



An ISO 9001  
Company

## Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

MATERIALS MANAGEMENT

<b>TITLE</b> <b>Supply of Forgings as per Spec. DIN17243 (15Mo3) or ENI10222-2 (16 Mo3) to BHEL Trichy</b>	Phone: +91 431 2577630 / 2577480 Fax : +91 431 2520 719 Email : <a href="mailto:nnithya@bheltry.co.in">nnithya@bheltry.co.in</a>
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<b>Reference Number:</b> <b>1401100191</b>	<b>Date:</b> 14.10.11	<b>Due date for submission of offer :</b> <b>25.11.11</b>
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**BHEL / Trichy is looking for Vendors to supply Forgings as per Spec. DIN17243 (15Mo3) or ENI10222-2 (16 Mo3) as per the attached documents.**

BHEL technical terms & conditions and all annexures can be downloaded from BHEL web site <a href="http://www.bhel.com">http://www.bhel.com</a> or from the Government tender website <a href="http://tenders.gov.in">http://tenders.gov.in</a> (public sector units) Bharath Heavy Electricals Limited) under reference “ <b>1401100191</b> ”	
Offer should reach us before 14:00 hours on the due date of 25.11.2011.	Yours faithfully, ENGINEER / PURCHASE/ C&F / MM For <b>Bharath Heavy Electricals Limited</b>



**ENQUIRY**  
(IMPORTS)

# 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: tkr@bheltry.co.in  
Web:

Page  
1/4

Enquiry No	Enquiry Date	Due Date for Quotation
1401100191	14.10.2011	25.11.2011
Please quote Enquiry No, Date and due date in all correspondences. This is only a request for quotation and not an order		

Item	Description	Unit	Quantity	Delivery Quantity	Schedule Date
10	D13130101277 INSTRUMENTATION NOZZLE AS PER DRG.NO. 2-93-170-05118/03.	NO	24.000	24.00	30.04.12
20	D13130101278 LEVEL TAP NOZZLE AS PER DRG.NO. 2-93-170-05120/03.	NO	24.000	24.00	30.04.12
30	D13130101279 VELOCITY MEASUREMENT NOZZLE AS PER DRG.NO. 2-93-170-05119/03.	NO	4.000	4.00	30.04.12
40	D13130101280 TEMP. MEASUREMENT NOZZLE AS PER DRG.NO. 2-93-170-05121/02.	NO	4.000	4.00	30.04.12
50	D13130101285 PDHRS NOZZLE END PART AS PER DRG.NO. 3-93-170-05234/02.	NO	8.000	8.00	30.04.12
60	D13130101295 THERMOWELL AS PER DRG.NO. 3-93-170-05171/02.	NO	8.000	8.00	30.04.12

## General Note:

- All Forgings shall be supplied as per
  - Specification DIN 17243 (15Mo3) or Specification EN 10222-2 (16Mo3).
  - Para No.8.1, 8.2, 8.3, 9.0, 10.0, 11.0 and 12.0 of PB-M-90 Rev-01.
  - Drawing Nos mentioned against each item.
- If forging is as per EN 10222-2 (16Mo3)
  - Steel melting shall be fully killed and of fine grain. It shall be melted in an electric furnace and Vacuum degase.
  - N2 content shall not exceed 0.009%.
  - Conditions of PB-M-90 Annexure-1 shall be met.
- Inspection :

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.

**VIGILANCE AWARENESS WEEK**

**31ST OCT-5TH NOV 2011**

**IF YOU HAVE ANY COMPLAINT /GRIEVANCES**

**YOU MAY CONTACT GM/VIGILANCE**

**PHONE:0431-2577962,2520334**

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

MANAGER / PURCHASE  
(FOSSIL BOILERS)  
Yours faithfully,



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Page  
2/4

1401100191 / 14.10.2011

a) For Foreign suppliers : by any of the following three approved third parties viz.

i. TUV(Nord), ii. BV, iii. SGS

b) For Indian suppliers : by BHEL and customer (NPCIL).

5. Offers from traders are not acceptable.

6. Though in the drawings the specification is mentioned as 15Mo3, please note that any of the two specifications [DIN 17243 (15Mo3) or EN 10222-2 (16Mo3)] is acceptable.

7. The materials are required for RAPP 7 & 8 and KAPP 3 & 4 (700MWe Nuclear power station) and no "End Use Certificate" will be given.

8. All the items are to be procured from a single source and order to be finalized on a 'total package' basis. Hence, part offers will be rejected. The rates quoted should include all charges like inspection / testing, freight, insurance etc. (i.e. no separate rate be indicated as extra).

9. Supplier shall submit Manufacturing / Testing / Inspection Drawing / Documents and Quality Assurance Plan (QAP) for our approval.

10. The actual production of materials is permitted only after review / approval of Manufacturing / Testing / Inspection Drawing / Documents and Quality Assurance Plan (QAP) by BHEL, Trichy & NPCIL.

11. Bidders shall submit the OFFER ( 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.

12. The OFFER, sealed and Superscribed as "Parts I & II inside" indicating Enquiry No., Due Date, Address & Reference of the

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Page  
3/4

**1401100191 / 14.10.2011**

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.

13. The OFFER to be addressed to:  
MANAGER / PURCHASE - C&F / MM / MFG  
4th Floor - Building 24  
BHARAT HEAVY ELECTRICALS LIMITED  
HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI - 620 014  
TAMIL NADU, INDIA.

Note: Bidders are requested to submit their offers only through sealed bids. As the part II (priced bid) will not be opened before the technical evaluation is completed, bidders are requested not to submit their bids through email/fax etc.

14. Offer validity should be minimum 90 days from the date of tender opening.
15. Acceptance of Performance Bank Guarantee (PBG) as per the format enclosed of 10% of the order value to be confirmed.
16. Foreign vendors: Prices to be quoted on CIF - Chennai Sea Port or FOB basis only and offers with Ex-works terms will not be considered.
17. All items are to be quoted on "per unit" basis.
18. The following agreement from foreign suppliers for their Indian agents:  
The following details are to be furnished along with the offer:
- Precise relationship between foreign suppliers and their Indian agents and their mutual interest in business, should be clearly spelt out.
  - Any payment, which the agent receives in India or abroad, from the foreign supplier, whether as a commission or as a general retainer fee, also needs to be brought on record and made explicit so as to ensure compliance to tax laws and to prevent leakage of foreign exchange.
  - 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.
  - The amount of agency commission agreed to between the foreign principal and the Indian agent should be

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Page  
4/4

1401100191 / 14.10.2011

specifically disclosed and the agency commission will be paid in Indian Rupees only.

19. LD Clause: If supplier fails to deliver the materials within the period specified in the contract the purchaser shall deduct as Liquidated Damages(LD), a sum equivalent to 0.5% of the price for each week or part thereof of delay upto a maximum of 15% of the price of the delayed or delivered goods.
20. RISK PURCHASE: Alternatively the purchaser at his 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 dispatch within the time stipulated as foresaid or if the same were not available, the best and the nearest available substitute therefore. The supplier shall be liable for any loss, which the purchaser may sustain by reason of such risk purchases in addition to LD at the rate mentioned in clause 15 above.
21. The correspondence between the bidder and BHEL through email are considered as 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.
22. 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 finalisation of the tender. Such bidders will not be permitted to participate in the further tender proceedings and will be communicated suitably.
23. Bidders to confirm / comply with all the above points in their "Technical and unpriced commercial bid".

**Enclosures:** "LD clause has to be confirmed without fail."

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(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 forbearance, 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:

NUCLEAR POWER CORPORATION OF INDIA LTD.  
(A Govt. of India Enterprise)

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

TECHNICAL SPECIFICATION

ON

LOW ALLOY STEEL FORGINGS

(USI No. 33111)

Revision No.	0	1		
Date of Issue Month/Year	February, 1988	October, 2006		
Total No. of Pages (including cover sheet)	1 + 42 = 43	2 + 43 = 45		

ORIGINAL

PREPARED BY : V.K.SHARMA sd/- 04/02/1988

CHECKED BY : ---

REVIEWED BY : ---

APPROVED BY : CH. SURENDAR sd/- 04/02/1988

(Name & Designation)

(Signature)

(Date)

(For Revision See Revision Control Sheet)



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ANNEXURE-1LOW ALLOY STEEL FORGINGS - 15 Mo 31.0 SCOPE

This Annexure covers the technical requirements for the supply of low alloy steel forgings conforming to DIN material number 1.5415.

2.0 PROCESS OF MANUFACTURE2.1 Steel Melting

The steel shall be melted in an open hearth/electric furnace. The steel shall be fully killed and preferably vacuum degassed.

2.2 Discard

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

2.3 Forging Process

The components shall be hot forged as close as practicable to their final shape by a press or hammer of sufficient capacity to work the metal throughout its section.

2.4 Repairs

Refer para 9.0 of PB-M-90.

3.0 CHEMICAL COMPOSITION

Both ladle and product analysis shall meet the following requirements:

<u>Element</u>	<u>Weight Percentage</u>
C	0.12 - 0.20
Si	0.15 - 0.35
Mn	0.50 - 0.70
P max	0.035
S max	0.035
Cr max	0.30
Mo	0.25 - 0.35
Cu max	0.30
N2 max	0.009

#### 4.0 Heat Treatment

The forgings shall be supplied in the normalised condition.

#### 5.0 MECHANICAL PROPERTIES

- 5.1 Mechanical tests shall be conducted in accordance with ASTM A-370 and ASTM E-21. Following minimum requirements shall be met with in final normalised condition. Wherever possible transverse specimen will be used failing which longitudinal specimens can be used for tests.

	<u>RT</u>	<u>350 deg-C</u>
Tensile Strength (N/sq mm)	440 - 580	To be reported
Yield Strength (N/sq mm)	270	190
% Elongation on 5d (in 50 mm gauge length)	21	To be reported
Reduction in area	35	-

#### 5.2 Notch Toughness

Three ISO-V test specimens will be tested at 20 deg-C. The longitudinal and transverse specimen will exhibit the following minimum values.

i) Average of three specimens	55 J
ii) Lowest single value	39 J

#### 5.3 Hardness Test

Hardness shall be measured on each forging after final heat treatment along the length as well as over the thickness of the forging at sufficient number of points to demonstrate uniformity.

#### 6.0 TEST COUPONS AND SPECIMEN LOCATION

Two separate test coupons (RTC & FTC) shall be identified and taken out from the forged bars. RTC (Raw Material Test Coupons) shall be used for preliminary tests before taking up final forging. RTC (Final Test Coupon) shall undergo same amount of working and heat treatment as the final forging.

The specimens for testing shall be atleast 1/4 't' from a heat treated surface and 1/2 't' from the end where 't' is the heat treated thickness.

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6.1 Tensile Test Specimen

Two tensile test specimens shall be taken from each coupon (RTC - 2 Nos. & FTC - 2 Nos.) for tests at room temperature and at 350 deg-C.

6.2 Impact Test Specimen

One set of Cv impact test specimen shall be taken from each (RTC & FTC) for tests at 20 deg-C. Lateral expansion and percent shear fracture shall be reported.

7.0 Non Destructive Examination

The dimensional checks, ultrasonic examination and magnetic particle tests shall be carried out on each forging as per para 8.1, 8.2 & 8.3 of PB-M-90.

8.0 QUALITY SURVEILLANCE, DOCUMENTATION, MARKING, PACKING AND SHIPMENT

Refer para 10, 11 & 12 of PB-M-90.

## 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  $t \leq 100$  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 at least one hub thickness, shall be free from defect indications equal to or above 3% hub thickness. Similarly, in case of forgings with integral protrusions, 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 35 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

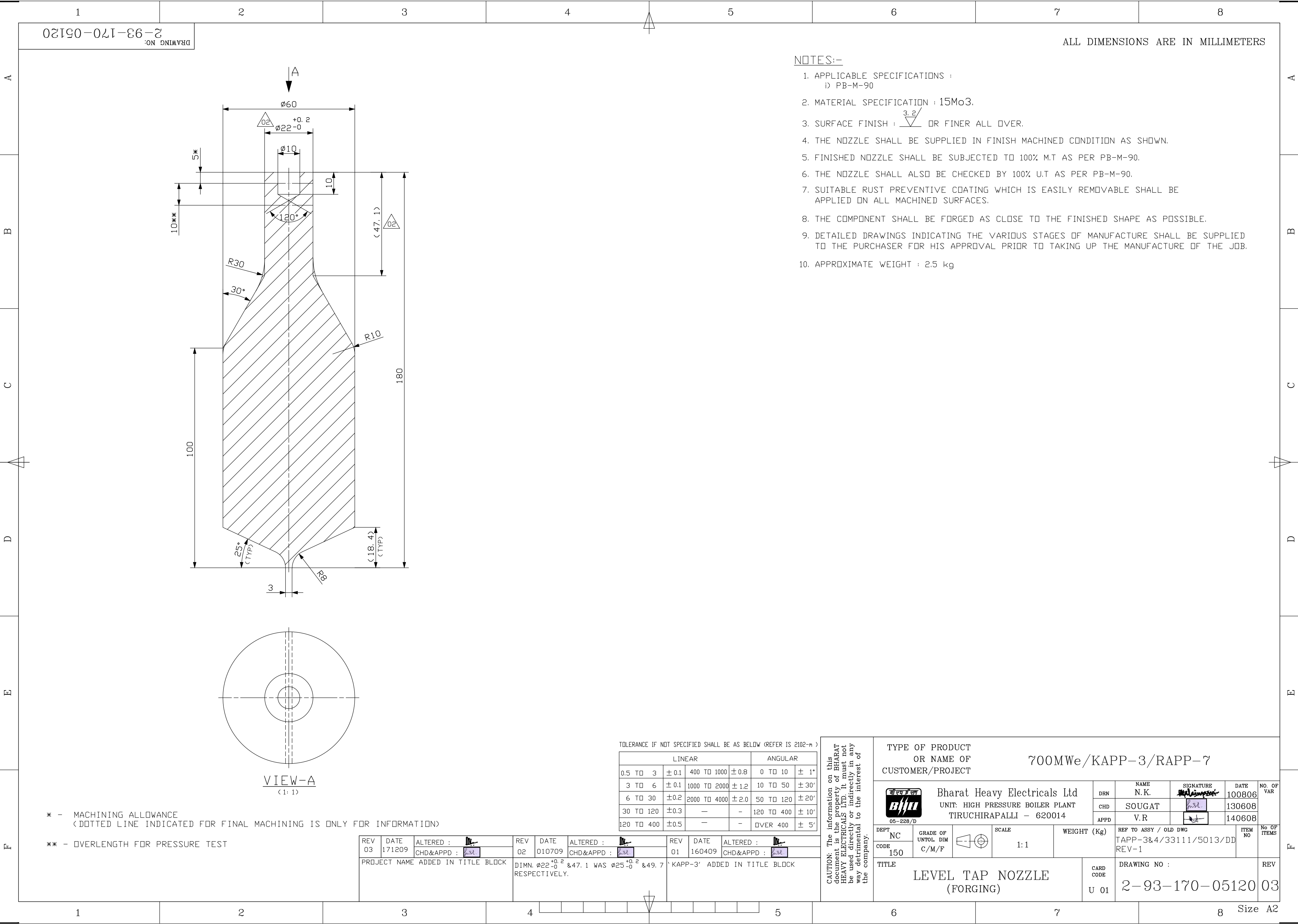
Each forging shall be marked with Product Serial Number, Heat and Material Specification. In case of forgings accompanied with forged test plates, corresponding test plate identification shall also be marked on the main forging indicating correspondence with top/bottom of original ingot.

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.



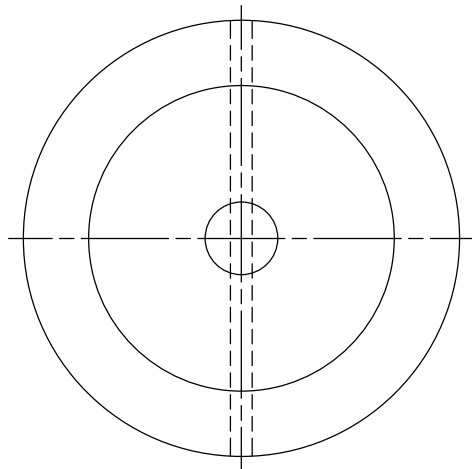
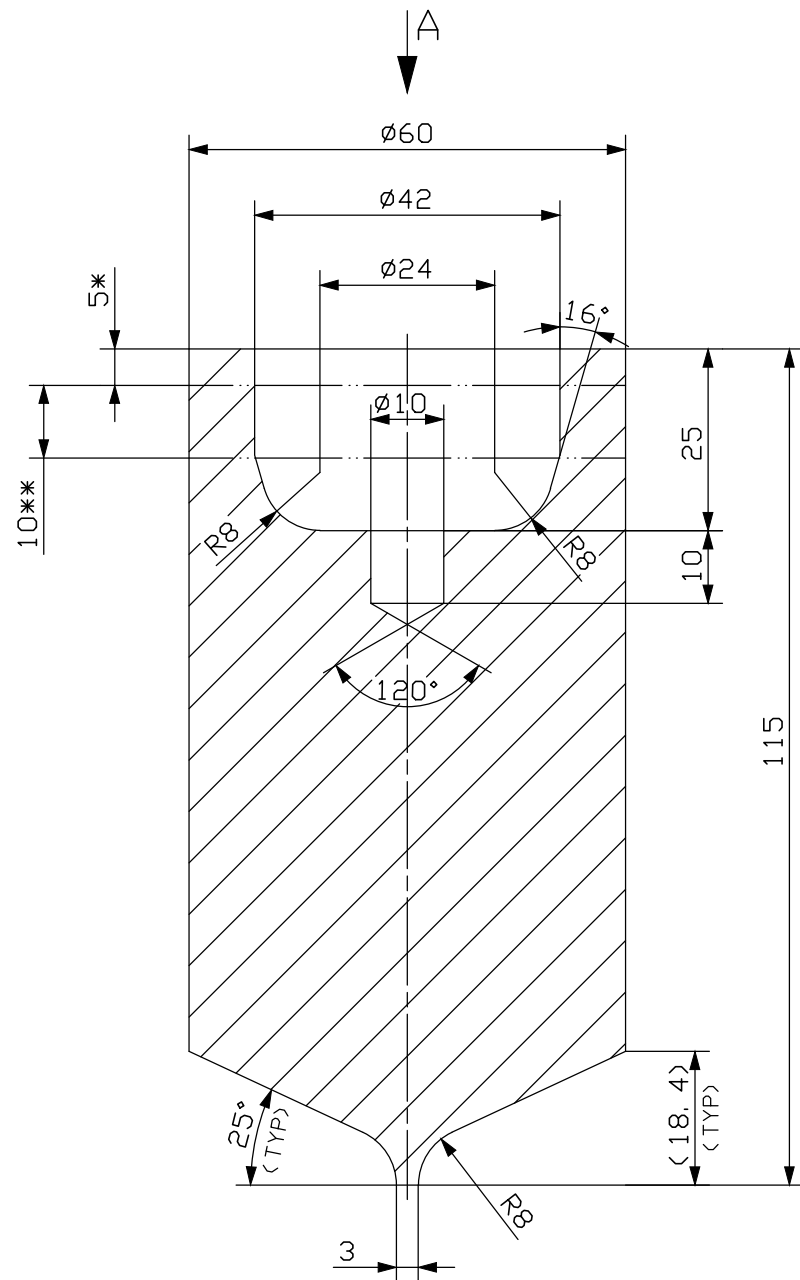






ALL DIMENSIONS ARE IN MILLIMETERS

1. APPLICABLE SPECIFICATIONS :  
i) PB-M-90
2. MATERIAL SPECIFICATION : 15Mo3.
3. SURFACE FINISH :  $\frac{3.2}{\sqrt{A}}$  OR FINER ALL OVER.
4. THE NOZZLE SHALL BE SUPPLIED IN FINISH MACHINED CONDITION AS SHOWN.
5. FINISHED NOZZLE SHALL BE SUBJECTED TO 100% M.T AS PER PB-M-90.
6. THE NOZZLE SHALL ALSO BE CHECKED BY 100% U.T AS PER PB-M-90.
7. SUITABLE RUST PREVENTIVE COATING WHICH IS EASILY REMOVABLE SHALL BE APPLIED ON ALL MACHINED SURFACES.
8. THE COMPONENT SHALL BE FORGED AS CLOSE TO THE FINISHED SHAPE AS POSSIBLE.
9. DETAILED DRAWINGS INDICATING THE VARIOUS STAGES OF MANUFACTURE SHALL BE SUPPLIED TO THE PURCHASER FOR HIS APPROVAL PRIOR TO TAKING UP THE MANUFACTURE OF THE JOB.
10. APPROXIMATE WEIGHT : 2 kg







VIEW-A  
 (1:1)

\* - MACHINING ALLOWANCE  
(DOTTED LINE INDICATED FOR FINAL MACHINING IS ONLY FOR INFORMATION)





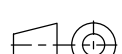
\*\* - OVERLENGTH FOR PRESSURE TEST

TOLERANCE IF NOT SPECIFIED SHALL BE AS BELOW (REFER IS 2102-m)						
LINEAR				ANGULAR		
0.5 TO 3	±0.1	400 TO 1000	±0.8	0 TO 10	± 1°	
3 TO 6	±0.1	1000 TO 2000	±1.2	10 TO 50	± 30'	
6 TO 30	±0.2	2000 TO 4000	±2.0	50 TO 120	± 10'	
30 TO 120	±0.3	—	—	120 TO 400	± 20'	
120 TO 400	±0.5	—	—	OVER 400	± 5'	

REV 02	DATE 171209	ALTERED :  CHD&APPD : 	REV 01	DATE 160409	ALTERED :  CHD&APPD : 
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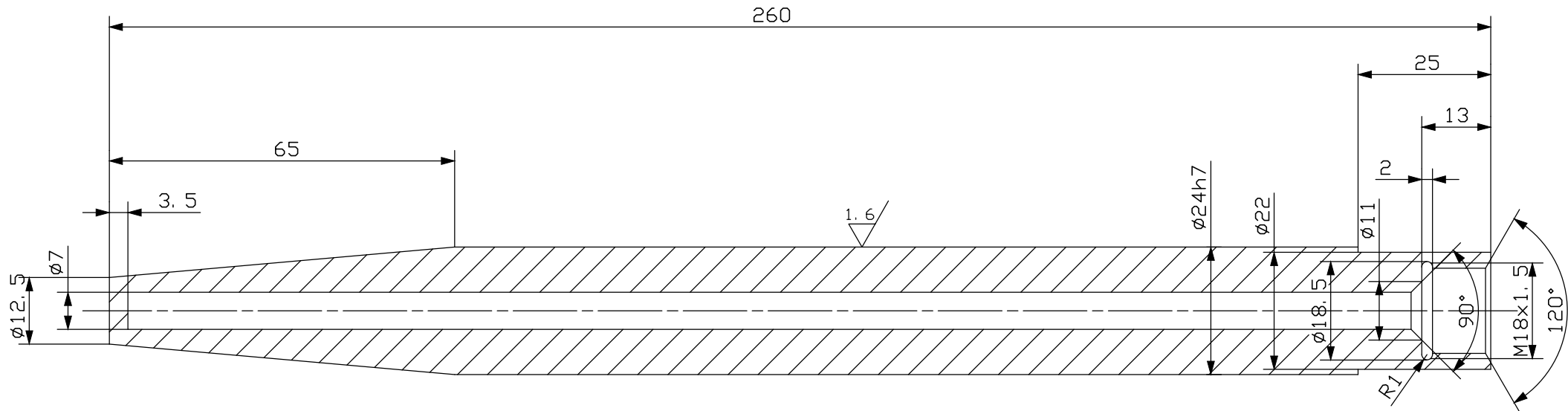
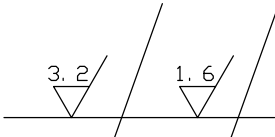
PROJECT NAME ADDED IN TITLE BLOCK	'KAPP-3' ADDED IN TITLE BLOCK
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TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		700MWe / KAPP-3 / RAPP-7				
 Bharat Heavy Electricals Ltd UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI - 620014 05-228/D		DRN	NAME N. K.	SIGNATURE 	DATE 120806	No. OF VAR
		CHD	SOUGAT		130608	
		APPD	V. R.		140608	
DEPT NC	GRADE OF UNTOL. DIM C/M/F	 SCALE 1:1	WEIGHT (Kg)	REF TO ASSY / OLD DWG TAPP-3&4/33111/5014/DD REV-0		ITEM NO
CODE 150						No. OF ITEMS
TITLE TEMPERATURE MEASUREMENT NOZZLE (FORGING)			CARD CODE U 01	DRAWING NO : 2-93-170-05121		REV 02

3-93-170-05171  
DRAWING NO:

ALL DIMENSIONS ARE IN MILLIMETERS





NOTES:-

1. APPLICABLE SPECIFICATIONS : PB-M-90
2. MATERIAL SPECIFICATION :15Mo3.
3. MISSING DATA SHALL BE SELECTED BY MANUFACTURER IN CONSULTATION WITH CUSTOMER AND MANUFACTURING DRG. SHALL BE SUBMITTED FOR APPROVAL.
4. MACHINED SURFACES SHALL BE SUITABLY PROTECTED BY BRIGHT COLOURED PEELABLE PLASTIC COAT.
5. THREADED SURFACE SHALL BE SUITABLY PROTECTED WITH SUITABLE THREADED PLUG.
6. THE DESIGN OF THERMOWELL IS SIMILAR TO DIN 43767, FORM D4.
7. APPROXIMATE WEIGHT : 0.72 kg


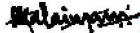


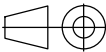
TOLERANCE IF NOT SPECIFIED SHALL BE AS BELOW (REFER IS 2102-m )

LINEAR				ANGULAR	
0.5 TO 3	± 0.1	400 TO 1000	± 0.8	0 TO 10	± 1°
3 TO 6	± 0.1	1000 TO 2000	± 1.2	10 TO 50	± 30'
6 TO 30	± 0.2	2000 TO 4000	± 2.0	50 TO 120	± 20'
30 TO 120	± 0.3	—	—	120 TO 400	± 10'
120 TO 400	± 0.5	—	—	OVER 400	± 5'

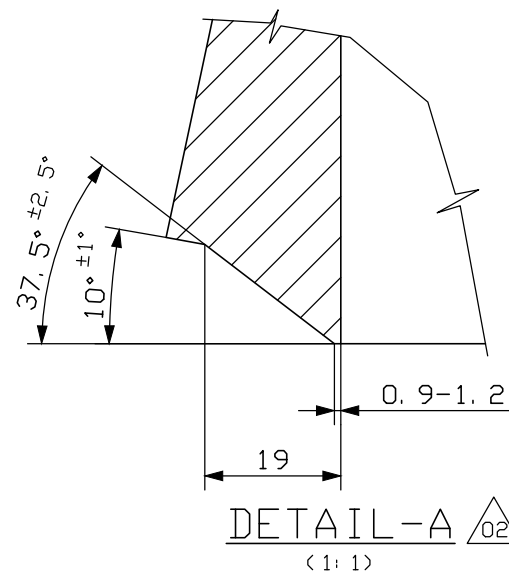
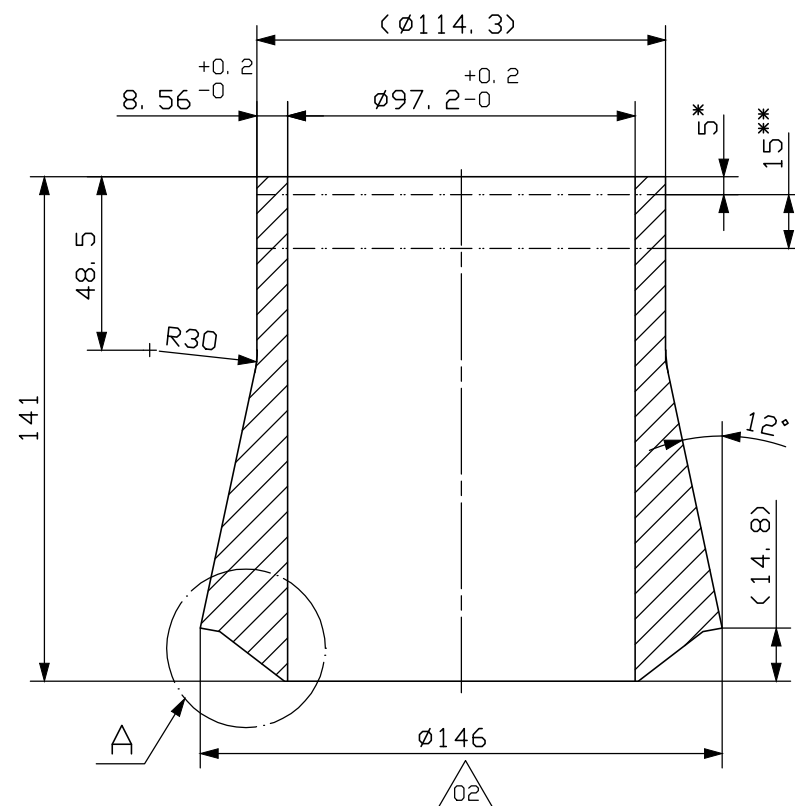
REV	DATE	ALTERED :
02	171209	CHD&APPD :
PROJECT NAME ADDED IN TITLE BLOCK		

ø24h7		0	-0.021
TOLERANCED DIMENSION		UPPER	LOWER
		ALLOWANCE	
GEN. TOLERANCE			
WELDING			
REV	DATE	ALTERED :	
01	170409	CHD&APPD :	
'KAPP-3' ADDED IN TITLE BLOCK			

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TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT					700MWe /KAPP-3/RAPP-7				
<div> 05-229/D</div> <div>Bharat Heavy Electricals Ltd UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI - 620014</div>					DRN	NAME N.K.	SIGNATURE 	DATE 170906	No. OF VAR
					CHD	SOUGAT		130608	
					APPD	V.R		140608	
EPT NC	GRADE OF UNTOL. DIM C/M/F		SCALE 1:1	WEIGHT (Kg) 0.72	REF TO ASSY / OLD DWG KAPP-3&4/33111/4006/DD			ITEM NO	No OF ITEMS
ODE 150									
TITLE THERMOWELL					CARD CODE U 01	DRAWING NO : 3-93-170-05171			REV 02

3-93-170-05234  
DRAWING NO:



TOLERANCE IF NOT SPECIFIED SHALL BE AS BELOW (REFER IS 2102-m)

LINEAR				ANGULAR	
0.5 TO 3	± 0.1	400 TO 1000	± 0.8	0 TO 10	± 1°
3 TO 6	± 0.1	1000 TO 2000	± 1.2	10 TO 50	± 30'
6 TO 30	± 0.2	2000 TO 4000	± 2.0	50 TO 120	± 20'
30 TO 120	± 0.3	—	—	120 TO 400	± 10'
120 TO 400	± 0.5	—	—	OVER 400	± 5'

REV	DATE	ALTERED :	REV	DATE	ALTERED :
02	080610	CHD&APPD : [Signature]	01	181209	CHD&APPD : [Signature]
NOZZLE ID & OTHER PROFILE DIMENSIONS ARE CHANGED AS PER CUSTOMER LETTER KAPP-3&4/RAPP-7&8/33111/NP/2010/M/165 DATED 02.06.2010.			PROJECT NAME ADDED IN TITLE BLOCK		

## NOTES:-

1. APPLICABLE SPECIFICATIONS :  
i) PB-M-90
2. MATERIAL SPECIFICATION : 15Mo3.
3. SURFACE FINISH :  $\sqrt{3.2}$  OR FINER ALL OVER.
4. THE NOZZLE SHALL BE SUPPLIED IN FINISH MACHINED CONDITION AS SHOWN.
5. FINISHED NOZZLE SHALL BE SUBJECTED TO 100% M.T AS PER PB-M-90.
6. THE NOZZLE SHALL ALSO BE SUBJECTED TO 100% U.T AS PER PB-M-90.
7. SUITABLE RUST PREVENTIVE COATING WHICH IS EASILY REMOVABLE SHALL BE APPLIED ON ALL MACHINED SURFACES.
8. THE COMPONENT SHALL BE FORGED AS CLOSE TO THE FINISHED SHAPE AS POSSIBLE.
9. DETAILED DRAWINGS INDICATING THE VARIOUS STAGES OF MANUFACTURE SHALL BE SUPPLIED TO THE PURCHASER FOR HIS APPROVAL PRIOR TO TAKING UP THE MANUFACTURE OF THE JOB.
10. WALL THICKNESS INDICATED ARE MINIMUM VALUES.
11. APPROXIMATE WEIGHT : 5.077 kg

- \* - MACHINING ALLOWANCE.
- \*\* - OVERLENGTH FOR PRESSURE TEST.

TYPE OF PRODUCT  
OR NAME OF  
CUSTOMER/PROJECT

700MWe/KAPP-3/RAPP-7



Bharat Heavy Electricals Ltd  
UNIT: HIGH PRESSURE BOILER PLANT  
TIRUCHIRAPALLI - 620014

DEPT	GRADE OF UNTOL. DIM	SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG	ITEM NO	No OF ITEMS
NC	C/M/F	1:2 ; 1:1				
CODE						
150						
TITLE			CARD CODE	DRAWING NO :	REV	
PDHRS NOZZLE END PART (FORGING)			U 01	3-93-170-05234	02	

Size A3