

 BHOPAL	PRE-QUALIFICATION REQUIREMENTS (PQR)	DOC. NO. : HGG-1910
	HYDRO GENERATOR ENGINEERING DIVISION	DATE: 20-07-2019 REV.: 00 PAGE 1 OF 1

The bid is invited from manufacturer or their authorized representative for supply of pole end plate forging as per drawing, purchase specification and quality plan.

Following are the Pre-Qualification Requirements (PQR):

S. No.	Description of pre-qualification requirement	Vendor Response	
		Complied/ Not complied	Supporting Documents required to accept compliance
1	Manufacturer of forging / their authorized representative.		Certificate of being manufacturer (for manufacturer) / authorization (for authorized representative).
2	Experience of manufacturing pole end plate forging or equivalent and supply of the same during last 7 years having individual forging weight between 50 to 500 kgs with following criteria: a) 3 supplies of minimum supply weight of 4000kgs. <i>OR</i> b) 2 supplies of minimum supply weight of 6000kgs. <i>OR</i> c) 1 supply of minimum supply weight of 8000kgs.		- Purchase order or - Test certificate & invoice.
3	Company shall be certified with ISO 9001 or equivalent.		Valid certificate to be submitted.
4	Financial soundness / capability: a) Minimum annual average turnover (sales) during last 3 years should be at least 30lacs INR. b) The company should not have been referred to BIFR/NCLT etc. and should not be a potential sick company.		- Financial statement. - Self certification and solvency certificate from scheduled bank.

Note:

1. Compliance to above Pre-qualification requirements are mandatory. In absence of compliance of above requirements vendor PQ application is liable to be rejected.
2. BHEL has right to verify information/ confirmation furnished, by asking additional documents proofs etc.
3. The reference date for 7 years experience shall be the date of enquiry.

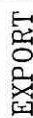
6744
20/07/19

(A. Chandrasekar)
20/7/2019
(D. K. Chandrasekar)

20.07.2019
(Anshuman Doshi)

(A. Bhatnagar)

TECHNICAL REQUIREMENTS:-



TECHNICAL REQUIREMENTS:—

1. FORGINGS SHALL BE SUPPLIED IN ACCORDANCE WITH CONDITION LAID DOWN IN DRG. NO. 3 253 02 01400.
2. THE END PLATES ARE TO BE ROUGH MACHINED TO DIMENSION SHOWN MACHINING TOLERANCE ± 0.5
3. MAX. ROUGHNESS OF MACHINED SURFACE SHALL NOT BE WORSE THAN 6.3 MICRONS EXCEPT WHERE OTHERWISE STATED.
4. P.F. NOS TO BE STAMPED IN 6 MM SIZE AS BELOW
A. FOR 48 NOS. (UNIT-1) USE P.F. NO. 310240 TO 310287
B. FOR 48 NOS. (UNIT-2) USE P.F. NO. 310288 TO 310335
C. FOR 48 NOS. (UNIT-3) USE P.F. NO. 310336 TO 310383
D. FOR 48 NOS. (UNIT-4) USE P.F. NO. 310384 TO 310431
E. FOR 04 NOS. (SPARE) USE P.F. NO. 310432 TO 310435
6. EACH FORGING SHALL BE TESTED ULTRASONICALLY IN ACCORDANCE WITH CORPORATE STANDARD AA 0850118 TO ENSURE FREEDOM FROM INTERNAL DEFECTS. THE NORMS OF ACCEPTANCE SHALL BE AS PER CATEGORY-2 OF THE ABOVE STANDARD.
5. ALL SURFACES SHALL BE PARALLEL & SQUARE.

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**SPECIFICATION OF ALLOY STEEL
FORGINGS-HARDENED AND TEMPERED
FOR
HYDROGENERATOR**

**HG 06004
Rev. 01**

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The minimum reduction ratio when forgings are made out of ingots shall be 4:1.

The coupling or driven end of the shaft shall be indicated on the drawing. These ends shall correspond to the bottom of the ingot.

7. HEAT TREATMENT :

After forging and rough turning, the forgings shall be hardened & tempered. Forgings shall be free from uneven internal stresses, and shall have homogeneous grain structure.

Details of heat treatment shall be furnished to BHEL as and when called for.

8. FREEDOM FROM DEFECTS :

The forging shall be homogeneous, free from excessive hardness, slag spots, sand seams, blow holes, clinks, cracks or other imperfections.

9. CHEMICAL COMPOSITION :

The chemical composition of the material based on melt analysis shall comply with the following requirement.

Element	% Minimum	% Maximum
Carbon	0.19	0.25
Manganese	0.60	1.00
Silicon	-	0.35
Sulphur	-	0.03
Phosphorus	-	0.03
Nickel	0.35	0.75
Chromium	0.35	0.65
Molybdenum	0.15	0.25

Note : Carbon equivalent shall not be exceed 0.50 percent when calculated from the formula given below :

$$CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

10. TEST SAMPLES :

10.1 Unless otherwise specified on the order/drawing, test samples shall be taken from each cast and each heat treatment batch. Test samples should be cut from the heat treated forgings by cold process only and shall receive no further heat treatment.

गोपनीय एवं अधिकार सुरक्षित
इस प्रपत्र पर दी गई जानकारी भारत हेवी इलेक्ट्रिकल्स लिमिटेड की संपत्ति है इसे प्रत्यक्ष या अप्रत्यक्ष रूप से कम्पनी के हितों को नुकसान पहुँचाने के लिए कदापि उपयोग नहीं किया जावे

**SPECIFICATION OF ALLOY STEEL
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Test samples shall be taken from locations indicated on the drawing, leaving enough material, if required, for testing at purchaser's end, integral with the forging.

10.2 When integral test pieces are not called for and it is not possible to destroy the forgings, separate test samples as mentioned on the order/drawing shall be provided from the blooms and billets from which the forgings are made. They shall be forged to the ruling section of the main forgings and shall be heat treated similarly and simultaneously with the forgings they represent.

10.3 Test samples shall be cylindrical in shape.

(a) Longitudinal / Radial test piece shall be taken from one end of the forging.
Radial test piece may be taken from economic considerations.

(b) Tangential test piece shall be taken from other end of the forging.

(c) Test piece diameter shall be 10mm for HG 06004 min.
(as per IS-1608:1995, amd. No. 1, May 2002, table 5).

Test piece shall be cut as below :

(i) For solid forgings: at a distance of one-third radius or one-sixth diagonal from the outer surface.

(ii) For hollow forgings: midway between the inner and outer surface of the wall thickness.

11. MECHANICAL PROPERTIES : (Longitudinal)

The test pieces, shall show the following properties for all ruling sections. Test methods are specified below :

10.1 Tensile test : IS : 1608

10.2 Hardness test (Brinell) : IS : 1500

10.3 Mechanical properties

i)	Tensile strength (in any direction)	- 620 N/mm ² Min
ii)	Yield strength (in any direction)	- 462 N/mm ² Min
iii)	Elongation 5.65 " so gauge length long / Radial - 16 % min	Tangential - 16% min
iv)	Reduction in area	- 40% min.
v)	Hardness (Brinell) for reference only	190-260

Note: For an indication of the general quality of the steel, the broken test pieces shall show a fracture of uniform silky appearance free from granular black or brilliant specks, though this would not be criteria for rejection.

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			SPECIFICATION OF ALLOY STEEL FORGINGS-HARDENED AND TEMPERED FOR HYDROGENERATOR	HG 06004 Rev. 01 PAGE 4 OF 7										
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			SPECIFICATION OF ALLOY STEEL FORGINGS-HARDENED AND TEMPERED FOR HYDROGENERATOR	HG 06004 Rev. 01 PAGE 5 OF 7
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			SPECIFICATION OF ALLOY STEEL FORGINGS-HARDENED AND TEMPERED FOR HYDROGENERATOR		HG 06004																																																
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ANNEXURE - I : RECOMMENDED TEST CERTIFICATE FORMAT FOR FORGINGS																																																					
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Supplier's Name and Address																																																					
1. Customer 2. TC No. & Date 3. PO No. 4. Process of Malting Ingot 5. Deoxidisation Process 6. Forging Method 7. BHEL's Reference for Approval of Bloom 8. Discard : Top _____% Bottom _____% 9. Reduction : ingot to Bloom Ratio Bloom to Blank 10. Batch No. 11. Heat / Melt No. 12. Spec. No. 13. Test Bar Size & Nos. 14. Supplier of the Ingot/billet/ Bloom and TC reference																																																					
15. FORGINGS COVERED BY TEST CERTIFICATE																																																					
S.No.		Drawing No. & Item No.		Description		Quantity & Weight																																															
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As Per Speon	Max.																																																				
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QA PLAN FOR: FORGINGS
QA PLAN NO: QSP/HG/104

QUALITY ASSURANCE DEPARTMENT

SHEET 1 of 2
DATE: 14/01/2016

PINO: _____
REVISION: 01

DATE: 13/10/1993

SL. NO.	COMPONENT/ASSY/ OPERATION	CHARACTERISTICS	CLASS	TYPE	QUANTUM OF CHECK	REF. DOC.	RECORD FORMAT	INSPECTION AGENCY	REMARKS
1.0	Forging stock (ingot or bloom)	a) Material certification	Major	Review	100%	Spec/ Drawing	TC	Supplier/BHEL/ Customer	
		b) Material identification	Major	Review	100%	Spec/ Drawing	TC	Supplier/BHEL/ Customer	
1.2	Forging	a) Visual and process checks <i>Dimensional</i>	Major	Review	100%	Approved forging process	Supplier QC record	Supplier/BHEL/ Customer	
		b) Heat treatment	Critical	Heat treatment	100%	Spec	TC	Supplier/BHEL/ Customer	
		c) Marking of test samples as per drawing	Major	Review	100%	Drawing	Supplier QC record	Supplier/BHEL/ Customer	
		d) Chemical analysis	Major	Chem	Sample	Spec	TC	Supplier/BHEL/ Customer	
		e) Mechanical analysis <i>UTS, YP, elongation, reduction in area</i>	Major	Mech	Sample	Spec	TC	Supplier/BHEL/ Customer	
		f) Ensure proof marking for availability of machining allowance	Major	Dimensional	100%	Drawing	Supplier QC record	Supplier/BHEL/ Customer	
		g) Marking of PF nos., etc. before rough machining	Major	Review	100%	Drawing	Supplier QC record	Supplier/BHEL/ Customer	
		h) Visual & dimensional checks of rough machined forgings	Major	Visual/ Dimensional	100%	Drawing	Supplier QC record	Supplier/BHEL/ Customer	

PREPARED BY: -SD-

CHECKED BY: -SD-

APPROVED BY: -SD-

DATE: 13/10/1993

REVISION 01: 1) "Important note" has been added. 2) The "Type" field was blank for 1.2 c) & 1.2 g). 3) The "Record format" field was blank for SI. No. 1.2 c). 4) The format has been updated.

PREPARED BY: *[Signature]* 14/01/2016

CHECKED BY: *[Signature]* 14/01/2016

APPROVED BY: *[Signature]*

DATE: 14/01/2016

कृष्णा चो. बंडारु
KRISHNA C BANDARU
वरि अभियंता (अभिकल्प) / Sr. Engineer (D)
एच.जी.ई. प्र. म. / HGE Division
बी.एच.ई.एल., भोपाल / BHEL, BHOPAL

रितेश गजमिये / RITESHGAJBHIYE
वरि प्रबंधक (अभिकल्प) / Sr. Manager (D)
एच.जी.ई. प्रभाग / HGE Division
बी.एच.ई.एल., भोपाल / BHEL, BHOPAL



QA PLAN FOR: FORGINGS
QA PLAN NO: QSP/HG/104

QUALITY ASSURANCE DEPARTMENT

DATE: 13/10/1993
PI NO: _____
REVISION: 01
SHEET 2 of 2
DATE: 14/01/2016

SL. NO.	COMPONENT/ASSY/ OPERATION	CHARACTERISTICS	CLASS	TYPE	QUANTUM OF CHECK	REF. DOC.	RECORD FORMAT	INSPECTION AGENCY	REMARKS
		i) UT on forging and boreoscopic examination	Major	NDT	100%	Drawing	TC	Supplier/BHEL/ Customer	
		j) Final marking of PF nos., heat nos., identification, etc.	Major	Review	100%	Drawing	TC	Supplier/BHEL/ Customer	
		k) Painting, preservation, and packing	Major	Review	100%	Drawing	TC	Supplier/BHEL/ Customer	

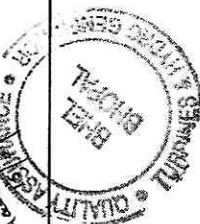
ABBREVIATIONS: NDT - Non Destructive Testing, Mech - Mechanical, Chem - Chemical, Elec - Electrical, Spec - Specification, TC - Test Certificate, QC - Quality Control

IMPORTANT NOTE: Some of the above-mentioned tests may be witnessed by the customer. This shall be intimated at a later date.

PREPARED BY: -SD-
CHECKED BY: -SD-
APPROVED BY: -SD-
DATE: 13/10/1993

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PREPARED BY: *[Signature]* 14/01/2016
CHECKED BY: *[Signature]* 14/01/2016
APPROVED BY: *[Signature]* 14/01/2016



रितेश गुजमिये / RITESH GAJBHIYE
वरि प्रबंधक (अभिकल्प) / Sr. Manager (D)
एच.जी.ई. प्रभाग / HGE Division
बी.एच.ई.एल., भोपाल / BHEL, BHOPAL

कृष्णा चौ. बंडारु
KRISHNA C BANDARU
वरि अभियंता (अभिकल्प) / Sr. Engineer (D)
एच.जी.ई. प्रभाग / HGE Division
बी.एच.ई.एल., भोपाल / BHEL, BHOPAL

Also, refer Annexure - A.

Required modifications are marked in this QAP.

[Handwritten signature]
14/01/2016
BHEL BHOVAL

ANNEXURE-A
PI NO. 240390732

Supplier test certificates for pole end plate (incoming material) shall have following particulars as per customers manufacturing quality assurance test requirements:

- Mechanical properties consists of UTS, YS, % elongation, reduction in area and impact if applicable.
- Chemical composition
- NDT (UT & MPI)
- Visual & dimensional check

The above requirements are marked in the attached quality plan QSP/HG/104 Rev01.

जयेश
27/07/19
जयेश कोटारिया
प्रबंधक / मय. न. ई.

(Khand-9/2
27/7/19
D.K. Chandrakar)
DGM/HGE