TENDER SPECIFICATION

BHEL PSSR SCT 1463

ERECTION, TESTING AND COMMISSIONING OF STEAM TURBINE, GENERATOR AND ITS AUXILIARIES FOR UNIT 1&2 OF 2X600MW

at

JINDAL INDIA THERMAL POWER LIMITED, DERANG, ANGUL, ORISSA

CORRIGENDUM-3 CLARIFICATIONS

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
Power Sector – Southern Region
690, Anna Salai, Nandanam, Chennai – 600 035.

				TENDER SPECIFICATION BHEL PSSR SCT 1463		
Clarifications sought by ome of the bidders in the tender specification are furnished below for your information						
CLARIFICATIONS TO TENDER SPECIFICATION BHEL PSSR						
S.NO	**DOCUMENT**	**CLAUSE**	**PAGE NO**	**BHEL CONDITIONS**	**CLARIFICATIONS**	BHEL CLARIFICATION
1	SCT1463_VOL 1A	1.3.13.1	24	Any special electrodes / consumables supplied by the manufacturing units for the respective packages will be issued free of cost	kindly specify scope and type of electrodes supply by BHEL	NICRO 82, D 3.5 will be supllied for strainer MS & HRH
2	SCT1463_VOL 1A	2.8.6	74	In the case of steel fabricated items, raw steel after fabrication has to be cleaned by Sand / shot blasting by and subsequent painting to be carried out.	Kindly Specfify The Scope.Is blasting is required for complete painting work	As per standard practice
3	SCT1463_VOL 1A	3. HEAT EXCHANGERS:	74	The feed water storage tank will be supplied in three sections withfeed pipe, heating steam header, spray nozzles, supports etc., inloose components. These are to be erected, aligned & welded inposition. Welding, NDT & heat treatment if required shall be carriedout by the contractor within quoted rate. IBR / statutoryrequirements	Kindly parovide Drawing for FST/deaerator or no of welding joints in FST and deaerator	Details and drawings enclosed for information.This drawings may undergo further revision during execution depends upon the site requirements.
4	SCT1463_VOL 1A	2.3.55	57	Certain adjustments in length may be necessary while erectingpipelines of STG & Auxiliaries and the contractor should remove theextra lengths/add extra lengths to suit the final layout afterpreparing edges afresh and adopting specified NDT, Heatreatment procedure, are in the scope of work.	Kindly Specfify pipelines, which come under NDT	Welding schedules for STG are enclosed for information.This schedules may undergo further revision during execution depends upon the site requirements.
5	SCT1463_VOL 1A	ANNEXURE-1	76	BRIFE LIST OF EQUIPMENTS/COMPONENTS TO BE ERECTED IN PER UNIT	Condenser tube is come under BOI and also Heat exchangers.Kindly clarify this..	Condenser tubes will be supplied as a BOI by BHEL/HWR.
6	SCT1463_VOL 1A	1.2.0	20	Handling at site stores / storage yard, Transportation to site of work is on contractors scope	Kindly specify the materials ,which delivered directlt to TG Hall by BHEL	Materail list with size & weight already furnished in the tender .
7	SCT1463_VOL 1A	2.2.1	50	All minor adjustments upto 25 mm of foundation level, dressing, chipping of foundation surface enlarging the pockets in foundations and grouting of equipments etc. as may be required for the erection of equipments / plants shall be carried out by the Contractor.	kindly specify the volume of Grouting	The approximate qty of 25 T grouting cement is required for grouting . However any additional quantity required also to be arranged by the bidder within the quoted cost.

All other conditions and date of tender submission remain same

AGM/Contracts

FIELD WELDING SCHEDULE
(Turbine Integral Piping)

PROJECT :- STEAM TURBINE
2X600 MW DERANG(ANGUL) TPS
(M/S JINDAL INDIA THERMAL POWER LTD.)

DOCUMENT NO. 4-13100-Q8001
REV. 00

SL. NO.	SYSTEM DESCRIPTION & DRG. NO.	MATERIAL TO BE WELDED	MATERIAL SPECIFICATION	DIMENSIONS d (Outside dia.)	DIMENSIONS t	POSITION OF WELDING	TYPE OF WELD	ELECTRODE FILLER SPECIFICATION: ROOT PASS PROCESS	ROOT PASS ROOT	FILLER PASS PROCESS	FILLER PASS FILLER	WPS NO.	PRE-HEAT TEMP. DEG. C	HEAT TREATMENT: TEMP. DEG. C	HEAT TREATMENT: HOLDING TIME IN MINUTES	NDT: METHOD	NDT: SPEC.NO. QUANTUM	NDT: ACCEPTANCE NORM. REFERENCE	REMARKS
01	SEAL STEAM 0-13105-N3001 TO 0-13105-N3007	PIPES/ FITTINGS/ FLANGES	ASTM A106 Gr-B ASTM A234 WPB ASTM A105	13.7 TO 114.3	UP TO 4.5 mm	AS PER DRGS./ SITE CONDITION	BUTT	GTAW	AWS-ER70S-2	GTAW	AWS-ER70S-2	CS 110114	NONE	NONE	N.A.	AS PER WELD TABLES AA/BB		AS PER HW0850199	
				141.3 & ABOVE															
				168.3 TO 508	ABOVE 4.5 mm			GTAW	AWS-ER70S-2	SMAW	E-7018	CS 110114 AND CS 11294							
			ASTM A335 P11 ASTM A234 WP11 ASTM A182 F11	88.9 TO 141.3	UP TO 4.5 mm			GTAW	AWS-ER80S-B2	GTAW	ER 80S B2	AS220120	200-250	640-660	1 Hr/IN				
			ASTM A335 P22 ASTM A234 WP22 ASTM A182 F22	114.3 TO 219.1	ABOVE 4.5 mm			GTAW	AWS-ER90S-B3	GTAW SMAW	ER 90S B3 E 9018 B3	AS 22061 AS22233	300	680-700					
			ASTM A335 P91 ASTM A234 WP91	26.7 TO 48.3	1.5 TO 14.0 mm			GTAW	ER 90S-B9	GTAW	ER 90S-B9	AS 220321	230(Min.)	720±10	12 hrs.				
02	CONDENSATE 0-13109-N3001 2-13109-N3002 2-13109-N3003	PIPES/ FITTINGS/ FLANGES	ASTM A106 Gr-B ASTM A234 WPB ASTM A105	13.7 TO 114.3	UP TO 4.5 mm	AS PER DRGS./ SITE CONDITION	BUTT	GTAW	AWS-ER70S-2	GTAW	AWS-ER70S-2	CS 110114	NONE	NONE	N.A.			AS PER HW0850199	
				141.3															
				114.3 TO 323.9	ABOVE 4.5 mm			GTAW	AWS-ER70S-2	SMAW	E-7018	CS 110114 AND CS 11294							
			ASTM A335 P22 ASTM A234 WP22 ASTM A182 F22	13.7 TO 33.4	ABOVE 4.5 mm			GTAW	AWS-ER90S-B3	GTAW + SMAW	ER 90S B3 E 9018 B3	AS 22061 AS22233	300	680-700					

REFERENCE DOCUMENTS :-

1- WELDING OF PIPES AS PER HW0620599.
2- CLASSIFICATION OF WELD GROUP AS PER HW0620099.
3- NDE ON FILLET WELDS SHALL BE AS PER WELD TABLES AA/BB.
4- FOR PRESSURE AND TEMPERATURE RATINGS OF EACH LINE,REFER REFER CORRESPONDING INTEGRAL PIPING B.O.M.

WORKED BY
-Sd-
(S.K.GUPTA)
26.07.2011

APPROVED BY
-Sd-
(S.GOEL)
26.07.2011

				TENDER SPECIFICATION BHEL PSSR SCT 1463		
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All other conditions and date of tender submission remain same

AGM/Contracts

PROJECT :- STEAM TURBINE
2X600 MW DERANG(ANGUL) TPS
(M/S JINDAL INDIA THERMAL POWER LTD.)

FIELD WELDING SCHEDULE
(Turbine Integral Piping)

DOCUMENT NO. 4-13100-Q8001

REV. 00

SL. NO.	SYSTEM DESCRIPTION & DRG. NO.	MATERIAL TO BE WELDED	MATERIAL SPECIFICATION	DIMENSIONS d (Outside dia.)	DIMENSIONS t	POSITION OF WELDING	TYPE OF WELD	ELECTRODE FILLER SPECIFICATION ROOT PASS PROCESS	ROOT PASS ROOT	FILLER PASS PROCESS	FILLER PASS FILLER	WPS NO.	PRE-HEAT TEMP. DEG. C	HEAT TREATMENT TEMP. DEG. C	HEAT TREATMENT HOLDING TIME IN MINUTES	NDT METHOD	NDT SPEC.NO. QUANTUM	NDT ACCEPTANCE NORM. REFERENCE	REMARKS
05	COOLING WATER 2-13161-N3001	PIPES/ FITTINGS/ FLANGES	ASTM A106 Gr-B ASTM A234 WPB ASTM A105	21.3 TO 33.4	UP TO 4.5 mm	AS PER DRGS./ SITE CONDITION	BUTT	GTAW	AWS-ER70S-2	GTAW	AWS-ER70S-2	CS 110114	NONE	NONE	N.A.	AS PER WELD TABLES AA/BB		AS PER HW0850199	
				355.6	ABOVE 4.5 mm			GTAW	AWS-ER70S-2	SMAW	E-7018	CS 110114 AND CS 11294							
06	COOLING WATER 2-13163-N3001	PIPES/ FITTINGS/ FLANGES	ASTM A106 Gr-B ASTM A234 WPB ASTM A105	21.3 TO 114.3	UP TO 4.5 mm	AS PER DRGS./ SITE CONDITION	BUTT	GTAW	AWS-ER70S-2	GTAW	AWS-ER70S-2	CS 110114	NONE	NONE	N.A.			AS PER HW0850199	
				355.6															
07	CONTROL FLUID 0-13155-N3001 TO 0-13155-N3003 0-13157-N3001 0-13112-N3001 TO 0-13112-N3010	PIPES/ FITTINGS/ FLANGES	ASTM A312 TP321 ASTM A403 WP321	13.7 TO 219	ALL	AS PER DRGS/ SITE CONDITION	BUTT	GTAW	AWS-ER347	GTAW	AWS-ER347	SS 11179	NONE	NONE	N.A.			AS PER HW0850199	

WORKED BY
-Sd-
(S.K.GUPTA)
26.07.2011

APPROVED BY
-Sd-
(S.GOEL)
26.07.2011

PROJECT :- STEAM TURBINE
2X600 MW DERANG(ANGUL) TPS
(M/S JINDAL INDIA THERMAL POWER LTD.)

FIELD WELDING SCHEDULE
(Turbine Integral Piping)

PART-AA
For oil and control fluid Services

DOCUMENT NO. 4-13100-Q8001

SL. NO.	Type of Weld	Operating Pressure (Bar)	DIA	RT	UT	SCE	Hardness
1.	Circumferential and longitudinal welds	≤2.5	All	X	X	Sample	X
2.	-do-	>2.5 upto ≤16	DN≤20	X	X	25%	(A)
3.	-do-	-do-	DN>20	10%	X	10%	(A)
4.	-do-	>16	DN≤20	X	X	100%	(B)
5.	-do-	>16	DN>20	100%	X	100%	(B)
6.	Nipples and Nozzles	≤2.5	All	X	(C)	10%	Sample
7.	-do-	>2.5 upto ≤16	All	X	(C)	10%	(A)
8.	-do-	>16	All	X	(C)	100%	(B)
9.	Weld on parts(Fillet Welds)	≤2.5	Without load transfer	X	(C)	Sample	X
10.	-do-	-do-	With load transfer	X	(C)	10%	X
11.	-do-	<2.5 upto <16	Without load transfer	X	(C)	Sample	(A)
12.	-do-	-do-	With load transfer	X	(C)	50%	(A)
13.	-do-	>16	Without load transfer	X	(C)	10%	(B)
14.	-do-	-do-	With load transfer	X	(C)	100%	(B)

NOTE:-

(A) Means 10% hardenss tests on grades such as 13 Cr Mo 44 and 10 Cr Mo 910 or other equivalent grades,including stainless steels.

(B) Means 25% hardenss tests on grades like 13 Cr Mo 44 or equivalent grades. 50% hardenss tests on grades like 10 Cr Mo 910 or equivalent grades, including stainless steel.

(C) For Nipples and nozzles and weld on parts with wall thickness >15 mm, in addition to SCE, RT or UT with same scope as SCE to be carried out.

WORKED BY
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(S.K.GUPTA)
26.07.2011

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26.07.2011

PROJECT :- STEAM TURBINE
2X600 MW DERANG(ANGUL) TPS
(M/S JINDAL INDIA THERMAL POWER LTD.)

FIELD WELDING SCHEDULE
(Turbine Integral Piping)

PART-BB

For water, steam and condensate Services.

DOCUMENT NO. 4-13100-Q8001

REV. 00

SL. NO.	Type of Weld	Operating Pressure (Bar)	DIA	Material	Remarks	RT	UT	SCE	Hardness
1.	Longitudinal Welds	≤2.5	All	All	Not full stressed welds	Sample	Sample	Sample	–
2.	– do –	– do –	All	All	Full stressed welds	10%	10%	10%	–
3.	– do –	>2.5	All	All	–	100%	100%	100%	–
4.	Circumferential	≤2.5	All	All	–	Sample	Sample	Sample	–
5.	– do –	>2.5–≤16	DN≤100	(A)	–	5%	5%	10%	–
6.	– do –	– do –	– do –	(B)	–	10%	10%	10%	a&b
7.	– do –	– do –	– do –	(G)	–	100%	100%	100%	100%
8.	– do –	– do –	D>100	(C)	–	10%	10%	10%	–
9.	– do –	– do –	– do –	(B)	–	25%	25%	100%	a&b
10.	– do –	– do –	– do –	(G)	–	100%	100%	100%	100%
11.	– do –	>16	DN≤100	(A)	–	25%	25%	10%	–
12.	– do –	– do –	– do –	(D)	–	50%	50%	50%	a&b
13.	– do –	– do –	– do –	(E)	–	100%	100%	100%	(c)
14.	– do –	– do –	– do –	(G)	–	100%	100%	100%	100%
15.	– do –	– do –	DN>100	(A)	–	50%	50%	10%	–
16.	– do –	– do –	– do –	(F)	–	100%	100%	100%	(c)
17.	– do –	– do –	– do –	(G)	–	100%	100%	100%	100%
18.	Nipples and nozzles	≤2.5	All	All	–	X	X	Sample	X
19.	– do –	>2.5	DN≤100	All	–	X	X	100%	X
20.	– do –	– do –	DN>100	t≤15mm	–	X	X	100%	X
21.	– do –	– do –	– do –	t>15mm	–	X	100%	100%	100%
22.	Weld on parts fillet	≤2.5	All	–	–	X	X	25%	–
23.	– do –	>2.5	DN≤100	All	Load bearing welds	X	X	100%	–
24.	– do –	– do –	D>100	t≤15mm	– do –	X	X	100%	–
25.	– do –	– do –	– do –	t>15	– do –	X	100%	100%	–

NOTE:-

(a) Means 20% hardness test for grades such as ASTM A335 P11 and t≥15mm or equivalent grades.
(b) Means 20% hardness test for grades such as ASTM A335 P22 and t≥15mm or equivalent grades.
(c) Hardness test on all welds with t≥15mm for austenitic steels.
(d) Wherever test scope is less than 100%,a butting ends between circumferential weld and longitudinal weld shall be examined by SCE.

Group A Materials: Material grades ASTM A106 Gr-B,ASTM A234 WPB,ASTM A105
Group B Materials: Material grades ASTM A335 P11,ASTM A234 WP11,ASTM A182 F11, ASTM A335 P22, ASTM A234 WP22, ASTM A182 F22
Group C Materials: All group (A) materials if used in sizes beyound DN >/= 100mm.
Group D Materials: group B materials if used in services beyond 16 bar pressure.
Group E Materials: stainless steels such as ASTM A312 TP321 & ASTM A403 WP321.
Group F Materials: Group (D) and (E) materials if used in services beyond 16 bar and size more than 100 mm.
Group G Materials: Material grades ASTM A335 P91,ASTM A234 WP91,ASTM A182 F91.

EITHER RT OR UT OF WELD JOINT TO BE CARRIED OUT.

WORKED BY
-Sd-
(S.K.GUPTA)
26.07.2011

APPROVED BY
-Sd-
(S.GOEL)
26.07.2011

FIELD WELDING SCHEDULE
FOR
H2 COOLER PIPING

THDF 115/59

S.NO.	PIPE SIZE (ODXTK)	TYPE OF JOINT	MAT. SPEC.	SIZE OF WELD	NO.OF WELD JOINTS	QTY.OF FILLER MAT. PER WELD IN Kg.	WPS NO.	REMARK
1	219.1X6.3	BUTT	AA10455	7Λ	7	0.165	CS110114	
2	60.3X3.91	"	AA01446	4Λ	20	0.030	"	
3	33.7X2.6	"	"	3Λ	25	0.012	"	
4	17.2X1.8	"	"	2Λ	15	0.003	"	
5	13.5X2.9	"	"	3Λ	8	0.003	"	
6	219.1X6.3	FILLET	AA10455	7V	20	0.090	"	

GENERAL :

1.Location of weld : As per piping layout drawing

2.Electrode filler material specification :

- **For carbon steel piping - ER70S-G**
- **For stainless steel piping- ER347**

3.NDT Requirement : As per HW0850199

4.Process of weld : TIG

Ref: **BHEL/HWR/EME/FWS_500MW**

Prepared by : AK MALHOTRA **Checked by : A.K. MALHOTRA** **Approved by : KR Gupta**

FIELD WELDING SCHEDULE
FOR
GENERATOR PIPING

THDF 115/59

S.NO.	PIPE SIZE (ODXTK)	TYPE OF JOINT	MAT. SPEC.	SIZE OF WELD	NO.OF WELD JOINTS	QTY.OF FILLER MAT. PER WELD IN Kg.	WPS NO.	REMARK
1	114.3X4.5	BUTT	AA10455	4Λ	160	0.084	CS110114	
2	88.9X4	"	AA01446	4Λ	160	0.052	"	
3	76.1X4	"	"	4Λ	35	0.048	"	
4	60.3X4	"	"	4Λ	235	0.030	"	
5	48.3X2.6	"	"	3Λ	7	0.020	"	
6	33.7X2.6	"	"	3Λ	75	0.012	"	
7	26.9X2.3	"	"	3Λ	45	0.005	"	
8	17.2X1.8	"	"	2Λ	65	0.003	"	
9	13.5X2.9	"	"	2Λ	45	0.003	"	
10	114.3X3.6	"	AA10755	4Λ	100	0.042	"	
11	88.9X2	"	"	2Λ	8	0.030	"	
12	60.3X2	"	"	2Λ	20	0.020	"	
13	48.3X2	"	"	2Λ	28	0.018	"	
14	33.7X2.6	"	"	3Λ	60	0.010	"	
15	21.3X2	"	"	2Λ	70	0.004	"	
16	13.5X2.6	"	"	3Λ	120	0.003	"	
17	114.3X4.5	FILLET	AA10455	4V	20	0.043	"	
18	88.9X4	"	"	4V	10	0.042	"	
19	60.3X4	"	"	4V	16	0.041	"	
20	114.3X3.6	"	AA10755	4V	5	0.025	"	
21	88.9X2.6	"	"	3V	6	0.020	"	
22	48.3X2	"	"	2V	6	0.009	"	

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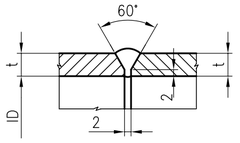
Prepared by : AK MALHOTRA **Checked by AK MALHOTRA** **Approved by : KR Gupta**

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

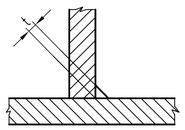
DRG. NO. 2-163-10-00014

SH. 01 OF 02



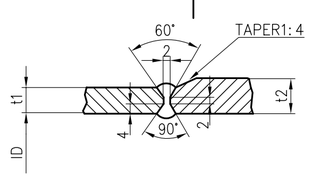
J-001

S.NO.	t	MATERIAL	WPS NO
J-001/A	6 TO 20	P1-P1 •	WE 001/WE 212
J-001/B	6 TO 20	P1-P8 •	WE 118
J-001/C	6 TO 20	P8-P8 •	WE 144
J-001/D	6 TO 20	P1-P8	WE 046
J-001/E	6 TO 20	P8-P8	WE 042
J-001/F	6 TO 20	P1-P1	WE 003/WE 006/WE 227
J-001/G	1.6 TO 9.6	P8-P8	WE 314



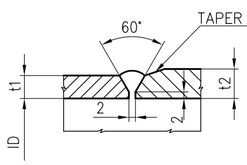
J-002

S.NO.	t	MATERIAL	WPS NO
J-002/A	UPTO△ 20	P1-P1 •	WE 001/WE 212
J-002/B	UPTO△ 20	P1-P8 •	WE 118
J-002/C	UPTO△ 20	P8-P8 •	WE 144
J-002/D	UPTO△ 20	P1-P8	WE 046
J-002/E	UPTO△ 20	P8-P8	WE 042
J-002/F	UPTO△ 20	P1-P1	WE 006/WE 507/WE 227



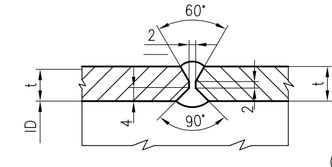
J-003

S.NO.	t1	t2	MATERIAL	WPS NO
J-003/A	10 TO 28	10 TO 28	P1-P1 •	WE 001/WE 212
J-003/B	10 TO 24	10 TO 24	P1-P8 •	WE 118
J-003/C	10 TO 24	10 TO 24	P8-P8 •	WE 144
J-003/D	10 TO 24	10 TO 24	P1-P8	WE 046
J-003/E	10 TO 24	10 TO 24	P8-P8	WE 042
J-003/F	10 TO 28	10 TO 28	P1-P1	WE 006/WE 227



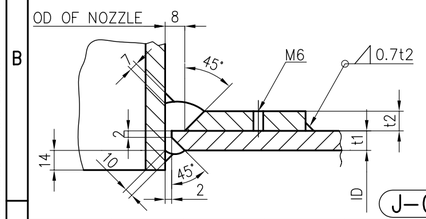
J-004

S.NO.	t1	t2	MATERIAL	WPS NO
J-004/A	8 TO 28	8 TO 28	P1-P1 •	WE 001/WE 212
J-004/B	8 TO 24	8 TO 24	P1-P8 •	WE 118
J-004/C	8 TO 24	8 TO 24	P8-P8 •	WE 144
J-004/D	8 TO 24	8 TO 24	P1-P8	WE 046
J-004/E	8 TO 24	8 TO 24	P8-P8	WE 042
J-004/F	8 TO 28	8 TO 28	P1-P1	WE 006/WE 227



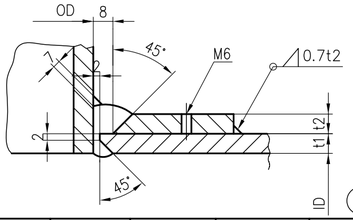
J-005

S.NO.	t	MATERIAL	WPS NO
J-005/A	10 TO 28	P1-P1 •	WE 001/WE 212
J-005/B	10 TO 24	P1-P8 •	WE 118
J-005/C	10 TO 24	P8-P8 •	WE 144
J-005/D	10 TO 24	P1-P8	WE 046
J-005/E	10 TO 24	P8-P8	WE 042
J-005/F	10 TO 28	P1-P1	WE 006/WE 227



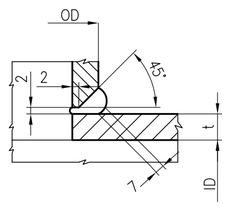
J-006

S.NO.	t1	t2	MATERIAL	WPS NO
J-006/A	8 TO 28	8 TO 28	P1-P1 •	WE 001
J-006/B	8 TO 24	8 TO 24	P1-P8 •	WE 118
J-006/C	8 TO 24	8 TO 24	P8-P8 •	WE 144
J-006/D	8 TO 24	8 TO 24	P1-P8	WE 046
J-006/E	8 TO 24	8 TO 24	P8-P8	WE 042
J-006/F	8 TO 28	8 TO 28	P1-P1	WE 006/WE 507



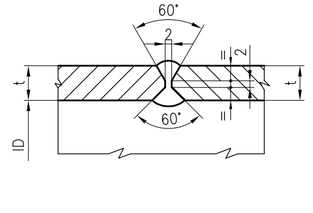
J-007

S.NO.	t1	t2	MATERIAL	WPS NO
J-007/A	8 TO 28	8 TO 28	P1-P1 •	WE 001
J-007/B	8 TO 24	8 TO 24	P1-P8 •	WE 118
J-007/C	8 TO 24	8 TO 24	P8-P8 •	WE 144
J-007/D	8 TO 24	8 TO 24	P1-P8	WE 046
J-007/E	8 TO 24	8 TO 24	P8-P8	WE 042
J-007/F	8 TO 28	8 TO 28	P1-P1	WE 006/WE 507



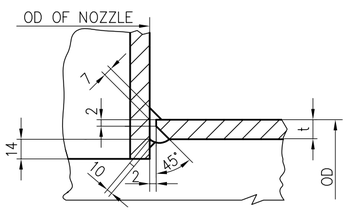
J-008

S.NO.	t	MATERIAL	WPS NO
J-008/A	10 TO 30	P1-P1 •	WE 001
J-008/B	6 TO 24	P1-P8 •	WE 118
J-008/C	6 TO 24	P8-P8 •	WE 144
J-008/D	6 TO 24	P1-P8	WE 046
J-008/E	6 TO 24	P8-P8	WE 042
J-008/F	10 TO 30	P1-P1	WE 006
J-008/G	31 TO 38	P1-P1	WE 007



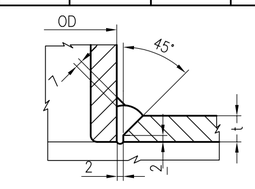
J-009

S.NO.	t	MATERIAL	WPS NO
J-009/A	10 TO 28	P1-P1 •	WE 001/WE 212
J-009/B	10 TO 24	P1-P8 •	WE 118
J-009/C	10 TO 24	P8-P8 •	WE 144
J-009/D	10 TO 24	P1-P8	WE 046
J-009/E	10 TO 24	P8-P8	WE 042
J-009/F	10 TO 28	P1-P1	WE 006



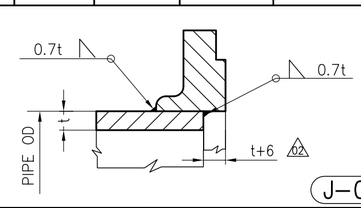
J-011

S.NO.	t	MATERIAL	WPS NO
J-011/A	18 TO 28	P1-P1 •	WE 001
J-011/B	10 TO 24	P1-P8 •	WE 118
J-011/C	10 TO 24	P8-P8 •	WE 144
J-011/D	10 TO 24	P1-P8	WE 046
J-011/E	10 TO 24	P8-P8	WE 042
J-011/F	18 TO 28	P1-P1	WE 006



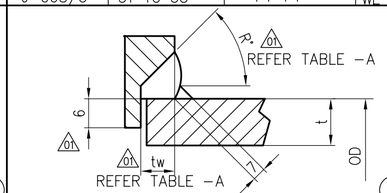
J-014

S.NO.	t1	MATERIAL	WPS NO
J-014/A	10 TO 28	P1-P1 •	WE 001
J-014/B	10 TO 24	P1-P8 •	WE 118
J-014/C	10 TO 24	P8-P8 •	WE 144
J-014/D	10 TO 24	P1-P8	WE 046
J-014/E	10 TO 24	P8-P8	WE 042
J-014/F	10 TO 30	P1-P1	WE 006



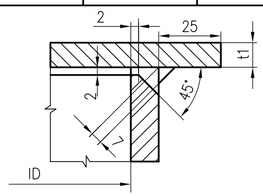
J-015

S.NO.	t	MATERIAL	WPS NO
J-015/A	10 TO 28	P1-P1 •	WE 001
J-015/B	10 TO 28	P1-P8 •	WE 118
J-015/C	8 TO 24	P8-P8 •	WE 144
J-015/D	8 TO 28	P1-P8	WE 046
J-015/E	8 TO 24	P8-P8	WE 042
J-015/F	10 TO 28	P1-P1	WE 006/WE 507



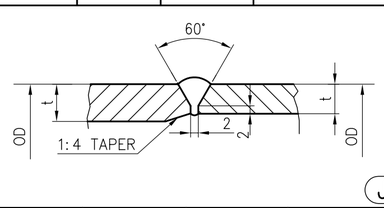
J-016

S.NO.	t	MATERIAL	WPS NO
J-016/A	10 TO 28	P1-P1 •	WE 001
J-016/B	10 TO 24	P1-P8 •	WE 118
J-016/C	10 TO 24	P8-P8 •	WE 144
J-016/D	10 TO 24	P1-P8	WE 046
J-016/E	10 TO 24	P8-P8	WE 042
J-016/F	10 TO 28	P1-P1	WE 006



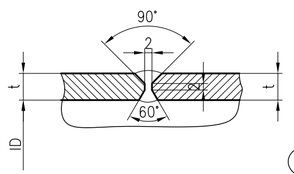
J-017

S.NO.	t1	MATERIAL	WPS NO
J-017/A	5 TO 50	P1-P1 •	WE 001
J-017/B	5 TO 50	P1-P8 •	WE 118
J-017/C	5 TO 50	P8-P8 •	WE 144
J-017/D	5 TO 24	P1-P8	WE 046
J-017/E	5 TO 20	P8-P8	WE 042
J-017/F	5 TO 31	P1-P1	WE 006
J-017/G	31 TO 38	P1-P1	WE 007



J-021

S.NO.	t	MATERIAL	WPS NO
J-021/A	8 TO 28	P1-P1 •	WE 001/WE 212
J-021/B	8 TO 24	P1-P8 •	WE 118
J-021/C	8 TO 24	P8-P8 •	WE 144
J-021/D	8 TO 24	P1-P8	WE 046
J-021/E	10 TO 24	P8-P8	WE 042
J-021/F	10 TO 28	P1-P1	WE 006



J-022

S.NO.	t1	MATERIAL	WPS NO
J-022/A	10 TO 28	P1-P1 •	WE 001/ WE 212
J-022/B	10 TO 24	P1-P8 •	WE 118
J-022/C	10 TO 24	P8-P8 •	WE 144
J-022/D	10 TO 24	P1-P8	WE 046
J-022/E	10 TO 24	P8-P8	WE 042
J-022/F	10 TO 30	P1-P1	WE 006/WE 227

△01 TABLE-A

SL NO	COUPLING SIZE	R°	tw (mm)
01	1/2"	45	5
02	3/4"	45	6
03	1"	45	6.5
04	1 1/4"	45	7.5
05	1 1/2"	30	15
06	2"	30	20.5

NOTES: –

1. TOLERANCE FOR ROOT FACE AND ROOT GAP ±1.0
2. ALL DIMENSIONS ARE IN mm
3. P1 – CARBON STEEL
4. P4 – ALLOY STEEL
5. P8 – STAINLESS STEEL
6. * – WITH PRE-HEAT
7. • – WITH STRESS RELIEVING
8. FOR TACK WELDING :

WPS NO	MATERIAL
WE 006	P1-P1
WE 046	P1-P8
WE 042	P8-P8
WE 118	P1-P8 •
WE 144	P8-P8 •

9. FOR REPAIR WELDING :

WE 006	P1-P1
WE 001	P1-P1 * •

10. △ INDICATES THROAT

REV.	DATE	ALTERED	CHECKED	APPD	REV.	DATE	ALTERED	CHECKED	APPD	REV.	DATE	ALTERED	CHECKED	APPD	REV.	DATE	ALTERED	CHECKED	APPD	REV.	DATE	ALTERED	CHECKED	APPD
															02	14.10.04			JSN	01	29.11.02			JSN
ZONE					ZONE					ZONE					ZONE	IN DETAIL J-015 DIMENSION t+6 WAS t+3				ZONE	1) THICKNESS tw INDICATED IN J-016 2) TABLE-A ADDED 3) DIM. 6MM INDICATED BETWEEN ID OF SHELL AND COUPLING DELETED.			

WELDING ENGG APPROVAL :	NAME	SIGNATURE	DATE
	S.S.PRAKASH		14.10.04

TYPE OF PRODUCT
OR
NAME OF CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	A.L.RAJAM		12.04.02	NA
CHD.	UMESH M		12.04.02	
APPD.	TSN.BHARGAV	JSN	12.04.02	

RESTRICTED USE

DEPT. HEE	GRADE OF TOL.DIM. C/M/F		SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
CODE 405			NA	NA	NA	NA	NA

TITLE: WELDING DETAILS & WPS NOS

CARD CODE

DRAWING NO. 2-163-10-00014 REV. 02

SHEET No. NO OF SHEETS

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED.
IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN any DETRIMENTAL TO THE INTEREST OF THE COMPANY

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY023026

COMPUTER FILE NAME 0230261

REF. DRG. NO.

SIGN. AND DATE

INVENTORY NO

17-08-2008 10:08:17

This Drawing is printed from Engineering Digital Archive System (EDAS). Therefore signatures are not essentially required.

BHARAT HEAVY ELECTRICALS LIMITED

Ramachandrapuram, Hyderabad – 502 032.

QW – 482 WELDING PROCEDURE SPECIFICATION (WPS)

Welding Procedure Specification No.: ***WE 006*** **Date:** **02-08-86** **Supporting PQR No.:** ***430***

Revision No.: ***04*** **Date:** ***15-03-99***

Welding Process (es) : ***SMAW*** **Type (s) :** ***MANUAL***

JOINTS (QW 402)

Joint Design : **As per manufacturing drawing (groove / fillet)**

Backing (Yes) : ***for double side butt welds and backing strip joints***
(No) : ***for single side welds***
Backing Material (Type) : ***Base metal / Weld metal***
Metal : ***Yes*** **Non-Fusing Metal :** ***No***
Retainer : ***No***

BASE METALS (QW – 403)

P. No. : 1 **Group No. :** 1&2 **TO** **P. No.: 1** **Group No.:** 1&2

OR
Specification type & grade : --- **to** Specification type & grade : ---
OR
Chemical Analysis & Mechanical Properties : --- **to** Chemical Analysis & Mechanical Properties : ----

Thickness Range :
Base Metal : **Groove:** ***5.0 mm to 50 mm*** **Fillet :** ***all sizes***

Pipe Dia. Range : Groove: ***all dia*** **Fillet : :** ***all sizes***

Other : Root spacing for backing strip joints : 8 - 10 mm
For others : 1-3 mm
403.13 : not applicable

Filler Metals (QW – 404)	
Spec. No. (SFA)	***5.1***
AWS NO (CLASS)	***E-7018***
F. No.	**4**
A. No.	***1***
Size of Filler Metals	***Dia 2.5; 3.15; 4.0; 5.0; 6.3 mm***
Deposited Weld Metal	
Thickness Range:Groove: **Fillet :**	***38 mm Max.*** **ALL**
Electrode Flux (Class)	***Basic***
Max. Bead Thickness	***5*** **mm**

Rev 04 : Changes in non essential variables

POSITIONS (QW-405)	POSTWELD HEAT TREATMENT (QW-407)
Position(s) : ALL POSITIONS **Welding Progression : UP for Vertical Down ---** **Position (s) Fillet : ALL**	**Temperature Range : NONE** **Time Range : --**
PREHEAT (QW-406)	**GAS (QW-408)**
Preheat Temp Min : 18 º C UPTO 31 mm **100º C ABOVE 31 mm** **Interpass Temp Max : 350 º C** **Preheat Maintenance : Nil**	**NOT APPLICABLE**

ELECTRICAL CHARACTERISTICS (QW-409)

Current AC or DC : ***DIRECT CURRENT*** **Polarity :** ***ELECTRODE POSITIVE***

Amps [Range] : 60 to 300 A **Volts Range : 22-32 V**

TECHNIQUE (QW-410)

String or Weave Bead : string and weave (max 3D)
Initial and Interpass Cleaning : chipping ; brushing ; grinding
Method of Back Gouging: by air arc gouging / grinding
Multiple or Single Pass : multiple pass / single pass
Multiple or Single Electrodes : single electrode
Peening : not allowed

Clean weld area to remove oil, rust, grease, etc. prior to welding.

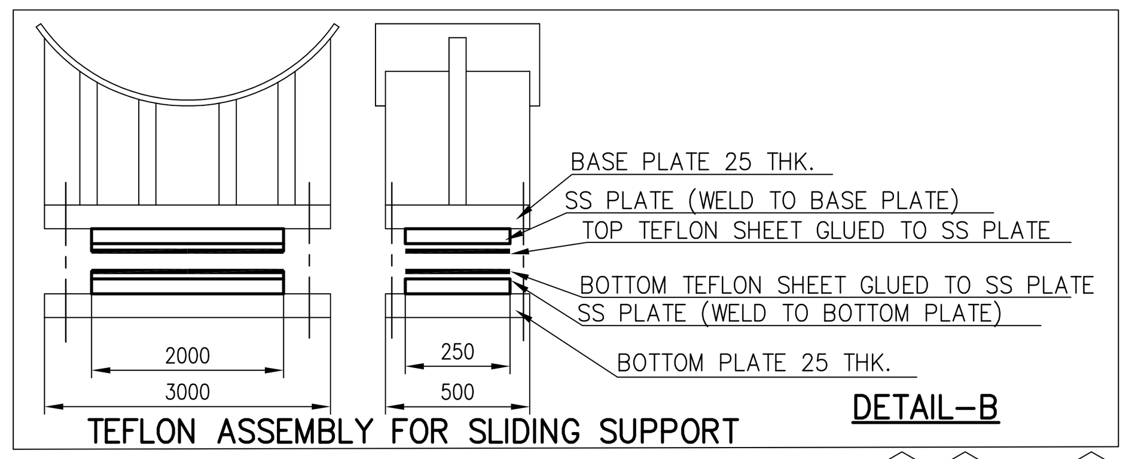
Weld Layer (s)	Process	Filler Metal		Current		Other
		Class	Dia mm	Type Polar	Amp Range	
1	*SMAW*	*E 7018*	*2.5*	*DC +*	*60-90*	
2	*SMAW*	*E 7018*	*3.15*	*DC +*	*90-140*	*STRING & WEAVE*
3	*SMAW*	*E 7018*	*4.0*	*DC +*	*140-180*	*(MAX 3xElectrode Dia)*
4	*SMAW*	*E 7018*	*5.0*	*DC +*	*180-240*	
5	*SMAW*	*E 7018*	*6.3*	*DC +*	*240-300*	

HEAD / WELDING ENGG

FIRST ANGLE PROJECTION

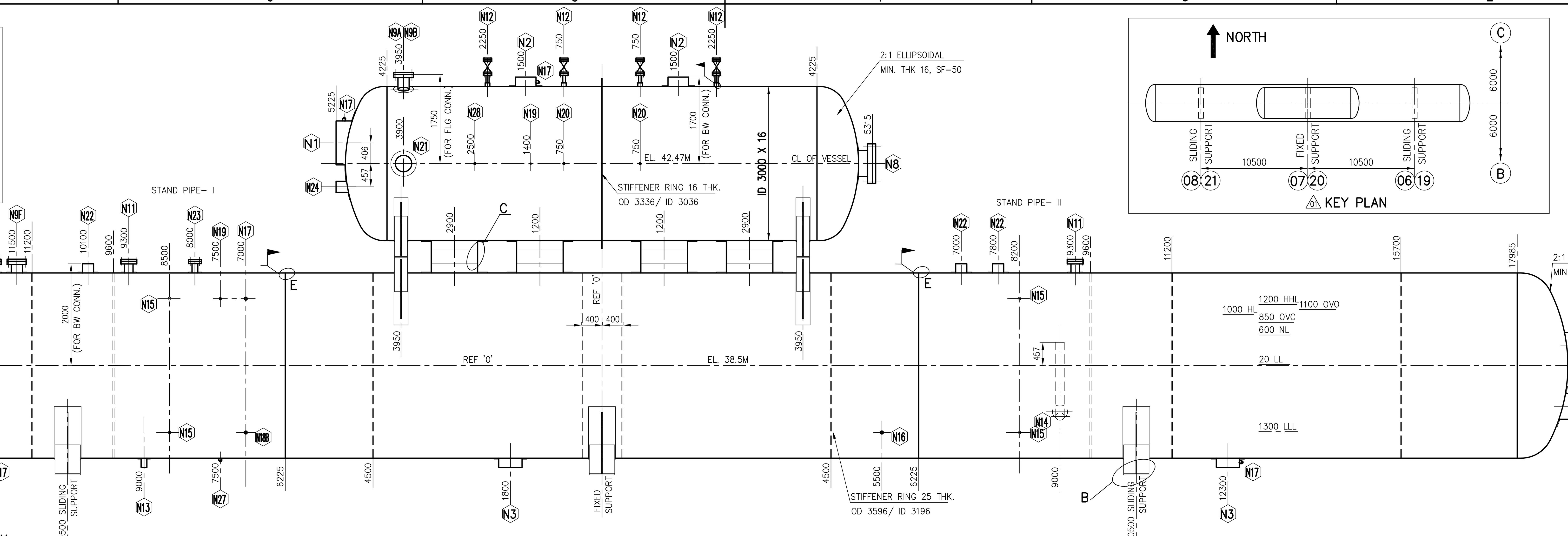
(ALL DIMENSIONS ARE IN mm)

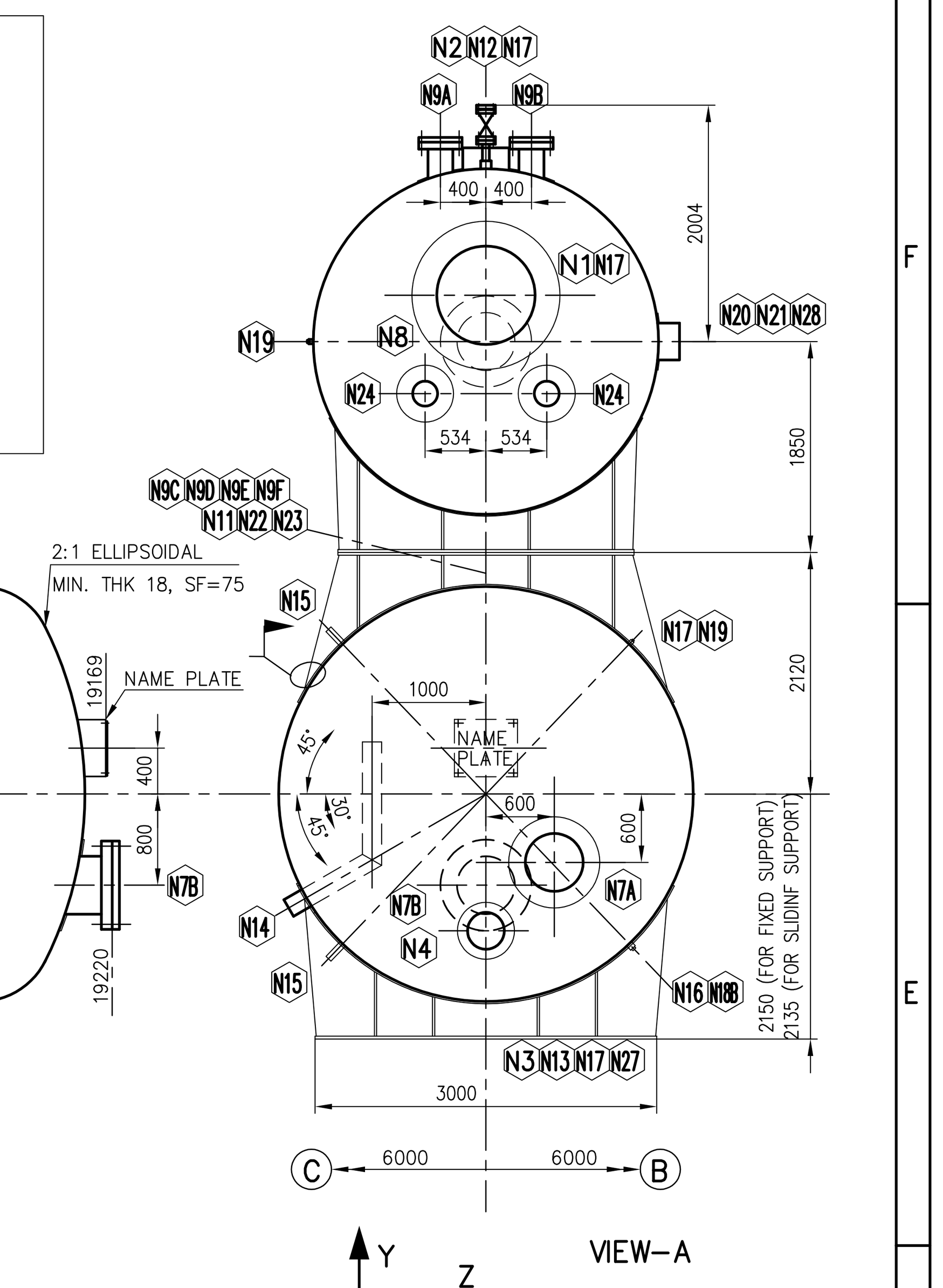
DRG. NO. 1-163-10-11360 SH OF



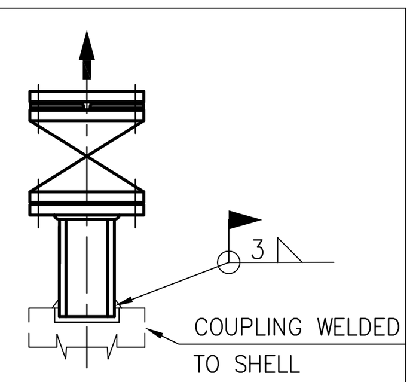
TEFLON ASSEMBLY FOR SLIDING SUPPORT

DETAIL-B

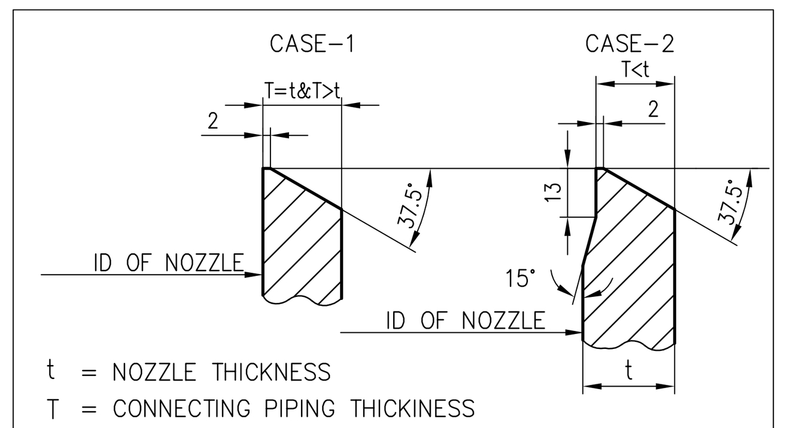




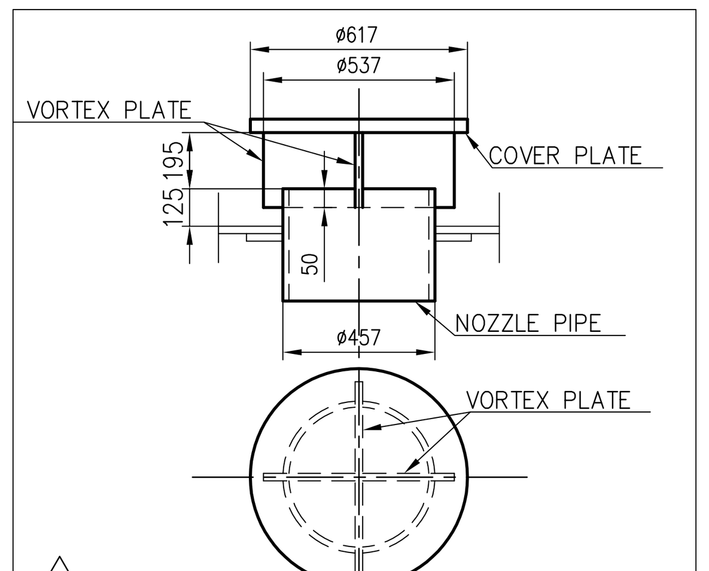
VIEW-A



DETAIL-D (FOR N12)



DETAIL-A



ANTIVORTEX DETAILS FOR NOZZLE N3

LOADS ON SUPPORTS

EMPTY	–	31470 Kg
OPERATING	–	100570 Kg
FLOODED	–	158360 Kg
HORIZONTAL	–	15836 Kg

MATERIALS OF CONSTRUCTION

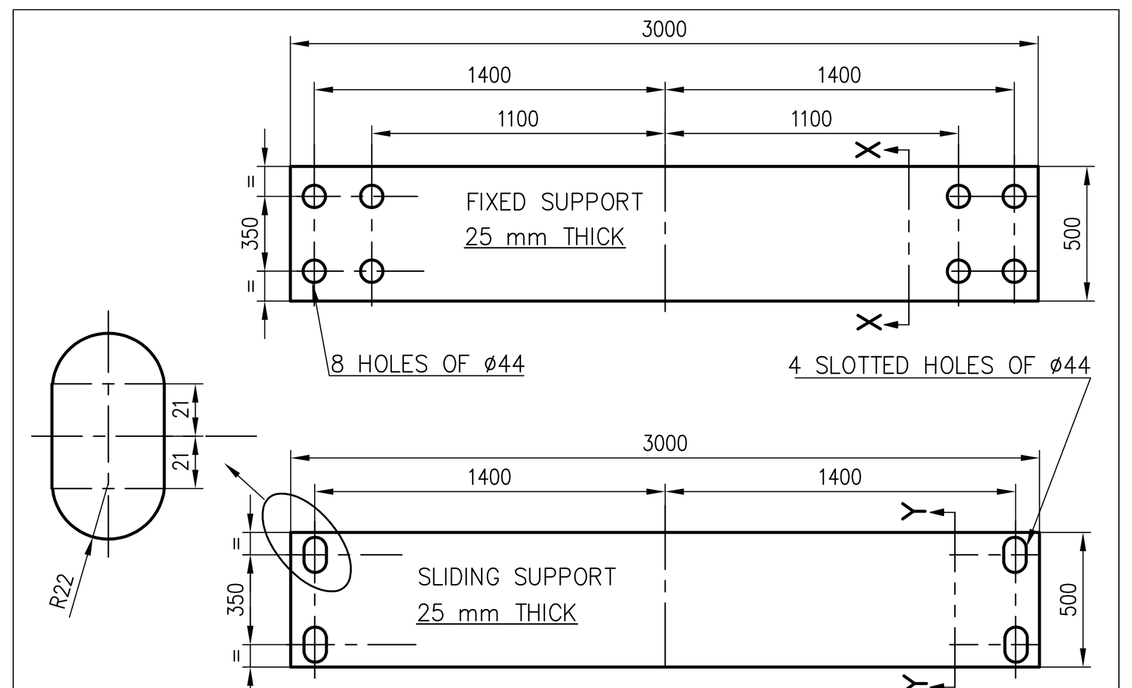
DESCRIPTION	MATERIAL
SHELL (ST.TANK & HEATER)	SA 516 Gr.70
DISHED ENDS	WITH S1,S5,S8
NOZZLE STUBS	SA 106 GR.B
TRAYS	SA 240 TP 304
COVERS FOR MAN HOLES	SA 105
TRAY REMOVAL OPENINGS	SA 106 Gr.B
SPRAY VALVE	SS TP 316
IMPINGEMENT PLATE	SA 240 TP 304L
SAFETY RELIEF VALVE	A216 WCB
VENT OFIFICE PLATE	SA 240 TP 304L
BOLTS+NUTS (INTERNAL)	SA 193 B8/ SA194 Gr.8
BOLTS+NUTS (EXTERNAL)	SA 193 B7/ SA194 Gr.2H
GASKET	NON ASBESTOS MSW WITH PTFE OR GRAPHITE FILLER

LOADS ON SUPPORTS

EMPTY	–	52460 Kg
OPERATING	–	166460 Kg
FLOODED	–	241980 Kg
HORIZONTAL	–	0 Kg

LOADS ON SUPPORTS

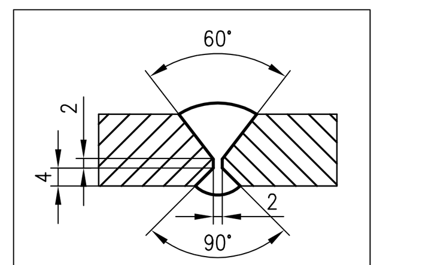
EMPTY	–	31470 Kg
OPERATING	–	100570 Kg
FLOODED	–	158360 Kg
HORIZONTAL	–	15836 Kg



SUPPORT BASE PLATE DETAIL

DESIGN DATA

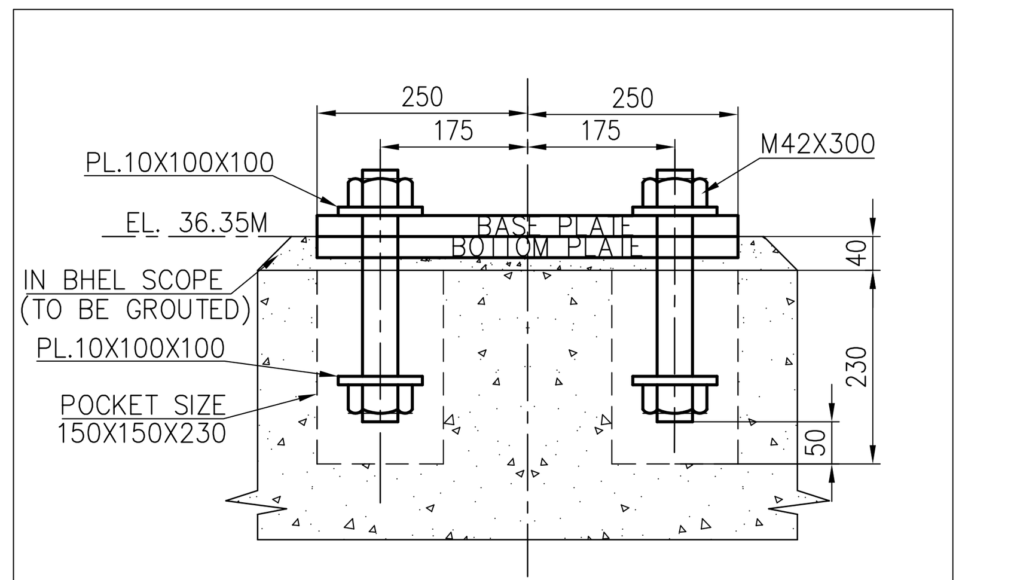
DESCRIPTION		
DESIGN PRESSURE	(atg)	9 & FULL VACUUM
HYDROTEST PRESSURE	(atg)	11.7
STORAGE TANK DESIGN TEMPERATURE (MAX/MIN)	°C	360/0
HEATER DESIGN TEMPERATURE (MAX/MIN)	°C	360/0
HYDROTEST TEMPERATURE (MAX/MIN)	°C	AMBIENT/17
RADIOGRAPHY		FULL
CORROSION ALLOWANCE – SHELLS/ HEADS	mm	3.2
CORROSION ALLOWANCE – RF PADS/ NOZZLES/ FLANGES	mm	1.6
OXYGEN CONTENT AT OUTLET	(cc/lit)	0.005
STORAGE TANK CAPACITY (BETWEEN NL & LLL FOR 6 MINUTES CAPACITY)	(cu.m)	226
OPERATING PRESSURE	(ata)	6.61
OPERATING TEMP.	°C	161.9
NO OF TRAYS		576
NO OF SPRAY NOZZLES		108
WEIGHTS – DRY	(kgs)	115400
WEIGHTS – OPERATING	(kgs)	367600
WEIGHTS – FLOODED	(kgs)	558700
INSPECTION		AS PER APPROVED QUALITY PLAN
VOLUME UPTO NL IN STORAGE TANK	(cu.m)	260
TOTAL VOLUME OF STORAGE TANK	(cu.m)	380
CARBON DIOXIDE CONTENT AT OUTLET		NIL



DETAIL-E

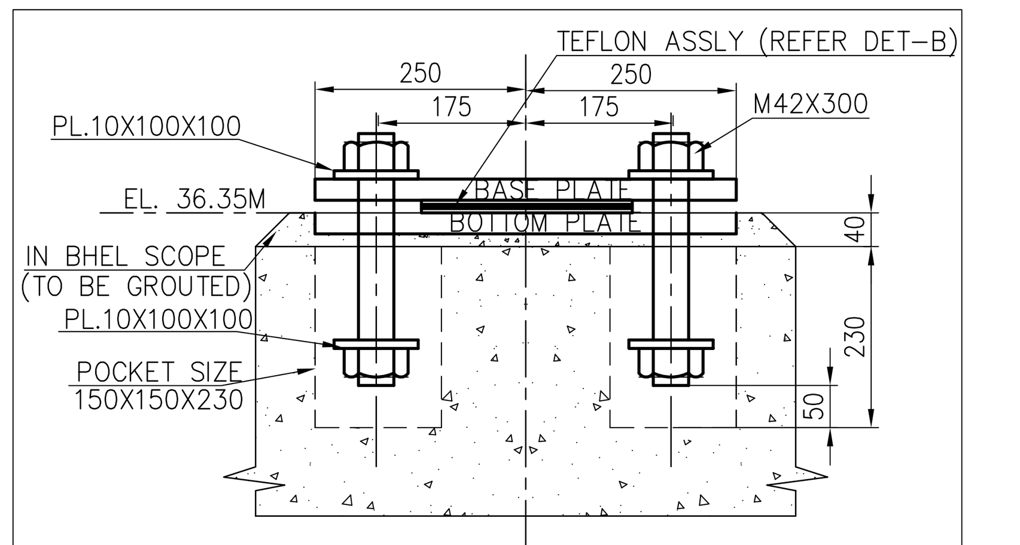
ALLOWABLE RESULTANT FORCES, MOMENTS & THERMAL MOVEMENTS AT DESIGN CONDITION

REF.	F(Kg)	M(Kg-M)	△X(MM)	△Y(MM)	△Z(MM)
N1	158606	32354	-24.47	31.95	0
N2	11442	4715	±7.34	37.31	0
N3	13285	6245	±60.22, -8.81	1.71	0
N4	43865	5215	-91.71	4.65	0
N13	6907	1259	-44.06	1.71	0
N14	7763	1853	44.06	6.12	-7.63
N21	9598	3300	-19.09	29.96	7.34
N22	8583	2413	-49.45, 34.27, 38.19	19.34	0
N23	6907	1259	-39.17	19.34	0
N24	34654	3084	-24.43	27.73	±2.61



SECTION X-X

SECTION BASE PLATE DETAIL VIEW FOR FIXED SUPPORT



SECTION Y-Y

SECTION BASE PLATE DETAIL VIEW FOR SLIDING SUPPORT

NOTES:-

1, HYDRO TEST BLANKING PLATE OF NOZZLES SHALL BE CUT AT SITE AND EDGE PREPARED AS PER DET-A.

2, SPOOL PIECES CONSTRUCTED OF SA516/70 WILL BE SUPPLIED TO AID IN PROPER FIT UP OF DOWN COMMERS AND EQUALIZERS. 2 BACKING RINGS WILL BE SUPPLIED WITH EACH SPOOL PIECE (REFER DET-C).

3, PAINTING
EXTERNAL: STORAGE TANK AND HEATER- TWO COATS OF HEAT RESISTANT ALUMINIUM PAINT. FINAL PAINT NOT APPLICABLE AS VESSEL IS INSULATED).
INTERNAL: HEATER- NIL
STORAGE TANK - TEMPRORY RUST PREVENTIVE PAINT

4, SHIPPING
HEATER: WILL BE DESPATCHED IN ONE ASSEMBLY.
STORAGE TANK: WILL BE DESPATCHED IN THREE SECTIONS.

5, FOUNDATION BOLTS
M42X300 FOUNDATION BOLT 16 NO'S WITH WASHER WILL BE SUPPLIED.

6, DESIGN CODE ASME SEC VIII DIV 1, 2007 ADD NIL.

7, COUNTER FLANGES ALONG WITH BOLTS NUTS AND GASKETS WILL BE SUPPLIED FOR FLANGED CONNECTIONS.

8, MOVEMENT OF SLIDING SUPPORT FORM COLD TO OPERATING CONDITION IS= ±21.58mm & AT DESIGN CONDITION= ±51.41mm

9, INDICATES SITE WELDING.

10, VENTILATOR CONN. IS A SPARE CONN. PROVIDED WITH BLIND FLANGE, WHICH CAN BE OPENED FOR VENTILATION INSIDE THE STORAGE TANK DURING MAINTAINANCE OPERATION.

11, HEATER SUPPORTS (2 NOS.) ON STORAGE TANK ARE DESPATCHED LOOSE FOR FINAL WELDING AT SITE.

12, ORIFICE ASSLY. AS PER DET-D SHALL BE WELDED TO COUPLING (N12) AT SITE.

13, HEAVIEST PIECE TO BE HANDLED DURING ERECTION= 40 TONNES.

14, FOR STANDPIPE DETAILS REF. DREG. 2-163-19-11539.

15, NOZZLE N3 PROVIDED WITH VORTEX BREAKER.

16, INSULATION: BONDED MINERAL ROCK-WOOL MATTRESS 75 THK., DENSITY 100 Kg/Cu.M (MIN.). WITH 22G ALUMINIUM SHEET CLADDING.

LIST OF NOZZLE CONNECTIONS

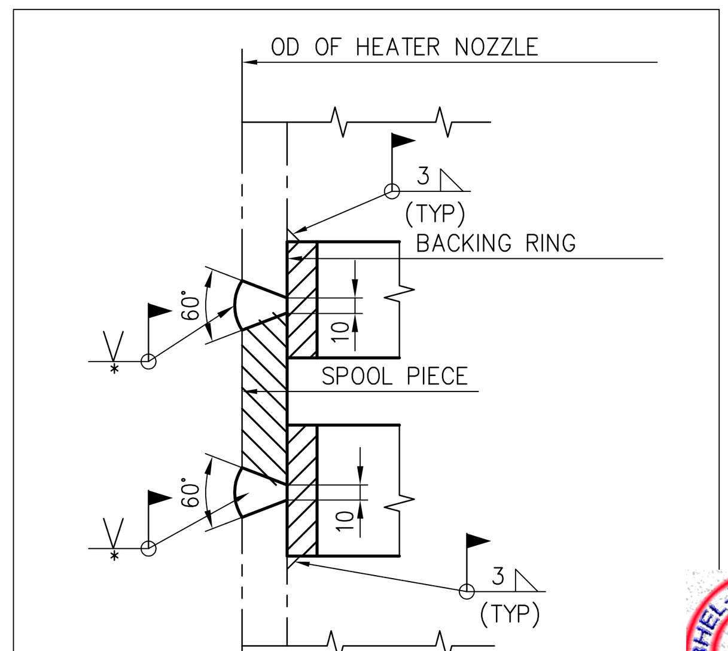
REF.	DESCRIPTION	SIZE	ODxthk/CONNECTING PIPE THK	QTY	END CONN.	REMARKS	REF.
N1	EXTRACTION STEAM INLET CONN.	34"	864x16/10	1	BW		N1
N2	CONDENSATE INLET	16"	406.4x16/9.53	2	BW		N2
N3	FEED WATER OUTLET	18"	457x16/12.7	3	BW	WITH VORTEX BREAKER	N3
N4	START UP HEATING STEAM INLET CONN.	12"	323.9x17.48/9.53	1	BW		N4
N7A,B	MAN HOLE	20"	508x16	2	FL 300# RF		N7
N8	TRAY REMOVAL OPENING	20"	508x16	1	FL 300# RF		N8
N9A TO F	SAFETY RELIEF VALVE CONN.	8"/10"	219.1x12.7	6	FL 300# RF	8"-300#/10"-150#	N9A TO F
N11	VENTILATOR	6"	168.3x10.97	2	FL 300# RF	REFER NOTE-11	N11
N12	VENT CONN.	2"	COUPLING 6000#	4	SW	REFER NOTE-12	N12
N13	DRAIN	4"	114.3x11.13/6.02	1	BW		N13
N14	OVER FLOW CONN.	6"	168.3x10.97/7.11	1	BW		N14
N15	STAND PIPE	2"	60.3x8.74	4	BW		N15
N16	SAMPLING CONNECTION	1"	COUPLING 6000#	1	SW		N16
N17	THERMOMETRER CONN. (THERMOWELL)	M33X2	SPECIAL COUPLING	5	SCREWED		N17
N18B	CONN. FOR RTD	M33X2	SPECIAL COUPLING	1	SCREWED		N18B
N19	PRESSURE GAUGE CONN.	1/2"	COUPLING 6000#	2	SW		N19
N20	PRESSURE TRANSMITTER CONN.	1/2"	COUPLING 6000#	2	SW		N20
N21	CBD TANK VENT	12"	323.9x17.48/9.53	1	BW		N21
N22	RECIRCULATION CONN. (BFP)	8"	219.1x12.7/30	3	BW	WITH DISPERSER	N22
N23	INITIAL FILLING CONN.	4"	114.3x11.13/4.0	1	FL 300# RF		N23
N24	HPH-5 DRIP CONN.	8"	219.1x12.7/6.35	2	BW	WITH DISPERSER	N24
N27	PG TEST THERMOWELL CONN.	M33X2	SPECIAL COUPLING	1	SCREWED		N27
N28	PG TEST PRESSURE TAP POINT CONN.	1/2"	COUPLING 6000#	1	SCREWED		N28

✳ 2 VALVE- SET PR 9.0 KG/CM^2 (g)
✳ 2 VALVE- SET PR 8.5 KG/CM^2 (g)
✳ 2 VALVE- SET PR 8.0 KG/CM^2 (g)

LIST OF FITTINGS & VALVES

REF.	DESCRIPTION	QTY	REMARKS
F1	COMPOUND PRESSURE GAUGE Kg/sq.cm.(g)	2	-1 to +10
F2	VENT ORIFICE PLATE	4	
F3	PG TEST THERMOWELL	1	
F4	LEVEL GAUGE (CC=2000)	4	1" SW
F5	LEVEL SWITCH (CC=350)	4	1" SW
F6	TEMPERATURE GAUGE	5	0-300°C
F7	THERMOWELL	6	
V1	STAND PIPE ISOLATION VALVE	4	2" 800# SW
V2	SAMPLING VALVE	1	1" SW
V3	SAFETY RELIEF VALVE (SET PRESS. ✳ REL.CAP. 60 T/hr/EACH)	6	8" 300# RF/10" 150# RF
V4	VENT VALVE	4	2" 300# RF
V5	ISOLATION VALVE FOR PRESSURE GAUGE CONN	2	1/2" 800# SW
V6	ISOLATION VALVE FOR LG CONN	8	1" 800# SW
V7	ISOLATION VALVE FOR LT CONN	6	1/2" 800# SW
V8	VENT & DRAIN VALVES FOR STAND PIPE	4	1" 800# SW
V9	ISOLATION VALVE FOR PRESSURE TRANSMITTER	2	1/2" 800# SW
V10	ISOLATION VALVE FOR PG PRESSURE TEST CONN	1	1/2" 800# SW
V11	VENT & DRAIN VALVE FOR LG	8 **	1/2" 800# SW
V12	ISOLATION VALVE FOR LEVEL SWITCHES	6	1" 800# SW
V13	VENT & DRAIN VALVE FOR LS	8 **	1/2" 800# SW

**= THESE ARE BUILT IN PARTS OF LEVEL GAUGE & LEVEL SWITCH AND NEED NOT BE SUPPLIED SEPERATELY



DETAIL-C

100% UT FOR SPOOL PIECE TO BACKING RING JOINT

REV.	DATE	ALTERED	CHECKED	APPD	ZONE	DESCRIPTION
02	10.12.10					REVISED IN-LINE WITH COMMENTS FROM CONSULTANT. NOTE-3 REVISED.
01	26.11.10					REVISED IN-LINE WITH COMMENTS FROM TCE.

CONSULTANT: TATA CONSULTING ENGINEERS, BANGLORE

PROJECT: JINDAL INDIA THERMAL POWER LIMITED PHASE-I (2X600MW), DERANG, ORISSA

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE
DRN.	AL RAJAM		22.06.10
CHD.	UMESH MENON		22.06.10
APPD.	B SRINIVAS		22.06.10

NO.OF VAR. N.A

DEPT. HEE CODE 405 | GRADE OF TOL.DIM. C/M/F | SCALE NTS | WEIGHT (KG) NA | REF. TO ASSY DRG. NA | ITEM NO. N.A | NO.OF ITEMS N.A

TITLE: GA OF SPRAY CUM TRAY DEAERATOR

CARD CODE

DRAWING NO. 1-163-10-11360 REV. 02

SHEET No. 1 NO OF SHEETS 1

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 2-163-19-11570

SH. 0F

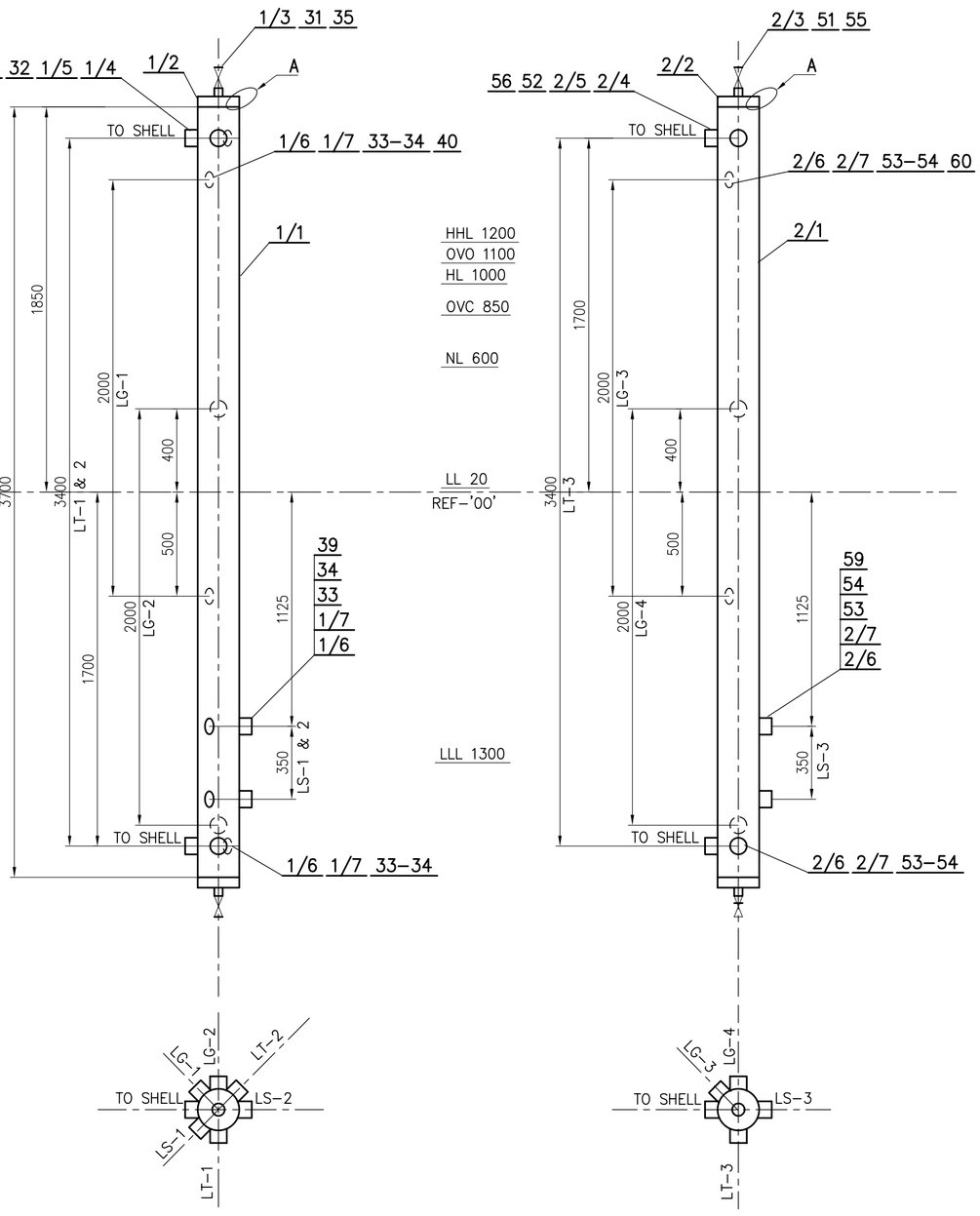
GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE NAME

REF. DRG. NO.

SIGN. AND DATE

INVENTORY NO



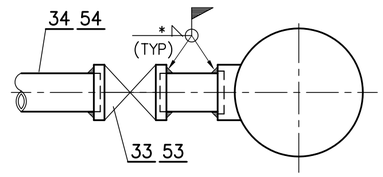
ORIENTATION OF CONN.

STAND PIPE-1

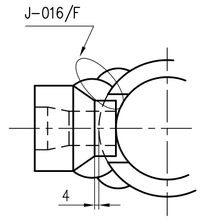
ORIENTATION OF CONN.

STAND PIPE-2

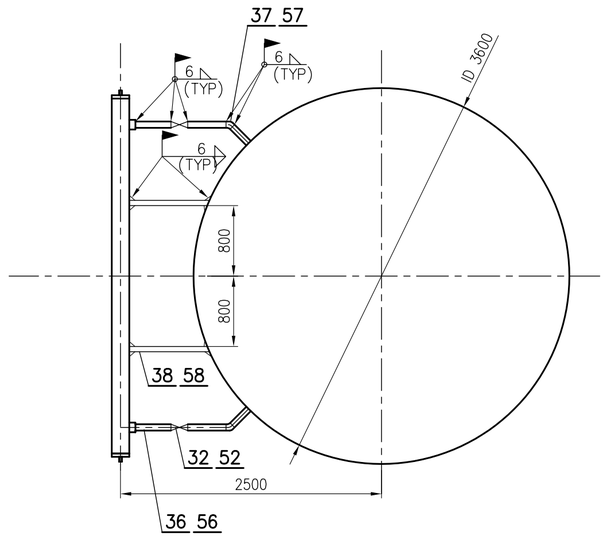
*=0.7 X CONNECTION PIPE THICKNESS.



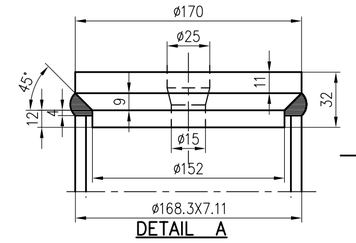
SW CONN. WELDING DETAIL
(FOR LS, LG & LT)



PIPE TO COUPLING WELDING



STAND PIPE TO SHELL CONNECTION DETAIL



DETAIL A

INSTRUMENT DETAILS

SL.No.	DESCRIPTION	C/C	END CONN.	QTY ON SP1	QTY ON SP2
1	LEVEL GUAGE (LG)	2000	1" SW	2	2
2	LEVEL TRANSMITTER (LT)	3400	1" SW	2	1
3	LEVEL SWITCH (LS)	350	1" SW	2	1

NOTES :-

1. HYDRAULIC TEST WILL BE DONE IN SHOP BEFORE DESPATCH AS PER HY0852061.
2. ⚑ REPRESENTS SITE WELDING

REV.	DATE	ALTERED	CHECKED	APPD
ZONE				

TYPE OF PRODUCT
OR
E OF CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

RESTRICTED USE

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	A.L.RAJAM		03.01.11	NA
CHD.	UMESH MENON		03.01.11	
APPD.	TSN BHARGAV		03.01.11	

DEPT.	GRADE OF TOL.DIM. C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
HEE		NTS	NA	NA	NA	NA
CODE 405						

TITLE
DEAERATOR STANDPIPE ASSEMBLY.
(FOR STAND PIPE I & II)

CARD CODE N.A.

DRAWING NO. 2-163-19-11570 REV. 00

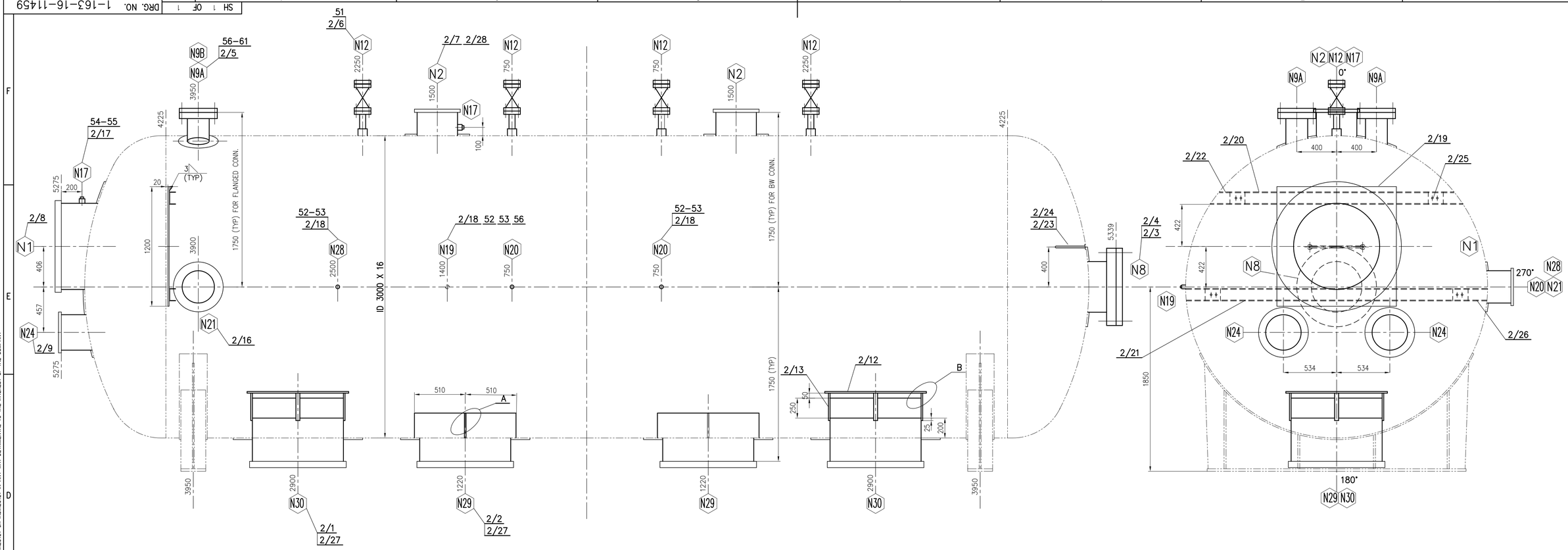
SHEET No. NO OF SHEETS

05-01-2011
09:44:14

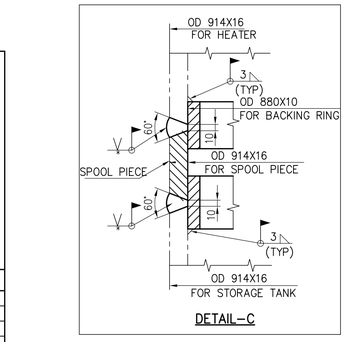
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

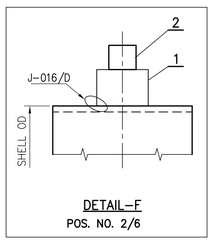
SH 1 OF 1 DRG. NO. 1-163-16-11459



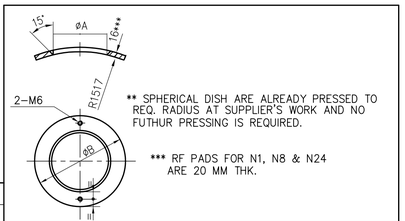
PREFIX 1/ TO ALL POS. NOs., EXCEPT POS. NOs. 51 TO 61.



DETAIL-C



DETAIL-F
POS. NO. 2/6



** SPHERICAL DISH ARE ALREADY PRESSED TO REQ. RADIUS AT SUPPLIER'S WORK AND NO FUTHUR PRESSING IS REQUIRED.

*** RF PADS FOR N1, N8 & N24 ARE 20 MM THK.

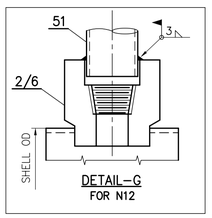
LIST OF NOZZLE CONNECTIONS

REF.	DESCRIPTION	SIZE	OD x THK	QTY	WELDING DETAILS: SHELL TO NOZZLE*	NOZZLE END CONNECTION: AT WORKS*	AT SITE*	RATING	TYPE	ØA	ØB	REMARKS	REF.	VAR NO.
N1	STEAM INLET	34"	864 x 16	1	DET-D1	DET-D1	DET-D5			880	1400		N1	01
N2A,N2B	CONDENSATE INLET	16"	406 x 16	2	DET-D1	DET-D1	DET-D5			422	650		N2A,B	02
N8	TRAY REMOVAL DOOR	20"	508 x 16	1	J-007/F	J-015/F	–	300#	SORF	524	800		N8	03
N9A,B	SAFETY RELIEF VALVE	8"	219.1 x 12.7	2	DET-D8	DET-D8	DET-D8	300#	SORF	235	400		N9A,B	04
N12	VENT CONN	2"	COUPLING 6000#	4	DET-F	DET-F	DET-G	300#	SW			REFER NOTE-12	N12	05
N17	TEMP. GAUGE CONN	M33X2	COUPLING	2	J-008/F	***	SCREW THERMOWELL		SCREWED			SPECIAL COUPLING	N17	06
N19	PRESSURE GAUGE CONN	1/2"	COUPLING 6000#	1	DET-D6	DET-D6	DET-D31		SW			**	N19	07
N20	PRESSURE TRANSMITTER CONN	1/2"	COUPLING 6000#	2	DET-D6	DET-D6	DET-D31		SW			**	N20	07
N21	CBD VENT	12"	323.6 x 17.48	1	DET-D1	DET-D1	DET-D5			340	500		N21	08
N24	HP-5 DRAIN INLET	8"	219.1 x 12.7	2	DET-D10	DET-D10	DET-D5			235	500		N24	09
N28	PG TEST PRESSURE TAP POINT CONN.	1/2"	COUPLING 6000#	1	DET-D6	DET-D6	DET-D31		SW			**	N28	07
N29	DOWN COMMER	36"	914 x 16	2	DET-D2	DET-D2	DET-D5 & DET-C			930	1400		N29	10
N30	EQUALIZER	36"	914 x 16	2	DET-D1	DET-D1	DET-D5 & DET-C			930	1400		N30	11

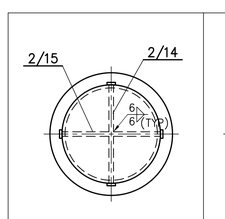
** SW PIPE TO COUPLING AFTER REMOVING PLUG
*** SCREW PLUG WITH WASHER

* NOTES FOR LIST OF NOZZLE CONN. TABLE

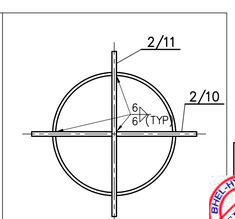
1) FOR DETAILS D1 TO D31 REFER DRG. 1-163-10-11267.
2) FOR DETAILS J-001/F, J-002/F, J-007/F, J-008/F, J-015/F, J-014/D & J-016/D REFER DRG. 2-16310-00014.
3) FOR DET-A, B, C, F & G REFER THIS DRG.



DETAIL-G
FOR N12



DETAIL-B



DETAIL-A

NOTES:-

1) ALL FLANGE BOLT HOLES SHALL STRADDLE NORMAL CENTRE LINES OF VESSEL.
2) ALL FABRICATED NOZZLES TO BE FULLY RADIOGRAPHED.
3) HYDROTEST BLANKING PLATES SHALL BE REMOVED ONLY AT SITE.
4) WPS FOR FILLET WELDS ON SHELL SHALL BE AS PER J-002/F.
5) ALL LONGITUDINAL AND CIRCUMFERENTIAL WELDS ARE TO BE BACK-GOUGED TO SOUND METAL.
6) MAGNETIC PARTICLE TEST REQUIRED ONLY AT NOZZLE TO HEAD WELDS AND NOZZLE TO SHELL WELDS.
7) VESSEL WILL BE DESPATCHED IN SINGLE PIECE.
8) INSIDE EDGES OF ALL PROJECTED NOZZLES SHALL BE ROUNDED OFF.
9) NOZZLES WHICH OVERLAP C-SEAMS SHALL MEET THE REQUIREMENTS OF UW-14
10) BOLTING TO SECURE HEATER TO STORAGE TANK IS 8 No'S OF M27x120
11) HYDROSTATIC TEST AS PER HY0852061.
12) NOZZLE N12 SHALL BE PLUGED AT WORKS FOR HYDROTEST PURPOSE. WHICH SHALL THEN BE REMOVED AT SITE AND VENT ORIFICE ASSLY (POS. NO. 51) AS PER RELEVANT DRG. SHALL BE WELDED AS PER DET-G FOR N12.
13) ⚑ INDICATES SITE WELDING.

IMPORTANT NOTES ON DEAERATOR VENT PIPING

1) NO SHARP BENDS AND TRAPS ARE ALLOWED IN VENT PIPING.
2) VENT PIPE SHALL RISE VERTICALLY FROM DEAERATOR HEATER IN A SHORT LENGTH OF PIPE
3) AVOIDE LONG LINES WITH GREAT NUMBERS OF TURNS
4) HORIZONTAL RUNS SHALL BE AVOIDED IN VENT PIPING.
5) DO'NT JOIN INDIVIDUAL VENT LINES WITH A COMMON HEADER.

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

REV.	DATE	ALTERED	CHECKED	APPD
ZONE				

TYPE OF PRODUCT
OR
OF CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	A.L. RAJAM		10.05.10	
CHD.	UMESH MENON		10.05.10	N.A
APPD.	B SRINIVAS		10.05.10	

DEPT.	GRADE OF TOL.DIM. C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
HEE		NTS	NA	NA	N.A	N.A
CODE 405						

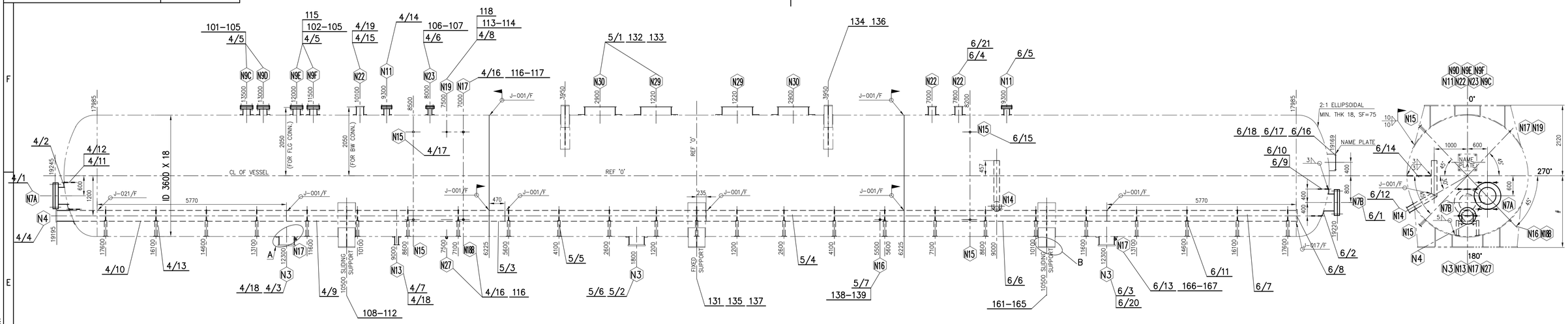
TITLE
NOZZLE ASSEMBLY
(FOR DEAERATOR HEATER)

CARD CODE

DRAWING NO. 1-163-16-11459 REV. 00
SHEET No. 1 NO OF SHEETS 1

25-05-2011
15:52:00

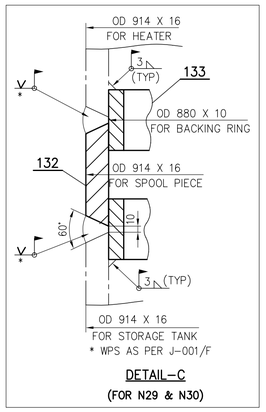
COMPUTER FILE NAME — REF. DRG. NO. — SIGN. AND DATE — INVENTORY NO



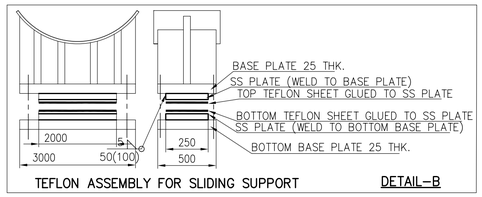
#= 2150 (FOR FIXED SUPPORT) & 2135 (FOR SLIDING SUPPORT), 15mm DIFFERENCE IN HEIGHT IS COMPENSATED BY TEFLON SHEET ASSLY. (REFER DET–B)

PREFIX 1/, 2/ & 3/ FOR POS. NOs. FOR SEC–I, II & III RESPECTIVELY, EXCEPT POS. NOs. 101–118, 131–139, 161–167.

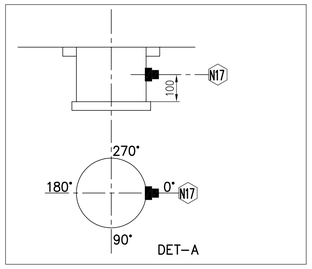
IMPORTANT: –
SUBCONTRACTOR SHALL TAKE CONCURRENCE FROM HE ENGG. DEPARTMENT, BEFORE MAKING ANY OPENINGS FOR NOZZLES ON THE SHELL & DISHED ENDS.



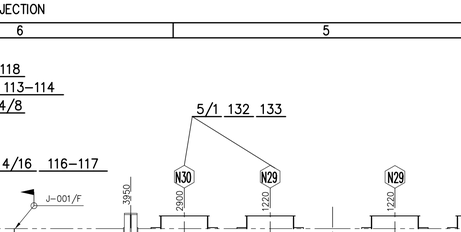
DETAIL–C
(FOR N29 & N30)



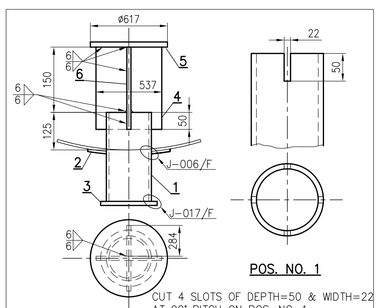
TEFLON ASSEMBLY FOR SLIDING SUPPORT DETAIL–B



DET–A



* SPHERICAL DISH ARE ALREADY PRESSED TO REQ. RADIUS AT SUPPLIER'S WORK AND NO FUTHUR PRESSING IS REQUIRED.



POS. NO. 1

CUT 4 SLOTS OF DEPTH=50 & WIDTH=22 AT 90° PITCH ON POS. NO. 1.

DETAIL–E

POS. NO. 4/3, 5/2, 6/3

LIST OF NOZZLE CONNECTIONS

REF.	DESCRIPTION	SIZE	OD x THK	QTY	WELDING DETAILS: SHELL TO NOZZLE *	NOZZLE END CONNECTION: AT WORKS *	AT SITE *	RATING	TYPE	øA	øB	REMARKS	REF.	VAR NO.
N3A–C	FEED WATER OUTLET	18"	457 X 16	3	DET–E	DET–E	DET–D5	–	BW	473	650	WITH VORTEX BREAKER	N3A–C	01
N4	STARTUP HEATING STEAM INLET CONN.	12"	323.9 X 17.48	1	DET–D1	DET–D1	DET–D5	–	BW	340	500		N4	02
N7A	MANHOLE	20"	508 X 16	1	J–007/F	J–015/F	–	300#	SORF	524	850		N7A	03
N7B	MANHOLE	20"	508 X 16	1	J–007/F	J–015/F	–	300#	SORF	524	850		N7B	03
N9C TO F	SAFETY RELIEF VALVE CONN.	8"	219.1 X 12.7	4	DET–D8	DET–D8	DET–D8	300#	SORF	235	400		N9C TO F	04
N11	VENTILATOR	6"	168.3 X 10.97	2	DET–D4	DET–D4	–	300#	SORF	184	300	REFER NOTE–15	N11	05
N13	DRAIN	4"	114.3 X 11.13	1	DET–D2	DET–D2	DET–D5	–	BW	130	250		N13	06
N14	OVER FLOW CONN.	6"	168.3 X 10.97	1	DET–D1	DET–D1	DET–D5	–	BW	184	300		N14	07
N15	STAND PIPE	2"	60.3 X 8.74	4	DET–D17	DET–D17	DET–D21	–	BW	–	–		N15	08
N16	SAMPLING CONNECTION	1"	COUPLING 6000#	1	DET–D6	DET–D6	DET–D31	–	–	–	–	**	N16	09
N17	THERMOMETER CONN.	M33X2	COUPLING	3	J–008/F	***	SCREW THERMOWELL	–	SCREWED	–	–	SPECIAL COUPLING	N17	10
N18B	CONN. FOR RTD	M33X2	COUPLING	1	J–008/F	***	SCREW THERMOWELL	–	SCREWED	–	–	SPECIAL COUPLING	N18B	10
N19	PRESSURE GAUGE CONN.	1/2"	COUPLING 6000#	1	DET–D6	DET–D6	DET–D31		SCREWED	–		**	N19	11
N22A–C	RECRCULATION CONN. (BFP)	8"	219.1 X 12.7	3	DET–D10	DET–D10	DET–D5	–	BW	235	400	WITH DISPERSER	N22A–C	12
N23	INTIAL FILLING CONN.	4"	114.3 X 11.13	1	DET–D3	DET–D3	DET–D3	300#	SORF	130	250		N23	13
N27	PG TEST THEMOWELL CONN.	M33X2	COUPLING	1	J–008/F	***	–		SCREWED				N27	10
N29	DOWN COMER	36"	914 X 16	2	DET–D1	DET–D1	DET–D5 & DET–C	–	BW	930	1300		N29	14
N30	EQUALIZER	36"	914 X 16	2	DET–D1	DET–D1	DET–D5 & DET–C	–	BW	930	1300		N30	14

** SW PIPE TO COUPLING AFTER REMOVING PLUG.
*** SCREW PLUG WITH WASHER.

NOTES:–

1. ALL NOZZLE BOLT HOLES SHALL STRADDLE NORMAL CENTRE LINES OF VESSEL.
2. ALL FABRICATED NOZZLES TO BE FULLY RADIOGRAPHED.
3. BUTT WELD CONNECTIONS TO HAVE HYDROTEST BLANK – OFF PLATES LEFT
4. IN PLACE (TO BE REMOVED AFTER HYDRAULIC TEST AT SITE)
5. WPS FOR FILLET WELDS ON SHELL ARE AS PER J–002/F & FILLET DIMENSION SHOWN SHOWN IS THROAT DIMENSION
6. ALL LONGITUDINAL AND CIRCUMFERENTIAL WELDS ARE TO BE BACK–GOUGED TO SOUND METAL.
7. M.P TEST REQUIRED ONLY AT NOZZLE TO HEAD WELDS AND NOZZLE TO SHELL WELDS
8. TANK WILL BE DESPATCHED IN THREE SECTIONS.
9. INSIDE EDGES OF ALL PROJECTED NOZZLES SHALL BE ROUNDED OFF.
10. NOZZLES WHICH OVERLAP C–SEAMS SHALL MEET THE REQUIREMENTS OF UW–14
11. FOUNDATION BOLTS:
    M42x300 STUD WITH TWO NUTS 16 No'S PER SET ALONG WITH WASHER SHALL BE SUPPLIED.
12. HYDROSTATIC TEST AS PER HY0852061
13. SPOOL PIECE CONSTRUCTED OF SA 516/70 WILL BE SUPPLIED TO AID IN PROPER FIT UP OF THE DOWN COMMERS AND EQUALIZERS. TWO BACKING RINGS WILL BE SUPPLIED WITH EACH SPOOL PIECE (REFER DET–C).
14. STORAGE TANK TO HEADER CONNECTION SHALL BE AS PER DET–C AT SITE. (DOWN COMMERS & EQUALISERS)
15. VENTILATOR IS A FLANGED CONN. BLANKED WITH A BLIND FLANGE. THIS CAN BE USED FOR VENTILATION INSIDE THE STORAGE TANK DURING ANY MAINTAINANCE OPERATION. THIS IS POSSIBLE BY OPENING THE BLIND FLANGE OF THE VENTILATOR NOZZLE.
16. SPOOL PIECE ARE EDGE PREPARED ONLY ON ONE SIDE AT WORKS. CUTTING SPOOL PIECE TO EXACT LENGTH AS PER SITE REQUIREMENT AND EDGE PREPARATION ON THE OTHER SIDE IS IN SITE SCOPE OF WORK.
17. BOLTING TO SECURE HEATER TO STORAGE TANK IS OF M27x120 IN SIZE AND 8 No'S IN QTY.
18. SYMBOL ⚑ INDICATES SITE WELDING
19. SADDLE SUPPORTS FOR SUPPORTING DEAERATOR HEATER SHALL BE DESPATCHED IN TACK WELDED CONDITION FROM WORKS. FINAL WELDIND SHALL BE AT SITE.
20. FOR NAME PLATE (POS. NO. 6/17) DRG. NO. REFER ST.TANK ASSLY. DRG.

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

REV.	DATE	ALTERED	CHECKED	APPD
ZONE				

TYPE OF PRODUCT
OR
OF CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME		DATE	NO.OF VAR.
DRN.	A.L RAJAM		11.05.10	
CHD.	UMESH MENON		11.05.10	
APPD.	B SRINIVAS		11.05.10	

RESTRICTED USE

DEPT: HEE	GRADE OF TOL.DIM. C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
CODE 405		NTS	NA	NA	NA	NA

TITLE
NOZZLE ASSLY. DETAILS
(DEAERATOR STORAGE TANK)

CARD CODE

DRAWING NO. 1-163-11-11365 REV. 00

SHEET No. NO OF SHEETS

COMPUTER FILE NAME — REF. DRG. NO. — SIGN. AND DATE — INVENTORY NO

18-03-2011
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