An ISO 9001 Company

Bharat Heavy Electricals Limited

(High Pressure Boiler Plant**)**
Tiruchirappalli – 620014, TAMIL NADU, INDIA
MATERIALS MANAGEMENT

TITLE: Supply of Forged Blocks to BHEL Trichy	Phone: +91 431 2577426 / 2575329 Fax : +91 431 2520 719 Email : tantuway@bheltry.co.in geetha@bheltry.co.in

Reference Number: 1401600026	**Date: 24.06.2016**	**Due date for submission of offer : 18.07.2016**

You are requested to quote the Enquiry number date and due date in all your correspondences. This is only a request for quotation and not an order.

Please note that under any circumstance both delayed offer and late offers will not be considered. Hence vendors are requested to ensure that the offer is reaching physically our office before 14.00 hrs on the date tender opening.

BHEL / Trichy is looking for Forged Blocks to BHEL Trichy as per the attached documents.

BHEL technical terms & conditions and all annexures can be downloaded from BHEL web site http://www.bhel.com or from the Government tender website http://tenders.gov.in (public sector units) Bharath Heavy Electricals Limited) under reference "**1401600026**"

Offer should reach us before 14:00 hours on the due date of 18.07.2016.	Yours Faithfully, For **Bharath Heavy Electricals Limited** Sr. Engineer / MM / Purchase - C&F

BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)
HIGH PRESSURE BOILER PLANT
PURCHASE DEPARTMENT - FOSSIL BOILERS
THIRUCHIRAPALLI - 620014
TAMILNADU (INDIA)

PHONE :2577480
GRAMS : BHARATELEC
FAX NO: 2520719
E-mail: skraman@bheltry.co.in,
nagarjuna@bheltry.co.in

Enquiry No	Enquiry Date	Due Date for Quotation
1401600026	24.06.2016	18.07.2016

Please quote Enquiry No, Date and due date in all correspondences. This is only a request for quotation and not an order.
Bid should be submitted in two parts. 1.Techno-commercial bid (Part-I) and 2.Price bid(Part-II) in a separate sealed cover and both covers must be placed in a third cover and sealed. Our Enquiry No., Enq. date & Enq. Due date must be written on all three covers.

Item	Description	Unit	Quantity	Delivery Schedule Quantity	Delivery Schedule Date
10	D13530101170 Forged block 430mm x 700mm x 700mm - 2 No.	NO	2.000	2.00	05.02.17

General Note:

1. Forgings to be supplied as per material specification 20MnMoNi55 & PB-M-90 Rev.01 (from page 01/33 to 12/33).
2. Forged block to be supplied as per specification PB-M-90 Rev.01 (from page 01/33 to page 12/33) & for this indent applicable clauses of PB-M-90 Rev.01 are given in Table 01.
3. For offer acceptance "Supplier has to give acceptance for the applicable clauses of PB-M-90 Rev.01 given in Table 01".
4. All vendors should submit an Experience Certificate detailing the quantity supplied, spec-wise; year-wise along with the un-priced P.O. Copies and proof of supply (such as Invoice & Bill of Lading copies) along with the offer for tendered specification and test certificates for the same. For offer acceptance, the manufactures shall have manufactured/tendered spec and the same shall have been supplied/in use/operation.
5. For indigenous supply, chemical composition and mechanical tests to be carried out in NABL accredited laboratory only.
6. RTCs (Raw material Test Coupons) as well as STCs (Simulated Heat Treated Test Coupons) to be taken from both ends (top & bottom) of the forgings.
7. Test samples to be taken "per Melt, per Heat Treatment Batch, per Size" for meeting the product analysis and mechanical tests requirement given in PB-M-90 Rev.01.
8. Final acceptance of the offers will be based on NPCIL recommendation.

The offers should reach us 30 minutes before the time of opening of tenders.
The offers will be opened at 14.30 hrs on the due date of tender in the presence of tenderers who have submitted their offer and who may like to be present for the tender opening.Late and delayed offers are liable to be rejected.

Yours faithfully,
For **BHARAT HEAVY ELECTRICALS LIMITED**

PRAKASH TANTUWAY
Senior Engineer
MANAGER / PURCHASE
Purchase / MM / C&P
FOSSIL BOILERS
BHEL, TIRUCHY - 620 014

Yours faithfully,

BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)
HIGH PRESSURE BOILER PLANT
PURCHASE DEPARTMENT - FOSSIL BOILERS
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E-mail: skraman@bheltry.co.in,
nagarjuna@bheltry.co.in

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9. Inspection agency for imports are BHEL approved third party -TUV (NORD), SGS and BV only.

10.,,Inspection agency for indigenous supply are BHEL and NPCIL.

11.,,The actual production of material is permitted only after review/approval of manufacturing /Testing /Inspection Drawing/Documents and Quality Assurance Plans (QAP) by BHEL and NPCIL. To prepare QAP, UT and MT procedures vendor shall refer the attached formats A, B & C.

12.,,Dispatch clearance for material shall be given after acceptance of Test Certificates by BHEL & NPCIL

13.,,Three sets of documents containing Test Certificates, copies of the approved Procedure, DCR, and Drawing etc. to be provided along with the supply of raw material.

14. Negative Tolerance on dimensions of forged blocks are not acceptable.

15. PBG shall be issued before the dispatch / Shipping of the materials-PBG shall be strictly as per BHEL format only.

16. Please confirm against each point in the TERMS AND CONDITIONS attached, sign and attach along with the offer.

17. Offer (Including all enclosures)shall be signed and stamped in each page by authorized representative of the bidder or else offer may be liable for rejection.

All the tenders may be addressed to the following address:

The Tender Opening Cell / MM
Room No: 26, Building 24, Ground Floor
Bharat Heavy Electricals Limited
TIRUCHIRAPALLI 620014

In case personal delivery of the offer, it shall be dropped into the respective box kept in Room No: 26, after duly entering the data in the system.

Offers will be accepted only up to 14.00 Hrs on the due date. Therefore, vendors shall ensure to submit the offers well before this time. All due date extension requirements should be addressed to the respective Purchase mail IDs. All the due date extension requests from vendors will be considered only up to 48 hours before the due date and time.

Vendors are requested to avoid submission of offers through e mail / fax. In case of any unavoidable

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Yours faithfully,
For **BHARAT HEAVY ELECTRICALS LIMITED**

PRAKASH TANTUWAY
MANAGER / PURCHASE
(FOSSIL BOILERS)
Purchase-MM, C&T
BHEL, TIRUCHY - 620 014.

BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)
HIGH PRESSURE BOILER PLANT
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nagarjuna@bheltry.co.in

1401600026 / 24.06.2016 23505

situation, offers shall be sent through e mail to the following mail ID only tender_cell@bheltry.co.in.

As tenders are being opened by Common Tender Opening Cell, offer covers should be sealed with tenderer's distinctive seal and super scribed with correct Tender No. item of supply and due date of opening.

The offers will be opened at 14.30 hrs on the due date of the tender in the presence of tenderers who have submitted their offer and who may like to be present for the tender opening. Late and delayed offers are liable to be rejected.

The bidder along with its associate/ collaborators/ sub-contractors/ sub-vendors/ consultants/ service providers shall strictly adhere to BHEL fraud prevention policy displayed on BHEL website http://www.bhel.com and shall immediately bring to the notice of BHEL management about any fraud or suspected fraud as soon as it comes to their notice.

The supplier shall submit EI/EII forms to BHEL time to time as indicated by the BHEL and in case of inordinate delay in issuing EI/EII forms, then BHEL reserves the right to deduct 5% of the value of the supplied items against which EI/EII forms pending to be issued

Enclosures:

"LD clause has to be confirmed without fail."

The offers should reach us 30 minutes before the time of opening of tenders.
The offers will be opened at 14.30 hrs on the due date of tender in the presence of tenderers who have submitted their offer and who may like to be present for the tender opening.Late and delayed offers are liable to be rejected.

Yours faithfully,
For **BHARAT HEAVY ELECTRICALS LIMITED**

PRAKASH TANTUWAY
Senior Engineer
Purchase / MM (C&T)
BHEL, TIRUCHY - 620 014

BHARAT HEAVY ELECTRICALS LIMITED
MM / PURCHASE - C&F
BHEL, Trichy – 620014

Annexure II

Enquiry Terms and Conditions

Note: This annexure has to be mandatorily filled in and signed by the manufacturer (or) mill and submitted along with Technical bid

S.No.	BHEL Requirements	Supplier Comments (Acceptance or otherwise for each point to be given)
1	**Material Specification:** Supply of Forged Blocks shall be strictly as per the material specification 20MnMoNi55 mentioned against each item of the enquiry.	
2	**Payment Term (Indigenous)** 1. Payment term is 100% direct payment after 45 days from the date of receipt and acceptance of materials. **Any deviation in the above payment term will attract loading as mentioned below.** **"Base rate of SBI (as applicable on the date of bid opening. Techno-commercial bid opening in case of two part bids) + 6% shall be considered for loading for the period of relaxation sought by bidders.** 2. Offers of indigenous Suppliers with payment terms as LC / Advance Payment / Payment through bank are liable for rejection.	
3	**Payment Term (Imports)** 1. BHEL Payment term is 100% payment on CAD basis after 45 days from the date of receipt of documents, specified in PO, at BHEL bank. Respective bank charges to respective account. **Any deviation in the above payment term will attract loading as mentioned below.** **"Base rate of SBI (as applicable on the date of bid opening. Techno-commercial bid opening in case of two part bids) + 6% shall be considered for loading for the period of relaxation sought by bidders.** 2. In the case of Usance LCs the loading will be considered @ 1.5% on the offered Value. 3. For LC at sight the loading will be considered @ 3.5% on the offered Value.	
	4. Incase of LC, LC will be opened only on intimation of readiness of material for shipment. LC will not be opened prior to readiness of materials. 5. Normally CAD at sight and Confirmed LCs are liable for rejection. However, if CAD at sight is accepted by BHEL, a loading of 5% will be done on the offered Value.	

4	**Liquidated Damages / Penalty** 1. LD shall be 0.5% of the total order value per week or part thereof subject to a maximum of 10% of the total order value. 2. **Any deviation from the above LD clause, loading will be applied to the extent to which it is not agreed by the bidder (at offered value).** 3. If LD is not accepted on total order value a loading of 10% on the offered value will be done. 4. For CFR contracts LD will be calculated from the date of B/L.	
5	**Bank Guarantee / Warrantee**: 1. The Bidder, in the event of an order, should furnish a bank Guarantee from BHEL's consortium banks (List attached) or counter-guaranty by vendor's bank to BHEL's consortium banks, at no extra cost to BHEL, in a proforma prescribed by BHEL, provided along with the order, for an amount equivalent to 10% (Ten percent) of the value of the contract. The BG shall be valid for period of 18 months from the date of last shipment or 12 months from the date of receipt / acceptance / at BHEL, TRICHY whichever is later, with a claim period of two months. . **(PBG shall be issued before the dispatch / Shipping of the materials)-PBG strictly as per BHEL format only.** 2. Supplier to accept guarantee/warrantee of "18 months from dispatch or 12 months from commissioning, whichever is earlier". Any deviation to this may lead to rejection of the offer.	
6	**Risk Purchase:** BHEL at its option will be entitled to terminate the contract and to purchase elsewhere at the risk and cost of the seller either the whole of the goods or any part which the supplier has failed to deliver or despatch within the time stipulated as aforesaid or if the same were not available, the best and the nearest available substitute thereof. The supplier shall be liable for any loss which BHEL may sustain by reason of such risk purchases in addition to LD at the maximum rate mentioned in the LD clause above.	
7	**BHEL will consider the ranking after the loading is applied as referred above wherever deviations are observed.**	
8	**Fixed Price**: Prices quoted by the bidder shall be fixed and not subject to any escalation whatsoever during the period of bid validity and execution of the Purchase Order. A bid submitted with an adjustable price will be liable for rejection. Prices shall be written in words and figures. In the event of any discrepancy with regard to total price and unit price whichever is less shall be considered correct. Unit rates quoted should include all the charges like third party inspection charges, packing & Forwarding etc. If the charges are shown separately, the same shall be in % of basic unit rate. No Lump sum charges shall be quoted.	
9	**Bid Currency**: 1. Indian bidders should submit the prices only in Indian Rupees. Foreign bidders may submit their bid in their preferred currency. 2. **For evaluation, Exchange rate (TT selling Rate of SBI) as on Techno Commercial bid opening date shall be considered.**	

	3. Delivery Conditions: **<u>For Indigenous bidders</u> - Ex-works offers will not be considered.** Bidders should submit their offer on FOR Destination, BHEL Stores, Trichy basis. The quote shall include all charges, including testing, packing, inspection, freight and insurance charges, etc. **A. Imports:** **a)** Bidders should submit their offer for CFR, Chennai Port with freight break up details and place of delivery – INTVT6-CONCOR ICD. **FOR CFR INCO TERMS** **b)** In the case of CFR terms, the following points are to be addressed in the offer: ➢ **<u>CONTAINERIZED CARGO:</u>** For CFR terms, moved through CONTAINERS (Suppliers should clearly specify this in their offer) it would be presumed by BHEL that the freight charges quoted should be on LILO (LINER IN LINER OUT) basis including extra charges, if any, like Container Imbalance Charges, Trade Imbalance charges or any other charges payable to the Liner. No other charges other than the quoted Freight rate will be paid by BHEL excepting applicable Terminal Handling Charges, Container cleaning Charges, DO charges to Shipping Liner at Discharge Port. If any deviation is taken by Tenderer, a loading of 22% on the freight rate per MT shall be considered by BHEL for arriving at the Total landed Cost. ➢ In case of shipment through Containers on CFR basis, the BL should bear the endorsement that "**14 free days for Container Detention is applicable**". ➢ Place of delivery – **INTVT6 – CONCOR ICD** should be clearly specified in the bill of lading. ➢ **<u>BREAKBULK CARGO:</u>** For CFR terms, moved through BREAK BULK Basis (Suppliers should clearly specify this in their offer) it would be presumed by BHEL that the freight charges quoted should be on LILO (LINER IN LINER OUT) basis. ➢ Place of delivery – INTVT6 – CONCOR ICD should be clearly specified in the bill of lading.	
10	**Validity:** 1. **The offers shall be kept open for acceptance for 90 days from the date of Tender opening. Once the tenders are submitted, rates cannot be changed on any grounds.** 2. BHEL reserves the right to negotiate L1 rate or re float the tender opened if L1 price is not the lowest acceptable price to them inter-alia other reasons. 3. Any other conditions which might have been quoted by the seller and are in Contravention to the terms prescribed in the order and which have not been specifically accepted in by purchaser will not be applicable to the contract.	
11	1. Please submit your offer in TWO part bid (technical cum commercial bid in one cover and price bid in another cover) in single cover. The Covers should be duly super scribed with the ENQUIRY NO and DUE DATE in BOLD letter without fail.	
12	1.Bidders shall submit the OFFER in English language (a single envelope containing two inner envelopes) as indicated below: Envelope 1: This sealed envelope should contain (a) technical bid	

(b) un-priced commercial bid (copy of the Priced Bid without the price details) This envelope should be clearly marked "Part I – Technical and Un-priced commercial bid, indicating Enquiry No., Due Date, Address & Reference of the Bidder.

Envelope II: This sealed envelope should contain price details. This envelope should be clearly marked "Part II - Price bid", indicating Enquiry No., Due Date, Address & Reference of the Bidder.

2. The OFFER, sealed and Super scribed as "Parts I & II inside" indicating Enquiry No., Due
Date, Address & Reference of the Bidder should reach this office on or before the due date by 14:00 Hrs (IST). OFFERS RECEIVED AFTER 14:00 Hrs (IST) WILL NOT BE CONSIDERED FOR EVALUATION.

The OFFER to be addressed to:

The Tender Opening Cell/MM
Room No-26 , Building – 24 ,
Ground Floor
Bharat Heavy Electrical Limited
Tiruchirappalli- 620014.

Note: Bidders are requested to submit their offers only through sealed bids.

3. Bidders may submit their bids through email/fax etc.

4. Tenders should be free from CORRECTION AND ERASURES,
Corrections if any, must be attested.

A. If, in the price structure quoted for the required goods, there is discrepancy between the unit price and the total price (which is obtained by multiplying the unit price by quantity), the unit price shall prevail and the total price corrected accordingly, unless in the opinion of the purchaser there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price corrected accordingly.
B. If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected.
C. If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (A) and (B) above.

5. **Offers from Stockiest, traders will not be acceptable.**

6. BHEL prefers the manufacturers to quote directly. In case this is not possible and the offer is being submitted by an Indian agent, the following details are to be furnished along with the offer:

a. The letter from their Principal authorizing the Indian agent to submit the offer on their Principal's behalf. In case the Indian agent submits offer on their own letter head then a covering letter (in original) from the Principal should be enclosed, clearly mentioning that they are bound by the offer submitted by the Indian agent on their behalf.

b. Precise relationship between foreign suppliers and their Indian agents and their mutual interest in business, should be clearly spelt out.

c. Any payment, which the agent receives in India or abroad, from the foreign supplier, whether as a commission or as a general retainer fee is to be mentioned in the offer.

d. All services to be rendered by the agent, whether of general nature or in relation to the particular contract, must be clearly stated by the foreign supplier and the Indian agent.

e. The amount of agency commission agreed to between the foreign principal and the Indian agent should be specifically disclosed and the agency commission will be paid in Indian Rupees only on satisfactory completion of the contract.

f. Copy of current agency agreement is to be enclosed without which the offer is liable for rejection.

The correspondence between the bidder and BHEL through email is considered to be valid document legally though not signed. It is treated as valid confirmations made on behalf of the respective company and comes under the legal ambit of the business transaction and hence binding on both the parties.

Bidders participating in the tender should declare in their technical bid whether they have been black-listed / kept on hold / given Business holiday for a specified period by any Public Sector Undertaking or Government Departments. The reasons for such action with details and the current status of such hold shall be clearly furnished to BHEL. If no such details are mentioned in the offer, it will be construed that the bidder is not under any such hold. However, at a later date if it comes to the notice of BHEL about any such hold under enforcement, BHEL reserves the right to reject the offer at any point of time and also under any stage of the finalization of the tender. Such bidders will not be permitted to participate in the further tender proceedings and will be communicated suitably.

7. Bidders who are not registered vendor of bhel Trichy have to
Submit the filled in supplier registration forms (SRF) available in the bhel website - www.bhel.com and the other required documents called for in the SRF (Including D&B reports for import vendors. Along with the technical bid without fail. The same
Shall be scrutinized as per bhel evaluation procedures.

8. If supplier is not a steel maker then source & form of raw material for the manufacturing shall be submitted product form wise.

9. The manufacturer shall submit filled in forging / forming / pressing supplier facility report.

10. In house test facilities for mechanical, chemical & non - destructive testing are mandatory requirements for consideration of this offer.

11. BHEL/End customer reserve the right to inspect the item ordered at any stage at vendor's works and if found not to meet the stipulated conditions, material is liable for rejection.

12. Acceptance of TC by BHEL before dispatch is must.

13. Date of price bid opening will be informed later after acceptance of offer on technical ground.

	14. Bidders are to confirm all the above points in their "Technical and unpriced commercial bid". Incomplete offers will not be considered. The technical documents submitted for consideration of offer (shall be in English) is to be signed and sealed in original by mill without fail. 15. Suppliers have to submit their registration forms online in BHEL portal (www.bhel.com). The hard copy of the supplier registration form (17 pages) and checklist (1 page)with signatory on all the pages shall be courier to the below mentioned address: **Mr. EBINESAN,** **DGM/SDC/MM,** **24 Bldg, IV Floor,** **BHEL, Trichy-620014.** **Phone- 0431-2577448** **e-mail- ebi@bheltry.co.in** 16. Documents not signed and stamped by the authorized signatory of the bidder shall not be accepted and considered for registration / evaluation of the bid etc. 17. Any additional documents submitted by supplier / bidder, during processing of registration application / tender or after placement of order, shall not be accepted unless it is submitted with forwarding letter and duly signed and stamped as mentioned above.	

REVISION CONTROL SHEET

DOCUMENT TYPE : TECHNICAL SPECIFICATION

NO. : PB-M-90 / Rev. No. 01

TITLE : Technical Specification for Low Alloy Steel Forgings

Rev. No. & Date	Description Of Revision	Revised by (Name & Signature)	Checked by (Name & Signature)	Reviewed by (Name & Signature)	Approved by (Name & Signature)
Rev. 01 06/10/2006	Fig. 2, 4 & 5 revised	(Ajit K. Shit) Exec.Engr.	(M.R.S.Saxena) ACE	(Bhaskar Pandit) ACE	(M.K.Sharma) ACE

SPECIFICATION

NO. PB-M-90

LOW ALLOY STEEL FORGINGS.

ISSUE

No.	DETAILS	INITIAL	No. OF PAGES	DATE
1	Original with		33	Feb. 1988
	Annexure 1		3	Feb.,88.
	Annexure 2		3	Feb.,88.
	Annexure 3		3	Feb.,88.
2.	fig 2,4 & 5 revised.	B.K.S.	—	Oct 2006

COMPILED BY V.K. SHARMA V.K.Sharma. REFERENCE FILE NO. 5NP/33111

APPROVED BY CH. SURENDAR Surendar 4/2/88

(43 SH)

QUENCHED AND TEMPERED LOW ALLOY STEEL FORGINGS

1.0 SCOPE

This Specification establishes minimum requirements for low alloy steel forgings used in the construction of Heat Exchangers and Pressure Vessels. The forgings are required to be made from fine grained, killed and vacuum degassed low alloy steel equivalent to DIN 20 Mn Mo Ni 55 grade with modified chemical composition. The manufacturing process adopted shall ensure cleanliness of the highest order, isotropy of the mechanical, chemical and metallurgical properties, superior fracture toughness and weldability.

2.0 APPLICABLE CODES AND STANDARDS

The following codes and standards of the issue in effect on the date of issuing the tender document shall form part of this specification. In case of conflict between the codes/ standards listed below and this specification, generally the specification will govern. The Supplier must obtain necessary clarification from the Purchaser in such a case.

i) ASME Section II - Part A - Ferrous Materials

ii) ASME Section III - Division 1 - Sub-Section NB

iii) ASME Section V - Non Destructive Examination

iv) ASTM - Relevant Standards

3.0 PROCESS OF MANUFACTURE

3.1 Melting

The steel shall be made by basic electric process and shall be vacuum degassed to remove objectionable gases particularly Hydrogen. Vacuum system should be of sufficient capacity to effect a blank-off pressure which is sufficiently low for sufficiently long duration.

3.2 Discard

Sufficient discard shall be made from each ingot to secure freedom from piping and excessive segregation.

3.3 Grain Size

Grain size shall be measured as per ASTM-E-112 and shall be 6 or finer. The grain size and microstructure shall be determined on a notched bar impact test specimen, obtained from Simulated Heat Treated Test Coupons. The examination

shall be on Longitudinal - Normal Section. In case of determination on an untested side (e.g. Tubesheet, Nozzles), these examinations shall be carried out on the forging directly. The micrographs for assessing the microstructure shall be made at a magnification allowing unambiguous assessment (as a rule: X 200).

3.4 Forging Process

The components shall be hot forged as close as practicable to their final finished shape and size by a press or hammer of sufficient capacity to work the metal throughout its section. The forging ratios shall not be less than 3. Tube sheet and primary head forgings, where overlay cladding is done, shall be processed in such a way that the minimum segregation portion shall be identified and kept for cladding zone.

Material flow shall be such as to favourably resist th stresses encountered in service (Main Working Direction).

3.5 Machining

Prior to the heat treatment, forgings shall be contour machined as close to the finish dimensions as possible.

4.0 CHEMICAL COMPOSITION

The chemical composition for both product and ladle analysis shall be as follows. The specimens for product analysis will be taken from simulated heat treated test coupons described elsewhere in this specification.

Element	Weight Percentage
C	0.17 - 0.23
Mn	1.20 - 1.50
Si	0.15 - 0.30
Mo	0.40 - 0.55 (1)
Ni	0.50 - 0.80
Cr	0.20 max.
Cu	0.12 max. (1)
V	0.02 max.
Co	0.03 max.

Element	Weight Percentage
Al (tot)	0.010 - 0.040
Sn	0.01 max.(1)
As	0.015 max.
Sb	0.007 max.
P	0.010 max.(1)
S	0.008 max.(1)
N (tot)	0.013(1)
H_2	1 ppm max.
O_2	20 ppm max.

The above chemical composition slightly differs from DIN 20 Mn Mo Ni 55 grade. Minor deviations may be permitted provided all other requirements of the specification are met. In the likelihood of the above limits being exceeded, the guaranteed maximum values shall be indicated in the bid itself.

Note (i) - If these figures are exceeded and check analysis levels of upto P ⩽ 0.015%, S ⩽ 0.015%, Mo ⩽ 0.63%, Cu ⩽ 0.18%, Sn ⩽ 0.016% and N (tot) ⩽ 0.015% are accepted, the inspection agency shall determine until further notice whether heat affected zone simulation tests and, where applicable, tangential section examinations are required. If intermediate annealing at 550 deg-C is planned in the course of further processing the permissibility of this annealing temperature shall be demonstrated in the course of the aforementioned tests/examinations. Extent and implementation of testing shall be agreed upon with the Inspection Agency.

5.0 HEAT TREATMENT

5.1 The forgings shall be supplied in quenched and tempered condition. The forgings, after contour machining near to finish dimensions, shall be heated to a temperature which produces an austenitic structure and then quenched in a suitable liquid medium ensuring uniform cooling. The tempering temperature shall be between 630 to 680°C. The measured highest temperature during stress relief heat treatment shall not be higher than the measured lowest temperature during tempering.

The uniformity of temperature during any of the heat treatment shall be proved by continuous temperature recording instruments with the help of thermocouples attached to the component.

5.2 Simulated Heat Treatment (SHT)

The simulated heat treatment (SHT) is intended to simulate the heating cycles which the actual component may experience during the course of fabrication. Such heat treatment is given to some of the test coupons called Simulated Heat Treated Test Coupons (STC). Heating and cooling rates shall be as indicated in figure below:

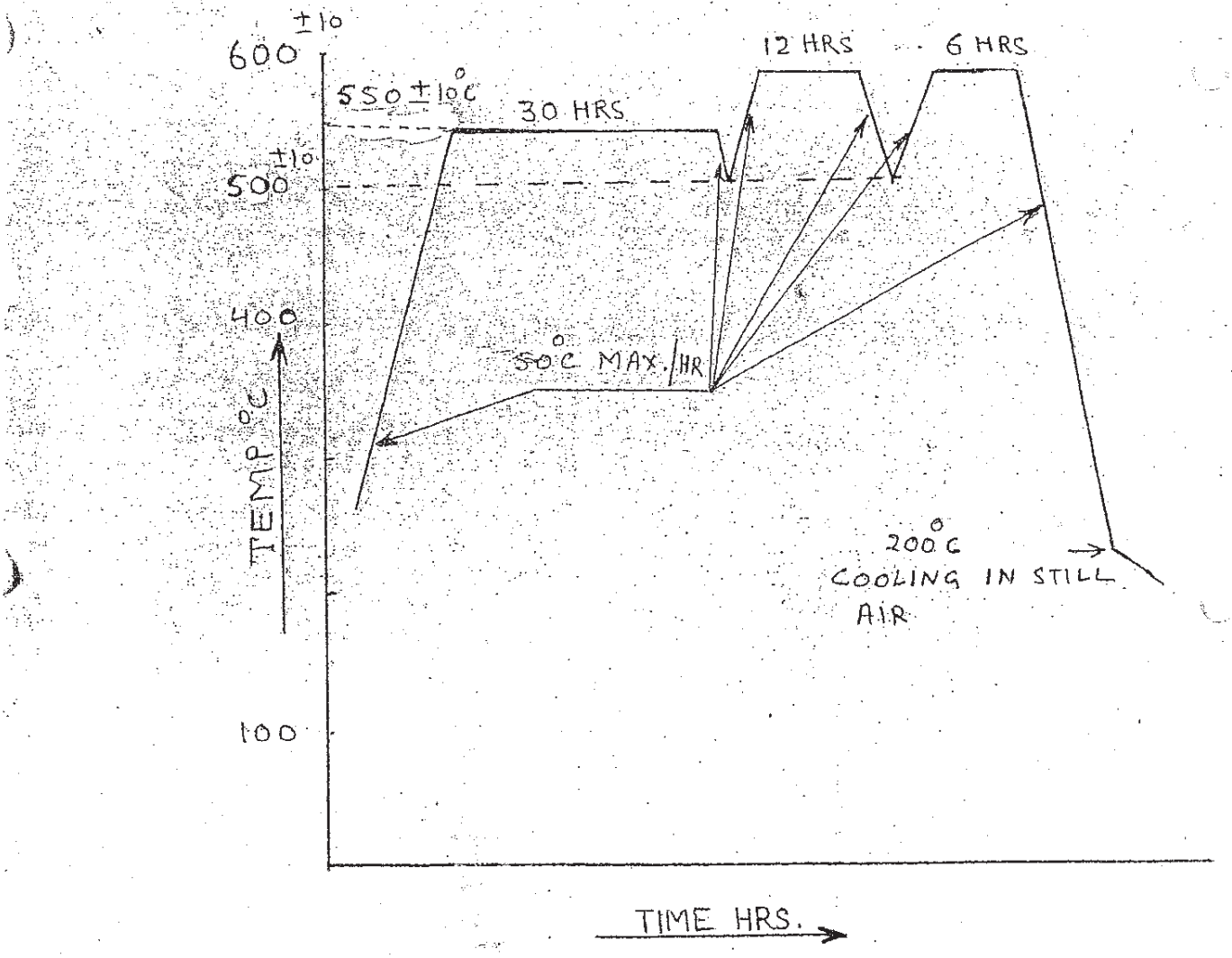

FIG.-1

6.0 MECHANICAL PROPERTIES

6.1 The mechanical tests shall be conducted as per ASTM A-20 and ASTM A-370 (DIN 50115, DIN 50125 and DIN 50145). Following minimum requirements shall be met with both in quenched and tempered and simulated heat treated condition.

Minima pertaining to mechanical properties at room temperature and 350 deg-C -

Product form	Test Temp.	Mechanical Properties		20 MnMoNi 55[1]	
Primary Head					
Spherical Ring	RT	Rm	l, tr, n	560-700	[N/mm^2]
Tube Sheet		$R_{p0.2}$	l, tr, n	390	[N/mm^2]
Shell		A_5	l, tr	19	[%]
Seconcary Head		Z	l, tr	45 (EW)	[%]
Nozzles		Z	n	35 (EW) / 45 (MW)	[%]
Primary Head	350°C	Rm	l, tr, n	505	[N/mm^2]
Spherical Ring		$R_{p0.2}$	l, tr, n	343[3]	[N/mm^2]
Shell		A_5	l, tr	16[2]	[%]
Secondary Head					
Nozzles					
Tube Sheet					

l = Longitudinal

tr = Transverse

n = Normal

EW = Smallest single value

MW = Average value of 3 specimens

A_5 = % Elongation on 5d (in 50 minimum gauge length)

Z = % Reduction in area

$R_{p0.2}$ = Yield Strength (0.2% Offset)

Rm = Tensile Strength

1) Sampling location T/4 x T/2 (resp. 80 x 80 mm for tube sheet).

2) 14% for Nozzles and Tube Sheet.

3) 314 N/mm^2 for Tube Sheet.

6.2 Notch Toughness

6.2.1 Nil Ductility Transition Temperature (T-NDT)

The nil-ductility transition temperature as determined by drop weight test in accordance with ASTM-E-208-84a shall not be higher than -15 deg-C.

In case T-NDT has already been established for this type of material, complete details of the test procedure and results will be reported which shall be subject to approval by the Purchaser.

6.2.2 Reference Nil-Ductility Transition Temperature (R-TNDT)

Three ISO-V transverse specimens will be tested at +18 deg-C for certification of RTNDT. The minimum absorbed energy and lateral expansion shall not be less than 68 J and 0.9 mm respectively, for any of the specimens. The percent shear fracture shall be reported.

6.2.3 Longitudinal and transverse ISO-V test specimens wi exhibit the following minimum values at -15 deg-C.

i) Average of 3 specimens 41 J

ii) Lowest single value 34 J

6.2.4 Cv-Impact Curve

Charpy V-notch impact strength versus temperature curves shall be established. Tests shall be conducted at least at six different temperatures including -15 deg-C and +18 deg-C, to fully define upper and lower energy shelves. The upper energy shelf shall have 100% shear fracture and lower energy shelf a maximum of 10% shear fracture. The test reports shall include absorbed energy, percent shear fracture and lateral expansion, plotted against temperature. The upper

shelf energy shall be more than 100 J. The absorbed energy and lateral expansion values at +18 deg-C and -15 deg-C shall meet the requirements of 6.2.2 & 6.2.3.

6.3 Hardness Test

Hardness of each forging shall be measured after tempering, before any further processing, along the grid as defined in each product specification to demonstrate uniformity. The minimum and maximum hardness value of each forging shall be reported. The difference between the two values for a forging shall not exceed 20 BHN. Tests shall be carried out as per ASTM-E-10.

6.4 Inclusion Rating

Inclusion rating shall be determined as per ASTM-E 45 and shall be better than

A	B	C	D
2.0	2.0	1.0	1.5

7.0 TESTS & EXAMINATIONS

7.1 Categories of Test Coupons

Compliance of the material with the specification requirements is checked on various categories of test coupons described as under:

i) Raw Material Test Coupons (RTC)

Test coupons obtained from the quenched and tempered forgings or forging extensions.

ii) Simulated Heat Treated Test Coupons (STC)

Test coupons obtained from the quenched and tempered forgings and subjected to simulated heat treatment described in Section 5.2.

iii) Final Production Test Coupons (FTC)

These are in the same condition as RTC. RTC and STC shall be tested at the Supplier's works whereas FTC will be despatched with the ordered item for production tests at the Purchaser's works.

7.2 Test Coupon Location

Top and bottom of the forgings shall be same as respective ends of the ingot. Sufficient material in the form of integrally forged ring or disc prolongations shall be

provided for the purpose of testing. Cylindrical shells and nozzle forgings from which more than one nozzle is to be made, shall have prolongations at both ends. Dished ends, tubesheets and single nozzle forgings shall have prolongations on the bottom end. RTC samples shall be tested first.

STC, RTC & FTC shall be taken from the adjacent areas at any location of the cross section in the following manner:

i) Full circumferential test rings shall be parted off from the forging prolongations after the final heat treatment. Entire cross section shall be divided into three sectors (say A, B & C), equally spaced at 120 deg. apart.

ii) Each sector shall be suitably marked to accommodate STC, RTC & FTC, adjacent to each other. Identification of the coupons shall be ensured by suitable methods prior to their separation from the test ring and all through the various stages of testing.

iii) The location of test coupons in the top and bottom test rings shall be diametrically opposite to each other.

iv) Any balance material from the test rings, if in excess of the test requirement, shall be kept reserved for any contingency which may arise during the course of testing.

Refer Figures 7 to 17 for location of test coupons.

7.3 Test Specimen Location

The test coupons shall be taken in such a way that the test specimens shall have their longitudinal axis at least 1/4 t (80 mm for tube sheet) from any surface and with the mid length of the specimens at least 1/2 t (80 mm for tube sheet) from any second surface, where 't' is the maximum heat treated thickness of the forging.

7.4 Specimen Directions

The mechanical properties are to be established along the following three mutually perpendicular directions:

i) Longitudinal - Parallel to the main working direction.

ii) Transverse - Transverse to the main working direction.

iii) Normal - Parallel to the direction of thickness (applicable for thicknesses in excess of 70 mm).

7.5 Chemical Analysis

Chemical analysis shall be carried out in accordance with ASTM-E 30 & ASTM-E 350. If the ingot is made from one heat, only one ladle analysis is required. However, in case of an ingot made from more than one heat, weighted average shall be reported.

For product analysis, samples from each STC shall be analysed. Samples for chemical analysis shall be taken from a depth of 1/4 t from any tempered wall surface and at least at a distance of 1/2 t from the heat treated edge of the coupon. Broken mechanical test specimens may be used.

Apart from STC samples the chemical composition shall also be determined as required by individual product specifications.

7.6 Mechanical Tests

The extent of tests required for each product has been included in tabular form under the product specifications.

For tension test, one specimen shall be tested from a sampling point at room temperature and at 350 deg-C. For impact test, one set of 3 Charpy-V notch specimens shall be tested at a given temperature.

NDT temperature shall be determined using STC Pellini specimens from one location. The NDT temperature so determined shall also be confirmed by tests on two transverse STC & RTC specimens from other locations.

7.7 Sulphur Prints (Baumann Prints)

Sulphur prints shall be prepared for each forging at the location and area specified in the relevant product specification.

8.0 NON DESTRUCTIVE EXAMINATION

8.1 Ultrasonic Examination

All forgings after the final heat treatment and machining shall be ultrasonically examined in accordance with SA-388, recommended practice for Ultrasonic Examination of Heavy Steel Forgings. Where ultrasonic examination is not feasible or only partially feasible due to the final component geometry after machining, examination shall be carried out for acceptance in the semi-machined condition. The forgings shall be examined for the total volume using both straight beam and angle beam search units, observing the scanning directions as indicated in figure 2, 3 and 4.

The reference level for the straight beam examination shall be 6 mm diameter flat bottomed hole for t > 100 mm and 3 mm for t ≤ 100 mm. For angle beam examination a 3 mm wide x 12 mm long x 0.03 t deep notch (3 mm maximum depth) where t is nominal thickness of the material.

All recordable indications (above 20 % of reference level), apparently within acceptable limits shall be investigated to confirm that they are parallel to the forging faces and not in the transverse direction i.e. not in the thickness direction. Defect indications exceeding 20 % of the reference level in thickness direction and exceeding the reference level parallel to the forging faces are not acceptable. In case of tube sheet with integral hub, the hub and the portion in the tubesheet underneath the hub for a depth of atleast one hub thickness, shall be free from defect indications equal to or above 3% hub thickness. Similarly, in case of forgings with integral protrusion the protrusion for a depth equal to the thickness of the protrusion, shall be free from defect indication greater than or equal to the protrusion thickness.

When a cluster of small indications are obtained on the screen whose amplitudes cannot be resolved, then the gain shall be adjusted to give a back echo equal about 80% of full screen height on an adjacent defect free region. At this gain setting, the cluster of indications causing loss of back echo shall be a cause of rejection of the forging. Loss of back echo is assumed when the back reflection falls below 5% of full calibration screen height. Additionally, at such locations the sound attenuation shall be measured. The sound attenuation at 2 M Hz shall not be more than 4DB/ Meter of single sound path.

Examination of forged bars must be performed from both thickness faces and from the cylindrical surface with normal beam probes. Additional scanning in the circumferential direction with 45 deg. angle beam probes shall be carried out for bars larger than 120 mm in diameter. The acceptance standard shall be as follows:

D < 60 mm	C.R.R. - 2 mm
D > 60 mm	C.R.R - 3 mm
D > 120 mm	C.R.R. - 4 mm

(C.R.R. - Circular Reference Reflector)

8.2 Magnetic Particle Examination

Each forging after final machining, shall be examined by magnetic particle method (MT) in accordance with ASME

Section III, para NB - 2545. The acceptance standards shall be as per para NB - 2545.3. The extent of examination shall be 100%. Demagnetisation after the test is required.

8.3 Dimensional Check

Each forging shall be checked for dimensional compliance with the approved drawings. The actual dimensions shall be recorded in a sketch/drawing and submitted for final acceptance.

9.0 REPAIRS

Repair is generally not permitted. Slight surface defects may be smoothly ground and blended without impairing the minimum wall thickness. No other repair shall be carried out without prior approval of the Purchaser or his authorised inspection agency. Plans for all repairs requiring heat treatment shall be submitted to the Purchaser or his authorised inspection agency for review and approval, prior to taking up the job. Repairs involving welding are prohibited.

All non-conformities shall be recorded and reported to the Purchaser to determine their disposal.

10. PROCEDURES, PLANS, REPORTS AND DOCUMENTATION

The manufacturer shall prepare manufacturing, testing, examination procedures and obtain Purchaser's approval prior to the commencement of manufacture. The manufacturer shall be responsible for preparation and issue of all certificates, reports and documents which shall be certified by the Purchaser or his authorised agency. Such certified final documents shall be supplied in bound volumes with proper identification.

11. QUALITY SURVEILLANCE

The forgings shall be subjected to quality surveillance by the Purchaser or his authorised agency during manufacture. The forgings shall not be shipped until the shipping release is given by the Purchaser/his authorised agency.

12. MARKING, PACKING AND SHIPMENT

Each forging shall be marked with Product Serial Number, Heat and Material Specification. In case of forgings accompanied with forged test plates, corresponding test plate identification shall also be marked on the main forging indicating correspondence with top/bottom of original ingot.

The forgings shall be protected against corrosion and damage in transit and shall be properly preserved and packed for sea-worthiness. The Supplier shall submit the preservation and packing plan for Purchaser's approval. Before shipment, suitable rust preventive coating shall be applied on the forgings to ensure sea-worthiness and tropical storage for two years.

(TO BE STAMPED IN ACCORDANCE WITH STAMP ACT AND THE EXPIRY DATE OF BG MUST BE AFTER 60 DAYS FROM THE DATE OF COMPLETION OF WARRANTY PERIOD)

PERFORMANCE BANK GUARANTEE

In accordance of M/s. Bharat Heavy Electricals Limited (A Government of India undertaking, a company incorporated under the Companies Act 1956 having its Registered Office at "BHEL House", SIRI Fort, New Delhi 110 049) through its High Pressure Boiler Plant Division located at Tiruverumbur, Tiruchirapalli- 620 014 (hereinafter called 'the Company') having entered into a contract with …….hereinafter called ' the said contractor ' which term includes 'suppliers' for the purpose of this Bond and under the terms and conditions of the contract No……. Dt ……. Between BHEL, Trichy and as per the contract, the contractor / supplier is to furnish a performance Bank guarantee for Rs. ……. for the due performance of the equipment to be supplied under the above referred contract and for the fulfillment of all the terms and conditions of the contract, We …….(indicate the name of the bank) (herein after referred to as the bank) at the request of …….. (Contractor(s)) do here by undertake to pay the company an amount not exceeding Rs…….against any loss or damage caused to or suffered or would be caused to or suffered by the company by reason of any breach by the said contractor (s) of any of the terms and conditions contained in the said agreement.

2. We …….(indicate the name of the bank with full address), do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the Company stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the Company by reason of breach by the said Contractor(s) of any of the terms and conditions contained in the said Agreement or by the reason of the contractor(s) 'failure to perform' the said agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs._____.

3. We undertake to pay unconditionally to the Company any money so demanded notwithstanding any dispute(s) raised by the Contractor in any suit, or proceedings pending before any Court or Tribunal or Arbitration or before any other authority relating thereto our liability under this present being absolute and unequivocal. The payment under this guarantee would not wait till the disputes have been decided by any Court or Tribunal or in the arbitration proceedings or by any other authority. The payment so made by us under this Bond shall be a valid discharge of liability for payment thereunder and the Contractor(s) shall have no claim against us for making such payment.

4. We…….(indicate the name of Bank), further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the Company under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged or till_____Office / Department/ Division of the Company certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharges this guarantee.

5. (I) Unless a demand or claim under this guarantee is made on us in writing on or before the _____we shall be discharged from all the liability under this guarantee thereafter. But where such claim or demand has been preferred by the Company with the Bank before the expiry of the said date, the claim shall be enforceable notwithstanding the fact that the said enforcement is effected after the said date.

(ii) For the purpose of this clause, any letter making demand on the Bank by M/s. BHEL dispatched by Registered Post with Ack.Due or by Telegram or by any Electronic media addressed to the above mentioned address of the Bank shall be deemed to be the claim / demand in writing referred to above irrespective of the fact as to whether and when the said letter reaches the Bank, as also any letter containing the said demand or claim is lodged with the bank personally.

6. We ……..(indicate the name of Bank), further agree with the company that the Company shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said agreement or to extend time of performance by the said Contractor (s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Company against the said Contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by any reason of any such variation or extension being granted to the said Contractor(s) or for any forbearence, act or omission on the part of the company or any indulgence by the company to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating would, but for this provision, have effect of not so relieving us.

7. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

8. It shall not be necessary for the company to proceed against the contractor before proceeding against the guarantor-bank and the guarantee herein contained shall be enforceable against them notwithstanding any security, which the company may have obtained or obtain from the Contractor shall, at the time when proceedings are taken against the guarantor hereunder be outstanding or unrealised.

9. Any claim or dispute arising under the terms of this document shall only be enforced or settled in the Courts at Tiruchirapalli.

10. The guarantor hereby declare that it has power to execute this guarantee and the executant has full powers to do so on its behalf under the proper authorities granted to him/them by the guarantor.

11. We ……(indicate the name of Bank) lastly undertake not to revoke this guarantee during its currency except with the previous consent of the company in writing.

In witness whereof we…….., (indicate the name of Bank) have hereunto setout Bank Seal the_____day _____month 200
BANK E-MAIL ID:
BANK PHONE NO.
BANK FAX NO:

List of Consortium Bank			
	Nationalised Bank		**Nationalised Bank**
1	Allahabad bank	19	Vijaya Bank
2	Andhra bank		**Public Sector Banks**
3	Bank of Baroda	20	IDBI
4	Canara Bank		**Foreign bank**
5	Corporation bank	21	CITI Bank N.A
6	Central bank	22	Deutsche Bank AG
7	Indian Bank	23	The Hongkong and Shanghai Banking Corporation Limited
8	Indian Oversea Bank	24	Standard Chartered Bank
9	Oriental bank of Commerce	25	The Royal Bank of Scotland N.V.
10	Punjab National Bank	26	J P Morgan
11	Punjab & Sindh Bank		**Private bank**
12	State Bank of India	27	Axis Bank
13	State Bank of Hyderabad	28	The Federal Bank Limited
14	Syndicate Bank	29	HDFC
15	State Bank of Travancore	30	Kotak Mahindra Bank
16	UCO Bank	31	ICICI
17	Union Bank of India	32	Indusind Bank
18	United Bank of India	33	Yes Bank

Sample Format -A

QAP

Supplier Details	BHEL P.O. No.: PO Date:	QAP NO:	Rev No.	Date:
Customer Details	Ref Docs PB-M-90 Rev 01	Page No:	Item Description : 20MnMoNi55 Forgings	

Sl. No.	Operation	Characteristics	Type of check/ method	Extent of Check	Reference Documents/Stds	Acceptance Standard	Format of Records	Inspection by			REMARKS
								Supplier	BHEL	NPCIL/ TPI	
1	Raw Material/ Incoming Inspection	Ladle Analysis (Chemical Analysis)	Spectrometric	1 sample /heat	20MnMoNi55 & as per PB-M-90 Rev 01	20MnMoNi55 & as per PB-M-90 Rev 01	Mill TC	P, R	R, H	R, H	
		Ingot/Bloom Identification	Visual	100%	Supplier's internal practice	20MnMoNi55 & as per PB-M-90 Rev 01	Test Report	P	W	W	
		Ingot Chemistry Check	Supplier to fill	on top and bottom of each ingot/heat	20MnMoNi55 & as per PB-M-90 Rev 01	20MnMoNi55 & as per PB-M-90 Rev 01	Test Report	P, R	R	R	
2	Forging	Temperature Reduction Ratio Dimensions	Measurments	100%	As per approved Manufacturing Process Plan(MPP) & PB-M-90 Rev 01	As per approved Manufacturing Process Plan(MPP) & PB-M-90 Rev 02	Supplier's log book	PR	R	R	
3	Heat Treatment	Type of HT - Hardening , Tempering Simulation HT	Loading temp.; ROH & ROC; Soaking Temp. & Time etc.; No. of Test Specimens to be loaded	100%	As per approved HT procedure and PB-M-90 Rev 01	As per approved HT procedure and PB-M-90 Rev 01	HT chart (time temp graph)	P,R	W	W	HT chart to be submitted. Furnace & Thermocouples shall be calibrated before taking up HT process.
4	Test Coupon	Identification	Stamping	As per approved MSTP	Approved MSTP & PB-M-90 Rev 01	Approved MSTP & PB-M-90 Rev 01	TP stamping report	P,R	H.W	H,W	

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		Product & Gas Analysis	Spectrometric	As per approved MSTP	Approved MSTP & PB-M-90 Rev 01	20MnMoNi55 & as per PB-M-90 Rev 01	Test Report	P,R	W	W	
5	Inspection & Testing	Physical Testing	Tensile Test (RT) & (HT)	As per approved MSTP	As per standards and PB-M-90 Rev01	20MnMoNi55 & as per PB-M-90 Rev 01	Test Report	P,R	W	H, W	Testing in NABL approved LAB
			Impact Test Cv Curve & RTNDT								
			T_{NDT}								
			Hardness Test								
		Macro Etch test	Macro Analysis				Test Report	P,R	W	W	
		Grain Size and Micro Structure	Micro Analysis				Test Report	P,R	W	W	
		Inclusion Rating	Micro Analysis				Test Report	P,R	W	W	
6	Non- Destructive examination	Ultrasonic Test (UT)	Pulse Echo Technique	100%	As per approved procedures & PB-M-90 Rev01	As per approved procedures & PB-M-90 Rev01	Test Report	P,R	W	W	
		Magnetic Particle Test (MPT)	Yok Wet Method	100%			Test Report	P,R	W	W	
7	Final Inspection	Dimension Check	Measurments	100%	As per PO & PB-M-90 Rev01	As per PO & PB-M-90 Rev01	Test Report	P, R	W	W	
		Surface Examination	Vsiual	100%	Shall be free from craks, scales , etc.	20MnMoNi55 & as per PB-M-90 Rev 01	Test Report				
		Identification & marking	Low stress stamp	100%	20MnMoNi55 & as per PB-M-90 Rev 01	20MnMoNi55 & as per PB-M-90 Rev 01	rub offs				
8	Preservation & Packing	Safe packing for transit	with polythene and wooden supports/box	100%	rust preventive coating	20MnMoNi55 & as per PB-M-90 Rev 01					
9	Issue of Shipping Release Note	Documentation		100%		All docs to be reviewed	Shipping release note			H	Shipping release note will be issued on acceptance of TC.

Legends- P: Perform , R: Review, W: wintess, H : Hold Point

Product analysis and mechanical testing as per QAP stage to be carrired out in NABL approved lab

Supplier : prepared and reviewed by :	For BHEL Approval	For NPCIL Approval

20/06/2016

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Sample Format -B(1)

PROCEDURE FOR ULTRASONIC TESTING

UT

1.0	Scope	Extent of examination as per applicable specn.
2.0	Technique	Method of testing to be detailed
3.0	Reference documents	ASME standards & as per applicable specifiction
4.0	NDT Personnel	Qualification of the personnel to be engaged
5.0	UT Equipment & Accessories	
	(i) Details of the Flaw Detector	Make & Model
	(ii) UT probe (Dual/Single Crystal)	Type of Probe
		Size of Probe
		Frequency
		Focal Length
	(iii) Angle Beam details	
	(iv) Couplant:	Type & Brand Name
6.0	Equipment Check before use	
7.0	Surface Preparation	
8.0	Calibration	Calibration Block requirements and its dimensional details
9.0	Calibration Confirmation	system changes & periodic examination checks
10.0	Scanning Plan	Directions of scanning to be given as a sketch
11.0	Scanning Procedure	stage of UT
		Technique Sheet references
		Scanning level
		Scanning Speed
		overlap % to cover total UT area
12.0	Recording	Defect recording
13.0	Report to give	(i) recordable indication
		(ii) location of recordable indiacations
		(iii) dimensions of the area not inspected
		(iv) Purchaser Drg. No. & Order No.
		(v) applicable specn., calibration details, Instrument details, surface condition, couplant and Search Unit
14.0	Quality Levels:	
15.0	Report Format	

25/06/2016

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Sample Format - B(2)

ULTRASONIC TEST CERTIFICATE

Certificate No. & Date:-
Work Order No.:-
Purchase Order No. & Date:-
Customer Name:-

Item No.	Component	Drg. No./Size (in mm)	Qty.	Job Sl. No.	Group No.	Material Specification

Ultrasonic Test Method:-
Details of the Equiptment used:-

Surface Condition		Type of Couplant use & Brand Name	
Searach Unit (including Sl. No.)		Scanning	
Search Unit Size		Range (mm) of CRT	
Frequency		Pulse Energy	
Ultrasonic Test Standard		Amplitude	
Acceptance Standard		Suppression	
Applicable Procedure, Specification with Rev. No.		Type of Cable and length	
Identification of Calibration Block		Operator Name	
Examination Conducted Surface		NDE Qualification LEVEL	

ATTENTUATOR SETTING

(i) Attentuator Reference Standard:
(ii) Attentuator Testing Sensitivity:

TEST RESULT:

REMARKS:

Test Witnessed By:

20/06/2016

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Sample Format - B(3)

TABLE

(to be followed for UT)

Drg. No. Reference			
Stage of Examination	After HT and proof-machining (semi-finished) condition		
Size of the proof-machined solid forging	Dimension after proof-machining for UT to be given.		
Type of Beam	NORMAL	NORMAL	ANGLE BEAM (45°)
Position of Scanning	with reference to Sketch	with reference to Sketch	with reference to Sketch
UT Reference Block details	hole details	hole details	Notch details
Direction of Scanning	Sketch to be given		

20/06/2016

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Sample Format - C(1)

SAMPLE PROCEDURE FOR MAGNETIC PARTICLE EXAMINATION

MT

1.0	Scope	Extent of examination as per applicable specn.
2.0	Procedure	Method of testing to be detailed
3.0	Reference documents	ASME & as per applicablespecification
4.0	NDT Personnel	Qualification of the personnel to be engaged
5.0	MT Equipment	
6.0	Examination Medium	Particle Type, Make & designation to be mentioned
7.0	Surface Preparation	
8.0	Calibration	Lifting Power of Yoke etc.
9.0	Sensitivity Check & Magnetic Field Adequacy:	Strength of magnetic field, sensitivity of detection etc.
10.0	Examination	Preliminary exmination; Direction of Magnetization & Method of Examination
11.0	Examination Coverage	allowable leg spacing of yoke, magnetic flux condition and field overlap to cover 100% of forging surface
12.0	Interpretation	Based on applicable specification
13.0	Demagnetization	Demagnetisation at any time after completing MPI
14.0	Evaluation	As per the referred code & specification
15.0	Report to give	(i) Non-rejectable indications (ii) Rejectable indiacations
16.0	Examination Record	(i) Equipment & type of current (ii) Magnetiac Particles type (iii) Map or record of indications (iv) Material and size
17.0	Acceptance Criteria	As per applicable Specification and ASME standards
18.0	Report Format	

20/06/2016

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Sample Format - C(2)

MAGNETIC PARTICLE EXAMINATION REPORT

Certificate No. & Date:-
Work Order No.:-
Purchase Order No. & Date:-
Customer Name:-

Item No.	Component	Drg. No./Size (in mm)	Qty.	Job Sl. No.	Group No.	Material Specification

Methods of Magnetization:
Examination Medium:
Test Equipment:

Surface Condition		Area Covered	
Current used		Lifting Power	
Production spacing		Powder Colour	
Calibration		Magnetization Time	
Test Standard		Date of Examination	
Acceptance Standard		Operator Name	
Applicable Procedure, Specification with Rev. No.		NDE Qualification LEVEL	

TEST RESULT:

REMARKS:

Test Witnessed By:

20/06/2016

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FORGE SHOP

1.00.00 Name of Company, Address

2.00.00 Type & No. of Forging Press : Forging hammer

Capacity - (Tonnes)

3.00.00 Max. size of Material that can be handled dimensions, weight and type of materials.

4.00.00 Production with relevant standards (for last three years)

Carbon Steel

Stainless Steel

Alloy steel

Inconel –

5.00.00 Heating Facilities -

5.10.00 Furnace - No. and capacity

5.10.10 Type - Oil Fired, Gas Fired, Electric heating

5.10.20 Dimensions

5.10.30 Mode of Temperature control & extent of automation.

5.10.40 Temperature recording facilities

5.20.00 Distance of heating furnace from Forging Press

5.30.00 Handling Facilities - Crane/Truck/Manual/ any other indicate list of such facility.

6.00.00 Availability of in-house Heat Treatment facility Yes/No

6.10.00 If yes: Type of heat treatment possible

6.20.00 If no, source of Heat Treatment with relevant details.

6.20.10 Annealing -

6.20.20 Normalising -

6.20.30 Stress Relieving -

6.20.40 Quenching: - Water/Oil

Any other Heat treatment? -

6.20.50 Type & No. of Furnace -

6.20.60 Dimensions, Type of Temp. Control,
Temp - Time Recording facilities.

7.00.00 Source of Raw Materials -

Indigenous/imported (Indicate source and quantity of material procured during last three years)

8.00.00 Machining Facilities -

List of machines installed

9.00.00 Cutting facilities - Type & No. of Machine

10.00.00 Availability of testing facilities Yes/No

10.10.00 If no - Indicate source of testing with relevant details

10.20.00 If yes :-

10.20.10 Chemical Analysis: Method

10.20.20 Mech. Testing

10.20.21 Hardness testing

10.20.22 Metallorgraphy

10.20.23 Universal Tensile Testing M/C -
Ambient Low Temp.

10.20.24 Any other tests –

10.30.00 Non-destructive

10.30.10 Radiography

FORGE SHOP

10.30.20 Ultrasonic Test

10.30.30 Dye Penetration

10.30.40 MPI

10.30.50 Any other NDE

11.00.00 Experience with Third Party/Statutory Agency:

Indicate the agency

12.00.00 Source of procurement of Dies & availability for Machining of such dies.

13.00.00 Consistency in supply:

13.10.00 Has the vendor produced items of similar nature in past?

13.20.00 Has the vendor maintained delivery commitments in past?

13.30.00 Has there been frequent labor trouble in past?

13.40.00 Has there been major upset due to faulty material management?

13.50.00 Is the system of planning & scheduling resilient enough to overcome temporary setbacks & make up lost time?

13.60.00 Has the vendor got standby arrangement for power?

13.70.00 Can the vendor quickly offload the work to other reliable sub-vendor?

13.80.00 Total order booked till date.

14.00.00 Remarks:

PLACE: SIGNATURE WITH SEAL

DATE:

TABLE 01			
Manufacturing and Testing Requirement for Forged Blocks 430 x 700 x 700 as per PB-M-90 Rev01			
S.NO.	**PB-M-90 Rev 01 Clauses**	**Confirmation required from suppliers**	**Suppliers comment (accepted / not accepted)**
1	1.0 Scope	Yes	
2	2.0 Applicable Codes and Standards	Yes	
3	3.0 Process of Manufacture	Yes	
4	3.1 Melting	Yes	
5	3.2 Discard	Yes	
6	3.4 Forging Process	Yes	
7	3.5 Machining	Yes	
8	4.0 Chemical Composition	Yes	
9	5.0 Heat Treatment, 5.1 & 5.2 Simulated Heat Tratment	Yes	
10	6.0 Mechanical Properties, 6.1	Yes	
11	6.2 Notch Toughness	Yes	
14	6.2.3 Longitudinal and transverse ISO-V test specimens will exhibit the following minimum value at -15°C i. Averaje of 3 specimens 41 J ii. Lowest single value 34 J	Yes	
16	6.3 Hardness	Yes	
17	7.1 Tests & Examinations	Yes	
18	7.1 (I.) Raw Material Test Coupons (RTC)	Yes	
19	7.1 (ii.) Simulated Heat Treated Test Coupons (STC)	Yes	
20	3.3 Grain Size	These Clauses are not applicable for the forged block testing requirements.	
21	6.4 Inclusion Rating		
12	6.2.1 Nil Ductility Tranisition Temperature (T-NDT)		
13	6.2.2 Reference Nil Ductility Tranisition Temperature (R-TNDT)		
15	6.2.4 Cv- Impact Curve		
22	7.1 (iii.) Final Production Test Coupons (PTC)		
23	7.2 Test Coupon Location		
24	7.3 Test Specimen Location	Yes	
25	7.4 Specimen Direction	Yes	
26	7.5 Chemical Analysis	Yes	
27	7.6 Mechanical Tests	Yes	
28	7.7 Sulphur Prints (Baumann Prints)	Yes	
29	8.0 Non Destructive Examination	Yes	
30	8.1 Ultasonic Examination	Yes	
31	8.2 Magnetic Particle Exammination	Yes	
32	8.3 Dimensional check	Yes	
33	9.0 Repairs	Yes	
34	10. Procedures, Plans, Reports and Documentation	Yes	
35	11. Quality Surveilance	Yes	
36	12. Marking, Packing and Shipment	Yes	

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