BHARAT HEAVY ELECTRICALS LIMITED

TIRUCHIRAPPALLI

REQUIREMENT OF NEW VENDORS FOR STEEL FABRICATION WITH BHEL MATERIAL

Outsourcing, BHEL, Tiruchirappalli invites new vendors within India for fabrication of Sub-assemblies and Headers for Nuclear steam generators with BHEL material for NPCIL, 700 MW project. Full details can be downloaded from BHEL's website **http://www.bhel.com** (*Tender Notifications* page) or from the government. Tenders website **http://tenders.gov.in** (*Public Sector Units* > *Bharat Heavy Electricals Limited* page) against Ref. No. **NIT_25294.** For registration with BHEL Tiruchirappalli, visit **http://www.bheltry.co.in** (Online Vendor Registration > Outsourcing page).

For clarifications, if any, contact:

Senior Manager, Outsourcing, BHEL, Tiruchirappalli – 620 014, Tamil Nadu Phone: (0431) 2574086, Fax 2520517, email: mradha@bheltry.co.in

Scope of Work

(SUB-ASSEMBLIES OF 700 MWe/NPCIL)

SHELL-1 ASSEMBLY (SA 11)

Drawing No.:- 2-HE-170-00998/00

1 Collection of Shell Forging and other components from Stores, BHEL, Trichy-14.

2 Getting qualified for welding by doing Procedure Qualifications (5 nos.) which include welding, NDE, HEAT TREATMENT, NDE & successful mechanical testing.

3 Marking of Shell axes, Nozzle (H, P, L, T & V) locations and for ferritic buttering to weld Gussets & Webs, as per Main View and View-A.

4 Ferritic buttering as per DETAIL-F & G to weld attachments, grinding & NDE.

5 Hole opening for Nozzles (H & P), grinding and EP as per DETAIL-E.

6 Welding of Angles to Gussets; Gussets and Webs to Shell, as per DETAIL-G & F, grinding & NDE.

7 Welding of Nozzles-H & P as per DETAIL-E and Nozzles-L, T & V as per DETAIL-D, grinding & NDE.

8 Nozzles-L, T & V are to be drilled (after welding) as per DETAIL-D followed by NDE.

9 Final inspection clearance and movement to BHEL.

SHELL-2 ASSEMBLY

Drawing No.:- 2-HE-170-00999/00

1 Collection of Shell Forging and other components from Stores, BHEL, Trichy-14.

2 Getting qualified for welding by doing Procedure Qualifications (5 nos.) which include welding, NDE, HEAT TREATMENT, NDE & successful mechanical testing.

3 Marking of Shell axes, orientation & location for ferritic buttering and welding of Lug-1 to 4 & Gusset-1, as per Main View, View-A, SECTION-BB, DETAIL-F, G, H, M & N.

4 Ferritic buttering for Lugs & Gussets on Shell, as per DETAIL-F, G, H, M & N; grinding & NDE.

5 Welding of Lugs-1 to 4 and Gusset to Shell, as per DETAIL-F, G, H, M & N, grinding and NDE.

6 Welding of Nozzle (3 nos.), grinding, NDE; drilling through as per DETAIL-D & NDE.

7 Cir. Seam joint between Shell-2 & Cone as per DETAIL-E, grinding NDE.

SHELL-3 ASSEMBLY

Drawing No.:- 2-HE-170-01000/00

1 Collection of Shell Forging and other components from Stores, BHEL, Trichy-14.

2 Getting qualified for welding by doing Procedure Qualifications (5 nos.) which include welding, NDE, HEAT TREATMENT, NDE & successful mechanical testing.

3 Marking of Shell axes, orientation & location for ferritic buttering and welding of Lug-5 to 8 & Gusset, as per Main View, View-A, DETAIL-E, G, K, R & S.

4 Ferritic buttering for Lugs & Gussets on Shell, as per DETAIL- E, G, K, R & S; grinding & NDE.

5 Welding of Lugs-5, 6 & 8 and Gussets to Shell, as per DETAIL- E, G, R & S, grinding and NDE.

6 Hole opening for Nozzle-F, grinding and EP as per DETAIL-F.

7 Welding of Nozzle-F as per DETAIL-F, grinding & NDE.

8

ASSEMBLY OF SHELL-2 & 3

Drawing No.:- 2-HE-170-01001/00

1 Collection of Shell-2 Assy. & Shell-3 Assy.

2 Cir. Seam joint between Shell-2 Assy. & Shell-3 Assy., as per DETAIL-B, grinding NDE.

3 Inspection Clearance and movement to BHEL, Trichy for Post Weld Heat Treatment.

4 After Heat Treatment (at BHEL), collecting back the assembly for final NDE of all joints.

5 Final inspection clearance and movement to BHEL.

SHELL - 4 & DISH HEAD Assembly

Drawing No.:- 2-HE-170-00993/00

1 Collection of **Shell-4**, **Dished Head** and other components from Stores, BHEL, Trichy-14.

2 Getting qualified for welding by doing Procedure Qualifications (7 nos.) which include welding, NDE, Heat Treatment, NDE & successful mechanical testing.

SHELL-4

a. Marking of Shell axes, orientation & location for ferritic buttering on Shell OD & ID to weld attachment as per Main View, View-C, DETAIL-P, H, K & L

b. Ferritic buttering on OD & ID of Shell-4 (as per DETAIL-P, H, K & L), grinding and NDE.

c. Fit up and welding of Nozzles (DETAIL-G) and Attachments (DETAIL-H) on OD of Shell-4; grinding & NDE.

d. Drilling through the Nozzles, as per DETAIL-Gfollowed by NDE for weld.

DISHED HEAD

a. On Dished Head, marking the main axes; boring the existing hole to weld Outlet Nozzle and edge preparation as per DETAIL-E3; fit-up & welding of Outlet Nozzle (DETAIL-E3), Support Ring (DETAIL-Q); grinding & NDE.

b. Fit-up and welding of Perforated Plate – 1 no. and Supports – 4 nos. to Support Ring, as shown in VIEW-C, DETAIL-F & SECTION-EE; grinding & NDE.

SHELL-4 & DISHED HEAD

- Fit-up of cir. Seam weld joint between Shell-4 & Dished Head as per DETAIL-N, welding, grinding & NDE.
- In Shell-4, opening a hole for Man Hole Nozzle, grinding & EP.
- Fit-up and welding of Man Hole Nozzle, grinding & NDE, as per DETAIL-E4.
- Fabrication of Attachments and welding on ID of Shell, as per DETAIL-K & L; grinding & NDE.
- Inspection Clearance and movement to BHEL, Trichy for Heat Treatment.
- After Heat Treatment (at BHEL), collecting back the assembly for final NDE of all joints.
- Final inspection clearance and movement to BHEL.

LOWER SHELL ASSEMBLY

Drawing No.:- 2-HE-170-00992/00

1 Collection of Shells (5 nos.) and other components from Stores, BHEL, Trichy-14.

2 Getting qualified for welding by doing Procedure Qualifications (3 nos.) which include welding, NDE & successful mechanical testing.

3 Marking of axes on all the 5 Shells.

4 Cir. Seam welding of Flange (1 no.) to Shell-1A (as per DETAIL-X & NDE and sending to BHEL, Trichy for machining and drilling of Flange holes.

5 Collection of Shell-1A from BHEL, Trichy.

6 Cir. Seam welding of Shells-1A, 1B, 2, 1C & 1D (4 joints), as per DETAIL-T and NDE.

7 Marking the axes & location, making holes and welding of Blocks (104 nos.) as per Main View & DETAIL-D; grinding and NDE.

8 Fabrication of Box Assembly – 1 no. and welding to Shell-1D, as per SECTION-NN; grinding & NDE.

(contd.)

9 Fabrication of Box Assembly – 1 no. and welding to Shell-1D, as per SECTION-NN; grinding & NDE.

10 Welding of Flow Throttle to Shell-1D as per SECTION-CC & DETAIL-F; other attachments as per DETAIL-K, grinding and NDE.

11 Final inspection clearance and movement to BHEL.

UPPER SHELL ASSEMBLY

Drawing No.:- 2-HE-170-00995/00

1 Collection of Shell (1 no.), Conical Shell (1 no.) and other components from Stores, BHEL, Trichy-14.

2 Getting qualified for welding by doing Procedure Qualifications (1 no.) which include welding, NDE & successful mechanical testing.

3 Fit up and welding of Flange-2 to Shell (DETAIL-C) and Flange-3 to Conical Shell (DETAIL-D), grinding and NDE.

4 Fit up and welding of Shell and Conical Shell, as per DETAIL-N, grinding & NDE.

5 Fit up and welding of Plate to Flange-3 as per DETAIL-D, grinding & NDE.

6 Marking the axes & location, making holes and welding of Guide Rod (16 nos.) as per Main View, View-A & DETAIL-D1; grinding and NDE.

7 Welding of Ladder (12 nos.) as per DETAIL-D2, grinding and NDE.

8 Final inspection clearance and movement to BHEL.

PLATE ASSEMBLY

Drawing No.:- 3-HE-170-02574/00

1 Collection of Plate (1 no.) & Ribs from Stores, BHEL, Trichy-14.

2 Getting qualified for welding by doing Procedure Qualifications (1 no.) which include welding, NDE, HEAT TREATMENT, NDE & successful mechanical testing.

3 Fit-up and welding of Ribs as per DETAIL-L, SECTION-RS, ZZ, & XY; grinding and NDE.

4 Final inspection clearance and movement to BHEL.

RING PIPE ASSEMBLY

Drawing No.:- 2-HE-170-00994/00

1 Collection of Item 01 to 07 as per the drg., from Stores, BHEL, Trichy-14.

2 Getting qualified for welding by doing Procedure Qualifications (4 nos.) which include welding, NDE, HEAT TREATMENT, NDE & successful mechanical testing.

3 Final inspection clearance and movement to BHEL.

4 Layout checking and extra length cutting and EP of Ring pipes (01 & 02).

5 Fit-up and welding of Plate (07) with Ring Pipes (01 & 02) as per DETAIL-D, D1; grinding & NDE.

6 Butt joint between Ring Pipe (01 & 02) as per DETAIL-F, grinding and NDE.

7 Drilling 92 holes for welding of J-Tube (04), as per View-B & DETAIL-C1.

8 Opening holes & EP to weld Connecting cone (06) – 2 nos., as per View-B & R.

9 Fit-up and welding of J-Tube (04) & Fixing Plate (05) - 92 sets as per SECTION-CC & DETAIL-J; welding of Connecting Cone (06) with Ring Pipe; welding of Connecting Pipe (03) to Connecting Cone (06), as per VIEW-R; grinding & NDE.

10 Final inspection clearance and movement to BHEL.

OUTLET HEADERS – 4 nos.

Drawing No.:- 2-HE-170-00997/00

NOTE: For NDE of weld joints, refer NOTE – 4 to 7 in the drg.

1 Collection of Header Forging with Integral Nozzles, Feeder Pipes(100NB,50NB, 65 NB & 20 NB), Dished Heads and other components as per the drg., from Stores, BHEL, Trichy-14.

2 Getting qualified for welding by doing Procedure Qualifications (6 nos.) which include welding, NDE, HEAT TREATMENT, NDE & successful mechanical testing.

3 Levelling the Header horizontally and marking the main axes of Header Forgings.

4 Feeder Pipes preparation:

a. Drilling of 6 mm hole in the Feeder Pipes (100NB, 50 NB & 65 NB) to position and weld 10 NB Stub as per SECTION-NN.

b. Welding of 10 NB Stub to Feeder pipes as per SECTION-NN, grinding & NDE

c. Drilling through the Stub, NDE and tapping 3/8" NPT thread as per SECTION-NN.

d. Correction of ovality in Feeder pipes, extra-length cutting, facing & edge preparation.

(contd.)

5	Fit-up and welding of Straight / Bent Feeder pipes using Flat Type Consumable Insert (Total Qty. is 106 nos.) as per DETAIL-W2; grinding and NDE.
6	Welding of Dished Heads (2 nos.) as per DETAIL-W1; grinding and NDE.
7	Welding of Pipe End Closures to Feeder Pipes as per DETAIL-W3 & W4; grinding & NDE.
8	Welding of Plate (1 no.) to Header as per SECTION-FF; grinding & NDE.
9	Final inspection clearance and movement to BHEL for Heat Treatment (HEAT TREATMENT).
10	After Heat Treatment (at BHEL), collecting back the assembly for final NDE of all joints.
11	Final inspection clearance and movement to BHEL.

GENERAL NOTES:

1. Fabricators should be aware of ASME Specifications as manufacture of all the sub-assemblies listed is to be carried out as per
    a. **ASME Sec III Division 1, Sub Section NB – Class 1 component**
    b. **ASME Sec IX requirements**.

2. NDE (PT, MT, RT & UT) of Pressure Retaining Welds and Attachment welds (eg. Supports) on Pressure Retaining Walls is to be carried out as per **ASME Sec III – NB 5000.**

3. Vendor shall confirm the capability for welding of Quenched & Tempered (Low alloy steel) material.

4. Shell-2 Assembly, Shell-3 Assembly and Assembly of Shell-2 &3 are inter-linked.

5. All operations in each sub-assembly are to be carried out as per BHEL approved documents (like Operation Process Sheet, Welding Procedure Plan, Drawing and Quality Plans etc.)

6. Third Party Inspection (TPI) is under the scope of vendor and to be arranged amongst the BHEL approved Third Party Inspection Agencies.

7. Interested vendors to submit their willingness along with the filled in formats.

8. Based on the Expression of Interest & Pre-qualification Criteria (PQC), Vendors will be short-listed for fabrication of the sub-assemblies.

9. Multiple stage inspection by BHEL/TPI/Customer are envisaged at all manufacturing stages.

Pre Qualification Criteria for ATP Sub-assemblies & Headers

Doc No:- ATP : S/c : 001 **Date :**

Vendor Name and Address:

Part-A (Mandatory)

Sl. No.	Paramter for evaluation	Minimum Required	As given by Firm	As observed in Audit	Remarks	Ok/Not Ok
1	Total Land area (including Area for Assembly)	2 acres				
2	Fencing/Compound wall	All around				
3	Covered Shed	30 x40 m				
4	EB Power Capacity in HP	100 HP (3 phase)				
5	Raw Material Receipt & Clearance at Vendor Works	Similar to Day Book Entry system				
6	Raw Material Testing	Access to testing labs. (NABL approved).				
7	**Material Handling**					
	<u>Handling Facility for Sub-assemblies</u> **EOT crane** to handle weight as indicated against Sl. (1) to (5) & (8) **Gantry / Mobile Crane** to handle weight as indicated against Sl. Nos. (6) & (7) SA-24L/U , 25 & 26)	(1) Shell-1 Assy.:- = 34 MT; (2) Assy. of Shell-2 & 3 = 57 MT; (3) Shell-4 & DH Assy.:-= 37 MT; (4) Lower Shell Assy.:- = 12 MT; (5) Upper Shell Assy.:- = 5 MT; (6) Plate Assy.:- = 3 MT; (7) Ring Pipe Assy.:- = 1 MT; (8) Outlet Headers = 15 MT				
8	**Welding Machine / facility Details**					
	Auto welding m/c (SAW) with track facility .	2 nos. - Min 500 amps				
	(SMAW) Welding M/c - 400 A Inverter	5 nos.				
	GTAW (Tig Welding) welding m/c - 200 A	2 nos.				
	Portable Flask Oven	2 nos. (min.)				
	Electrode Baking & Drying Oven (Calibrated)	1 + 1 no.				
	Flux Baking Oven (Calibrated) for SAW in SA-12 & 13.	1 no.				
9	Pre heating & post heating	Facilities to suit the job requirement.				
10	Roller Positioners (for SA-11 to 13 & 24 L & 24U.	4 nos. (minimum ONE No. with power drive)				

Pre Qualification Criteria for ATP Sub-assemblies & Headers

Doc No:- ATP : S/c : 001 **Date :**

Vendor Name and Address:

Part-A (Mandatory)

Sl. No.	Paramter for evaluation	Minimum Required	As given by Firm	As observed in Audit	Remarks	Ok/Not Ok
11	Grinding M/c	2 Nos.				
12	Bench Grinding	1 Nos				
13	Radial Drilling M/c	2 Nos				
14	Gas cutting	2 nos.				
15	Band saw	1				
16	**Measuring Instruments (all calibrated)**					
	Tape 3m, 5m, 20m	each 2 Nos				
	Vernier 0 - 200 mm	1No.				
	Feeler Gauge	1No.				
	Weld fillet gauge 25 MM	1 no				
	Straight Edge	1 no.				
	Try square	1 no.				
	Sprit level	1 no.				
	Water level checking arrangement	1 no.				
	Micrometer	1 no.				
17	**NDE (PT/MT; RT & UT) Testing facility with qualified personnel:**	In-house test facility with qualified Level-II & III personnel sufficient to carry out NDE required for each sub-assembly requirements. Alternatively, BHEL approved NDE Agencies shall be tied up based on payment by vendor.				
18	Office room with 2 PC , internet facility and printer	To be verified				
19	IT Pan Card	Self Attested copy				
20	TIN No	as applicable				
21	Excise Registration Certificate	as applicable				

Pre Qualification Criteria for ATP Sub-assemblies & Headers

Doc No:- ATP : S/c : 001 **Date :**

Vendor Name and Address:

Part-A (Mandatory)

Sl. No.	Paramter for evaluation	Minimum Required	As given by Firm	As observed in Audit	Remarks	Ok/Not Ok
22	Office room with 2 PC , internet facility and printer	Must				
23	Audited Profit & Loss Account and Balance Sheet for the past 2 years.	Indicating CA membership number				
Part - B (Optional)						
1	**Standby Generator**					
	Capacity (HP)					
	Owned or On rent					
2	Stenciling					
3	Radial Drilling M/c with Tapping facility for ROH, SA-26					
4	Horizontal boring machine to drill Nozzle holes in Shells for SA-11, 12 & 13					

Auditor-1:

Prepared by:

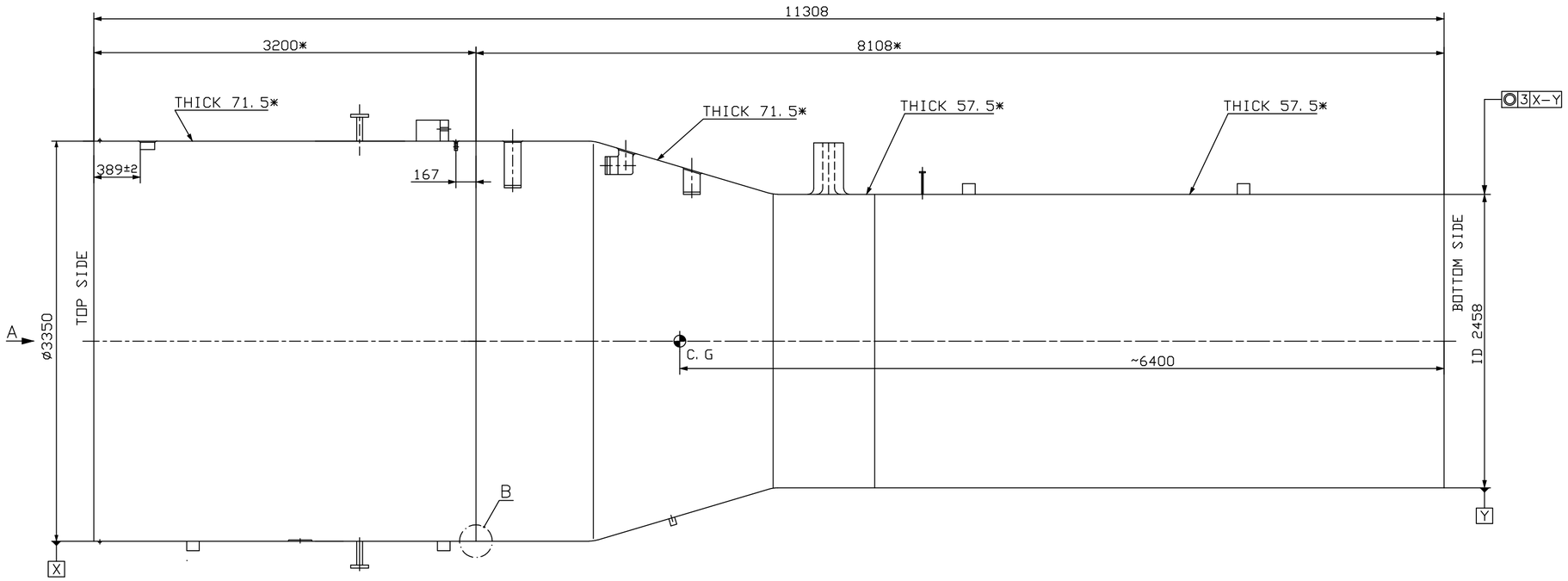
Auditor-2:

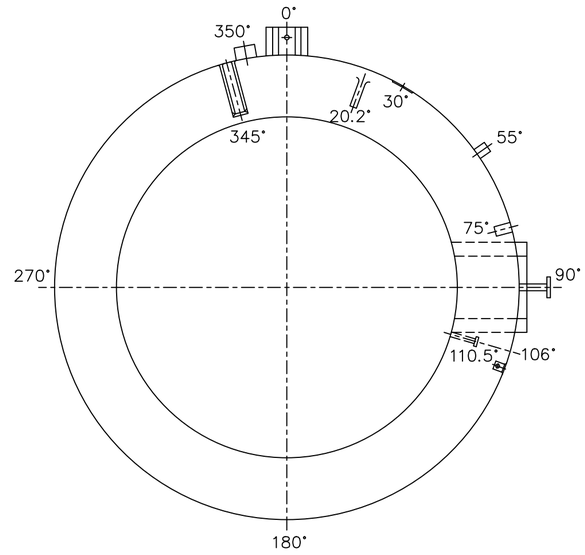
Approved By

Important Notes :	
01	**1. Part-A requirement is a must for qualifying the vendor. Hence, filling up all evaluation parameters is a must and shall be available at the time of spot visit**
02	**2. Part-B is only optional and need not be considered for disqualifying the vendor.**

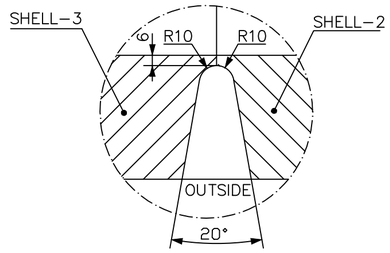
DRAWING NO: 2-HE-170-01001

ALL DIMENSIONS ARE IN MILLIMETERS





VIEW-A



DETAIL-B

NOTES:

1. MANUFACTURING AND TESTING AS PER : ASME SEC.III NB 2010 EDN. OR BETTER
2. THE BUTT WELDS SHALL BE SUBJECTED TO MT/PT, UT AND RT AS PER RELEVANT APPROVED SPECIFICATIONS AND AT APPROVED STAGES.
3. BASE METAL AREAS INCLUDING HAZ. WHEREFROM TEMPORARY ATTACHMENTS ARE REMOVED SHALL BE SUBJECTED TO MT/PT AS PER RELEVANT APPROVED SPECIFICATIONS.
4. BUTT WELDS SHALL BE GROOVED BACK TO SOUND METAL BEFORE WELDING FROM SECOND SIDE.
5. WELD EDGE OFFSET ON BOTH INSIDE AND OUTSIDE SURFACES OF CIR-SEAM WELDS SHALL BE EQUALISED WITH A TRANSITION ANGLE OF MAXIMUM 5 DEGREES
6. THE FINISH MACHINED SURFACES, BUTTERED SURFACES, THREADED SURFACES, AND WELD EDGE PREPARATION SHALL BE PRESERVED AND PROTECTED SUITABLY TO AVOID ANY DAMAGE DURING HANDLING, HEAT TREATMENT OR OTHERWISE
7. LINE X-Y THE REFERENCE AXIS OF ASSEMBLY IS DEFINED AS STRAIGHT LINE JOINING THE CENTRE OF BOTTOM SIDE AND CENTRE OF TOP SIDE ENDS OF THIS SHELL ASSEMBLY
8. ANY DEVIATIONS ON THE LENGTH SHALL BE APPROVED BY THE CUSTOMER.
9. TEMPORARY ATTACHMENT, IF ANY, FOR HANDLING SHALL BE PROVIDED WITH CUSTOMER'S APPROVAL.
10. MATERIAL:
    i) SHELL : 20MnMoNi55
11. WEIGHT ~ : 56.5T
12. (*) DIMENSIONS ARE FOR REFERENCE ONLY

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 :

GENERAL TOLERANCES

FOR WELDING
B DIN 8570

CAUTION:
THIS DRAWING SHOULD BE KEPT IN STRICT CONFIDENCE AND UNDER NO CIRCUMSTANCES BE MADE AVAILABLE TO OTHERS OR ALLOW TO MAKE USE OF THEM

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT

HEAT EXCHANGER

W.O. No.D135 TO D138

Bharat Heavy Electricals Ltd
UNIT: HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI - 620014
05-228/D

	NAME	SIGNATURE	DATE	NO. OF VAR
DRN	E.B		17.10.15	
CHD	R.R/N.K.K		19.10.15	
APPD	A.S		20.10.15	

DEPT	GRADE OF UNTOL DIM		SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG	ITEM NO	No OF ITEMS
NC	C/M/F						
CODE 150							

TITLE	CARD CODE	DRAWING NO :	REV
ASSY. OF SHELL 2 & 3 (FOR SUB-CONTRACTING)	U 01	2-HE-170-01001	00

Size A2

DRAWING NO: 3-HE-170-02574

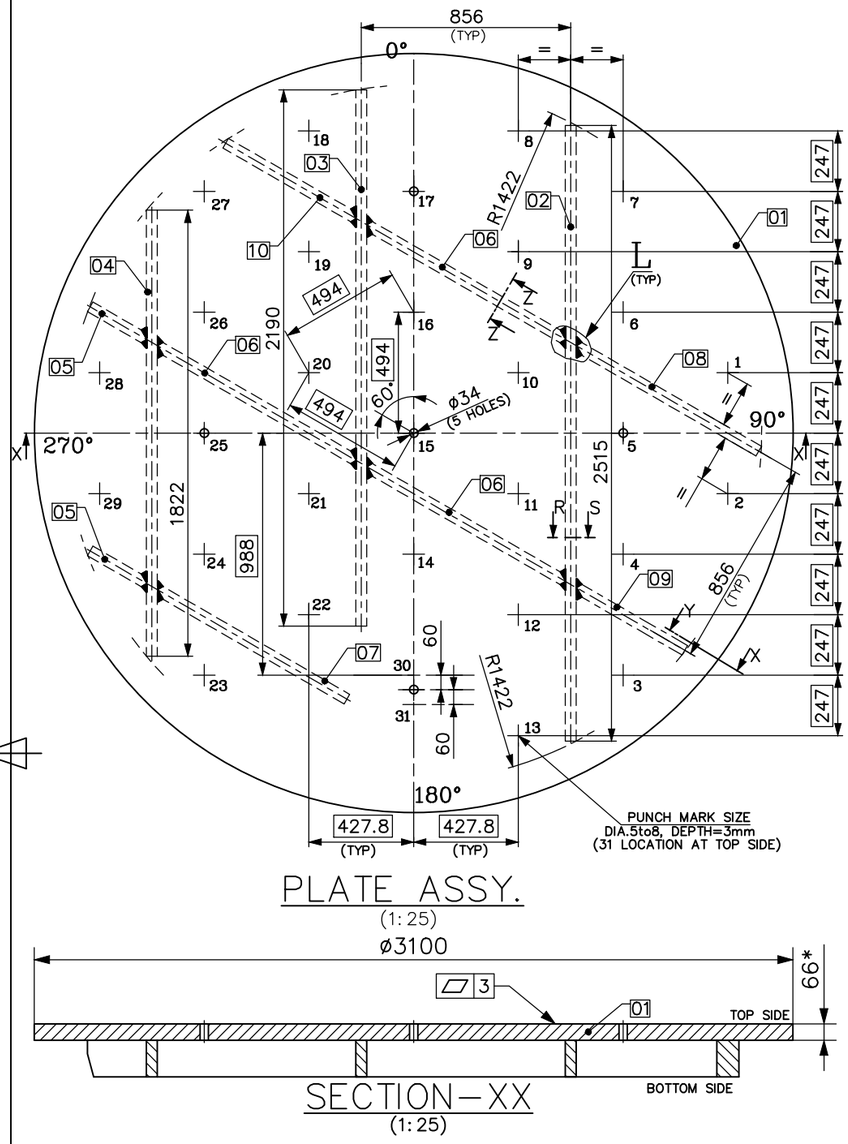
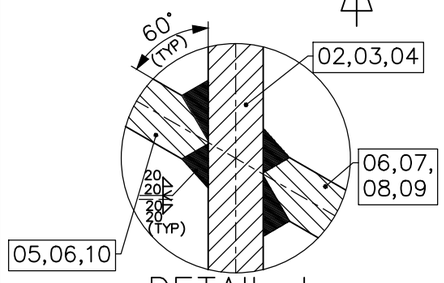
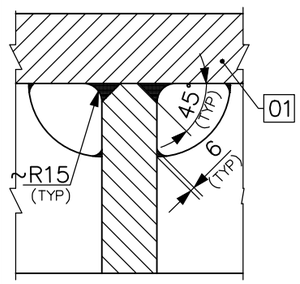


PLATE ASSY.
(1:25)

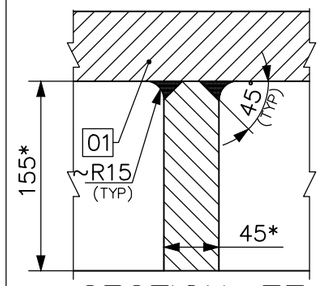
SECTION–XX
(1:25)



DETAIL–L
(WELD DETAIL OF RIBS)



SECTION–RS
(1:5)(VIEW ROTATED)



SECTION–ZZ
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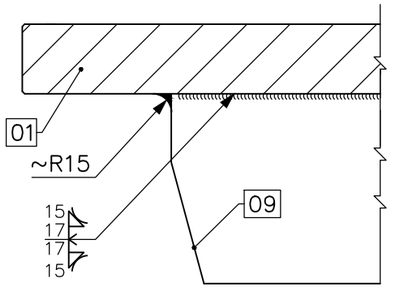
(VIEW ROTATED)

ALL DIMENSIONS ARE IN MILLIMETERS



SECTION–XY
(1:5)

VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER/SIZE	TEM NO / VAR NO	MATERIAL CODE / MATERIAL SPECN	A/C	D1 UNIT / QUANTITY	UNIT WEIGHT	GS	ZONE
	10	RIB–9 PL.45X155X614				16Mo3	A		33.700 1		
	09	RIB–8 PL.45X155X512				16Mo3	A		28.100 1		
	08	RIB–7 PL.45X155X861				16Mo3	A		47.203 1		
	07	RIB–6 PL.45X155X894				16M03	A		49.012 1		
	06	RIB–5 PL.45X155X936				16Mo3	A		51.320 3		
	05	RIB–4 PL.45X155X265				16Mo3	A		14.530 2		
	04	RIB–3 PL.45X155X1822				16Mo3	A		99.900 1		
	03	RIB–2 PL.45X155X2190				16Mo3	A		120.100 1		
	02	RIB–1 PL.45X155X2515				16Mo3	A		137.900 1		
	01	PLATE PL 66x3100x3100				16Mo3	A		5074.000 1		

NOTES:

1. MANUFACTURING AND TESTING ARE AS PER ASME B&PV CODE SECTION–III NB EDITION 2010 OR BETTER.
2. MATERIAL : 16Mo3
3. WEIGHT : 5773 Kg./Assy.
4. ALL WELD EDGES, FIRST AND FINAL PASS OF ALL WELDS SHALL BE SUBJECTED TO MT/PT.
5. * DIMENSIONS ARE ONLY FOR REFERENCE INFORMATION.

CAUTION:
THIS DRAWING SHOULD BE KEPT IN STRICT CONFIDENCE AND UNDER NO CIRCUMSTANCES BE MADE AVAILABLE TO OTHERS OR ALLOW OTHERS TO MAKE USE OF THEM.

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

LINEAR				ANGULAR	
0.5 TO 6	±0.1	315 TO 1000	±0.8	0 TO 10°	±1°
6 TO 30	±0.2	1000 TO 2000	±1.2	10° TO 50°	±30'
30 TO 120	±0.3	2000 TO 4000	±2.0	50° TO 120°	±20'
120 TO 315	±0.5	4000 TO 8000	±3.0	OVER TO120°	±10'
—	—	OVER TO 8000	±4.0	—	—

REV	DATE	
		ALTERED:
		CHECKED:

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT

HEAT EXCHANGER
WO.NO.D135 TO 138

05-229/D

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

	NAME	SIGNATURE	DATE
DRN	NJR	N.Jayaraj	171015
CHD	RRV/EARUN	R.Ravi	191015
APPD	AS		201015

NO. OF VAR

DEPT	GRADE OF UNTOL DIM	SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG	ITEM NO	No OF ITEMS
NC	C/M/F	1:25 1:5	5773			
CODE 150						

TITLE
PLATE ASSEMBLY
(FOR SUB–CONT.)

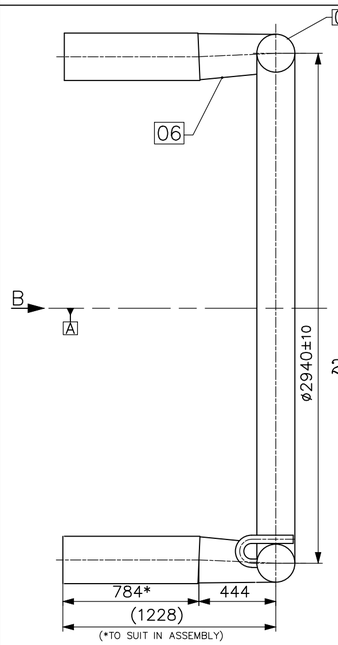
CARD CODE U 01

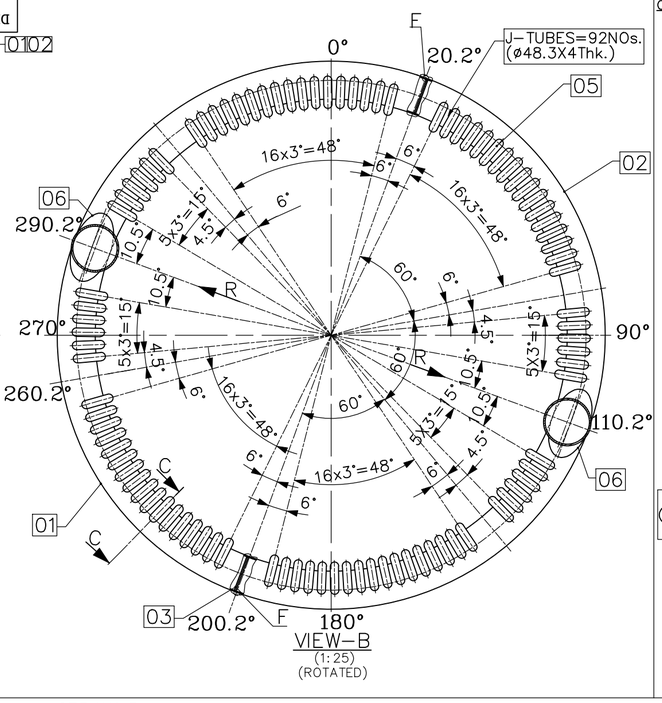
DRAWING NO : 3–HE–170–02574

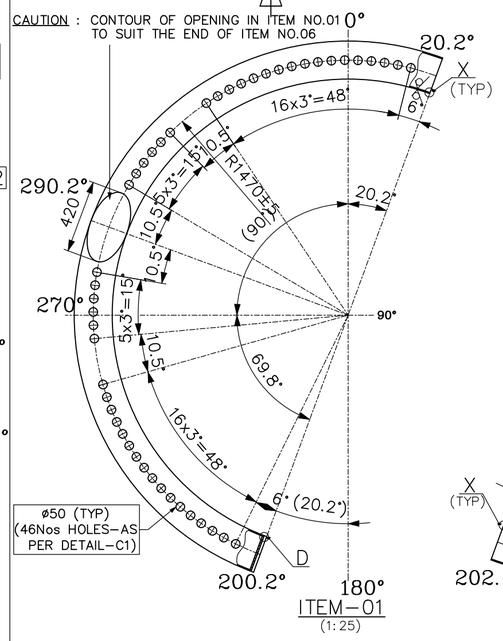
REV 00

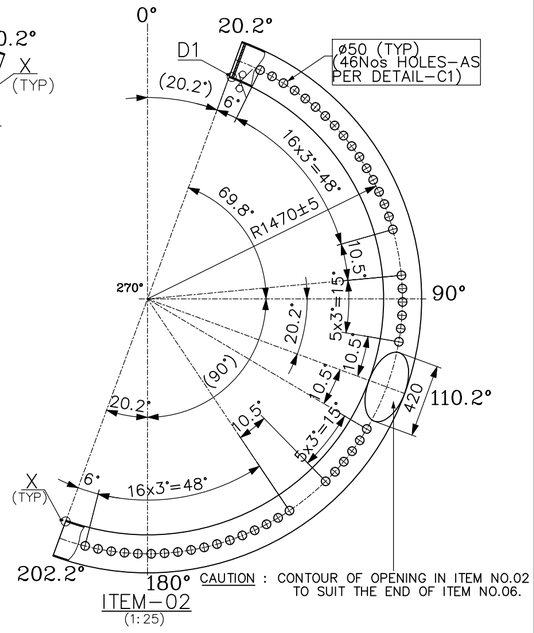
Size A3

DRAWING NO: 2-HE-170-00994

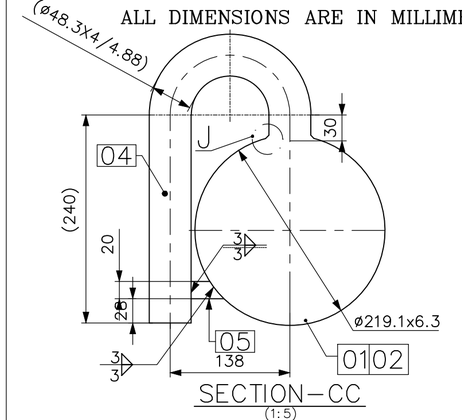


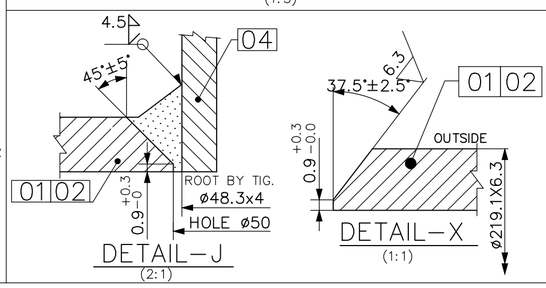


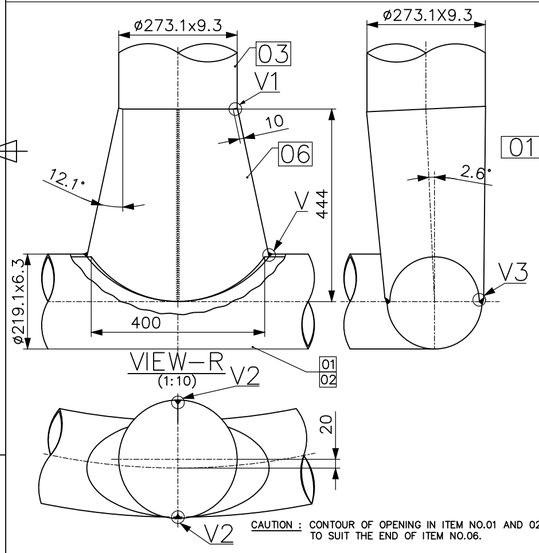


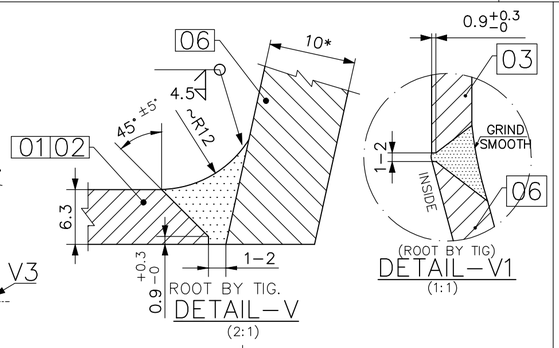


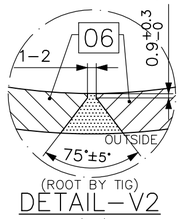
ALL DIMENSIONS ARE IN MILLIMETERS

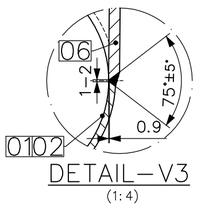


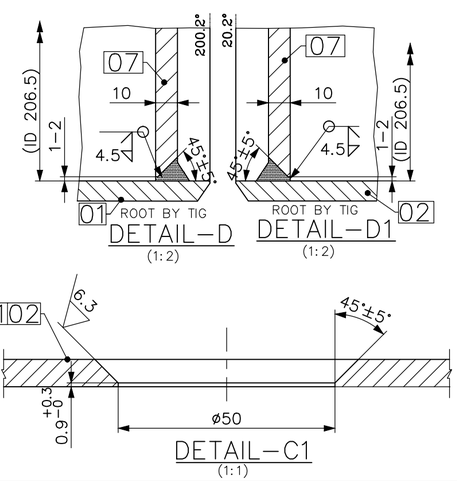


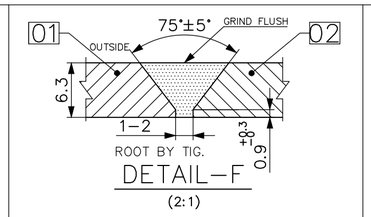












CAUTION:
THIS DRAWING SHOULD BE KEPT IN STRICT CONFIDENCE AND UNDER NO CIRCUMSTANCES BE MADE AVAILABLE TO OTHERS OR ALLOW OTHERS TO MAKE USE OF THEM.

VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER/SIZE			A/C			GS	ZONE
					ITEM NO	MATERIAL CODE		UNIT	UNIT WEIGHT		
					VAR NO	MATERIAL SPECN		D1	QUANTITY		
	07	PLATE PL.10x204.5x204.5				16Mo3	A		2.576 2		
	06	CONNECTING CONE PL.10x449x514				16Mo3	A		18.117 4		
	05	FIXING PLATE PL.6x20x38				16Mo3	A		0.036 92		
	04	J-TUBE ø48.3x4/4.88...490Lg.				SA 213 T11	A		2.140 92		
	03	CONNECTING PIPE-1 PIPE ø273.1x9.3x790Lg./				16Mo3	A		47.797 2		
	02	RING PIPE-2 ø219.1x6.3...4619Lg.				SA335 P11	A		156.000 1		
	01	RING PIPE-1 ø219.1x6.3...4619Lg.				SA335 P11	A		156.000 1		

NOTES:
1. MANUFACTURING AND TESTING ARE AS PER ASME B&PV CODE SECTION-III NB EDITION 2010 OR BETTER.
2. ALL WELD EDGES AND MACHINED SURFACES SHALL BE SUBJECTED TO MT/PT.
3. THE WELDS SHALL BE SUBJECTED TO MT/PT.
4. * DIMENSIONS ARE ONLY FOR REFERENCE INFORMATION.
5. WEIGHT : 2457 Kg/Assy.

REV	DATE	ALTERED:
		CHECKED:

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT

HEAT EXCHANGER
WO.NO.D135 TO 138

Bharat Heavy Electricals Ltd
UNIT: HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI - 620014
05-228/D

	NAME	SIGNATURE	DATE	NO. OF VAR
DRN	NJR		171015	
CHD	RRV/MAK		191015	
APPD	AS		201015	

DEPT	GRADE OF UNTOL DIM		SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG	ITEM NO	No OF ITEMS
NC	C/M/F						07
CODE 150							

TITLE
RING PIPE ASSEMBLY
(FOR SUB-CONT.)

CARD CODE U 01

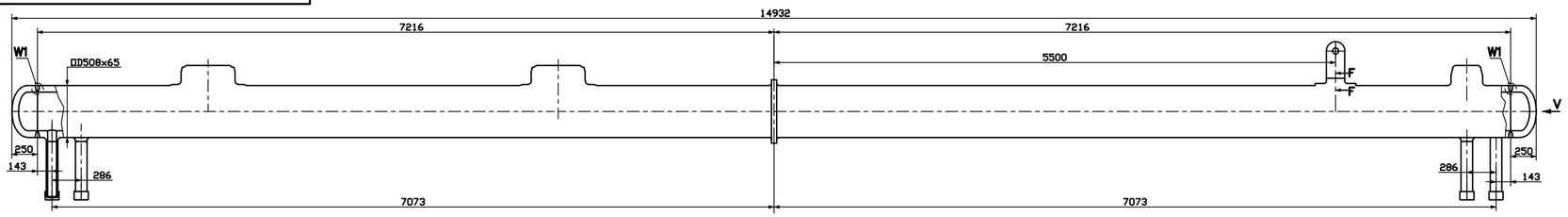
DRAWING NO : 2-HE-170-00994

REV 00

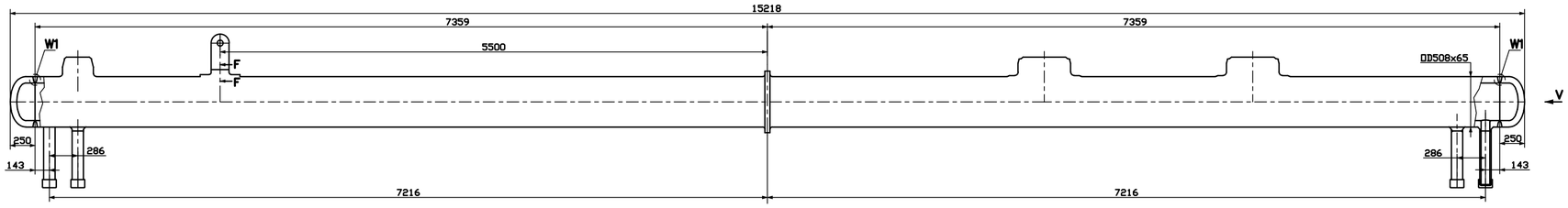
Size A2

DRAWING NO: 2-HE-420-00997

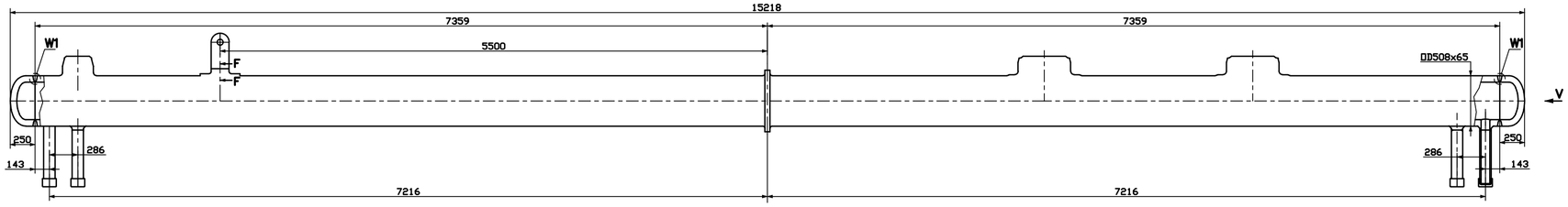
ALL DIMENSIONS ARE IN MILLIMETERS



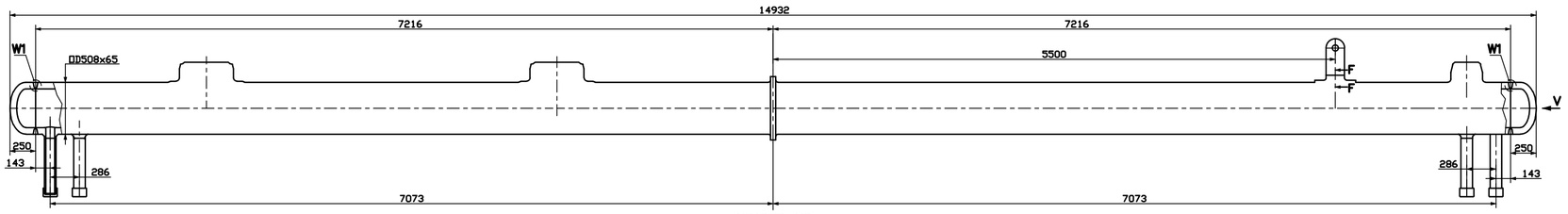
HEADER–H1



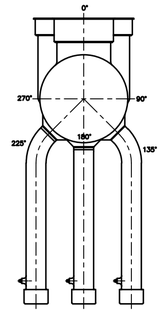
HEADER–H4



HEADER–H5



HEADER–H8



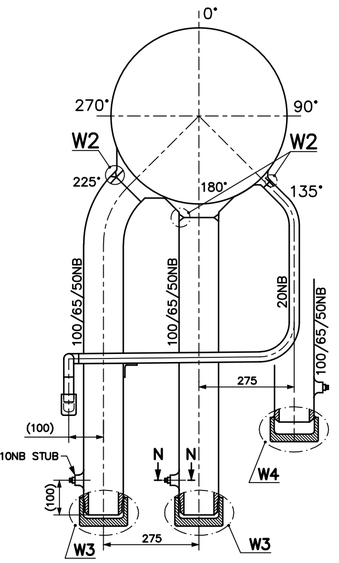
VIEW–V

NOZZLE QUANTITY

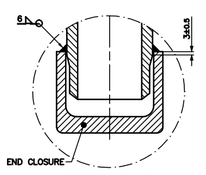
NOZZLE DESCRIPTION	QUANTITY			
	H1	H4	H5	H8
FEEDER PIPE–100NB	86	86	85	86
FEEDER PIPE–100NB WITH VENTURI	11	9	10	11
FEEDER PIPE–65NB	1	1	1	1
FEEDER PIPE–65NB WITH VENTURI	–	1	1	–
FEEDER PIPE–50NB	–	–	1	–
FEEDER PIPE–50NB WITH VENTURI	–	1	–	–
INSTRUMENTATION PIPE–20NB	8	8	8	8
INSTRUMENTATION STUB–10NB	98	98	98	98
3/8" NPT PLUG (C.S.)	98	98	98	98
3/8" NPT PLUG (BRASS)	98	98	98	98

NOTES: –

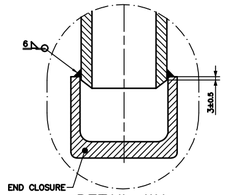
1. MANUFACTURING AND TESTING AS PER : ASME SEC–III NB.
2. MATERIAL :
   - i) HEADER PIPE : SA350 GR LF2
   - ii) FEEDER PIPES : SA333 GR6
   - iii) PLATE : SA516 GR70
   - iv) STD. FITTINGS : SA420 GR WPL6
   - v) PIPE END CLOSURE : SA105
   - vi) 3/8" NPT PLUG : SA105 & BRASS
3. WEIGHT/HEADER : ~14 Tonnes
4. ALL WELD EDGES AND MACHINED SURFACES SHALL BE SUBJECTED TO MT/PT.
5. FIRST AND FINAL PASSES OF ALL WELDS SHALL BE SUBJECTED TO MT/PT.
6. BUTT WELDS BETWEEN HEADER PIPE WITH DISHED END AS GIVEN IN DETAIL–W1 SHALL BE SUBJECTED TO MT/PT, UT & RT.
7. BUTT WELDS BETWEEN HEADER INTEGRAL NOZZLES AND 100NB,65NB,50NB & 20NB PIPES AS GIVEN IN DETAIL–W2 SHALL BE SUBJECTED TO MT/PT, UT & RT.



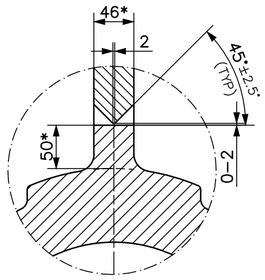
TYPICAL CONNECTION–100/65/50/20NB



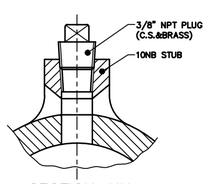
DETAIL–W3



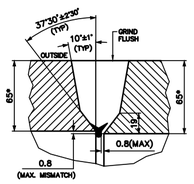
DETAIL–W4



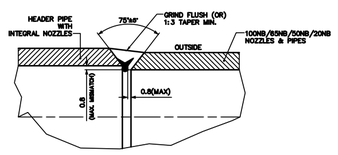
SECTION–FF



SECTION–NN



DETAIL–W1



DETAIL–W2

REV	DATE	ALTERED :
01		CHD&APPD :

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: OUTLET HEADER ASSEMBLY
W.O.No. D142

Bharat Heavy Electricals Ltd
UNIT: HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI – 620014
05-228/D

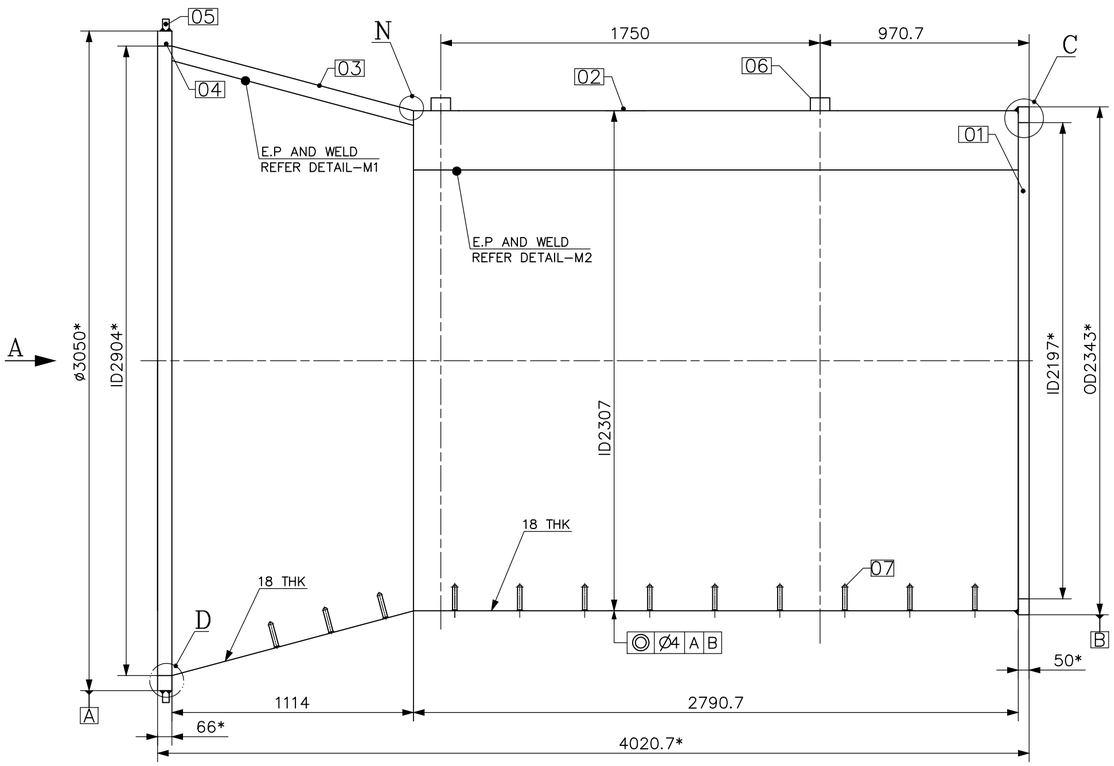
	NAME	SIGNATURE	DATE	NO. OF VAR
DRN	KR		241015	
CHD	RRV		241015	
APPD	A.S.		241015	

DEPT	GRADE OF UNTOL. DIM	SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG	ITEM NO	No OF ITEMS
NC	C/M/F					
CODE 150						

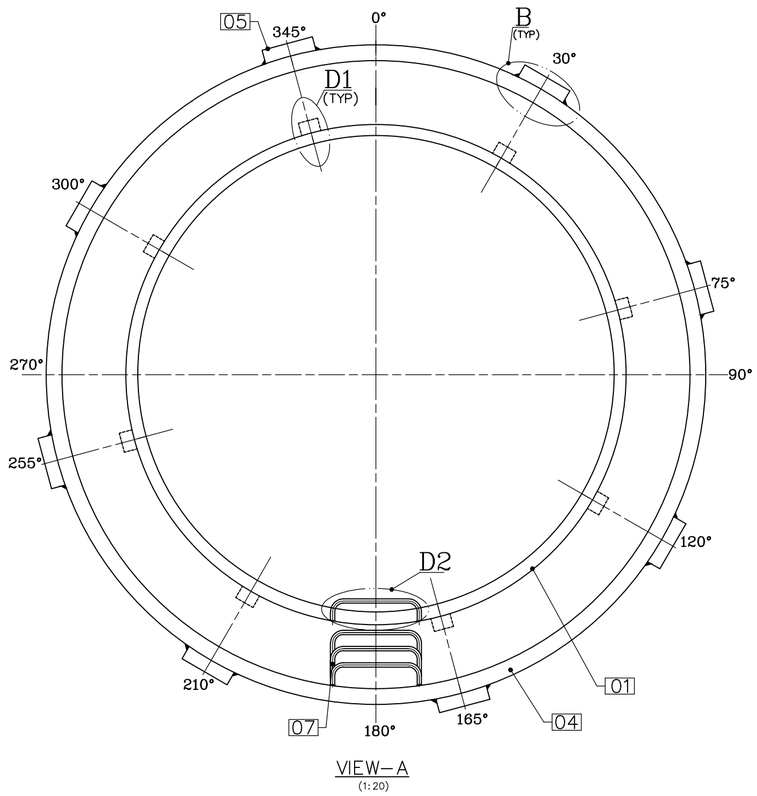
TITLE	CARD CODE	DRAWING NO :	REV
OUTLET HEADERS (FOR SUB–CONTRACTING)	U 01	2–HE–420–00997	00

Size A2

DRAWING NO: 2-HE-170-00995

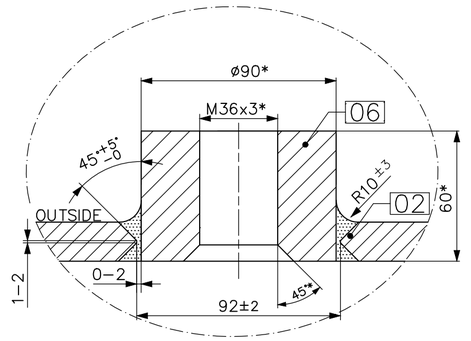


(LADDER ORIENTATION AT 180°)

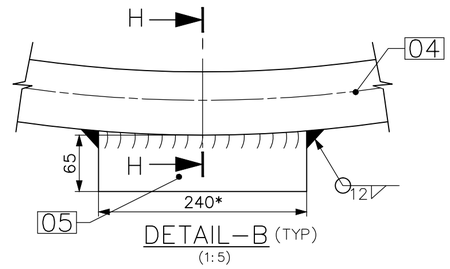


VIEW–A
(1:20)

ALL DIMENSIONS ARE IN MILLIMETERS



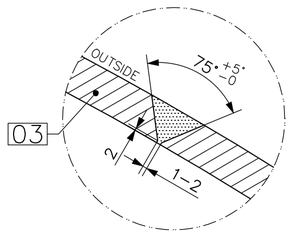
DETAIL–D1



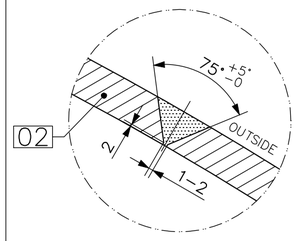
DETAIL–B (TYP)
(1:5)

NOTES:

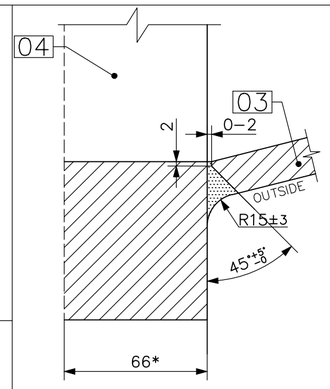
1. MANUFACTURING AND TESTING ARE AS PER ASME B&PV CODE SECTION–III NB EDITION 2010 OR BETTER.
2. WEIGHT : 4913 Kg./Assy.
3. ALL WELD EDGES, FIRST AND FINAL PASS OF ALL WELDS SHALL BE SUBJECTED TO MT/PT.
4. ALL WELD EDGES AND MACHINED SURFACES SHALL BE SUBJECTED TO MT/PT.
5. * DIMENSIONS ARE ONLY FOR REFERENCE INFORMATION.
6. BUTT WELDS SHALL BE 10% SPOT RADIOGRAPHED.
7. BUTT WELDS AND ATTACHMENT WELDS SHALL BE GROOVED BACK TO SOUND METAL BEFORE WELDING FROM SECOND SIDE.



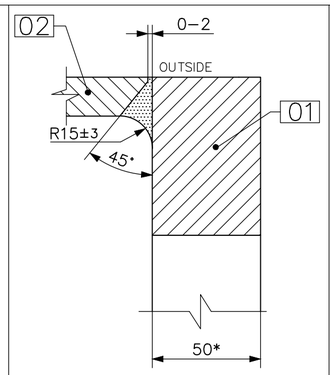
DETAIL–M1
(1:2)
WELD ORIENTATION–15°



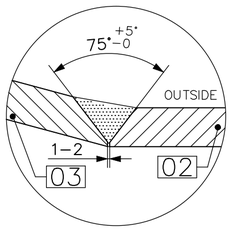
DETAIL–R
(1:2)



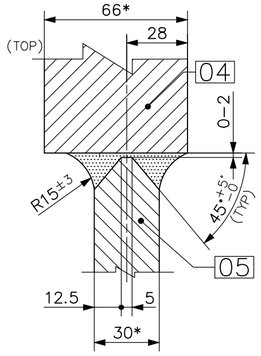
DETAIL–D
(1:2)



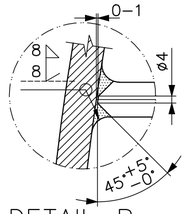
DETAIL–C
(1:2)



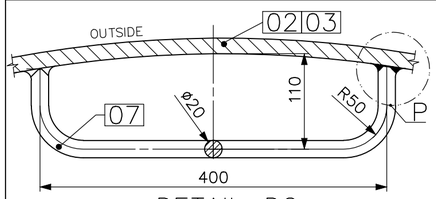
DETAIL–N
(1:2)



SECTION–HH
(1:2)



DETAIL–P



DETAIL–D2
(1:2)

CAUTION:
THIS DRAWING SHOULD BE KEPT IN STRICT CONFIDENCE AND UNDER NO CIRCUMSTANCES BE MADE AVAILABLE TO OTHERS OR ALLOW OTHERS TO MAKE USE OF THEM.

VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER/SIZE	ITEM NO	MATERIAL CODE	A/C	UNIT	UNIT WEIGHT	GS	ZONE
					VAR NO	MATERIAL SPECN		D1	QUANTITY		
	07	LADDER ROD ø20/PL 20				SA–105	A		1.358 12		
	06	GUIDE ROD ø100/PL 66				16Mo3	A		2.520 16		
	05	PLATE PL 30x70x240				16Mo3	A		3.944 8		
	04	FLANGE–3 OD3050/ID2904x66				15Mo3	A		354.000 1		
	03	CONICAL SHELL PL 8x2568x8213				16Mo3	A		1400.629 1		
	02	SHELL PL 18x7305x2791				16Mo3	A		2864.547 1		
	01	FLANGE–2 OD2343/ID2197x50				15Mo3	A		205 1		

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

LINEAR				ANGULAR	
0.5 TO 6	±0.1	315 TO 1000	±0.8	0 TO 10°	±1°
6 TO 30	±0.2	1000 TO 2000	±1.2	10° TO 50°	±30'
30 TO 120	±0.3	2000 TO 4000	±2.0	50° TO 120°	±20'
120 TO 315	±0.5	4000 TO 8000	±3.0	OVER TO120°	±10'
—	—	OVER TO 8000	±4.0	—	—

REV	DATE	ALTERED / CHD&APPD

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT

HEAT EXCHANGER
WO.NO.: D135 TO 138

Bharat Heavy Electricals Ltd
UNIT: HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI – 620014
05-228/D

	NAME	SIGNATURE	DATE
DRN	NJR		201015
CHD	RRV/EARUN		221015
APPD	A.S.		221015

NO. OF VAR

DEPT	GRADE OF UNTOL DIM	SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG	ITEM NO	NO OF ITEMS
NC	C/M/F					
CODE 150						

TITLE: UPPER SHELL ASSY. (FOR SUB–CONT.)

CARD CODE: U 01

DRAWING NO : 2–HE–170–00995

REV 00

Size A2