulic press above 3000 Tons. The proof for make, model & capacity of power hammer or hydraulic press shall be furnished.	
3.2	Heating furnaces for the heating of the ingots / blooms.	With multi-zones temperature controllers & graph recorder.	
3.3	Heat treatment facilities for pinion blank forgings.	Heat treatment furnaces with multi-zones temperature controllers & graph recorder.	

4.0 Facilities for open/close die forging:

Sl. No.	Item Description	Criteria	Type of forging process to be used & Details
4.1	Manufacturing of pinion blank forgings by open die/close die forging process.	The pinion blank forgings can be manufactured by open die/close die forging by process of upset forging.	

5.0 Metallurgical and Chemical Laboratory *

Sl No.	Item Description	Criteria	Photographs of inhouse facility (machine along with rating plate & make) and other details (Make, Model , Year of Installation, Specification of plant and machinery.) / Outsourced from NABL approved laboratory
5.1	Chemical composition testing facility	Availability of Emission Spectrometer or wet chemical facilities with certified reference material (CRM).	
5.2	Metallurgical Microscope	Metallurgical Microscope with magnification power of min. 500x & metallographic sample preparation facilities .	
5.3	Macro-etch test facility	1. Macro-etch test facility for grain flow checking. 2. Supplier to furnish sketches of grain flow pattern achieved in earlier manufactured pinion/gear blank forgings.	
5.4	Experimental/lab heat treatment furnace.	Calibrated laboratory/experimental heat treatment furnace with temperature recorder & controller up to 1200°C.	
5.5	Polishing machine.	Polishing machine for sample preparation (upto mirror/super finish).	

6.0 Physical Laboratory *

Sl. No.	Item Description	Criteria	Photographs of inhouse facility (machine along with rating plate & make) and other details (Make, Model , Year of Installation, Specification of plant and machinery.) / Outsourced from NABL approved laboratory
6.1	Universal Testing Machine (UTM)	Universal Testing Machine of min. 20 tonne capacity with graphical recording facilities for conducting tensile tests.	
6.2	Hardness testing machine	Hardness testing machine for Brinell and Vickers scale.	
6.3	Impact Testing Machine	Charpy V-Notch facility for conducting impact test along with notch broaching machine & profile projector and trained machinist for making V-notch profile.	
6.4	Shadowgraph facilities	Shadowgraph facilities for assuring correct notch profile and dimension for impact test specimen.	

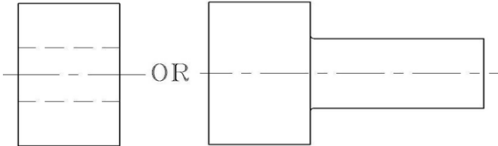
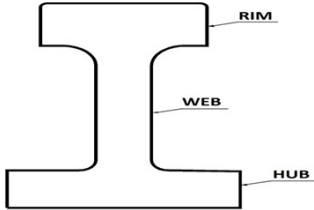
(*) - In case of non-availability of any testing facility inhouse, the same can be outsourced from NABL approved laboratory.

7.0 NDT Facilities:

Sl. No.	Item Description	Criteria	Photographs of facility (machine along with rating plate & make) and other details (Make, Model , Year of Installation, Specification of plant and machinery.)
7.1	Ultrasonic testing facility	Ultrasonic testing facility with all accessories.	
7.2	Magnetic Particle Inspection (MPI) facility	Magnetic Particle Inspection (MPI) facility for checking sub-surface flaws.	

8.0 Qualified Personnel:			
Sl. No.	Description	Criteria	Details of qualified personnel & certificates
8.1	Qualified personnel for conducting various tests.	The supplier should ensure the availability of Qualified Metallurgist, Chemist and NDT level-II certified personnel with them. The certificates of NDT level-II personnel (duly signed & sealed by forging supplier) shall be provided.	

9.0 Forging Ratio:			
Sl. No.	Description	Criteria	Details of stage wise manufacturing plan with forging ratio & sketches
9.1	Forging ratio from ingot to bloom/billet/bar and from bloom/billet/bar to final blank	1. The forging ratio shall be 4:1 minimum from ingot to bloom/billet/bar & 4:1 minimum from bloom/billet/bar to final blank stage. 2. The detailed forging process with dimensional sketch & forging ratio of each stage followed by supplier (meeting the requirement of clause 9.1.1) in earlier manufactured pinion/gear blank forgings shall be provided.	

10.0 Past Experience:			
Sl. No.	Description	Criteria	Details of previous PO
10.1	Past experience of manufacturing of gear/pinion blank forgings	<p>Supplier shall have past experience of manufacturing & supply of minimum 40 nos. pinion blank forgings of shape similar to</p>  <p>and OD of 80mm (min.) OR minimum 40 nos. gear blank forgings (made from closed die forging process) with Rim, web & hub shape similar to</p>  <p>and OD of 400mm (min.) as per material specification TM10581 or other Traction grades of case hardening steel of specifications IS:4432-1988/DIN17210/EN 10084 (with min. mechanical properties as per requirement of TM10581), in the last 5 years from date of enquiry. Note: Vendor to ensure that documents submitted against ii) & iv) shall correlate with the submitted P.O. copy. Document submitted against iii) shall correlate with item description/drawing no. mentioned in PO.</p>	<p>a. Details of previous PO's: i) PO copies. ii) Drawing of item. iii) Material test certificate (from inhouse lab/NABL lab). iv) Supply proof (Copy of invoices). v) Photograph of close die (in case of past experience of gear blank forgings).</p>

Sl. No.	Description	Criteria	Compliance (Yes/No)
11.1	Prototype clearance of first lot of pinion blanks before bulk supply.	For vendors supplying this item to BHEL Bhopal for the first time, 1st lot of pinion blanks shall be supplied for quality inspection at BHEL, Bhopal and bulk supply shall be undertaken only after clearance of first lot by BHEL Bhopal. Note: Vendor has to initiate the supplies as per PO delivery only. Delay in supply of 1st lot of pinion blanks or rejection of pinion blanks due to any non-conformity/ quality deficiency shall not be considered as a reason for delay in supply of pinion blanks in subsequent deliveries as per PO requirement.	
11.2	Final acceptance of pinion blank forgings.	Final acceptance will be based on material & dimensional inspection as per drawing requirement at BHEL, Bhopal. Vendor to provide its confirmation to agree for the same.	
11.3	Vendor should be forging manufacturer.	Vendor should be a forging manufacturer and not a trader.	
11.4	Verification of information furnished by vendor.	For verification of information furnished by vendor, additional documents, proofs etc. may be required by BHEL. Vendor to confirm providing the same.	

12.0 Submission of various Test samples:			
Sl. No.	Description	Criteria	Confirmation for submission (Yes/No)
12.1	Submission of test samples with consignment	Four separately forged longitudinal test samples, (18±1 mm dia and 610 mm long) per heat treatment batch of 400 nos. pinion blanks or part thereof, machined from duly forged test bar, having similar reduction ratio and heat treatment as the forging it represents, shall be provided per heat for testing at BHEL.	
12.2	Submission of one additional pinion blank for macro-etch test (as per ASTM E381) at BHEL, along with first consignment. Note: The cost of 1 no. additional pinion blank shall be in the scope of the supplier.	1. In case of supply of this pinion blank for the first time to BHEL, one additional pinion blank for macro-etch test shall be supplied to BHEL along with first consignment. 2. In case of earlier supply of this pinion blank to BHEL, macroetch test shall be repeated at an interval of every three years of last macroetch test of supplier's supply of that particular pinion blank forging. For above, one additional pinion blank for macroetch test at BHEL end shall be supplied along with first consignment.	

Notes:
1) Compliance of all the points in above technical PQR is mandatory. In absence of compliance of above, vendor's offer is liable to be rejected.
2) Information / compliance / documents submitted by vendor shall be authentic in all aspects. In case any deviation / false information / forged documents are observed, BHEL is free to initiate appropriate punitive proceeding against the supplier.