



BHARAT HEAVY ELECTRICALS LIMITED
HEEP HARIDWAR INDIA-PIN 249403
FAX NO: 0091 1334 226462
PHONE NO: 0091 1334 284142

EOI: TURBINE/EOI/16-17/01

Date of issue: 21/07/2016

M/S.....

Sub: BHEL-HEEP/EOI (C&F)/2016

Dear Sir,

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

We are looking for reputed Vendors having capability to supply as per Specifications/Documents provided as per Annexure-4.

Sealed tenders with the Tender No. and opening date clearly super scribed on the cover are invited from the manufacturers for the supply of the following items:-

Tender No	Pair/SI no	Description of Item	Last date to download documents from BHEL websites	Opening date	
TURBINE/EOI/16-17/01	A	1	W97375523010 Moving Blade 1L	12.08.16	13.08.16
		2	W97375523037 Locking Blade 1L		
	B	3	W97375523053 Moving Blade 1R		
		4	W97375523070 Locking Blade 1R		
	C	5	W97375523029 Moving Blade 2L		
		6	W97375523045 Locking Blade 2L		
	D	7	W97375523061 Moving Blade 2R		
		8	W97375523088 Locking Blade 2R		

The details of items are given in **Annexure-1**.

The tender documents can be downloaded from our web site www.bhel.com or www.bhelhwr.co.in or www.tenders.gov.in, after downloading the tender documents from web site, while submitting the tender as detailed in "Instruction to Bidders"

The date for opening of tender shall be 13.08.2016. Tenders will be received up to 1.45 P.M. on **13.08.2016** and opened on the same day at 2.00 P.M. in the Tender Room. **Please note that tender received after due date & time (1.45 PM on 13.08.2016) will not be REPEAT will not be opened.** BHEL will not be responsible for any type of postal / courier delay.

Specifications & Drawing of the above items are available on our above mentioned website. Other cross referred documents can either be physically collected from BHEL, Haridwar or can be obtained by email sachin_m@bhelhwr.co.in, r_kumar@bhelhwr.co.in or jainv@bhelhwr.co.in. Amendments/Corrigendum, if any, will be hosted on our web site only. Other terms and conditions will be as per tender documents.

The offer of the vendors who are De-Listed/ Under Hold by BHEL, shall not be considered till the period of their De-list/ Hold. The offers of the bidders who are on the banned list and

also the offer of the bidders, who engage the services of the banned firm, shall be rejected. The list of banned firms is available on BHEL website www.bhel.com

Documents submitted with the offer/bid by the bidder (original registered supplier) shall be *signed and stamped in each page* by authorized representative of the bidder. Documents *not signed and stamped in each page* by the authorized signatory of the bidder, may not be accepted and considered for evaluation of the bid.

Please submit your Technical offer only for the above requirement subject to our terms and conditions. No price bid is to be submitted along with this offer.

The authorized representative should bring authority letter from their parent company (Manufacturer) for the specific tender no. attending the bid opening.

KINDLY READ "INSTRUCTIONS TO BIDDERS." QUOTATION NOT IN ACCORDANCE WITH THE INSTRUCTIONS ARE LIABLE TO BE DISQUALIFIED AND IGNORED.

INSTRUCTIONS TO BIDDER

Eligibility and Pre- Qualification criteria are enclosed. The offers are invited from suppliers having technical capability as per enclosed tender documents and PQR. The offers received will be technically evaluated by BHEL and short listed vendors will be asked to submit their detailed Techno-Commercial offers through formal NIT/Enquiry, for our future requirements.

Only Technical BID along with documents in support of PQR are to be submitted at this stage. No price bid is to be submitted along with this offer.

The Technical Bid submitted by you should comprise of the following documents:

1. **Annexure-2** for Pre-qualification requirement. Point wise reply to all the points mentioned in Pre- Qualifying Requirement specified in the tender. Relevant documents as requested in Pre- Qualifying Requirement must be attached.
2. Vendor Registration Form (SRF)
(Kindly follow the link and follow instructions: <http://supplier.bhel.in/>)
The SRF duly filled up will be assessed for manufacturing capability quality systems being followed, organizational soundness and financial worthiness.
3. Non-disclosure agreement as per **Annexure 3**. The agreement shall be duly stamped & signed.

The following shall be super scribed on the envelope:

1. TENDER NO AND ITEMS DESCRIPTION
2. DUE DATE FOR OPENING.
3. VENDOR'S FULL NAME & ADDRESS


Envelopes shall be addressed to:

To,
Head of Materials Management,
Heavy Electrical Equipment Plant,
BHEL,
Hardwar- 249403

Envelopes not marked as above are liable to be ignored and will not be opened.

1. The Quotation should be from the Principal / Original Manufacturer, failing which the quotation is likely to be ignored. However, if OEM / Principal insist on engaging the services of an agent, such agent shall not be allowed to represent more than one manufacturer / supplier in the same tender. Moreover, either the agent could bid on behalf of the manufacturer / supplier or the manufacturer / supplier could bid directly but not both. In case bids are received from both, the manufacturer / supplier and the agent, bid received from the agent shall be ignored. In Case the quotation is submitted through agent, the quotation must accompany original authorization letter from the Principal / Original Manufacturer.
2. The bidders will have to submit signed & stamped offer on each page / bid in original directly to BHEL. **Unsigned bids is liable to be ignored.**
3. The suppliers or their authorized person may be allowed to attend the tender opening, if duly authorized by their principals, through a specific letter for a particular enquiry or for specific price bid opening on that particular day. General authorization letter is not acceptable
4. Any corrections / amendments shall be properly & fully authenticated with signature. No overwriting is acceptable.

Tender No	Pair/SI no	Description of Item	Drawing No	
TURBINE/EOI/16-17/01	A	1	W97375523010 Moving Blade 1L	01020258001 01 REV: 00
		2	W97375523037 Locking Blade 1L	01020258001 03 REV: 00
	B	3	W97375523053 Moving Blade 1R	01020258017 02 REV: 00
		4	W97375523070 Locking Blade 1R	01020258017 04 REV: 00
	C	5	W97375523029 Moving Blade 2L	01020258002 01 REV: 00
		6	W97375523045 Locking Blade 2L	01020258002 03 REV: 00
	D	7	W97375523061 Moving Blade 2R	01020258018 02 REV: 00
		8	W97375523088 Locking Blade 2R	01020258018 04 REV: 00

 HARIDWAR	Mandatory Technical Pre-Qualification Requirements (PQR) for Finish Machined Nimonic Blades	Rev. No. 00
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"Finish Machined Nimonic Material Blades" for Super-critical IP Turbine in completely finish machined condition is to be procured as per details and technical requirements in given below Material codes and drawing no. as mentioned in Table-1:

Table-1


Pair/Sl.No.	Material Code	ITEM DESCRIPTION	Drg. No.	
A	1	W97375523010	MOVING ST 1L	01020258001 01 REV:00
	2	W97375523037	LOCKING ST 1L	01020258001 03 REV:00
B	3	W97375523053	MOVING ST 1R	01020258017 02 REV:00
	4	W97375523070	LOCKING ST 1R	01020258017 04 REV:00
C	5	W97375523029	MOVING ST 2L	01020258002 01 REV:00
	6	W97375523045	LOCKING ST 2L	01020258002 03 REV:00
D	7	W97375523061	MOVING ST 2R	01020258018 02 REV:00
	8	W97375523088	LOCKING ST 2R	01020258018 04 REV:00

Vendor must fulfill the following Pre-Qualification Requirements (PQR). Offers of vendors not meeting these requirements will not be considered.

- Vendor must have experience of manufacturing and supplying at least one set (quantity equivalent to as mentioned in the tender) of similar size (length & width) machined twisted profile turbine blades of Nimonic-80A material on CNC 5-axis machine. In support of past experience, vendor to submit information in the format below about the customer(s)/Company where such blades have been supplied:

Sl. No	Name of customer and name of the contact person	Detailed Address	Phone no. and email address of contact person	Purchase order No	Year of supply	Quantity

- As documentary evidence, vendor to submit at least one test certificate(s) for material of blade supplied, dispatch document(s) and un-priced PO copies from the above supplies.
- Vendor must have in house machining facility to manufacture blades as per the requirement of enquired drawings. Blade should be machined in single setting on CNC 5-axis machine except the end cutting operation done at Root and Shroud. Details of machining facilities to be submitted with offer.
 - Vendor should have in house checking facilities to check finish blades in 3D CMM as per the requirement of enquired drawings.

 HARIDWAR	Mandatory Technical Pre-Qualification Requirements (PQR) for Finish Machined Nimonic Blades	Rev. No. 00 Page 2 of 2
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4. Blade material as per BHEL specification HW12784 must be procured from BHEL approved source M/s Walzwerke Einsal GMBH, Germany only.
5. Vendor to submit detailed Manufacturing Plan and Quality Plan along with the offer for BHEL review and approval.
6. Moving blades and their corresponding Locking blades are to be procured from the same source. Vendor to offer Moving blades and their corresponding Locking blades in pair A, B, C & D (refer Table1). Offer for a single material code without their corresponding paired material code will not be considered.
7. All the dimensions & surface finish of the final finished product shall be as per drawing. Vendor to also ensure that there should not be any visual defects like waviness, line mark, steps, chatter marks etc. on blades.
8. All the special requirements given in the drawing shall be taken care by the supplier.
9. Vendor to confirm that, in case of placement of PO, following documents shall be furnished with despatch documents-
 - a. Raw Material Test certificates.
 - b. Complete Inspection report with all drawing dimensions including Blade profile at all the sections as per the Table given in the drawing.
10. On receipt of order, vendor who has not supplied such blades in past to BHEL, Haridwar require to manufacture and provide two Moving blades of any material code along with 3D CMM dimensional report (consists of all the dimensions mentioned in the drawing and profile at section mentioned in the table). Bulk production will start only after written acceptance of sample blades from BHEL.
11. BHEL will not provide 3D model of the blades to the vendor.
12. All tools and technological items required for the manufacturing of said item are to be arranged by the vendor.

Important Note:

1. All the documents and correspondences are to be in English language only.
2. BHEL reserves the right to verify information submitted by vendor. In case the information is found to be false / incorrect, the offer shall be rejected.

NON-DISCLOSURE AND PROPRIETARY INFORMATION AGREEMENT

BETWEEN

_____ (**Name of the Vendor**),, having its registered offices in _____ (**Address of Vendor**), registered under the no. _____ of the Companies' register of _____ (**Name of Place and Country**), capital stock of _____ (**Value**), with a place of business in _____ (**Name of Place and Country**) (hereinafter referred to as "**_____ (Name of Vendor)**");

AND

Bharat Heavy Electricals Ltd a company incorporated under the Indian Companies Act 1956 having its registered offices at BHEL House, Siri Fort, New Delhi -110 049 and having one of its works at Heavy Electrical Equipment Plant, Ranipur, Haridwar-249403 (Uttarakhand), India registered under the No. 4281 of 1964-65 of the companies register of Delhi, capital stock of Rs 4895.2 million with a place of registered office in New Delhi (hereinafter referred to as "BHEL") hereinafter also referred to individually as "the Party" or collectively as "the Parties".

BACKGROUND

This Agreement sets forth the rights and obligations of the Parties with respect to the use, handling, protection and safeguarding of Proprietary Information that is disclosed by and between the Parties.

WHEREAS

A) the Parties wish to pursue exploratory discussions concerning a possible collaboration between them in relation to the Program defined in Exhibit 1;

B) during the ensuing discussions and negotiations it may occur that either Party discloses to the other technical, financial or business information of a proprietary or confidential nature, which the Parties intend to protect against, making it available, by any means to any third person, and other unauthorized use and/or further disclosure by the recipient, in accordance with the terms and conditions set forth herein;

NOW, THEREFORE, the Parties have agreed as follows:

1. The term “Proprietary Information” shall mean any information or data of whatsoever kind of a confidential or proprietary nature, including but not limited to, commercial information, know how and technical information in the form of designs, drawings, concepts, requirements, specifications, software, interfaces, components, processes, or the like, that have been or will be disclosed by either Party to the other pursuant to this Agreement, either in writing, orally or other form, which is designated as “Proprietary” or “Confidential” by the disclosing Party by means of formal declaration or an appropriate stamp, legend or any other written or orally notice .
2. Proprietary Information may be conveyed, without limitation, through any written or printed documents, samples, models, electronic form on disk, tape, other storage media or any other means of disclosing such Proprietary Information that either Party may elect to use during the life of this Agreement, but if an originating Party originally discloses information orally or visually, the receiving Party will protect such information as Proprietary Information to the extent that the originating Party :
 - identifies the Information as Proprietary at the time of original disclosure,
 - summarizes the Proprietary Information in writing .

Information stored in electronic form on disk, tape, other storage media will be adequately marked if a proprietary legend displays when the information originally runs on a computer system and when the information is printed from its data file.

Proprietary Information also includes any information which can be obtained by examination, testing or analysis of any hardware or material substance or any component part of such hardware or material substance provided by the Disclosing Party even though the requirements in Clause 1 for marking and designation have not been fulfilled.

3. Each Party, to the extent of its rights to do so, shall disclose to the other only the Proprietary Information which the disclosing Party deems appropriate to fulfil the objectives of this Agreement. The Parties hereby represent that the disclosure of Proprietary Information by and between themselves shall be made in compliance with, and subject to the laws and regulations of the Disclosing Party's country.

4. The receiving Party hereby agrees and covenants that, from the effective date of this Agreement until the expiry date as per article 11 and the following period as per article 12, the Proprietary Information that either Party receives from the other shall:
 - a) be protected and kept in strict confidence by the receiving Party which must use the same degree of care it uses to protect its own confidential information and in no case less than a reasonable care;

 - b) be only disclosed to and used by those persons within the receiving Party's organization or that of its parent or controlled companies who have a need to know and solely for the purposes specified in this Agreement, and be treated by such persons or entities with the same degree of care and subject to the same restrictions;

 - c) to procure that each third party to whom Proprietary Information is disclosed under this Agreement is made aware of the provisions of this Agreement prior to such disclosure to it and that each such third party is

bound by obligations of confidentiality which are no less onerous than those contained in this Agreement;

- d) neither be disclosed nor caused to be disclosed or made available, either directly or indirectly, to any third Party or persons other than those mentioned in subparagraph b) above or other persons upon which both of the contractual Parties shall agree in an amendment to this Agreement;
- e) not to copy, reproduce or reduce to writing any part of such Proprietary Information except as may be reasonably necessary for the purpose referred to in the Recitals of this Agreement

PROVIDED THAT the Receiving Party shall be entitled to make any disclosure required by court order or government or regulatory requirement of the Disclosing Party's Proprietary Information subject to notifying the Disclosing Party as soon as possible of such requirement

- 5. Any Proprietary Information and copies thereof disclosed by either Party to the other shall remain the property of the disclosing Party and shall be immediately returned or destroyed by the receiving Party upon request.
- 6. The receiving Party shall have no obligations or restrictions with respect to any Proprietary Information for which the receiving Party can prove that:
 - a) is in or which comes into the public domain otherwise than as a result of a breach of this Agreement by any person to whom a disclosure of Proprietary Information is made as permitted under this Agreement or of any other duty of confidentiality relating to the Proprietary Information of which the Receiving Party has knowledge; or
 - b) it has been in its possession without restriction at the time of the disclosure, as evidenced by written documentation in its files; or
 - c) it has been lawfully received from a third Party without breach of this Agreement; or

- d) it has been or is published without violation of this Agreement; or
 - e) it has been independently developed in good faith by employees of the receiving Party who did not have access to the Proprietary Information; or
 - f) it has not been properly declared, designated or confirmed as Proprietary or Confidential; or
 - g) the protection period has expired according to articles 11 and 12 of this Agreement.
7. With respect to any exchange of Proprietary Information which may occur as a result of this Agreement, it is expressly understood and agreed that the persons listed in Exhibit 2 shall, on behalf of the respective Parties, be the exclusive individuals authorized to receive from and transmit to the other Party Proprietary Information under this Agreement. Each Party may replace at any time its respective authorized individuals identified in such Exhibit 2, within its own organization. Any such new designation by a Party shall be made by written notice to the other at the address indicated in such Exhibit 2.
8. Any Proprietary Information which is identified as “Classified Information”, or whose export is subject to an export license, shall be identified as such by the disclosing Party at the time of disclosure and the disclosure, protection, use and handling thereof, shall remain subject to the security procedures and restrictions imposed by the disclosing Party's Government.
9. The disclosure of Proprietary Information under this Agreement by either Party to the other shall not be construed as granting to the receiving Party any right, whether express or implied by licence or otherwise, on the matters, inventions or discoveries to which such information pertains, or as granting any trademark, patents, copyrights, trade secret right or other form of intellectual property right.

10. Nothing in this Agreement may be construed as an obligation of either Party to disclose any Proprietary Information to the other, or to enter into any subsequent contractual relationship with such other Party.
11. This Agreement covers the exchange of Proprietary Information which may be made by either Party to the other until ten years from signing of the agreement or any extension thereto which may be agreed upon by the Parties in writing. Proprietary information relevant to the Program detailed in Exhibit 1, already made available to the other contractual Party before the effective date, shall also be protected under this Agreement.

It is understood by the parties that, prior to disclosure, the Disclosing Party shall have obtained any government authorisation needed for the export of the Proprietary Information

12. The expiry of the period contemplated in Article 11 of this Agreement shall not relieve the receiving Party from complying with the obligations imposed by Article 4 here above with respect to the use and protection of the Proprietary Information, received prior the date of such expiry, for a period of ten (10) years after such expiry.
13. The Parties are independent contractors. Each will bear all costs and expenses in connection with this Agreement. This Agreement is intended to facilitate only the exchange of Proprietary Information and is not intended to be, and shall not be construed to create a teaming agreement, joint venture, association, partnership, or other business organisation or agency arrangement and no Party shall have the authority to bind the other without the other Party's separate prior written agreement .
14. This Agreement shall be governed by and shall be interpreted in accordance with the substantive Indian laws. Irrespective of the foregoing each Party shall remain

bound by the provisions of its own national laws and regulations with respect to the transfer or use of Classified Information or information whose export is subject to an export license.

15. All disputes among the Parties, in connection with or arising out of the existence, validity, construction, performance and termination of this Agreement (or any terms thereof), which the Parties are unable to resolve among themselves, shall be finally settled by an Arbitration. The Arbitration shall be held in Haridwar (India), in English language, in accordance with the rules laid down in the arbitration and reconciliation act of India.
16. The foregoing constitutes the entire Agreement among the Parties with respect to the subject matter hereof and supersedes and cancels all prior representations, negotiations, commitments, undertakings, communications, either oral or written, acceptances, understandings and agreements among the Parties with respect to or in connection with any of the matters to which such Agreement applies or refers.
17. Notices to _____(**Name of Vendor**) shall be made at the following address:

(Complete Address of Vendor)

Attention: Mr. _____(**Name of the Authorised Person of Vendor**)

Notices to BHEL shall be made at the following address:

BHARAT HEAVY ELECTRICALS LIMITED,
HEAVY ELECTRICAL EQUIPMENT PLANT,
Ranipur, Haridwar-249403 (Uttarakhand), India

Attention: _____(**Name of the PPX Incharge**)

18. The effective date of this Agreement shall be the date of the last signature appearing herein.

IN WITNESS WHEREOF, each of the Parties has caused this Agreement, to be executed by its duly authorized officer.

Date :

Signed for and on behalf of

Signed for and on behalf of

(Name of Vendor)

BHEL

By:

By:

Title:

Title:

Signature:

Signature:

EXHIBIT 1

to the

NON-DISCLOSURE AGREEMENT

between

_____ **(Name of Vendor)**

and

BHARAT HEAVY ELECTRICALS LIMITED

dated:

The Non Disclosure Agreement covers the exchange of Proprietary Information which may occur during the discussions and negotiations in view of a possible cooperation between the Parties in the following programs:

-Description of Material or Services for which the order is placed

_____ **(Name of Vendor)** list of products that require an exchange of Proprietary Information which may be occur during the discussions and negotiations in view of a possible cooperation for the above programs :

EXHIBIT 2

to the

NON-DISCLOSURE AGREEMENT

between

_____ **(Name of Vendor)**

and

Bharat Heavy Electricals Ltd.

dated:

Personnel of the Parties authorized to receive and/or transmit Proprietary Information under this Agreement:

For **(Name of Vendor)**

(Name of Person)

Tel.

Fax

Address.

Tel.

Fax

Address.

For Bharat Heavy Electricals Ltd.

Mr.

Tel. 01334

Fax 01334

Address. Main Administration Building

BHEL, HEEP, Haridwar

India

Mr.

Tel. 01334

Fax 01334

Address. Main Administration Building

BHEL, HEEP, Haridwar

India

दिनांक एवं हस्ताक्षर
& DATE



संस्थान क्रय विनिर्देश (हीप - हरिद्वार)

HW 12784

पृष्ठ का
Page 1 of 7

SUPERSEDES
INVENTORY NO

TLV 9520 10 07/2008

**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.

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स्वत्वाधिकार एवं गोपनीय
इस दस्तावेज में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की संपत्ति है इसका प्रयोक्ता एवं अपरयोक्ता रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए।

हस्ताक्षर एवं दिनांक
SIGN & DATE

सामग्री सूची संख्या INVENTORY NO

TSX	B. CHOUDHARY	<i>B. Choudhary</i>	नाम NAME	दिनांक एवं हस्ताक्षर SIGNATURE & DATE
IPSC	V. K. CHAUHAN	<i>V. K. Chauhan</i>		
QAX	N. K. MANWANI	<i>N. K. Manwani</i>	अनुवादक TRANSLATED BY	
STE	P. K. BANSAL	<i>P. K. Bansal</i>	निर्माणकर्ता WORKED BY	PANKAJ AGARWAL
			जांचकर्ता CHECKED BY	ASHISH RANJAN
सहमत विभाग AGREED DEPTT	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षणकर्ता SUPERVISED BY	GOPAL KRISHNAN
			स्वीकृति APPROVED	संस्थान मानक समिति PLANT STANDARDS COMMITTEE
			निर्माण PREPARED	मानक विभाग ISSUED: STANDARDS DIVISION
				दिनांक DATE: 20.09.2011
				Gr. No. 2.60

Rev 01
9.4.14

Pankaj 20/9/11
A. Ranjan 20.9.11
G. Krishnan 20.9.11



PLANT PURCHASE SPECIFICATION
(HEEP - HARIDWAR)

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:

REV 01

निर्माणकर्ता WORKED BY	Ashish Ranjan	<i>A.Ranjan</i>	20.9.11
जांचकर्ता CHECKED BY	Gopal Krishnan	<i>G.Krishnan</i>	20.9.11

सामग्री सूची संख्या को
INVENTORY NO.

0.2% proof Strength N/mm ²	Tensile Strength N/mm ²	Elongation (Lo=5d) (%)	Reduction in area (%)	Impact Energy (J)	Hardness HBW
≥ 600	1000 - 1300	≥ 17	≥ 17	≥ 20 ¹⁾	≥ 260

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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 ≥ 100 h
 Elongation A_u ≥ 4 %
 Reduction of area Z_u ≥ 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.

स्वत्वधिकार एवं गोपनीय
 इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए।

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:

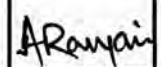
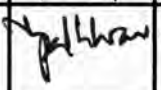
Following NDE shall be performed in delivery condition:


- 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.

हस्ताक्षर एवं दिनांक
SIGN & DATE

सामग्री सूची संख्या
INVENTORY NO.

REV 01

निर्माणकर्ता WORKED BY	Ashish Ranjan		20.09.11
जांचकर्ता CHECKED BY	Gopal Krishnan		20.9.11

दिनांक एवं हस्ताक्षर SIGN & DATE		<p align="center">संस्थान क्रय विनिर्देश (हीप - हरिद्वार)</p> <p align="center">PLANT PURCHASE SPECIFICATION</p> <p align="center">(HEEP - HARIDWAR)</p>	<p align="right">HW 12784</p> <p align="right">पृष्ठ का Page 4 of 7</p>			
सामग्री सूची संख्या को अधिकारित करता है	SUPERSEDES INVENTORY NO.	<p>7.2.3.2 Criteria for registration and decision:</p> <p>a) Regarding UT inspection quality class 3 according to EN10308 (table 3) shall be applied.</p> <p>The decision limit for loss of back wall echo is 3 dB for all bar dimensions. The recording level is defined with $> 1\text{mm } d_{eq}$. All indication $d_{eq} \leq 1\text{mm}$ are acceptable.</p> <p>b) PT: Indications $\geq 5\text{ mm}$ are unacceptable. Indications-free grinding excavations with depths $\leq 1\text{mm}$ are acceptable.</p> <p>8.0 MARKING: Blades are to be marked as per attachment 2 and specification AA0400310.</p> <p>9.0 DOCUMENTATION:</p> <p>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:</p> <ul style="list-style-type: none"> • 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 <p>10.0 CLEARANCE FOR DELIVERY:</p> <p>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.</p> <p>11.0 DEVIATIONS:</p> <p>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.</p> <p>12.0 PROCESS QUALIFICATION:</p> <p>A qualification review, performed jointly by the BHEL and supplier, is required before starting production for the first order.</p> <p>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.</p> <p>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.</p>				
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<p align="center">स्वत्वाधिकार एवं गोपनीय</p> <p align="center">इस प्रलेख में कोई भी सूचना भारत हेवी इलेक्ट्रिकल्स की संपत्ति है इस्तेमाल के बिना प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए।</p>						
दिनांक एवं हस्ताक्षर SIGN & DATE	24/9/11					
सामग्री सूची संख्या INVENTORY NO.	P-4101	REV 01	निर्माणकर्ता WORKED BY	Ashish Ranjan	A.Ranjan	20.9.11
			जांचकर्ता CHECKED BY	Gopal Krishnan	G.Krishnan	20.9.11

सामग्री सूची संख्या को अधिकतम करता है
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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

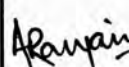
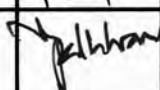
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दिनांक एवं हस्ताक्षर SIGN & DATE
 24/9/11

सामग्री सूची संख्या
 INVENTORY NO.
 P-4101

REV 01

निर्माणकर्ता WORKED BY	Ashish Ranjan		20.09.11
जांचकर्ता CHECKED BY	Gopal Krishnan		20.9.11

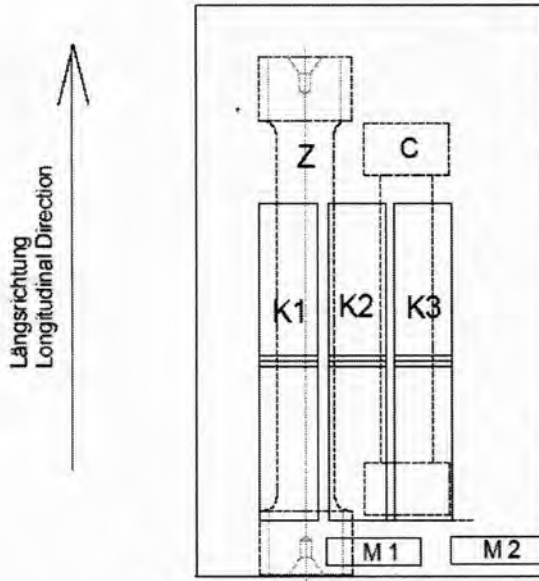


Attachment 1

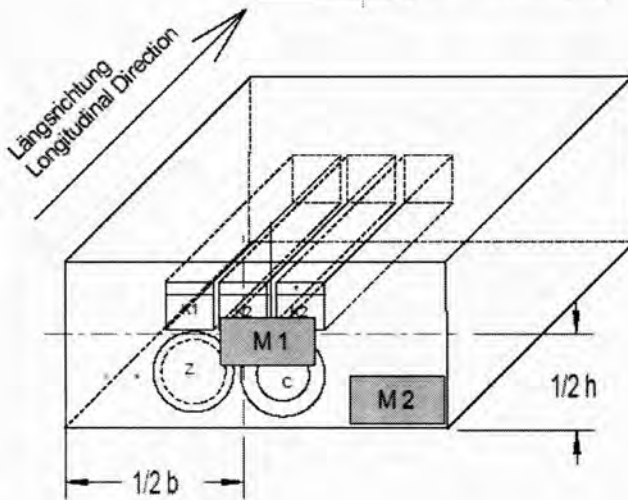
STANDARD TESTING

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

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- Z: Tensile Specimen
- C: Creep test specimen
- K1- K3: Charpy impact specimen
- M1: Micro specimen (Cross Section)
- M2: Micro specimen (Cross Section)



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हस्ताक्षर एवं दिनांक
 SIGN & DATE
 24/9/11

सामग्री सूची संख्या
 INVENTORY NO.
 P- 4101

REV 01

निर्माणकर्ता WORKED BY	Ashish Ranjan	<i>Ashish Ranjan</i>	20.09.11
जांचकर्ता CHECKED BY	Gopal Krishnan	<i>Gopal Krishnan</i>	20.09.11



संस्थान क्रय विनिर्देश (हीप - हरिद्वार)

HW 12784

पृष्ठ का

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PLANT PURCHASE SPECIFICATION
(HEEP - HARIDWAR)

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.

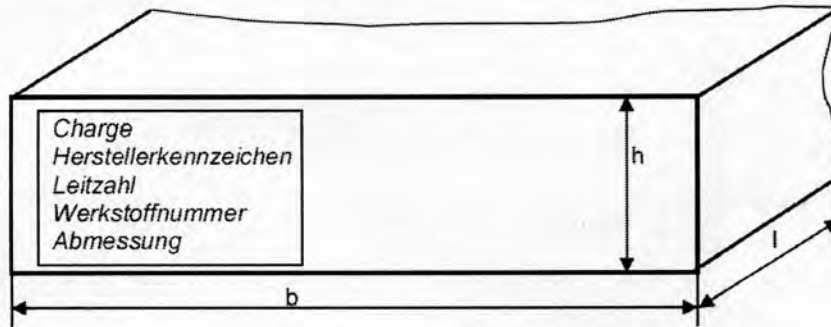
Material No.

Dimensions

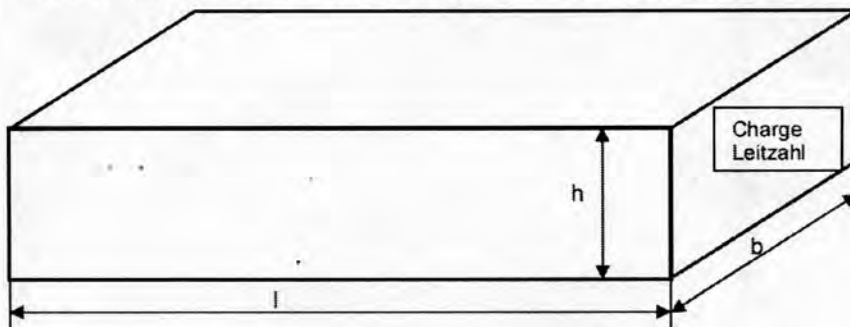
The identification marking shall be applied as follows:

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

SUPERSEDES INVENTORY NO.

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दिनांक एवं हस्ताक्षर
SIGN & DATE

24/9/11

सामग्री सूची संख्या
INVENTORY NO.

P-4101

REV 01

निर्माणकर्ता
WORKED BY

Ashish Ranjan

Ashish Ranjan

20.09.11

जांचकर्ता
CHECKED BY

Gopal Krishnan

Gopal Krishnan

20.9.11

MANUFACTURER'S NAME AND ADDRESS		STANDARD 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
1	2	3	4	5	6	7	8	9	D	10		11

MANUFACTURER/SUBCONTRACTOR		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 ALL 'W' INDICATED IN COLUMN 'N' SHALL BE 'CHP' OF CUSTOMER	FOR CUSTOMER USE	
				APPROVED BY