

HEEP: HARDWAR-249 403 (UTTARAKHAND)

Fax: 01334-226462, Phone: 284144 E-mail: pkbansal@bhelhwr.co.in;

Tender no: PPX-F&HE/EOI/SL/16-17/01

Due Date: 09/05/2016

Notice for Expression of Interest for empanelment of New Vendors

The Heavy Electrical Equipment Plant (HEEP) located in Haridwar, is one of the major manufacturing plants of BHEL. The core business of HEEP includes design and manufacture of large steam and gas turbines, turbo generators, hydro turbines and generators and so on.

We are looking for reputed vendors having capability for supplying following materials-

SI.	Description	Probable Sizes	Annual Requirement	Pre-Qualification Requirements/ Specification
1	17% Mn Steel Non Magnetic Bars/Flats: Austenitic Alloy Steel Bar Grade X40MnCrN19K as per BHEL specification HW10784 Rev: 02	Dia- 12, 16, 18, 26, 30, 36, 40, 42 & 45 mm	17 MT	Annexure- I
2	IPB/IPBV Beams: Wide parallel flange beam (ISWPB as per IS12778 or IPB as per DIN1025-Part-2) & IPBV as per DIN1025-Part-4 with raw material as per Grade E250, Quality A of IS: 2062 or S275JR/S355 as per DIN EN 10025-2 as per BHEL specification AA10108 Rev: 11. No construction welding is permitted for manufacturing IPB/IPBV/ISWPB beams.	IPB 100, 120, 160, 180, 200, 220, 240, 260, 300, 400, 500 mm, IPBV 160, 240, 260 mm, ISWPB 140×140×33.7 OR IPB 140 mm, ISWPB 160×160×42.59 OR IPB 160 mm.	45 MT	Annexure- II
3	Creep Round Bars ESR Grade: Steel Bars Grade X12CrMoWVNBN 10-1-1 as per BHEL Specification HW10661 Rev: 00 and addendum to Spec. HW10661.	Dia- 25, 45, 55, 85, 110, 140, 160, 180, 225 & 240 mm	16 MT	Annexure- III
4	Creep Round Bar- 9-12% CRMOV Steel: a. Steel Bars Grade X10CrMoVNB9-1 as per BHEL specification HW10662 Rev: 00 and addendum to specification.	Dia- 20, 25, 30, 45, 55, 65, 105, 115, 125, 150, 160 & 200 & 240 mm	10 MT	Annexure- IV
	b. Steel Bars Grade X18CrMoNbVN11- 1+QT as per BHEL specification HW18814 Rev: 01 and addendum to specification.	Dia- 25, 35, 50,60, 85, 110 & 140 mm	30 MT	Annexure- V

Contact persons:

Mr. Yashpal Yadav

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Designation: Sr. Mgr (PPX-F & HE) Email: rschn@bhelhwr.co.in

Phone No: +91 1334-281478 Mobile: +91 9410395890 Mr. P K Bansal

Designation: AGM (PPX- F & HE) Email Id: pkbansal@bhelhwr.co.in Phone No: +91 1334-285304 Mobile: +91 9411111546



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The offers received will be technically evaluated by BHEL & successful short listed parties will be asked to submit their detailed Techno-Commercial offers through formal NIT/Enquiry for our future requirements. Vendors shall confirm that there is no deviation with respect to BHEL Specifications. However deviations, if any are to be listed as a separate attachment. The offers that do not meet the substantial requirements of our specifications are liable to be ignored.

Following documents are to be necessarily filled and submitted along with the technical offer:

- Details/ Documents in support of Specification/PQR (Annexure-I, II & III, IV & V up-loaded)
- 2. Quality Requirements (Annexure-VII) & Quality Plan format (Annexure-VII).
- **3.** Supplier/Vendor Registration Form- Go through online supplier registration portal https://supplier.bhel.in/. After filling the online registration form send the copy of same along with your offer within due date.
- 4. Details of Manufacturing Facility
- **5.** Company Profile.
- **6.** Financial report of the company.
- **7.** Past experience along with documentary proof.

Only Technical BID along with the documents mentioned above should be sent and the envelope containing the offer shall be duly sealed and super scribed as "Technical Offer for (ITEM NAME) AGAINST Tender No. PPX-F&HE/EOI/SL/16-17/01

Due Date-09.05.2016, SUBMITTED BY (Name of company)"

- This notification shall be published on <u>www.bhel.com</u>, <u>www.tenders.gov.in</u> and www.bhelhwr.co.in
- Last date for downloading tender documents shall be 08.05.2016 till 1700 Hrs.(IST). Tenders will be received up to 13:45 Hrs. (IST) on 09.05.2016 will be considered and opened on the same day at 14:00 Hrs. (IST) in the Tender Room BHEL HEEP, Haridwar.
- Technical Offers complete in all respect must be addressed to "Shri P K BANSAL, AGM (PPX-F)".
- EMD & Tender fee are not applicable.
- The Quotation should be from the Principal / Original Manufacturer, failing which the quotation may likely to be ignored. In Case the quotation is submitted through agent, the quotation must accompany original authorization letter.
- Late offers will not be considered in any case. BHEL will not be responsible for any type of postal delay / incomplete information from vendor.
- Amendments / Corrigendum, if any, will be hosted on our web site only.

For any further details please log on to www.bhel.com or www.tenders.gov.in or <

(P K BANSAL) AGM (PPX- F & HE)



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ANNEXURE-I

Pre-Qualification Requirements for Round Bars of material grade X40MnnCrN19-

1. Vendor must have experience of manufacturing and supplying round bars of material grade X40MnCrN19 (material number 1.3813). Details of the experience for material grade X40MnCrN19 is to be submitted in the format given below:

SI. No	Name of customer	Purchase order No	Dimensions (Diameter X Length)	Year of supply	Quantity

Test certificates covering chemical composition, mechanical properties, non-destructive test report and dimension reports of above purchase orders of rounds of material grade X40MnCrN19 are to be submitted with offer.

- 2. Vendor must have in-house rolling/forging/cold drawing, heat treatment facilities to manufacture round bars of material grade X40MnCrN19 as per BHEL specification HW10784.
- **3.** Vendor to submit in house steel melting including secondary refining facility details. In case in house steel melting facility not available in house, vendor to inform their source for raw material. Details of steel melting with secondary refining facility and experience for material grade X40MnCrN19 to be submitted.
- **4.** Details of the testing facilities (in-house or outsourced) are to be submitted. In case of outsourcing of any test, vendor to submit details of testing house. Testing shall be carried out at Government accredited labs only.
- 5. Vendor to confirm that they will meet all the requirements of BHEL specification HW10784.

Section Page 1 of 4	7	ή	T			· · · · · · · · · · · · · · · · · · ·						10		
AUSTENITIC ALLOY STEEL BAR (ROUNDS & FLATS) (X 40 MnCrN19K) 1. GENERAL: This specification governs the requirements of cold drawn steel bars of grade X40MnCrN19K (Material No. 1.3813) round and flats. 2. APPLICATION: The steel bar shall be used for manufacture of tension bolts, press fingers etc. 3. DIMENSIONS & TOLERANCE: 3.1 The dimensions of the bar shall be stated on the order. 3.2 The tolerances shall be as per Annexure - I. 4. MANUFACTURE: The bars can either be rolled or forged provided that the required mechanical properties in cold drawn condition are fulfilled. 5. CHEMICAL COMPOSITION: The material shall conform to the chemical composition shall be as follows: Carbon Silicon Manganese Chromium Nitrogen Sulphur Phosphorus and heat treatment batch). The test amount shall be 10% of the bars with a minimum of 10 bars. When the lot consists of less than 10 bars all bars shall be tested. The mechanical properties are to be determined on both the hardest and softest bar for each melt and heat treatment batch. The speciment is to be taken in longitudinal direction from centre of the bars. 0.2% Proof stress and tensile strength shall be determined on each and every cross-section.	FR SIG	ш	भी एम ई ए	TPT	संस्था	न क्रय	विनिर्देश	(हीप	– हरिह	र्रार) ⊢		10		
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& DATE	<i>र्षण ई एव</i> संस्थान क्रय विनिदेश (हीप – हरिद्वार)	पृष्ठ का									
& DATE	PLANT PURCHASE SPECIFICATION (HEEP-HARDWAR)	Page 2	of ·	4							
INVENTORY NO.	Following properties shall be achieved at room temperature:										
INVEN	0.2 % Proof Stress: ≥ 500 N/mm²		•								
9 46.	Tensile Strength: $850 - 1250 \text{ N/mm}^2$ Elongation (I_0 =5d) (%): $\geq 20\%$										
सामग्रा सूचा संख्या का अधिकमित करता है	Elongation (l₀=5d) (%): ≥ 20% Reduction in area: ≥ 35%		*								
अधिक	Impact Energy (J): ≥ 90 *										
!	Hardness (HB30): 260 - 360										
Limited.It must the company	*Average of 3 Charpy V-notch specimens										
Limited he com	7. NON DESTRUCTIVE TEST:										
ctrical sst of t	7.1 Scope of inspection:										
The information on this documents is the property of Bharat Heavy Electrical Limited.It m not be used directly or indirectly in any way detrimental to the interest of the company	Following NDT shall be performed in delivery condition for all bars										
y of Bharat Heavy Electric etrimental to the interest	Verification Test										
of Bhr etrimen	Complete ultrasonic inspection (UT) according to EN 10308 type 1a-1c (table1)										
way d	 Liquid penetrate test according to EN 10228-2 or according to any other technique 	ue that guara	ntees								
s is the propert y in any way o	achieving the requested registration and decision criteria										
n this documents is the ectly or indirectly in	7.2 Criteria for Registration and decision.		•								
this doc	7.2.1 <u>UT Inspection</u> Regarding LIT inspection quality class 3 according to EN 19209 (table 3) about to a										
tion on ed direc	Regarding UT inspection quality class 3 according to EN 10308 (table 3) shall be to The decision limit for loss of back wall echo is 3 dB for all bar dimensions. Any line										
nforma ot be us	in homogeneity larger than 10mm in any direction is not accepted.	ai oi suriace	- IIKE								
Thei	7.2.2 Surface crack inspection										
	Quality class 4 according to EN 10228-2 (table 1) shall be applied.										
यस एवं ज्ञियाः जाए	8.0 TEST CERTIFICATES:										
इस प्रसेख में दी गई सूचना मारत हेरी इलेक्ट्रिक्टनत से सम्पत्ति है इसका प्रत्यक्ष एवं एक्स स्तप से किसी में तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जा	The supplier shall furnish four copies of test certificates unless and otherwise state	d on the orde	er:								
में दी गई सूबना मारत हेवी इतोन्द्रेकल्स की सम्पत्ति है इसका प्रत्थ किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न वि	8.1 BHEL'S Reference										
की सम्प्री रेतमें हा	Purchase Order										
फूकल्स ग्नी के हि	Specification Number										
वी इतिबि ोकिका	8.2 Supplier's Reference:										
९५८९वाथिकार ५५ गापनाथ वनामात्त्व हेवी इत्रेक्ट्रिकल्स की सम्परि एष्ट प्रचोग, जो कि कंपनी के हित में हारि	Name or emblem of the supplier Material Designation										
ई सूचना मितरहा	Melt No.										
मेदीना प्रियमा	Steel melting process										
प्रलेख सन्पर्	Complete detail of heat – treatment										
证 证	,										
इस प्रलेख : अप्रत्यक्ष रूप से	8.3 Results of Testing										
इस	8.3 <u>Results of Testing</u> 8.3.1 Chemical Analysis	·									
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& DATE	8.3.1 Chemical Analysis 8.3.2 Mechanical Properties. All individual values are to be given.										
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& DATE	 8.3.1 Chemical Analysis 8.3.2 Mechanical Properties. All individual values are to be given. 8.3.3 Type and results of non-destructive testing and final surface inspection. 8.3.4 Verification test Confirmation 										
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RY NO.	8.4 <u>Dimension</u>	al Results:						-	
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NO.		•			,		•	Annexure-I
SUPERSEDES INVENTORY NO	I. FOR ROUI	ND BARS:						
	1. 7	Tolerance or	round bars shall	be as follows:				
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ON of Bhr	II. FOR _, FLAT	BAKS:						
VD (1. 1	Tolerance or	ı flat bars shall be	as follows: :				
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HEEP: HARDWAR-249 403 (UTTARAKHAND)

Fax: 01334-226462, Phone: 284144 E-mail: pkbansal@bhelhwr.co.in;

ANNEXURE-II

Pre-Qualification Requirements for IPB/IPBV Beams-

- 1. Welded beam is not acceptable.
- 2. Vendor must have experience of manufacturing and supplying IPB/IPBV beams as per IS: 12778 or DIN 1025 (e.g. IPB 100, 200, 300; IPBV 260, 240 etc). In support of experience vendor to submit details in the following format:

SI. No.	Name of customer	Purchase order No.	Size	Year of supply	Quantity

Test certificates of past supplies are to be submitted in support of experience.

3. Vendor must meet any one of the following manufacturing facility requirement:

Vendor must have in house steel melting and rolling facility to manufacture IPB/IPBV beam as per IS: 12778 or DIN 1025.

Or

Vendor having in house rolling facility but in house steel melting facility not available. Vendor has to submit details of their source of raw material with their manufacturing facilities.

Or

Vendor having in house steel melting facility but in house rolling facility not available. Vendor has to submit details of their source of rolling with their manufacturing facilities.

- 4. Material shall be as per IS: 2062, E250 Gr A or S275JR, EN10025 or S355, EN10025
- 5. Certification / Approval for IPB/IPBV beam from BIS/TUV/BVQI etc., if available, may be submitted.



CORPORATE PURCHASING SPECIFICATION

AA10108

Rev No. 11

PAGE 1 of 2

STRUCTURAL STEEL-STANDARD QUALITY

(PLATES, SECTIONS, STRIPS, FLATS & BARS)

(ORDERING DESCRIPTION)

1.0 GENERAL:

This specification governs the quality requirements of structural steel plates, strips, flats, bars and sections such as angles, beams, channels and tees etc. of IS: 2062-2011, Gr: E250, Quality A

2.0 APPLICATION:

For general engineering purpose.

3.0 CONDITION OF DELIVERY:

Plates, Bars & Sections: Hot rolled in straight lengths without twists & Bends

4.0 COMPLIANCE WITH NATIONAL STANDARDS:

Material shall comply with the requirements of IS: 2062 - 2011, Gr. E250, Quality A

Material offered to EN 10025-2:2004 Gr. S275JR is also acceptable. The tolerance on dimensions for plates shall comply with EN 10029.

5.0 DIMENSIONS AND TOLERANCES:

5.1 DIMENSIONS:

5.1.1 Sizes

Material shall be supplied to the dimensions specified on BHEL Order.

5.1.2 Length

Unless otherwise specified, hot rolled bars and sections shall be supplied in 3 to 6 metres length.

5.2 Tolerances:

5.2.1 The tolerances on hot rolled material shall comply with IS: 1852. However, no plate shall be under the specified thickness at any point.

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١	Rev No.11	Amd No.	Reaffirmed	Prepared	Issued	Dt. of 1st Issue		
Appendiction of the last of th	Dt:22-02-2014	Dt:	Year:	HPEP, Hyderabad	Corp.R&D	July, 1976		

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AA10108

Rev No. 11

PAGE 2 of 2

CORPORATE PURCHASING SPECIFICATION



5.2.2 Straight for hot rolled bars:

Unless otherwise specified, the permissible deviation in straightness shall not exceed 5 mm in any 1000 mm length.

6.0 HARDNESS (BRINELL):

When tested in accordance with IS: 1500, the material shall show a brinell hardness in the range of 120-156 HB.

Note: Hardness test shall be conducted only when tensile test cannot be performed.

7.0 TEST CERTIFICATES:

Unless otherwise specified, three copies of test certificates shall be supplied.

In addition, the supplier shall ensure to enclose one copy of the test certificate along with their dispatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information.

AA10108 Rev.11 / IS:2062 Grade: E250 Quality A / EN 10025-2 Gr. S275JR,

BHEL order no., Melt no. Size, Results of chemical analysis and Mechanical tests, Supplier's name, Identification no. TC no., Signature of competent authority etc.

8.0 PACKING AND MARKING:

Plates shall be transported suitably to avoid damage during transit.

For plates below 10 mm thick, each pile (preferably of 16 plates) and each plate 10 mm thick & over shall be marked with melt no. AA10108, BHEL order no., Supplier's name, Identification no., Size & weight on any one corner and encircled with paint preferably of white colour.

9.0 REFERRED STANDARDS (Latest publications including amendments):

1) IS: 1500

2) IS: 1852

3) EN 10029

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HEEP: HARDWAR-249 403 (UTTARAKHAND)

Fax: 01334-226462, Phone: 284144 E-mail: pkbansal@bhelhwr.co.in;

ANNEXURE-III

<u>Pre-Qualification Requirements for Round Bars of material grade</u> X12CrMoWVNbN10-1-1, Specification HW10661 with addendum-

Round bars of material grade X12CrMoWVNbN10-1-1 shall be used in Steam Turbine High Temperature application. Material shall be subjected to creep condition.

1. Vendor must have experience of manufacturing and supplying forged/rolled bars of material grade X12CrMoWVNbN10-1-1. In support of experience, vendor to submit details of past three supplies in the format given below:

SI.	Name of customer	Purchase order	Size	Year of	Quantity
No		No		supply	

Vendor to submit test certificates covering chemical, mechanical, heat treatment details, non-destructive test etc of purchase order referred above in support of experience.

2. Vendor must have in-house manufacturing facilities like melting, secondary refining including electro slag re-melting facility, rolling / forging, heat treatment etc. to manufacture round bars as per BHEL specification HW10661 with addendum.

Outsourcing of any of above operation is not acceptable.

Vendor shall submit following manufacturing details with relevant supporting documents:

- Steel melting facility, secondary refining including electro slag re-melting facility
- Rolling facility Minimum and maximum dimension which can be rolled (diameter and length)
- Forging facility Press / Hammer details Minimum and maximum dimension which can be forged (diameter and length)
- Heat Treatment Furnace details, quenching media (air, oil, polymer) etc, Furnace calibration certificates for uniformity of temperature within the furnace at different zones
- **3.** Vendor to furnish in house testing facilities to carry out testing as per the requirements of BHEL specification HW10661. In case of outsourcing of any test, vendor to submit details of testing house. Testing shall be carried out at Government accredited labs only.
- **4.** Vendor to confirm that they will meet all the requirements of BHEL specification HW10661 with their addendum.
- 5. Creep Rupture data for material grade X12CrMoWVNbN10-1-1, if available, may be submitted.

HW 10661 क्रय विनिर्देश भी एम ई एम संस्थान (हीप – हरिद्वार) DATE पृष्ठ एवं हरते ' PLANT PURCHASE SPECIFICATION Page 1 Of 4 (HEEP - HARDWAR) SUPERSEDES NVENTORY NO. STEEL BARS GRADE X12CrMoWVNb N10-1-1 TLV 9258/10, Feb'08 1.0 GENERAL: This specification governs the quality of steel Bars of grade X12CrMoWVNbN 10-1-1, material no. 1.4906. 2.0 APPLICATION: For turbine components. 3.0 CONDITION OF DELIVERY: Rolled / forged and Heat Treated. Limited It must mation on this documents is the property of Bharat Heavy Electrical. Lumited (t.m. used directly or indirectly in any way detrimental to the interest. of the company 4.0 DIMENSION AND TOLERANCES: Bars shall be supplied to the dimension specified on the purchase order. Length: COPYRIGHT AND CONFIDENTIAL Unless otherwise stated in the order, hot rolled bars shall be supplied in 3 to 6 meters length or in multiples with maximum of 10 percent short down to 1 meter. Forged bars shall be supplied in lengths of 1.5 to 3 meters. **Tolerances: Hot Rolled Bars:** The bars shall not vary from specified diameter or distance across flats by more than 2.5%. The tolerance on the forged bars shall be as follows: Diameter, mm Tolerance, mm 50 to 125 +6.0 125 to 175 +8.0 Š > 175 +12.5Insignificant surface defect in the form of dent and ripple marks are permissible provided their रूप से किसी भी तरह प्रयोग, जो कि कंपनी के द्विस में शनिकारक हो न किया जाए <u>.</u> depth does not exceed half the tolerance on each size. इस प्रलेख में दी गई सूचना भारत हेवी इसोबिट्रकरूस की सम्पत्ति है इसका प्रत्यक्ष 5.0 MANUFACTURE: ESR steel shall be used. Use of any other steel secondary treatment is to be agreed in advance with BHEL. Cast ingot is to be used as starting material for the production of bars. स्वत्वाधिकार एवं गोपनीय The bars can either be rolled or forged provided that the requested mechanical properties are fulfilled. 6.0 CHEMCIAL COMPOSITION: Heat analysis in weight %: Element Ρ Mn S Cr Ni Mo W ٧ Ν Αl Min. 0.11 0.40 10.2 1.00 0.70 0.95 0.15 0.045 Max. 0.13 0.12 0.50 0.010 0.005 10.8 1.10 0.80 1.05 0.25 0.060 SECTION The content of trace elements such as Cu, As, Sb, Sn and Ti shall be given for information in test certificate. DATE दिनांक TSX B. CHOUDHARY NAME SIGNATURE & DATE हरताक्षार एव MRC & PSC V.K.CHAUHAN

TRANSLATED BY

CHECKED BY

Pankaj Agarwal

Ashish Ranjan

Gopal Krishnan

PLANT STANDARDS COMMITTEE

: मानक विभाग

ISSUED: STANDARDS DIVISION

संस्थान मानक समिति

निर्माणकर्ता WORKED BY

पर्यवेक्षणकर्ता SUPERVISED BY

अनुवादल

जांचकर्ता

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APPROVED :

PREPARED: MTE

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सामग्री सूची संख्या INVENTORY NO. 409



संस्थान क्रय विनिर्देश (हीप - हरिद्वार)

PLANT PURCHASE SPECIFICATION

(HEEP - HARDWAR)

HW 10661

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Page 2 of 4

7.0 HEAT TREATMENT:

Bars shall be supplied in quenched and tempered condition. A martensitic microstructure shall be obtained along the whole section of the bar.

Quench Hardening: 1050 - 1100° C/ air or liquid quenching

Tempering:

At least two times

Level 1: T1 = 570°C/4 hour/air or liquid

Level 2: $T_2 \ge 700^{\circ}C$

If bars need to be straightened after heat treatment, stress relieving is mandatory after completion of entire straightening process. The stress relieving shall be carried out at 20 - 50°C below the tempering temperature with a subsequent slow cooling rate.

8.0 MECHANICAL PROPERTIES:

The specimens are to be taken in longitudinal (L) direction according to EN10083-1. For bars with diameter (d) or side length (a, b) > 100mm, the specimens shall be taken at a distance d/3 for round and a/3, b/3 for rectangular bars from the respective surfaces. In this case, transverse specimens (T) are also allowed.

In case of manufacturinEg machined components, following condition to be met:

A hardness test shall be performed to verify the uniformity of the strength within a delivery lot (per melt and heat treatment batch). The test amount shall be 10% of the bars with a minimum of 10 bars. When the lot contains less than 10 bars, all bars shall be tested. The mechanical properties shall be tested on both the softest and hardest bars.

If raw parts are to be manufactured from forged bar, which is forged to different diameter, the following requirements shall be met:

For a ratio of up to 1.25 (according to EN10269, clause 10.1.2) between the diameter of the taper shank and the shaft section of valve stem, the testing of mechanical properties is to be done only on bigger diameter

In case of a ratio of diameter > 1.25 mechanical properties shall be tested on all diameters.

Impact energy test shall be performed on bars having side length ≥ 10mm or diameter ≥ 15mm respectively.

The following Mechanical properties shall be achieved at room temperature

Diameter (d)	0.2% Proof	Tensile	Elongation		Reduction Ir		Impact Energy		Hardness
Side length (a1)	Strength	Strength	I ₀ = 5d (%) in area		rea	J			
(mm)	(N/mm²)	(N/mm²)	(%)				HB30		
			L	Т	L	Т	L	Т	-
d, a ≤100	700 - 800	≤ 1000	≥ 14	-	≥ 50	-	≥ 40 ²	-	260 - 310
100 < d, a	700 - 800	≤ 1000	-	≥ 13	-	≥ 40	-	≥ 24 ²	260 - 310

¹⁾ The values of the smallest side length (a) shall be reached.

²⁾ Average of 3 Charpy V-notch specimen, longitudinal or transverse

Rev. No.	निर्माणकर्ता Worked by	ASHISH	Hayar	14.01-11
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संस्थान क्रय विनिर्देश (हीप - हरिद्वार) HW 10661 SIGN & DATE PLANT PURCHASE SPECIFICATION पुष्ठ (HEEP - HARDWAR) Page 3 of 4 9.0 OUTER AND INNER QUALITY / NON DESTRUCTIVE TESTING: INVENTORY NO 9.1 SURFACE CONDITION: Cracks, other material separation or more severe linear inclusions lines are only acceptable when located in the dimensional tolerances area. को अधिकमित करता है । 9.2 SCOPE OF INSPECTION: सामग्री सूची संख्या Following NDE shall be performed in delivery condition: Verification inspection of all bars 100% U.T of all bars with diameter $30 \le d \le 500$ mm according to EN10308 type 1a - 1c(table 1) 9.3 CRITERIA FOR REGISTRATION AND DECISION: For ultrasonic inspection following quality classes according to EN10308 (table 2) shall be way defruitemental to the interest of the com-The information on this abenenium is the property of Danzai Henry Electrical Limited it must not be used thready or indirectly in any way detiniouslal to the inseries of the conapplied depending upon the diameter (d) or side length (a, b): COPYRIGIT AND CONFIDENTIAL d or $(a, b) \le 200$ mm: Quality class 4 d or (a, b) > 200mm: Quality class 3 The decision limit for loss of back wall echo is 3 dB for all bar dimensions. Any linear or surface like inhomogenity larger than 10mm in any direction is not acceptable. This quality requirement applies also for bars having diameter d <30mm, although it is not necessary to prove by testing, Regarding forged bars with two different diameters, a 45° - transducer shall be used for sectional variations over the entire 360°. Defects that will be cut during final machining shall be evaluated individually. 10.0 MARKING: The marking of the materials shall be such that heat no., steel grade/specification & इस ४०५४ में दे नई सूचना गारत हेटी इतिहिन्दळता की रूप्पति है इस्का प्रकाश एक अग्रस्थ २५५ से किसी १९ सरह प्रयोग, जो कि कंपनी के हित में शिष्टियासक हो न किया. जार manufacturer name / identifications are legible. 11.0 TEST CERTIFICATES: स्वत्वाधिकार एवं गोपनीय The supplier shall supply four copies of test certificates as per EN 10204, certificate3.1 B, unless otherwise stated on the order. The test certificates shall bear the following: BHEL References: Specification no., Purchase orders no. Suppliers references: Name, emblem, material designation, melt no, Heat-treatment batch no. Results of Testing: Melting process, melt analysis, Mechanical properties, all individual values shall be reported Details of Heat-treatment performed. हरताक्षर एवं दिनांक SIGN & DATE U.T result Confirmation of the verification inspection

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समग्री मूडी संख्या SUPERSEDES को अधिकृतित करता हैं ! INVENTORY NO.	12.0 CLEARANCE FOR DELIVERY: The total results of the tests carried out are the deciding fashall evaluate the total results taking into consideration to examines accordingly the permissibility of deviation (if any The clearance however does not relieve the supplier of the permissible defects, which are found later. 13.0 CROSS REFERRED STANDARDS: EN 10269, EN 10083-1, EN 10308, EN10204,	he intended use) from the speci	e of the material and fied properties.
COPYRIGHT AND CONFIDENTIAL. The information on this documents is the property of Blumar Heavy Flacushall named It make not be used threats or malreach, in any way during and the increase of the company.	EN 19203, EN 19903 1, EN 19909, EN 19204,		
स्वत्ताधिकार एवं गोपनीय इष्ट प्रतेष्ठ में में महंभूतनामत्त हेट इतिहेत्कल की समीत हैं हुरका प्रवार ए प्रतयहा हम में किसी भी तस्त प्रदोश, की कि काजी के दित में हाजिकरक हैं निवार जाए।			
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Addendum to Specification HW10661

(Material Grade: X12CrMoWVNbN10-1-1)

PRODUCT AND PROCESS QUALFICATION:

1.0 General:

Product and process qualification procedures are required for first order. The product and process qualification is required for each of the manufacturer's fabrication facility.

Depending on the complexity of the product and / or process and experience from the first orders, requirement of additional process qualification in subsequent orders shall be reviewed by BHEL.

Prior to the start of manufacture, the manufacturer has to submit a manufacturing and testing plan to BHEL in which the quality assured process workflow, i.e. the sequence of process activities (manufacturing, testing and inspection steps) are specified in chronological order.

BHEL must be informed for any change in manufacturing and testing processes. Depending on the type and scope and thus the significance of any given change, BHEL will decide whether it is necessary to requalify the product and/or process.

Subcontracting of process steps to sub suppliers is only acceptable after written approval from BHEL.

1.1 The following additional tests have to be performed during qualification:

1.1.1 Tensile tests at elevated temperature

In accordance with EN 10002-5 a tensile test (in the same direction as at room temperature) has to be performed at 600°C.

Following properties must be achieved:

0.2% Proof Stress ≥ 365 Mpa, Tensile Strength ≥ 415 MPa, Elongation ($l_0=5d$) $\geq 18\%$ Reduction in area ≥ 65%

1.1.2 Microstructure Examination

The homogeneity of the microstructure has to be checked and documented by microsection. The microstructure must be uniform and free from porosity, excessive segregation and other inhomogeneities.

A Delta ferrite content > 5% is not acceptable.

The inclusion content has to be determined in accordance with ASTM E 45.

The grain size must be measured after all heat treatments have been performed in accordance with ASTM E 112 or ISO 643. Grain size 4 or finer must be achieved. A deviation from the average grain size of more than 2 grain sizes is not permissible.

2.0 Cross Referred Standards:

1. EN 10002-5

2. ASTM E112

3. ISO 643

4. ASTM E-45

(T. S. Gopal Krishnan) SDGM/MTE

HEEP, BHEL, Haridwar

Dy. Mgr/MTE HEEP, BHEL, Haridwar



HEEP: HARDWAR-249 403 (UTTARAKHAND)

Fax: 01334-226462, Phone: 284144 E-mail: pkbansal@bhelhwr.co.in;

ANNEXURE-IV

<u>Pre-Qualification Requirements for Round Bars of material grade X10CrMoVNb9-1, Specification HW10662 with addendum-</u>

Round bars of material grade X10CrMoVNb9-1 shall be used in Steam Turbine High Temperature application. Material shall be subjected to creep condition.

1. Vendor must have experience of manufacturing and supplying forged/rolled bars of material grade X10CrMoVNb9-1. In support of experience, vendor to submit details of past three supplies in the format given below:

Sl. No	Name of customer	Purchase order No	Size	Year of	Quantity
				supply	

Vendor to submit test certificates covering chemical, mechanical, heat treatment details, non-destructive test etc. of purchase order referred above in support of experience.

2. Vendor must have in-house manufacturing facilities like melting, secondary refining including vacuum degassing facility, rolling / forging, heat treatment etc. to manufacture round bars as per BHEL specification HW10662 with addendum.

Outsourcing of any of above operation is not acceptable.

Vendor shall submit following manufacturing details with relevant supporting documents:

- Steel melting facility, secondary refining including vacuum degassing facility
- Rolling facility Minimum and maximum dimension which can be rolled (diameter and length)
- Forging facility Press / Hammer details Minimum and maximum dimension which can be forged (diameter and length)
- Heat Treatment Furnace details, quenching media (air, oil, polymer) etc., Furnace calibration certificates for uniformity of temperature within the furnace at different zones
- **3.** Vendor to furnish in house testing facilities to carry out testing as per the requirements of BHEL specification HW10662. In case of outsourcing of any test, vendor to submit details of testing house. Testing shall be carried out at Government accredited labs only.
- **4.** Vendor to confirm that they will meet all the requirements of BHEL specification HW10662 with their addendum.
- 5. Creep Rupture data for material grade X10CrMoVNb9-1, if available, may be submitted.

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सामग्री सूची संख्या



संस्थान क्रय विनिर्देश (डीप - डिरद्वार)

PLANT PURCHASE SPECIFICATION

(HEEP - HARDWAR)

HW 10662

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Page 2 of 3

7.0 HEAT TREATMENT:

Quench Hardening: 1040 - 1090° C/ air, oil, polymer*

Tempering: 730°C - 780°C / air, furnace

*In case of polymer the cooling rate shall be comparable to cooling with oil.

If bars need to be straightened after heat treatment, stress relieving is mandatory after completion of entire straightening process. The stress relieving shall be carried out at 20 - 30°C below the tempering temperature with a subsequent slow cooling rate.

8.0 MECHANICAL PROPERTIES:

A hardness test shall be performed to verify the uniformity of the strength within a delivery lot (per melt and heat treatment batch). The test amount shall be 10% of the bars with a minimum of 10 bars. When the lot contains less than 10 bars, all bars shall be tested. The mechanical properties shall be tested on both the softest and hardest bars.

The specimens are to be taken in longitudinal direction (L) according to EN10083 -1.

For bars with diameter (d) respectively side lengths (a, b) > 100mm, the specimens shall be taken at a distance d/3 respectively a/3 and b/3 from respective surfaces. For this case, transverse specimens (T) are also acceptable.

Impact energy test shall be performed on bars having side length \geq 12mm or diameter \geq 16mm respectively.

The following Mechanical properties shall be achieved at room temperature

Diameter (d)	ameter (d) 0.2% Proof		Eloi	ngation	Impact	Impact Energy		
ide length (a¹) Strength		Strength	I _o =	I ₀ = 5d (%)		J		
(mm)	(N/mm²)	(N/mm²)	L	Т	L	Т	НВ30	
d ≤ 225	≥ 450	620 - 850	≥ 20	≥ 18	≥ 68 ²⁾	≥ 68 ²⁾	195 - 265	
a ≤ 180		•						
225 < d ≤ 600	≥ 430	600 - 830	≥ 20	≥ 18	≥ 68 ²⁾	≥ 68 ²⁾	185 - 255	
180 < a ≤ 400								

¹⁾ The values of the smallest side length (a) shall be reached.

9.0 OUTER AND INNER QUALITY / NON DESTRUCTIVE TESTING:

9.1 SURFACE CONDITION:

Cracks, other material separation or more severe linear inclusions lines are only acceptable when located in the dimensional tolerances area.

9.2 SCOPE OF INSPECTION:

Following NDE shall be performed in delivery condition:

- Verification inspection of all bars
- 100% U.T of all bars ≥ 30 mm thickness / diameter according to EN10308 type 1a 1c (table 1)

9.3 CRITERIA FOR REGISTRATION AND DECISION:

For ultrasonic inspection following quality classes according to EN10308 (table 2) shall be applied depending upon the diameter (d) or side length (a,b):

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सामग्री सूची संख्या INVENTORY NO. P - 4092

²⁾ Average of 3 Charpy V-notch specimen, longitudinal or transverse

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Addendum to Specification HW10662

(Material Grade: X10CrMoVNb9-1)

PRODUCT AND PROCESS QUALFICATION

1.0 General:

Product and process qualification procedures are required for first order. The product and process qualification is required for each of the manufacturer's fabrication facility.

Depending on the complexity of the product and / or process and experience from the first orders, requirement of additional process qualification in subsequent orders shall be reviewed by BHEL.

Prior to the start of manufacture, the manufacturer has to submit a manufacturing and testing plan to BHEL in which the quality assured process workflow, i.e. the sequence of process activities (manufacturing, testing and inspection steps) are specified in chronological order.

BHEL must be informed for any change in manufacturing and testing processes. Depending on the type and scope and thus the significance of any given change, BHEL will decide whether it is necessary to requalify the product and/or process.

Subcontracting of process steps to sub suppliers is only acceptable after written approval from BHEL.

1.1 The following additional tests have to be performed during qualification:

1.1.1 Tensile tests at elevated temperature

In accordance with EN 10002-5 a tensile test in longitudinal direction has to be performed at 600°C. Following properties must be achieved:

0.2% Proof Stress \geq 215 Mpa, Tensile Strength \geq 255 MPa, Elongation (I_0 =5d) \geq 22% Reduction in area \geq 66%

1.1.2 Microstructure Examination

The homogeneity of the microstructure has to be checked and documented by microsection. The microstructure must be uniform and free from porosity, excessive segregation and other inhomogeneities.

Delta ferrite content > 5% is not acceptable.

The inclusion content has to be determined in accordance with ASTM E 45.

The grain size must be measured after all heat treatments have been performed in accordance with ASTM E 112 or ISO 643. Grain size 4 or finer must be achieved. A deviation from the average grain size of more than 2 grain sizes is not permissible.

2.0 Cross Referred Standards:

1. EN 10002-5

2. ASTM E112

3. ISO 643

4. ASTM E-45

(T. S. Gopal Krishnan) SDGM/MTE HEEP, BHEL, Haridwar

Dy. Mgr/MTE HEEP, BHEL, Haridwar



HEEP: HARDWAR-249 403 (UTTARAKHAND)

Fax: 01334-226462, Phone: 284144 E-mail: pkbansal@bhelhwr.co.in;

ANNEXURE-V

Pre-Qualification requirements for round bars of material grade X18CrMoNbVN11-1+QT, Specification HW18814 with addendum-

Round bars of material grade X18CrMoNbVN11 - 1 shall be used in Steam Turbine High Temperature application. Material shall be subjected to creep condition.

- 1. Vendor must have experience of manufacturing and supplying forged/rolled bars of material grade X18CrMoNbVN11 1/ X19CrMoNbVN11-1. Material supplied in hardened and tempered condition only will be considered for experience.
- 2. Minimum experience requirement:

Vendor must meet any one of the following experience criteria in grade X18CrMoNbVN11-1/X19CrMoNbVN11 - 1 on the tender opening date. :

- Successfully executed at least three orders

Or

- Supplied minimum 5 Tons

Or

- Executed at least one order and having Creep Rupture data for 1000hrs **or** Creep Properties as per EN10269. Creep Rupture data/ Creep test results has to be submitted with offer.

In support of above vendor to submit experience details as applicable as per format below:

SI. No	Name of customer	Purchase order No	Size	Year of supply	Quantity

As documentary evidence, vendor to submit test certificates covering chemical, mechanical, heat treatment details. The correlation of test certificates with purchase order referred in support of experience has to be ensured by vendor.

3. Vendor must have in-house manufacturing facilities like melting, secondary refining including vacuum degassing, rolling / forging, heat treatment etc. to manufacture round bars as per BHEL specification HW18814 and enquiry size. **Vacuum degassed steel shall be used.**

Details of the manufacturing facilities like steel melting, secondary refining including vacuum degassing, rolling / forging, heat treatment etc. shall be provided with offer.

Outsourcing of any of above operation is not acceptable.

Vendor shall submit following manufacturing details with relevant supporting documents with offer:



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Fax: 01334-226462, Phone: 284144 E-mail: pkbansal@bhelhwr.co.in;

- Steel melting facility including secondary refining & vacuum degassing facility
- Rolling facility Minimum and maximum dimension which can be rolled (diameter and length)
- Forging facility Press / Hammer details Minimum and maximum dimension which can be forged (diameter and length)
- Heat Treatment Furnace details, quenching media (air, oil, polymer) etc.
- **4.** Vendor to furnish in house testing facilities to carry out testing as per the requirements of BHEL specification HW18814. In case of outsourcing of any test, vendor to agree to carry out testing at Government accredited labs only.
- **5.** Vendor to confirm that they will meet all the requirements of BHEL specification HW18814 with their addendum. Clause wise confirmation to be given with offer.

TLV 9367/13, Sep'08



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HW 18814

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Page 1 Of 4

PLANT PURCHASE SPECIFICATION

(HEEP - HARDWAR)

HEAT RESISTANT STEEL BARS GRADE X18CrMoNbVN11-1 +QT

(Steel Bars ≤ 160 mm diameter or side length for service temperature ≤ 580°C)

1.0 GENERAL:

This specification governs the quality of steel Bars of grade X18CrMoNbVN11-1.

2.0 APPLICATION:

The Bars shall be used for turbine components.

3.0 CONDITION OF DELIVERY:

The bars shall be supplied in the rolled or forged and quenched and tempered condition.

4.0 DIMENSION AND TOLERANCES:

The dimensions and tolerances shall be as per order or order drawing.

5.0 MANUFACTURE:

Degassed, e.g. vacuum degassed steel shall be used. The use of any other steel treatment shall be agreed upon with the purchaser in advance.

6.0 HEAT-TREATMENT:

Hardening: 1100-1130°C /air or oil or comparable polymer

Tempering: 670 – 720°C (min. 2 hours)

If bars need to be straightened after the heat treatment, a stress relieving treatment shall be performed after completion of the entire straightening process. Stress relieving is to be carried out at 20-50°C below the tempering temperature with a subsequent slow cooling rate.

Bundling of bars is allowed only, if the temperature is measured and documented on the outside and within the inner part of the bundle, in order to verify the temperatures. This shall be done during all heat treatment steps.

7.0 CHEMICAL COMPOSITION:

Dt. 07-11-12

Heat analysis in weight %

Element	С	Si	Mn	Р	S	Ni	Cr	Мо	V	Nb	N	Al _{total}	В
Min.	0.17		0.30			0.20	10.0	0.50	0.10	0.25	0.05		
Max.	0.23	0.50	0.80	0.025	0.015	0.50	11.0	0.80	0.30	0.55	0.08	0.015	0.002

1) A maximum Al-content of 0.010% shall be aimed.

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ISSUED: STANDARDS DIVISION DATE:25.04.2011

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PLANT PURCHASE SPECIFICATION

(HEEP - HARDWAR)

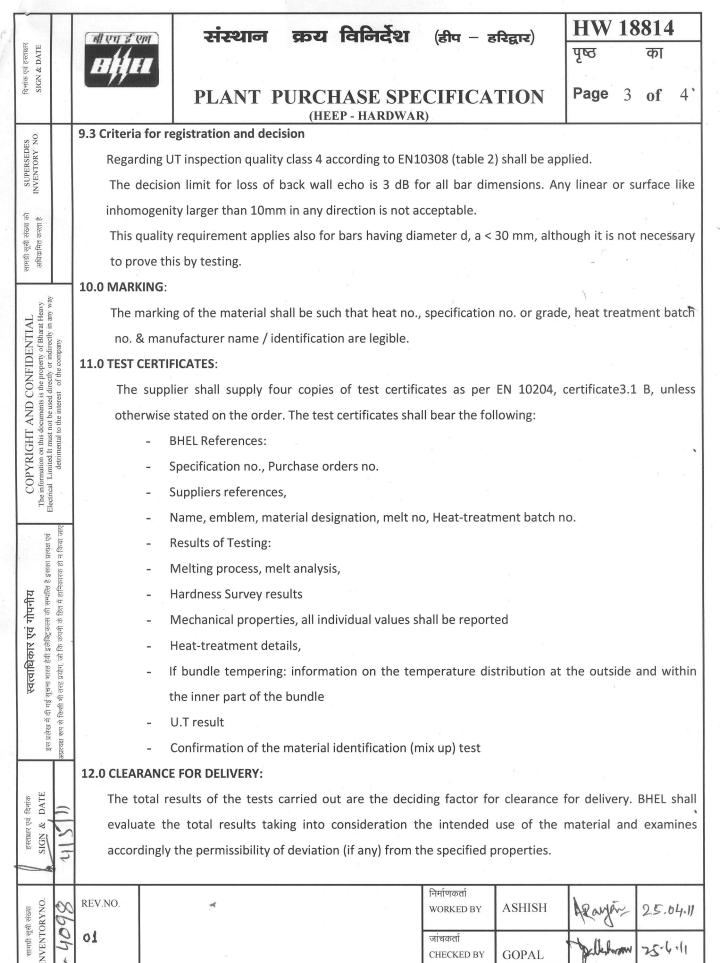
8.0 MECHANICAL PROPERTIES:

A hardness test shall be performed to verify the uniformity of the strength within a delivery lot (per melt and heat treatment batch). The test amount shall be 10% of the bars with a minimum of 10 bars. When the lot contains less than 10 bars all bars shall be tested for hardness. The mechanical properties shall be tested on hardest and softest bar.

The specimens are to be taken in longitudinal direction according to EN10269. For bars with diameter (d) or side lengths (a, b) > 100mm, the specimen shall be taken at a distance d/3 respectively a/3 and b/3 from the respective surfaces. In this case, transverse specimens are also allowed. The following properties shall be achieved at room temperature:

Diameter (d)/ side length (a) ¹	0.2% Proof Strength	Tensile Strength	Elongation $(l_0 = 5d)$	Reduction of area	Impact Energy ²	Hardness HB30
(mm)	(N/mm^2)	(N/mm^2)	(%)	(%)	(J)	
d,a ≤ 160	≥ 780	900-1050	≥ 10	≥ 40	≥ 20	270-320

ANI ocumen	the int	side	length (a) ¹	Strength	Strength	$(l_0 = 5d)$	of ar	ea	Energy ²	HB30			
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C(The infi Electrical		1) The values of the smallest side length (a) shall be reached. 2) Average of 6 Charmy V notes an eliminate maintain and the smallest side length (b) shall be reached.											
क्ष एवं	न किया जाए	2) Average of 6 Charpy V-notch specimens, minimum value = 16J											
सका प्रत्य	ह हो न वि	Impact energy test shall be performed on bars having side length ≥ 12 mm or diameter											
मित हैं है।	हानिकार		≥ 16 mm respectively.										
गोपनी सकी सम	के हिता में	9.0 OUTE	2.16 mm respectively. 0.0 OUTER AND INNER QUALITY/NON DESTRUCTIVE EXAMINATION:										
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	क्र		verificat	ion test of all ba	ars								
दिनांक DATE			Complet	te ultrasonic ins	pection (UT) o	f all bars ≥ 3	30 mm thick	ness/diam	neter accord	ling to EN			
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Addendum to Specification HW18814

(Material Grade: X18CrMoNbVN11-1+QT)

PRODUCT AND PROCESS QUALFICATION:

1.0 General:

Product and process qualification procedures are required for first order. The product and process qualification is required for each of the manufacturer's fabrication facility.

Depending on the complexity of the product and / or process and experience from the first orders, requirement of additional process qualification in subsequent orders shall be reviewed by BHEL.

Prior to the start of manufacture, the manufacturer has to submit a manufacturing and testing plan to BHEL in which the quality assured process workflow, i.e. the sequence of process activities (manufacturing, testing and inspection steps) are specified in chronological order.

BHEL must be informed for any change in manufacturing and testing processes. Depending on the type and scope and thus the significance of any given change, BHEL will decide whether it is necessary to requalify the product and/or process.

Subcontracting of process steps to sub suppliers is only acceptable after written approval from BHEL.

1.1 The following additional tests have to be performed during qualification:

1.1.1 Tensile tests at elevated temperature:

In accordance with EN 10002-5 a tensile test in longitudinal direction has to be performed at 550°C. Following properties must be achieved:

> 0.2% Proof Stress ≥ 475 Mpa, Tensile Strength ≥ 520 MPa, Elongation (I₀=5d) ≥ 16% Reduction in area ≥ 55%

In accordance with EN 10002-5 a tensile test in longitudinal direction has to be performed at 600°C. Following properties must be achieved:

> 0.2% Proof Stress ≥ 395 Mpa, Tensile Strength ≥ 425 MPa, Elongation ($l_0=5d$) ≥ 18% Reduction in area ≥ 60%

1.1.2 Microstructure Examination

The homogeneity of the microstructure has to be checked and documented by micro section. The microstructure must be uniform and free from porosity, excessive segregation and other in homogeneities.

Delta ferrite content > 5% is not acceptable.

The inclusion content has to be determined in accordance with ASTM E 45.

The grain size must be measured after all heat treatments have been performed in accordance with ASTM E 112 or ISO 643. Grain size 4 or finer must be achieved. A deviation from the average grain size of more than 2 grain sizes is not permissible.

2.0 Cross Referred Standards:

1. EN 10002-5

2. ASTM E112

3. ISO 643

4. ASTM E-45

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HEEP, BHEL, Haridwar



HEEP: HARDWAR-249 403 (UTTARAKHAND)

Fax: 01334-226462, Phone: 284144 E-mail: pkbansal@bhelhwr.co.in;

ANNEXURE-VI

Quality Requirements-

- ➤ Vendor to submit quality plan in the enclosed format, along with offers for BHEL approval. Refer annexure-V for quality plan format.
- Inspection by TPI (LRS/TUV/BV) for import and BHEL nominated agency 'TUV' for indigenous as per BHEL approved Quality Plan.



HEEP: HARDWAR-249 403 (UTTARAKHAND)

Fax: 01334-226462, Phone: 284144 E-mail: pkbansal@bhelhwr.co.in;

ANNEXURE-VII

(Quality Plan Format)

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