An ISO 9001 Company

Bharat Heavy Electricals Limited

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

TITLE **SUPPLY OF REACTOR HEADER FORGINGS TO BHEL TRICHY**	Phone: +91 431 2577480 / 2577446 Fax : +91 431 2520 719 Email : tkr@bheltry.co.in

Reference Number: 1401100007	**Date: 06.01.11**	**Due date for submission of offer : 11.02.11**

BHEL / Trichy is looking for Vendors to supply REACTOR HEADER FORGINGS and related items 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 "1401100007 "

Offer should reach us before 14:00 hours on the due date of 11.01.2011.	Yours faithfully, MANAGER / PURCHASE/ C&F / MM For **Bharath Heavy Electricals Limited**

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BHARAT HEAVY ELECTRICALS LIMITED

ENQUIRY

(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:

Enquiry No	Enquiry Date	Due Date for Quotation
1401100007	06.01.2011	11.02.2011

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 Schedule Quantity	Delivery Schedule Date
10	D13930229001 Reactor Outlet Header-H1 as per DRG 0-93-420-05151/03. Reactor Outlet Header-H1 as per DRG 0-93-420-05151/03.	NO	4.000	4.00	30.06.11
20	D13930229002 Reactor Inlet Header-H2 as per DRG 0-93-420-05152/03.	NO	4.000	4.00	30.06.11
30	D13930229003 Reactor Inlet Header-H3 as per DRG 0-93-420-05153/03.	NO	4.000	4.00	30.06.11
40	D13930229004 Reactor Outlet Header-H4 as per DRG 0-93-420-05154/03.	NO	4.000	4.00	30.06.11
50	D13930229005 Reactor Outlet Header-H5 as per DRG 0-93-420-05155/03.	NO	4.000	4.00	30.06.11
60	D13930229006 Reactor Inlet Header-H6 as per DRG 0-93-420-05156/03.	NO	4.000	4.00	30.06.11
70	D13930229007 Reactor Inlet Header-H7 as per DRG 0-93-420-05157/03.	NO	4.000	4.00	30.06.11
80	D13930229008 Reactor Outlet Header-H8 as per DRG 0-93-420-05158/03.	NO	4.000	4.00	30.06.11
90	D13930229009 R O H Dished End as per DRG 3-93-420-05237/00.	NO	32.000	32.00	30.06.11
100	D13930229010 R I H Dished End as per DRG 3-93-420-05238/00.	NO	32.000	32.00	30.06.11

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
25TH OCT-1ST NOV 2010
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,

BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)
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1401100007 / 06.01.2011

110	D13930229011 3/8" N B Instrumentation Nozzle as per DRG 3-93-420-05243/01.	NO	1720.000	1,720.00	30.06.11
120	D13930229012 SAMPLE FORGING-1 as per Drg SK:4:D139:001/00 and Clause No. 9.3 of Technical delivery condition No. D139-TDC-001 Rev:02	NO	1.000	1.00	30.06.11
130	D13930229013 SAMPLE FORGING-2 as per Drg SK:4:D139:002/00 and Clause No. 9.3 of Technical delivery condition No. D139-TDC-001 Rev:02	NO	1.000	1.00	30.06.11
140	D13930229014 SAMPLE FORGING-3 as per Drg SK-4-D139-003/00 and Clause No. 9.3 of Technical delivery condition No. D139-TDC-001 Rev:02	NO	1.000	1.00	30.06.11
150	D13930229015 SAMPLE FORGING-4 as per Drg SK-4-D139-004/00 and Clause No. 9.3 of Technical delivery condition No. D139-TDC-001 Rev:02	NO	1.000	1.00	30.06.11
160	D13930229016 FORGED PIPE OD 457 x 65thk ---3200 Lg	NO	2.000	2.00	31.05.11
170	D13930229017 SAMPLE FORGING-5 as per Drg SK:4:D139:005/00 and Clause No. 9.3 of Technical delivery condition No. D139-TDC-001 Rev:02	NO	1.000	1.00	30.06.11
180	D13930229018 SAMPLE FORGING-6 as per Drg SK:4:D139:006/00 and Clause No. 9.3 of Technical delivery condition No. D139-TDC-001 Rev:02	NO	1.000	1.00	30.06.11

General Note:

01. Bidders shall submit the OFFER (a single envelope containing two inner envelopes) as indicated below:

Envelope I: This sealed envelope should contain
(a) technical bid
(b) un-priced commercial bid (copy of the Price Bid without the price details)

The offers should reach us 30 minutes before the time of opening of tenders.
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HIGH PRESSURE BOILER PLANT
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(c) duly filled and signed Integrity Pact and
(d) duly filled and signed Annexure II.

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.

The OFFER, sealed and superscribed 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). Tenders received after 14.00 Hrs (IST) will not be considered for evaluation.

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 (the price bid) will not be opened before the technical evaluation is completed, bidders are requested not to submit their bids through email/fax etc.

02. All forgings are to be supplied as per
a. Spec. SA350LF2CL.1
b. Drawing nos. mentioned against each item in the enquiry &
c. TDC: D139-TDC-001 Rev:02

03. Inspection:
aa. For foriegn suppliers: by any of the three approved third parties viz.,
i. TUV Nord (North) ii. BV and iii. SGS.
bb. For Indian suppliers: by BHEL and customer (NPCIL)

04. Offer validity should be minimum 90 days from the date of tender opening.

05. Acceptance of Performance Bank Guarantee (PBG) of 10% of the order value to be confirmed.

06. 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. Offers from suppliers sourcing materials from

China / supplies from China are not acceptable. Offers from Traders are also not acceptable.

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MANAGER / PURCHASE
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(A Government of India Undertaking)
HIGH PRESSURE BOILER PLANT
PURCHASE DEPARTMENT - FOSSIL BOILERS
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07. All the items are to be quoted on "per unit" basis.

08. All the items are to be procured from a single source and order will 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). Evaluation of offers shall be on "Net Cash Outflow to BHEL basis" for all the items as a package.

09. Duly filled & signed Integrity Pact (IP) should be furnished along with offer. IP should be signed by the authorized official of the bidder / vendor / contractor.

    Offers without enclosing the signed IP will be rejected.

10. This tender / contract will be monitored by an Independent External Monitor (IEM) by name

    Shri D.P.Bagchi, IAS (Retd.)

11. The materials are required for 700MWe Nuclear Power Plant for KAPP 3&4 and RAPP 7&8 and

    "End Use Certificate" will not be given.

12. Wherever specification(s) / approved specification(s) is indicated in the drawings, it refers to the document D139-TDC-001 Rev:02.

13. "Clause No.9.3 of TDC No. D139-TDC-001 (Latest Rev)" indicated in the drawings shown against enquiry sl.nos. 120, 130, 140, 150, 170 & 180 is to be read as "Clause No. 9.3 of the document D139-TDC-001 Rev:02".

14. Agency agreement from foreign suppliers for their Indian agents:
    The following details are to be furnished along with the offer:
    14a. Precise relationship between foreign suppliers and their Indian agents and their mutual interest in the business, should be clearly spelt out.
    14b. 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.
    14c. 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.
    14d. 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.

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15. LD clause: If the 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 of delay upto a maximum of 15% of the price of the delayed/ undelivered goods.

16. 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 aforesaid or if the same were not available, the best and the nearest available substitutes 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.

17. 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.

18. 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.

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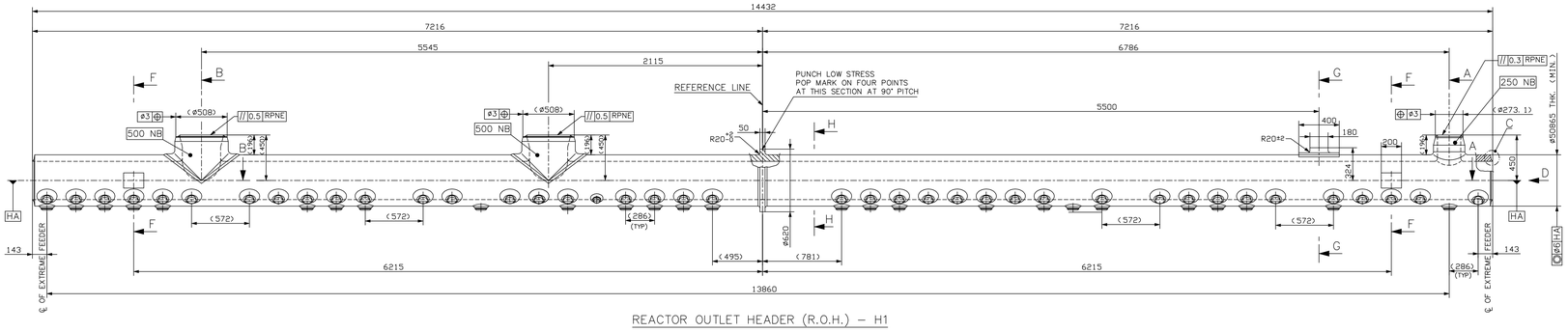
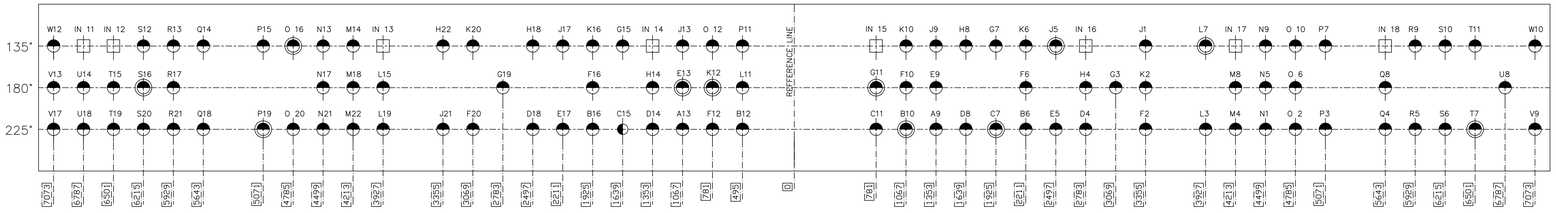
Yours faithfully,
For **BHARAT HEAVY ELECTRICALS LIMITED**

MANAGER / PURCHASE
(FOSSIL BOILERS)
Yours faithfully,

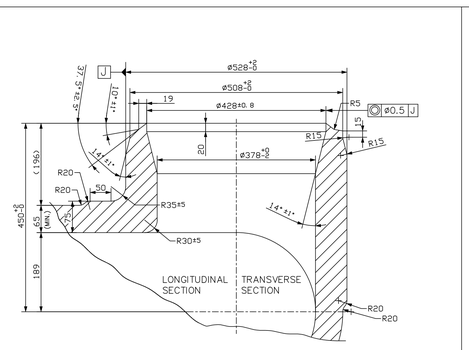
DRAWING NO 0-93-420-05151



REACTOR OUTLET HEADER (R.O.H.) – H1



FEEDER PIPE NOZZLE DEVELOPED PLAN FOR (R.O.H.)– H1



500 NB

SECTION–BB
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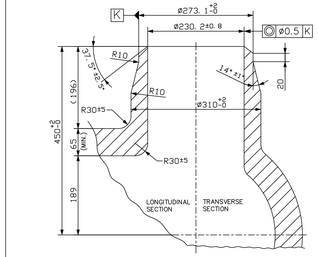

250 NB

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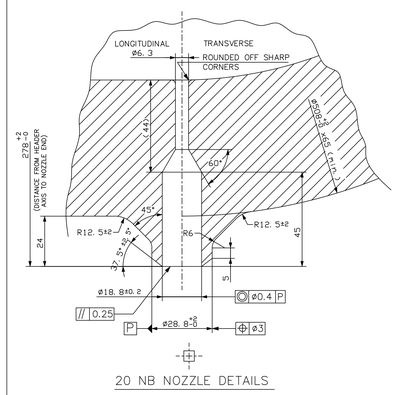
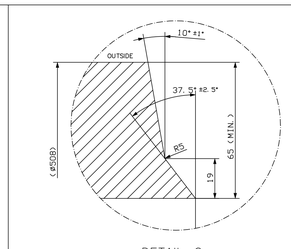
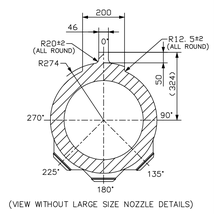


20 NB NOZZLE DETAILS

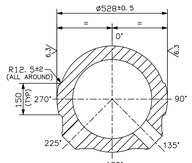


DETAIL–C
(1:1)



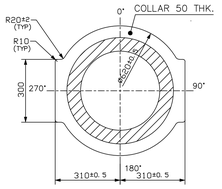
(VIEW WITHOUT LARGE SIZE NOZZLE DETAILS)

SECTION–GG



(VIEW WITHOUT LARGE SIZE NOZZLE DETAILS)

SECTION–FF



(VIEW WITHOUT NOZZLE AND FEEDERS DETAILS)

SECTION–HH

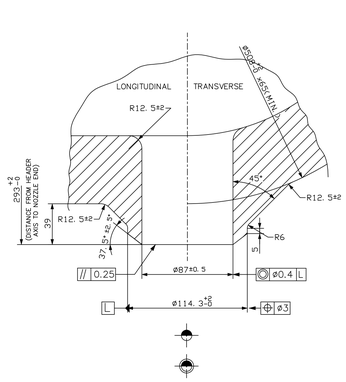
ALL DIMENSIONS ARE IN MILLIMETERS

NOTES:

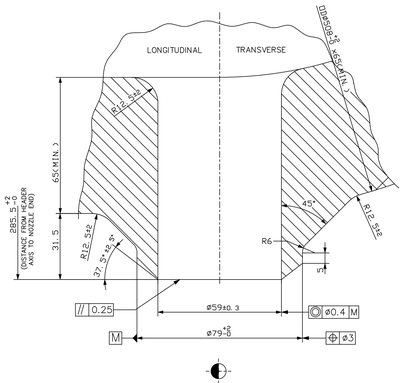
1. MATERIAL SPECIFICATION FOR THE HEADER FORGING IS SA350 GR. LF2 CL. 1. WITH SUPPLEMENTARY REQUIREMENTS ON CHEMICAL COMPOSITION AS GIVEN IN THE APPROVED SPECIFICATION.
2. FORGED HEADER MATERIAL MANUFACTURING, TESTING, EXAMINATIONS AND PACKING SHALL BE IN ACCORDANCE WITH ASME SEC. III NB CL. 1 AND AS PER APPROVED SPECIFICATION.
3. THE HEADER WITH INTEGRAL NOZZLES SHOWN IN THE DRAWING SHALL BE MANUFACTURED BY FORGING OR FORMING OR COMBINATION OF SIMILAR OPERATIONS.
4. HEADER IS TO BE FORGED AS SINGLE PIECE AND IT SHALL BE SUPPLIED AS NORMALISED CONDITION, WELD JOINTS ARE NOT PERMITTED TO FORM THE HEADER.
5. HEADERS H1 TO H8 SHALL BE IN FULL COMPLIANCE WITH SPECIFICATION WITH THE FOLLOWING EXCEPTIONS AND ADDITIONAL REQUIREMENTS.
   - 5.1 MATERIAL SHALL BE FULLY KILLED, FINE GRAINED STEEL PRODUCED BY VACUUM TREATMENT AND ELECTRO SLAG REMELTING SHALL BE USED, ADDITIONAL IMPURITY ELEMENTS RESTRICTION Sn=0.0115 MAX, N=0.013% MAX, As=0.025% MAX, AND Sb=0.007% MAX SHALL APPLY.
   - 5.2 REPRESENTATIVE NOZZLES SHALL BE SECTIONED IN LONGITUDINAL & TRANS PLANES AND EXAMINED FOR METAL FLOW, SOUNDNESS, REQUIRED CONTOURS AND REINFORCEMENT BY SUPPLIER. SAMPLE NOZZLES AND HEADER PIPE TEST SECTIONS FROM SAME PRODUCTION HEAT FOR PURCHASER'S USE SHALL BE SUPPLIED.
   - 5.3 TEST COUPONS TAKEN FROM EACH HEADER SHALL BE SUBJECTED TO SIMULATED POST WELD HEAT TREATMENT AS REQUIRED IN ASME SEC.–III NB, AT 600 PLUS OR MINUS 10°C X 6 Hrs. MAXIMUM.
   - 5.5 ADDITIONAL FRACTURE TOUGHNESS REQUIREMENT SHALL BE AS PER NB-2331 AS APPLICABLE TO VESSEL IMPACT SPECIMENS, ORIENTED IN TRANSVERSE (TANGENTIAL) AND NORMAL (RADIAL) DIRECTIONS, SHALL BE TESTED AT TEMPERATURE NOT GREATER THAN + 15°C TO OBTAIN 68 JOULES AND 0.90mm OF ABSORBED ENERGY AND LATERAL EXPANSION RESPECTIVELY AS A MIN. NDT TEMPERATURE AS DETERMINED BY DROP WEIGHT TEST SHALL BE LOWER THAN –15°C DROP WEIGHT CONFIRMATORY TEST SHALL SHOW TWO 'NO BREAKS' AT –15°C.
   - 5.6 ALL SPECIFIED MECHANICAL, METALOGRAPHIC, CHEMICAL ANALYSIS TEST SHALL BE CONDUCTED ON SPECIMENS TAKEN FROM BOTH ENDS AND MID LENGTH REGION OF EACH HEADER. THE SPECIFIED MIN. TEST VALUES SHALL BE APPLICABLE AND COMPLIED BY SPECIMENS OF ALL ORIENTATIONS: LONGITUDINAL, TRANSVERSE AND NORMAL (i.e AXIAL, TRANGENTIAL AND RADIAL RESPECTIVELY) DETAILS SHALL BE PROVIDED BY THE BIDDER.
   - 5.7 SURFACE FINISH SHALL BE 6.3 MICRONS ALL OVER.
   - 5.8 WALL THICKNESS INDICATED ARE SPECIFIED IN MINIMUM VALUES.
6. WHEN NOT SPECIFIED THE BEST TOLERANCE ACHIEVABLE ON THE VARIOUS DIMENSIONS SHALL BE CLEARLY INDICATED BY THE SUPPLIER.
7. SPECIAL REQUIREMENTS WHEN NOZZLE PROTRUSIONS ARE OBTAINED BY MACHINING.
   - 7.1 AS FORGED HEADER SHALL BE OF SUITABLE CONFIGURATION, SOUNDNESS AND PROPERTIES SUCH THAT THE NOZZLES SHALL ALSO HAVE SPECIFIED MECHANICAL PROPERTIES ALONG THEIR AXES.
   - 7.2 FROM BOTH END AND MID LENGTH REGION OF EACH HEADER, ADDITIONAL TENSION IMPACT AND DROP WEIGHT TEST SHALL BE CONDUCTED ON RADIAL SPECIMENS (PARALLEL TO NOZZLE AXES)
   - 7.3 IMPACT TEST SHALL BE CONDUCTED ON RADIAL SPECIMENS AT ATLEAST 7 TEMPERATURES (–45°C, –15°C, +0°C, +18°C –, –, –°C) AND TRANSITION CURVES (FOR ABSORBED ENERGY, LATERAL EXPANSION, % SHEAR FRACTURE) COVERING LOWER AND UPPER SHELVES SHALL BE DRAWN FOR EACH MELT AND HEAT TREATMENT BATCH. FATIGUE TEST ON RADIAL TANGENTIAL SPECIMENS) SHALL BE CONDUCTED TO DEMONSTRATE THAT MARGINS OF SAFETY ON BOTH Sa (STRAIN AMPLITUDE AND N CYCLES NOT LESS THAN 2 AND 20 RESPECTIVELY ARE AVAILABLE w.r.t. ASME SEC III DIV.1 APPENDICES, DESIGN FATIGUE CURVE Fig: 1-9-1. SUPPLIER SHALL PROVIDE THE DETAILS.
   - 7.4 NOZZLES SHALL BE THOROUGHLY EXAMINED FOR SOUNDNESS BY VOLUMETRIC AND SURFACE NDE (ACCEPTANCE STANDARDS SHALL BE BASED ON FINAL NOZZLE THICKNESS)
   - ~~7.5 DETAILS AND EXTENT OF THE ABOVE MECHANICAL TESTS AND NDE SHALL BE PROPOSED IN THE BID AND MUTUALLY AGREED UPON BEFORE PLACEMENT OF ORDER.~~
8. DETAILED DRAWING INDICATING VARIOUS STAGES OF MANUFACTURE SHALL BE SUBMITTED FOR APPROVAL
9. WELD EDGES AND MACHINED SURFACES SHALL BE SUBJECTED TO MT/ PT AS PER APPROVED SPECIFICATIONS.
10. ALL MACHINED SURFACES AND WELD EDGES SHALL BE SUITABLY PROTECTED DURING TRANSPORTATION.
11. HEADERS SHALL BE PROPERLY PACKED AND COVERED IN WOODEN BOX STRENGTHENED WITH SUITABLE STEEL STRUCTURE.
12. HEADER FORGING SHALL BE SUPPLIED IN FINISH MACHINED CONDITION.
13. DETAILED FORGING DRAWING SHALL BE SUBMITTED BY SHOWING LOCATIONS OF THE TEST COUPONS.
14. RPNE – THE PLANE PERPENDICULAR TO THE REFERENCE PLANE OF THE NOZZLE AXIS PARALLEL TO REFERENCE HEADER AXIS (HA) AT THE DISTANCE SHOWN IN THE DRAWING FROM REFERENCE HEADER AXIS.
15. SUITABLE PERMANENT MARKS SHALL BE MARKED ON THE EXTERNAL SURFACE OF HEADER FOR DEFINING 'HA'
16. TOLERANCE ON LENGTH DIMENSIONS ARE ±3mm UNLESS OTHERWISE SPECIFIED.
17. TOLERANCE IF NOT SPECIFIED SHALL BE GIVEN BELOW FOR MACHINING
    0 TO 50 ±0.2
    50 TO ABOVE ±0.3

NOZZLE LEGENDS AND QUANTITY DETAILS

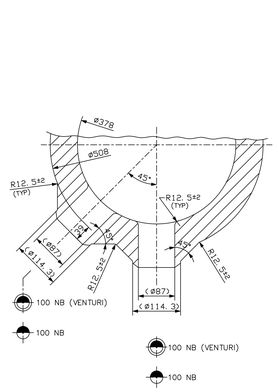
SYMBOL	NOZZLE DESCRIPTION	No. OFF NOZZLE OPENINGS
	FEEDER PIPE NOZZLE 100NB	86
	FEEDER PIPE NOZZLE 100NB (VENTURI)	11
	FEEDER PIPE NOZZLE 65NB	1
	INSTRUMENTATION NOZZLE 20NB	8
250 NB	SHUT DOWN COOLING INLET	1
500 NB	S.G. INLET	2



100 NB NOZZLE DETAILS



65 NB NOZZLE DETAILS



MERGING DETAILS OF MAJOR NOZZLES

TOLERANCE IF NOT SPECIFIED SHALL BE AS BELOW (REFER IS2102-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 : CHD&APPD :	NOTES
03	22.12.10		NOTES MINOR CORRECTIONS INCORPORATED
02	24.11.10		DRG. REVISED AS PER CUSTOMER REQUIREMENTS AND NOTE-5.4 DELETED
01	29.10.10		SECTION-FF AND GG ADDED

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 700MWe

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

	NAME	SIGNATURE	DATE	NO. OF YAP
DRN	E.B		14.08.10	
CHD	MANDAL		01.10.10	
APPD	V.R		04.10.10	

DEPT CODE	GRADE OF CNTROL ITM	SCALE	WEIGHT (Kg)	REF TO ADRY / OLD DWG	ITEM NO	No. OF ITEMS
NC 150	C/M/F		10518	KAPP 3A4/33117/2006/DD		

TITLE: REACTOR OUTLET HEADER–H1 (FORGING)

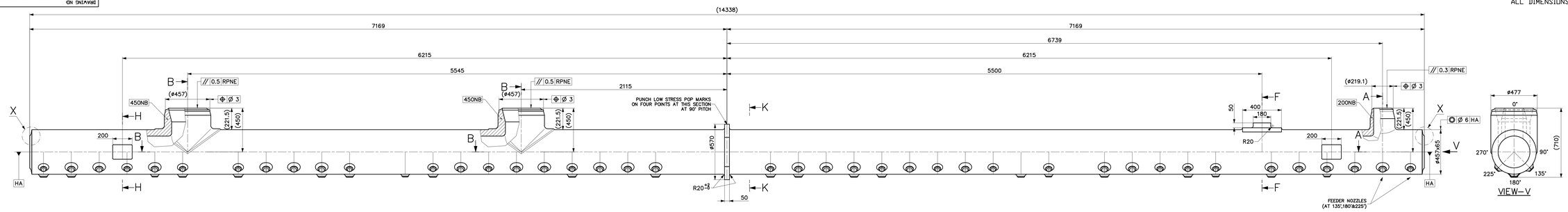
CARD CODE: U 01

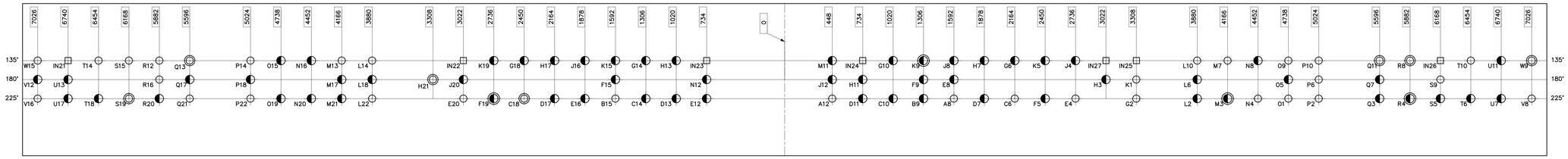
DRAWING NO : 0-93-420-05151 REV 03

Size A0

DRAWING NO. 0-93-420-05152

ALL DIMENSIONS ARE IN MILLIMETERS

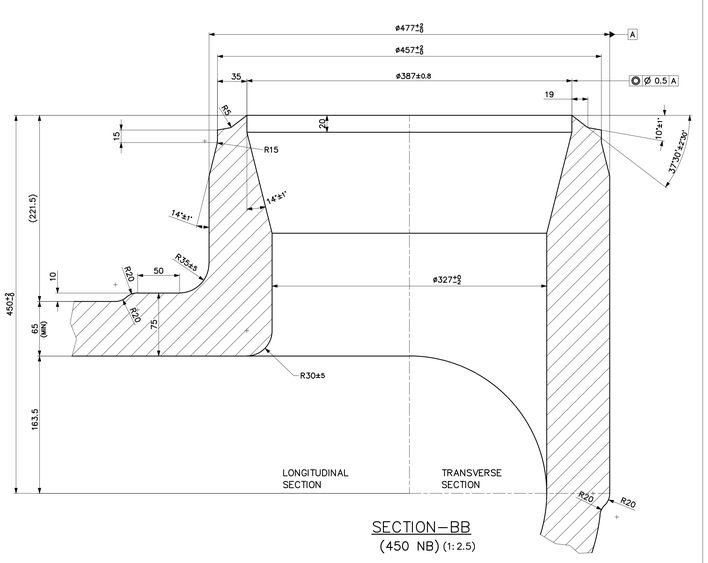




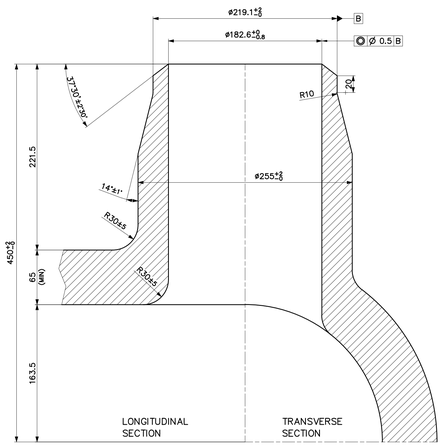
FEEDER PIPE NOZZLES DEVELOPED PLAN FOR RIH–H2

NOZZLE LEGEND & QUANTITY

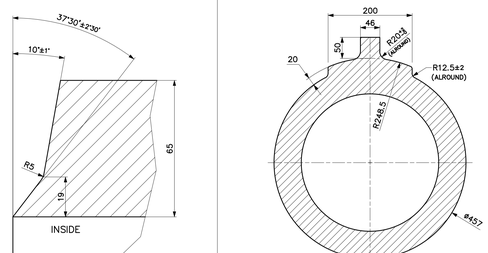
SYMBOL	NOZZLE DESCRIPTION	QTY
◐	FEEDER PIPE NOZZLE 65NB	56
⊕	FEEDER PIPE NOZZLE 50NB	31
⊡	INSTRUMENTATION NOZZLE 20NB	7
◐	FEEDER PIPE NOZZLE 65NB WITH VENTURI	4
⊕	FEEDER PIPE NOZZLE 50NB WITH VENTURI	7
NB200	SHUT–OUT COOLING OUTLET	1
NB450	PCP OUTLET	2



SECTION–BB
(450 NB) (1:2.5)



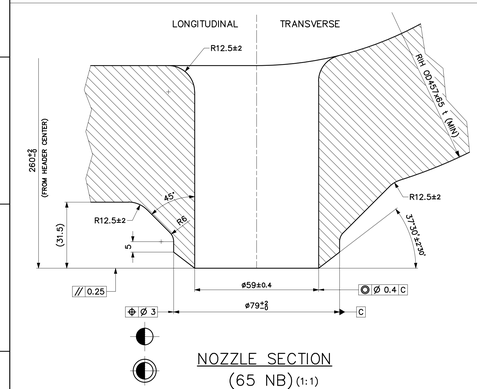
SECTION–AA
(200 NB) (1:2.5)



DETAIL–X

SECTION–FF
(1:5)
(VIEW WITHOUT NOZZLE DETAILS)

SECTION–HH
(1:5)
(VIEW WITHOUT NOZZLE DETAILS)



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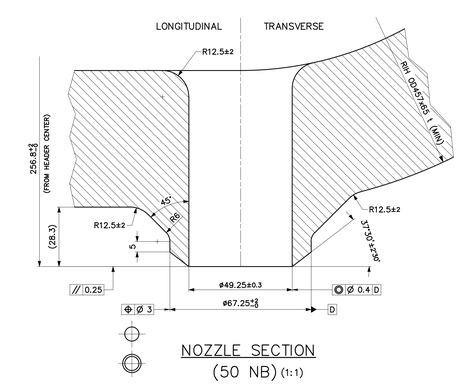
(65 NB) (1:1)



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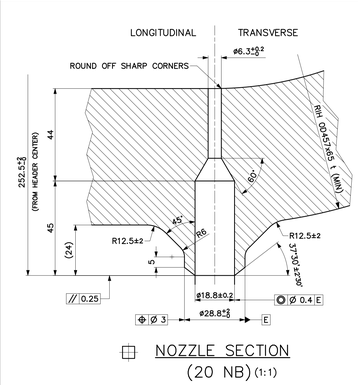
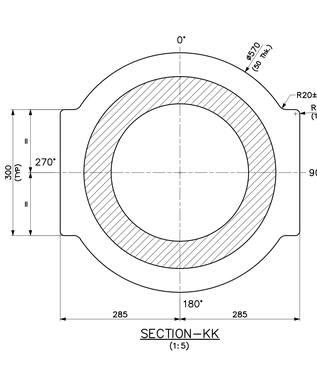
(50 NB) (1:1)



NOZZLE SECTION
(20 NB) (1:1)



SECTION–KK
(1:5)

NOTES: –

1. MATERIAL SPECIFICATION FOR THE HEADER FORGING IS SA350GRLF2 CLASS1 WITH SUPPLEMENTARY REQUIREMENT ON CHEMICAL COMPOSITION AS GIVEN IN THE APPROVED SPECIFICATION.
2. FORGED HEADER MATERIAL, MANUFACTURING, TESTING, EXAMINATIONS AND PACKING SHALL BE IN ACCORDANCE WITH ASME SEC–III NB CL1 AND AS PER APPROVED SPECIFICATION.
3. THE HEADER WITH INTEGRAL NOZZLES SHOWN IN THE DRAWING SHALL BE MANUFACTURED BY FORGING OR FORMING OR A COMBINATION OF SIMILAR OPERATIONS.
4. HEADER IS TO BE FORGED AS SINGLE PIECE AND IT SHALL BE SUPPLIED AS NORMALISED CONDITION. WELD JOINTS ARE NOT PERMITTED TO FORM THE HEADERS.
5. HEADERS H1 TO H8 SHALL BE IN FULL COMPLIANCE WITH SPECIFICATION WITH THE FOLLOWING EXCEPTIONS AND ADDITIONAL REQUIREMENTS.
   - 5.1 MATERIAL SHALL BE FULLY KILLED, FINE GRAINED STEEL PRODUCED BY VACUUM TREATMENT AND ELECTROSLAG REMELTING SHALL BE USED. ADDITIONAL IMPURITY ELEMENT RESTRICTION Sn=0.011% MAX, N=0.013% MAX, As=0.025 MAX AND Sb=0.007 MAX SHALL APPLY.
   - 5.2 REPRESENTATIVE NOZZLES SHALL BE SECTIONED (IN LONGITUDINAL & TRANS. PLANES) AND EXAMINED FOR METAL FLOW, SOUNDNESS, REQUIRED CONTOURS AND REINFORCEMENT BY SUPPLIER. SAMPLE NOZZLES AND HEADER PIPE TEST SECTIONS FROM SAME PRODUCTION HEAT FOR PURCHASER'S USE SHALL BE SUPPLIED.
   - 5.3 TEST COUPONS TAKEN FROM EACH HEADER SHALL BE SUBJECTED TO SIMULATED POST WELD HEAT TREATMENT AS REQUIRED IN ASME SEC–III NB, AT 600 PLUS OR MINUS 10 DEG C x 6 Hrs MAX.
   - 5.5 ADDITIONAL FRACTURE TOUGHNESS REQUIREMENT SHALL BE AS PER NB–2331 AS APPLICABLE TO VESSELS. IMPACT SPECIMENS, ORIENTED IN TRANSVERSE (TANGENTIAL) AND NORMAL (RADIAL) DIRECTIONS, SHALL BE TESTED AT TEMPERATURE NOT GREATER THAN +18 DEG C TO OBTAIN 68 JOULES AND 0.90 MM OF ABSORBED ENERGY AND LATERAL EXPANSION RESPECTIVELY AS A MINIMUM NDT TEMPERATURE AS DETERMINED BY DROP WEIGHT TEST SHALL BE LOWER THAN MINUS 15 DEG C DROP WEIGHT CONFIRMATORY TEST SHALL SHOW TWO 'NO BREAKS' AT MINUS 15 DEG C
   - 5.6 ALL SPECIFIED MECHANICAL, METALLOGRAPHIC, CHEMICAL ANALYSIS TESTS SHALL BE CONDUCTED ON SPECIMENS TAKEN FROM BOTH ENDS AND MID LENGTH REGION OF EACH HEADER. THE SPECIFIED MIN. TEST VALUES SHALL BE APPLICABLE AND COMPLIED BY SPECIMENS OF ALL ORIENTATIONS: LONGITUDINAL, TRANVERSE AND NORMAL (ie., AXIAL, TANGENTIAL AND RADIAL RESPECTIVELY) DETAILS SHALL BE PROVIDED BY THE BIDDER.
   - 5.7 SURFACE FINISH SHALL BE 6.3 $\sqrt{}$ MICRONS ALL OVER.
   - 5.8 WALL THICKNESS INDICATED ARE SPECIFIED IN MINIMUM VALUE.
6. WHEN NOT SPECIFIED, THE BEST TOLERANCE ACHIEVABLE ON THE VARIOUS DIMENSIONS SHALL BE CLEARLY INDICATED BY THE SUPPLIER.
7. SPECIAL REQUIREMENTS WHEN NOZZLE PROTRUSIONS ARE OBTAINED BY MACHINING.
   - 7.1 AS FORGED HEADER SHALL BE OF SUITABLE CONFIGURATION, SOUNDNESS AND PROPERTIES SUCH THAT THE NOZZLES SHALL ALSO HAVE SPECIFIED MECHANICAL PROPERTIES ALONG THEIR AXES.
   - 7.2 FROM BOTH END & MID LENGTH REGION OF EACH HEADER, ADDITIONAL TENSION IMPACT AND DROP WEIGHT TESTS SHALL BE CONDUCTED ON RADIAL SPECIMENS (PARALLEL TO NOZZLE AXES)
   - 7.3 IMPACT TESTS SHALL BE CONDUCTED ON RADIAL SPECIMENS AT ATLEAST 7 TEMPERATURES (–45 DEG C, –15 DEG C, +0 DEG C, +18 DEG C, –,–,– DEG C) AND TRANSITION CURVES (FOR ABSORBED ENERGY, LATERAL EXPANSION, % SHEAR FRACTURE) COVERING LOWER AND UPPER SHELVES SHALL BE DRAWN FOR EACH MELT AND HEAT TREATMENT BATCH. FATIGUE TESTS (ON RADIAL AND TANGENTIAL SPECIMENS) SHALL BE CONDUCTED TO DEMONSTRATE THAT MARGINS OF SAFETY ON BOTH Sa (STRAIN AMPLITUDE) AND N (CYCLES) NOT LESS THAN 2 AND 20 RESPECTIVELY ARE AVAILABLE w.r.t. ASME SEC–III DIV–1 APPENDICES DESIGN FATIGUE CURVE FIG: 1–9–1 SUPPLIER SHALL PROVIDE THE DETAILS.
   - 7.4 NOZZLES SHALL BE THOROUGHLY EXAMINED FOR SOUNDNESS BY VOLUMETRIC AND SURFACE NDE. (ACCEPTANCE STANDARDS SHALL BE BASED ON FINAL NOZZLE THICKNESS)
   - ~~7.5 DETAILS AND EXTENT OF THE ABOVE MECHANICAL TESTS AND NDE SHALL BE PROPOSED IN THE BID AND MUTUALLY AGREED UPON BEFORE PLACEMENT OF ORDER.~~
8. DETAILED DRAWING INDICATING VARIOUS STAGES OF MANUFACTURE SHALL BE SUBMITTED FOR APPROVAL.
9. WELD EDGES AND MACHINED SURFACES SHALL BE SUBJECTED TO MT/PT AS PER APPROVED SPECIFICATION.
10. ALL MACHINED SURFACES AND WELD EDGES SHALL BE SUITABLY PROTECTED DURING TRANSPORTATION.
11. HEADERS SHALL BE PROPERLY PACKED AND COVERED IN WOODEN BOX STRENGTHENED WITH SUITABLE STEEL STRUCTURE.
12. HEADER FORGING SHALL BE SUPPLIED IN FINISH MACHINED CONDITION.
13. DETAILED FORGING DRAWING SHALL BE SUBMITTED BY SHOWING LOCATIONS OF THE TEST COUPONS.
14. RPNE – THE PLANE PERPENDICULAR TO THE REFERENCE PLANE OF THE NOZZLE AXIS PARALLEL TO REFERENCE HEADER AXIS (HA) AT THE DISTANCE SHOWN IN DRAWING FROM REFERENCE HEADER AXIS.
15. SUITABLE PERMANENT MARKS SHALL BE MARKED ON THE EXTERNAL SURFACE OF HEADERS FOR DEFINING 'HA'
16. TOLERANCE ON LENGTH DIMENSIONS ARE ±3mm UNLESS OTHERWISE SPECIFIED.
17. TOLERANCE IF NOT SPECIFIED SHALL BE AS GIVEN BELOW,
    FOR MACHINING : ±0.2 FOR 0–50
    ±0.3 FOR ABOVE 50

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 : CHD&APPD :	CORRECTED IN LINE WITH CUSTOMER'S LATEST REVISED DRG.
03	221210		
02	101210		CORRECTED IN LINE WITH CUSTOMER'S LATEST REVISED DRG. NOTE–5.4 DELETED.
01	201010		CORRECTED IN LINE WITH CUSTOMER'S LATEST REVISED DRG.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 700MWe

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

	NAME	SIGNATURE	DATE	NO. OF YRS
DSN	K.R.		250910	
CHD	SOUGHAT		250910	
APPD	V.R.		250910	

DEPT.	SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG.	TRIM NO.	NO. OF ITEMS
NC		9275	KAPP–3&4/33117/2001/DD		

GRADE OF UNWOL. CAT. C/M/F | CODE 150

TITLE: REACTOR INLET HEADER–H2 (FORGING)

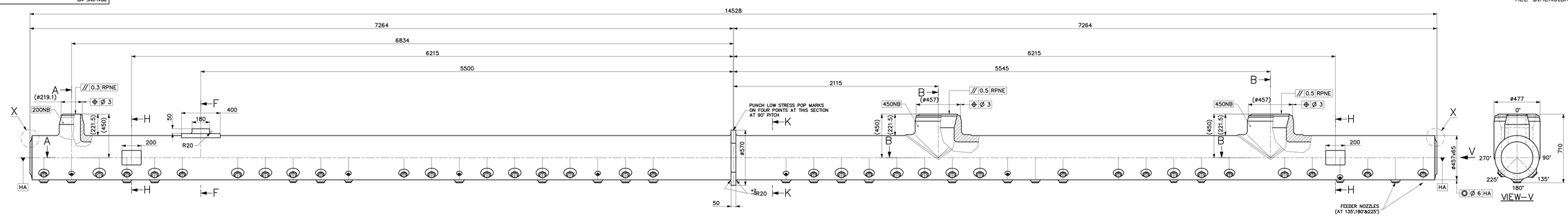
CARD CODE: U 01

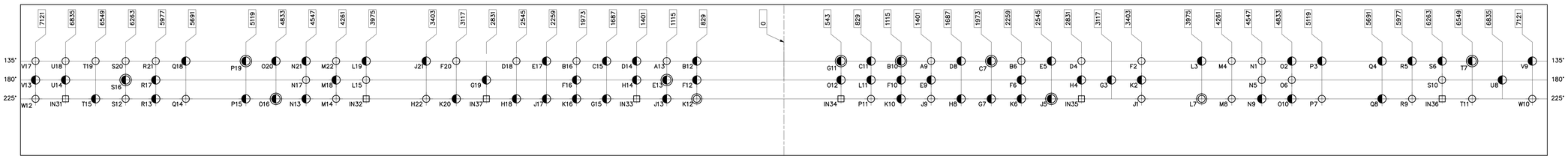
DRAWING NO : 0–93–420–05152 | REV 03

Size A0

DRAWING NO. 0-93-420-05153

ALL DIMENSIONS ARE IN MILLIMETERS

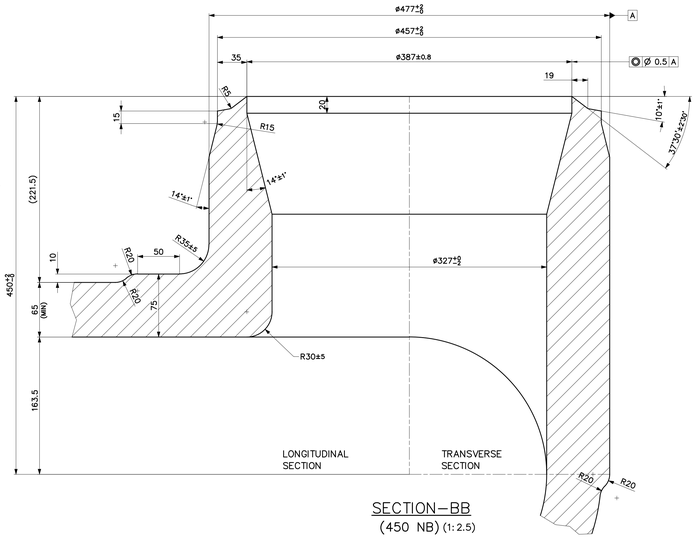




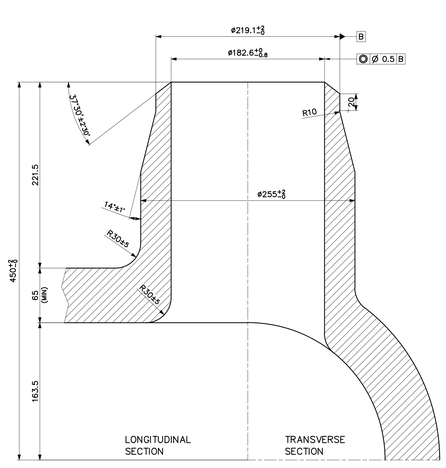
NOZZLE LEGEND & QUANTITY

SYMBOL	NOZZLE DESCRIPTION	QTY
	FEEDER PIPE NOZZLE 65NB	53
	FEEDER PIPE NOZZLE 50NB	34
	INSTRUMENTATION NOZZLE 20NB	7
	FEEDER PIPE NOZZLE 65NB WITH VENTURI	9
	FEEDER PIPE NOZZLE 50NB WITH VENTURI	2
NB200	SHUT–DOWN COOLING OUTLET	1
NB450	PCP OUTLET	2

FEEDER PIPE NOZZLES DEVELOPED PLAN FOR RIH–H3



SECTION–BB
(450 NB) (1:2.5)



SECTION–AA
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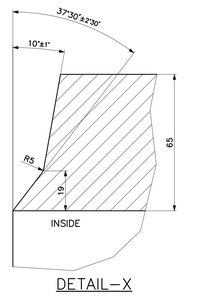
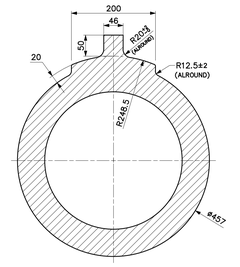
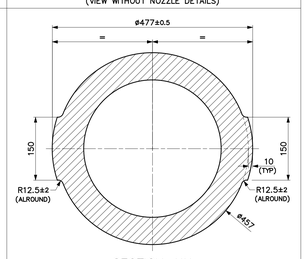


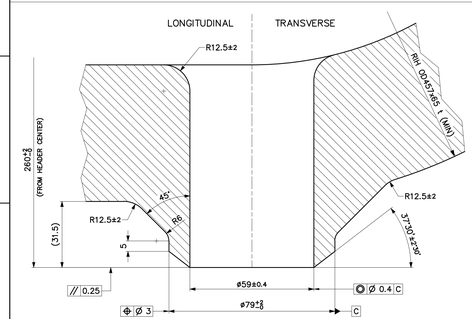
DETAIL–X



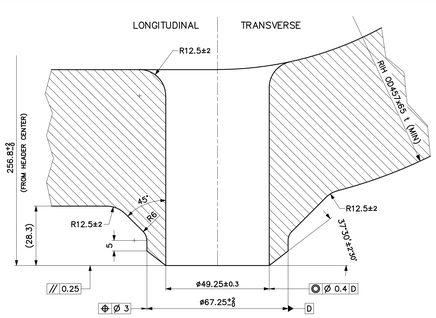
SECTION–FF
(1:5)
(VIEW WITHOUT NOZZLE DETAILS)



SECTION–HH
(1:5)
(VIEW WITHOUT NOZZLE DETAILS)



NOZZLE SECTION
(65 NB) (1:1)



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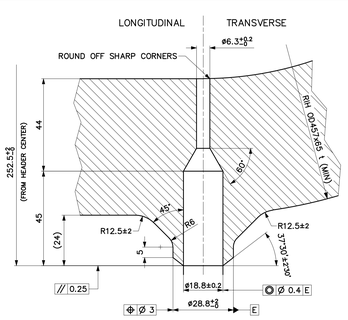
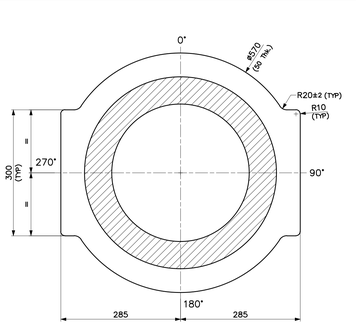


NOZZLE SECTION
(20 NB) (1:1)



SECTION–KK
(1:5)

NOTES: –

1. MATERIAL SPECIFICATION FOR THE HEADER FORGING IS SA350GRLF2 CLASS1 WITH SUPPLEMENTARY REQUIREMENT ON CHEMICAL COMPOSITION AS GIVEN IN THE APPROVED SPECIFICATION.
2. FORGED HEADER MATERIAL, MANUFACTURING, TESTING, EXAMINATIONS AND PACKING SHALL BE IN ACCORDANCE WITH ASME SEC–III NB CL1 AND AS PER APPROVED SPECIFICATION.
3. THE HEADER WITH INTEGRAL NOZZLES SHOWN IN THE DRAWING SHALL BE MANUFACTURED BY FORGING OR FORMING OR A COMBINATION OF SIMILAR OPERATIONS.
4. HEADER IS TO BE FORGED AS SINGLE PIECE AND IT SHALL BE SUPPLIED AS NORMALISED CONDITION. WELD JOINTS ARE NOT PERMITTED TO FORM THE HEADERS.
5. HEADERS H1 TO H8 SHALL BE IN FULL COMPLIANCE WITH SPECIFICATION WITH THE FOLLOWING EXCEPTIONS AND ADDITIONAL REQUIREMENTS.
   - 5.1 MATERIAL SHALL BE FULLY KILLED, FINE GRAINED STEEL PRODUCED BY VACUUM TREATMENT AND ELECTROSLAG REMELTING SHALL BE USED. ADDITIONAL IMPURITY ELEMENT RESTRICTION Sn=0.011% MAX, N=0.013% MAX, As=0.025 MAX AND Sb=0.007 MAX SHALL APPLY.
   - 5.2 REPRESENTATIVE NOZZLES SHALL BE SECTIONED (IN LONGITUDINAL & TRANS. PLANES) AND EXAMINED FOR METAL FLOW, SOUNDNESS, REQUIRED CONTOURS AND REINFORCEMENT BY SUPPLIER. SAMPLE NOZZLES AND HEADER PIPE TEST SECTIONS FROM SAME PRODUCTION HEAT FOR PURCHASER'S USE SHALL BE SUPPLIED.
   - 5.3 TEST COUPONS TAKEN FROM EACH HEADER SHALL BE SUBJECTED TO SIMULATED POST WELD HEAT TREATMENT AS REQUIRED IN ASME SEC–III NB, AT 600 PLUS OR MINUS 10 DEG C x 6 Hrs MAX.
   - 5.5 ADDITIONAL FRACTURE TOUGHNESS REQUIREMENT SHALL BE AS PER NB–2331 AS APPLICABLE TO VESSELS. IMPACT SPECIMENS, ORIENTED IN TRANSVERSE (TANGENTIAL) AND NORMAL (RADIAL) DIRECTIONS, SHALL BE TESTED AT TEMPERATURE NOT GREATER THAN +18 DEG C TO OBTAIN 68 JOULES AND 0.90 MM OF ABSORBED ENERGY AND LATERAL EXPANSION RESPECTIVELY AS A MINIMUM NDT TEMPERATURE AS DETERMINED BY DROP WEIGHT TEST SHALL BE LOWER THAN MINUS 15 DEG C DROP WEIGHT CONFIRMATORY TEST SHALL SHOW TWO 'NO BREAKS' AT MINUS 15 DEG C
   - 5.6 ALL SPECIFIED MECHANICAL, METALLOGRAPHIC, CHEMICAL ANALYSIS TESTS SHALL BE CONDUCTED ON SPECIMENS TAKEN FROM BOTH ENDS AND MID LENGTH REGION OF EACH HEADER. THE SPECIFIED MIN. TEST VALUES SHALL BE APPLICABLE AND COMPLIED BY SPECIMENS OF ALL ORIENTATIONS: LONGITUDINAL, TRANVERSE AND NORMAL (ie., AXIAL, TANGENTIAL AND RADIAL RESPECTIVELY) DETAILS SHALL BE PROVIDED BY THE BIDDER.
   - 5.7 SURFACE FINISH SHALL BE 6.3 MICRONS ALL OVER.
   - 5.8 WALL THICKNESS INDICATED ARE SPECIFIED IN MINIMUM VALUE.
6. WHEN NOT SPECIFIED, THE BEST TOLERANCE ACHIEVABLE ON THE VARIOUS DIMENSIONS SHALL BE CLEARLY INDICATED BY THE SUPPLIER.
7. SPECIAL REQUIREMENTS WHEN NOZZLE PROTRUSIONS ARE OBTAINED BY MACHINING.
   - 7.1 AS FORGED HEADER SHALL BE OF SUITABLE CONFIGURATION, SOUNDNESS AND PROPERTIES SUCH THAT THE NOZZLES SHALL ALSO HAVE SPECIFIED MECHANICAL PROPERTIES ALONG THEIR AXES.
   - 7.2 FROM BOTH END & MID LENGTH REGION OF EACH HEADER, ADDITIONAL TENSION IMPACT AND DROP WEIGHT TESTS SHALL BE CONDUCTED ON RADIAL SPECIMENS (PARALLEL TO NOZZLE AXES)
   - 7.3 IMPACT TESTS SHALL BE CONDUCTED ON RADIAL SPECIMENS AT ATLEAST 7 TEMPERATURES (–45 DEG C, –15 DEG C, +0 DEG C, +18 DEG C, –,–,– DEG C) AND TRANSITION CURVES (FOR ABSORBED ENERGY, LATERAL EXPANSION, % SHEAR FRACTURE) COVERING LOWER AND UPPER SHELVES SHALL BE DRAWN FOR EACH MELT AND HEAT TREATMENT BATCH. FATIGUE TESTS (ON RADIAL AND TANGENTIAL SPECIMENS) SHALL BE CONDUCTED TO DEMONSTRATE THAT MARGINS OF SAFETY ON BOTH Sa (STRAIN AMPLITUDE) AND N (CYCLES) NOT LESS THAN 2 AND 20 RESPECTIVELY ARE AVAILABLE w.r.t. ASME SEC–III DIV–1 APPENDICES DESIGN FATIGUE CURVE FIG. 1–9–1 SUPPLIER SHALL PROVIDE THE DETAILS.
   - 7.4 NOZZLES SHALL BE THOROUGHLY EXAMINED FOR SOUNDNESS BY VOLUMETRIC AND SURFACE NDE. (ACCEPTANCE STANDARDS SHALL BE BASED ON FINAL NOZZLE THICKNESS)
   - ~~7.5 DETAILS AND EXTENT OF THE ABOVE MECHANICAL TESTS AND NDE SHALL BE PROPOSED IN THE BID AND MUTUALLY AGREED UPON BEFORE PLACEMENT OF ORDER.~~
8. DETAILED DRAWING INDICATING VARIOUS STAGES OF MANUFACTURE SHALL BE SUBMITTED FOR APPROVAL.
9. WELD EDGES AND MACHINED SURFACES SHALL BE SUBJECTED TO MT/PT AS PER APPROVED SPECIFICATION.
10. ALL MACHINED SURFACES AND WELD EDGES SHALL BE SUITABLY PROTECTED DURING TRANSPORTATION.
11. HEADERS SHALL BE PROPERLY PACKED AND COVERED IN WOODEN BOX STRENGTHENED WITH SUITABLE STEEL STRUCTURE.
12. HEADER FORGING SHALL BE SUPPLIED IN FINISH MACHINED CONDITION.
13. DETAILED FORGING DRAWING SHALL BE SUBMITTED BY SHOWING LOCATIONS OF THE TEST COUPONS.
14. RPNE – THE PLANE PERPENDICULAR TO THE REFERENCE PLANE OF THE NOZZLE AXIS PARALLEL TO REFERENCE HEADER AXIS (HA) AT THE DISTANCE SHOWN IN DRAWING FROM REFERENCE HEADER AXIS.
15. SUITABLE PERMANENT MARKS SHALL BE MARKED ON THE EXTERNAL SURFACE OF HEADERS FOR DEFINING 'HA'
16. TOLERANCE ON LENGTH DIMENSIONS ARE ±3mm UNLESS OTHERWISE SPECIFIED.
17. TOLERANCE IF NOT SPECIFIED SHALL BE AS GIVEN BELOW,
    FOR MACHINING : ±0.2 FOR 0–50
    ±0.3 FOR ABOVE 50

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
3 TO 6	±0.1	1000 TO 2000	±1.2
6 TO 30	±0.2	2000 TO 4000	±2.0
30 TO 120	±0.3	—	—
120 TO 400	±0.5	—	—

ANGULAR	
0 TO 10	± 1°
10 TO 50	± 30'
50 TO 120	± 20'
120 TO 400	± 10'
OVER 400	± 5'

REV	DATE	ALTERED : CHD&APPD :
03	221210	CORRECTED IN LINE WITH CUSTOMER'S LATEST REVISED DRG.
02	101210	CORRECTED IN LINE WITH CUSTOMER'S LATEST REVISED DRG. NOTE–5.4 DELETED.
01	201010	CORRECTED IN LINE WITH CUSTOMER'S LATEST REVISED DRG.

CAUTION: The information on this drawing is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be lent, copied or used for any detrimental purpose to the interest of the company.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 700MWe

BHEL — Bharat Heavy Electricals Ltd
UNIT: HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI – 620014

	NAME	SIGNATURE	DATE	NO. OF YRS
DSN	K.R.		250910	
CHD	SOUGHAT		250910	
APPD	V.R.		250910	

DEPT	GRADE OF UNTOL DIM	SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG	ITEM NO	NO. OF ITEMS REQ
NC	C/M/F		9393	KAPP–3&4/33117/2001/DD		
CODE 150						

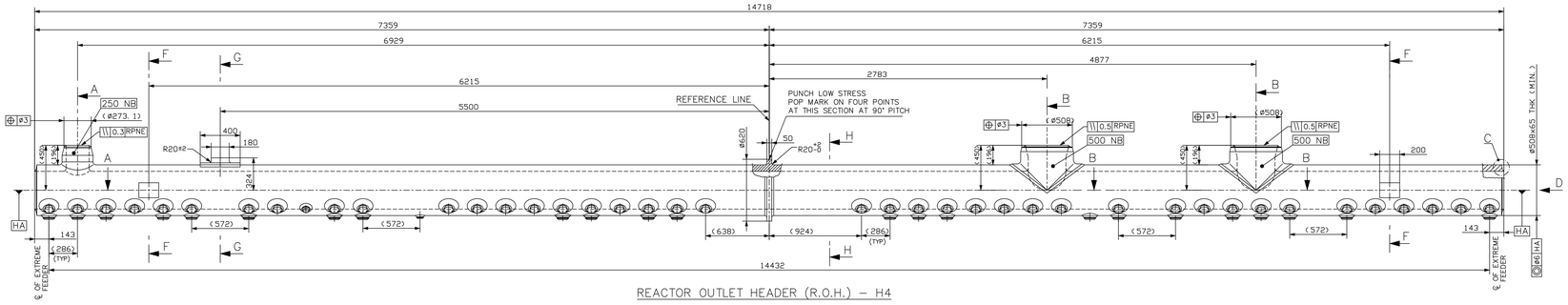
TITLE: REACTOR INLET HEADER–H3 (FORGING)

CARD CODE: U 01

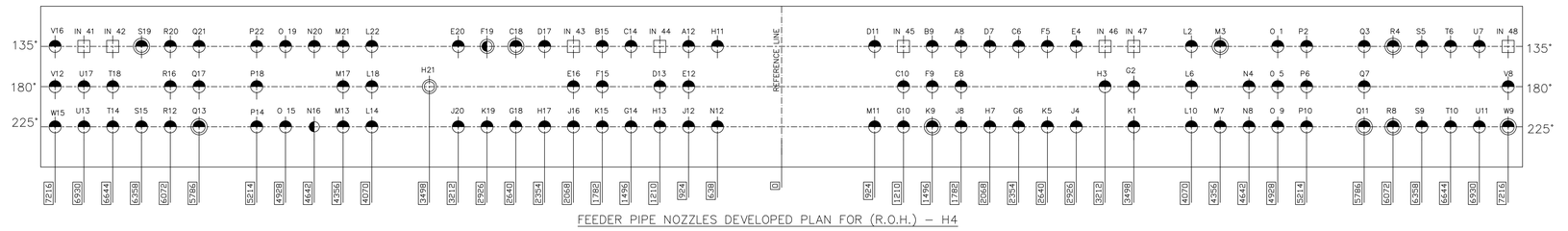
DRAWING NO : 0–93–420–05153 03 REV

Size A0

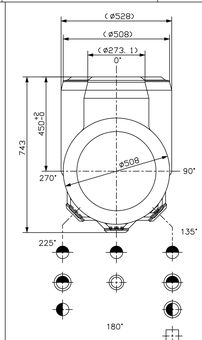
DRAWING NO 0-93-420-05154



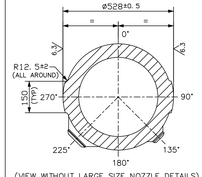
REACTOR OUTLET HEADER (R.O.H.) – H4



FEEDER PIPE NOZZLES DEVELOPED PLAN FOR (R.O.H.) – H4

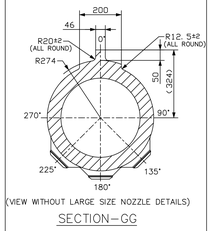


VIEW–D



(VIEW WITHOUT LARGE SIZE NOZZLE DETAILS)

SECTION–FF



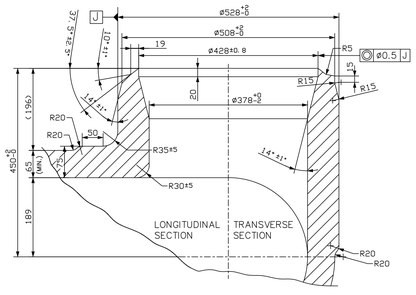
(VIEW WITHOUT LARGE SIZE NOZZLE DETAILS)

SECTION–GG

ALL DIMENSIONS ARE IN MILLIMETERS

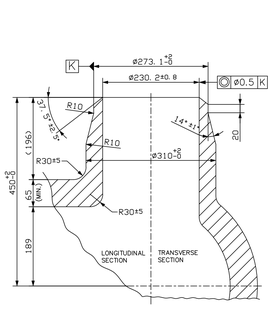
NOTES:

1. MATERIAL SPECIFICATION FOR THE HEADER FORGING IS SA350 GR. LF2 CL. 1. WITH SUPPLEMENTARY REQUIREMENTS ON CHEMICAL COMPOSITION AS GIVEN IN THE APPROVED SPECIFICATION.
2. FORGED HEADER MATERIAL MANUFACTURING, TESTING, EXAMINATIONS AND PACKING SHALL BE IN ACCORDANCE WITH ASME SEC. III NB CL. 1 AND AS PER APPROVED SPECIFICATION.
3. THE HEADER WITH INTEGRAL NOZZLES SHOWN IN THE DRAWING SHALL BE MANUFACTURED BY FORGING OR FIRMING OR COMBINATION OF SIMILAR OPERATIONS.
4. HEADER IS TO BE FORGED AS SINGLE PIECE AND IT SHALL BE SUPPLIED AS NORMALISED CONDITION. WELD JOINTS ARE NOT PERMITTED TO FORM THE HEADER.
5. HEADERS H1 TO H8 SHALL BE IN FULL COMPLIANCE WITH SPECIFICATION WITH THE FOLLOWING EXCEPTIONS AND ADDITIONAL REQUIREMENTS.
   - 5.1 MATERIAL SHALL BE FULLY KILLED, FINE GRAINED STEEL PRODUCED BY VACUUM TREATMENT AND ELECTRO SLAG REMELTING SHALL BE USED, ADDITIONAL IMPURITY ELEMENTS RESTRICTION Sn=0.011% MAX, N=0.013% MAX, As=0.025% MAX, AND Sb=0.007% MAX SHALL APPLY.
   - 5.2 REPRESENTATIVE NOZZLES SHALL BE SECTIONED IN LONGITUDINAL & TRANS PLANES AND EXAMINED FOR METAL FLOW, SOUNDNESS, REQUIRED CONTOURS AND REINFORCEMENT BY SUPPLIER. SAMPLE NOZZLES AND HEADER PIPE TEST SECTIONS FROM SAME PRODUCTION HEAT FOR PURCHASER'S USE SHALL BE SUPPLIED.
   - 5.3 TEST COUPONS TAKEN FROM EACH HEADER SHALL BE SUBJECTED TO SIMULATED POST WELD HEAT TREATMENT AS REQUIRED IN ASME SEC. –III NB, AT 600 PLUS OR MINUS 10°C X 6 Hrs. MAXIMUM.
   - 5.5 ADDITIONAL FRACTURE TOUGHNESS REQUIREMENT SHALL BE AS PER NB-2331 AS APPLICABLE TO VESSEL IMPACT SPECIMENS, ORIENTED IN TRANSVERSE (TANGENTIAL) AND NORMAL (RADIAL) DIRECTIONS, SHALL BE TESTED AT TEMPERATURE NOT GREATER THAN + 18°C TO OBTAIN 68JOULES AND 0.90mm OF ABSORBED ENERGY AND LATERAL EXPANSION RESPECTIVELY AS A MIN. NDT TEMPERATURE AS DETERMINED BY DROP WEIGHT TEST SHALL BE LOWER THAN –15°C DROP WEIGHT CONFIRMATORY TEST SHALL SHOW TWO 'NO BREAKS' AT –15°C.
   - 5.6 ALL SPECIFIED MECHANICAL, METALOGRAPHIC, CHEMICAL ANALYSIS TEST SHALL BE CONDUCTED ON SPECIMENS TAKEN FROM BOTH ENDS AND MID LENGTH REGION OF EACH HEADER. THE SPECIFIED MIN. TEST VALUES SHALL BE APPLICABLE AND COMPLIED BY SPECIMENS OF ALL ORIENTATIONS (LONGITUDINAL, TRANSVERSE AND NORMAL (ie AXIAL, TRANGENTIAL AND RADIAL RESPECTIVELY) DETAILS SHALL BE PROVIDED BY THE BIDDER.
   - 5.7 SURFACE FINISH SHALL BE 6.3 MICRONS ALL OVER.
   - 5.8 WALL THICKNESS INDICATED ARE SPECIFIED IN MINIMUM VALUES.
6. WHEN NOT SPECIFIED THE BEST TOLERANCE ACHIEVABLE ON THE VARIOUS DIMENSIONS SHALL BE CLEARLY INDICATED BY THE SUPPLIER.
7. SPECIAL REQUIREMENTS WHEN NOZZLE PROTRUSIONS ARE OBTAINED BY MACHINING.
   - 7.1 AS FORGED HEADER SHALL BE OF SUITABLE CONFIGURATION, SOUNDNESS AND PROPERTIES SUCH THAT THE NOZZLES SHALL ALSO HAVE SPECIFIED MECHANICAL PROPERTIES ALONG THEIR AXES.
   - 7.2 FROM BOTH END AND MID LENGTH REGION OF EACH HEADER, ADDITIONAL TENSION IMPACT AND DROP WEIGHT TEST SHALL BE CONDUCTED ON RADIAL SPECIMENS (PARALLEL TO NOZZLE AXES)
   - 7.3 IMPACT TEST SHALL BE CONDUCTED ON RADIAL SPECIMENS AT ATLEAST 7 TEMPERATURES (–45°C, –15°C, +0°C, +18°C –,–,–°C) AND TRANSITION CURVES (FOR ABSORBED ENERGY, LATERAL EXPANSION, ½ SHEAR FRACTURE) COVERING LOWER AND UPPER SHELVES SHALL BE DRAWN FOR EACH MELT AND HEAT TREATMENT BATCH. FATIGUE TEST (ON RADIAL TANGENTIAL SPECIMENS) SHALL BE CONDUCTED TO DEMONSTRATE THAT MARGINS OF SAFETY ON BOTH Sa (STRAIN AMPLITUDE AND N CYCLES NOT LESS THAN 2 AND 20 RESPECTIVELY ARE AVAILABLE w.r.t. ASME SEC III DIV.1 APPENDICES, DESIGN FATIGUE CURVE Fig: 1-9-1. SUPPLIER SHALL PROVIDE THE DETAILS.
   - 7.4 NOZZLES SHALL BE THOROUGHLY EXAMINED FOR SOUNDNESS BY VOLUMETRIC AND SURFACE NDE (ACCEPTANCE STANDARDS SHALL BE BASED ON FINAL NOZZLE THICKNESS)
   - ~~7.5 DETAILS AND EXTENT OF THE ABOVE MECHANICAL TESTS AND NDE SHALL BE PROPOSED IN THE BID AND MUTUALLY AGREED UPON BEFORE PLACEMENT OF ORDER.~~
8. DETAILED DRAWING INDICATING VARIOUS STAGES OF MANUFACTURE SHALL BE SUBMITTED FOR APPROVAL
9. WELD EDGES AND MACHINED SURFACES SHALL BE SUBJECTED TO MT/ PT AS PER APPROVED SPECIFICATIONS.
10. ALL MACHINED SURFACES AND WELD EDGES SHALL BE SUITABLY PROTECTED DURING TRANSPORTATION.
11. HEADERS SHALL BE PROPERLY PACKED AND COVERED IN WOODEN BOX STRENGTHENED WITH SUITABLE STEEL STRUCTURE.
12. HEADER FORGING SHALL BE SUPPLIED IN FINISH MACHINED CONDITION.
13. DETAILED FORGING DRAWING SHALL BE SUBMITTED BY SHOWING LOCATIONS OF THE TEST COUPONS.
14. RPNE – THE PLANE PERPENDICULAR TO THE REFERENCE PLANE OF THE NOZZLE AXIS PARALLEL TO REFERENCE HEADER AXIS (HA) AT THE DISTANCE SHOWN IN THE DRAWING FROM REFERENCE HEADER AXIS.
15. SUITABLE PERMANENT MARKS SHALL BE MARKED ON THE EXTERNAL SURFACE OF HEADER FOR DEFINING 'HA'
16. TOLERANCE ON LENGTH DIMENSIONS ARE ±3mm UNLESS OTHERWISE SPECIFIED.
17. TOLERANCE IF NOT SPECIFIED SHALL BE GIVEN BELOW FOR MACHINING
    0 TO 50 ±0.2
    50 TO ABOVE ±0.3



500 NB

SECTION–BB (1:5)



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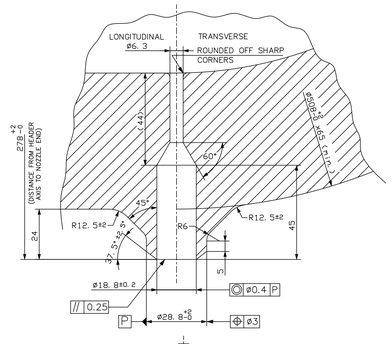
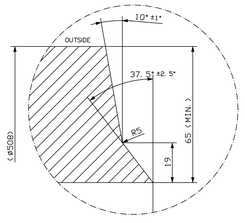
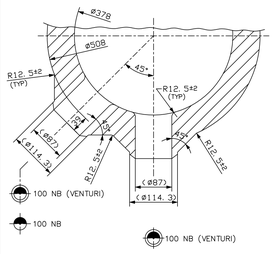
SECTION–AA (1:5)



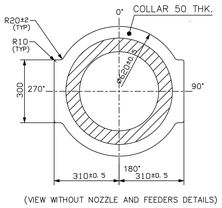
20 NB NOZZLE DETAILS



DETAIL–C (1:1)



MERGING DETAILS OF MAJOR NOZZLES

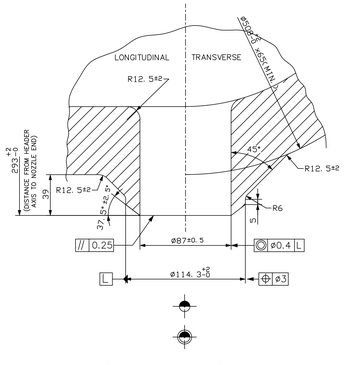


(VIEW WITHOUT NOZZLE AND FEEDERS DETAILS)

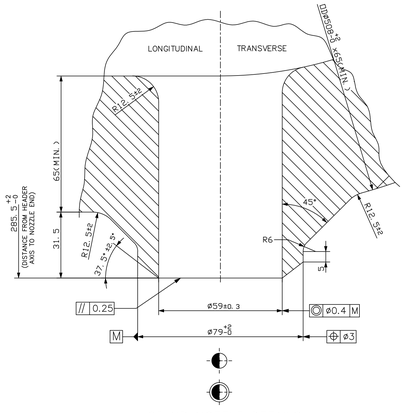
SECTION–HH

NOZZLE LEGENDS AND QUANTITY DETAILS

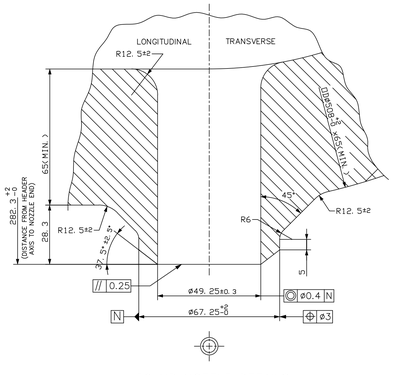
SYMBOL	NOZZLE DESCRIPTION	No. OFF NOZZLE OPENINGS
	FEEDER PIPE NOZZLE 100NB	86
	FEEDER PIPE NOZZLE 100NB (VENTURI)	9
	FEEDER PIPE NOZZLE 65NB	1
	FEEDER PIPE NOZZLE 65NB (VENTURI)	1
	FEEDER PIPE NOZZLE 50NB (VENDURI)	1
	INSTRUMENTATION NOZZLE 20NB	8
250 NB	SHUT DOWN COOLING INLET	1
500 NB	S.G. INLET	2



100 NB NOZZLE DETAILS



65 NB NOZZLE DETAILS



50 NB NOZZLE DETAILS

TOLERANCE IF NOT SPECIFIED SHALL BE AS BELOW (REFER IS:2102-1)

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	
03	22.12.10	CHD&APPD	NOTES MINOR CORRECTIONS INCORPORATED
02	24.11.10	CHD&APPD	DRG. REVISED AS PER CUSTOMER REQUIREMENTS AND NOTE-5.4 DELETED
01	20.10.10	CHD&APPD	SECTION-FF AND GG ADDED

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 700MWe

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

	NAME	SIGNATURE	DATE	NO. OF YAR
DRN	E.B		14.08.10	
CHD	MANDAL		01.10.10	
APPD	V.R		04.10.10	

DEPT: NC | CODE: 150 | GRADE OF CNTRL. DSN: C/M/F | SCALE | WEIGHT (Kg): 10722 | REF TO ADTY / OLD DWG: KAPP 3&4/33117/2006/DD | ITEM NO | No. OF ITEMS

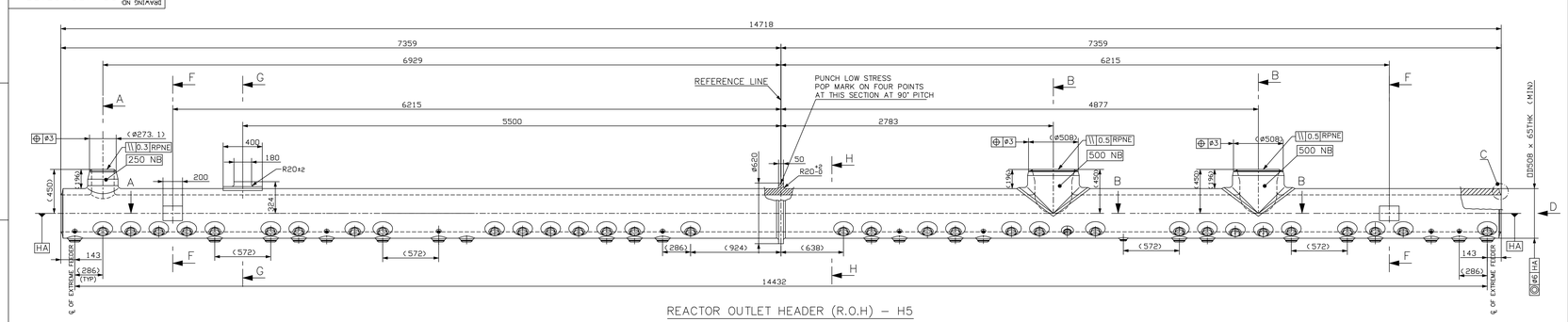
TITLE: REACTOR OUTLET HEADER – H4 (FORGING)

CARD CODE: U 01

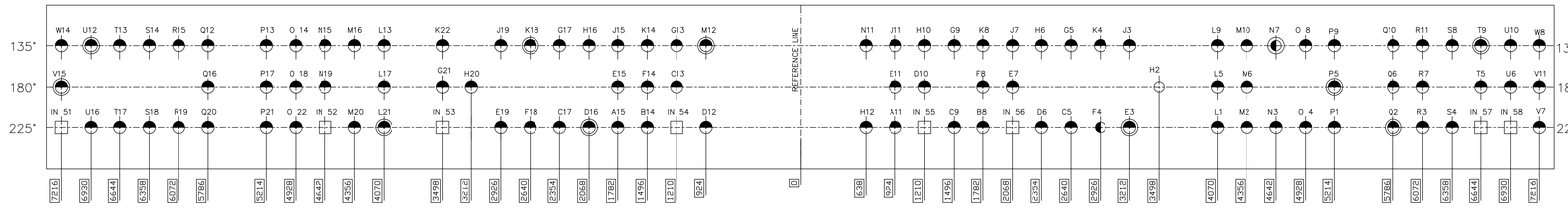
DRAWING NO: 0-93-420-05154 | REV: 03

Size A0

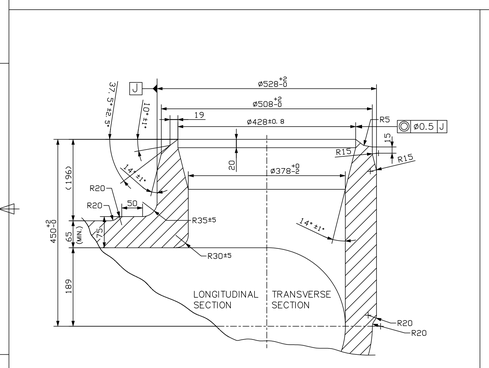
DRAWING NO 0-93-420-05155



REACTOR OUTLET HEADER (R.O.H) – H5

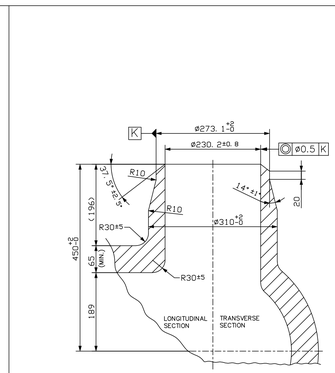


FEEDER PIPE DEVELOPED PLAN FOR (R.O.H.)–H5



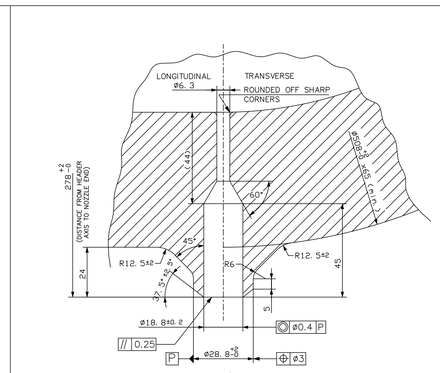
500 NB

SECTION–BB (1:5)

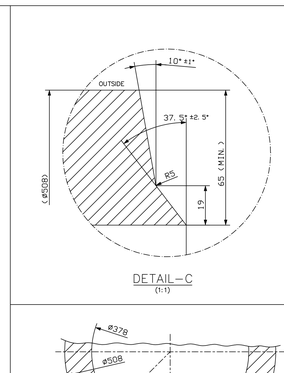


250 NB

SECTION–AA (1:5)

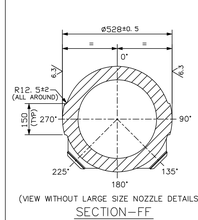


20 NB NOZZLE DETAILS



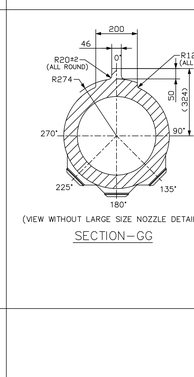
DETAIL–C (1:1)

VIEW–D



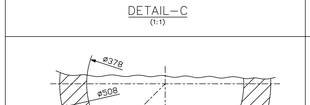
(VIEW WITHOUT LARGE SIZE NOZZLE DETAILS)

SECTION–FF

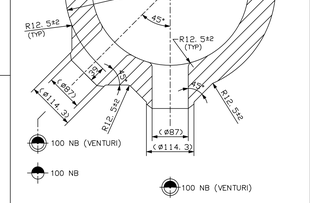


(VIEW WITHOUT LARGE SIZE NOZZLE DETAILS)

SECTION–GG

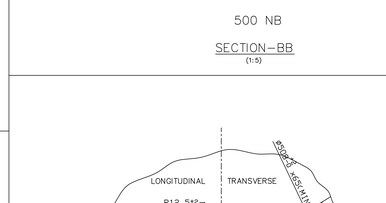


MERGING DETAILS OF MAJOR NOZZLES

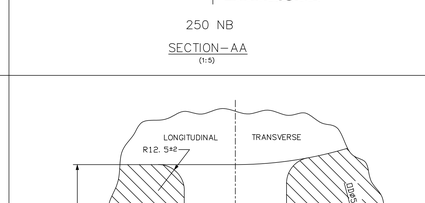


(VIEW WITHOUT NOZZLE AND FEEDERS DETAILS)

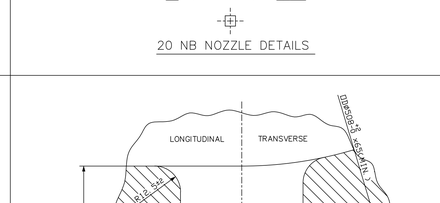
SECTION–HH



100 NB NOZZLE DETAILS



50 NB NOZZLE DETAILS



65 NB NOZZLE DETAILS

ALL DIMENSIONS ARE IN MILLIMETERS

NOTES:

1. MATERIAL SPECIFICATION FOR THE HEADER FORGING IS SA350 GR. LF2 CL. 1. WITH SUPPLEMENTARY REQUIREMENTS ON CHEMICAL COMPOSITION AS GIVEN IN THE APPROVED SPECIFICATION.
2. FORGED HEADER MATERIAL MANUFACTURING, TESTING, EXAMINATIONS AND PACKING SHALL BE IN ACCORDANCE WITH ASME SEC. III NB CL. 1 AND AS PER APPROVED SPECIFICATION.
3. THE HEADER WITH INTEGRAL NOZZLES SHOWN IN THE DRAWING SHALL BE MANUFACTURED BY FORGING OR FORMING OR COMBINATION OF SIMILAR OPERATIONS.
4. HEADER IS TO BE FORGED AS SINGLE PIECE AND IT SHALL BE SUPPLIED AS NORMALISED CONDITION, WELD JOINTS ARE NOT PERMITTED TO FORM THE HEADER.
5. HEADERS H1 TO H8 SHALL BE IN FULL COMPLIANCE WITH SPECIFICATION WITH THE FOLLOWING EXCEPTIONS AND ADDITIONAL REQUIREMENTS.
   - 5. 1 MATERIAL SHALL BE FULLY KILLED, FINE GRAINED STEEL PRODUCED BY VACUUM TREATMENT AND ELECTRO SLAG REMELTING SHALL BE USED, ADDITIONAL IMPURITY ELEMENTS RESTRICTION S=<0. 011% MAX, N=0. 013% MAX, As+Sn 0. 025% MAX. AND Sb+0. 007% MAX SHALL APPLY.
   - 5. 2 REPRESENTATIVE NOZZLES SHALL BE SECTIONED IN LONGITUDINAL & TRANS PLANES AND EXAMINED FOR METAL FLOW, SOUNDNESS, REQUIRED CONTOURS AND REINFORCEMENT BY SUPPLIER. SAMPLE NOZZLES AND HEADER PIPE TEST SECTIONS FROM SAME PRODUCTION HEAT FOR PURCHASER'S USE SHALL BE SUPPLIED.
   - 5. 3 TEST COUPONS TAKEN FROM EACH HEADER SHALL BE SUBJECTED TO SIMULATED POST WELD HEAT TREATMENT AS REQUIRED IN ASME SEC. -III NB, AT 600 PLUS OR MINUS 10°C X 6 Hrs. MAXIMUM.
   - 5. 5 ADDITIONAL FRACTURE TOUGHNESS REQUIREMENT SHALL BE AS PER NB-2331 AS APPLICABLE TO VESSEL IMPACT SPECIMENS, ORIENTED IN TRANSVERSE (TANGENTIAL) AND NORMAL (RADIAL) DIRECTIONS, SHALL BE TESTED AT TEMPERATURE NOT GREATER THAN + 18°C TO OBTAIN 68 JOULES AND 0. 90mm OF ABSORBED ENERGY AND LATERAL EXPANSION RESPECTIVELY AS A MIN. NDT TEMPERATURE AS DETERMINED BY DROP WEIGHT TEST SHALL BE LOWER THAN -15°C DROP WEIGHT CONFIRMATORY TEST SHALL SHOW TWO 'NO BREAKS' AT -15°C.
   - 5. 6 ALL SPECIFIED MECHANICAL, METALOGRAPHIC, CHEMICAL ANALYSIS TEST SHALL BE CONDUCTED ON SPECIMENS TAKEN FROM BOTH ENDS AND MID LENGTH REGION OF EACH HEADER. THE SPECIFIED MIN. TEST VALUES SHALL BE APPLICABLE AND COMPLIED BY SPECIMENS OF ALL ORIENTATIONS: LONGITUDINAL, TRANSVERSE AND NORMAL (ie AXIAL, TRANGENTIAL AND RADIAL RESPECTIVELY) DETAILS SHALL BE PROVIDED BY THE BIDDER.
   - 5. 7 SURFACE FINISH SHALL BE $\frac{6.3}{}$ MICRONS ALL OVER.
   - 5. 8 WALL THICKNESS INDICATED ARE SPECIFIED IN MINIMUM VALUES.
6. WHEN NOT SPECIFIED THE BEST TOLERANCE ACHIEVABLE ON THE VARIOUS DIMENSIONS SHALL BE CLEARLY INDICATED BY THE SUPPLIER.
7. SPECIAL REQUIREMENTS WHEN NOZZLE PROTRUSIONS ARE OBTAINED BY MACHINING.
   - 7. 1 AS FORGED HEADER SHALL BE OF SUITABLE CONFIGURATION, SOUNDNESS AND PROPERTIES SUCH THAT THE NOZZLES SHALL ALSO HAVE SPECIFIED MECHANICAL PROPERTIES ALONG THEIR AXES.
   - 7. 2 FROM BOTH END AND MID LENGTH REGION OF EACH HEADER, ADDITIONAL TENSION IMPACT AND DROP WEIGHT TEST SHALL BE CONDUCTED ON RADIAL SPECIMENS (PARALLEL TO NOZZLE AXES)
   - 7. 3 IMPACT TEST SHALL BE CONDUCTED ON RADIAL SPECIMENS AT ATLEAST 7 TEMPERATURES (-45°C, -15°C, +0°C, +18°C -,-,-°C) AND TRANSITION CURVES (FOR ABSORBED ENERGY, LATERAL EXPANSION, % SHEAR FRACTURE) COVERING LOWER AND UPPER SHELVES SHALL BE DRAWN FOR EACH MELT AND HEAT TREATMENT BATCH. FATIGUE TEST (ON RADIAL TANGENTIAL SPECIMENS) SHALL BE CONDUCTED TO DEMONSTRATE THAT MARGINS OF SAFETY ON BOTH Sa (STRAIN AMPLITUDE AND N CYCLES NOT LESS THAN 2 AND 20 RESPECTIVELY ARE AVAILABLE w. r. t. ASME SEC III DIV. 1 APPENDICES, DESIGN FATIGUE CURVE Fig 1-9-1. SUPPLIER SHALL PROVIDE THE DETAILS.
   - 7. 4 NOZZLES SHALL BE THOROUGHLY EXAMINED FOR SOUNDNESS BY VOLUMETRIC AND SURFACE NDE (ACCEPTANCE STANDARDS SHALL BE BASED ON FINAL NOZZLE THICKNESS)

   ~~7. 5 DETAILS AND EXTENT OF THE ABOVE MECHANICAL TESTS AND NDE SHALL BE PROPOSED IN THE BID AND MUTUALLY AGREED UPON BEFORE PLACEMENT OF ORDER.~~
8. DETAILED DRAWING INDICATING VARIOUS STAGES OF MANUFACTURE SHALL BE SUBMITTED FOR APPROVAL
9. WELD EDGES AND MACHINED SURFACES SHALL BE SUBJECTED TO MT/ PT AS PER APPROVED SPECIFICATIONS.
10. ALL MACHINED SURFACES AND WELD EDGES SHALL BE SUITABLY PROTECTED DURING TRANSPORTATION.
11. HEADERS SHALL BE PROPERLY PACKED AND COVERED IN WOODEN BOX STRENGTHENED WITH SUITABLE STEEL STRUCTURE.
12. HEADER FORGING SHALL BE SUPPLIED IN FINISH MACHINED CONDITION.
13. DETAILED FORGING DRAWING SHALL BE SUBMITTED BY SHOWING LOCATIONS OF THE TEST COUPONS.
14. RPNE – THE PLANE PERPENDICULAR TO THE REFERENCE PLANE OF THE NOZZLE AXIS PARALLEL TO REFERENCE HEADER AXIS (HA) AT THE DISTANCE SHOWN IN THE DRAWING FROM REFERENCE HEADER AXIS.
15. SUITABLE PERMANENT MARKS SHALL BE MARKED ON THE EXTERNAL SURFACE OF HEADER FOR DEFINING 'HA'
16. TOLERANCE ON LENGTH DIMENSIONS ARE ±3mm UNLESS OTHERWISE SPECIFIED.
17. TOLERANCE IF NOT SPECIFIED SHALL BE GIVEN BELOW FOR MACHINING
    0 TO 50 ±0. 2
    50 TO ABOVE ±0. 3

NOZZLE LEGENDS AND QUANTITY DETAILS

SYMBOL	NOZZLE DESCRIPTIONS	No. OFF NOZZLE OPENINGS
	FEEDER PIPE NOZZLE 100NB	85
	FEEDER PIPE NOZZLE 100NB (VENTURI)	10
	FEEDER PIPE NOZZLE 65NB	1
	FEEDER PIPE NOZZLE 65NB (VENTURI)	1
	FEEDER PIPE NOZZLE 50NB	1
	INSTRUMENTATION NOZZLE 20NB	8
250 NB	SHUT DOWN COOLING INLET	1
500 NB	S. G. INLET	2

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 :	CHD&APPD :
03	22.12.10		

NOTES MINOR CORRECTIONS INCORPORATED

REV	DATE	ALTERED :	CHD&APPD :
02	25.11.10		

DRG. REVISED AS PER CUSTOMER REQUIREMENTS AND NOTE-5. 4 DELETED

REV	DATE	ALTERED :	CHD&APPD :
01	20.10.10		

SECTION-FF AND GG ADDED

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 700MWe

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

	NAME	SIGNATURE	DATE	NO. OF YAR
DSN	E B		14.08.10	
CHD	MANDAL		01.10.10	
APPD	V R		04.10.10	

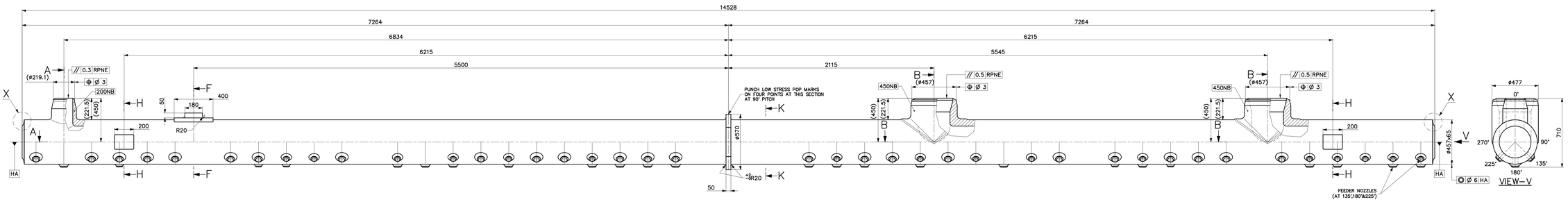
DRGN	GRADE OF UNTOL. DIM	SCALE	WEIGHT (Kg)	REF TO ADDY / OLD DWG	ITEM NO	NO. OF ITEMS
NC	C/M/P		10722	KAPP 3X4/33117/2006/DD		
CODE 150						

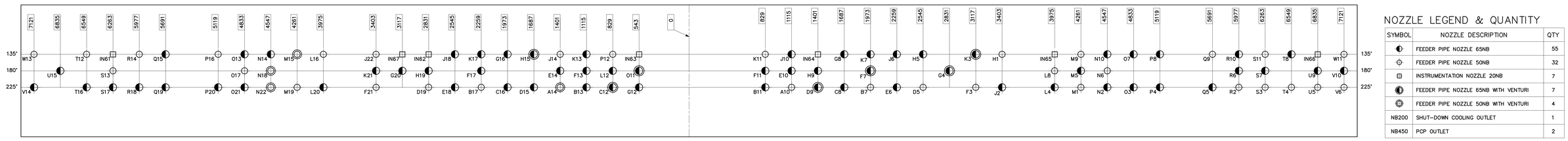
TITLE	CARD CODE	DRAWING NO :	REV
REACTOR OUTLET HEADER – H5 (FORGING)	U 01	0-93-420-05155	03

Size A0

DRAWING NO. 0-93-420-05156

ALL DIMENSIONS ARE IN MILLIMETERS

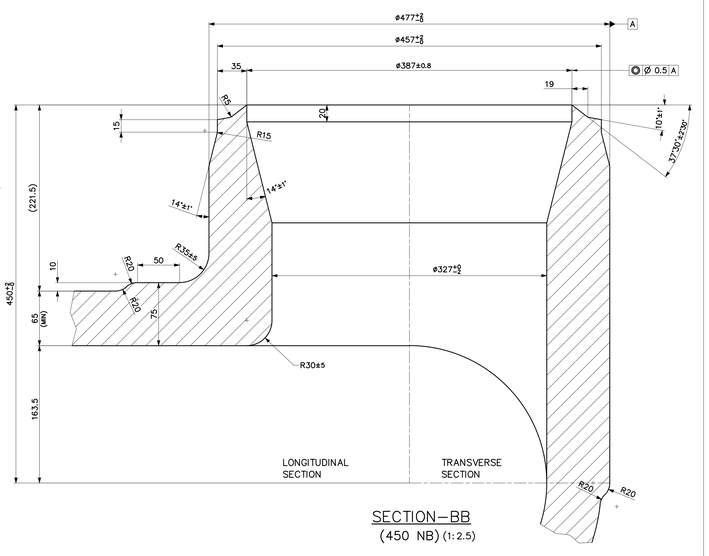




FEEDER PIPE NOZZLES DEVELOPED PLAN FOR RIH–H6

NOZZLE LEGEND & QUANTITY

SYMBOL	NOZZLE DESCRIPTION	QTY
	FEEDER PIPE NOZZLE 65NB	55
	FEEDER PIPE NOZZLE 50NB	32
	INSTRUMENTATION NOZZLE 20NB	7
	FEEDER PIPE NOZZLE 65NB WITH VENTURI	7
	FEEDER PIPE NOZZLE 50NB WITH VENTURI	4
NB200	SHUT–DOWN COOLING OUTLET	1
NB450	PCP OUTLET	2



SECTION–BB
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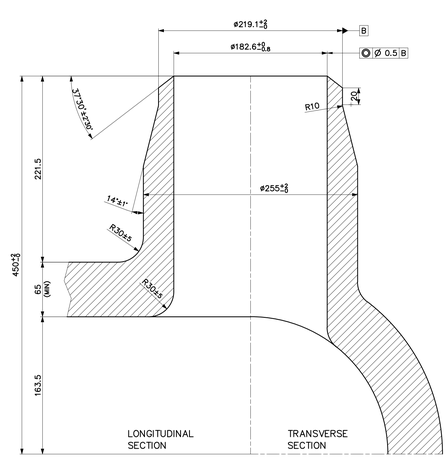

SECTION–AA
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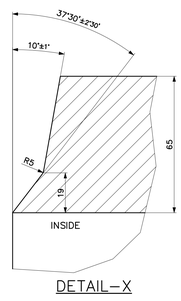
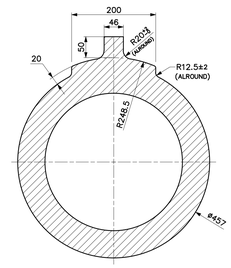
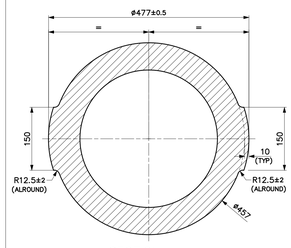


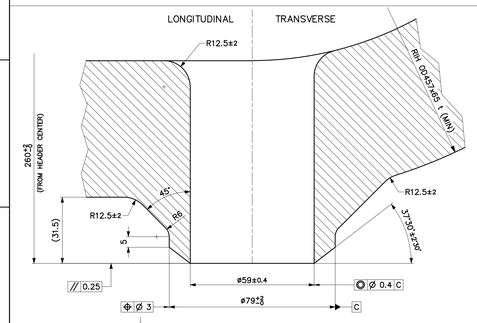
DETAIL–X



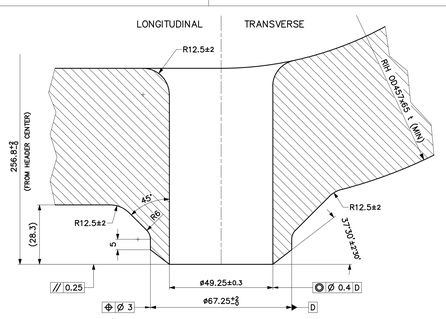
SECTION–FF
(1:5)
(VIEW WITHOUT NOZZLE DETAILS)



SECTION–HH
(1:5)
(VIEW WITHOUT NOZZLE DETAILS)



NOZZLE SECTION
(65 NB) (1:1)



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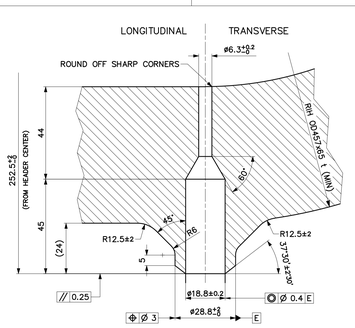
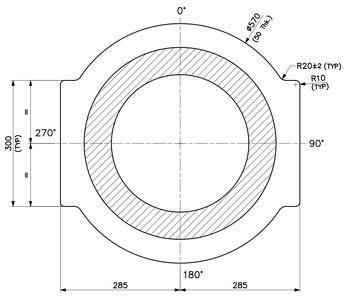


NOZZLE SECTION
(20 NB) (1:1)



SECTION–KK
(1:5)

NOTES: –

1. MATERIAL SPECIFICATION FOR THE HEADER FORGING IS SA350GRLF2 CLASS1 WITH SUPPLEMENTARY REQUIREMENT ON CHEMICAL COMPOSITION AS GIVEN IN THE APPROVED SPECIFICATION.
2. FORGED HEADER MATERIAL, MANUFACTURING, TESTING, EXAMINATIONS AND PACKING SHALL BE IN ACCORDANCE WITH ASME SEC–III NB CL1 AND AS PER APPROVED SPECIFICATION.
3. THE HEADER WITH INTEGRAL NOZZLES SHOWN IN THE DRAWING SHALL BE MANUFACTURED BY FORGING OR FORMING OR A COMBINATION OF SIMILAR OPERATIONS.
4. HEADER IS TO BE FORGED AS SINGLE PIECE AND IT SHALL BE SUPPLIED AS NORMALISED CONDITION. WELD JOINTS ARE NOT PERMITTED TO FORM THE HEADERS.
5. HEADERS H1 TO H8 SHALL BE IN FULL COMPLIANCE WITH SPECIFICATION WITH THE FOLLOWING EXCEPTIONS AND ADDITIONAL REQUIREMENTS.
   5.1 MATERIAL SHALL BE FULLY KILLED, FINE GRAINED STEEL PRODUCED BY VACUUM TREATMENT AND ELECTROSLAG REMELTING SHALL BE USED. ADDITIONAL IMPURITY ELEMENT RESTRICTION Sn=0.011% MAX, N=0.013% MAX, As=0.025 MAX AND Sb=0.007 MAX SHALL APPLY.
   5.2 REPRESENTATIVE NOZZLES SHALL BE SECTIONED (IN LONGITUDINAL & TRANS. PLANES) AND EXAMINED FOR METAL FLOW, SOUNDNESS, REQUIRED CONTOURS AND REINFORCEMENT BY SUPPLIER. SAMPLE NOZZLES AND HEADER PIPE TEST SECTIONS FROM SAME PRODUCTION HEAT FOR PURCHASER'S USE SHALL BE SUPPLIED.
   5.3 TEST COUPONS TAKEN FROM EACH HEADER SHALL BE SUBJECTED TO SIMULATED POST WELD HEAT TREATMENT AS REQUIRED IN ASME SEC–III NB, AT 600 PLUS OR MINUS 10 DEG C x 6 Hrs MAX.
   5.5 ADDITIONAL FRACTURE TOUGHNESS REQUIREMENT SHALL BE AS PER NB–2331 AS APPLICABLE TO VESSELS. IMPACT SPECIMENS, ORIENTED IN TRANSVERSE (TANGENTIAL) AND NORMAL (RADIAL) DIRECTIONS, SHALL BE TESTED AT TEMPERATURE NOT GREATER THAN +18 DEG C TO OBTAIN 68 JOULES AND 0.90 MM OF ABSORBED ENERGY AND LATERAL EXPANSION RESPECTIVELY AS A MINIMUM NDT TEMPERATURE AS DETERMINED BY DROP WEIGHT TEST SHALL BE LOWER THAN MINUS 15 DEG C DROP WEIGHT CONFIRMATORY TEST SHALL SHOW TWO 'NO BREAKS' AT MINUS 15 DEG C
   5.6 ALL SPECIFIED MECHANICAL, METALLOGRAPHIC, CHEMICAL ANALYSIS TESTS SHALL BE CONDUCTED ON SPECIMENS TAKEN FROM BOTH ENDS AND MID LENGTH REGION OF EACH HEADER. THE SPECIFIED MIN. TEST VALUES SHALL BE APPLICABLE AND COMPLIED BY SPECIMENS OF ALL ORIENTATIONS: LONGITUDINAL, TRANVERSE AND NORMAL (ie., AXIAL, TANGENTIAL AND RADIAL RESPECTIVELY) DETAILS SHALL BE PROVIDED BY THE BIDDER.
   5.7 SURFACE FINISH SHALL BE 6.3 MICRONS ALL OVER.
   5.8 WALL THICKNESS INDICATED ARE SPECIFIED IN MINIMUM VALUE.
6. WHEN NOT SPECIFIED, THE BEST TOLERANCE ACHIEVABLE ON THE VARIOUS DIMENSIONS SHALL BE CLEARLY INDICATED BY THE SUPPLIER.
7. SPECIAL REQUIREMENTS WHEN NOZZLE PROTRUSIONS ARE OBTAINED BY MACHINING.
   7.1 AS FORGED HEADER SHALL BE OF SUITABLE CONFIGURATION, SOUNDNESS AND PROPERTIES SUCH THAT THE NOZZLES SHALL ALSO HAVE SPECIFIED MECHANICAL PROPERTIES ALONG THEIR AXES.
   7.2 FROM BOTH END & MID LENGTH REGION OF EACH HEADER, ADDITIONAL TENSION IMPACT AND DROP WEIGHT TESTS SHALL BE CONDUCTED ON RADIAL SPECIMENS (PARALLEL TO NOZZLE AXES)
   7.3 IMPACT TESTS SHALL BE CONDUCTED ON RADIAL SPECIMENS AT ATLEAST 7 TEMPERATURES (–45 DEG C, –15 DEG C, +0 DEG C, +18 DEG C, –,–,– DEG C) AND TRANSITION CURVES (FOR ABSORBED ENERGY, LATERAL EXPANSION, % SHEAR FRACTURE) COVERING LOWER AND UPPER SHELVES SHALL BE DRAWN FOR EACH MELT AND HEAT TREATMENT BATCH. FATIGUE TESTS (ON RADIAL AND TANGENTIAL SPECIMENS) SHALL BE CONDUCTED TO DEMONSTRATE THAT MARGINS OF SAFETY ON BOTH Sa (STRAIN AMPLITUDE) AND N (CYCLES) NOT LESS THAN 2 AND 20 RESPECTIVELY ARE AVAILABLE w.r.t. ASME SEC–III DIV–1 APPENDICES DESIGN FATIGUE CURVE FIG. 1–9–1 SUPPLIER SHALL PROVIDE THE DETAILS.
   7.4 NOZZLES SHALL BE THOROUGHLY EXAMINED FOR SOUNDNESS BY VOLUMETRIC AND SURFACE NDE. (ACCEPTANCE STANDARDS SHALL BE BASED ON FINAL NOZZLE THICKNESS)
   ~~7.5 DETAILS AND EXTENT OF THE ABOVE MECHANICAL TESTS AND NDE SHALL BE PROPOSED IN THE DID AND MUTUALLY AGREED UPON BEFORE PLACEMENT OF ORDER.~~
8. DETAILED DRAWING INDICATING VARIOUS STAGES OF MANUFACTURE SHALL BE SUBMITTED FOR APPROVAL.
9. WELD EDGES AND MACHINED SURFACES SHALL BE SUBJECTED TO MT/PT AS PER APPROVED SPECIFICATION.
10. ALL MACHINED SURFACES AND WELD EDGES SHALL BE SUITABLY PROTECTED DURING TRANSPORTATION.
11. HEADERS SHALL BE PROPERLY PACKED AND COVERED IN WOODEN BOX STRENGTHENED WITH SUITABLE STEEL STRUCTURE.
12. HEADER FORGING SHALL BE SUPPLIED IN FINISH MACHINED CONDITION.
13. DETAILED FORGING DRAWING SHALL BE SUBMITTED BY SHOWING LOCATIONS OF THE TEST COUPONS.
14. RPNE – THE PLANE PERPENDICULAR TO THE REFERENCE PLANE OF THE NOZZLE AXIS PARALLEL TO REFERENCE HEADER AXIS (HA) AT THE DISTANCE SHOWN IN DRAWING FROM REFERENCE HEADER AXIS.
15. SUITABLE PERMANENT MARKS SHALL BE MARKED ON THE EXTERNAL SURFACE OF HEADERS FOR DEFINING 'HA'
16. TOLERANCE ON LENGTH DIMENSIONS ARE ±3mm UNLESS OTHERWISE SPECIFIED.
17. TOLERANCE IF NOT SPECIFIED SHALL BE AS GIVEN BELOW,
    FOR MACHINING : ±0.2 FOR 0–50
    ±0.3 FOR ABOVE 50

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 : CHD&APPD :
03	221210	CORRECTED IN LINE WITH CUSTOMER'S LATEST REVISED DRG.
02	101210	CORRECTED IN LINE WITH CUSTOMER'S LATEST REVISED DRG. NOTE–5.4 DELETED.
01	201010	CORRECTED IN LINE WITH CUSTOMER'S LATEST REVISED DRG.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 700MWe

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

	NAME	SIGNATURE	DATE	NO. OF YAX
DSN	K.R.		270910	
CHD	SOUGHAT		270910	
APPD	V.R.		270910	

DEPT: NC | GRADE OF UNTOL. DIM: C/M/F | SCALE | WEIGHT (Kg): 9393 | REF TO ASSY / OLD DWG: KAPP–3&4/33117/2001/DD | ITEM NO | NO. OF ITEMS

CODE: 150 | CARD CODE: U 01

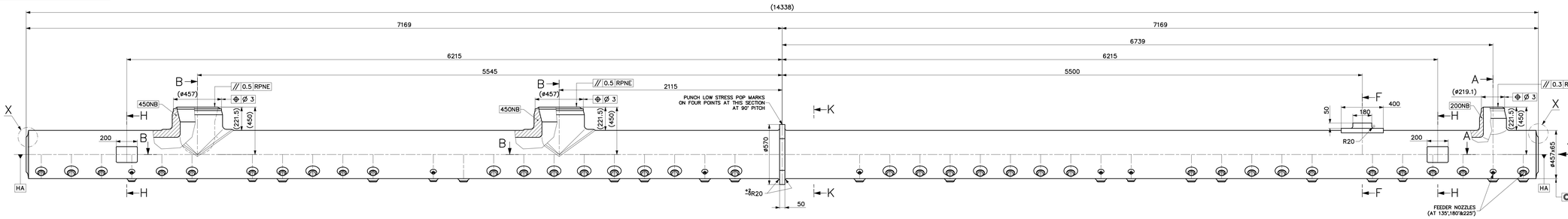
TITLE: REACTOR INLET HEADER–H6 (FORGING)

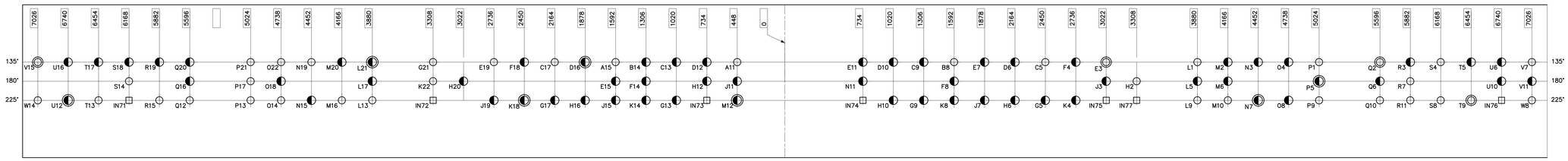
DRAWING NO : 0–93–420–05156 | REV: 03

Size A0

DRAWING NO. 0-93-420-05157

ALL DIMENSIONS ARE IN MILLIMETERS

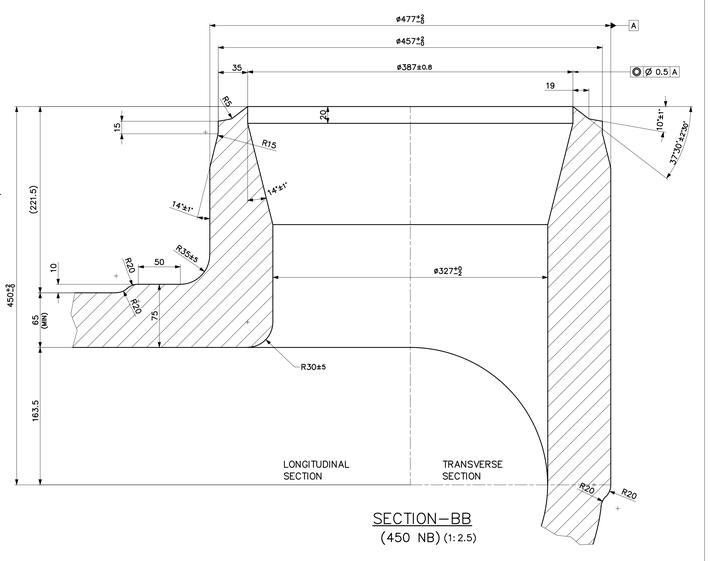




FEEDER PIPE NOZZLES DEVELOPED PLAN FOR RIH–H7

NOZZLE LEGEND & QUANTITY

SYMBOL	NOZZLE DESCRIPTION	QTY
	FEEDER PIPE NOZZLE 65NB	53
	FEEDER PIPE NOZZLE 50NB	34
	INSTRUMENTATION NOZZLE 20NB	7
	FEEDER PIPE NOZZLE 65NB WITH VENTURI	7
	FEEDER PIPE NOZZLE 50NB WITH VENTURI	4
NB200	SHUT–DOWN COOLING OUTLET	1
NB450	PCB OUTLET	2



SECTION–BB
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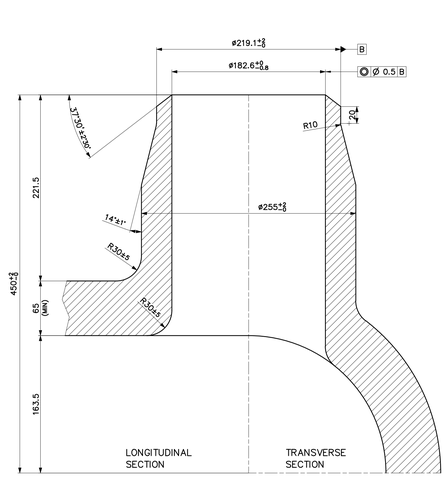

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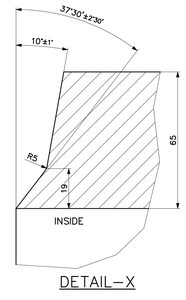
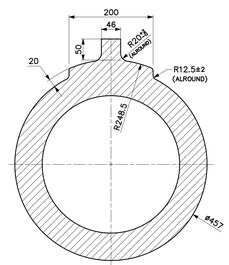
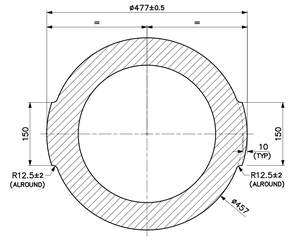


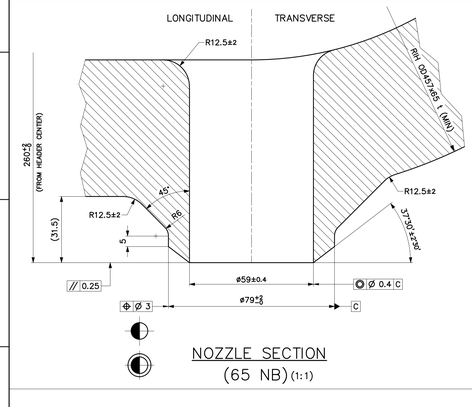
DETAIL–X



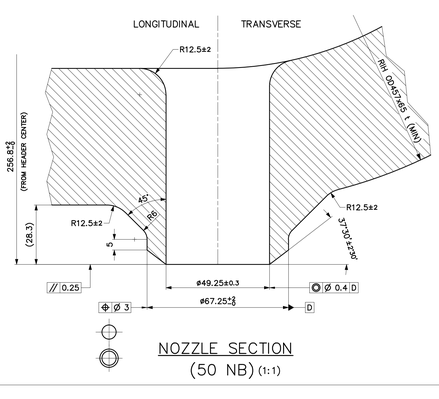
SECTION–FF
(1:5)
(VIEW WITHOUT NOZZLE DETAILS)



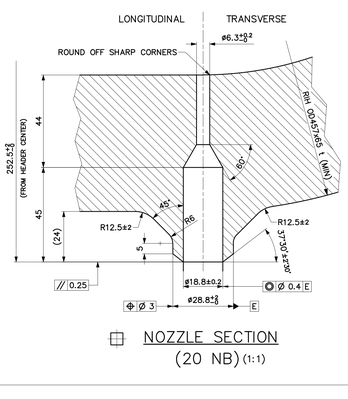
SECTION–HH
(1:5)
(VIEW WITHOUT NOZZLE DETAILS)



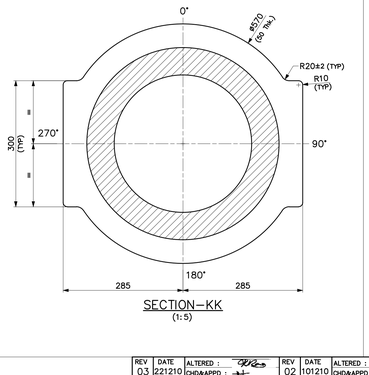
NOZZLE SECTION
(65 NB) (1:1)



NOZZLE SECTION
(50 NB) (1:1)



NOZZLE SECTION
(20 NB) (1:1)



SECTION–KK
(1:5)

NOTES: –

1. MATERIAL SPECIFICATION FOR THE HEADER FORGING IS SA350GRLF2 CLASS1 WITH SUPPLEMENTARY REQUIREMENT ON CHEMICAL COMPOSITION AS GIVEN IN THE APPROVED SPECIFICATION.
2. FORGED HEADER MATERIAL, MANUFACTURING, TESTING, EXAMINATIONS AND PACKING SHALL BE IN ACCORDANCE WITH ASME SEC–III NB CL1 AND AS PER APPROVED SPECIFICATION.
3. THE HEADER WITH INTEGRAL NOZZLES SHOWN IN THE DRAWING SHALL BE MANUFACTURED BY FORGING OR FORMING OR A COMBINATION OF SIMILAR OPERATIONS.
4. HEADER IS TO BE FORGED AS SINGLE PIECE AND IT SHALL BE SUPPLIED AS NORMALISED CONDITION. WELD JOINTS ARE NOT PERMITTED TO FORM THE HEADERS.
5. HEADERS H1 TO H8 SHALL BE IN FULL COMPLIANCE WITH SPECIFICATION WITH THE FOLLOWING EXCEPTIONS AND ADDITIONAL REQUIREMENTS.
   - 5.1 MATERIAL SHALL BE FULLY KILLED, FINE GRAINED STEEL PRODUCED BY VACUUM TREATMENT AND ELECTROSLAG REMELTING SHALL BE USED. ADDITIONAL IMPURITY ELEMENT RESTRICTION Sn=0.011% MAX, N=0.013% MAX, As=0.025 MAX AND Sb=0.007 MAX SHALL APPLY.
   - 5.2 REPRESENTATIVE NOZZLES SHALL BE SECTIONED (IN LONGITUDINAL & TRANS. PLANES) AND EXAMINED FOR METAL FLOW, SOUNDNESS, REQUIRED CONTOURS AND REINFORCEMENT BY SUPPLIER. SAMPLE NOZZLES AND HEADER PIPE TEST SECTIONS FROM SAME PRODUCTION HEAT FOR PURCHASER'S USE SHALL BE SUPPLIED.
   - 5.3 TEST COUPONS TAKEN FROM EACH HEADER SHALL BE SUBJECTED TO SIMULATED POST WELD HEAT TREATMENT AS REQUIRED IN ASME SEC–III NB, AT 600 PLUS OR MINUS 10 DEG C x 6 Hrs MAX.
   - 5.5 ADDITIONAL FRACTURE TOUGHNESS REQUIREMENT SHALL BE AS PER NB–2331 AS APPLICABLE TO VESSELS. IMPACT SPECIMENS, ORIENTED IN TRANSVERSE (TANGENTIAL) AND NORMAL (RADIAL) DIRECTIONS, SHALL BE TESTED AT TEMPERATURE NOT GREATER THAN +18 DEG C TO OBTAIN 68 JOULES AND 0.90 MM OF ABSORBED ENERGY AND LATERAL EXPANSION RESPECTIVELY AS A MINIMUM NDT TEMPERATURE AS DETERMINED BY DROP WEIGHT TEST SHALL BE LOWER THAN MINUS 15 DEG C DROP WEIGHT CONFIRMATORY TEST SHALL SHOW TWO 'NO BREAKS' AT MINUS 15 DEG C
   - 5.6 ALL SPECIFIED MECHANICAL, METALLOGRAPHIC, CHEMICAL ANALYSIS TESTS SHALL BE CONDUCTED ON SPECIMENS TAKEN FROM BOTH ENDS AND MID LENGTH REGION OF EACH HEADER. THE SPECIFIED MIN. TEST VALUES SHALL BE APPLICABLE AND COMPLIED BY SPECIMENS OF ALL ORIENTATIONS: LONGITUDINAL, TRANVERSE AND NORMAL (ie., AXIAL, TANGENTIAL AND RADIAL RESPECTIVELY) DETAILS SHALL BE PROVIDED BY THE BIDDER.
   - 5.7 SURFACE FINISH SHALL BE 6.3 MICRONS ALL OVER.
   - 5.8 WALL THICKNESS INDICATED ARE SPECIFIED IN MINIMUM VALUE.
6. WHEN NOT SPECIFIED, THE BEST TOLERANCE ACHIEVABLE ON THE VARIOUS DIMENSIONS SHALL BE CLEARLY INDICATED BY THE SUPPLIER.
7. SPECIAL REQUIREMENTS WHEN NOZZLE PROTRUSIONS ARE OBTAINED BY MACHINING.
   - 7.1 AS FORGED HEADER SHALL BE OF SUITABLE CONFIGURATION, SOUNDNESS AND PROPERTIES SUCH THAT THE NOZZLES SHALL ALSO HAVE SPECIFIED MECHANICAL PROPERTIES ALONG THEIR AXES.
   - 7.2 FROM BOTH END & MID LENGTH REGION OF EACH HEADER, ADDITIONAL TENSION IMPACT AND DROP WEIGHT TESTS SHALL BE CONDUCTED ON RADIAL SPECIMENS (PARALLEL TO NOZZLE AXES)
   - 7.3 IMPACT TESTS SHALL BE CONDUCTED ON RADIAL SPECIMENS AT ATLEAST 7 TEMPERATURES (–45 DEG C, –15 DEG C, +0 DEG C, +18 DEG C, –,–,– DEG C) AND TRANSITION CURVES (FOR ABSORBED ENERGY, LATERAL EXPANSION, % SHEAR FRACTURE) COVERING LOWER AND UPPER SHELVES SHALL BE DRAWN FOR EACH MELT AND HEAT TREATMENT BATCH. FATIGUE TESTS (ON RADIAL AND TANGENTIAL SPECIMENS) SHALL BE CONDUCTED TO DEMONSTRATE THAT MARGINS OF SAFETY ON BOTH Sa (STRAIN AMPLITUDE) AND N (CYCLES) NOT LESS THAN 2 AND 20 RESPECTIVELY ARE AVAILABLE w.r.t. ASME SEC–III DIV–1 APPENDICES DESIGN FATIGUE CURVE FIG: 1–9–1 SUPPLIER SHALL PROVIDE THE DETAILS.
   - 7.4 NOZZLES SHALL BE THOROUGHLY EXAMINED FOR SOUNDNESS BY VOLUMETRIC AND SURFACE NDE. (ACCEPTANCE STANDARDS SHALL BE BASED ON FINAL NOZZLE THICKNESS)
   - ~~7.5 DETAILS AND EXTENT OF THE ABOVE MECHANICAL TESTS AND NDE SHALL BE PROPOSED IN THE BID AND MUTUALLY AGREED UPON BEFORE PLACEMENT OF ORDER.~~
8. DETAILED DRAWING INDICATING VARIOUS STAGES OF MANUFACTURE SHALL BE SUBMITTED FOR APPROVAL.
9. WELD EDGES AND MACHINED SURFACES SHALL BE SUBJECTED TO MT/PT AS PER APPROVED SPECIFICATION.
10. ALL MACHINED SURFACES AND WELD EDGES SHALL BE SUITABLY PROTECTED DURING TRANSPORTATION.
11. HEADERS SHALL BE PROPERLY PACKED AND COVERED IN WOODEN BOX STRENGTHENED WITH SUITABLE STEEL STRUCTURE.
12. HEADER FORGING SHALL BE SUPPLIED IN FINISH MACHINED CONDITION.
13. DETAILED FORGING DRAWNG SHALL BE SUBMITTED BY SHOWING LOCATIONS OF THE TEST COUPONS.
14. RPNE – THE PLANE PERPENDICULAR TO THE REFERENCE PLANE OF THE NOZZLE AXIS PARALLEL TO REFERENCE HEADER AXIS (HA) AT THE DISTANCE SHOWN IN DRAWING FROM REFERENCE HEADER AXIS.
15. SUITABLE PERMANENT MARKS SHALL BE MARKED ON THE EXTERNAL SURFACE OF HEADERS FOR DEFINING 'HA'
16. TOLERANCE ON LENGTH DIMENSIONS ARE ±3mm UNLESS OTHERWISE SPECIFIED.
17. TOLERANCE IF NOT SPECIFIED SHALL BE AS GIVEN BELOW,
    FOR MACHINING : ±0.2 FOR 0–50
    ±0.3 FOR ABOVE 50

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 :	CHD&APPD :
03	221210		
CORRECTED IN LINE WITH CUSTOMER'S LATEST REVISED DRG.			

REV	DATE	ALTERED :	CHD&APPD :
02	101210		
CORRECTED IN LINE WITH CUSTOMER'S LATEST REVISED DRG. NOTE–5.4 DELETED.			

REV	DATE	ALTERED :	CHD&APPD :
01	201010		
CORRECTED IN LINE WITH CUSTOMER'S LATEST REVISED DRG.			

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 700MWe

Bharat Heavy Electricals Ltd
UNIT: HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI – 620014
05–226/0

	NAME	SIGNATURE	DATE	NO. OF YAS
DSN	K.R.		250910	
CHD	SOUGHAT		250910	
APPD	V.R.		250910	

DEPT	GRADE OF UNTOL. DIM	SCALE	WEIGHT (Kg)	REF TO ABBT / OLD DWG	ITEM NO	No. OF ITEMS
NC	C/M/F		9275	KAPP–3&4/33117/2001/DD		
CODE 150						

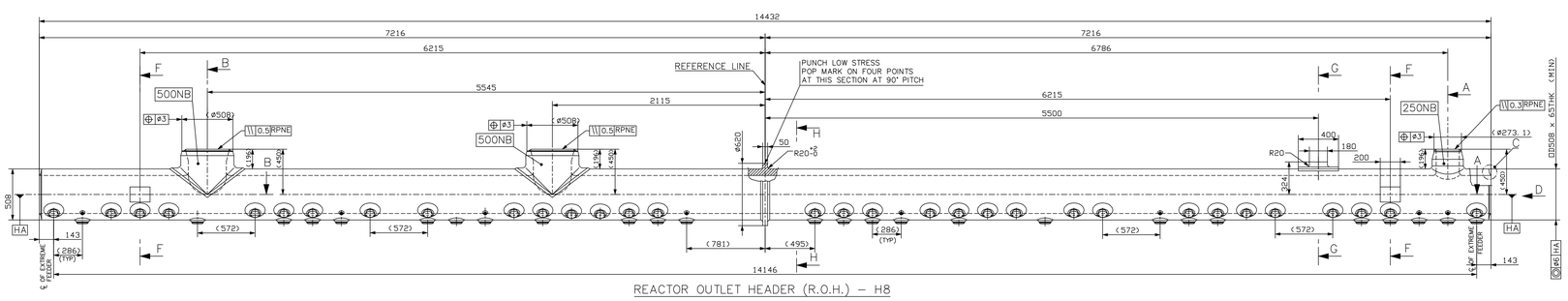
TITLE: REACTOR INLET HEADER–H7 (FORGING)

CARD CODE: U 01

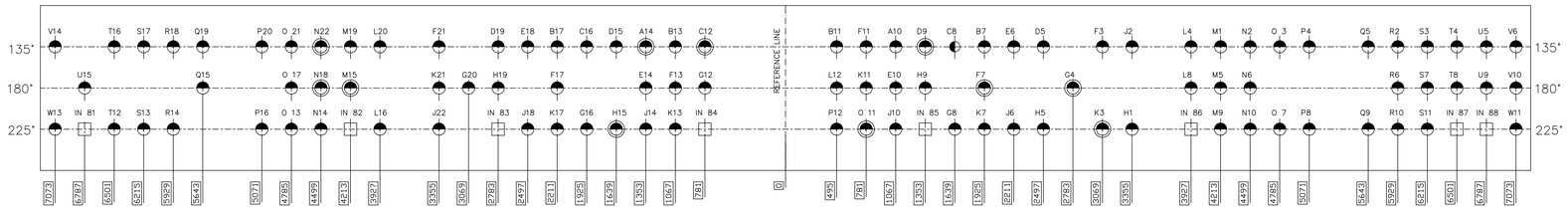
DRAWING NO : 0–93–420–05157 | REV 03

Size A0

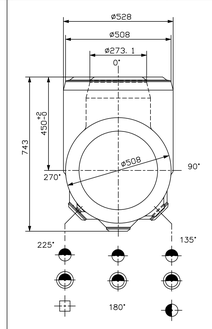
DRAWING NO 0-93-420-05158



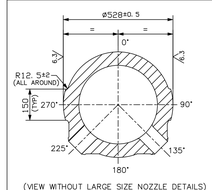
REACTOR OUTLET HEADER (R.O.H.) – H8



FEEDER PIPE NOZZLE DEVELOPED PLAN FOR (R.O.H.)–H8

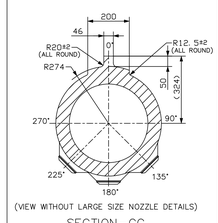


VIEW–D



(VIEW WITHOUT LARGE SIZE NOZZLE DETAILS)

SECTION–FF



(VIEW WITHOUT LARGE SIZE NOZZLE DETAILS)

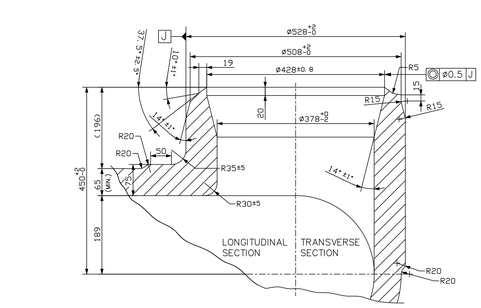
SECTION–GG

DETAIL–C
(1:1)

ALL DIMENSIONS ARE IN MILLIMETERS

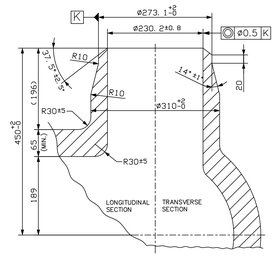
NOTES:

1. MATERIAL SPECIFICATION FOR THE HEADER FORGING IS SA350 GR. LF2 CL. 1. WITH SUPPLEMENTARY REQUIREMENTS ON CHEMICAL COMPOSITION AS GIVEN IN THE APPROVED SPECIFICATION.
2. FORGED HEADER MATERIAL MANUFACTURING, TESTING, EXAMINATIONS AND PACKING SHALL BE IN ACCORDANCE WITH ASME SEC. III NB CL. 1 AND AS PER APPROVED SPECIFICATION.
3. THE HEADER WITH INTEGRAL NOZZLES SHOWN IN THE DRAWING SHALL BE MANUFACTURED BY FORGING OR FORMING OR COMBINATION OF SIMILAR OPERATIONS.
4. HEADER IS TO BE FORGED AS SINGLE PIECE AND IT SHALL BE SUPPLIED AS NORMALISED CONDITION, WELD JOINTS ARE NOT PERMITTED TO FORM THE HEADER.
5. HEADERS H1 TO H8 SHALL BE IN FULL COMPLIANCE WITH SPECIFICATION WITH THE FOLLOWING EXCEPTIONS AND ADDITIONAL REQUIREMENTS.
   - 5.1 MATERIAL SHALL BE FULLY KILLED, FINE GRAINED STEEL PRODUCED BY VACUUM TREATMENT AND ELECTRO SLAG REMELTING SHALL BE USED, ADDITIONAL IMPURITY ELEMENTS RESTRICTION Sn=0.011% MAX, N=0.013% MAX, As=0.025% MAX, AND Sb=0.007% MAX. SHALL APPLY.
   - 5.2 REPRESENTATIVE NOZZLES SHALL BE SECTIONED IN LONGITUDINAL & TRANS PLANES AND EXAMINED FOR METAL FLOW, SOUNDNESS, REQUIRED CONTOURS AND REINFORCEMENT BY SUPPLIER. SAMPLE NOZZLES AND HEADER PIPE TEST SECTIONS FROM SAME PRODUCTION HEAT FOR PURCHASER'S USE SHALL BE SUPPLIED.
   - 5.3 TEST COUPONS TAKEN FROM EACH HEADER SHALL BE SUBJECTED TO SIMULATED POST WELD HEAT TREATMENT AS REQUIRED IN ASME SEC.-III NB, AT 600 PLUS OR MINUS 10°C X 6 Hrs. MAXIMUM.
   - 5.5 ADDITIONAL FRACTURE TOUGHNESS REQUIREMENT SHALL BE AS PER NB-2331 AS APPLICABLE TO VESSEL IMPACT SPECIMENS, ORIENTED IN TRANSVERSE (TANGENTIAL) AND NORMAL (RADIAL) DIRECTIONS, SHALL BE TESTED AT TEMPERATURE NOT GREATER THAN + 18°C TO OBTAIN 68 JOULES AND 0.90mm OF ABSORBED ENERGY AND LATERAL EXPANSION RESPECTIVELY AS A MIN. NDT TEMPERATURE AS DETERMINED BY DROP WEIGHT TEST SHALL BE LOWER THAN -15°C DROP WEIGHT CONFIRMATORY TEST SHALL SHOW TWO 'NO BREAKS' AT -15°C.
   - 5.6 ALL SPECIFIED MECHANICAL, METALOGRAPHIC, CHEMICAL ANALYSIS TEST SHALL BE CONDUCTED ON SPECIMENS TAKEN FROM BOTH ENDS AND MID LENGTH REGION OF EACH HEADER. THE SPECIFIED MIN. TEST VALUES SHALL BE APPLICABLE AND COMPLIED BY SPECIMENS OF ALL ORIENTATIONS. LONGITUDINAL, TRANSVERSE AND NORMAL (i.e AXIAL, TRANGENTIAL AND RADIAL RESPECTIVELY) DETAILS SHALL BE PROVIDED BY THE BIDDER.
   - 5.7 SURFACE FINISH SHALL BE 6.3 MICRONS ALL OVER.
   - 5.8 WALL THICKNESS INDICATED ARE SPECIFIED IN MINIMUM VALUES.
6. WHEN NOT SPECIFIED THE BEST TOLERANCE ACHIEVABLE ON THE VARIOUS DIMENSIONS SHALL BE CLEARLY INDICATED BY THE SUPPLIER.
7. SPECIAL REQUIREMENTS WHEN NOZZLE PROTRUSIONS ARE OBTAINED BY MACHINING.
   - 7.1 AS FORGED HEADER SHALL BE OF SUITABLE CONFIGURATION, SOUNDNESS AND PROPERTIES SUCH THAT THE NOZZLES SHALL ALSO HAVE SPECIFIED MECHANICAL PROPERTIES ALONG THEIR AXES.
   - 7.2 FROM BOTH END AND MID LENGTH REGION OF EACH HEADER, ADDITIONAL TENSION IMPACT AND DROP WEIGHT TEST SHALL BE CONDUCTED ON RADIAL SPECIMENS (PARALLEL TO NOZZLE AXES)
   - 7.3 IMPACT TEST SHALL BE CONDUCTED ON RADIAL SPECIMENS AT ATLEAST 7 TEMPERATURES (-45°C, -15°C, +10°C, +18°C, ---°C) AND TRANSITION CURVES (FOR ABSORBED ENERGY, LATERAL EXPANSION, % SHEAR FRACTURE) COVERING LOWER AND UPPER SHELVES SHALL BE DRAWN FOR EACH MELT AND HEAT TREATMENT BATCH. FATIGUE TEST (ON RADIAL TANGENTIAL SPECIMENS) SHALL BE CONDUCTED TO DEMONSTRATE THAT MARGINS OF SAFETY ON BOTH Sa (STRAIN AMPLITUDE AND N CYCLES NOT LESS THAN 2 AND 20 RESPECTIVELY ARE AVAILABLE w.r.t. ASME SEC III DIV.1 APPENDICES, DESIGN FATIGUE CURVE Fig. 1-9-1. SUPPLIER SHALL PROVIDE THE DETAILS.
   - 7.4 NOZZLES SHALL BE THOROUGHLY EXAMINED FOR SOUNDNESS BY VOLUMETRIC AND SURFACE NDE (ACCEPTANCE STANDARDS SHALL BE BASED ON FINAL NOZZLE THICKNESS)
   - ~~7.5 DETAILS AND EXTENT OF THE ABOVE MECHANICAL TESTS AND NDE SHALL BE PROPOSED IN THE BID AND MUTUALLY AGREED UPON BEFORE PLACEMENT OF ORDER.~~
8. DETAILED DRAWING INDICATING VARIOUS STAGES OF MANUFACTURE SHALL BE SUBMITTED FOR APPROVAL
9. WELD EDGES AND MACHINED SURFACES SHALL BE SUBJECTED TO MT/ PT AS PER APPROVED SPECIFICATIONS.
10. ALL MACHINED SURFACES AND WELD EDGES SHALL BE SUITABLY PROTECTED DURING TRANSPORTATION.
11. HEADERS SHALL BE PROPERLY PACKED AND COVERED IN WOODEN BOX STRENGTHENED WITH SUITABLE STEEL STRUCTURE.
12. HEADER FORGING SHALL BE SUPPLIED IN FINISH MACHINED CONDITION.
13. DETAILED FORGING DRAWING SHALL BE SUBMITTED BY SHOWING LOCATIONS OF THE TEST COUPONS.
14. RPNE - THE PLANE PERPENDICULAR TO THE REFERENCE PLANE OF THE NOZZLE AXIS PARALLEL TO REFERENCE HEADER AXIS (HA) AT THE DISTANCE SHOWN IN THE DRAWING FROM REFERENCE HEADER AXIS.
15. SUITABLE PERMANENT MARKS SHALL BE MARKED ON THE EXTERNAL SURFACE OF HEADER FOR DEFINING 'HA'
16. TOLERANCE ON LENGTH DIMENSIONS ARE ±3mm UNLESS OTHERWISE SPECIFIED.
17. TOLERANCE IF NOT SPECIFIED SHALL BE GIVEN BELOW FOR MACHINING
    0 TO 50 ±0.2
    50 TO ABOVE ±0.3



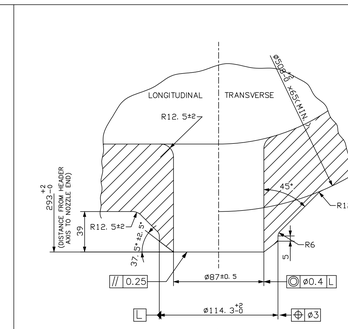
500 NB

SECTION–BB
(1:5)

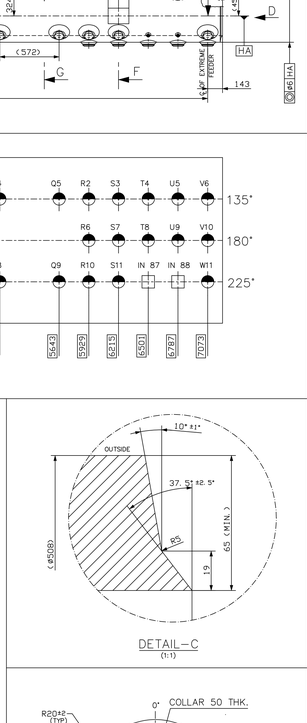


250 NB

SECTION–AA
(1:5)

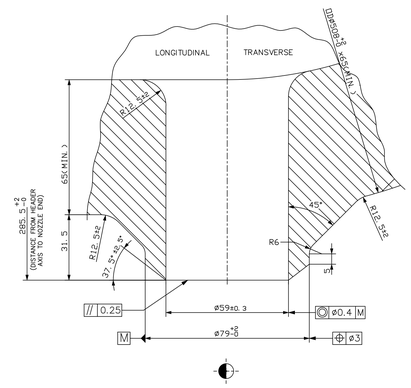


100 NB NOZZLE DETAILS

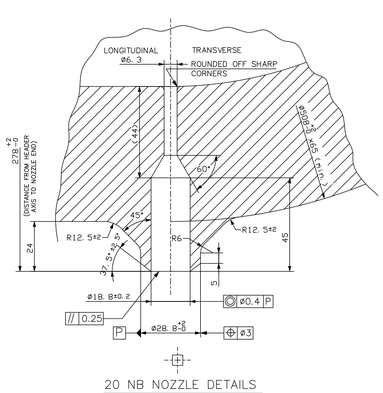


(VIEW WITHOUT NOZZLE AND FEEDERS DETAILS)

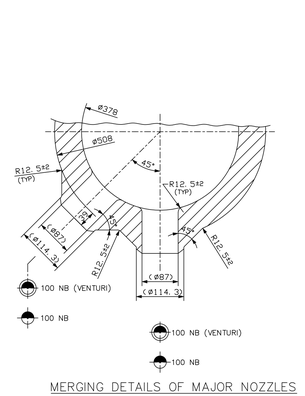
SECTION–HH



65 NB NOZZLE DETAILS



20 NB NOZZLE DETAILS



MERGING DETAILS OF MAJOR NOZZLES

NOZZLE LEGENDS AND QUANTITY DETAILS

SYMBOL	NOZZLE DESCRIPTION	No. OFF NOZZLE OPENINGS
	FEEDER PIPE NOZZLE 100NB	86
	FEEDER PIPE NOZZLE 100NB (VENTURI)	11
	FEEDER PIPE NOZZLE 65NB	1
	INSTRUMENTATION NOZZLE 20NB	8
250 NB	SHUT DOWN COOLING INLET	1
500 NB	S.G. INLET	2

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 :	CHD&APPD :
03	22.10.10		

NOTE MINOR CORRECTIONS INCORPORATED

REV	DATE	ALTERED :	CHD&APPD :
02	25.11.10		

DRG. REVISED AS PER CUSTOMER REQUIREMENTS AND NOTE-5.4 DELETED

REV	DATE	ALTERED :	CHD&APPD :
01	20.10.10		

SECTION-FF AND GG ADDED

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 700MWe

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

	NAME	SIGNATURE	DATE	NO. OF SHT
DRN	K.B		14.08.10	
CHD	MANDAL		01.10.10	
APPD	V.R		04.10.10	

DEPT	GRADE OF UNTOL DIM	SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG	ITEM NO	NO. OF ITEMS
NC	C/M/F	/	10518	KAPP 3&4/33117/2006/DD		
CODE 150						

TITLE: REACTOR OUTLET HEADER – H8 (FORGING)

CARD CODE: U 01

DRAWING NO : 0-93-420-05158 REV 03

Size A0