BHARAT HEAVY ELECTRICALS LIMITED
HEEP: HARDWAR-249 403 (UK)
Fax: 01334-226462, Phone: 01334-284144
E-mail: pkbansal@bhelhwr.co.in;

Tender no: PPX-F&HE/EOI/SL/15-16/03 **Due Date: 11/04/2016**

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-

Sl.	Description	Probable Sizes	Annual Requirement	Pre-Qualification Requirements
1	**Rectangular Flat Bars for Turbine Blade Grade NiCr20TiAl as per Spec. HW12784 Rev:01**	60x26 mm & 62x28 mm	**4.5 MT**	**Annexure- I**

Contact persons:

Mr. Yashpal Yadav
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Mr. P K Bansal
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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:

1. Details/ Documents in support of Specification/PQR (**Annexure-I up-loaded**)
2. Quality Requirements **(Annexure- II) & Quality Plan format (Annexure-III).**
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.

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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/15-16/03**

Due Date-11.04.2016, SUBMITTED BY (Name of company)"

- This notification shall be published on ***www.bhel.com***, ***www.tenders.gov.in*** and ***www.bhelhwr.co.in***
- Last date for downloading tender documents shall be 10.04.2016 till 1700 Hrs.(IST). Tenders will be received up to 13:45 Hrs. (IST) on 11.04.2016 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 ***www.bhelhwr.co.in***

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

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ANNEXURE-I

Expression of Interest: Requirements for rectangular flats for turbine of material grade NiCr20TiAl

Rectangular flat bars of material grade **NiCr20TiAl** is used for manufacturing of milled blades for Steam Turbines of rating 800MW.

1. Vendor to submit their manufacturing experience of flats/round bars in material grade **NiCr20TiAl.** Following details of past supplies to be submitted in support of experience:

- Un-priced purchase order,
- Name of customer, quantity
- Year of supply,
- Cross Section (width X thickness X length) / diameter & Weight

Test certificates of past supplies for above material grades shall be furnished for review.

2. Vendor must have in house forging / rolling, heat treatment and straightening facility to manufacture rectangular bars (e.g. cross section 64 X 29 X 1000-6000mm). Outsourcing of any of the above mentioned manufacturing operation is not allowed.

3. (a) Following are the mandatory melting and secondary refining facility required to meet BHEL specification:

- Vacuum Induction Melting Facility
- Vacuum Arc Re-melting **or** Electro Slag Re-melting facility for secondary refining

(b) Vendor has to inform in house melting and secondary refining facilities details as per 3 (a).

(c) In case in house melting and refining facility not available, vendor to inform their source for raw material with details including experience for material grade NiCr20TiAl. Details of melting and secondary refining facility as mentioned at 3(a) are to be submitted.

4. Following are the mandatory testing facility required to meet BHEL specification:
Chemical Composition; Mechanical Properties; Creep Rupture; Metallography & Microstructure; Non Destructive (Ultrasonic & Dye Penetrant), dimensional.

Vendor shall furnish in house testing facilities to carry out testing as per the requirements as mentioned above. In case of outsourcing of any test, vendor is to inform details of their source. Testing is to be carried out at Government accredited labs only.

Note: All documents submitted must be in English language only.

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ANNEXURE-II

Quality Requirements-

- Vendor to submit quality plan in the enclosed format, along with offers for BHEL approval. Refer annexure-III 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.

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ANNEXURE-III

(Quality Plan Format)

MANUFACTURER'S NAME AND ADDRESS		QUALITY PLAN				TO BE FILLED BY BHEL	TO BE FILLED BY BHEL
BHEL	VENDOR'S NAME	ITEM		QP NO.			
				REV			
		DRG. NO.	AS PER PO				
		SPEC.	AS PER PO				
		REV		Page 1 of 1			

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS		AGENCY			REMARKS
										M	B	N	
1	2	3	4	5	6	7	8	9	D	10			11

		LEGEND: ! RECORDS IDENTIFIED WITH 'TICK' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. M: MANUFACTURER / SUBCONTRACTOR B: BHEL / NOM. INSPECTION AGENCY N: CUSTOMER INDICATE 'P' PERFORM 'W' WITNESS AND 'V' VERIFICATION	FOR CUSTOMER USE	
MANUFACTURER/SUBCONTRACTOR		ALL 'W' INDICATED IN COLUMN 'N' SHALL BE 'CHP' OF CUSTOMER		APPROVED BY

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ANNEXURE-IV

SPECIFICATION

BAR MATERIAL FOR TURBINE BLADES
NiCr20TiAl

1.0 GENERAL:

The specification governs the quality of bars, rolled or forged for milled turbine blades in grade NiCr20TiAl (Material no. 2.4952).

2.0 APPLICATION:

Bars are required for blades used for turbine and compressor.

3.0 CONDITION OF DELIVERY:

Bars shall be supplied in hot rolled or forged and milled, heat treated condition. The bars should be straight and free from waviness.

4.0 DIMENSION AND TOLERANCES:

The dimension shall be as per order and tolerance shall be as per EN 10269.

5.0 GENERAL REQUIREMENTS:

The manufacturer must demonstrate that he has implemented a quality system that meets the requirements stipulated in EN ISO 9000. The stipulations of the present purchasing specification apply for all the manufacturers' production shops, as well as their sub-suppliers. If the material is delivered for the first time, a process qualification according to clause 12.0 "Process qualification" must be performed. Separate process qualification is required for each facility of the manufacturer.

Before starting the production, the manufacturer shall provide BHEL a manufacturing and inspection sequence plan (MIP) for information after the successful process qualification. The MIP establishes the quality assured sequence of operations. Information on internal and external specifications is also given in the MIP. BHEL may view the manufacturer's internal MIP if he wishes to do so. The manufacturer has to inform BHEL about every change in the manufacturing or subcontractor process or inspection process. BHEL decides if a new qualification process is necessary. Subcontracting of any manufacturing steps is permissible only with BHEL written approval.

Also manufacturer shall submit test instructions for non-destructive and destructive testing which are performed as part of his own quality assurance measures. The test instructions shall include precise information on the tests, illustrated by sketches if necessary. General hints on other specification are not sufficient.

6.0 MANUFACTURING:

6.1 Melting:

The alloy shall be made by vacuum induction melting / electro-slag re-melting (VIM / ESR) or by vacuum induction melting / vacuum arc re-melting (VIM / VAR) process.

6.2 Ingot Discard:

Sufficient discard shall be made from each ingot to ensure freedom from piping, injurious segregation and other imperfections.

6.3 Forging:

The ingot conversion shall be conducted in such a manner as to produce substantially uniform structure throughout the forged bar. The manufacturing process of the bars can be rolling or forging.

6.4 Heat Treatment:

The forging shall be heat treated to get desired mechanical properties as per clause 7.2.1.

Solution treatment : 8 h at 1050 - 1080°C, Air cooling
Stabilizing: 24 h at 845°C (± 10°C), Air cooling
Precipitation hardening: 16 h at 700°C (± 10°C), Air cooling

The forming process and the solution treatment shall be chosen in such a way that over the whole cross section a homogeneous microstructure with a grain size of 3 to 6 according to ASTM E 122 will be reached. (See also 7.2.2)

7.0 PROPERTIES AND TESTS:

7.1 Chemical Composition:

Heat analysis in weight % (according to EN 10269 table 1) shall be as follows:

C	0.04 – 0.10	**Si**	≤ 0.30	**Mn**	≤ 1.00
P	≤ 0.010	**S**	≤ 0.010	**Cr**	18.0 – 21.0
Ti	1.80 – 2.70	**Ni**	Rest	**Co**	≤ 1.00
Fe	≤ 1.50	**Al**	1.0 – 1.8	**B**	≤ 0.008
Cu	≤ 0.20	**Ti + Al**	≥ 3.50		

7.2 Position of test pieces:

Specimen extraction is performed as per attachment 1.The specimens are to be taken in longitudinal direction. The positions of the specimens given in the attachment are meant to serve only as an example. Details concerning the locations of specimens, both at bar material and at bar material made of semi finished parts, are to be agreed upon by BHEL and must be given in the MIP, including a sketch of the specimen location.

7.2.1 Mechanical Properties:

It shall be ensured that the required mechanical properties are achieved throughout the entire bar cross section. The uniformity of the strength of the bars of a given delivery (per melt and heat treatment batch = **test unit**) shall be verified by a hardness test per EN ISO 6506-1. HBW 10/3000 or HBW 5/750 shall be used. Any other hardness test method shall be subject to prior agreement with BHEL. The hardness test shall be performed on 10% of each test unit, however on at least 10 bars, or if the test unit comprises less than 10 bars on every bar.

Mechanical properties shall be determined on the hardest and softest bar indentified by this test. Tensile testing shall be conducted according to EN 10002 resp. ASTM E8M (preferred round tension test specimen with L_0 = 50 mm and d_0 = 10 mm) or ASTM E8 (Standard specimen per fig. 8). Impact testing shall be performed with standard-test pieces with V-notch according to EN 10045. The following properties must be demonstrated at room temperature by the following tests:

0.2% proof Strength N/mm²	Tensile Strength N/mm²	Elongation (Lo=5d) (%)	Reduction in area (%)	Impact Energy (J)	Hardness HBW
≥ 600	1000 - 1300	≥ 17	≥ 17	≥ 20 [1)]	≥ 260

[1)] Average of 3 Charpy V-notch specimens.

In addition a short time creep rupture test according to DIN EN 10291 or other agreed standard has to be carried out, using the following parameters:

Test temperature: T = 750°C

Proof stress σ_o = 310 MPa

The following values have to be reached:

Creep rupture time $t_m \geq 100$ h

Elongation $A_u \geq 4$ %

Reduction of area $Z_u \geq 4$ %

If no creep rupture is occurred after 100 h, the proof stress can be increased for further 30 MPa after every 24 h, until the creep rupture occurred.

7.2.2 Grain Size Check:

The metallographic examination has to be carried out at the beginning and at the end of the hardest and softest bar and in each case in the corner and in the center of the cross section. A substantially homogeneous microstructure with a grain size 3 -6 according to ASTM E 112 has to be achieved in the cross section. A grain size DUPLEX ALA 3 according to ASTM E 930 is acceptable provided, that a grain size of 1 is not exceeded. A deviating microstructure has to be documented according to ASTM E 1181 and to be approved by the BHEL. Reduction of amount of testing can be agreed with the BHEL. For this purpose the manufacturer has to provide adequate results.

7.2.3 Outer and Inner Quality / NDE:

7.2.3.1 Scope of Inspection:

Following NDE shall be performed in delivery condition:

- Visual inspection of all bars
- verification test of all bars
- Complete ultrasonic inspection (UT) of all bars according to EN 10308 type 1a (table 1) or other agreed standard (e.g. AMS STD 2154) has to be carried out. The calibration block and the reference block have to be manufactured out of materials with similar acoustic properties and similar surface conditions. The test has to be performed only by employees with level 2 certified according to EN 473 or SNT-TC-1A.
- 100% PT of all bars without the face areas according to EN 571-1. It is permitted to carry out a UT with a double transducer probe in the near surface area instead of PT.

7.2.3.2 Criteria for registration and decision:

a) Regarding UT inspection quality class 3 according to EN10308 (table 3) shall be applied.

The decision limit for loss of back wall echo is 3 dB for all bar dimensions. The recording level is defined with > 1mm d_{eq}. All indication $d_{eq} \leq$ 1mm are acceptable.

b) PT: Indications ≥ 5 mm are unacceptable. Indications-free grinding excavations with depths ≤ 1mm are acceptable.

8.0 MARKING:

Blades are to be marked as per attachment 2 and specification AA0400310.

9.0 DOCUMENTATION:

The supplier shall supply four copies of the test certificate 3.1 as per EN10204 unless and otherwise stated on the order. The test certificate shall bear the following information:

- Order no.
- Specification no. / Material Designation
- Heat Number, heat analysis and melting method
- Complete information of all heat treatments performed
- Results of mechanical testing, including a list with all measured hardness
- Photos of microstructure with results of the grain size determination & creep test report
- Results of non destructive testing
- Confirmation of the material identification check
- Confirmation of the dimensional and visual check

10.0 CLEARANCE FOR DELIVERY:

The total results of the tests / checks carried out are the deciding factor for clearance for delivery, and hence shall be intimated to BHEL in advance. In case of nonconformance, BHEL evaluates the total results taking into consideration intended use of the material and examines accordingly the acceptability of deviation (if any). No material shall be delivered, if deviated, without acceptance by BHEL. The clearance, however, does not relieve the supplier of his responsibility for the hidden / unreported non-permissible defects which are found later.

11.0 DEVIATIONS:

Deviations from this Purchase Specification, which arise during manufacturing, may be submitted to BHEL in writing, giving full details of the deviation. Acceptance of concession request will be at the sole discretion of BHEL.

12.0 PROCESS QUALIFICATION:

A qualification review, performed jointly by the BHEL and supplier, is required before starting production for the first order.

This initial process qualification is required for each fabrication facility of the manufacturer. The fabrication and inspection parameters stipulated during this phase form the basis of the manufacturing and inspection sequence plan (MIP) which the supplier prepares at his own responsibility. Manufacturing is commenced after the check of conformity by the purchaser and depends on the results of the qualification review, If necessary; the manufacturing parameters are to be further optimized.

Unless otherwise stipulated by the purchaser, the process qualification shall also be required for the first three orders in addition. If desired, a process qualification can also be called for as verification of the reliability of fabrication.

In addition to the scope of testing and examination given in section 7.0 the following tests shall performed (also on the hardest and softest bar):

- Mechanical tests also in the edge position of the cross section
- Photos of the microstructure with results of the grain size determination in longitudinal direction

All results shall be given in a detailed report to BHEL.

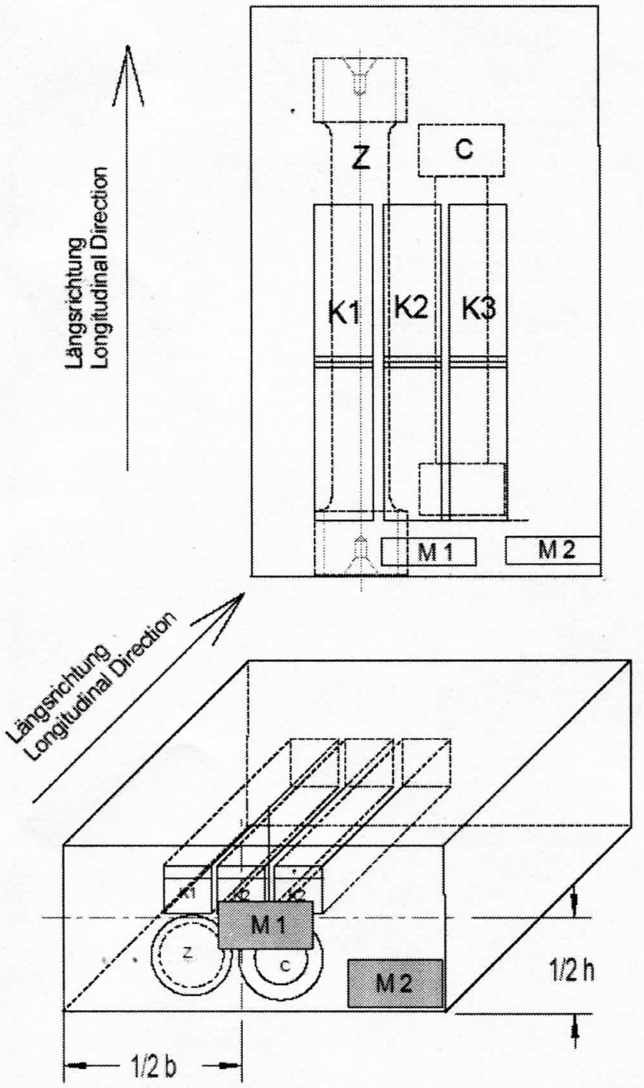
13.0 CROSS REFERRED STANDARDS:

EN ISO 9000, ASTM E122, EN 10269, EN ISO 6506-1, EN 10002, ASTM E8M, EN 10045, DIN EN 10291, ASTM E930, ASTM E1181, EN 10308, EN 473, EN 571-1, EN10204

Attachment 1

STANDARD TESTING

Make sure that all specimens are located in the middle of material.



Z: Tensile Specimen

C: Creep test specimen

K1- K3: Charpy impact specimen

M1: Micro specimen (Cross Section)

M2: Micro specimen (Cross Section)

हस्ताक्षर एवं दिनांक SIGN & DATE	REV 01	निर्माणकर्ता WORKED BY	Ashish Ranjan	ARanjan	20.09.11
सामग्री सूची संख्या INVENTORY NO. P-4101		जांचकर्ता CHECKED BY	Gopal Krishnan	[signature]	20.9.11

Attachment 2

Marking for Steel for Steam Turbine Blades

Following details are to be marked on the blades:

Heat No.

Manufacturer Name / Reference

Purchase order No.

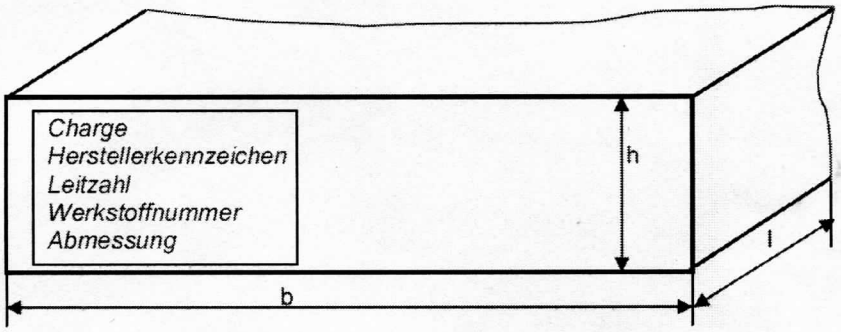
Material No.

Dimensions

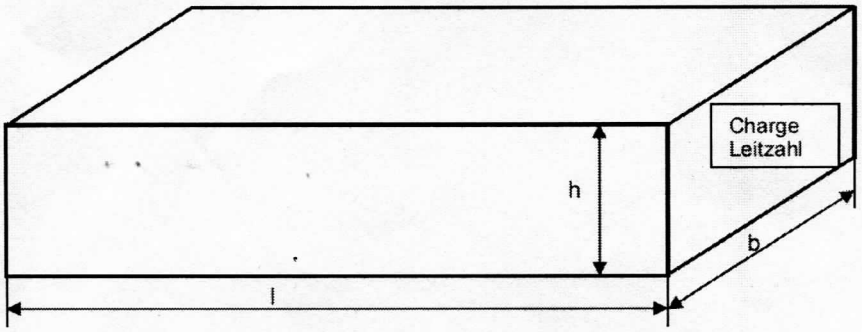
The identification marking shall be applied as follows:

In Case of bars:

Marking of each individual bar at the front with details mentioned above.



In case of cut pieces (cut bars, rhomboids): with stamped figures, ink stamp or stickers/labels



h = Dicke, thickness
l = Länge, length
b = Breite, width