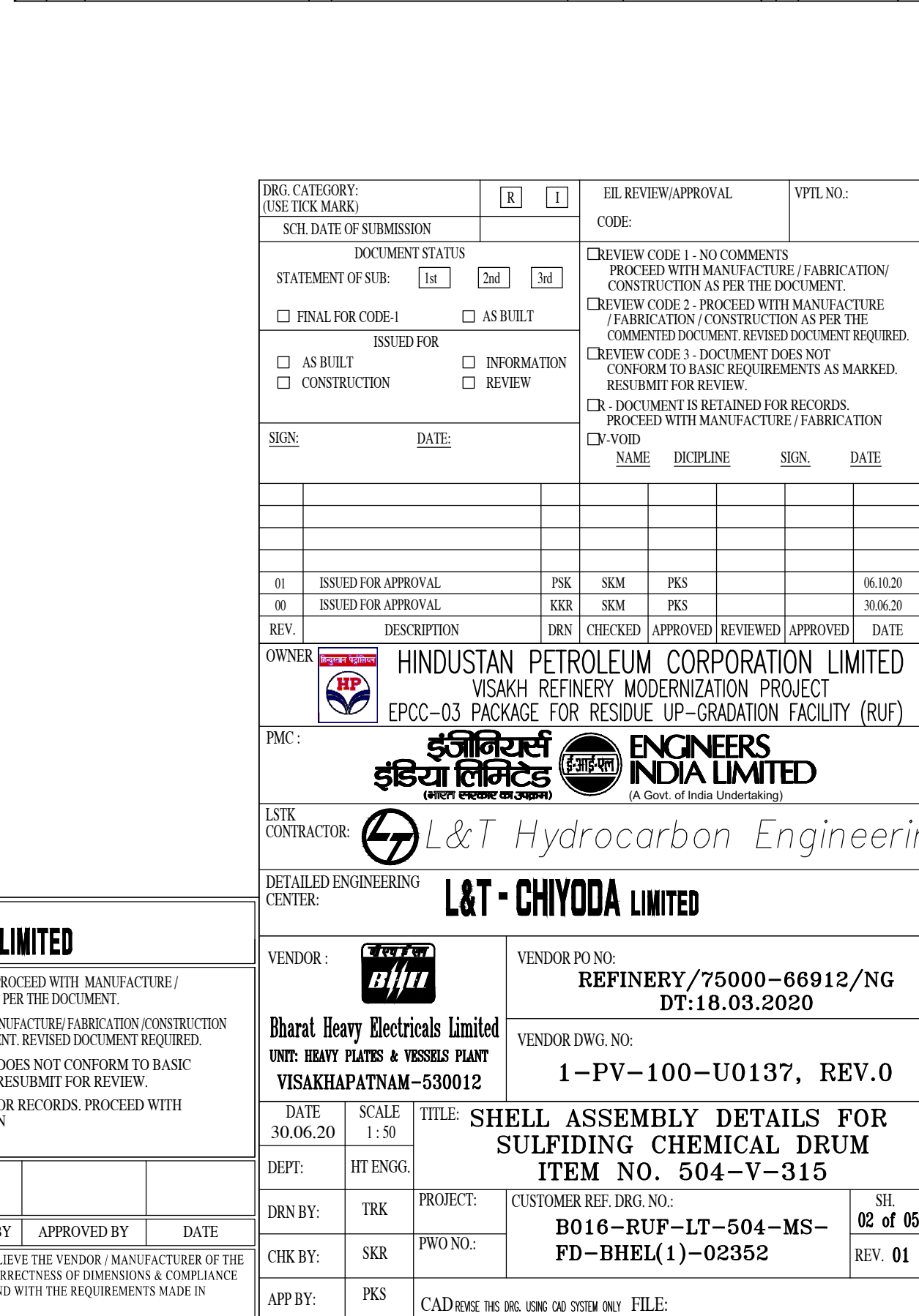
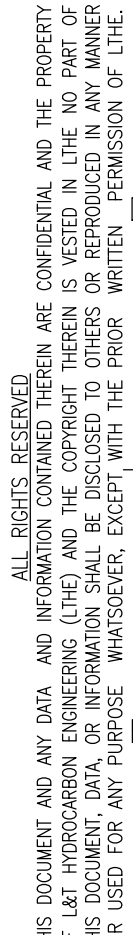




FLANGE DIMENSIONS
AS PER B16.5

LG.

R10
(TYP.)

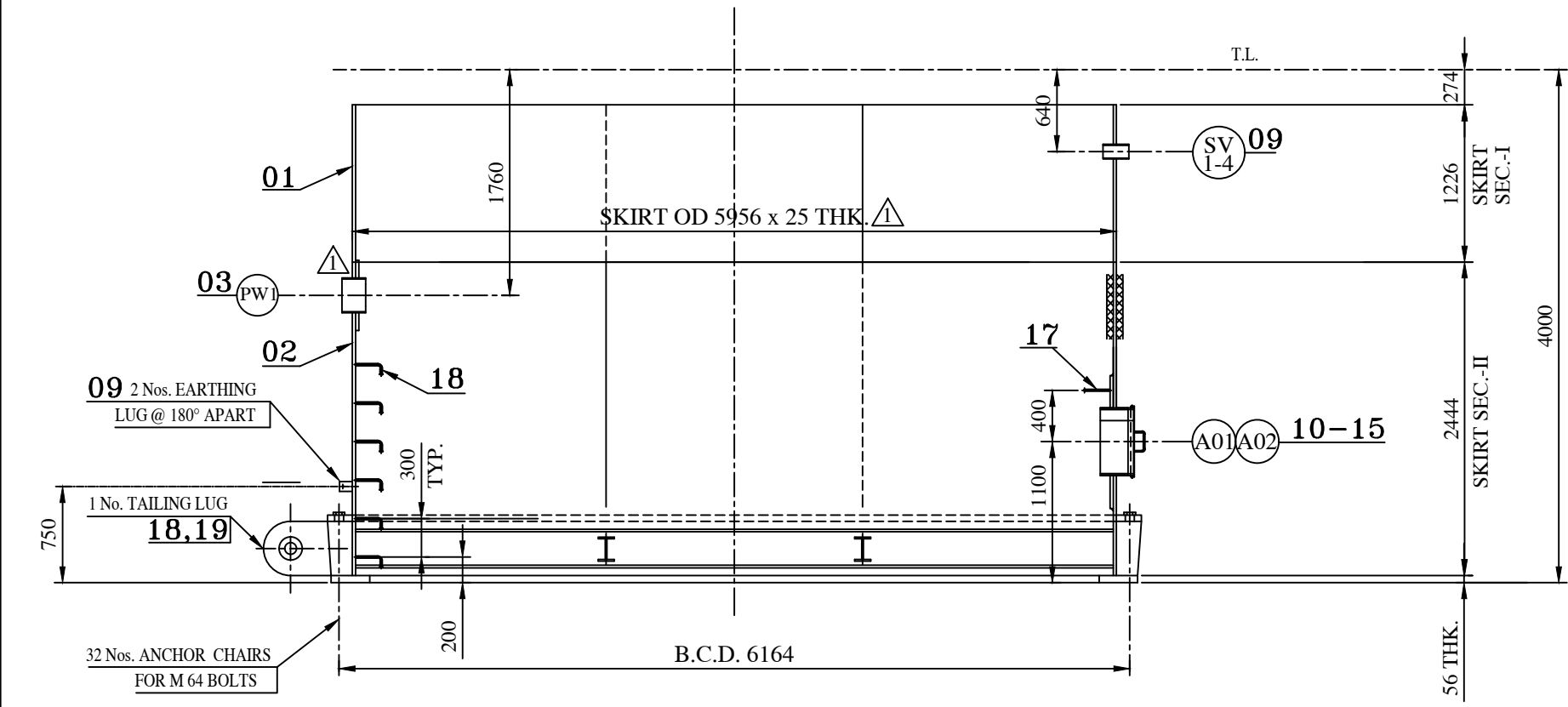
tl

O.D.

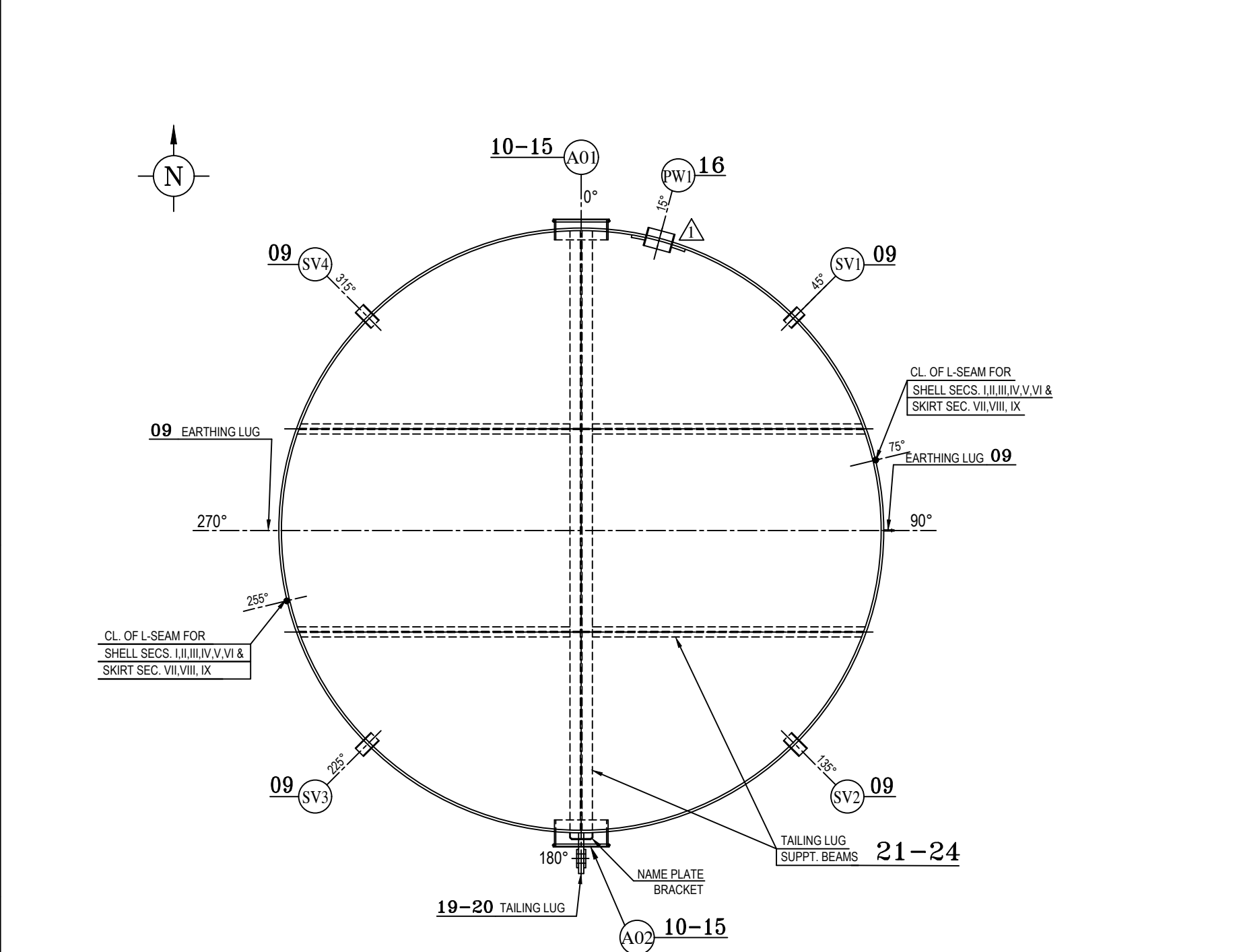
VARIANT-2
FOR ITEM Nos. 15,16,18,33

L&T

L&T - CHIYODA LIMITED				L&T - CHIYODA LIMITED	
☐ REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE/FABRICATION CONSTRUCTION AS PER THE DOCUMENT. ☐ REVIEW CODE 2 - PROCEED WITH MANUFACTURE/FABRICATION CONSTRUCTION AS PER THE DOCUMENTED DOCUMENT. REVISED DOCUMENT REQUIRED. ☐ REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW. ☐ R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE/FABRICATION ☐ V-VOID				VENDOR :  Bharat Heavy Electricals Limited UNIT: HEAVY PLANTS & TESSIES PLANT UNTS-KAPHAPTNAM-530012	
DATE 30.06.20				SCALE 1:50	
DEPT:				HT ENGG.	
DRN BY: TRK				PROJECT: SHELL ASSEMBLY DETAILS FOR SULFIDING CHEMICAL DRUM ITEM NO. 504-V-315	
CHK BY: SKR				CUSTOMER REF. DRG. NO.: B016-RUP-LT-504-MS-FD-BHEL(1)-02352	
APP BY: PKS				PWO NO.:	
COMMENTS: THIS PROJECT / APPROVAL DOES NOT RELIEVE THE VENDOR / MANUFACTURER OF THE FULL RESPONSIBILITY AS TO DESIGN CORRECTNESS OF DIMENSIONS & COMPLIANCE WITH ALL APPLICABLE REGULATIONS AND WITH THE REQUIREMENTS MADE IN PURCHASER SPECIFICATIONS.				CAD/REUSE THE DRG. USING OLD SYSTEM ONLY FILE:	
REVIEWED BY:				SH 02 of 05 REV. 01	
APPROVED BY:					

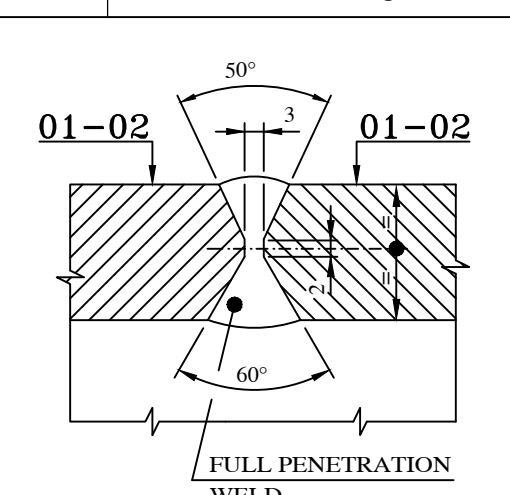


ELEVATION

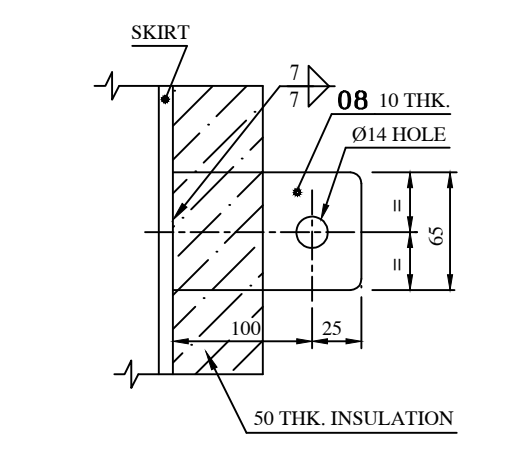


PLAN VIEW

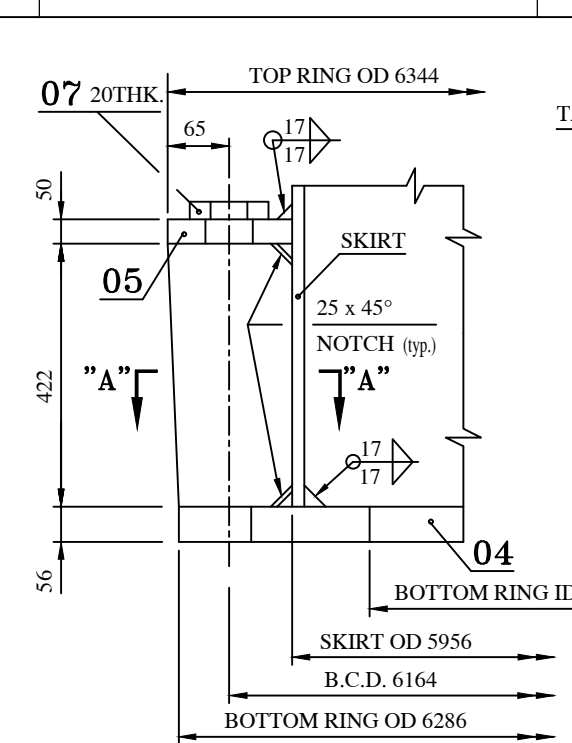
• FOR ACTUAL ORIENTATION, PLAN VIEW TO BE REFERRED



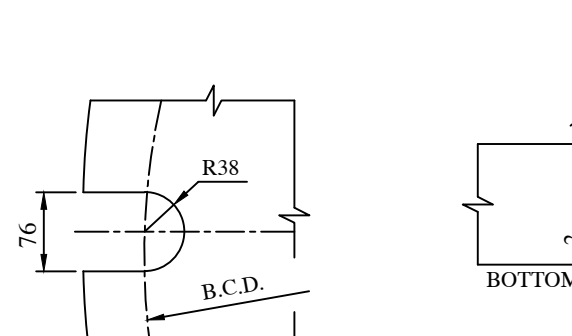
TYP.WELD DETAIL OF L-SEAM/C-SEAM FOR SKIRT SECS. I & II



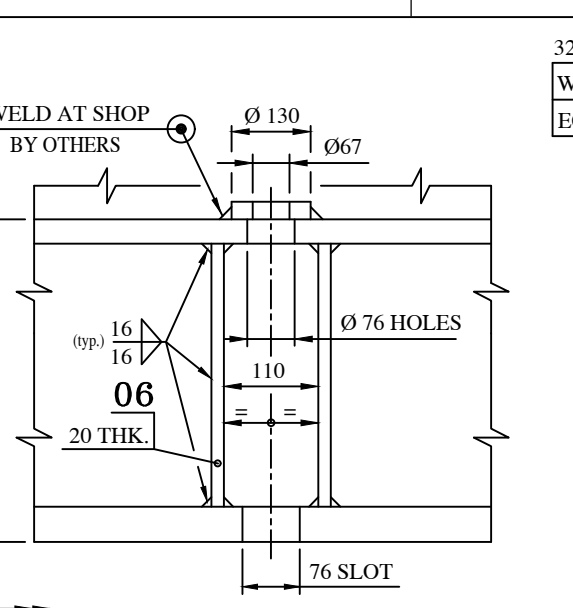
DETAIL OF EARTHING LUG (QTY. 2 Nos.)



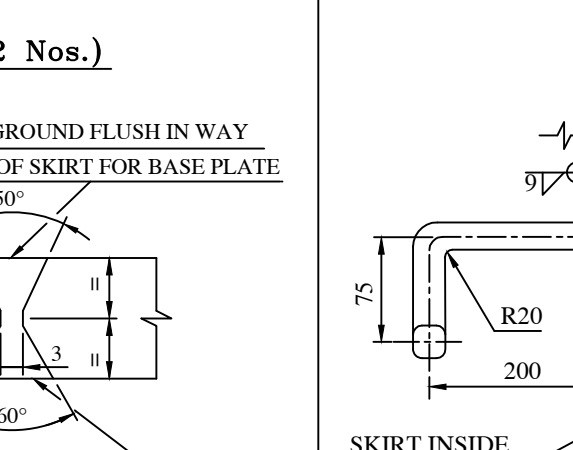
DETAIL OF ANCHOR CHAIRS (32 Nos.)



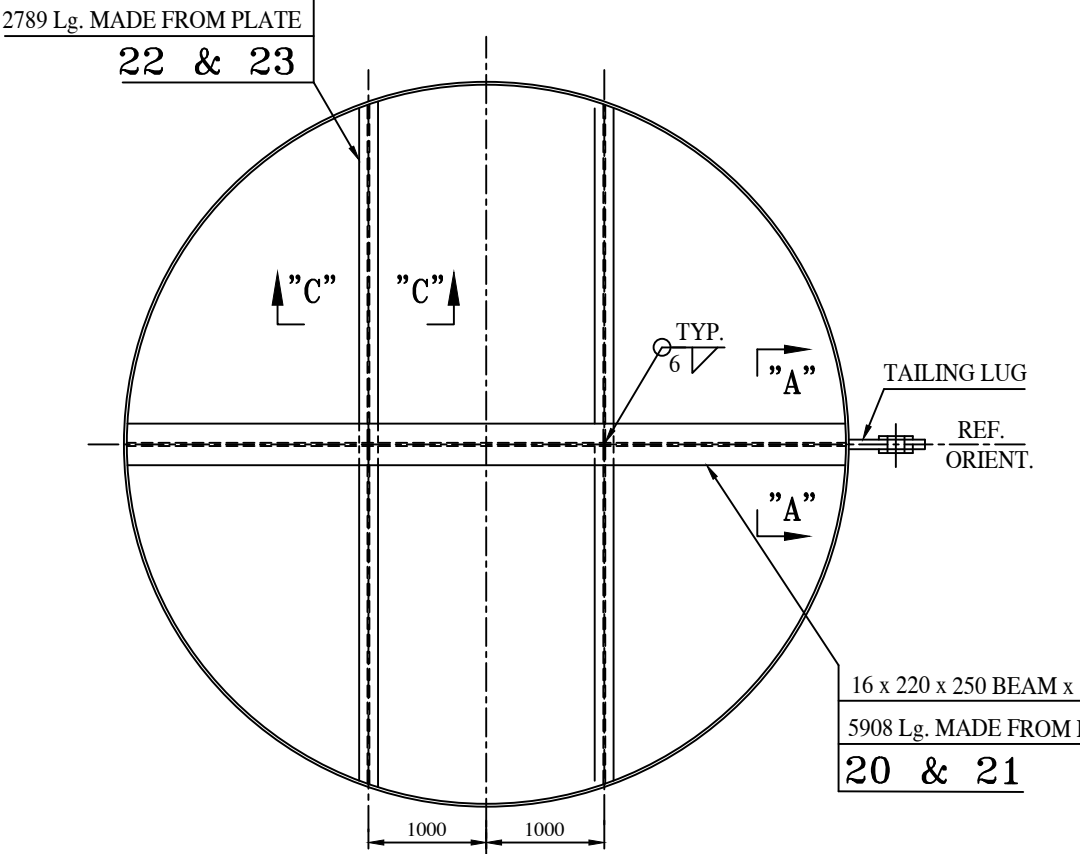
TYP. WELD DETAIL OF BASE PLATE SEGMENTS



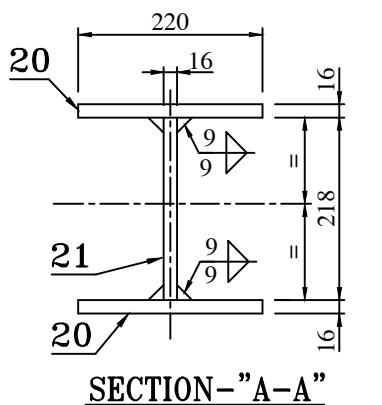
DETAIL OF LADDER RUNG SHARP CORNERS TO BE ROUNDED OFF



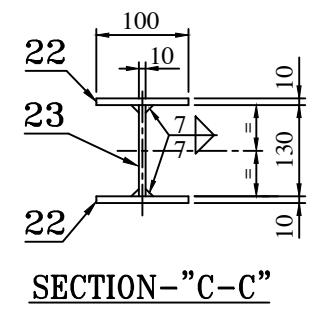
DETAIL OF STIFFENING BEAM



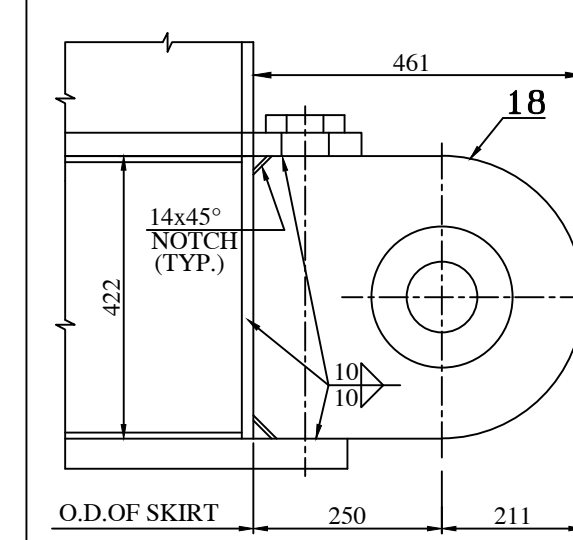
PLAN VIEW



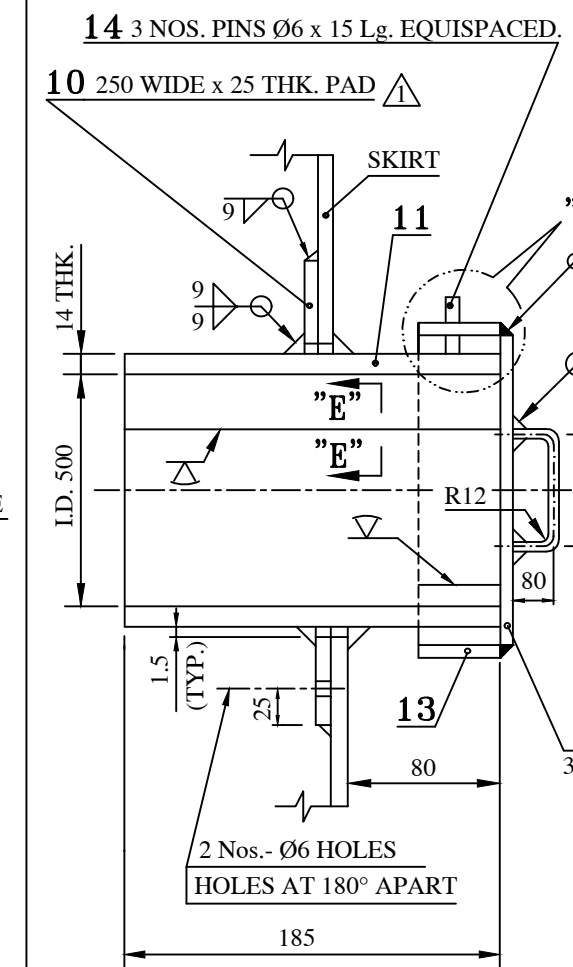
SECTION-A-A



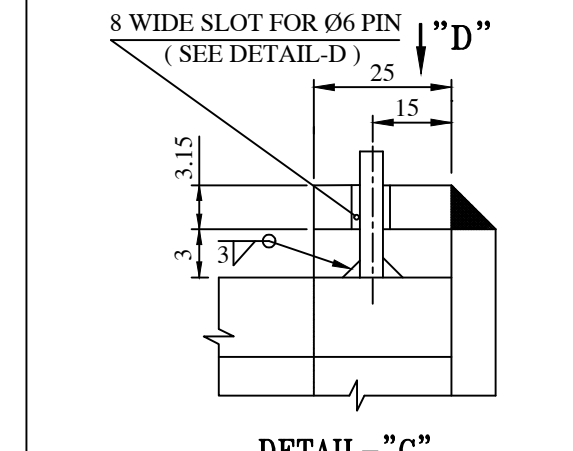
SECTION-C-C



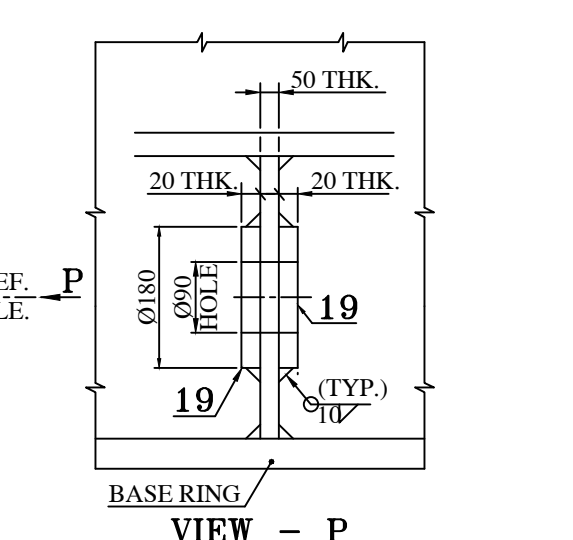
DETAIL OF TAILING LUG (1 NO.)



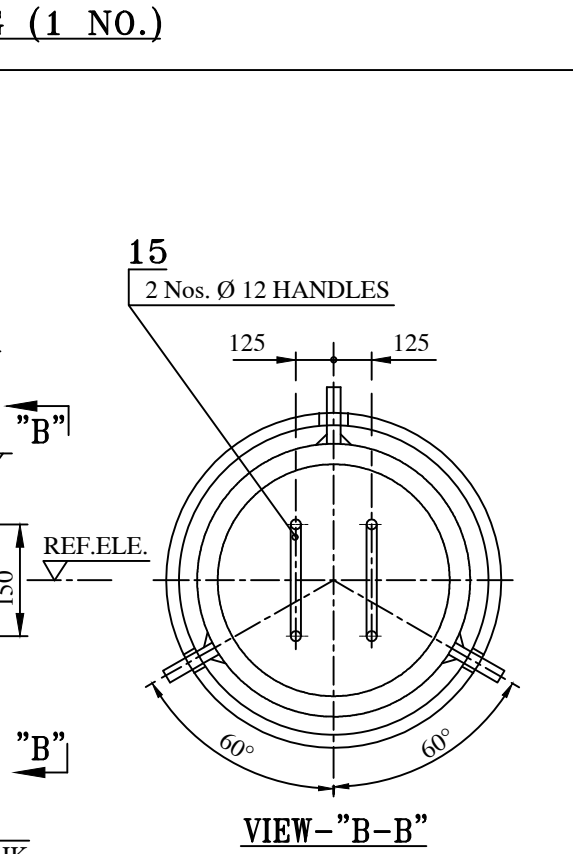
DETAIL OF ACCESS OPENING - A0 1 & 2



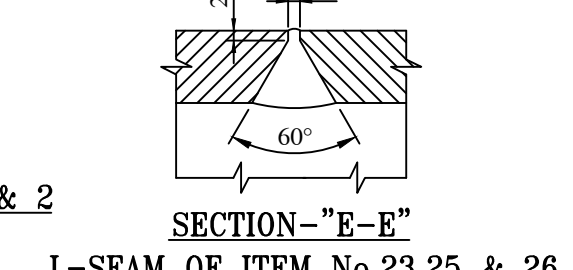
DETAIL-C



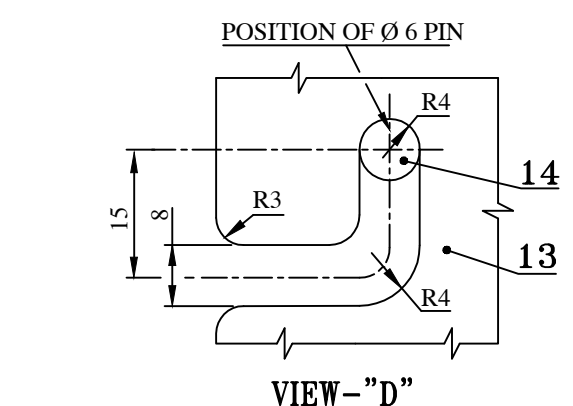
VIEW - P



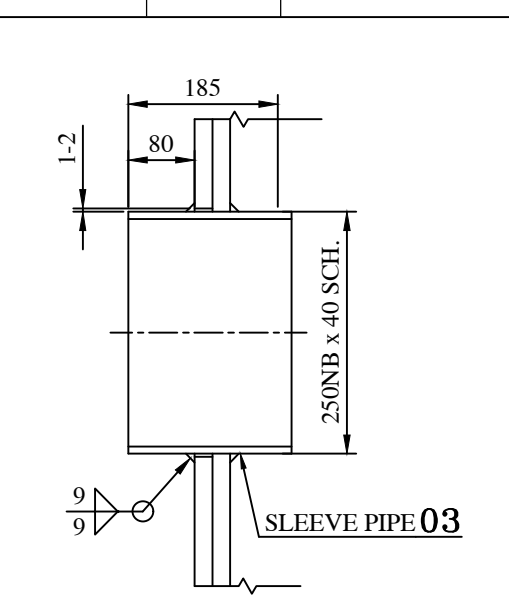
VIEW-B-B



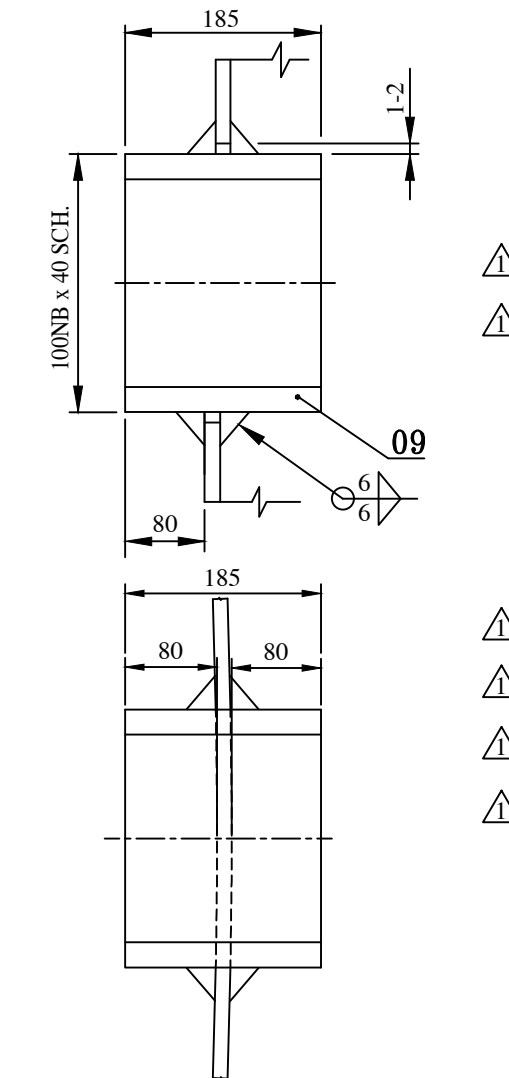
SECTION-E-E



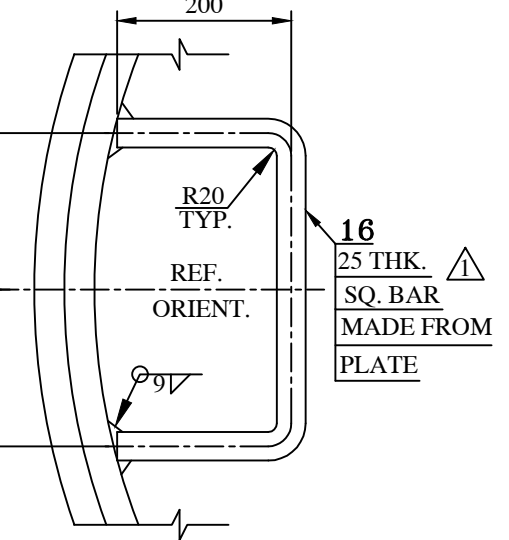
VIEW-D



DETAIL OF NOZZLE - PW1



DETAIL OF SKIRT VENT (SV 1-4)



DETAIL OF HAND GRIP

SPECIAL NOTE: BHEL SHALL ENSURE COMPLIANCE OF ALL DIMENSIONS/SKETCHES IN THIS MANUFACTURING ASSEMBLY DRAWING W.R.T GENERAL ASSEMBLY DRAWING.

24	PAD - PW1 O.D.546 x I.D.273 x 25 THK.	XXX	114.650
23	FAB.BEAM MIDDLE PL. 10 THK. x 130 x 2789	XXX	28.462
22	FAB.BEAM TOP&BOT.PL. 10 THK. x 100 x 2789	XXX	21.894
21	FAB.BEAM MIDDLE PL. 16 THK. x 218 x 5908	XXX	161.766
20	FAB.BEAM TOP&BOT.PL. 16 THK. x 220 x 5908	XXX	163.250
19	TAILING LUG SIDE COVER PL. 20 THK. x OD 180 / ID 90	XX	3.000
18	TAILING LUG PLATE 50 THK. x 461 x 422	XX	76.358
17	LADDER RUNG 25 x 25 x 900 L.G.	XXX	2.826
16	HAND GRIP 25 x 25 x 750 L.G.	XXX	2.355
15	HANDLE Ø12 x 330 L.G.	XXX	0.293
14	PIN - A01 & A02 Ø6 x 15 L.G.	XXX	0.003
13	SIDE COVER - A01 & A02 O.D.540 x 3.15 THK. x 25 L.G.	XXX	1.042
12	COVER PLATE - A01 & A02 O.D.534 x 3.15 THK.	XXX	5.540
11	ACCESS PIPE - A01 & A02 O.D.500 x 14 THK. x 185 L.G.	XXX	34.605
10	PAD - A01 & A02 O.D.1028 x I.D.531 x 25 THK.	XXX	114.650
09	SKIRT VENT 100NB x 40 SCH. x 185 L.G.	XXX	3.134
08	EARTHING LUG 10THK x 65 x 125	XXX	0.589
07	WASHER O.D.130 x I.D.67 x 20 THK.	XXX	1.530
06	RIB 20 THK. x 194 x 422	XXX	12.853
05	COMPRESSION RING O.D.6344 x I.D.5956 x 50 THK	XXX	1471.180
04	BASE RING O.D.6286xI.D.5686x56 THK.	XXX	2480.080
03	SLEEVE FOR NOZZLE - PW1 250NB x 40SCH. x 185 L.G.	XXX	11.756
02	SKIRT SECTION-II 25 THK. x 2444 x 9316	IS 2062 E250B	4290.469
01	SKIRT SECTION-I 25 THK. x 1226 x 9316	SA 516 GR.70	2152.257

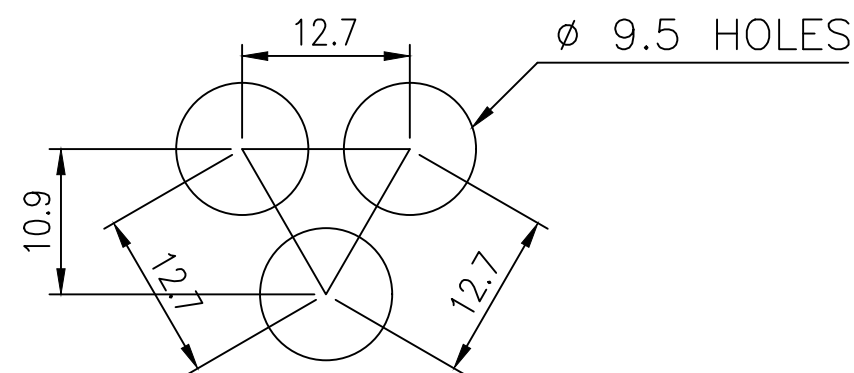
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SCH. DATE OF SUBMISSION				
DOCUMENT STATUS				
STATEMENT OF SUB:	1st	2nd	3rd	
FINAL FOR CODE-1				
ISSUED FOR				
AS BUILT				
CONSTRUCTION				
INFORMATION				
REVIEW				
SIGN:				
DATE:				

01	ISSUED FOR APPROVAL	PSK	SKM	PKS	06.10.20
02	ISSUED FOR APPROVAL	KKR	SKM	PKS	30.06.20
REV.	DESCRIPTION	DRN	CHECKED	APPROVED	DATE
OWNER	HINDUSTAN PETROLEUM CORPORATION LIMITED				
PM:	ENGINEERS INDIA LIMITED				
CONTRACTOR:	L&T Hydrocarbon Engineering				

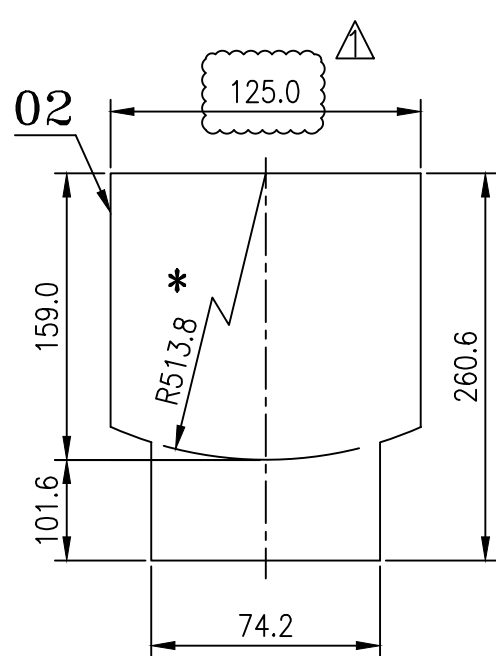
L&T - CHIYODA LIMITED			
REVIEW CODE 1 - NO COMMENTS PROCDED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE DOCUMENT.			
REVIEW CODE 2 - PROCDED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.			
REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW.			
R - DOCUMENT IS RETAINED FOR RECORDS. PROCDED WITH MANUFACTURE / FABRICATION			
V-VOID			
DATE	30.06.20	SCALE	1:50
DEPT:	HT ENGG.	TITLE:	GENERAL ASSEMBLY OF SULFIDING CHEMICAL DRUM ITEM NO. 504-V-315
DRN BY:	TRK	PROJECT:	CUSTOMER REF. DRG NO.:
CHK BY:	SKR	PWO NO.:	B016-RUF-LT-504-MS-PD-BHEL(1)-02352
APP BY:	PKS	CAD/REGE HAS DRG. USING CAD SYSTEM ONLY	FILE:

L&T - CHIYODA LIMITED			
VENDOR PO NO.:			
REFINERY/75000-66912/NG DT:18.03.2020			
VENDOR DWG. NO.:			
1-PV-100-U0138, REV.0			
GENERAL ASSEMBLY OF SULFIDING CHEMICAL DRUM ITEM NO. 504-V-315			
DRN BY:	TRK	PROJECT:	CUSTOMER REF. DRG NO.:
CHK BY:	SKR	PWO NO.:	B016-RUF-LT-504-MS-PD-BHEL(1)-02352
APP BY:	PKS	CAD/REGE HAS DRG. USING CAD SYSTEM ONLY	FILE:

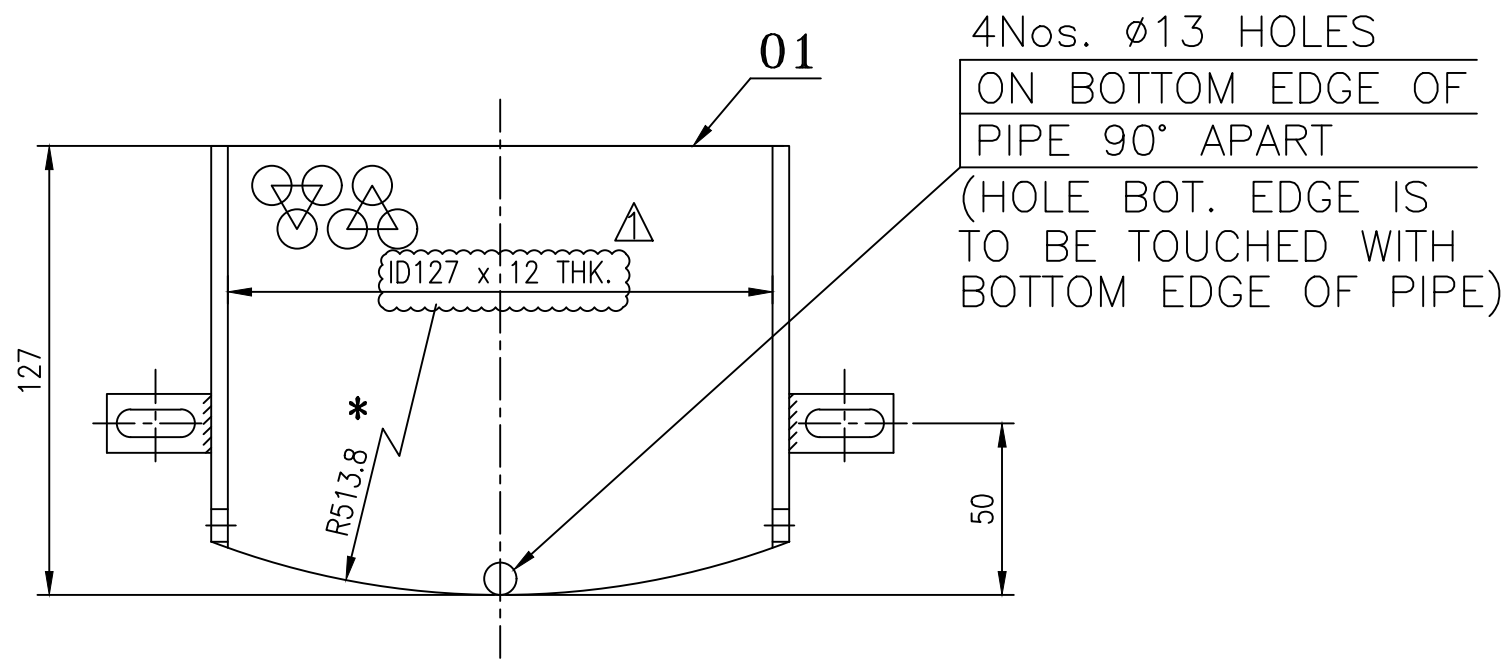
	07	MACHINE HEX. BOLT WITH TWO NUTS 1/2" UNC x 75 LG.						0.120	
						SS304L		2	
	06	VORTEX BREAKER VERT. SUPT. PL. 22 THK. x 32 x 75				SA516 Gr.70+NACE		0.343	
								2	
	05	VORTEX BREAKER VERT. SUPT. PL. 14 THK. x 32 x 52				SA516 Gr.70+NACE		0.137	
								2	
	04	VORTEX BREAKER TOP PLATE OD 152 x 12 THK.				SA516 Gr.70+NACE		1.709	
								1	
	03	VORTEX BREAKER PLATES 12 THK. x 260.6 x 56.5 AS PER DRG.				SA516 Gr.70+NACE		1.144	
								2	
	02	VORTEX BREAKER PLATE 12 THK. x 260.6 x 125 AS PER DRG.				SA516 Gr.70+NACE		2.571	
								1	
	01	PIPE FOR STRAINER ID 127x12 THK.x127 LG. FROM PL 12TK x 450 x 140				SA516 Gr.70+NACE		0.625	
								1	
VARIANT NUMBER	ITEM NO.	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO	MATERIAL CODE	A/C/P	UNIT	UNIT WEIGHT
						MATERIAL SPECIFICATION			QTY



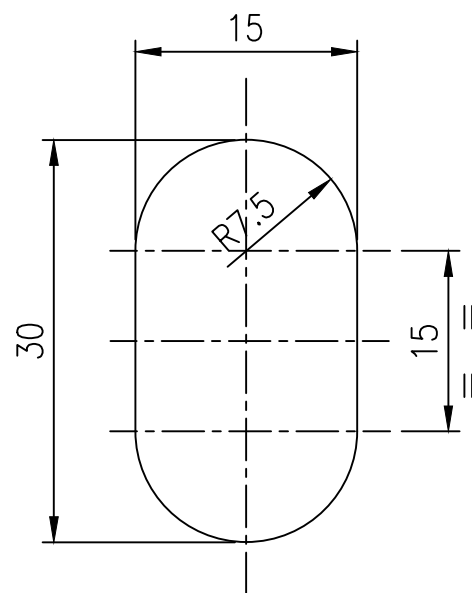
DETAIL OF PITCH



VORTEX BREAKER PLATE(1)



* THIS PROFILE SUIT TO PERPENDICULAR TO VESSEL LONGITUDINAL AXIS

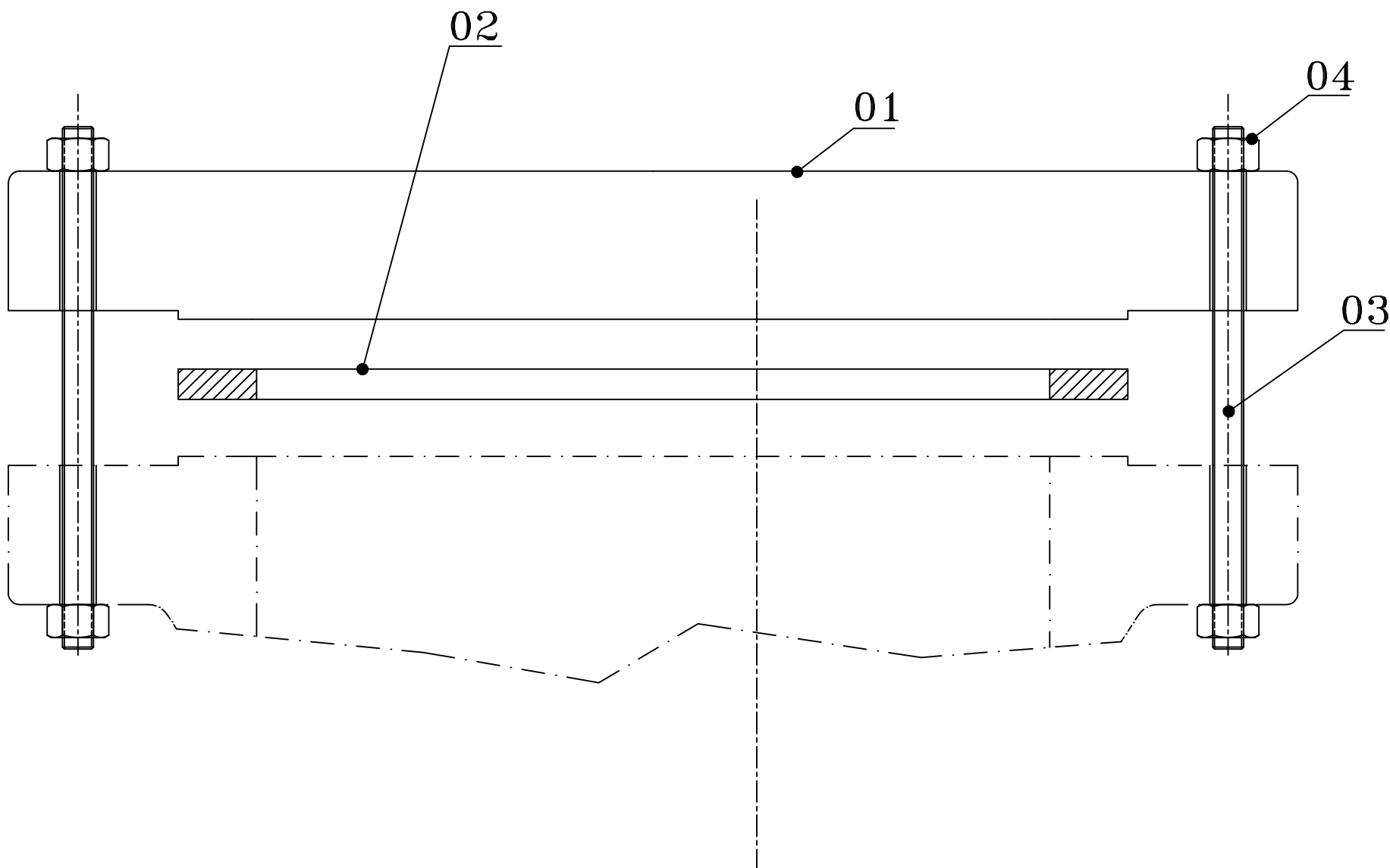


DETAIL OF SLOT
(TYP)

L&T - CHYODA LIMITED			
☐	REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION/ CONSTRUCTION AS PER THE DOCUMENT.		
☐	REVIEW CODE 2 - PROCEED WITH MANUFACTURE/FABRICATION/CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.		
☐	REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW.		
☐	R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION		
☐	V-VOID		
COMMENTED BY	REVIEWED BY	APPROVED BY	DATE
THIS REVIEW / APPROVAL DOES NOT RELIEVE THE VENDOR / MANUFACTURER OF THE FULL RESPONSIBILITY AS TO DESIGN CORRECTNESS OF DIMENSIONS & COMPLIANCE WITHALL APPLICABLE REGULATIONS AND WITH THE REQUIREMENTS MADE IN PURCHASER SPECIFICATIONS.			

BHEL DRAWING No.		CLIENT DRAWING No.		DRAWING TITLE		REV. No.	
REFERENCE DOCUMENTS / DRAWINGS							
DRG. CATEGORY: (USE TICK MARK)		☐ R ☐ I		EIL REVIEW/APPROVAL		VPTL NO.:	
SCH. DATE OF SUBMISSION				CODE:			
DOCUMENT STATUS				☐ REVIEW CODE 1 – NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION/ CONSTRUCTION AS PER THE DOCUMENT.			
STATEMENT OF SUB: ☐ 1st ☐ 2nd ☐ 3rd				☐ REVIEW CODE 2 – PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.			
☐ FINAL FOR CODE-1 ☐ AS BUILT				☐ REVIEW CODE 3 – DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW.			
ISSUED FOR				☐ R – DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION			
☐ AS BUILT ☐ INFORMATION				☐ V – VOID			
☐ CONSTRUCTION ☐ REVIEW				NAME DISCIPLINE SIGN DATE			
SIGN:		DATE:					
01 CUSTOMER COMMENTS INCORPORATED		PSK		SKM		PKS	
00 ISSUED FOR APPROVAL		KKR		SKM		PKS	
REV. DESCRIPTION		DRN		CHECKED		APPROVED	
OWNER				REVIEWED		APPROVED	
		HINDUSTAN PETROLEUM CORPORATION LIMITED VISAKH REFINERY MODERNIZATION PROJECT EPCC-03 PACKAGE FOR RESIDUE UP-GRADATION FACILITY (RUF)					
PMC :		इंडियनर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम)					
LSTK CONTRACTOR:		 L&T Hydrocarbon Engineering					
DETAILED ENGINEERING CENTER:		L&T - CHIYODA LIMITED					
VENDOR :							
Bharat Heavy Electricals Limited		VENDOR PO NO: Refinery/75000-66912/NG; DATE:18.03.2020					
UNIT: HEAVY PLATES & VESSELS PLANT VISAKHAPATNAM-530012		VENDOR DWG. NO: 3-PV-100-U0223, REV. 0					
DATE 29.06.20		SCALE 1:3		TITLE: ORIENTATION DETAILS FOR SULFIDING CHEMICAL DRUM (ITEM NO. 504-V-315)			
DEPT: HT ENGG.		(STRAINER & VORTEX BREAKER ASSEMBLY AT NOZZLE 2)					
DRN BY: KKR		PROJECT:		CUSTOMER DRG. NO.:		SH. 04 OF 05	
CHK BY: SKM		PWO NO.:		B016-RUF-LT-504-MS-		REV. 01	
APP BY: PKS		FD-BHEL(1)-02352					
CAD REVISE THIS DRG. USING CAD SYSTEM ONLY FILE:							

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SPECIAL NOTE:

BHEL SHALL ENSURE COMPLIANCE OF ALL DIMENSIONS/SKETCHES IN THIS MANUFACTURING ASSEMBLY DRAWING W.R.T GENERAL ASSEMBLY DRAWING.

	04	NUT 1 1/2"-8UN				----		0.595	
						SA194GR.2HM		48	
	03	STUD 1 1/2"-8UNx280 LG				----		1.970	
						SA193GR.B7M		24	
	02	GASKET; SPW SS316L GRAF. FILLED INNER RING				----		3.370	
						SS 316 INNER RING+ CS RING		1	
	01	BLANK FLANGE 24"NPS 300#				----		342.000	
						SA 105		1	
04		NOZZLE-24" - 300#				----		437.210	
						(WELDMENT)			
	04	NUT 3/4"-10UNC				----		0.088	
						SA194GR.2HM		24	
	03	STUD 3/4"-10UNC x 135 LG				----		0.250	
						SA193GR.B7M		12	
	02	GASKET; SPW SS316L GRAF. FILLED INNER RING				----		0.200	
						SS 316 INNER RING+ CS RING		1	
	01	BLANK FLANGE 6"NPS 600#				----		23.000	
						SA 105		1	
03		NOZZLE-6" - 600#				----		10.788	
						(WELDMENT)			
	04	NUT 3/4"-10UNC				----		0.088	
						SA194GR.2HM		112	
	03	STUD 3/4"-10UNCx120 LG				----		0.224	
						SA193GR.B7M		56	
	02	GASKET; SPW SS316L GRAF. FILLED INNER RING				----		0.200	
						SS 316 INNER RING+ CS RING		7	
	01	BLANK FLANGE 3"NPS 300#				----		7.000	
						SA 105		7	
02		NOZZLE-3" - 300#				----		10.788	
						(WELDMENT)			
	04	NUT 5/8"-11UNC				----		0.054	
						SA194GR.2HM		128	
	03	STUD 5/8"-11UNCx100 LG.				----		0.126	
						SA193GR.B7M		64	
	02	GASKET; SPW SS316L GRAF. FILLED INNER RING				----		0.200	
						SS 316 INNER RING+ CS RING		8	
	01	BLANK FLANGE 2"NPS 600#				----		3.500	
						SA 105		8	
01		NOZZLE-2" - 600#				----		10.788	
						(WELDMENT)			
VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	UNIT	DRAWING NUMBER	ITEM NO VAR-NO	MATERIAL CODE	UNIT WEIGHT		
						MATERIAL SPECN	QUANTITY		

L&T - CHIYODA LIMITED

- ☐ REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION/ CONSTRUCTION AS PER THE DOCUMENT.
- ☐ REVIEW CODE 2 - PROCEED WITH MANUFACTURE/FABRICATION/CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.
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- ☐ R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION
- ☐ V-VOID

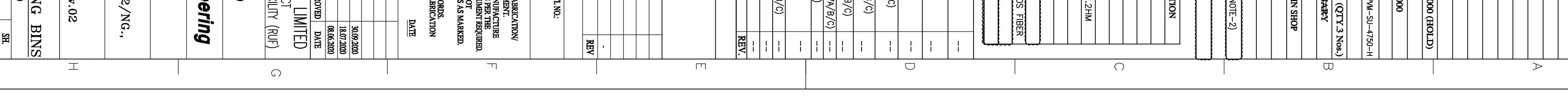
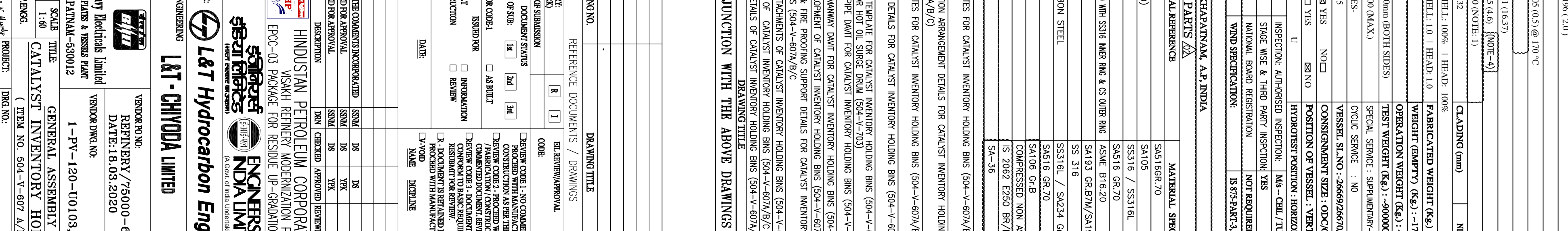
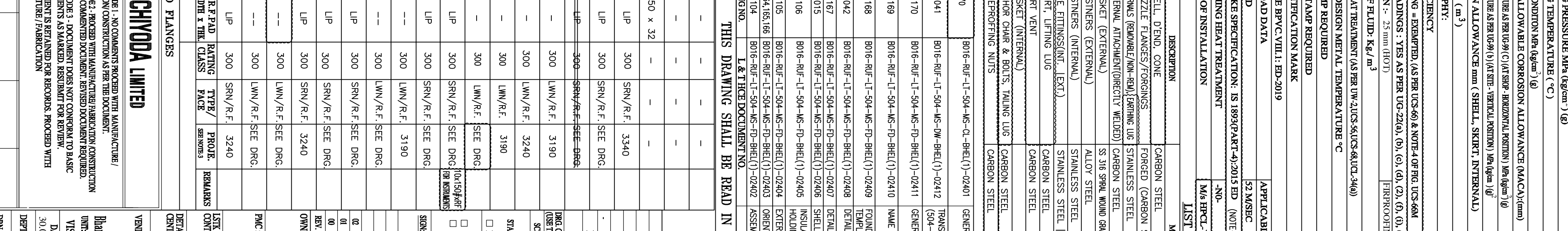
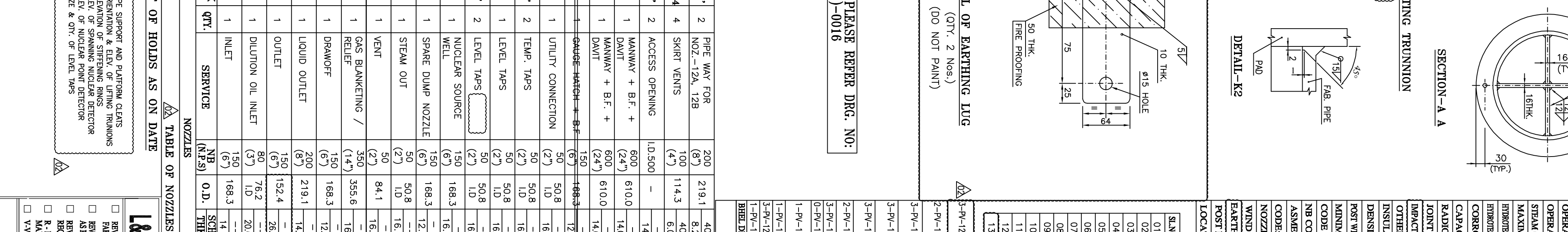
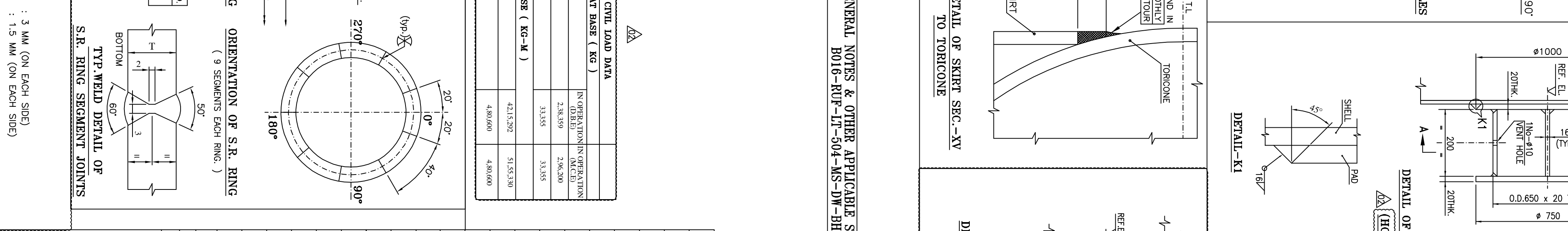
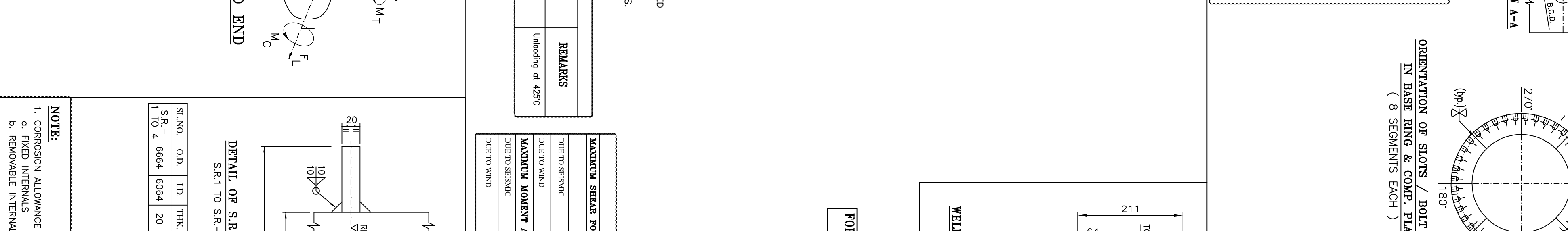
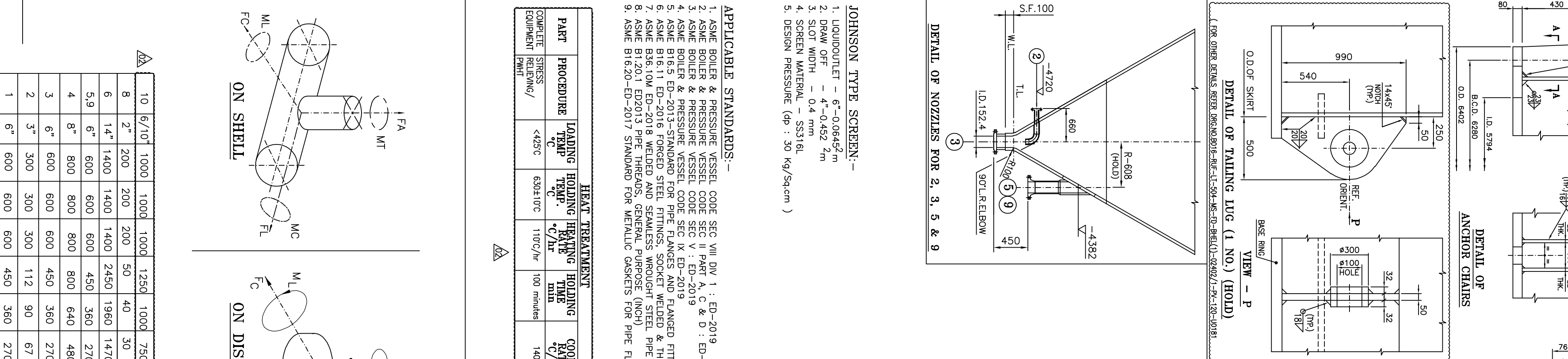
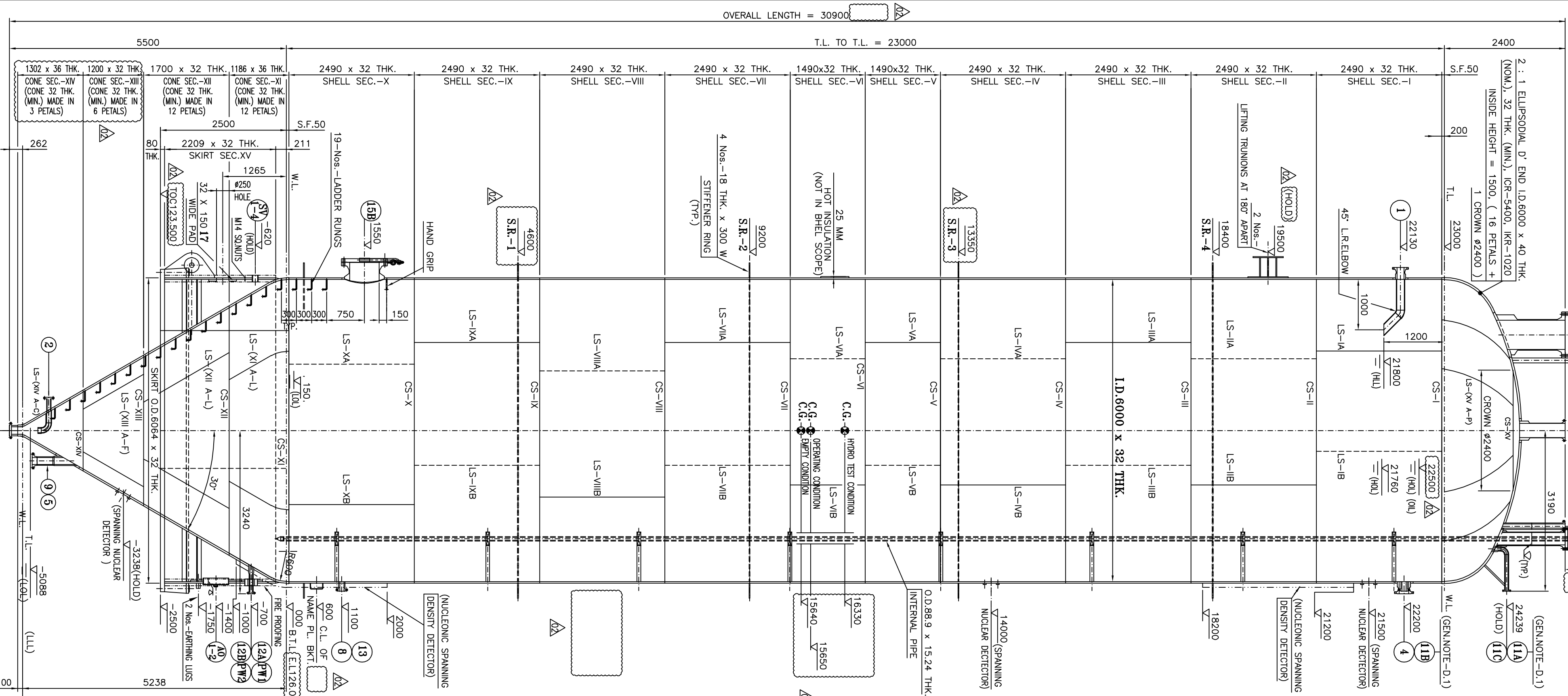
COMMENTED BY	REVIEWED BY	APPROVED BY	DATE

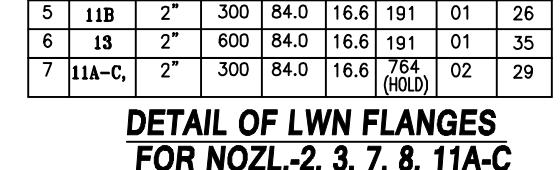
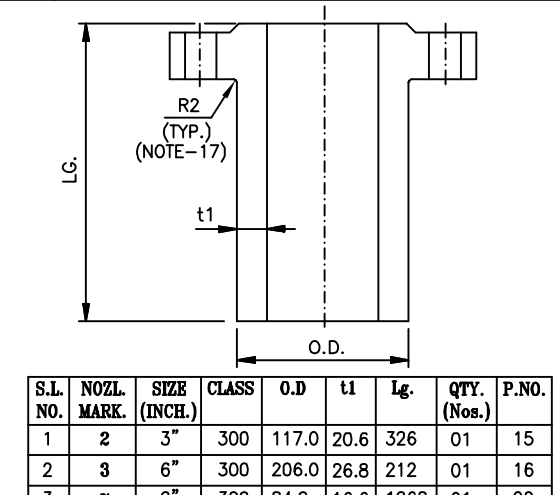
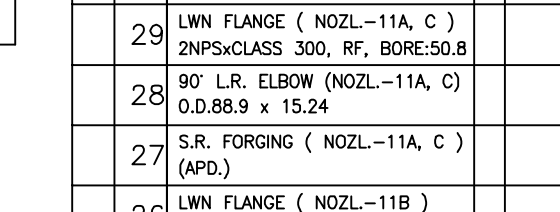
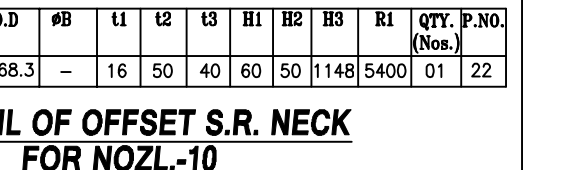
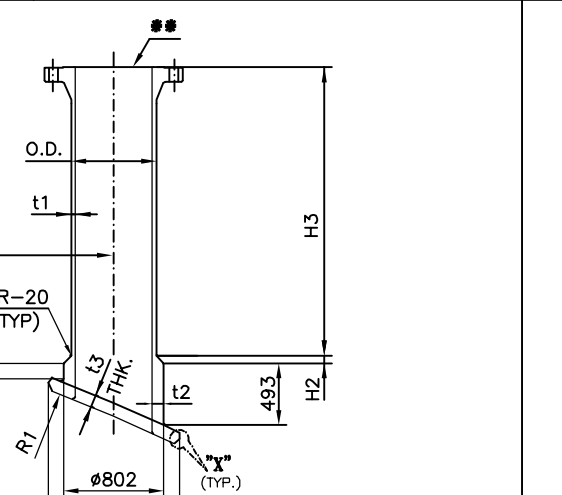
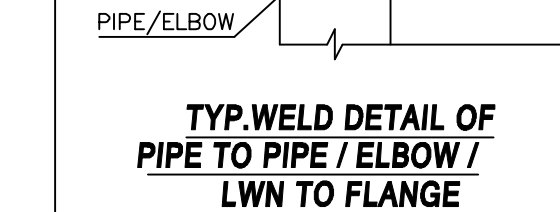
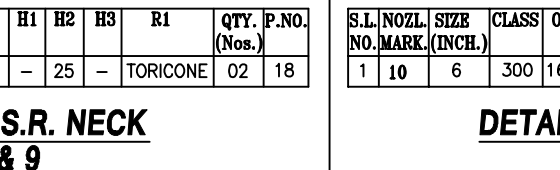
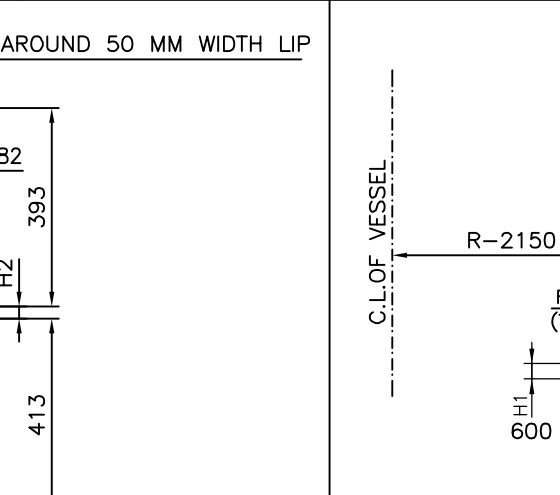
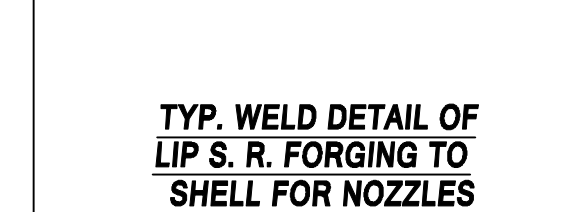
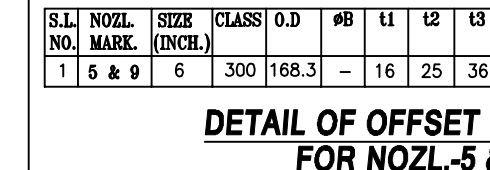
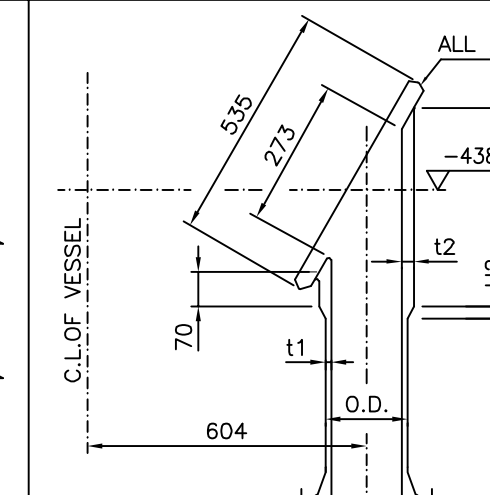
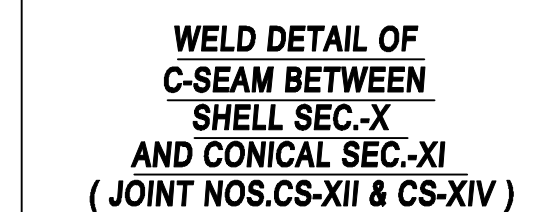
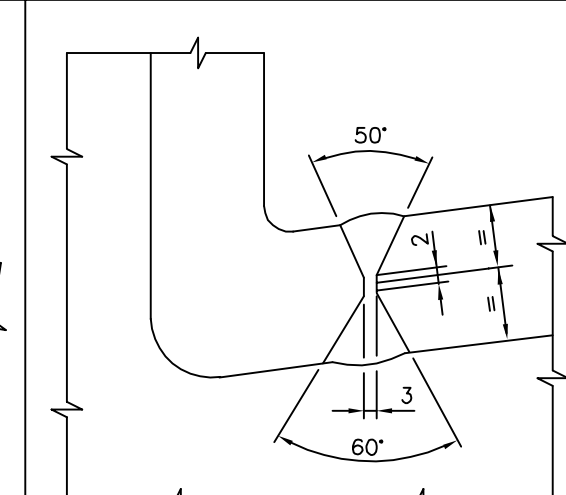
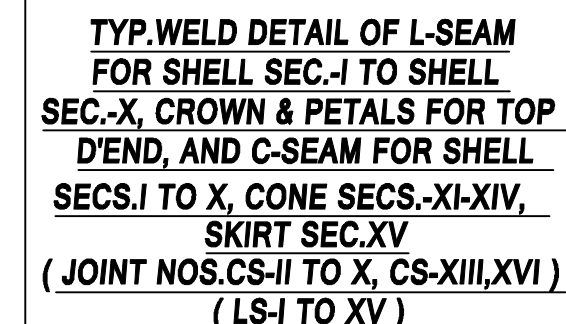
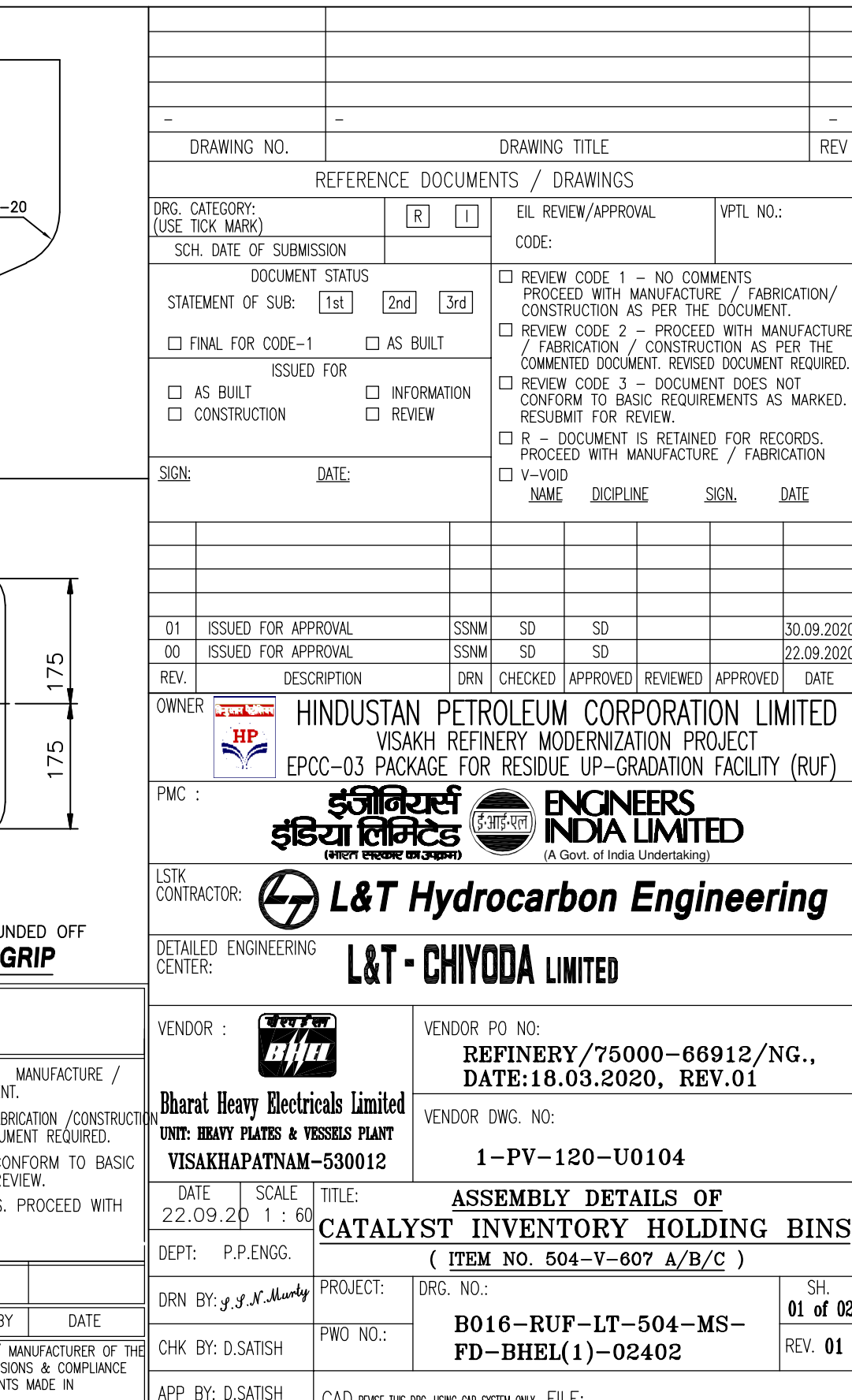
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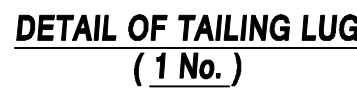
1-PV-100-U0062	B016-RUF-LT-504-MS FD-BHEL(1)-02352	GEN. ASSEMBLY OF SULFIDING CHEMICAL DRUM (504-V-315)	**
1-PV-100-U0061	B016-RUF-LT-504-MS GA-BHEL(1)-02351	GEN. ASSEMBLY OF SULFIDING CHEMICAL DRUM (504-V-315)	**
DRAWING NO.	CLIENT DRAWING NO.	DRAWING TITLE	REV
REFERENCE DOCUMENTS / DRAWINGS ** SHALL BE UPDATED IN AS BUILT DRG.			
DRG. CATEGORY: (USE TICK MARK)		☒ R ☐ I	EIL REVIEW/APPROVAL CODE:
SCH. DATE OF SUBMISSION		VPTL NO.:	
DOCUMENT STATUS STATEMENT OF SUB: ☒ 1st ☐ 2nd ☐ 3rd		☐ REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION/ CONSTRUCTION AS PER THE DOCUMENT.	
☐ FINAL FOR CODE-1 ☐ AS BUILT		☐ REVIEW CODE 2 - PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.	
☐ AS BUILT ☐ INFORMATION		☐ REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW.	
☐ CONSTRUCTION ☐ REVIEW		☐ R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION	
SIGN: _____		DATE: _____	
		☐ V-VOID NAME _____ DICIPLINE _____ SIGN. _____ DATE _____	
00	ISSUED FOR APPROVAL	KKR	DS
00	ISSUED FOR APPROVAL	KKR	DS
REV.	DESCRIPTION	DRN	CHECKED
OWNER	HINDUSTAN PETROLEUM CORPORATION LIMITED VISAKH REFINERY MODERNIZATION PROJECT EPCC-03 PACKAGE FOR RESIDUE UP-GRADATION FACILITY (RUF)		
PMC :	ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)		
LSTK CONTRACTOR:	L&T Hydrocarbon Engineering		
DETAILED ENGINEERING CENTER:	L&T - CHIYODA LIMITED		
VENDOR :		BHEL PO NO: REFINERY/75000-66912/NG; DATE: 18.03.2020	
Bharat Heavy Electricals Limited UNIT: HEAVY PLATES & VESSELS PLANT VISAKHAPATNAM-530012		BHEL DWG. NO: 3-PV-100-U0224, REV. 0	
DATE 30.06.20	SCALE N.T.S	TITLE: ASSEMBLY DETAILS FOR HYDRO TEST OF SULFIDING CHEMICAL DRUM (504-V-315)	
DEPT: HT ENGG.			
DRN BY:KKR		PROJECT:	CUSTOMER REF. DRG. NO. : SH. 5 OF 5
CHK BY: SKR		PWO NO.:	B016-RUF-LT-504-MS- FD-BHEL(1)-02352 REV. 01
APP BY: PKS		CAD REVISE THIS DRG. USING CAD SYSTEM ONLY FILE:	

1060-1 (HEH)-70-SK-045-LT-RUP-9-108 (N/A) (M)

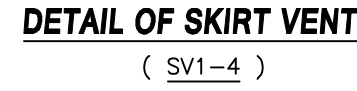
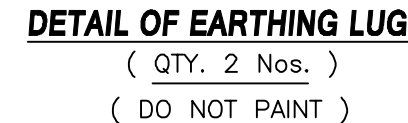
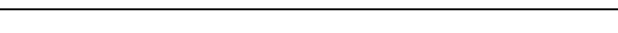
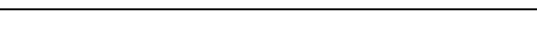
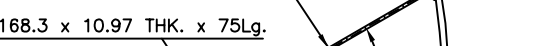
60101-021-A-1
No. 3RD THIRD



[illegible]



DETAIL OF INTERNAL PIPE ARRANGEMENT FOR NOZZLE-1



1-PV-120-U0103	8016-PIF-U-504-MS-TO-BHEL()-00402	GENERAL ASSEMBLY OF CATALYST INVENTORY HOLDING BINS (504-V-607A/B/C)	
BHEL DRG. NO	DRAWING NO.	DRAWING TITLE	

[illegible]

PMC: **इंजीनियर्स इंडिया लिमिटेड**  **ENGINEERS INDIA LIMITED**
(A Govt. of India Undertaking)

MANUFACTURE / MENT.	VENDOR:		VENDOR PO NO: REFINERY/75000-66912/NG ; DATED : 18-03-2020. REV.00
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		30/09/20	1:00	CATALYST INVENTORY HOLDING BI	
		DEPT: PP.ENG.	(ITEM NO. 607 A/B/C)		
		DRNRY: SSN Murty	PROJECT:	DRG.NO:	SI

	11		12
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- ☐ REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION/CONSTRUCTION AS PER THE DOCUMENT.
- ☐ REVIEW CODE 2 - PROCEED WITH MANUFACTURE/FABRICATION /CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.
- ☐ REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW.
- ☐ R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE /FABRICATION
- ☐ v.vom

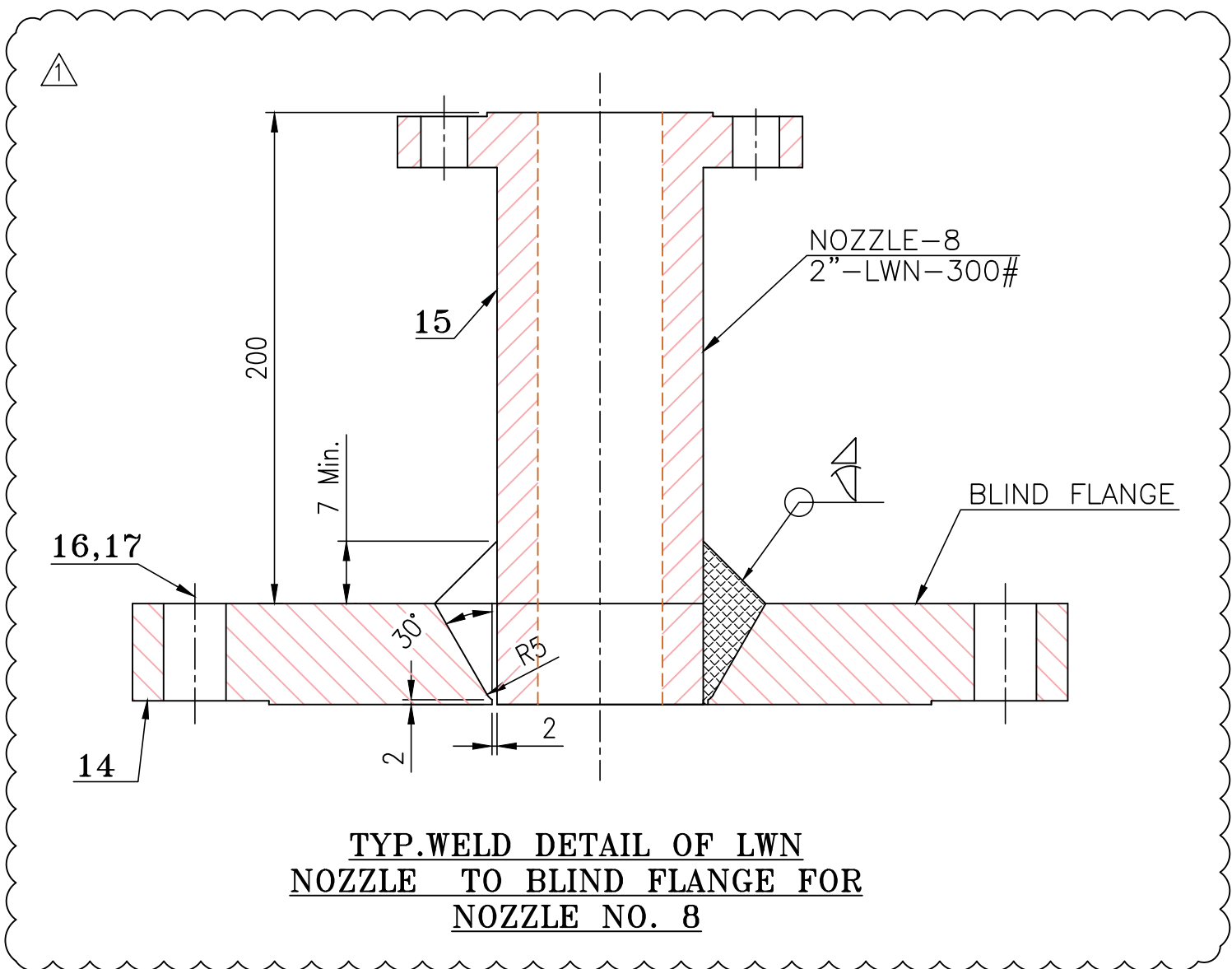
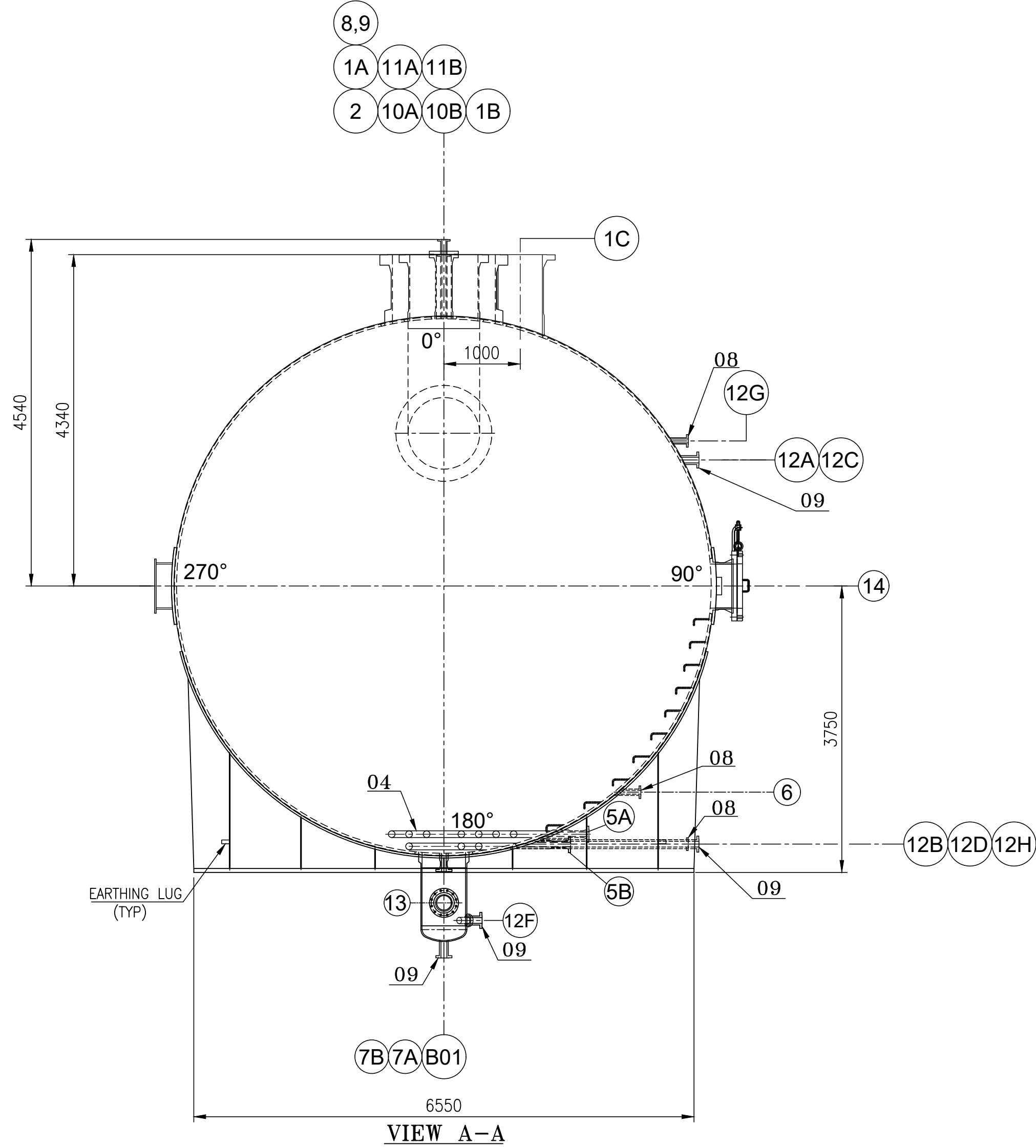
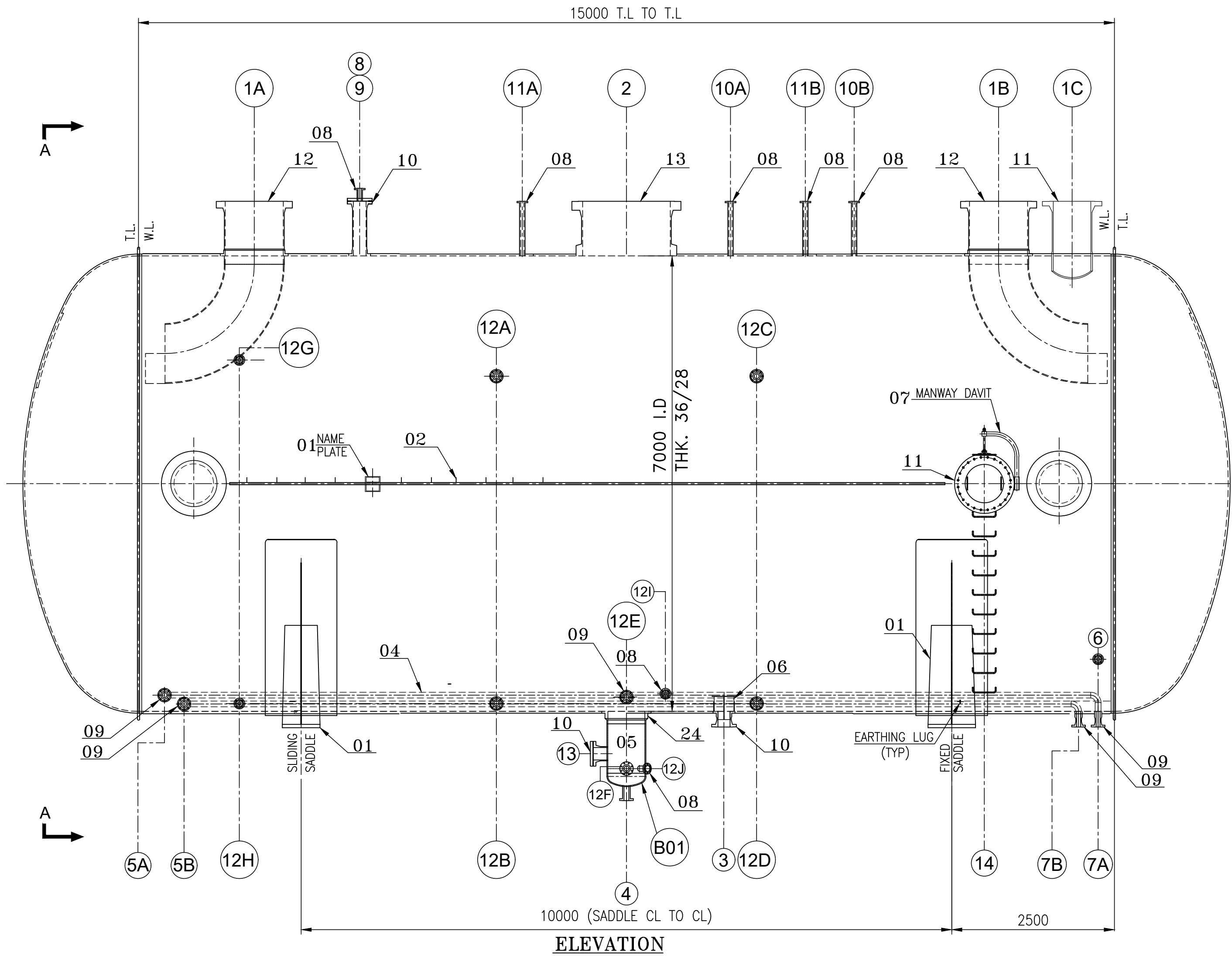
COMMENTED BY	REVIEWED BY	APPROVED BY	DATE
THIS REVIEW / APPROVAL DOES NOT RELIEVE THE VENDOR / MANUFACTURER OF THE FULL RESPONSIBILITY AS TO DESIGN CORRECTNESS OF DIMENSIONS & COMPLIANCE WITH ALL APPLICABLE REGULATIONS AND WITH THE REQUIREMENTS MADE IN PURCHASER SPECIFICATIONS.			

VISAKHAPATNAM-530012 1-PV-120-U0181, REV.00

DRN BY: S.S.N.Murthy	PROJECT:	DRG. NO.:	S. 02
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CHK BY: D.SATISH	FD-BHEL(1)-02402	REV.
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APP BY: DSAISH	CAD REUSE THIS Dwg. USING CAD SYSTEM ONLY	FILE:
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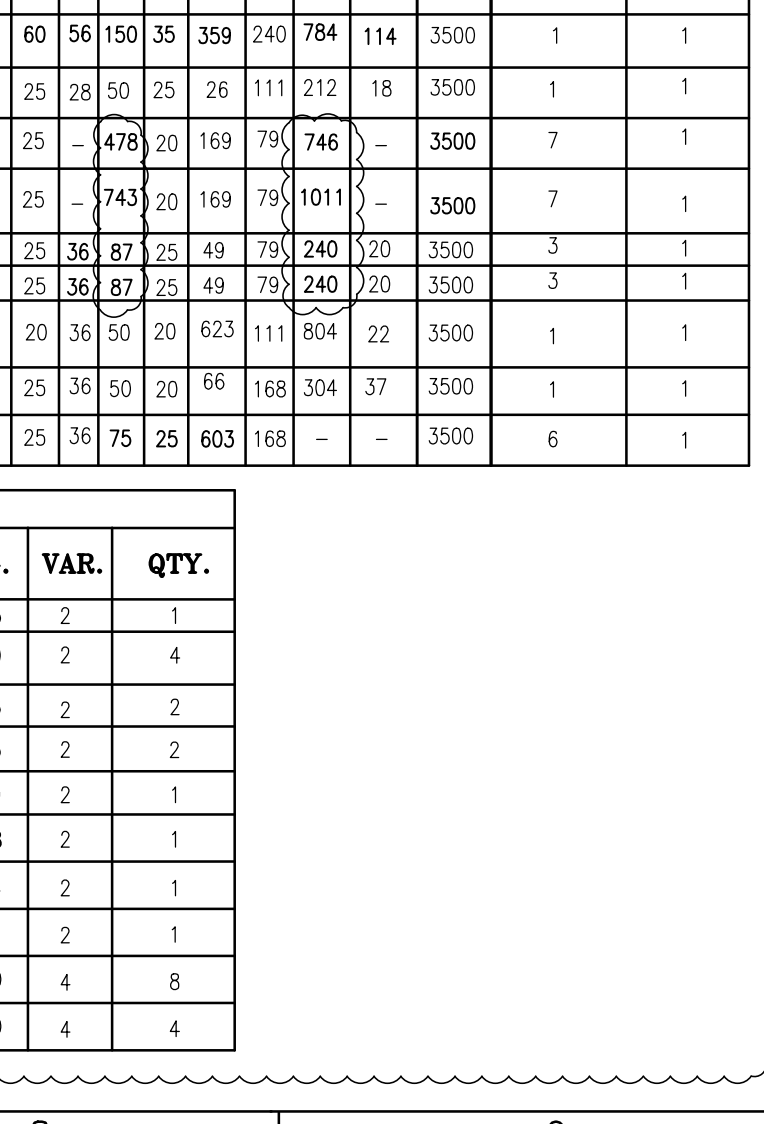
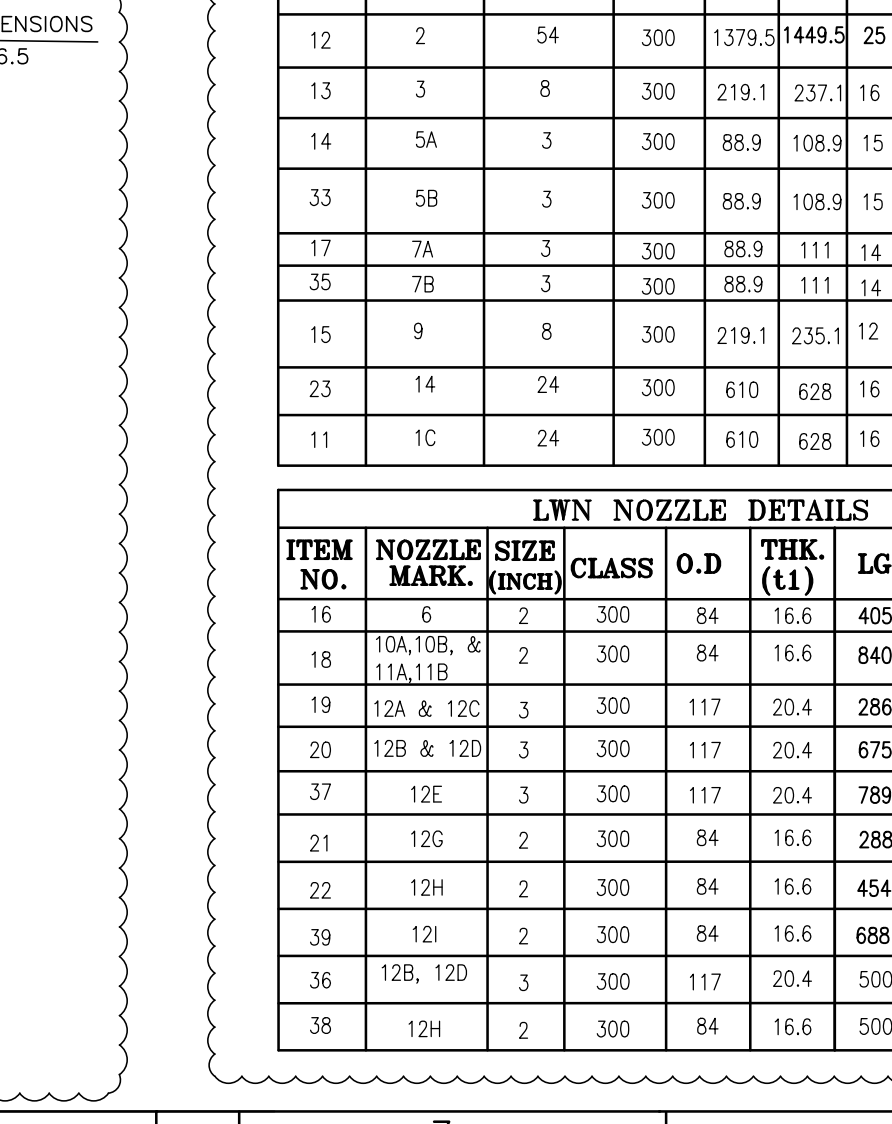
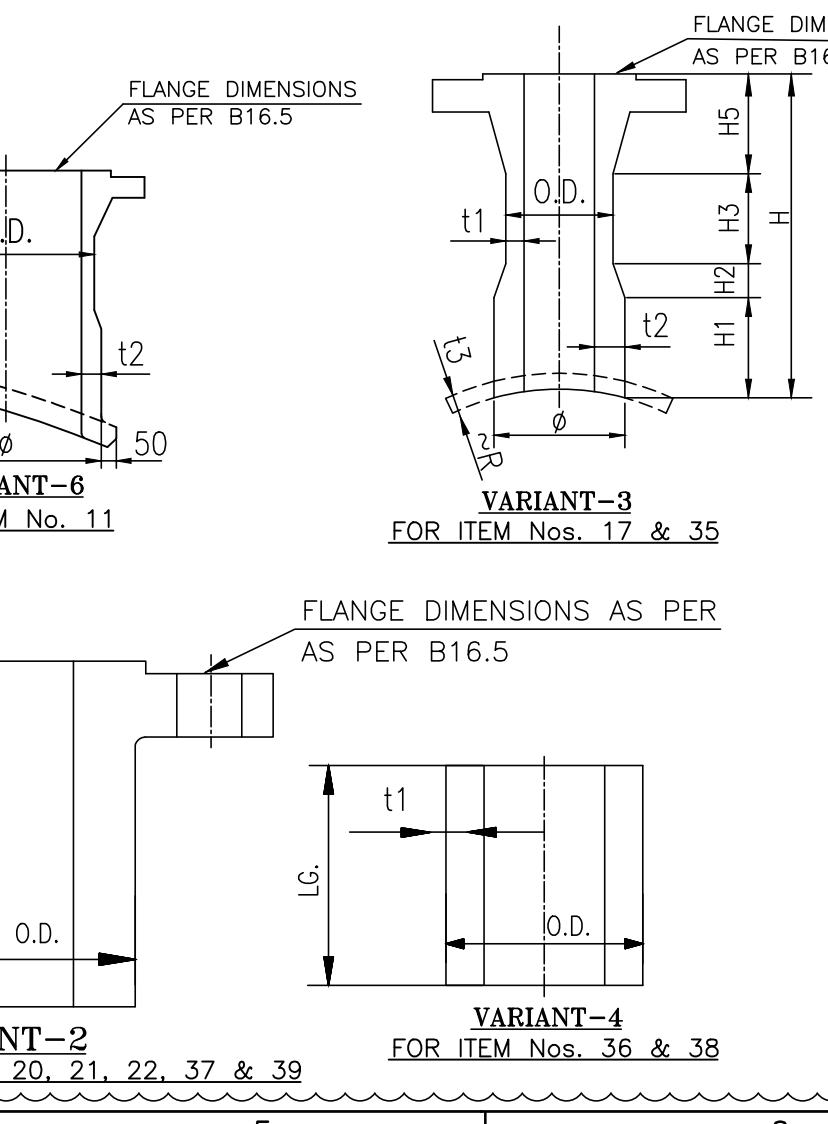
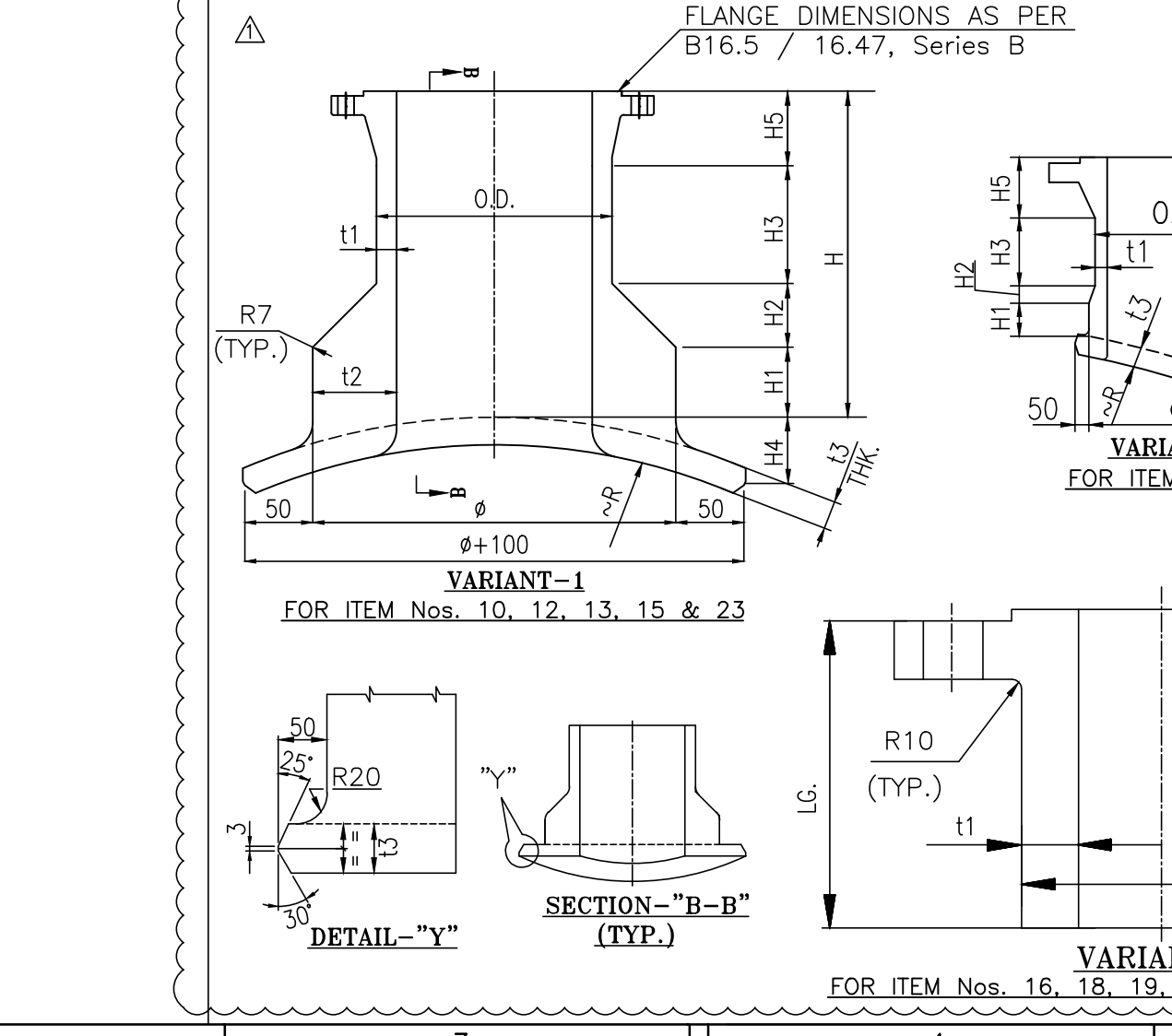
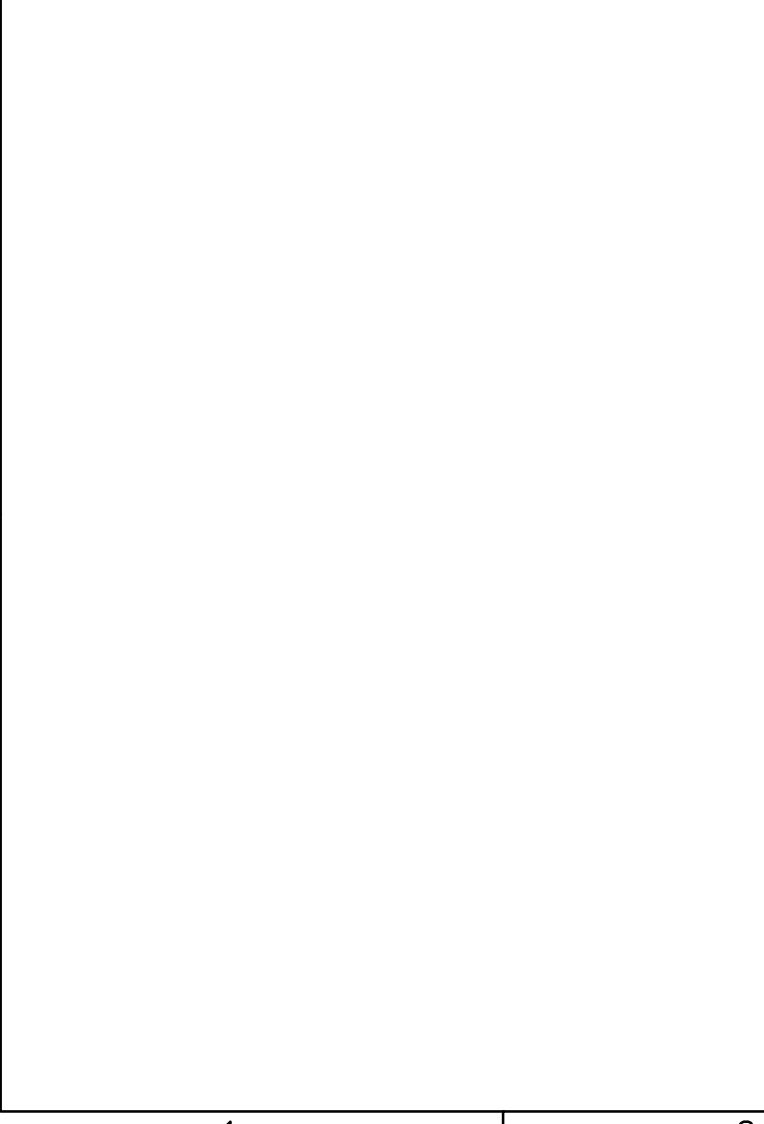
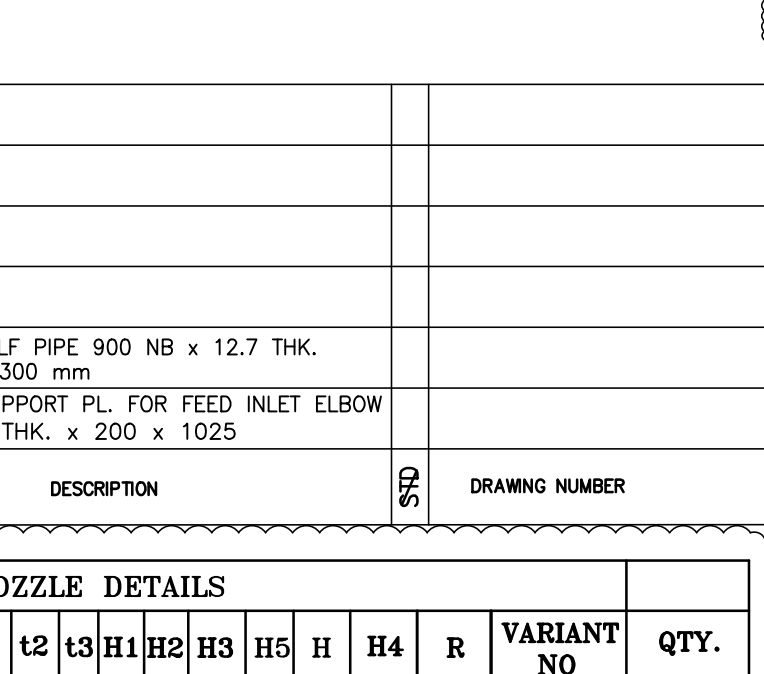
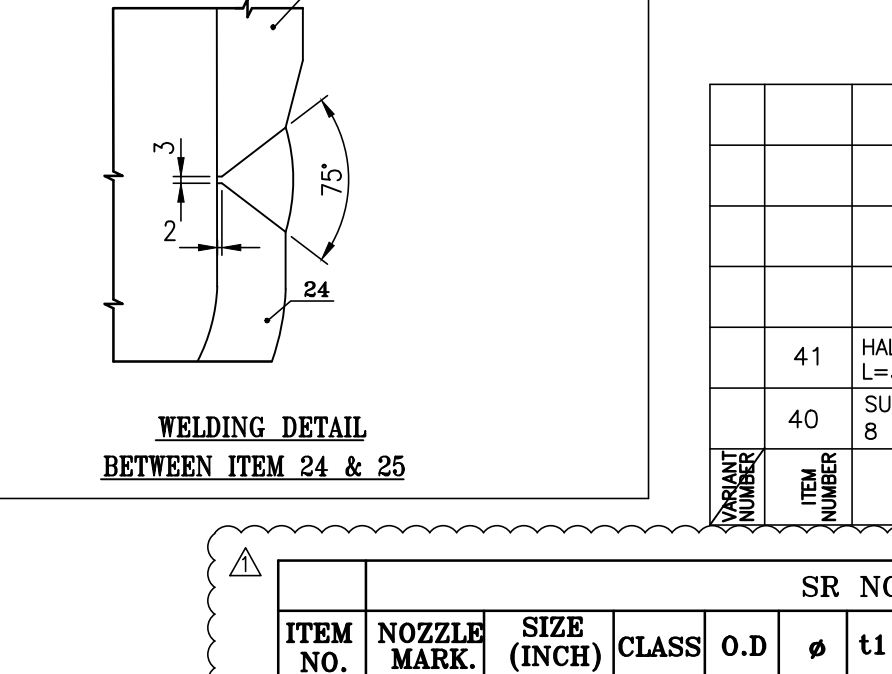
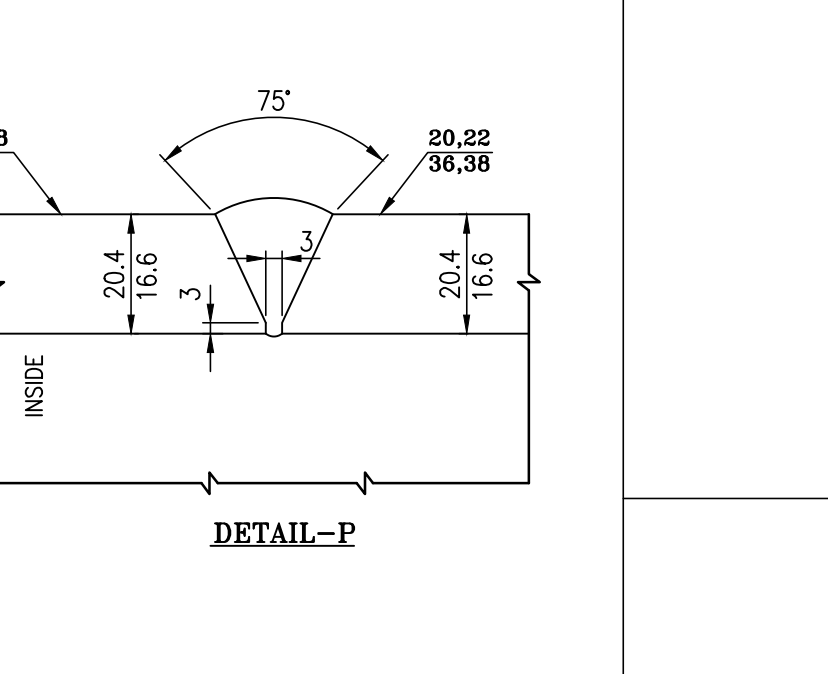
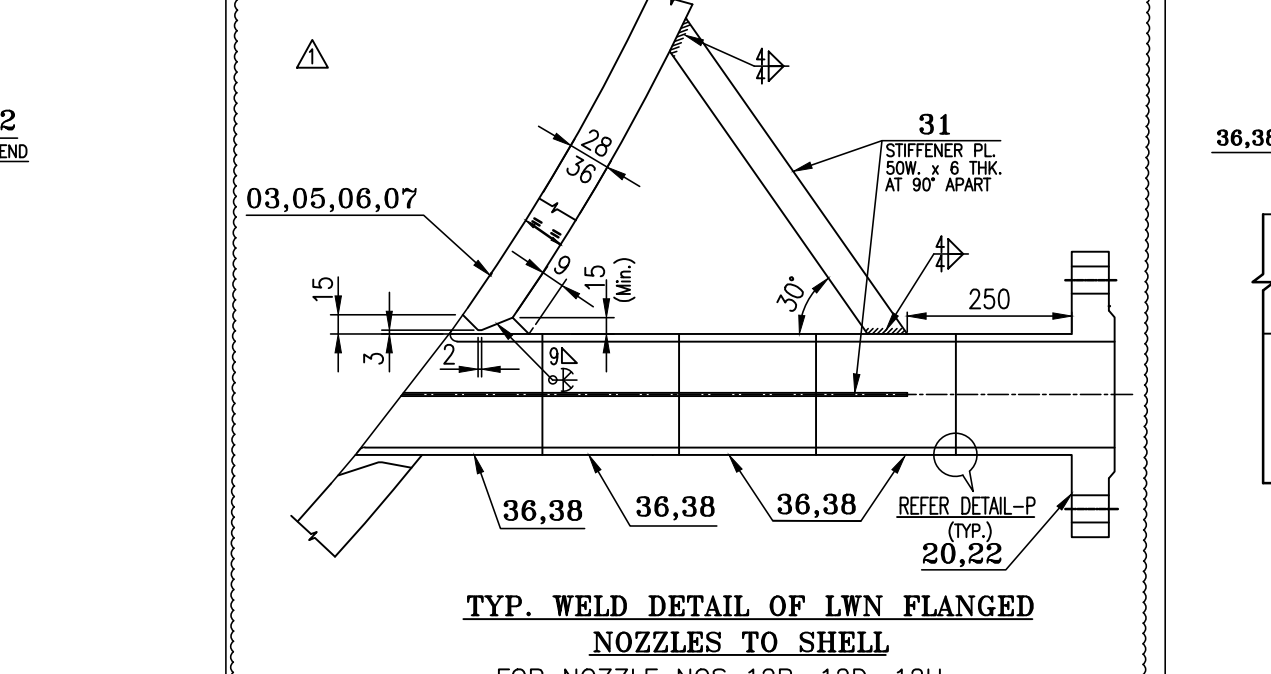
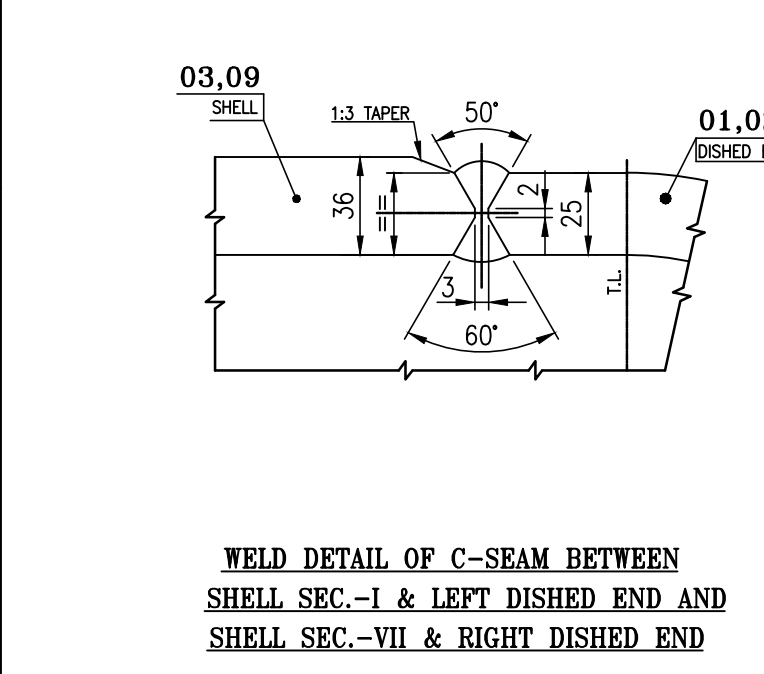
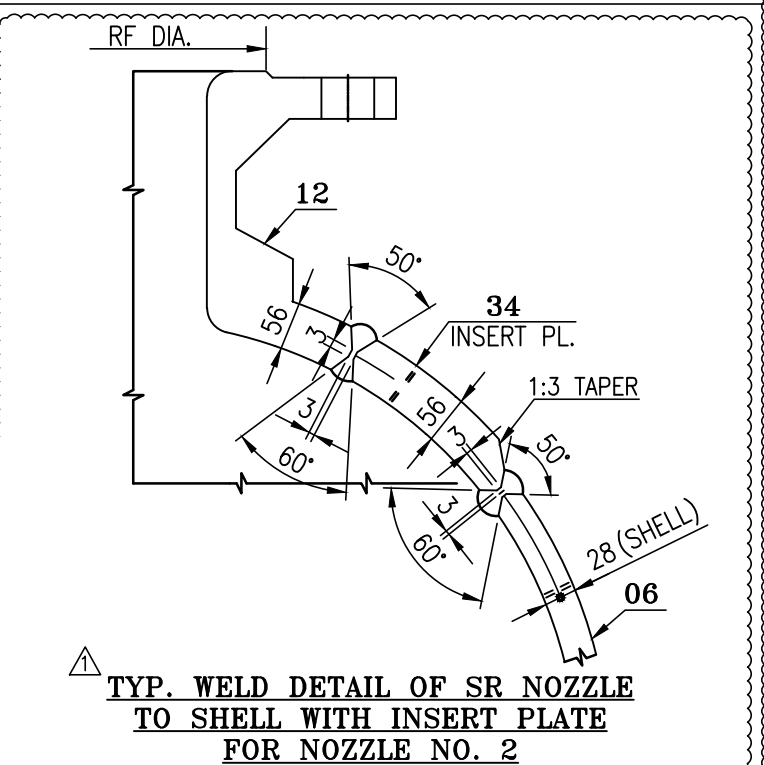
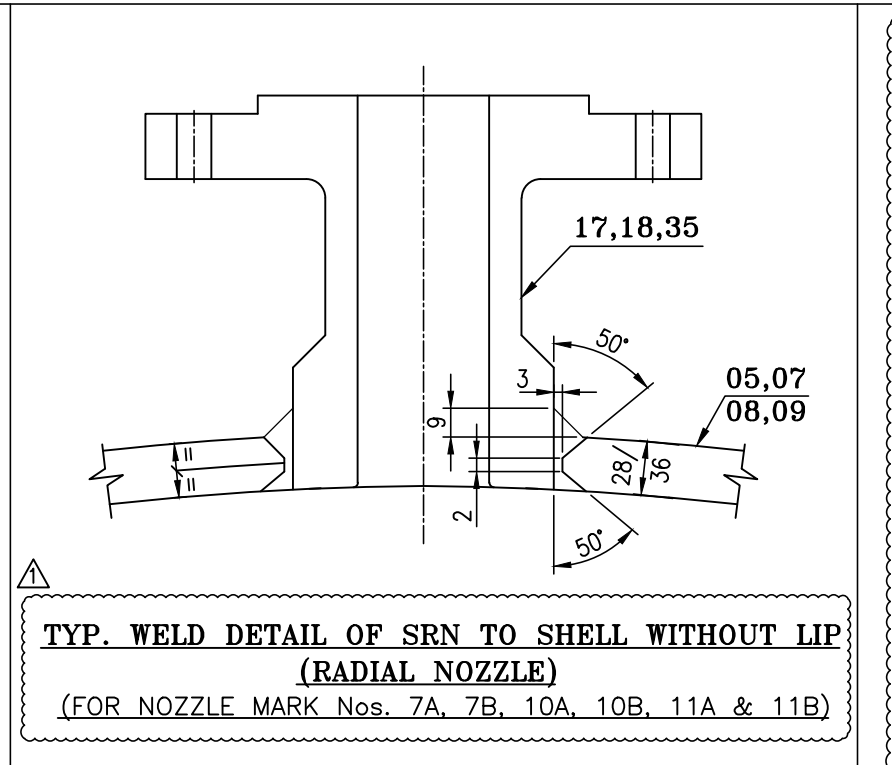
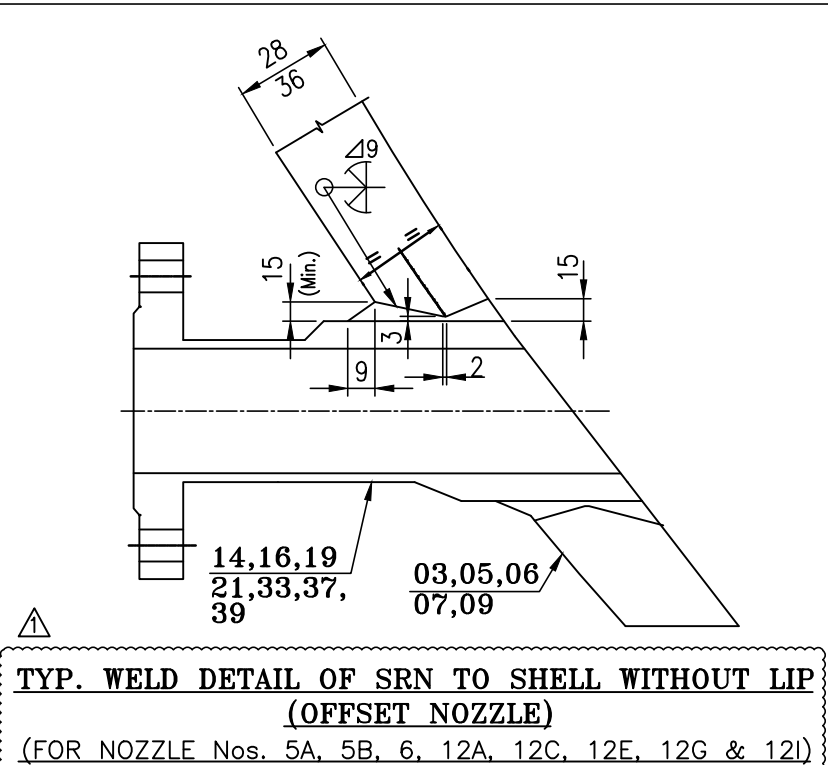
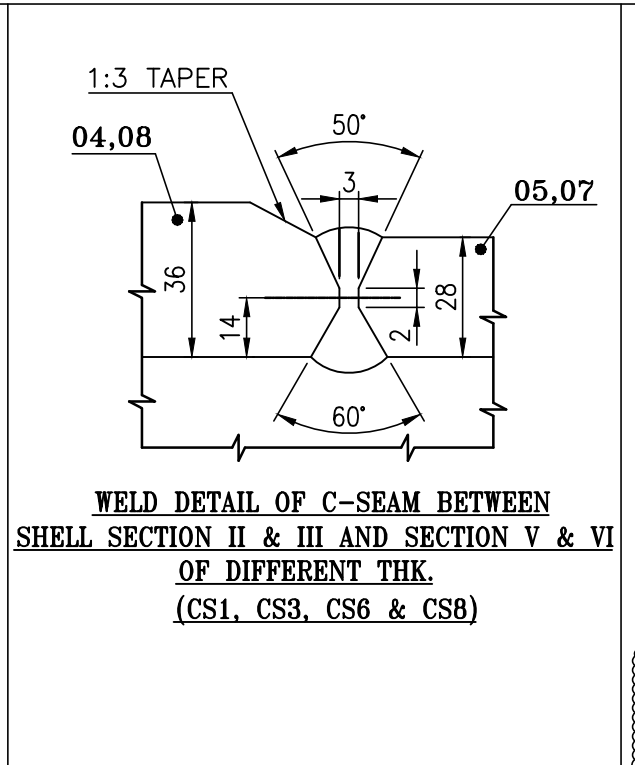
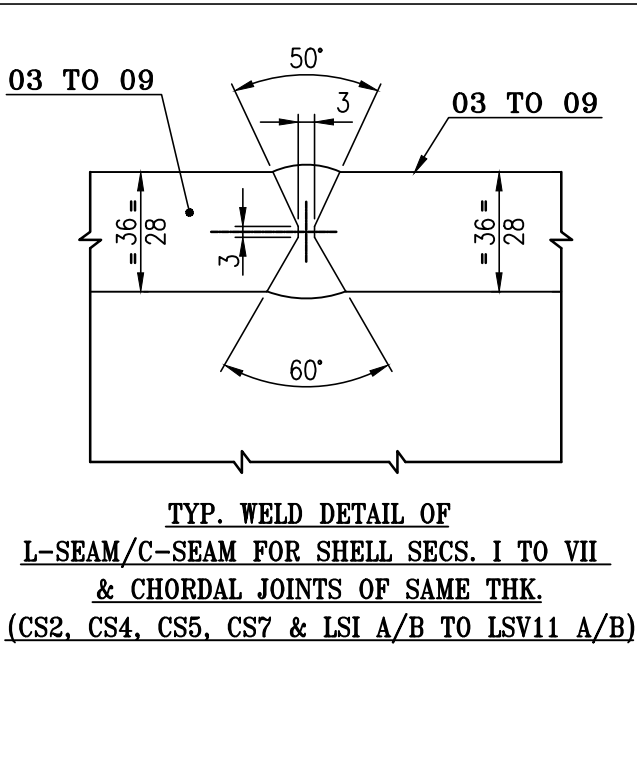
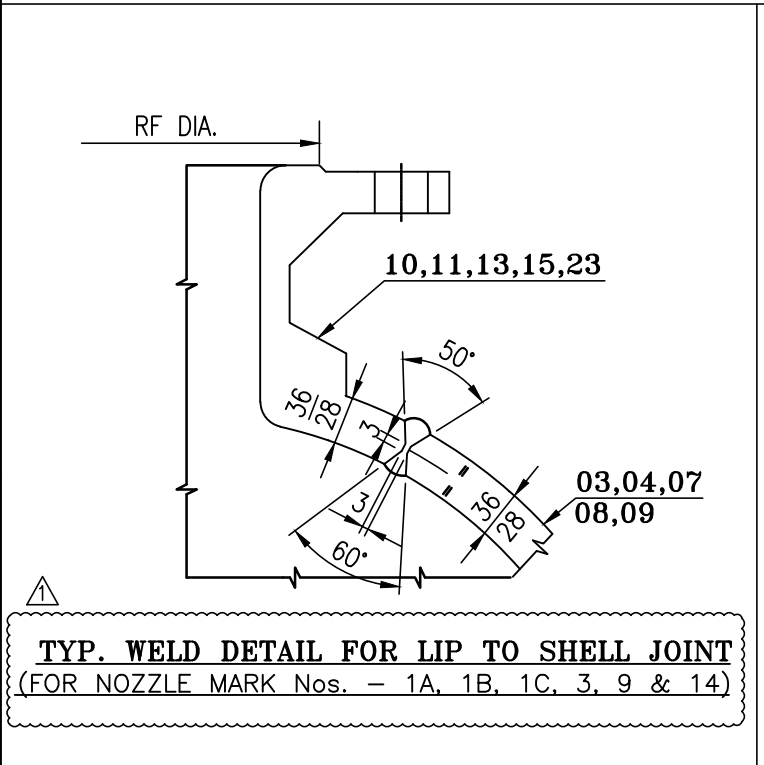
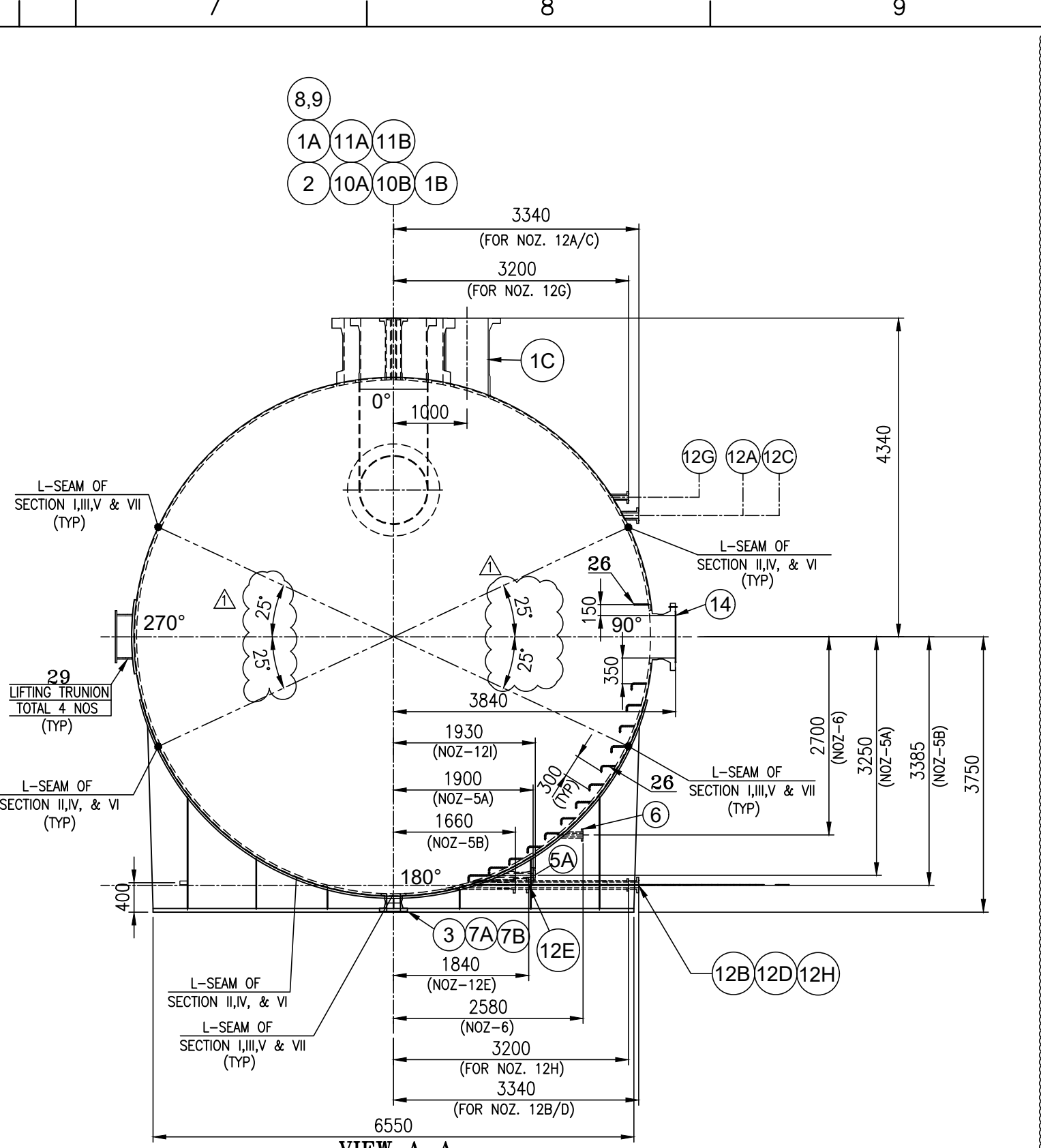
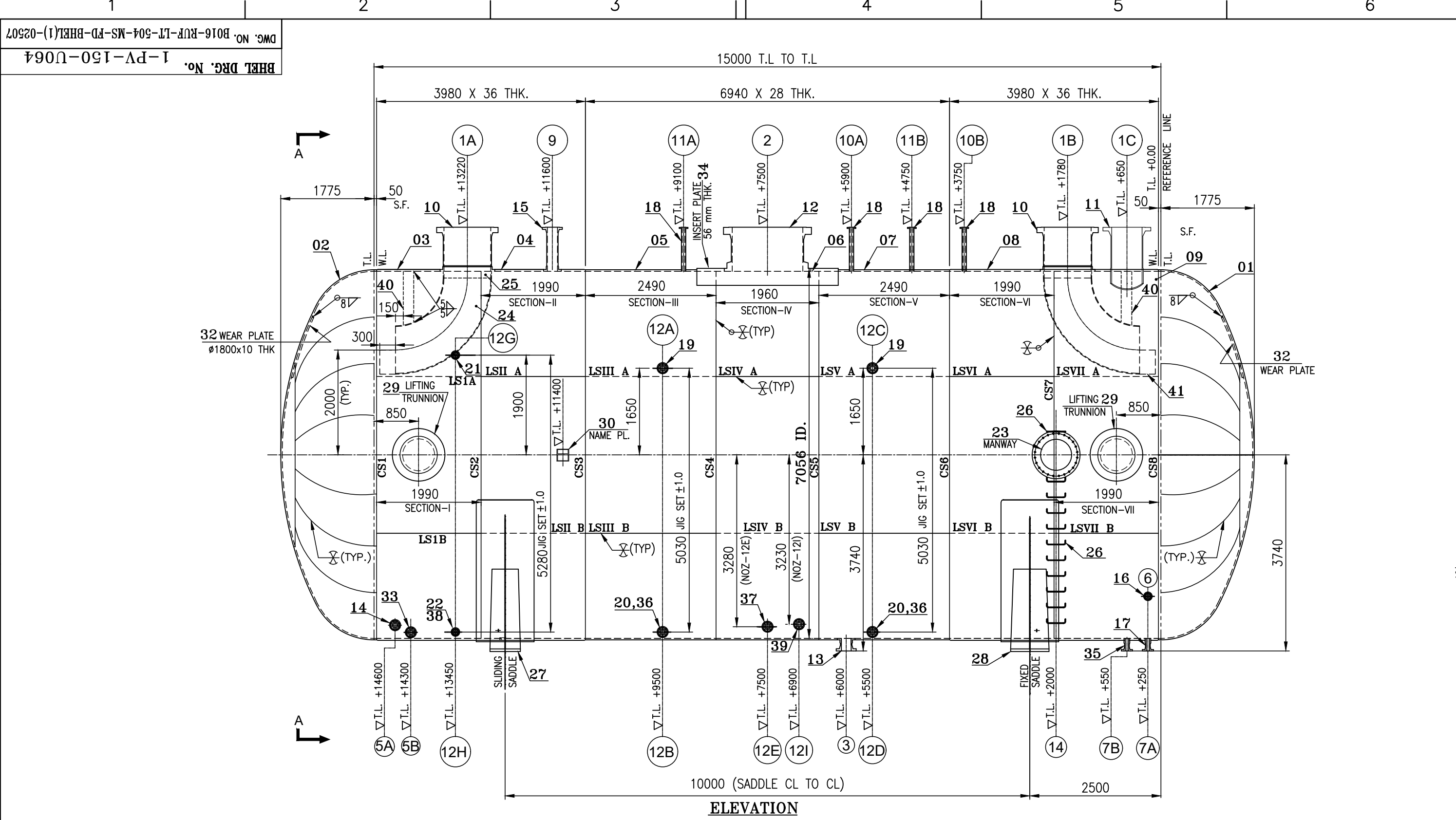
ITEM NO.	DESCRIPTION	REV	DRAWING NUMBER	ITEM NO.	MATERIAL CODE	REV	UNIT WEIGHT	QUANTITY
17	SPIRAL WOUND GASKET 200NB x 300#				GRAFIL FILLED WITH SS316 INNER RING AND CS OUTER RING		0.20	1
16	FULLY THREADED STUD WITH 2 NUTS 7/8" - 9 UNC x 140 LG				SA193 GR. B7M SA194 GR. 2HM	SET	0.63	12
15	LWN NOZZLE - 8 30NB x 300# L= AS PER PROJECTION	PPPV-2438-PV-150-001	14		SA105 NACE+HIC		8.000	1
14	BLIND FLANGE FOR NOZZLE-9, 8" 300#				SA105 NACE+HIC		37.000	1
13	BLANK FLANGES FOR NOZZLE-2 NPS 54", 300#	3-PV-150-U0260	06		SA 193Gr.B7M/SA194Gr.2H	SET	3069.641	1
12	BLANK FLANGES FOR NOZZLE-1A,1B NPS 36", 300#	3-PV-150-U0260	05		SA 193Gr.B7M/SA194Gr.2H	SET	1047.580	2
11	BLANK FLANGES FOR NOZZLE-1C,13 NPS 24", 300#	3-PV-150-U0260	04		SA 193Gr.B7M/SA194Gr.2H	SET	442.450	2
10	BLANK FLANGES FOR NOZZLE-3,9,13 NPS 8", 300#	3-PV-150-U0260	03		SA 193Gr.B7M/SA194Gr.2H	SET	44.760	3
09	BLANK FLANGES FOR NOZZLES 4,5A,B,7A,B,12A,B,C,D,E,F-3" 300#	3-PV-150-U0260	02		SA 193Gr.B7M/SA194Gr.2H	SET	10.400	11
08	BLANK FLANGES FOR NOZZLES 6,8,10A,B,11A,B,12G,H,J-2" 300#	3-PV-150-U0260	01		SA 193Gr.B7M/SA194Gr.2H	SET	5.572	10
07	DETAILS OF MAN-WAY DAVIT FOR HT FLARE KO DRUM (504-V-802)	3-PV-150-U0175					495.631	1
06	STRAINER & VORTEX BREAKER OF ASSEMBLY DETAILS OF OIL OUTLET NOZZLE OF LP FLARE KO DRUM (504-V-802)	3-PV-150-U0256					38.592	1
05	ASSEMBLY DETAILS OF BOOT SHELL FOR LP FLARE KO DRUM (504-V-802)	2-PV-150-U0059					484.000	1
04	STEAM COIL AND SUPPORTS FOR LP FLARE KO DRUM (504-V-802)	1-PV-150-U0166					1164.000	1
03	EXTERNAL ATTACHMENTS OF LP FLARE KO DRUM (504-V-802)	1-PV-150-U0113					--	1
02	INSULATION SUPPORT DETAILS OF LP FLARE KO DRUM (504-V-802)	1-PV-150-U0114					70.680	1
01	SHELL ASSEMBLY DETAILS OF LP FLARE KO DRUM (504-V-802)	1-PV-150-U0164					127024.000	1

REV	BHEL DRAWING NO.	CLIENT DRAWING NO.	DRAWING TITLE	REV
3-PV-150-U0178	B016-RUF-LT-504-MS-FD-BHEL(1)-02511	GENERAL NOTES FOR LP FLARE KO DRUM (504-V-802)	**	
1-PV-150-U0111	B016-RUF-LT-504-MS-GA-BHEL(1)-02501	GENERAL ASSEMBLY OF LP FLARE KO DRUM (504-V-802)	**	

REV	DESCRIPTION	DRN	CHECKED	APPROVED	REVIEWED	APPROVED	DATE
01	L&T COMMENTS INCORPORATED	MK	AVR	TK			11.09.20
02	ISSUED FOR APPROVAL	MK	AVR	TK			15.07.20

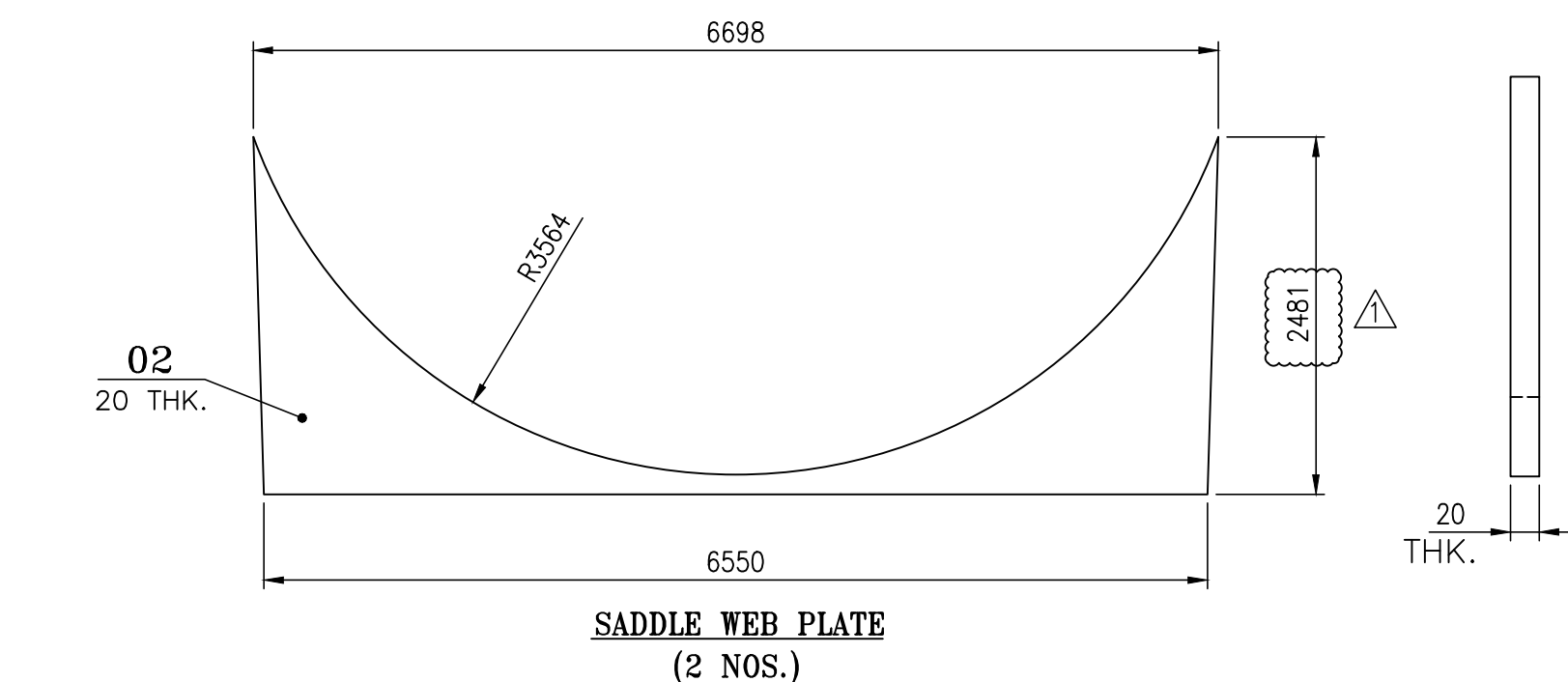
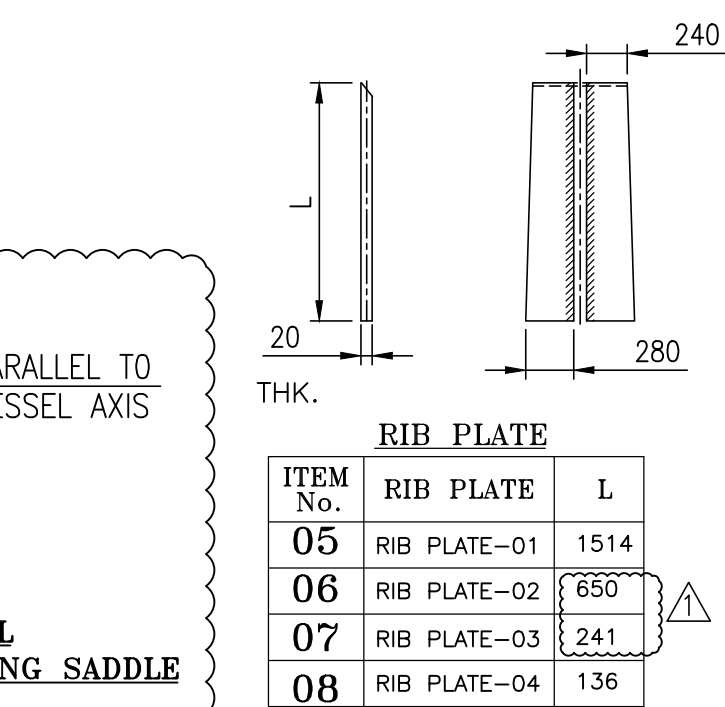
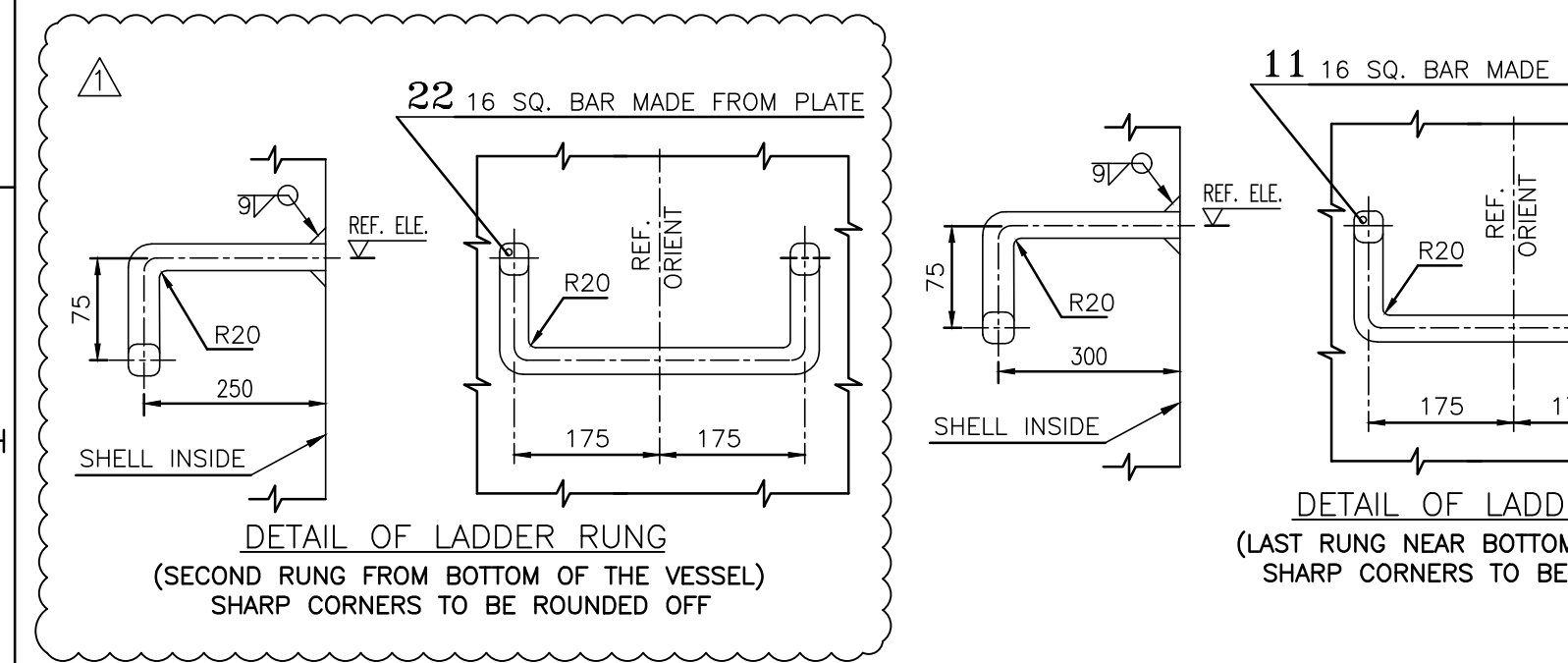
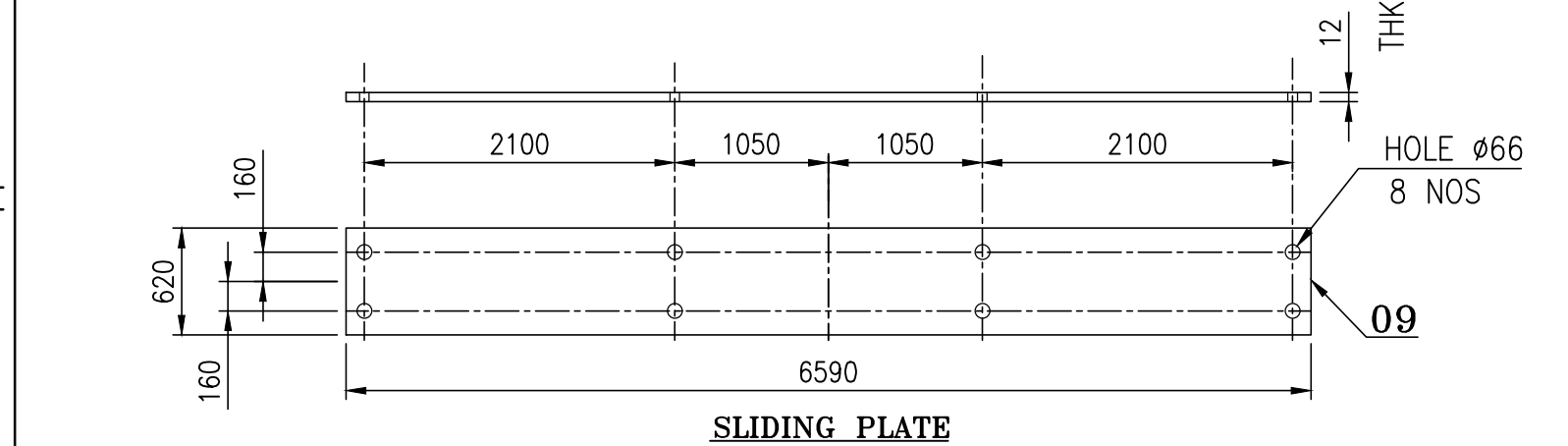
OWNER	HINDUSTAN PETROLEUM CORPORATION LIMITED	Refinery/75000-66912/NG; DATE:18.03.2020
PMC	INDIA INFRASTRUCTURE LIMITED	
LSK CONTRACTOR	L&T Hydrocarbon Engineering	
DETAILED ENGINEERING CENTER	L&T - CHIYODA LIMITED	

VENDOR	Bharat Heavy Electricals Limited	VENDOR PO NO.	Refinery/75000-66912/NG; DATE:18.03.2020
UNIT	HEAVY PLATES & YESSIES PLANT	VENDOR DWG. NO.	1-PV-150-U0112, REV.B
PROJECT	VISAKHAPATNAM-530012	TITLE	ASSEMBLY DETAILS OF LP FLARE KO DRUM ITEM NO. 504-V-802
DRN BY	MUNAYYA K	PROJECT	CUSTOMER REFERENCE DRG. NO. B016-RUF-LT-504-MS-FD-BHEL(1)-02502
CHK BY	A V RAO	PWD NO.	
APP BY	TARAKESH K	CAD REVISION	THIS DRG. USING ON SCREEN ONLY FILE.



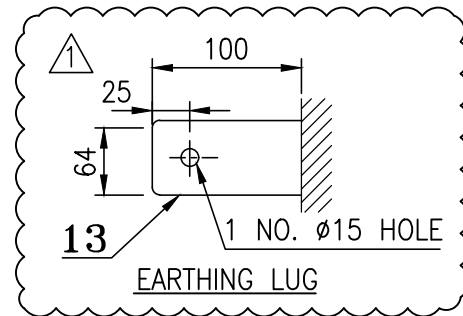
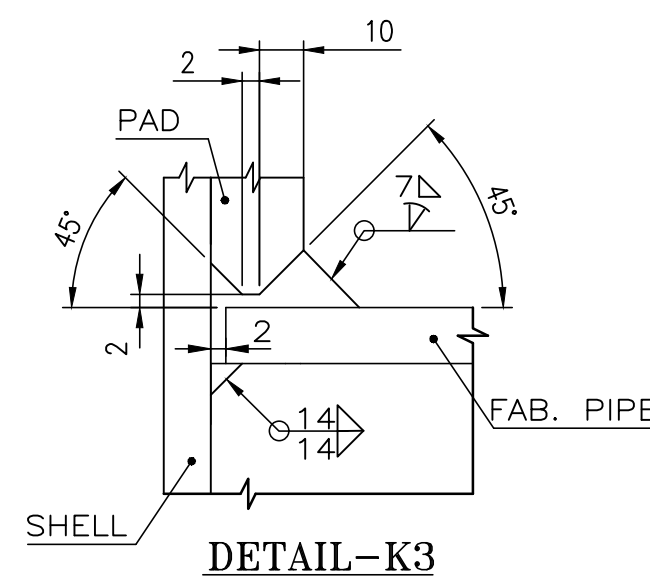
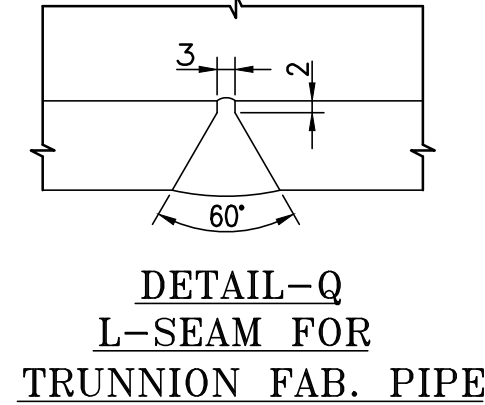
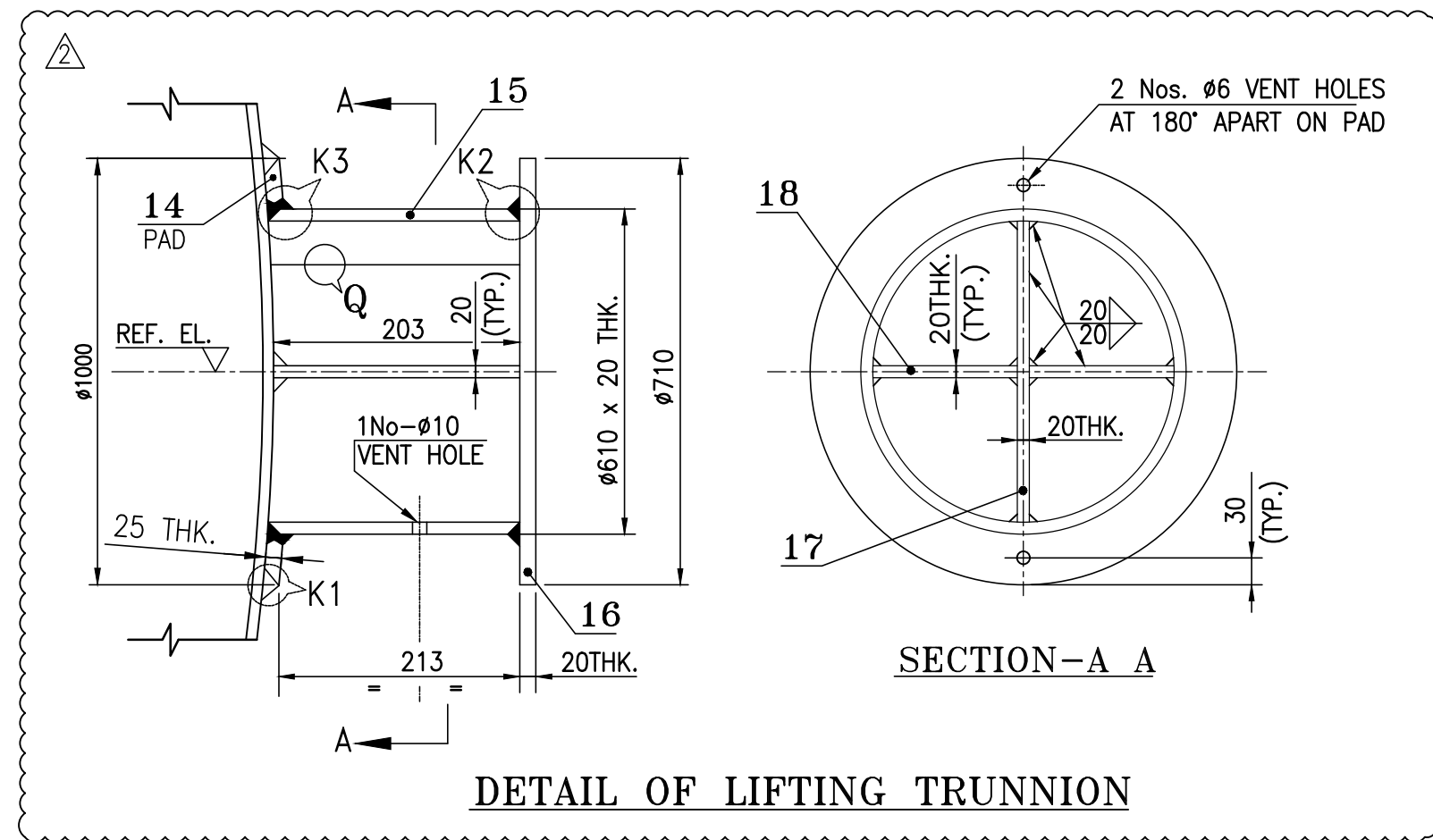
ITEM NO.	DESCRIPTION	UNIT	QTY.	UNIT WEIGHT
39	LW NOZZLE - 12I 50 NB x 300# RF; L=OUT AS PER PROJECTION		1	21.56
38	LWN SPOOL-12H 50 NB x 300# RF; L=OUT AS PER PROJECTION		4	13.80
37	LW NOZZLE - 12E 80 NB x 300# RF; L=OUT AS PER PROJECTION		1	43.45
36	LWN SPOOL - 12B & 12D 80 NB x 300# RF; L=OUT AS PER PROJECTION		2	24.30
35	SRWN NOZZLE - 7B 80 NBx300# RF		1	17.08
34	INSERT PLATE FOR NOZZLE-2 3000 x 5000 x 56 THK CUT HOLE TO SR NOZZLE LIP		1	3113.00
33	SRWN NOZZLE - 5B 80 NB x 300# RF;		1	53.20
32	WEAR PLATES 1800 x 10THK		2	203.58
31	STIFFENER PL. FOR NOZ-12B, 12D & 12H 50 x 6 THK.; 15 METRE		2	35.33
30	NAME PLATE BRACKET	3-PV-150-U0177	1	5.50
29	LIFTING TRUNNION	1-PV-150-U0165	4	417.14
28	FIXED SADDLE SUPPORT ASSEMBLY	1-PV-150-U0165	1	4980.38
27	SLIDING SADDLE SUPPORT ASSEMBLY	1-PV-150-U0165	1	5354.60
26	LADDER RUNGS & HAND GRIP	1-PV-150-U0165	1	25.65
25	PIPE 900 NB x 12.7 THK. 130 LG.		1	36.70
24	90° LR ELBOW 900 NB-12.7 THK.		2	625.00
23	SRWN NOZZLE - 14 600 NB x 300# RF; LIP		1	358.00
22	LW NOZZLE - 12H 50 NB x 300# RF; L=800		1	19.21
21	LW NOZZLE - 12G 50 NB x 300# RF; L=AS PER PROJECTION		1	10.55
20	LW NOZZLE - 12B & 12D 80 NB x 300# RF; L=800		2	43.98
19	LW NOZZLE - 12A & 12C 80 NB x 300# RF; L=AS PER PROJECTION.		2	18.96
18	LWN NOZZLE - 10A-B, 11A-B 50 NB x 300# RF;		4	25.78
17	SRWN NOZZLE - 7A 80 NBx300# RF		2	17.77
16	LW NOZZLE - 6 50 NB x 300# RF;		1	13.77
15	SRWN NOZZLE - 9 200 NB x 300# R.F. LIP		1	96.00
14	SRWN NOZZLE - 5A 80 NB x 300# RF		1	39.58
13	SRWN NOZZLE - 3 200 NB x 300# RF LIP		1	61.00
12	SRWN NOZZLE - 2 1350 NB x 300# RF LIP		1	2014.00
11	SRWN NOZZLE - 1C 600 NB x 300# RF LIP		1	560.37
10	SRWN NOZZLE - 1A&1B 900 NB x 300# RF LIP		2	894.00
09	SHELL SECTION-VII 11052 x 1990 X 36 THK		2	6215.43
08	SHELL SECTION-VI 11052 x 1990 X 36 THK		2	6215.43
07	SHELL SECTION-V 11039.6 x 2490 X 28 THK		2	6042.00
06	SHELL SECTION-IV 11039.6 x 1960 X 28 THK		2	4755.95
05	SHELL SECTION-III 11039.6 x 2490 X 28 THK		2	6042.00
04	SHELL SECTION-II 11052 x 1990 X 36 THK		2	6215.43
03	SHELL SECTION-I 11052 x 1990 X 36 THK		2	6215.43
02	LEFT SIDE DISHED END 25 THK (NOM.)	3-PV-010-U0104	1	10618.00
01	RIGHT SIDE DISHED END 25 THK (NOM.)	3-PV-010-U0104	1	10618.00

GENERAL NOTES FOR LP FLARE KO DRUM			
BHEL(1)-02511			
GENERAL ASSEMBLY OF LP FLARE KO DRUM			
ITEM No. 504-V-802			
BHEL DRAWING No. CLIENT DRAWING No. DRAWING TITLE			
REFERENCE DOCUMENTS / DRAWINGS (** LATEST REVISION No. TO BE UPDATED IN ASBUILT DRAWING)			
Dwg. CATEGORY: (USE TICK MARK)			
SCH. DATE OF SUBMISSION			
DOCUMENT STATUS			
STATEMENT OF SUB: [1st] [2nd] [3rd]			
[] FINAL FOR CODE-1 [] AS BUILT			
[] AS BUILT [] INFORMATION [] REVIEW			
[] CONSTRUCTION [] REVIEW			
SIGN: DATE:			
01 L&T COMMENTS INCORPORATED MK AVR TK 11.08.20			
02 ISSUED FOR APPROVAL MK AVR TK 15.07.20			
REV. DESCRIPTION DRN CHECKED APPROVED REVIEWED APPROVED DATE			
OWNER HINDUSTAN PETROLEUM CORPORATION LIMITED			
VISAKH REFINERY MODERNIZATION PROJECT			
EPCC-03 PACKAGE FOR RESIDUE UP-GRADATION FACILITY (RUF)			
PMC : INDIAN OVERSEAS LIMITED			
L&T Hydrocarbon Engineering			
L&T - CHIYODA LIMITED			
VENDOR : Bharat Heavy Electricals Limited			
VENDOR DWG. NO: 1-PV-150-U0164, REV.B			
TITLE: SHELL ASSEMBLY DETAILS OF LP FLARE KO DRUM			
ITEM NO. 504-V-802			
DATE: 15.07.20 SCALE: 1:70			
DEPT: HT ENGG.			
DRN BY: MUNAYYA K PROJECT: CUSTOMER REFERENCE DRAWING No.			
CHK BY: A V RAO PWO NO.: B016-RUF-LT-504-MS-FD-BHEL(1)-02502			
APP BY: TARAKESH K CAD FILE: B016-RUF-LT-504-MS-FD-BHEL(1)-02502			



NOTES:-

1. VAR-00 IS FOR FIXED SADDLE SUPPORT ASSEMBLY.
2. VAR-01 IS FOR SLIDING SADDLE SUPPORT ASSEMBLY.
3. VAR-02 IS FOR LIFTING TRUNION ASSEMBLY.



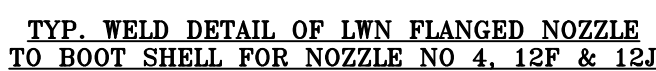
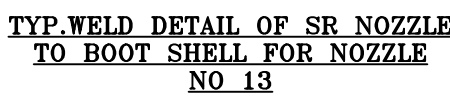
ITEM NUMBER	DESCRIPTION	QTY	DRAWING NUMBER	MATERIAL CODE	MATERIAL SPECIFICATION	UNIT WEIGHT	QUANTITY
02	19	LADDER RUNG 16 SQ. - 1000 Lg.			SA 516 GR.70 (NACE+HIC)	2.01	1
02	18	RIBS - LIFTING TRUNION 20 THK. x 275 x 203			SA 516 GR.70	8.77	8
02	17	RIB - LIFTING TRUNION 20 THK. x 570 x 214			SA 516 GR.70	19.15	8
02	16	COVER - LIFTING TRUNION #710 x 20THK.			SA 516 GR.70	62.20	4
02	15	LIFTING TRUNION PIPE 20 THK. x 214 x 1853.5 LG.			SA 516 GR.70	62.28	4
02	14	PAD - LIFTING TRUNION #1000 x 25 THK.; #614 HOLE			SA 516 GR.70 (NACE+HIC)	96.03	1
00	01	13	EARTHING LUG 6 THK. x 64 x 100		SA 240 TP 304	0.30	2
		12	HAND GRIP 16 SQ. - 750 Lg.		SA 516 GR.70 (NACE+HIC)	1.51	1
		11	LADDER RUNG 16 SQ. - 1100 Lg.		SA 516 GR.70 (NACE+HIC)	2.22	1
		10	LADDER RUNG 16 SQ. - 900 Lg.		SA 516 GR.70 (NACE+HIC)	1.81	11
		09	SADDLE SLIDING PLATE 620 X 6590 X 12 THK.		SA 516 GR.70 (NACE+HIC)	389.61	1
00	01	08	RIB PLATE-4 ; 136 X 20 THK.		SA 240 TYP 304	5.56	4
00	01	07	RIB PLATE-3; 241 X 20 THK.		SA 516 GR.70	9.84	8
00	01	06	RIB PLATE-2; 650 X 20 THK.		SA 516 GR.70	26.533	8
00	01	05	RIB PLATE-1; 1514 X 20 THK.		SA 516 GR.70	61.81	8
02	03	04	BASE PLATE FOR SLIDING SADDLE 580 X 6550 X 50 THK.		SA 516 GR.70	1463.64	1
01	03	03	BASE PLATE FOR FIXED SADDLE 580 X 6550 X 50 THK.		SA 516 GR.70	1479.03	2
00	01	02	SADDLE WEB PLATE 2481 X 6698 X 20 THK.		SA 516 GR.70	784.75	2
00	01	01	WRAPPER PLATE 1100 X 9542 X 28 THK.		SA 516 GR.70 (NACE+HIC)	2307.00	2

[illegible]

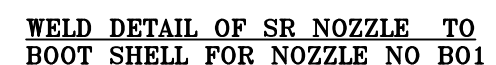


LWN NOZZLE DETAILS								
ITEM NO.	NOZZLE MARK.	SIZE (INCH)	CLASS	O.D	THK. (t)	LG.	VAR.	QTY.
03	4	3	300	117	20.4	232	2	1
04	12F	3	300	117	20.4	232	2	1
05	12J	2	300	84	16.6	180	2	1

FOR FIGURES OF VARIANT No. 1 & 2, REFER SHELL ASSEMBLY DRAWING (1-PV-150-U0164)



TOTAL WEIGHT: 484 Kg

REFERENCE DOCUMENTS / DRAWINGS

REV.	DESCRIPTION	DRN	CHECKED	APPROVED	REVIEWED	APPROVED	DATE
OWNER	 HINDUSTAN PETROLEUM CORPORATION LIMITED VISAKH REFINERY MODERNIZATION PROJECT EPCC-03 PACKAGE FOR RESIDUE UP-GRADATION FACILITY (RUF)						

LSTK
CONTRACTOR:  L&T Hydrocarbon Engineering

VENDOR :		VENDOR PO NO: Refinery/75000-66912/NG; DATE:18.03.2020
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DATE 07.07.20		SCALE 10	TITLE: ASSEMBLY DETAILS OF BOOT SHELL FOR LP FLARE KO DRUM ITEM NO. 504-V-802
DEPT:			

CHK BY: AVR	PWC NO.: BHEL(1)-02502	REV. 01
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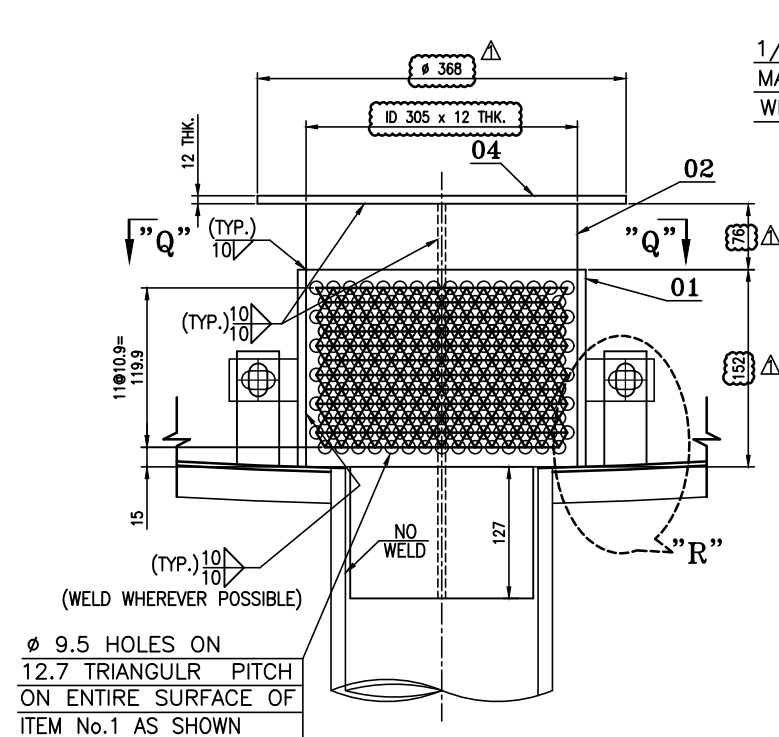
APP BY: TK CAD REVISE THIS DRG. USING CAD SYSTEM ONLY FILE:

L&T - CHIYODA LIMITED

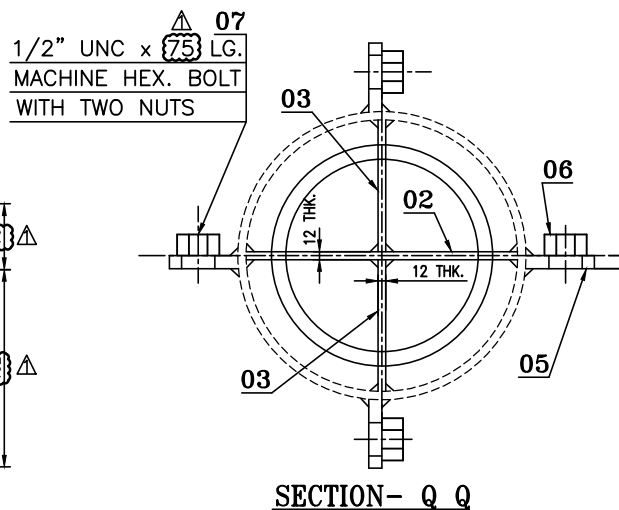
- | | |
|--------------------------|---|
| ☐ | REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION/ CONSTRUCTION AS PER THE DOCUMENT. |
| ☐ | REVIEW CODE 2 - PROCEED WITH MANUFACTURE/FABRICATION/CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED. |
| ☐ | REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW. |
| ☐ | R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION |
| ☐ | V-VOID |

COMMENTED BY	REVIEWED BY	APPROVED BY	DATE

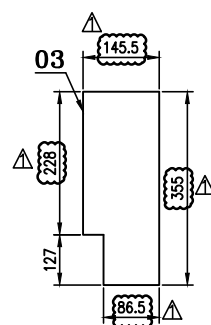
THIS REVIEW / APPROVAL DOES NOT RELIEVE THE VENDOR / MANUFACTURER
OF THE FULL RESPONSIBILITY AS TO DESIGN CORRECTNESS OF DIMENSIONS
& COMPLIANCE WITHALL APPLICABLE REGULATIONS AND WITH THE
REQUIREMENTS MADE IN PURCHASER SPECIFICATIONS.



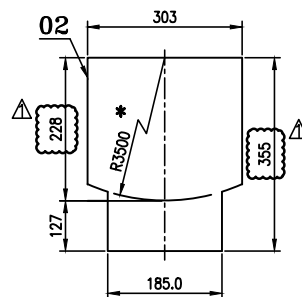
DETAIL OF STRAINER & VORTEX BREAKER AT NOZZLE-3



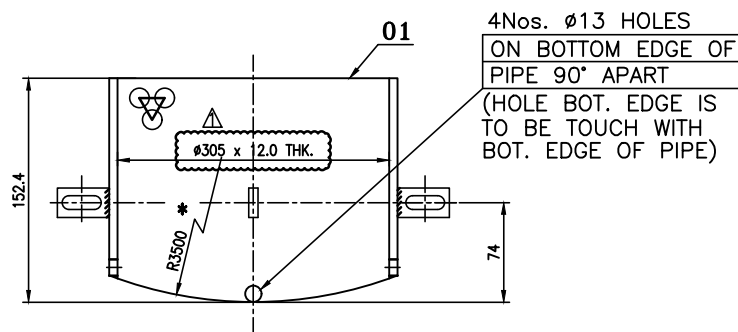
DETAIL OF PITCH



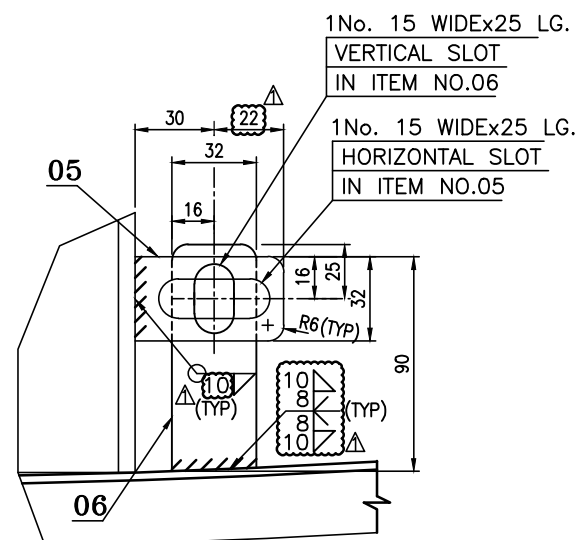
VORTEX BREAKER PLATE(2)



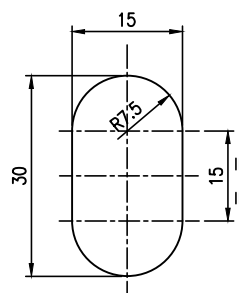
VORTEX BREAKER PLATE(1)



VORTEX BREAKER PIPE
* THIS PROFILE SUIT TO PERPENDICULAR TO
VESSEL LONGITUDINAL AXIS



DETAIL - R
(TYP)



DETAIL OF SLOT
(TYP)

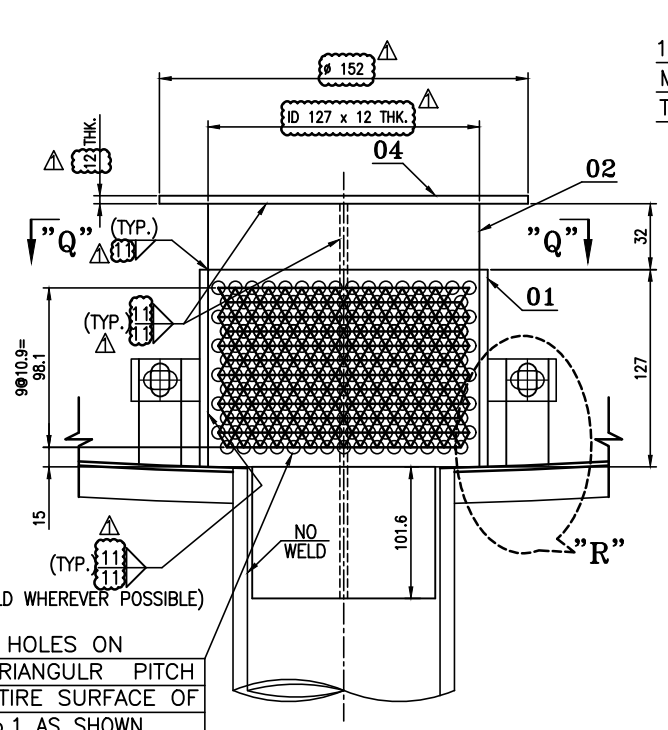
TOTAL WEIGHT: 38.592 Kg									
VARIANT NUMBER	ITEM NO.	DESCRIPTION	STD.	DRAWING NUMBER	ITEM NO.	MATERIAL CODE	K/G P.	UNIT	UNIT WEIGHT
									QUANTITY
	07	MACHINE HEX. BOLT WITH TWO NUTS 1/2" UNC x 75 LG.				SS304L			0.120 4
	06	VORTEX BREAKER VERT. SUPT. PL. 22 THK. x 32 x 100				SA516 Gr.70+NACE+HIC			0.484 4
	05	VORTEX BREAKER VERT. SUPT. PL. 14 THK. x 32 x 52				SA516 Gr.70+NACE+HIC			0.137 4
	04	VORTEX BREAKER TOP PLATE OD 368 x 12 THK.				SA516 Gr.70+NACE+HIC			10.020 1
	03	VORTEX BREAKER PLATES 12 THK. x 355 x 145.5 AS PER DRG.				SA516 Gr.70+NACE+HIC			4.165 2
	02	VORTEX BREAKER PLATE 12 THK. x 355 x 303 AS PER DRG.				SA516 Gr.70+NACE+HIC			8.708 1
	01	PIPE FOR STRAINER ID 305x12THK.-152.4 LG. FROM PLATE - 12THK. x 155 x 996				SA516 Gr.70+NACE+HIC			8.570 1

BHEL DRAWING No.		CLIENT DRAWING No.		DRAWING TITLE		REV.No.	
REFERENCE DOCUMENTS / DRAWINGS							
DRG. CATEGORY: (USE TICK MARK)		R I		EIL REVIEW/APPROVAL CODE:		VPTL NO.:	
SCH. DATE OF SUBMISSION							
DOCUMENT STATUS				☐ REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE DOCUMENT.			
STATEMENT OF SUB: 1st 2nd 3rd				☐ REVIEW CODE 2 - PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.			
☐ FINAL FOR CODE-1 ☐ AS BUILT ☐ AS BUILT ☐ INFORMATION ☐ CONSTRUCTION ☐ REVIEW				☐ REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW.			
SIGN: _____ DATE: _____				☐ R - DOCUMENT IS RETAINED FOR RECORDS, PROCEED WITH MANUFACTURE / FABRICATION ☐ V-VOID NAME DISCIPLINE SIGN DATE			
01		CUSTOMER COMMENTS INCORPORATED		VAR		09.09.20	
00		ISSUED FOR APPROVAL		VAR		21.05.20	
REV.		DESCRIPTION		DRN		DATE	
OWNER		 HINDUSTAN PETROLEUM CORPORATION LIMITED VISAKH REFINERY MODERNIZATION PROJECT EPCC-03 PACKAGE FOR RESIDUE UP-GRADATION FACILITY (RUF)					
PMC :		 ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)					
LSTK CONTRACTOR:		 L&T Hydrocarbon Engineering					
DETAILED ENGINEERING CENTER:		L&T - CHIYODA LIMITED					
VENDOR :		 Bharat Heavy Electricals Limited UNIT: HEAVY PLATES & VESSELS PLANT VISAKHAPATNAM-530012					
VENDOR PO NO:		Refinery/75000-66912/NG; DATE:18.03.2020					
VENDOR DWG. NO:		3-PV-150-U0256, REV. B					
DATE		SCALE		TITLE:			
07-07-20		N.T.S		ASSEMBLY DETAILS OF LP FLARE KO DRUM (ITEM NO. 504-V-802)			
DEPT: HT ENGG.		(STRAINER & VORTEX BREAKER ASSEMBLY AT NOZZLE 3)					
DRN BY: V.A.RAO		PROJECT:		CUSTOMER REFERENCE DRG. NO.:		SH. 01 OF 01	
CHK BY: A.V.RAO		PWO NO.:		B016-RUF-LT-504-MS-		REV. 01	
APP BY: K.TARAKESH		CAD REUSE THIS DRG. USING OLD SYSTEM ONLY FILE:					

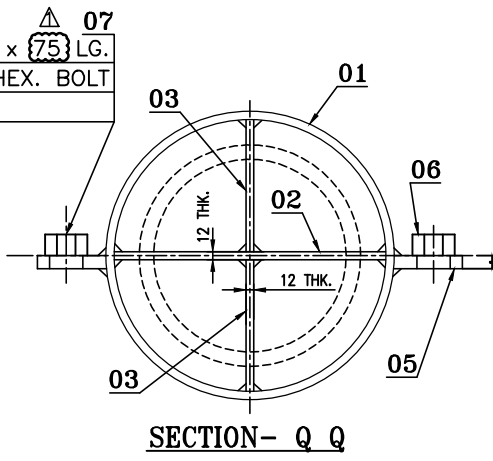
L&T - CHIYODA LIMITED			
☐	REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION/ CONSTRUCTION AS PER THE DOCUMENT.		
☐	REVIEW CODE 2 - PROCEED WITH MANUFACTURE/FABRICATION/CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.		
☐	REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW.		
☐	R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION		
☐	V-VOID		
COMMENTED BY	REVIEWED BY	APPROVED BY	DATE
THIS REVIEW / APPROVAL DOES NOT RELIEVE THE VENDOR / MANUFACTURE OF THE FULL RESPONSIBILITY AS TO DESIGN CORRECTNESS OF DIMENSIONS & COMPLIANCE WITHALL APPLICABLE REGULATIONS AND WITH THE REQUIREMENTS MADE IN PURCHASER SPECIFICATIONS.			

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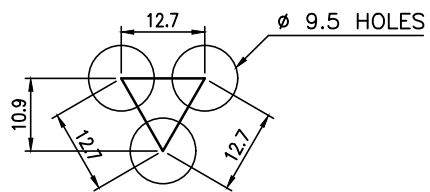
DRG. NO. B016-RUF-LT-504-MS-PD-BHEL(1)-02502
BHEL DRG. NO. 3-PV-150-U0257



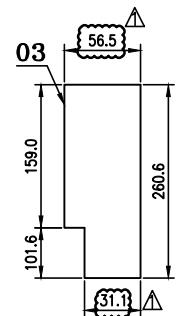
DETAIL OF STRAINER & VORTEX BREAKER AT NOZZLE-4



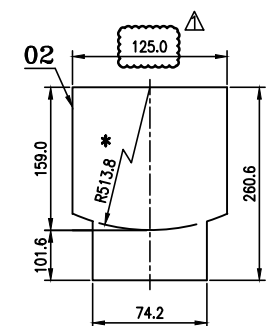
SECTION- Q Q



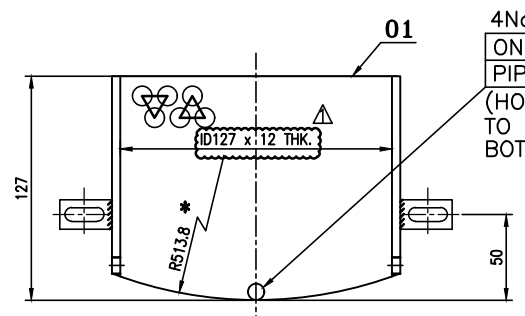
DETAIL OF PITCH



VORTEX BREAKER PLATE(2)

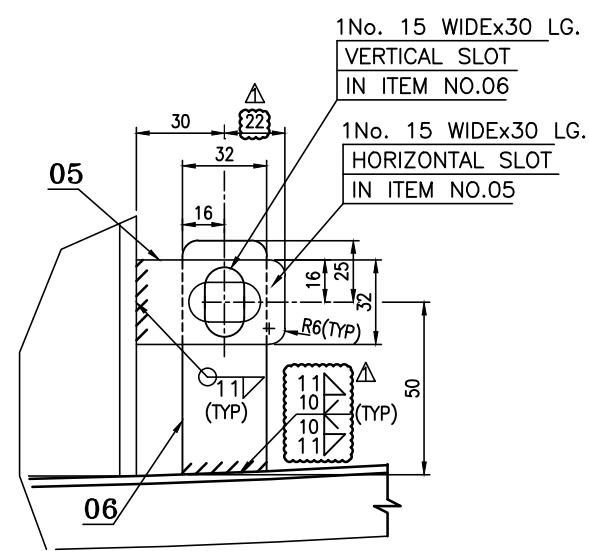


VORTEX BREAKER PLATE(1)

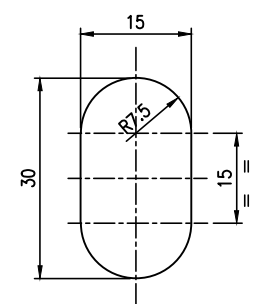


VORTEX BREAKER PIPE

* THIS PROFILE SUIT TO PERPENDICULAR TO VESSEL LONGITUDINAL AXIS



DETAIL - R (TYP)



DETAIL OF SLOT (TYP)

TOTAL WEIGHT: 8.393 Kg									
ITEM NO.	DESCRIPTION	MATERIAL CODE	UNIT	QUANTITY	UNIT WEIGHT	MATERIAL SPECIFICATION	DRAWING NUMBER	ITEM NO.	DESCRIPTION
07	MACHINE HEX. BOLT WITH TWO NUTS 1/2" UNC x 75 LG.	SS304L		0.120	2				
06	VORTEX BREAKER VERT. SUPT. PL. 22 THK. x 32 x 75	SA516 Gr.70+NACE+HIC		0.343	2				
05	VORTEX BREAKER VERT. SUPT. PL. 14 THK. x 32 x 52	SA516 Gr.70+NACE+HIC		0.137	2				
04	VORTEX BREAKER TOP PLATE OD 152 x 12 THK.	SA516 Gr.70+NACE+HIC		1.709	1				
03	VORTEX BREAKER PLATES 12 THK. x 260.6 x 56.5 AS PER DRG.	SA516 Gr.70+NACE+HIC		1.144	2				
02	VORTEX BREAKER PLATE 12 THK. x 260.6 x 125 AS PER DRG.	SA516 Gr.70+NACE+HIC		2.571	1				
01	PIPE FOR STRAINER ID 127x12 THK.x127 LG. FROM PL 12TK x 450 x 140	SA516 Gr.70+NACE+HIC		0.625	1				

BHEL DRAWING No.	CLIENT DRAWING No.	DRAWING TITLE	REV. No.
REFERENCE DOCUMENTS / DRAWINGS			
DRG. CATEGORY: (USE TICK MARK)	☒ R ☐ I	EIL REVIEW/APPROVAL CODE:	VTPL NO.:
SCH. DATE OF SUBMISSION	DOCUMENT STATUS		
STATEMENT OF SUB: ☒ 1st ☐ 2nd ☐ 3rd	☐ REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION/ CONSTRUCTION AS PER THE DOCUMENT.		
☐ FINAL FOR CODE-1 ☐ AS BUILT	☐ REVIEW CODE 2 - PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.		
☐ AS BUILT ☐ INFORMATION	☐ REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW.		
☐ CONSTRUCTION ☐ REVIEW	☐ R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION		
SIGN:	DATE:	☐ V-VOID	
NAME	DICPLINE	SIGN.	DATE
01 CUSTOMER COMMENTS INCORPORATED VAR AVR K.T 09.09.20			
00 ISSUED FOR APPROVAL VAR AVR K.T 21.05.20			
REV.	DESCRIPTION	DRN	CHECKED [] APPROVED [] REVIEWED [] APPROVED [] DATE
OWNER	HINDUSTAN PETROLEUM CORPORATION LIMITED VISAKH REFINERY MODERNIZATION PROJECT EPCC-03 PACKAGE FOR RESIDUE UP-GRADATION FACILITY (RUF)		
PMC :			
LSTK CONTRACTOR:			
DETAILED ENGINEERING CENTER:	L&T - CHIYODA LIMITED		
VENDOR :		VENDOR PO NO:	Refinery/75000-66912/NG; DATE:16.03.2020
Bharat Heavy Electricals Limited UNIT: HEAVY PLATES & VESSELS PLANT VISAKHAPATNAM-530012	VENDOR DWG. NO:	3-PV-150-U0257, REV. B	
DATE 07-07-20	SCALE N.T.S	TITLE:	ASSEMBLY DETAILS OF LT FLARE KO DRUM BOOT (ITEM NO. 504-V-802)
DEPT: HT ENGG.	PROJECT:	CUSTOMER REFERENCE DRG. NO.:	SH.01 OF 01
DRN BY: V.A.RAO	PWO NO.:	B016-RUF-LT-504-MS-	REV. 01
CHK BY: A.V.RAO	FD-BHEL(1)-02502		
APP BY: K.TARAKESH	CAD MAKE THIS DRG. USING CAD SYSTEM ONLY. FILE:		

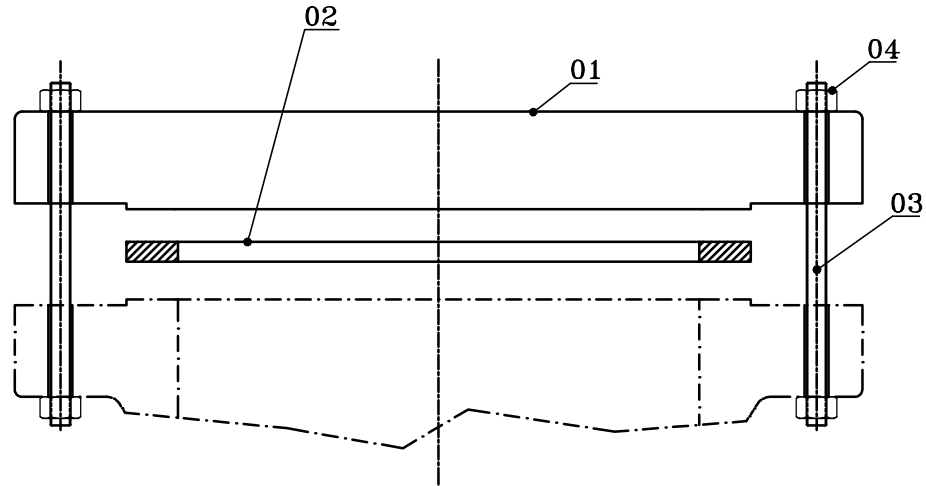
L&T - CHIYODA LIMITED			
☐ REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE DOCUMENT.			
☐ REVIEW CODE 2 - PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.			
☐ REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW.			
☐ R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION			
☐ V-VOID			
COMMENTED BY	REVIEWED BY	APPROVED BY	DATE
THIS REVIEW / APPROVAL DOES NOT RELIEVE THE VENDOR / MANUFACTURER OF THE FULL RESPONSIBILITY AS TO DESIGN CORRECTNESS OF DIMENSIONS & COMPLIANCE WITH ALL APPLICABLE REGULATIONS AND WITH THE REQUIREMENTS MADE IN PURCHASER SPECIFICATIONS.			

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REF. NO. B016-RUF-LT-504-MS-PD-BHEL(1)-02502

DRG. NO. 3-PV-150-U0260

	04	NUT 1 7/8"-8UN			----		1.905	
					SA194GR.2HM		144	
	03	STUD 1 7/8"-8UN x 480 LG			----		4.500	
					SA193GR.B7M		48	
	02	GASKET; SPW SS316L GRAF. FILLED INNER RING			----		3.370	
					SS 316 INNER RING+ CS RING		1	
	01	BLANK FLANGE 54"NPS 300#			----		2575.951	
					SA 105		1	
06		NOZZLE-54" - 300#			----		---	
					(WELDMENT)			
	04	NUT 1 5/8"-8UN			----		0.736	
					SA194GR.2HM		192	
	03	STUD 1 5/8"-8UN x 340 LG			----		3.208	
					SA193GR.B7M		64	
	02	GASKET; SPW SS316L GRAF. FILLED INNER RING			----		3.370	
					SS 316 INNER RING + CS OUTER RING		2	
	01	BLANK FLANGE 36"NPS 300#			----		870.898	
					SA 105		2	
05		NOZZLE-36" - 300#			----		---	
					(WELDMENT)			
	04	NUT 1 1/2"-8UN			----		0.595	
					SA194GR.2HM		144	
	03	STUD 1 1/2"-8UN x 280 LG			----		2.260	
					SA193GR.B7M		48	
	02	GASKET; SPW SS316L GRAF. FILLED INNER RING			----		3.370	
					SS 316 INNER RING + CS OUTER RING		2	
	01	BLANK FLANGE 24"NPS 300#			----		342.000	
					SA 105		2	
04		NOZZLE-24" - 300#			----		---	
					(WELDMENT)			
	04	NUT 7/8"-9 UNC			----		0.135	
					SA194GR.2HM		72	
	03	STUD 7/8"-9 UNC x 140 LG			----		0.360	
					SA193GR.B7M		36	
	02	GASKET; SPW SS316L GRAF. FILLED INNER RING			----		0.200	
					SS 316 INNER RING + CS OUTER RING		3	
	01	BLANK FLANGE 8"NPS 300#			----		37.000	
					SA 105		3	
03		NOZZLE-8" - 300#			----		---	
					(WELDMENT)			
	04	NUT 3/4"-10 UNC			----		0.088	
					SA194GR.2HM		176	
	03	STUD 3/4"-10 UNC x 120 LG			----		0.224	
					SA193GR.B7M		88	
	02	GASKET; SPW SS316L GRAF. FILLED INNER RING			----		0.200	
					SS 316 INNER RING + CS OUTER RING		11	
	01	BLANK FLANGE 3"NPS 300#			----		7.000	
					SA 105		11	
02		NOZZLE-3" - 300#			----		---	
					(WELDMENT)			
	04	NUT 5/8"-11 UNC			----		0.054	
					SA194GR.2HM		160	
	03	STUD 5/8"-11 UNC x 100 LG			----		0.1260	
					SA193GR.B7M		80	
	02	GASKET; SPW SS316L GRAF. FILLED INNER RING			----		0.200	
					SS 316 INNER RING + CS OUTER RING		10	
	01	BLANK FLANGE 2"NPS 300#			----		3.500	
					SA 105		10	
01		NOZZLE-2" - 300#			----		---	
					(WELDMENT)			
VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	DRAWING NUMBER	ITEM-NO VAR-NO	MATERIAL CODE MATERIAL SPECN	UNIT QTY	UNIT WEIGHT QUANTITY	3



1-PV-100-U0062	B016-RUF-LT-504-MS FD-BHEL(1)-02352	GEN. ASSEMBLY OF SULFIDING CHEMICAL DRUM (504-V-315)	**
1-PV-100-U0061	B016-RUF-LT-504-MS GA-BHEL(1)-02351	GEN. ASSEMBLY OF SULFIDING CHEMICAL DRUM (504-V-315)	**
DRAWING NO.	CLIENT DRAWING NO.	DRAWING TITLE	REV

DRG. CATEGORY: (USE TICK MARK)		☒ R ☐ I	EIL REVIEW/APPROVAL CODE:		VPTL NO.:	
SCH. DATE OF SUBMISSION		DOCUMENT STATUS		STATEMENT OF SUB: ☒ 1st ☐ 2nd ☐ 3rd		
☐ FINAL FOR CODE-1		☐ AS BUILT		☐ REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION/ CONSTRUCTION AS PER THE DOCUMENT.		
☐ AS BUILT		☐ INFORMATION		☐ REVIEW CODE 2 - PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.		
☐ CONSTRUCTION		☐ REVIEW		☐ REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW.		
SIGN:		DATE:		☐ R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION		
				☐ V-VOID		
				NAME DISCIPLINE SIGN DATE		

01	ISSUED FOR APPROVAL	KMY	AVR	TK	---	---	07.07.20
REV.	DESCRIPTION	DRN	CHECKED	APPROVED	REVIEWED	APPROVED	DATE
OWNER	HINDUSTAN PETROLEUM CORPORATION LIMITED VISAKH REFINERY MODERNIZATION PROJECT EPCC-03 PACKAGE FOR RESIDUE UP-GRADATION FACILITY (RUF)						

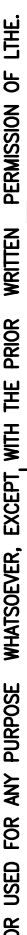
PMC :	 ENGINEERS NDIA LIMITED (A Govt. of India Undertaking)
LSTK CONTRACTOR:	 L&T Hydrocarbon Engineering

DETAILED ENGINEERING CENTER:		L&T - CHIYODA LIMITED	
VENDOR :		BHEL PO NO: REFINERY/75000-66912/NG; DATE: 18.03.2020	
 Bharat Heavy Electricals Limited UNIT: HEAVY PLATES & VESSEL PLANT VISAKHAPATNAM-530012		BHEL DWG. NO: 3-PV-150-U0260, REV. A	

DATE 07.07.20	SCALE N.T.S	TITLE: ASSEMBLY DETAILS FOR HYDRO TEST OF HT FLARE KO DRUM ITEM NO. 504-V-802	
DEPT: HT ENGG.		PROJECT:	CUSTOMER REF. DRG. NO. :
DRN BY: MUNAYYA K		PWO NO.:	B016-RUF-LT-504-MS- FD-BHEL(1)-02502
CHK BY: A V RAO		SH.1 OF 1 REV. 00	
APP BY: TARAKESH K		CAD MAKE THIS DRG. USING CAD SYSTEM ONLY FILE:	

L&T - CHIYODA LIMITED			
☐ REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION/ CONSTRUCTION AS PER THE DOCUMENT.			
☐ REVIEW CODE 2 - PROCEED WITH MANUFACTURE/FABRICATION/CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.			
☐ REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW.			
☐ R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION			
☐ V-VOID			
COMMENTED BY	REVIEWED BY	APPROVED BY	DATE
THIS REVIEW / APPROVAL DOES NOT RELIEVE THE VENDOR / MANUFACTURER OF THE FULL RESPONSIBILITY AS TO DESIGN CORRECTNESS OF DIMENSIONS & COMPLIANCE WITHALL APPLICABLE REGULATIONS AND WITH THE REQUIREMENTS MADE IN PURCHASER SPECIFICATIONS.			

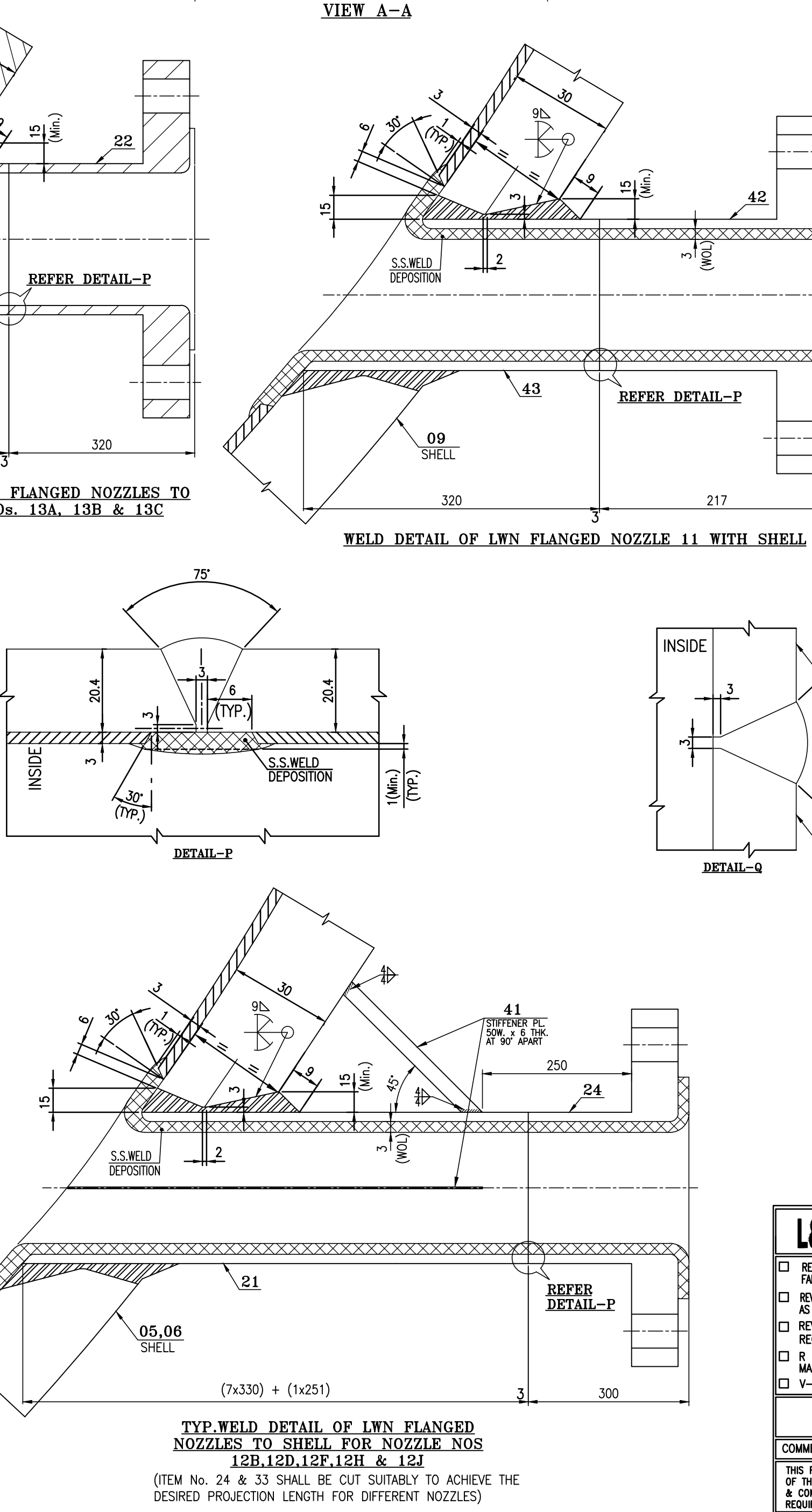
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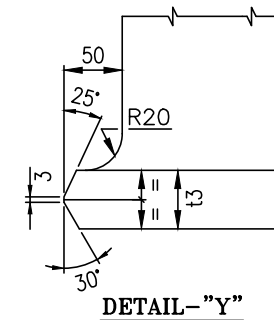
VARIANT
NUMBER

A horizontal number line with two tick marks. The first tick mark is labeled '11' and the second tick mark is labeled '12'.

TOTAL WEIGHT: 160697.1



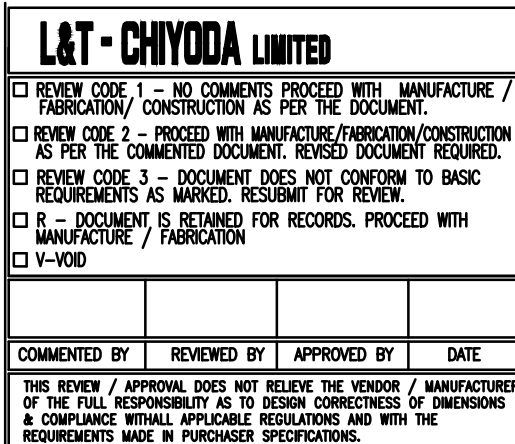
ALL RIGHTS RESERVED



ITEM NO.	NOZZLE MARK No.	SIZE (NPS) (INCH)	CLASS	O.D	ø	t1	t2	t3	H1	H2	H3	H4	H6	H5	R	VARIANT NO
11 (IN SHEET 2 OF 8)	1A & 1B	36	300	920.8	938.8	16	25	60	70	25	561	72	181	105	3253	1
13 (IN SHEET 2 OF 8)	2	50	300	1277.9	1325.9	16	45	60	110	25	467	110	235	140	3253	1
14 (IN SHEET 2 OF 8)	3	12	600	323.8	381.8	16	45	30	90	25	67	24	165	75.5	3253	1
15 (IN SHEET 2 OF 8)	4	8	300	219.1	255.1	12	30	30	90	25	640	20	112	43	3253	1
16 (IN SHEET 2 OF 8)	5	10	300	273	329	12	40	30	90	25	634	23	118	50	3253	1
17 (IN SHEET 2 OF 8)	8	8	300	219.1	255.1	12	30	30	100	25	630	20	112	43	3253	1
18 (IN SHEET 2 OF 8)	14	24	300	610	762	14	90	30	100	25	84	44	168	72	3253	1

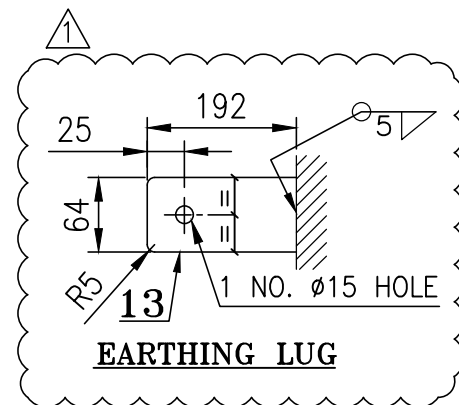
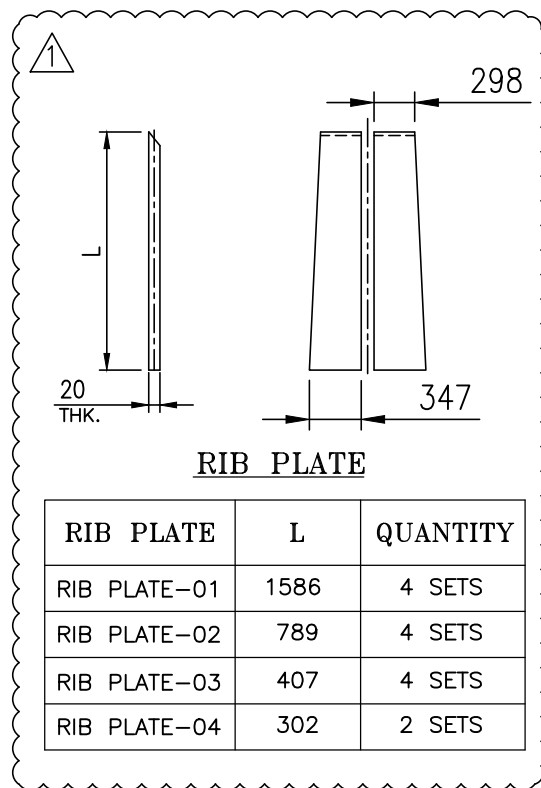
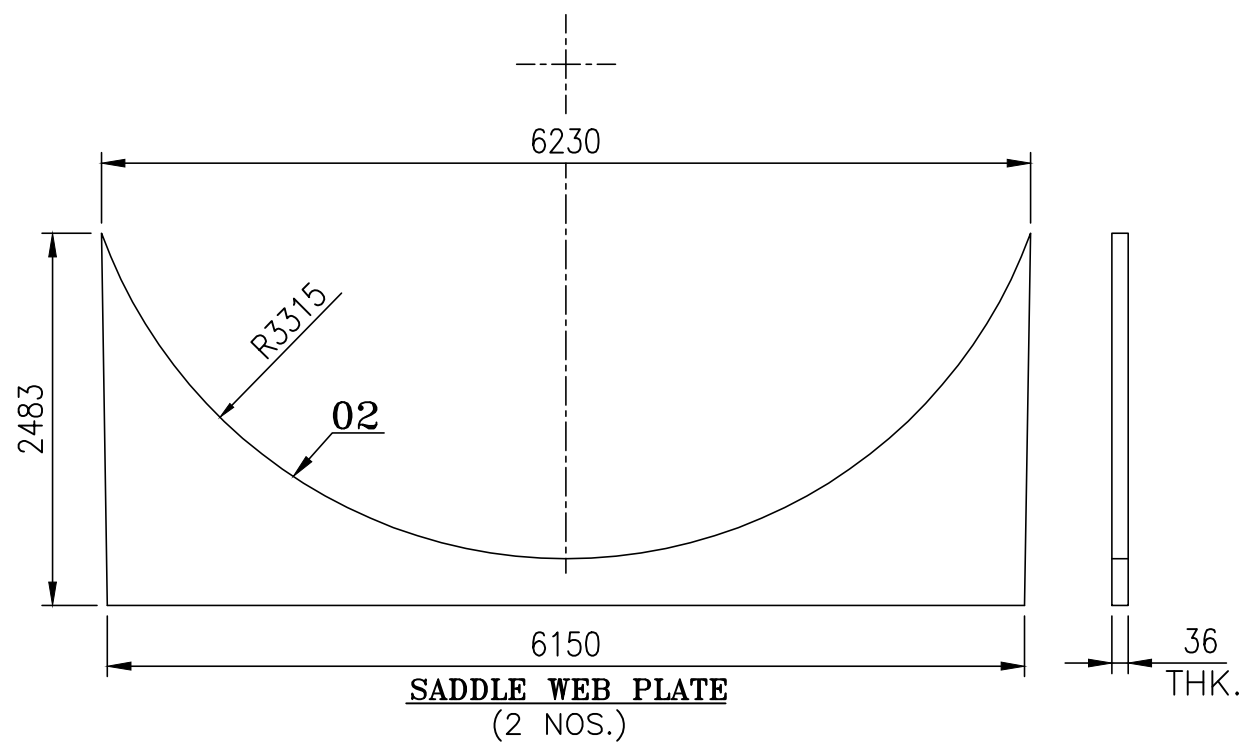
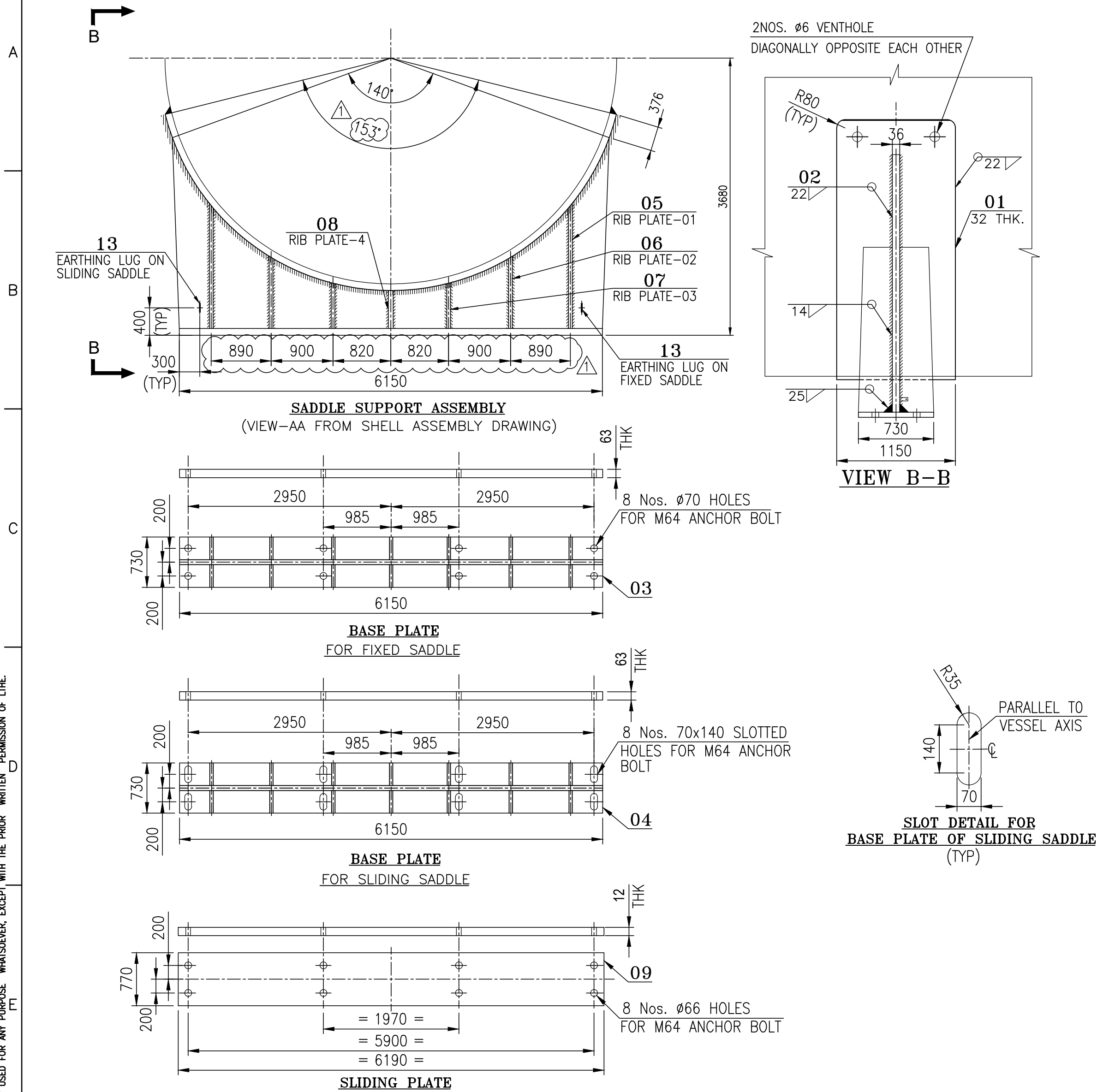
ITEM NO.	NOZZLE MARK No.	SIZE (NPS) (INCH)	CLASS	O.D	THK. (t1)	THK. (t2)	VAR.
19 (IN SHEET 2 OF 8)	6A,6B,6C	3	300	117	20.4	30	2
11 (IN SHEET 6 OF 8)	7	3	300	117	20.4	30	2
20 (IN SHEET 2 OF 8)	9A, 9B, 10A & 10B	3	300	117	20.4	30	2
22 (IN SHEET 2 OF 8)	13A, 13B, 13C	3	300	117	20.4	30	2
42 (IN SHEET 2 OF 8)	11	3	300	117	20.4	30	2
23 (IN SHEET 2 OF 8)	12A, 12C, 12G, 12I	3	300	117	20.4	30	2
33 (IN SHEET 2 OF 8)	12E	3	300	117	20.4	30	2
24 (IN SHEET 2 OF 8)	12B,D,F,H,J	3	300	117	20.4	30	2
21 (IN SHEET 2 OF 8)	SPOOLS FOR NOZ-9A,9B,10A,10B, 12B,12D,12F,12H,12J	3	-	117	20.4	-	3
25 (IN SHEET 2 OF 8)	SPOOLS FOR NOZ-13A,13B,13C	3	-	117	20.4	-	3
42 (IN SHEET 2 OF 8)	SPOOLS FOR NOZ-11	3	-	117	20.4	-	3

BHEL SHALL ENSURE COMPLIANCE OF ALL DIMENSIONS/SKETCHES IN THIS
MANUFACTURING ASSEMBLY DRAWING W.R.T GENERAL ASSEMBLY DRAWING:
B016-RUF-LT-504-MS-GA-BHEL(1)-02651

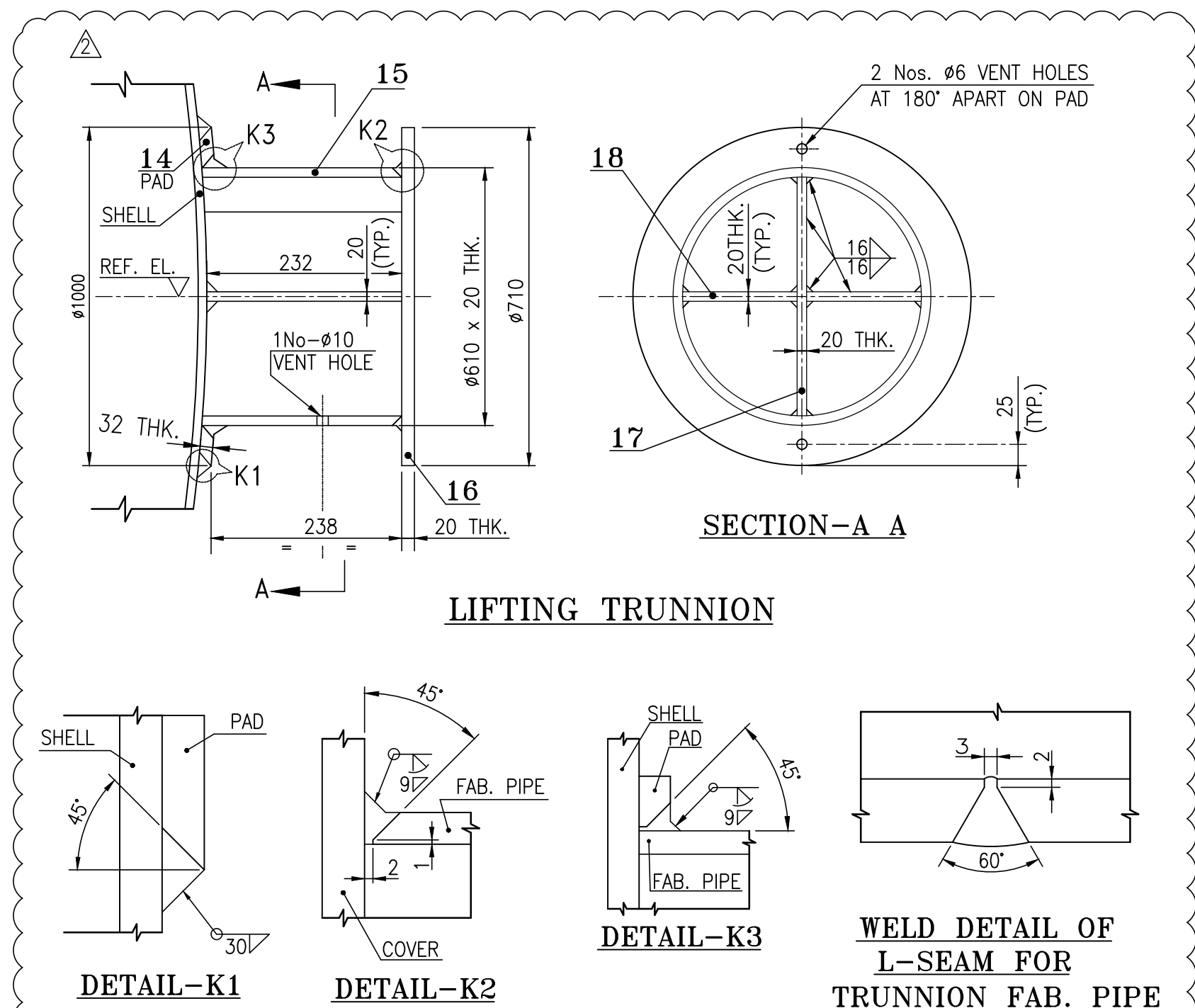
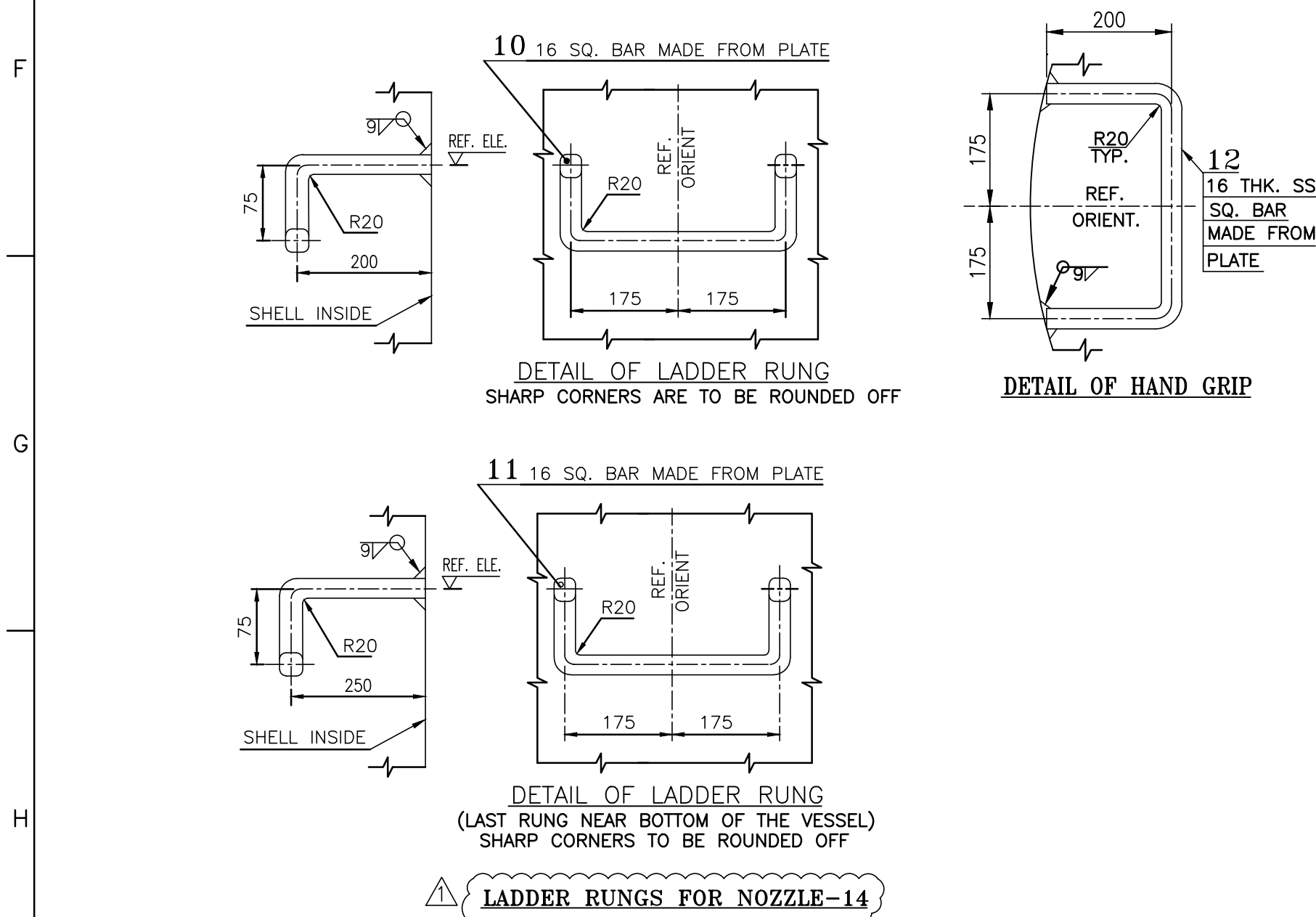


DRAWING NO.	CLIENT DRAWING NO.	DRAWING TITLE						REV	
REFERENCE DOCUMENTS / DRAWINGS									
DRG. CATEGORY: (USE TICK MARK)		☐ R ☐ I		EIL REVIEW/APPROVAL			VPIL NO.:		
SCH. DATE OF SUBMISSION				CODE:					
DOCUMENT STATUS				☐ REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION/ CONSTRUCTION AS PER THE DOCUMENT. ☐ REVIEW CODE 2 - PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED. ☐ REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW. ☐ R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION ☐ V-VOID NAME DISCIPLINE SIGN DATE					
STATEMENT OF SUB: ☐ 1st ☐ 2nd ☐ 3rd									
☐ FINAL FOR CODE-1 ☐ AS BUILT									
ISSUED FOR									
☐ AS BUILT ☐ INFORMATION ☐ CONSTRUCTION ☐ REVIEW									
SIGN:		DATE:							
00	ISSUED FOR APPROVAL			KMY	AVR	TK	---	---	16.10.20
REV.	DESCRIPTION			DRN	CHECKED	APPROVED	REVIEWED	APPROVED	DATE
OWNER  HINDUSTAN PETROLEUM CORPORATION LIMITED VISAKH REFINERY MODERNIZATION PROJECT EPCC-03 PACKAGE FOR RESIDUE UP-GRADATION FACILITY (RUF)									
PMC :  L&T  ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)									
LSTK CONTRACTOR:  L&T Hydrocarbon Engineering									
DETAILED ENGINEERING CENTER: L&T - CHIYODA LIMITED									
VENDOR :  Bharat Heavy Electricals Limited UNIT: HEAVY PLATES & THERMAL PLANT VISAKHAPATHAM-530012				BHEL PO NO: REFINERY/75000-66912/NG; DATE: 18.03.2020					
				BHEL DWG. NO: 3-PV-180-U0240, REV. A					
DATE 16.10.20	SCALE N.T.S	TITLE: ASSEMBLY DETAILS OF HT FLARE KO DRUM ITEM NO. 504-V-805A							
DEPT: HT ENGG.		PROJECT:		CUSTOMER REF. DRG. NO. :					SH. 3 OF 8
DRN BY: MUNAYYA K		PWO NO.:		B016-RUF-LT-504-MS- FD-BHEL(1)-02652					REV. 00
CHK BY: A V RAO									
APP BY: TARAKESH K		CAD RENSE THIS DRG. USING CAD SYSTEM ONLY FILE:							

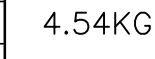
SPECIAL NOTE:
BHEL SHALL ENSURE COMPLIANCE OF ALL DIMENSIONS/SKETCHES IN THIS
MANUFACTURING ASSEMBLY DRAWING W.R.T GENERAL ASSEMBLY DRAWING:
B016-RUF-LT-504-MS-GA-BHEL(1)-02651



	18	RIBS – LIFTING TRUNION 20 THK. x 275 x 232				SA 516 GR.70			10.017
	17	RIB – LIFTING TRUNION 20 THK. x 570 x 244				SA 516 GR.70			21.836
	16	COVER – LIFTING TRUNION ø710 x 20THK.				SA 516 GR.70			62.200
	15	LIFTING TRUNION PIPE 20 THK. x 246 x 1853.5 LG.				SA 387 GR.22 CL.2			71.586
	14	PAD – LIFTING TRUNION ø1004 x 32 THK.				SA 387 GR.22 CL.2			125.458
	13	EARTHING LUG 6 THK. x 65 x 192				SA 240 TP 304			0.592
	12	HAND GRIP 16 SQ. – 750 Lg.				SA 240 TP 347			1.536
	11	LADDER RUNG 16 SQ. – 1000 Lg.				SA 240 TP 347			2.048
	10	LADDER RUNG 16 SQ. – 900 Lg.				SA 240 TP 347			1.844
	09	SADDLE SLIDING PLATE 770 X 6190 X 12 THK.				SA 240 TYP 304			454.937
	08	RIB PLATE–4 ; 302 X 20 THK.				SA 516 GR.70			15.291
	07	RIB PLATE–3; 407 X 20 THK.				SA 516 GR.70			20.912
	06	RIB PLATE–2; 789 X 20 THK.				SA 516 GR.70			40.557
	05	RIB PLATE–1; 1586 X 20 THK.				SA 516 GR.70			80.304
	04	BASE PLATE FOR SLIDING SADDLE 730 x 6150 x 63 THK.				SA 516 GR.70			2166.284
	03	BASE PLATE FOR FIXED SADDLE 730 x 6150 x 63 THK.				SA 516 GR.70			2205.056
	02	SADDLE WEB PLATE 2483 X 6230 X 36 THK.				SA 516 GR.70			1547.870
	01	WRAPPER PLATE 1150 X 8853 X 32 THK.				SA 387 GR.22 CL.2			2557.455
									2
ITEM NUMBER	ITEM NUMBER	DESCRIPTION	SIZE	DRAWING NUMBER	ITEM NO.	MATERIAL CODE	UNIT	UNIT WEIGHT	
					ITEM NO.	MATERIAL SPECIFICATION		QUANTITY	

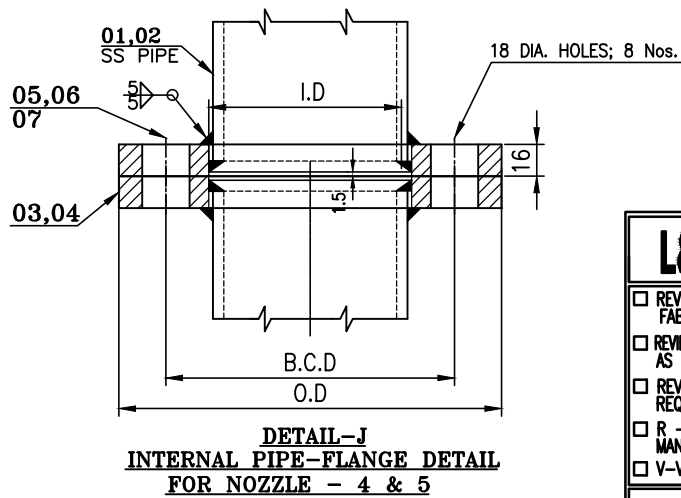
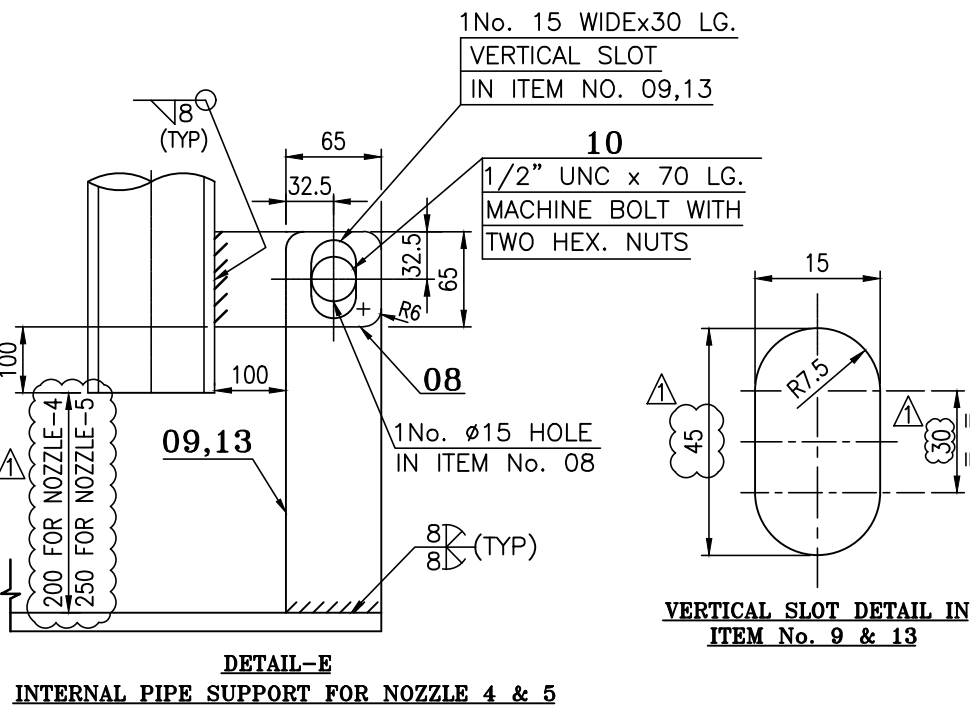
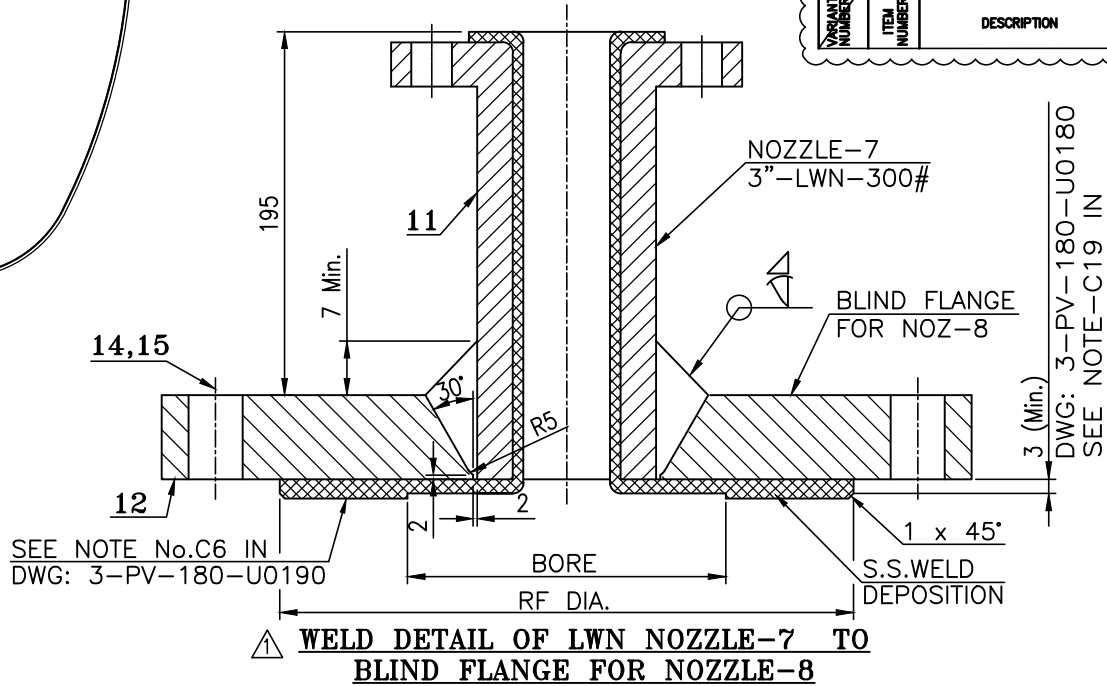
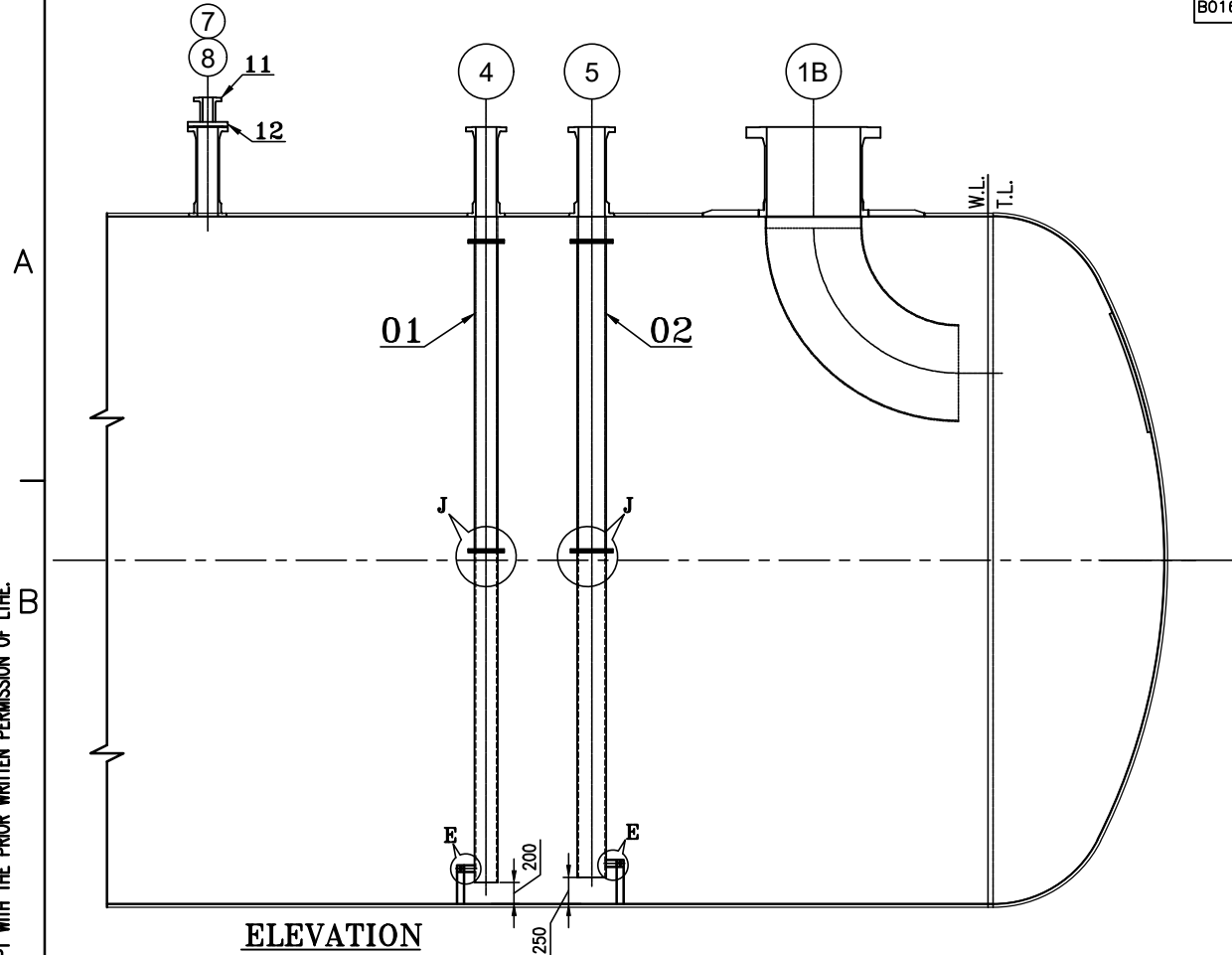


REFERENCE DOCUMENTS / DRAWINGS									
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SCH. DATE OF SUBMISSION				CODE:					
DOCUMENT STATUS									
STATEMENT OF SUB: [Tst] [2nd] [3rd]				☐ REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION/ CONSTRUCTION AS PER THE DOCUMENT.					
☐ FINAL FOR CODE-1				☐ AS BUILT					
ISSUED FOR				☐ INFORMATION					
☐ AS BUILT				☐ REVIEW					
☐ CONSTRUCTION				☐ R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION					
SIGN:				☐ V-VOID					
DATE:				NAME		DISCIPLINE		SIGN	
DATE		NAME		DISCIPLINE		SIGN		DATE	
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DATE		NAME		DISCIPLINE		SIGN			



SPECIAL NOTE:
BHEL SHALL ENSURE COMPLIANCE OF ALL DIMENSIONS/SKETCHES IN THIS MANUFACTURING ASSEMBLY DRAWING W.R.T GENERAL ASSEMBLY DRAWING: B016-RUF-LT-504-MS-GA-BHEL(1)-02651

ITEM NUMBER		DESCRIPTION	STD	DRAWING NUMBER	ITEM CODE	MATERIAL CODE	UNIT WEIGHT	QUANTITY
15		SPIRAL WOUND GASKET NPS 8" x 300#				GRAFIL FILLED WITH SS316 INNER RING AND CS OUTER RING	0.200	1
14		FULLY THREADED STUD WITH 2 NUTS 7/8" - 9 UNC x 160 LG				SA 453 GR. 660 CL. A	0.682	12
13		INTERNAL PIPE SUPPORT PLATE FOR NOZ-5; 12 THK. x 65 x 415 LG.				SA 240 TP 347	2.487	1
12		BLIND FLANGE-NPS 8"-300#;RF				SA 182 F22 CL.3	37.000	1
11		LW NOZZLE - 7 NPS 3" x 300# RF; L=236				A243 81PV 1800 1009	16.694	1
10		MACHINE BOLT WITH TWO HEX. NUTS: 1/2" UNC x 70 LG.				SA182Gr.F22CL.3+3mm SS347 WOL	0.124	2
09		INTERNAL PIPE SUPPORT PLATE FOR NOZ-4; 12 THK. x 65 x 365 LG.				SA 240 TP 347	2.175	1
08		INTERNAL PIPE SUPPORT PLATE 12 THK. x 65 x 165 LG.				SA 240 TP 347	1.013	2
07		FULL FACED GASKET SHEET 250NB ID:276; OD:400				CNAF	-	3
06		FULL FACED GASKET SHEET 200NB ID:222; OD:340				CNAF	-	3
05		STUD WITH 2 NUTS 5/8" UNC; 90 LONG				SA193GR.B8CA/SA194GR.8CA	0.222	32
04		INTERNAL FLANGE FOR PIPE 250NB ID:276 x OD:400 x 16 THK.				SA 240 TP 347	8.427	3
03		INTERNAL FLANGE FOR PIPE 200NB ID:222 x OD:340 x 16 THK.				SA 240 TP 347	6.667	3
02		PIPE OD 273 x 15.09 THK. 3004 LG.				SA 312 TP 347	288.415	2
01		PIPE OD 219.1 x 15.09 THK. 3029 LG.				SA 312 TP 347	229.962	2



ITEM NO.	PIPE SIZE	I.D	B.C.D	O.D
03	200NB	222	290	340
04	250NB	276	350	400

L&T - CHIYODA LIMITED

☐ REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE DOCUMENT.
☐ REVIEW CODE 2 - PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.
☐ REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW.
☐ R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION
☐ V-VOID

COMMENTED BY	REVIEWED BY	APPROVED BY	DATE

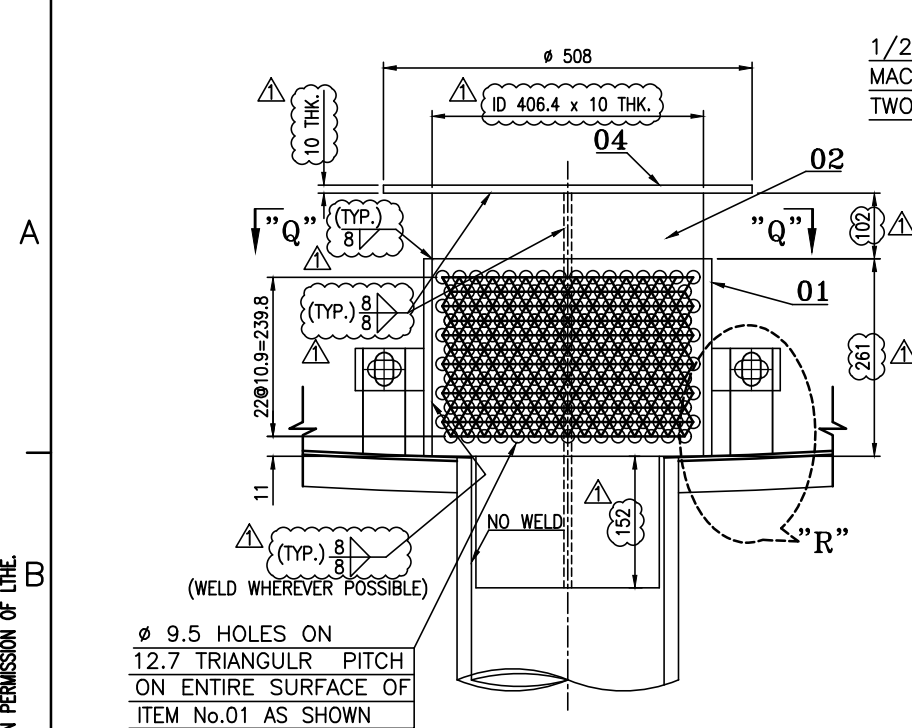
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DRAWING NO.		DRAWING TITLE		REV
REFERENCE DOCUMENTS / DRAWINGS				
DRG. CATEGORY: (USE TICK MARK)	☒ R	EIL REVIEW/APPROVAL CODE:	VPTL NO.:	
SCH. DATE OF SUBMISSION		DOCUMENT STATUS STATEMENT OF SUB: ☒ 1st ☐ 2nd ☐ 3rd		
☐ FINAL FOR CODE-1 ☐ AS BUILT ☐ CONSTRUCTION		☐ AS BUILT ☒ INFORMATION ☐ REVIEW	☐ REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE DOCUMENT. ☐ REVIEW CODE 2 - PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED. ☐ REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW. ☐ R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION ☐ V-VOID	
SIGN:	DATE:			
OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED VISAKH REFINERY MODERNIZATION PROJECT EPCC-03 PACKAGE FOR RESIDUE UP-GRADATION FACILITY (RUF)				
PMC: ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)				
LSTK CONTRACTOR: L&T Hydrocarbon Engineering				
DETAILED ENGINEERING CENTER: L&T - CHIYODA LIMITED				
VENDOR: Bharat Heavy Electricals Limited UNIT: HEAVY PLATES & VESSELS PLANT VISAKHAPATNAM-530012		VENDOR PO NO: Refinery/75000-66912/NG; DATE:18.03.2020		
DATE		VENDOR DWG. NO: 3-PV-180-U0053, REV.0		
DEPT: HT ENGG.	TITLE: INTERNAL PIPE DETAILS OF HT FLARE KO DRUM ITEM NO. 504-V-805A			
DRN BY: MUNAYYA K	PROJECT:	CUSTOMER REFERENCE DRG. NO.:		SH.06 of 08
CHK BY: A V RAO	PWO NO.:	B016-RUF-LT-504-MS-FD-BHEL(1)-02652		REV. 01
APP BY: TARAKESH K	CAD REUSE THIS DRG. USING CAD SYSTEM ONLY. FILE:			

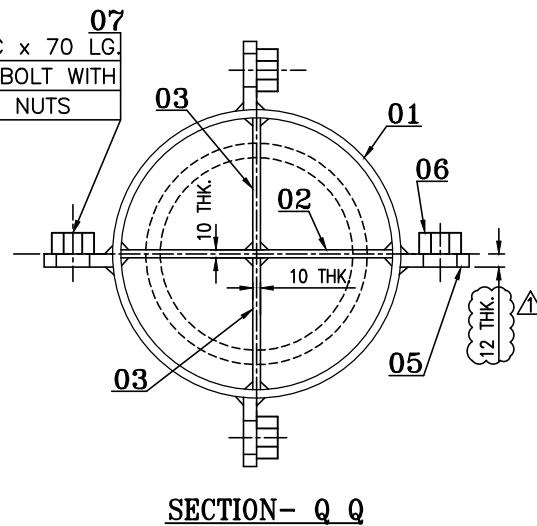
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DRG. NO. B016-RUF-LT-504-MS-PD-BHEL(1)-02652
BHEL DRG. NO. 3-PV-180-U0226

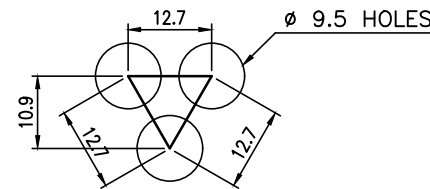
SPECIAL NOTE:
BHEL SHALL ENSURE COMPLIANCE OF ALL DIMENSIONS/SKETCHES IN THIS MANUFACTURING ASSEMBLY DRAWING W.R.T GENERAL ASSEMBLY DRAWING: B016-RUF-LT-504-MS-GA-BHEL(1)-02651



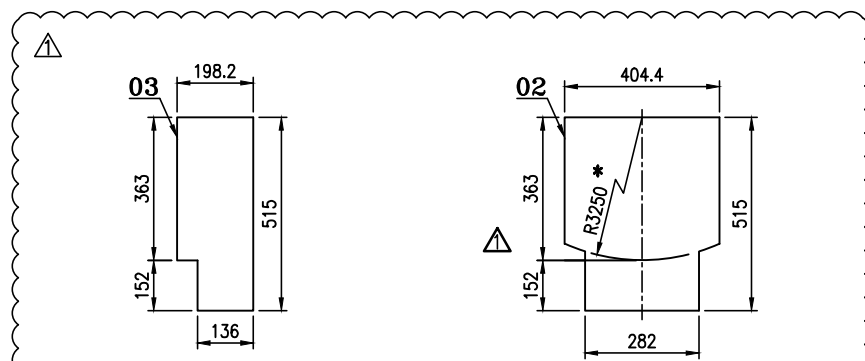
DETAIL OF STRAINER & VORTEX BREAKER AT NOZZLE-3



SECTION- Q Q

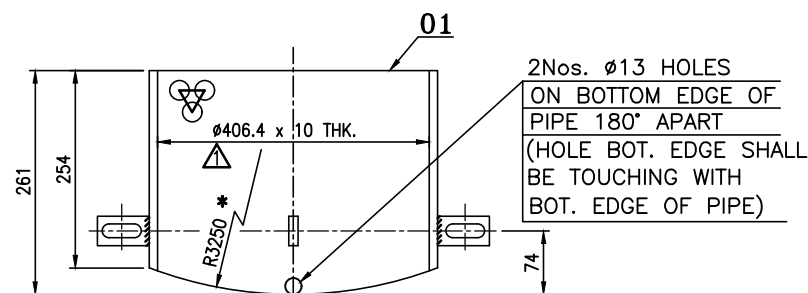


DETAIL OF HOLE PITCH

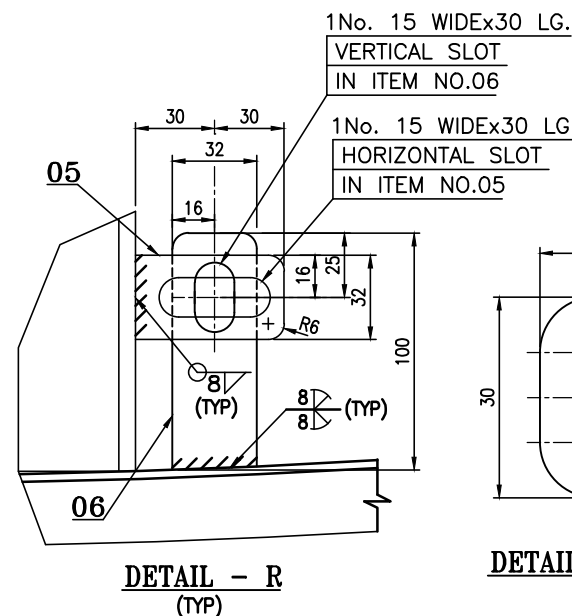


VORTEX BREAKER PLATE(2)

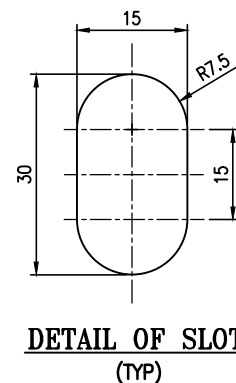
VORTEX BREAKER PLATE(1)



* THIS PROFILE SUITS TO PERPENDICULAR DIRECTION OF VESSEL LONGITUDINAL AXIS



DETAIL - R (TYP)



DETAIL OF SLOT (TYP)

TOTAL WEIGHT: 63.302									
ITEM NO.	DESCRIPTION	MATERIAL CODE	UNIT	QUANTITY	UNIT WEIGHT	TOTAL WEIGHT	MATERIAL SPECIFICATION	DRAWING NUMBER	ITEM NO.
07	MACHINE BOLT WITH TWO HEX. NUTS 1/2" UNC x 70 LG.	SA193Gr.B8CA/SA194Gr.8CA	KG	0.116	4				
06	VORTEX BREAKER VERT. SUPT. PL. 12 THK. x 32 x 100	SA 240 TP 347	KG	0.196	4				
05	VORTEX BREAKER HORIZ. SUPT. PL. 12 THK. x 32 x 60	SA 240 TP 347	KG	0.119	4				
04	VORTEX BREAKER TOP PLATE OD 508 x 10 THK.	SA 240 TP 347	KG	16.215	1				
03	VORTEX BREAKER PLATE(2) 10 THK. x 515 x 198.2 AS PER DRG.	SA 240 TP 347	KG	7.341	2				
02	VORTEX BREAKER PLATE(1) 10 THK. x 515 x 404.4 AS PER DRG.	SA 240 TP 347	KG	15.006	1				
01	PIPE FOR STRAINER ID406.4x10TK-261LG. 1308 x 261 x 10TK.	SA 240 TP 347	KG	15.675	1				

DRAWING NO.		DRAWING TITLE	
REFERENCE DOCUMENTS / DRAWINGS			
DRG. CATEGORY: (USE TICK MARK)	☒ R ☐ I	EIL REVIEW/APPROVAL CODE:	VPIL NO.:
SCH. DATE OF SUBMISSION	DOCUMENT STATUS		
STATEMENT OF SUB: ☐ 1st ☐ 2nd ☐ 3rd	☐ REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION/ CONSTRUCTION AS PER THE DOCUMENT.		
☐ FINAL FOR CODE-1 ☐ AS BUILT	☐ REVIEW CODE 2 - PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.		
☐ AS BUILT ☐ INFORMATION	☐ REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW.		
☐ CONSTRUCTION ☐ REVIEW	☐ R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION		
SIGN:	DATE:	☐ V-VOID	
NAME DISCIPLINE SIGN DATE			
01 REVISED AS PER CUST. COMMENTS VAR AVR K.T 16.10.20			
00 ISSUED FOR APPROVAL VAR AVR K.T 21.05.20			
REV.	DESCRIPTION	DRN	CHECKED APPROVED REVIEWED APPROVED DATE
OWNER	HINDUSTAN PETROLEUM CORPORATION LIMITED VISAKH REFINERY MODERNIZATION PROJECT EPCC-03 PACKAGE FOR RESIDUE UP-GRADATION FACILITY (RUF)		
PMC :	ENGINEERS NDIA LIMITED (A Govt. of India Undertaking)		
LSTK CONTRACTOR:	L&T Hydrocarbon Engineering		
DETAILED ENGINEERING CENTER:	L&T - CHIYODA LIMITED		
VENDOR :	VENDOR PO NO: HPCL RUF-STA-NGU-0010 DT:18.03.2020		
Bharat Heavy Electricals Limited UNIT: HEAVY PLATES & VESSELS PLANT VISAKHAPATNAM-530012	VENDOR DWG. NO: 3-PV-180-U0226, REV. 0		
DATE 07-07-20	SCALE N.T.S	TITLE: ASSEMBLY DETAILS OF HT FLARE KO DRUM (ITEM NO. 504-V-805A)	
DEPT: HT ENGG.	(STRAINER & VORTEX BREAKER ASSEMBLY AT NOZZLE 3)		
DRN BY: K. MUNAYYA	PROJECT:	DRG. NO.:	SH. 07 OF 08
CHK BY: A.V.RAO	PWO NO.:	B016-RUF-LT-504-MS- FD-BHEL(1)-02652	REV. 01
APP BY: K.TARAKESH	CAD MAKE THIS DRG. USING CAD SYSTEM ONLY FILE:		

L&T - CHIYODA LIMITED			
☐ REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE DOCUMENT.			
☐ REVIEW CODE 2 - PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.			
☐ REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW.			
☐ R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION			
☐ V-VOID			
COMMENTED BY	REVIEWED BY	APPROVED BY	DATE
THIS REVIEW / APPROVAL DOES NOT RELIEVE THE VENDOR / MANUFACTURER OF THE FULL RESPONSIBILITY AS TO DESIGN CORRECTNESS OF DIMENSIONS & COMPLIANCE WITH ALL APPLICABLE REGULATIONS AND WITH THE REQUIREMENTS MADE IN PURCHASER SPECIFICATIONS.			

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ALL RIGHTS RESERVED

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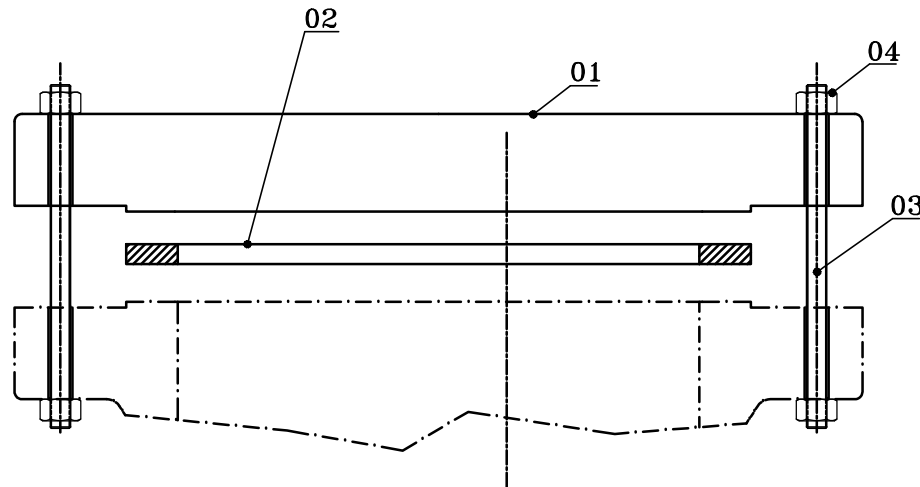
REF. NO. B016-RUF-LT-504-MS-PD-BHEL(1)-02652									
DRG. NO. 3-PV-180-U0239									
		04	NUT 1 7/8"-8UN				----		1.905
							SA194GR.2HM		132
		03	STUD 1 7/8"-8UNx 440 LG				----		4.000
							SA193GR.B7M		44
		02	GASKET-300#; SPW SS316L GRAF. FILLED INNER RING				----		3.370
							SS 316 INNER RING+ CS RING		1
		01	BLANK FLANGE NPS 50"-300#				----		2014.87
							SA 105		1
	07		NOZZLE-50" - 300#				----		---
							(WELDMENT)		
		04	NUT 1 5/8"-8UN				----		0.736
							SA194GR.2HM		192
		03	STUD 1 5/8"-8UNx 350 LG				----		3.303
							SA193GR.B7M		64
		02	GASKET-300#; SPW SS316L GRAF. FILLED INNER RING				----		1.250
							SS 316 INNER RING+ CS RING		2
		01	BLANK FLANGE NPS 36"-300#				----		1104.51
							SA 105		2
	06		NOZZLE-36" - 300#				----		---
							(WELDMENT)		
		04	NUT 1 1/2"-8UN				----		0.595
							SA194GR.2HM		72
		03	STUD 1 1/2"-8UN x 265 LG				----		2.170
							SA193GR.B7M		24
		02	GASKET-300#; SPW SS316L GRAF. FILLED INNER RING				----		1.000
							SS 316 INNER RING+ CS RING		1
		01	BLANK FLANGE NPS 24"-300#				----		342.000
							SA 105		1
	05		NOZZLE-24" - 300#				----		---
							(WELDMENT)		
		04	NUT 1 1/4"-8UN				----		0.357
							SA194GR.2HM		60
		03	STUD 1 1/4"-8UN x 255 LG				----		1.376
							SA193GR.B7M		20
		02	GASKET-600#; SPW SS316L GRAF. FILLED INNER RING				----		0.750
							SS 316 INNER RING+ CS RING		1
		01	BLANK FLANGE NPS 12"-600#				----		83.000
						SA 105		1	
04		NOZZLE-12" - 600#				----		---	
						(WELDMENT)			
	04	NUT 1"-8UN				----		0.193	
						SA194GR.2HM		48	
	03	STUD 1"-8UN x 185 LG				----		0.624	
						SA193GR.B7M		16	
	02	GASKET-300#; SPW SS316L GRAF. FILLED INNER RING				----		0.500	
						SS 316 INNER RING+ CS RING		1	
	01	BLANK FLANGE NPS 10"-300#				----		58.000	
						SA 105		1	
03		NOZZLE-10" - 300#				----		---	
						(WELDMENT)			
	04	NUT 7/8"-9UNC				----		0.135	
						SA194GR.2HM		48	
	03	STUD 7/8"-9UNC x 140 LG				----		0.360	
						SA193GR.B7M		24	
	02	GASKET-300#; SPW SS316L GRAF. FILLED INNER RING				----		0.200	
						SS 316 INNER RING+ CS RING		2	
	01	BLANK FLANGE NPS 8"-300#				----		37.000	
						SA 105		2	
02		NOZZLE-8" - 300#				----		---	
						(WELDMENT)			
	04	NUT 3/4"-10UNC				----		0.088	
						SA194GR.2HM		352	
	03	STUD 3/4"-10UNC x 120 LG				----		0.224	
						SA193GR.B7M		176	
	02	GASKET-300#; SPW SS316L GRAF. FILLED INNER RING				----		0.200	
						SS 316 INNER RING+ CS RING		22	
	01	BLANK FLANGE NPS 3"-300#				----		7.000	
						SA 105		22	
01		NOZZLE-3" - 300#				----		---	
						(WELDMENT)			
VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	\$	DRAWING NUMBER	ITEM-NO	MATERIAL CODE	A/C/P	UNIT WEIGHT	3
					MAR-NO	MATERIAL SPECN	CH	QUANTITY	

A3

CUT TO CLEAR THE ATTACHMENTS.

SPECIAL NOTE:

BHEL SHALL ENSURE COMPLIANCE OF ALL DIMENSIONS/SKETCHES IN THIS MANUFACTURING ASSEMBLY DRAWING W.R.T GENERAL ASSEMBLY DRAWING: B016-RUF-LT-504-MS-GA-BHEL(1)-02651



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L&T - CHIYODA LIMITED			
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☐ R - DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION			
☐ V-VOID			
COMMENTED BY	REVIEWED BY	APPROVED BY	DATE
THIS REVIEW / APPROVAL DOES NOT RELIEVE THE VENDOR / MANUFACTURER OF THE FULL RESPONSIBILITY AS TO DESIGN CORRECTNESS OF DIMENSIONS & COMPLIANCE WITHALL APPLICABLE REGULATIONS AND WITH THE REQUIREMENTS MADE IN PURCHASER SPECIFICATIONS.			

DRAWING NO.		CLIENT DRAWING NO.		DRAWING TITLE		REV
REFERENCE DOCUMENTS / DRAWINGS						
DRG. CATEGORY: (USE TICK MARK)		☒ R	☐ I	EIL REVIEW/APPROVAL CODE:		VPIL NO.:
SCH. DATE OF SUBMISSION						
DOCUMENT STATUS		☐ REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE DOCUMENT.				
STATEMENT OF SUB: 1st 2nd 3rd		☐ REVIEW CODE 2 - PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.				
☐ FINAL FOR CODE-1		☐ AS BUILT				
ISSUED FOR		☐ REVIEW CODE 3 - DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW.				
☐ AS BUILT		☐ INFORMATION				
☐ CONSTRUCTION		☐ REVIEW				
SIGN:		DATE:				
NAME		DISCIPLINE		SIGN		DATE
00	ISSUED FOR APPROVAL	KMY	AVR	TK	---	07.07.20
REV.	DESCRIPTION	DRN	CHECKED	APPROVED	REVIEWED	APPROVED DATE
OWNER	HINDUSTAN PETROLEUM CORPORATION LIMITED VISAKH REFINERY MODERNIZATION PROJECT EPCC-03 PACKAGE FOR RESIDUE UP-GRADATION FACILITY (RUF)					
PMC :	ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)					
LSTK CONTRACTOR:	L&T Hydrocarbon Engineering					
DETAILED ENGINEERING CENTER:		L&T - CHIYODA LIMITED				
VENDOR :		BHEL PO NO: REFINERY/75000-66912/NG; DATE: 18.03.2020				
BHEL Bharat Heavy Electricals Limited UNIT: HEAVY PLATES & VESSELS PLANT VISAKHAPATNAM-530012		BHEL DWG. NO: 3-PV-180-U0239, REV. A				
DATE	SCALE	TITLE:				
07.07.20	N.T.S	ASSEMBLY DETAILS OF HT FLARE KO DRUM				
DEPT: HT ENGG.		ITEM NO. 504-V-805A				
DRN BY: MUNAYYA K		PROJECT:		CUSTOMER REF. DRG. NO. :		SH.8 OF 8
CHK BY: A V RAO		PWO NO.:		B016-RUF-LT-504-MS-FD-BHEL(1)-02652		REV. 00
APP BY: TARAKESH K		CAD REUSE THIS DRG. USING CAD SYSTEM ONLY FILE:				

	MANUFACTURER'S NAME & ADDRESS BHEL-VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN	Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B016-504 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020
		QAP NO: B016-RUF-LT-504-QC-QD-BHEL (1)-02001 Rev.0 Date : 01-10-2020 Page 1 of 12 BHEL SO: 2438; Internal CQP No: 2505	

Code of Construction: ASME Section VIII Div.1, Edition 2019 with "U" Stamping.

VESSELS with SKIRT		
Sl. No.	Item Description	Tag Number
1.	SULFIDING CHEMICAL DRUM	504-V-315
2.	CATALYST INVENTORY HOLDING BIN	504-V-607 A/B/C
VESSELS with BOOT and Saddle		
Sl. No.	Item Description	Tag Number
1.	HOS PRODUCT DRUM	504-V-201
2.	HP FLARE KO DRUM	504-V-801
3.	LP FLARE KO DRUM	504-V-802

BHPV to specify the special requirements like NACE service & its stages shall be captured suitably on the ITP.

 P. Gopi Kishore Manager/QA/BHEL	 A.K. Mandal AGM/Q & BE/BHEL	TUV	AI	LTHE	EIL
Prepared By	Reviewed By	Approved			

		MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.		QUALITY ASSURANCE PLAN QAP NO: B016-RUF-LT-504-QC-QD-BHEL (1)-02001 Rev.0 Date : 01-10-2020 Page 2 of 12 BHEL SO: 2438; Internal CQP No: 2505		Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B016-504 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020			
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection			EIL	Remarks
					M	TUV	AI		

1.0	Design & Drawings approval	Drawings & Design Calculations	ASME Sec VIII Div.1 Ed 2019 & PR Specifications	Drawings & Design Calculations	H	V	R		
2.0	ITP / QAP	Documents & Inspection Stages	ASME Sec VIII Div.1 Ed 2019 & other specifications as per approved General Assembly drawing	QAP	H	H	A		
3.0	Procedures								
3.1	Welding Procedure Specification & WPQ	Compliance to ASME Sec IX	ASME Sec VIII Div.1 & Sec IX and CLG and EIL specifications	WPS & PQR	H	R/W	R		TPIA inspection envisaged for any new WPS or WPQ R- for old PQR W-New PQR to be qualified.
3.2	All Manufacturing, Test Procedures a) NDT (UT/RT/MT/PT) b) NDE Plan c) Surface Preparation & Painting d) Hydro test e) Hardness test f) Heat Treatment	Procedure & Acceptance Criteria	ASME Sec VIII Div.1 Ed 2019 & & other specifications as per approved General Assembly drawing	Procedure	H	R	R		

		MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN		Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B016-504 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020					
			QAP NO: B016-RUF-LT-504-QC-QD-BHEL (1)-02001 Rev.0 Date : 01-10-2020 Page 3 of 12 BHEL SO: 2438; Internal CQP No: 2505							
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection			EIL	Remarks	
					M	TUV	AI			
3.2a	Heat Treatment procedure for Dénd	Procedure & Acceptance Criteria	ASME Sec VIII Div.1 Ed 2019 & PR Specifications	Procedure	H	R	R			
4.0	Raw Materials									
4.1	Plates, Pipes, Fittings, Forgings, Fasteners, Gaskets etc., (as applicable) at sourcing locations.	PO., Approved Drawings	ASME Section II A & other specifications as per PR	Test Certificates / Check test results	H	R	R		Raw materials will be inspected by BHEL appointed TPIA.	

Material shall comply to EIL specification: 6.-79-0003 for applicable tags.

 MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.		QUALITY ASSURANCE PLAN			Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B016-504 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020				
		QAP NO: B016-RUF-LT-504-QC-QD-BHEL (1)-02001 Rev.0 Date : 01-10-2020 Page 4 of 12 BHEL SO: 2438; Internal CQP No: 2505							
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection			EIL	Remarks
					M	TUV	AI		

Raw Materials after receipt									
4.2	All Pressure parts / Part attached to Pressure part	PO., Approved Drawings	ASME Section II A & other specifications as per PR	Test Certificates / Check test results	H	H	R		
4.3	Non Pressure parts	PO., Approved Drawings	ASME Section II A & other specifications as per PR	Test Certificates / Check test results	H	R	-		
4.4	Welding Consumables	PO	ASME Section II C, CLG PVM-SU-4750-H & other specifications as per PR	Test Certificates	H	R	R		
4.5	Fasteners & Gaskets	PO, Drawings	ASME Section II A & other specifications as per PR	Test Certificates	H	W	-		PMI of AS, SS Material as applicable.

		MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN		Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara					
			QAP NO: B016-RUF-LT-504-QC-QD-BHEL (1)-02001 Rev.0 Date : 01-10-2020 Page 5 of 12 BHEL SO: 2438; Internal CQP No: 2505		Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B016-504 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020					
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection			EIL	Remarks	
					M	TUV	AI			

5.0	Fabrication of Dished Ends along with PTC as applicable								
5.1	Transfer of Marking and Heat Number	Material Spec & Heat Number	Drawing & TDC	Inspection Report	H	R	R		
5.2	Weld Edge Preparation & DPT	Detection of flaws	Drawing	Inspection Report	H	R	R		
5.3	Fit up & Welding, WFMT of L-Seam WFMT IN ALL STAGES	Offset & weld geometry	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	-		Refer Note-1
5.4	100% PT on chipped back L-seam weld	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	-		Refer Note-1
5.5	Forming of Dished End	Dimensional & Template check	As per Drawing	Inspection Report	H	R	-		
5.6	Heat Treatment (along with PTC)	Time & Temperature	ASME Sec VIII Div.1 & Drawing	HT Chart / Report	H	R	-		HT procedure duly approved to be followed.
5.7	100% PT on Knuckle inside & outside including welds and WEP after forming & heat treatment	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	W	-		
5.8	100% RT of L-Seam weld after forming and heat treatment	Detection of flaws	ASME Sec VIII Div.1 & Drawing	RT Films / Records	H	R	R		

Along with Boot D/E as per applicable tags

		MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN		Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B016-504 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020					
			QAP NO: B016-RUF-LT-504-QC-QD-BHEL (1)-02001 Rev.0 Date : 01-10-2020 Page 6 of 12 BHEL SO: 2438; Internal CQP No: 2505							
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection			EIL	Remarks	
					M	TUV	AI			

5.9	Final Dimensions (minimum thickness, profile, roundness, ovality etc.,)	Visual & dimensional	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	H	R		Along with Boot D/E as per applicable tags
5.10	Test Coupon testing (if applicable)	Tensile Strength & Hardness as applicable.	ASME Sec VIII Div.1 & PVM-SU-4750-H Cl.No. 7.6 to 7.8	Test report ← along with complete Equipment	H	H	-		
6.0	Fabrication of Main Shell / Boot along with PTC as applicable								
6.1	Plate marking and cutting	Dimensions	Drawing	Inspection Report	H	R	R		
6.2	Weld Edge Preparation & DPT	Detection of flaws	Drawing	Inspection Report	H	W	R		
6.3	Shell rolling	Dimensions	Drawing	Inspection Report	H	-	-		
6.4	Fit up & Welding, WFMT of L-Seam	Offset & weld geometry	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	RW	-		
6.5	100% PT on chipped back L-seam weld	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	-		
6.6	RT on L-seam weld	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	R		Refer Note-2

	MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN QAP NO: B016-RUF-LT-504-QC-QD-BHEL (1)-02001 Rev.0 Date : 01-10-2020 Page 7 of 12 BHEL SO: 2438; Internal CQP No: 2505			Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B016-504 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020				
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection			EIL	Remarks
					M	TUV	AI		

7.0	Shell to Shell Circular Seam fabrication								
7.1	Weld Edge Preparation & DPT	Detection of flaws	Drawing	Inspection Report	H	R	R		
7.2	Fit up & Welding, WFMT of C-Seam	Offset & weld geometry	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	RW	-		Refer Note-1
7.3	100% PT on chipped back C-seam weld	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	-		Refer Note-1
7.4	RT on C-seam weld	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	R		Refer Note-2
8.0	Shell to Dished end / Shell to Boot / Boot to Boot Dished end Circular Seam fabrication								
8.1	Weld Edge Preparation & DPT	Detection of flaws	Drawing	Inspection Report	H	R	R		
8.2	Fit up & Welding, WFMT of C-Seam	Offset & weld geometry	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	RW	-		Refer Note-1
8.3	100% PT on chipped back C-seam weld	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	-		Refer Note-1
8.4	RT on C-seam weld	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	R		Refer Note-2

		MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN		Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara				
			QAP NO: B016-RUF-LT-504-QC-QD-BHEL (1)-02001 Rev.0 Date : 01-10-2020 Page 8 of 12 BHEL SO: 2438; Internal CQP No: 2505		Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B016-504 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020				
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection			EIL	Remarks
					M	TUV	AI		

9.0	Fabrication of Nozzle Assemblies								
9.1	Weld Edge Preparation & DPT	Detection of flaws	Drawing	Inspection Report	H	R	R		
9.2	Fit up, Welding of C-Seam of pipes /elbows / flanges / nozzle neck	Offset & weld geometry	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	-		Refer Note-1
9.3	RT on C-seam weld	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	R		
10.0	Nozzle to Shell / Dished end / Boot / Boot Dished end fabrication								
10.1	Marking and Openings of nozzles on shell / dished end.	Location and Orientation	Drawing	Inspection Report	H	R	R		
10.2	PT on weld edges & after root run	Detection of flaws	Drawing	Inspection Report	H	R	-		
10.3	Fit up & Welding of Nozzles on shells / dished ends	Offset & weld geometry	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	RW	-		Refer Note-1
10.4	100% RT on Lip type nozzle weld (if applicable)	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	R		
10.5	PT on final weld of Nozzle to shell / dished ends	Detection of flaws	Drawing	Inspection Report	H	RW	-		

	MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN			Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B016-504 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020				
		QAP NO: B016-RUF-LT-504-QC-QD-BHEL (17-02001) Rev.0 Date : 01-10-2020 Page 9 of 12 BHEL SO: 2438; Internal CQP No: 2505							
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection			EIL	Remarks
					M	TUV	AI		

Please separate the stages for saddle & skirt supports with respect to tag number as NDE requirements are clearly specified in Chevron specification PVM-SU-4750.

10.6	100% PT on chipped back C-seam weld	Detection of flaws	Drawing	Inspection Report	H	R	-		
10.7	100% UT on nozzle to shell / nozzle to pipe, before PWHT if applicable	Detection of flaws	Drawing	Inspection Report	H	W	-		
10.8	Pneumatic test on RF pads	Detection of leakage	Drawing	Inspection Report	H	R W	-		
11.0	Fabrication of Internal attachments								
11.1	Welding of Internal attachments	Location & Dimensions	Drawing	Inspection Report	H	-	-		
11.2	NDE for Internal attachments weld	Detection of flaws	Drawing	Inspection Report	H	-	-		
12.0	Saddle / Skirt fabrication and Assembly								
12.1	Fit up and Welding of Saddle/Skirt, saddle/Skirt with Vessel	Offset & weld geometry	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	-		
12.2	100% PT on welds	Detection of flaws	Drawing	Inspection Report	H	R	-		
12.3	Dimensional inspection of Saddle / Skirt	Dimensions	Drawing	Inspection Report	H	W	-		W-During Final Inspection

PVM-SU-4750-H CI. No.: 9.5 - TO BE COMPLY AND ADDED IN INSPECTION STAGE ACTIVITY FOR TAG NO.- 504-V-315 AND 504-V-607A/B/C.

	MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN			Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B016-504 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020				
		QAP NO: B016-RUF-LT-504-QC-QD-BHEL (1)-02001 Rev.0 Date : 01-10-2020 Page 10 of 12 BHEL SO: 2438; Internal CQP No: 2505							
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection			EIL	Remarks
					M	TUV	AI		

13.0	Final Dimensional inspection before PWHT & clearance for PWHT	Dimensions & orientations	Drawing	Inspection Report	H	H	R		
14.0	PWHT of Equipment along with PTC	Time & Temperature	ASME Sec VIII Div.1 & Drawing	HT Chart / Report	H	R	-		PWHT procedure duly approved to be followed
15.0	Hardness check of all pressure joints on weld / HAZ / PM	Hardness	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	H	-		
16.0	NDE after PWHT 100% UT on pressure retaining weld	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	RW	-		
17.0	Spot PT on internal & External welds	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	RW	-		
18.0	Final Dimensional inspection	Dimensions & orientations	Drawing	Inspection Report	H	H	R		Complete Equipment Visual inspection of both Internal & External
19.0	Hydro static testing followed by drying & cleaning	No pressure drop or leakage	Drawing	Inspection Report	H	H	R		
20.0	Spot PT after Hydro testing	Detection of flaws	Drawing	Inspection Report	H	W	-		

ADD COUPON TESTING STAGE

H

	MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN			Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B016-504 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020				
		QAP NO: B016-RUF-LT-504-QC-QD-BHEL (1)-02001 Rev.0 Date : 01-10-2020 Page 11 of 12 BHEL SO: 2438; Internal CQP No: 2505							
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection			EIL	Remarks
					M	TUV	AI		

21.0	Outside Surface Preparation (Blasted Surface Profile & Salt Contamination Tests)	Surface profile & salt contamination	Drawing & Approved procedure	Inspection Report	H	RW	-		
22.0	Painting	Visual & DFT etc	Drawing, Approved procedure	Inspection Report	H	RW	-		
23.0	Nozzles blanking & N2 filling (if specified in drawing)	Physical verification	Drawing		H	W	-		
24.0	Name plate fixing, punching and rub off	Visual	Drawing	Inspection Report	H	H	-		
25.0	Inspection of Mandatory & Commissioning spares	Physical Verification	Drawing & approved spares list (as applicable)	Inspection Report	H	H	-		
26.0	Manufacturer's Data Report & Final Documentation	Documentation	Drawings & ITP/QAP	MDR	H	R	-		
27.0	Issue of IRN & clearance for dispatch	Completeness	Drawing, Approved procedure	Inspection Release Note	H	H	-		

	MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN			Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B016-504 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020				
		QAP NO: B016-RUF-LT-504-QC-QD-BHEL (1)-02001 Rev.0 Date : 01-10-2020 Page 12 of 12 BHEL SO: 2438; Internal CQP No: 2505							
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection			EIL	Remarks
					M	TUV	AI		

Notes:

- 1) As per CLG Spec. PVM-SU-4750-H Clause No. 9.2, WFMT shall be performed for Category A,B,C & D butt-welded root areas and prior to back welding.
- 2) Extent of RT shall be in line to the approved drawing.

Legends:

P: Perform	Drawing : Approved Drawing	WPS: Welding procedure specification	DFT: Dry film thickness
A-Approval	Spec : Specification	WPQ; Welder performance Qualification	RT: Radiographic testing
W-Witness	LS: Longitudinal Seam welding	TUV: TUV India Pvt Ltd., (Third party inspection agency appointed by M/s LTHE	UT: Ultrasonic testing manual
RW: Random Witness	M-BHEL or BHEL approved sub-contractor		PT: Dye penetrant testing
H: Hold	IRN: Inspection release note issued by TUV		MPT: Magnetic particle testing
V: Verification of reports/Procedures	HT Chart: Heat Treatment chart	PR: Purchase Requisition	R: Review

		Residue Upgradation Facility (RUF) EPCC-3 Package for Visakh Refinery Modernization Project (VRMP)		 L&T Hydrocarbon Engineering													
				L&T-CHIYODA LIMITED													
Title: INSPECTION & TEST PLAN (504-V-805 A) Doc. No.: B016-RUF-LT-504-QC-QD-BHEL(1)-02006				Rev. No.: 0 Page : 1 of 1													
OWNER : HINDUSTAN PETROLEUM CORPORATION LIMITED (HPCL) PMC : ENGINEERS INDIA LIMITED, NEW DELHI (EIL) UNIT : 504 PMC JOB NO. : B016 EQUIPMENT DESCRIPTION : ODC Vessels EQUIPMENT TAG : 504-V-805 A P. R. NO : B016-RUF-LT-504-MS-PR-0007 VENDOR NAME : BHARAT HEAVY ELECTRICALS LIMITED VENDOR DOCUMENT NO. : CQP 2499																	
DOCUMENT SUBMISSION STATUS – LTHE/VENDOR		1.1.1.1 REVIEW STATUS															
DOC. CATEGORY: (USE TICK MARK)		LTHE		EIL													
☐ A ☐ R ☐ I		☐ REVIEW CODE 1 – NO COMMENTS. PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE DOCUMENT.		☐ REVIEW CODE 1 – NO COMMENTS. PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE DOCUMENT.													
☒ REVIEW CODE 2 – PROCEED WITH MANUFACTURE/FABRICATION/CONSTRUCTION AS PER COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.		☐ REVIEW CODE 2 – PROCEED WITH MANUFACTURE/FABRICATION/CONSTRUCTION AS PER COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.		☐ REVIEW CODE 2 – PROCEED WITH MANUFACTURE/FABRICATION/CONSTRUCTION AS PER COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED.													
ISSUED FOR		☐ REVIEW CODE 3 – DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW.		☐ REVIEW CODE 3 – DOCUMENT DOES NOT CONFORM TO BASIC REQUIREMENTS AS MARKED. RESUBMIT FOR REVIEW.													
☐ REVIEW ☐ INFORMATION ☐ CONSTRUCTION ☐ AS BUILT Reviewed & Commented R.m. Jha 		☐ R- DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION ☐ V- VOID		☐ R- DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION ☐ V- VOID													
09.09.2020		QA_QC DISCIPLINE		VR SIGN													
09.09.2020		09.09.20 DATE		09.09.20 DATE													
Total Comments-32																	
<table border="1"> <tr> <td>0</td> <td>INSPECTION & TEST PLAN</td> <td>P.G Kishore</td> <td>A.K Mandal</td> <td></td> <td></td> </tr> <tr> <td>Rev.</td> <td>Description</td> <td>Prepared By</td> <td>Reviewed By</td> <td>Approved By</td> <td>Approved Date</td> </tr> </table>						0	INSPECTION & TEST PLAN	P.G Kishore	A.K Mandal			Rev.	Description	Prepared By	Reviewed By	Approved By	Approved Date
0	INSPECTION & TEST PLAN	P.G Kishore	A.K Mandal														
Rev.	Description	Prepared By	Reviewed By	Approved By	Approved Date												

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All NDE & testing requirements shall be captured with respect to EIL, CLG specification requirements.

	MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN	Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B-016 1-B016-504 on all pages L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020
		QAP NO: B016-RUF-LT-504-QC-QD-BHEL(1)-02006 Rev. 0 Date : 29-08-2020 Page 1 of 16 BHEL SO: 2438; Internal CQP No: 2499	

Code of Construction: ASME Section VIII Div.1, Edition 2019 with "U" Stamping.

Sl. No.	Item Description	Tag Number
1.	HT FLARE KO DRUM	504-V-805 A

P. Gopi Kishore Manager/QA/BHEL	A.K. Mandal AGM/Q & BE/BHEL	TUV	AI	LTHE	EIL
Prepared By	Reviewed By	Approved			

		MANUFACTURER'S NAME & ADDRESS BHEL-VISAKHAPATNAM or Approved Sub Contractor.		QUALITY ASSURANCE PLAN		Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B 016 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020					
				QAP NO: B016-RUF-LT-504-QC-QD-BHEL(1)-02006 Rev.0 Date : 29-08-2020 Page 2 of 16 BHEL SO: 2438; Internal CQP No: 2499							
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection				EIL	Remarks	
					M	TUV	AI	LTHE			

1.0	Design & Drawings approval	Drawings & Design Calculations	ASME Sec VIII Div.1 Ed 2019 & Customer Specifications	Drawings & Design Calculations	H	V	R			
2.0	ITP / QAP	Documents & Inspection Stages	ASME Sec VIII Div.1 Ed 2019 & & other specifications as per approved General Assembly drawing	QAP	H	H	A			
3.0		Procedures								
3.1	Welding Procedure Specification & WPQ (Refer Note-7)	Compliance to ASME Sec IX	ASME Sec VIII Div.1 & Sec IX 2-and licensor and PMC specification	WPS & PQR	H	R/W#	R			TPIA inspection envisaged for any new WPS or WPQ R- for old PQR W#-New PQR to be qualified by TPIA appointed by BHEL.
3.2	All Manufacturing, Test Procedures a) NDT (UT/RT/MT/PT) b) NDE Plan c) Surface Preparation & Painting d) Hydro test e) Ferrite measurement f) PMI g) Hardness test h) Pickling & Passivation i) PWHT Procedure	Procedure & Acceptance Criteria	ASME Sec VIII Div.1 Ed 2019 & & other specifications as per approved General Assembly drawing	Procedure	H	R 3-R	R			

PR/MR

Remove this column

Replaced by Reviewed for AI

WFMT to be included

ISR & DHT Procedure to be included

		MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN		Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B 016 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020						
			QAP NO: B016-RUF-LT-504-QC-QD-BHEL(1)-02006 Rev.0 Date : 29-08-2020 Page 3 of 16 BHEL SO: 2438; Internal CQP No: 2499								
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection				EIL	Remarks	
					M	TUV	AI	LTHE			

3.2a	Heat Treatment procedure for Dénd	Procedure & Acceptance Criteria	ASME Sec VIII Div.1 Ed 2019 & Customer Specifications	Procedure	H	R	R			
3.2b	Heat Treatment procedure for complete equipment	Procedure & Acceptance Criteria	ASME Sec VIII Div.1 Ed 2019 & Customer Specifications	Procedure	H	R	R			
3.2c	Annealing Procedure to control Hardness of Formed Components	Procedure & Acceptance Criteria	ASME Sec VIII Div.1 Ed 2019 & Customer Specifications	Procedure	H	R	R			
3.2d	Procedure for material handling and protection of high alloy clad or weld-overlaid vessel parts and the completed vessels	Procedure	PVM-SU-1322-H.1 (Cl. No. 6.1.5)	Procedure	H	R	R			
4.0	Raw Materials									
4.1	Plates, Pipes, Fittings, Forgings, Fasteners, Gaskets etc., (as applicable) at sourcing locations.	PO., Approved Drawings	ASME Section II A & other specifications as per approved General Assembly drawing	Test Certificates / Check test results	H	R	R W			Raw materials will be inspected by BHEL appointed TPIA.

Please check with specification & comply

& LAS material, Alloy 625

		MANUFACTURER'S NAME & ADDRESS BHEL-VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN		Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B 016 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020					
			QAP NO: B016-RUF-LT-504-QC-QD-BHEL(1)-02006 Rev.0 Date : 29-08-2020 Page 4 of 16 BHEL SO: 2438; Internal CQP No: 2499							
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection				EIL	Remarks
					M	TUV	AI	LTHE		

Raw Materials after receipt										
4.2	All Pressure parts / Part attached to Pressure part	PO., Approved Drawings	ASME Section II A & other specifications as per approved General Assembly drawing	Test Certificates / Check test results	H	H	R W			PMI of SS Material as applicable.
4.3	Non Pressure parts	PO., Approved Drawings	ASME Section II A & other specifications as per approved General Assembly drawing	Test Certificates / Check test results	H	R	R ⁻			
4.4	Welding Consumables	PO	ASME Section II C & CLG PVM-SU-5004-I	Test Certificates	H	R	R			
4.5	Fasteners & Gaskets	PO, Drawings	5-and other licensor and PMC specification ASME Section II A & other specifications as per approved General Assembly drawing	Test Certificates	H	W	-			PMI of SS Material as applicable.

EIL SPECIFICATION 6-12-0003 & CLAD VESSEL SPECIFICATION SHALL BE CAPTURED

As per EIL specification 6-12-0003, UT shall be carried out for weld edges.

		MANUFACTURER'S NAME & ADDRESS BHEL-VISAKHAPATNAM or Approved Sub Contractor.		QUALITY ASSURANCE PLAN QAP NO: B016-RUF-LT-504-QC-QD-BHEL(1)-02006 Rev.0 Date : 29-08-2020 Page 5 of 16 BHEL SO: 2438; Internal CQP No: 2499		Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B 016 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020					
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection				EIL	Remarks	
					M	TUV	AI	LTHE			

Fabrication of Dished Ends										
5.0										
5.1	Transfer of Marking and Heat Number for Plates	Material Spec & Heat Number	Drawing & TDC	Inspection Report	H	R	W	R		
5.2	Weld Edge Preparation & DPT	Detection of flaws	Drawing	Inspection Report	H	R	R			
5.3	Fit up & Welding of L-Seam along with PTC	Offset & weld geometry	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	-			
5.4	100% PT on chipped back L-seam weld	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	-			
	Clad restoration on L-seam weld	Welding parameters	WPS	-	H	R	-			Refer Note-1
	100% PT on clad restoration each layer	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R/RW	-			8- Refer Note-4
	Ferroxyl test after clad restoration	No iron contamination	Approved procedure	Inspection Report	H	W	-			It shall be after Hydro test and Pickling & Passivation
	Ferrite Number	% delta ferrite	PVM-SU-1322-H.1 Cl.No. 9.3.2	Inspection Report	H	RW	-			It shall be at the time of Final Dimensional Inspection
5.9	Chemical Analysis after Clad restoration	Chemical properties	PVM-SU-1322-H.1 Cl.No. 9.3.1.3 (a,b,c) AND 9.3.1.4 (a,b,c &d) OR 6-12-0007 Rev.4 Cl.No. 5.6	Inspection Report	H	R#	-			# Chip extraction shall be witnessed by L-TPIA.

6-Add one activity as per note - 6 & 7 for all plates before cutting

Add NDE of complete weld joint & CuSO4 Test prior to Clad restoration

9-Delete from all stage activity

		MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN		Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B 016 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020						
			QAP NO: B016-RUF-LT-504-QC-QD-BHEL(1)-02006 Rev.0 Date : 29-08-2020 Page 6 of 16 BHEL SO: 2438; Internal CQP No: 2499								
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection				EIL	Remarks	
					M	TUV	AI	LTHE			

5.10	Forming of Dished End	Dimensional & Template check	As per Drawing	Inspection Report	H	R	-			Forming & Heat Treatments as specified in Drawing.
5.11	Heat Treatment (along with PTC)	Time & Temperature	ASME Sec VIII Div.1 & Drawing	HT Chart / Report	H	R	-			HT procedure duly approved to be followed.
5.12	100% PT on Knuckle inside & outside including welds and WEP after forming & heat treatment	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	W	-			
5.13	100% RT of L-Seam weld after forming and heat treatment	Detection of flaws	ASME Sec VIII Div.1 & Drawing	RT Films / Records	H	R	R			
	Dis-bondment check (spot UT) for rolled sections of clad and weld overlay	Lack of bonding	ASME Sec VIII Div.1 & PVM-SU-1322-H.1 Cl.No. 9.2.2	UT Report	H	W	-			
5.15	Final Dimensions (minimum thickness, profile, roundness, ovality etc.,)	Visual & dimensional	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	H	R			Dished End NDE shall be witnessed by L-TPIA at the time of final visual & dimension of dish ends.
5.16	Test Coupon testing	Tensile Strength & Hardness as applicable.	ASME Sec VIII Div.1 & PVM-SU-4750-H Cl.No. 7.6 to 7.8	Test report	H	H	-			

Add CuSO₄ Test

Reports shall be submitted to AI for acceptance

Applicable EIL specification shall be referred.

		MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN			Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B 016 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020					
			QAP NO: B016-RUF-LT-504-QC-QD-BHEL(1)-02006 Rev.0 Date : 29-08-2020 Page 7 of 16 BHEL SO: 2438; Internal CQP No: 2499								
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection				EIL	Remarks	
					M	TUV	AI	LTHE			

6.0	Fabrication of Main Shell along with PTC as applicable									10-Refer comment no-6
6.1	Plate marking and cutting	Dimensions	Drawing	Inspection Report	H	R	R			
6.2	Weld Edge Preparation & DPT	Detection of flaws	Drawing	Inspection Report	H	W	R			
6.3	Shell rolling	Dimensions	Drawing	Inspection Report	H	-	-			
6.4	Fit up & Welding of L-Seam along with PTC	Offset & weld geometry	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	RW	-			
5	100% PT on chipped back L-seam weld	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	-			
6	100% RT on L-seam weld & test coupon	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	R			12- Refer Note-4
6.7	Clad restoration on L-seam weld	Welding parameters	WPS	-	H	R	-			Refer Note-1
6.8	100% PT on clad restoration each layer	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R/ RW	-			RW- for Final Layer
6.9	Ferroxyl test after clad restoration	No iron contamination	Approved procedure	Inspection Report	H	W	-			It shall be after Hydro test and Pickling & Passivation
6.10	Ferrite Number	% delta ferrite	PVM-SU-1322-H.1 Cl.No. 9.3.2	Inspection Report	H	RW	-			It shall be at the time of Final Dimensional Inspection

Add
CuSO4
test

11-& WFMT

13-Refer comment no-9

Stage for steam coil fabrication,NDE & its testing to be included

		MANUFACTURER'S NAME & ADDRESS BHEL-VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN		Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B 016 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020						
			QAP NO: B016-RUF-LT-504-QC-QD-BHEL(1)-02006 Rev.0 Date : 29-08-2020 Page 8 of 16 BHEL SO: 2438; Internal CQP No: 2499								
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection				EIL	Remarks	
					M	TUV	AI	LTHE			

6.11	Chemical Analysis after Clad restoration	Chemical properties	PVM-SU-1322-H.1 Cl.No. 9.3.1.3 (a,b,c) AND 9.3.1.4 (a,b,c &d) OR 6-12-0007 Rev.4 Cl.No. 5.6	Inspection Report	H	R #	-			# Chip extraction shall be witnessed by L-TPIA.
6.12	Dis-bondment check (spot UT) for rolled sections of clad	Lack of bonding	ASME Sec VIII Div.1 & PVM-SU-1322-H.1 Cl.No. 9.2.2	UT Report	H	W	-			
6.13	Test Coupon testing	Hardness	ASME Sec VIII Div.1	Test report	H	W	-			
14- PVM-SU-4750-H: Clause No.: 7.8.2b - Production test plates shall be heat treated with the vessel unless accepted otherwise by Owner.										
7.0	Shell to Shell Circular Seam fabrication									
7.1	Weld Edge Preparation & DPT	Detection of flaws	Drawing	Inspection Report	H	R	R			
7.2	Fit up & Welding of C-Seam	Offset & weld geometry	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	RW	-			
7.3	100% PT on chipped back C-seam weld	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	-			
7.4	100% RT on C-seam weld	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	R			16- Refer Note-4
	Clad restoration on C-seam weld	Welding parameters	WPS	-	H	R	-			Refer Note-1

Add
CuSO4
Test

		MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN			Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B 016 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020						
			QAP NO: B016-RUF-LT-504-QC-QD-BHEL(1)-02006 Rev.0 Date : 29-08-2020 Page 9 of 16 BHEL SO: 2438; Internal CQP No: 2499									
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection				EIL	Remarks		
					M	TUV	AI	LTHE				

7.6	100% PT on clad restoration each layer	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R/ RW	-			RW- for Final Layer
7.7	Ferroxyl test after clad restoration	No iron contamination	Approved procedure	Inspection Report	H	W	-			It shall be after Hydro test and Pickling & Passivation
7.8	Ferrite Number	% delta ferrite	PVM-SU-1322-H.1 Cl.No. 9.3.2	Inspection Report	H	RW	-			It shall be at the time of Final Dimensional Inspection
7.9	Chemical Analysis after Clad restoration	Chemical properties	PVM-SU-1322-H.1 Cl.No. 9.3.1.3 (a,b,c) AND 9.3.1.4 (a,b,c &d) OR 6-12-0007 Rev.4 Cl.No. 5.6	Inspection Report	H	R #	-			# Chip extraction shall be witnessed by L-TPIA.
8.0	Shell to Dished end Circular Seam fabrication									
8.1	Weld Edge Preparation & DPT	Detection of flaws	Drawing	Inspection Report	H	R	R			
8.2	Fit up & Welding of C-Seam	Offset & weld geometry	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	RW	-			
8.3	100% PT on chipped back C-seam weld	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	-			
8.4	100% RT on C-seam weld	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	R			R-RT Films 19- Refer Note-4
8.5	Clad restoration on C-seam weld	Welding parameters	WPS	-	H	R	-			Refer Note-1

		MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN			Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B 016 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020					
			QAP NO: B016-RUF-LT-504-QC-QD-BHEL(1)-02006 Rev.0 Date : 29-08-2020 Page 10 of 16 BHEL SO: 2438; Internal CQP No: 2499								
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection				EIL	Remarks	
					M	TUV	AI	LTHE			

8.6	100% PT on clad restoration each layer	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R/ RW	-			RW- for Final Layer
8.7	Ferroxyl test after clad restoration	No iron contamination	Approved procedure	Inspection Report	H	W	-			It shall be after Hydro test and Pickling & Passivation
8.8	Ferrite Number	% delta ferrite	PVM-SU-1322-H.1 Cl.No. 9.3.2	Inspection Report	H	RW	-			It shall be at the time of Final Dimensional Inspection
8.9	Chemical Analysis after Clad restoration	Chemical properties	PVM-SU-1322-H.1 Cl.No. 9.3.1.3 (a,b,c) AND 9.3.1.4 (a,b,c &d) OR 6-12-0007 Rev.4 Cl.No. 5.6	Inspection Report	H	R #	-			# Chip extraction shall be witnessed by L-TPIA.
9.0	Wed overlay of Nozzles, Pipes, Elbow and blind flanges									
9.1	Nozzle & Elbows, ID Check and Record up to NPS 3 before overlay with Nozzle identification	Dimensions	Drawing	Inspection Report	H	W	-			
9.2	Weld overlay	Welding parameters	Drawing	-	H	R	-			
9.3	Weld overlay thickness from inside the nozzle (ID Check)	Thickness	Drawing	Inspection Report	H	W	-			

		MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN			Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B 016 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020						
			QAP NO: B016-RUF-LT-504-QC-QD-BHEL(1)-02006 Rev.0 Date : 29-08-2020 Page 11 of 16 BHEL SO: 2438; Internal CQP No: 2499									
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection				EIL	Remarks		
					M	TUV	AI	LTHE				

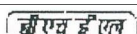
9.4	100% PT on weld overlay each layer	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R/ RW	-			RW- for Final Layer
9.5	Ferrite Number	% delta ferrite	PVM-SU-1322-H.1 Cl.No. 9.3.2	Inspection Report	H	RW	-			It shall be at the time of Final Dimensional Inspection
9.6	Chemical Analysis of weld overlay	Chemical properties	PVM-SU-1322-H.1 Cl.No. 9.3.1.3 (a,b,c) AND 9.3.1.4 (a,b,c &d) OR 6-12-0007 Rev.4 Cl.No. 5.6	Inspection Report	H	R #	-			# Chip extraction shall be witnessed by L-TPIA.
10.0	Fabrication of Nozzle Assemblies									
10.1	Weld Edge Preparation & DPT	Detection of flaws	Drawing	Inspection Report	H	R	R			
10.2	Fit up & Welding of C-Seam of pipes /elbows / flanges / nozzle neck	Offset & weld geometry	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	-			
10.3	100% RT on C-seam weld	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	R			R-RT Films

		MANUFACTURER'S NAME & ADDRESS BHEL-VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN		Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B 016 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020						
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S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection				EIL	Remarks	
					M	TUV	AI	LTHE			

11.0	Nozzle to Shell / Dished end fabrication									
11.1	Marking and Openings of nozzles on shell / dished end.	Location and Orientation	Drawing	Inspection Report	H	R	R	-		
11.2	PT on weld edges & after root run	Detection of flaws	Drawing	Inspection Report	H	R	-			
11.3	Fit up & Welding of Nozzles on shells / dished ends	Offset & weld geometry	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	RW	-			
11.4	PT on final weld of Nozzle to shell / dished ends	Detection of flaws	Drawing	Inspection Report	H	RW	-			
11.5	100% PT on chipped back C-seam weld	Detection of flaws	Drawing	Inspection Report	H	R	-			
11.6	100% UT on nozzle to shell / nozzle to pipe	Detection of flaws	Drawing	Inspection Report	H	W	-			
11.7	Pneumatic test on RF pads	Detection of leakage	Drawing	Inspection Report	H	RW	-			

24-100% RT of insert plate to shell and insert plate to SR nozzle as applicable nozzles
SR nozzle o shell as applicable nozzles

25-PI. check applicability

		MANUFACTURER'S NAME & ADDRESS BHEL-VISAKHAPATNAM or Approved Sub Contractor.		QUALITY ASSURANCE PLAN			Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara					
				QAP NO: B016-RUF-LT-504-QC-QD-BHEL(1)-02006			Project Name: VRMP-Visakh Refinery Modernisation Project					
				Rev.0			Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam					
				Date : 29-08-2020			PMC : Engineers India Limited (EIL)					
				Page 13 of 16			EIL Job No. : B 016					
				BHEL SO: 2438; Internal CQP No: 2499			L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020					
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection				EIL	Remarks		
					M	TUV	AI	LTHE				

[illegible]

		MANUFACTURER'S NAME & ADDRESS BHEL-VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN		Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B 016 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020						
			QAP NO: B016-RUF-LT-504-QC-QD-BHEL(1)-02006 Rev.0 Date : 29-08-2020 Page 14 of 16 BHEL SO: 2438; Internal CQP No: 2499								
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection				EIL	Remarks	
					M	TUV	AI	LTHE			

15.0	PWHT of Equipment along with PTC	Time & Temperature	ASME Sec VIII Div.1 & Drawing	HT Chart / Report	H	R	-			PWHT procedure duly approved to be followed
16.0	Hardness check of all pressure joints on weld / HAZ / PM	Hardness	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	H	-			
17.0	NDE after PWHT 100% UT on pressure retaining weld	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	RW	-			28-Refer Note - 8
18.0	Spot PT on internal & External welds	Detection of flaws	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	RW	-			
19.0	Final Dimensional inspection 29-after PWHT	Dimensions & orientations	Drawing	Inspection Report	H	H	R			Complete Equipment Visual inspection of both Internal & External
20.0	Hydro static testing followed by drying & cleaning	No pressure drop or leakage	Drawing	Inspection Report	H	H	R			
21.0	Spot PT after Hydro testing	Detection of flaws	Drawing	Inspection Report	H	W	-			
22.0	Pickling & Passivation of 30-inside weld overlays of nozzles, clad surface of shells, dished ends and further cleaning and drying	Dimensions	Drawing	Inspection Report	H	W	-			
23.0	Ferroxyl test after clad restoration	No iron contamination	Approved procedure	Inspection Report	H	RW	-			

31-Pickling & Passivation

	MANUFACTURER'S NAME & ADDRESS BHEL-VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN			Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B 016 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020					
		QAP NO: B016-RUF-LT-504-QC-QD-BHEL(1)-02006 Rev.0 Date : 29-08-2020 Page 15 of 16 BHEL SO: 2438; Internal CQP No: 2499								
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection				EIL	Remarks
					M	TUV	AI	LTHE		

24.0	Outside Surface Preparation (Blasted Surface Profile & Salt Contamination Tests)	Surface profile & salt contamination	Approved procedure	Inspection Report	H	RW	-			
24.1	Painting	Visual & DFT etc	Drawing, Approved procedure	Inspection Report	H	RW	-			
25.0	Nozzles blanking & N2 filling (if specified in drawing)	Physical Verification	Drawing	Inspection Report	H	W	-			
26.0	Name plate fixing, punching and rub off	Visual	Drawing	Inspection Report	H	H	-			
27.0	Inspection of Mandatory & Commissioning spares	Physical Verification	Drawing	Inspection Report	H	H	-			
28.0	Issue of IRN & clearance for dispatch	Completeness	Drawing, Approved procedure	Inspection Release Note	H	H	-			
	Manufacturer's Data Report & Final Documentation	Documentation	Drawings & ITP/QAP	MDR	H	R	-			

32-To be written after 27

- 1) Pressure Test, NCR Verification, ASME Name Plate Verification, Authorization for ASME Punch, Attachment of ASME Name Plate, Signing of MDR etc. All this points are HOLD point for AI
- 2) Add CuSO4 test prior to start any Clad restoration welding in any weld.
- 3) Internal Visual and Dimensional verification shall be offered to AI
- 3) Complete NDE(RT) shall be done prior to start clad restoration.
- 4) Thickness verification shall be done after CS welding and prior to Clad restoration.

		MANUFACTURER'S NAME & ADDRESS BHEL- VISAKHAPATNAM or Approved Sub Contractor.	QUALITY ASSURANCE PLAN			Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara Project Name: VRMP-Visakh Refinery Modernisation Project Customer : Hindustan Petroleum Corporation Limited- Visakhapatnam PMC : Engineers India Limited (EIL) EIL Job No. : B 016 L & T Job No.& PO No.: RUFV & REFINERY/75000-66912/NG Dt.18-03-2020					
			QAP NO: B016-RUF-LT-504-QC-QD-BHEL(1)-02006 Rev.0 Date : 29-08-2020 Page 16 of 16 BHEL SO: 2438; Internal CQP No: 2499								
S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection				EIL	Remarks	
					M	TUV	AI	LTHE			

Notes:

- 1) As per PVM-SU-1322-H.1 – 6.3.7: Clad removal (strip back or repairs) shall be verified using copper sulphate to ensure complete removal of the clad before alloy welding.
- 2) As per PVM-SU-1322-H.1 – 9.1.3: Required radiographic and ultrasonic examinations shall be performed on completed Category A, B, C, and D weld joints after the weld overlay has been applied and any PWHT has been completed.
- 3) As per PVM-SU-1322-H.1 – 9.1.2: Magnetic particle examination shall be made of the surfaces of Category A, B, C, and D welds that are to be covered by weld overlay at the last stage of fabrication prior to applying the overlay.
- 4) As per 6-12-0007 Rev. 4 (Supplementary specification for Clad Vessels Clause No.: 5.3 - Weld joint in the base plate shall be radiographed as specified in engg. Drawing / data sheet for detection of cracks/flows before clad side welding is carried out. Just before clad restoration welding, the prepared surface shall be inspected by 100% dye penetrant testing.
- 5) As per 6-12-0007 Rev. 4 (Supplementary specification for Clad Vessels Clause No.: 6.1.4 - 100% Ultrasonic test shall be carried out of areas where attachments are to be welded directly to the cladding. The above areas shall include 50 mm.
- 6) As per PVM-SU-1322-H.1 – 9.2.2: UT according to ASME Code, Section II, SA 578, shall be made of clad plates within 1T (1 × total clad + base material plate thickness) of the edges to be welded, and covering an area extending 1T from load-bearing internal attachments designated on the vessel drawing.
- 7) PQR qualification shall be as per Licensor Specification No.: PVM-SU-5004-I, Clause No.: 8.2 & 11.2.
- 8) As per PVM-SU-1322-H.1 – 9.3.3.1: The completed vessel bulk weld overlay (primary method of applying the internal corrosion-resistant lining) shall be checked for bond flaw indications after PWHT by UT in accordance with ASME Code, Section II, SA 578).
- 9) As per PVM-SU-1322-H.1 – 9.3.4.2: Prior to any heat treatment including PWHT, PT of the entire surface shall be performed in accordance with mandatory appendix 8 of ASME Code, Section VIII, Div. 1 or Section VIII, Div. 2, as applicable.

Legends:

P: Perform	Drawing : Approved Drawing	WPS: Welding procedure specification	DFT: Dry film thickness
A-Approval	Spec : Specification	WPQ: Welder performance Qualification	RT: Radiographic testing
W-Witness	LS: Longitudinal Seam welding	TUV: TUV India Pvt Ltd., (Third party inspection agency appointed by M/s LTHE	UT: Ultrasonic testing manual
RW: Random Witness	M-BHEL or BHEL approved sub-contractor		PT: Dye penetrant testing
H: Hold	IRN: Inspection release note issued by TUV		MPT: Magnetic particle testing
V: Verification of reports/Procedures	HT Chart: Heat Treatment chart	R: Review	

please include the above requirements as ITP stages

	Residue Upgradation Facility (RUF) EPCC-3 Package for Visakh Refinery Modernization Project (VRMP)	 L&T Hydrocarbon Engineering
		L&T- CHIYODA LIMITED
Title: FORMING & POST WELD HEAT TREATMENT PROCEDURE for ODC & CrMo Vessels Doc. No.: B016-RUF-LT-504-QC-QD-BHEL(1)-02019		Rev. No.: 0 Page 1 of 34

OWNER : HINDUSTAN PETROLEUM CORPORATION LIMITED (HPCL)
PMC : ENGINEERS INDIA LIMITED, NEW DELHI (EIL)
UNIT : 504
PMC JOB NO. : B016
EQUIPMENT DESCRIPTION : ALL VESSELS
EQUIPMENT TAG : 504-V-101, 504-V-105, 504-V-109, 504-V-110, 504-V-122, 504-V-126, 504-V-201, 504-V-306, 504-V-313, 504-V-315, 504-V-602, 504-V-607A/B/C, 504-V-703, 504-V-801, 504-V-802, 504-V-803, 504-V-804, 504-V-805A, 504-V-807, 504-V-809, 504-V-811
P. R. NO. : B016-RUF-LT-504-MS-PR-0007
VENDOR NAME : BHARAT HEAVY ELECTRICALS LIMITED
VENDOR DOCUMENT NO. : HPVP-WT-2438-QAP-19 REV.0

DOCUMENT SUBMISSION STATUS – LTHE/VENDOR	REVIEW STATUS					
	LTHE			EIL		
DOC. CATEGORY: (USE TICK MARK)	Code 1 – No Comments. Proceed With ☐ Manufacture / Fabrication / Construction As Per The Document. Code 2 – Proceed With ☐ Manufacture/Fabrication/Construction As Per Commented Document. Revised Document Required. Review Code 3 – Document Does Not ☐ Conform To Basic Requirements As Marked. Resubmit For Review ☐ Code R– Document Is Retained For Records. Proceed With Manufacture / Fabrication ☐ Code V- Void (Submission Required / Not Required)			Code 1 – No Comments. Proceed With ☐ Manufacture / Fabrication / Construction As Per The Document. Code 2 – Proceed With ☐ Manufacture/Fabrication/Construction As Per Commented Document. Revised Document Required. Review Code 3 – Document Does Not ☐ Conform To Basic Requirements As Marked. Resubmit For Review ☐ Code R– Document Is Retained For Records. Proceed With Manufacture / Fabrication ☐ Code V- Void (Submission Required / Not Required)		
☐ R ☐ I						
ISSUED FOR						
☐ INFORMATION ☐ REVIEW ☐ CONSTRUCTION ☐ AS BUILT						
	DISCIPLINE	SIGN	DATE	DISCIPLINE	SIGN	DATE

00	1 st submission for Approval	V DEEPAK NAIDU	P V D RAMESH	B. ROY	14.08.2020
Revision No.	Description	Prepared by	Reviewed by	Reviewed by	Approved by
					Approved Date

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	Residue Upgradation Facility (RUF) EPCC-3 Package for Visakh Refinery Modernization Project (VRMP)	 <i>L&T Hydrocarbon Engineering</i>
		L&T- CHIYODA LIMITED
Title: FORMING & POST WELD HEAT TREATMENT PROCEDURE for ODC & CrMo Vessels Doc. No.: B016-RUF-LT-504-QC-QD-BHEL(1)-02019		Rev. No.: 0 Page 3 of 34

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1.0 SCOPE:

This document describes the forming and heat treatment procedure in preparation and issue of heat treatment technology chart

2.0 REFERENCE DOCUMENTS:

ASME Sec VIII Div.1 Edition 2019, NACE SP0472-2010, PVM-SU-5290.2, PVM-SU-4750-H, PVM-SU-1322-H.1.

3.0 APPLICABILITY:

Applicable to all the pressure vessels of this specific project with respect to forming, Post forming heat treatment, post weld heat treatment or stress relieving, ISR & DHT.

4.0 REQUIREMENT:

As per ASME Sec VIII Div.1 Edition 2019, the approved drawing, ITP

5.0 STAGE:

As per approved ITP

6.0 TYPE OF HEAT TREATMENT

6.1 POST WELD HEAT TREATMENT:

- After receipt of requisition (Exhibit-01) of post weld heat treatment or stress relieving of all carbon and low alloy steel materials as per the drawing, from technology section, heat treatment technology sheet/chart as per relevant part UW-40 (a) of ASME Sec VIII Div.1 Edition 2019 will be prepared by Welding Technology.
- Sr. Engineer (QC) shall check the identification of items before sending for heat treatment and after receiving the items from heat treatment.
- Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- Thermocouples shall be placed such that the entire component (including the anticipated (hottest and coldest zones) is covered.
- The maximum distance between any two thermocouples shall not exceed 4.6 metres.
- The temperature difference between any two thermocouples during heating and cooling cycles shall not exceed 70°C.
- Unless otherwise specified, the following rules shall apply to establish the governing thickness (T) for determining the soaking time for PWHT. Soaking time is accounted as the time between the temperature crossing and leaving the minimum recommended temperature.
- For Butt welds; "T" shall be thickness of the weld. For bar stock "T" shall be the diameter. For fillet welds, "T" shall be the throat thickness. If a fillet weld is used in conjunction with a groove weld, "T" shall be the total of the depth of the groove plus the fillet throat thickness.
- For partial penetration branch welds, the thickness shall be the depth of the groove prior to welding.

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- j. For repairs, the thickness shall be depth of the groove as prepared for repair welding.
- k. For combination of different welds in a component, the higher governing thickness "T" shall govern.
- l. Location, type of thermocouples, method of TC attachment, heating control system details to be recorded along with sketch by QC-shop (or) QC-OS for review by TPI/Customer.
- m. Methods used to support the vessel (or) part assembly & Bracing used to prevent distortion to be recorded by QC-shop (or) QC-OS for review by TPI/Customer.
- n. Heat treatment parameters like Loading temp., Rate of Heating, Soaking temperature, soaking time, rate of cooling and unloading temperature of the equipment (or) sub-assemblies are provided as per relevant codes and standards & service conditions and basic details are as follows -

1. Soaking temperatures and Holding/Soaking time for different materials are as follows-

Material	Soaking Temperature	Holding/Soaking
Carbon steel	630 ± 10°C	Minimum 60 minute (1hr/25mm of thk)
Low alloy steel (1.25Cr-0.5Mo)	670 ± 10°C	Minimum 60 minute (1hr/25mm thk)
Low alloy steel (2.25Cr-1Mo)	690 ± 10°C	Minimum 2 hours (1hr/25mm of thk)

2. Maximum ROH/ROC shall be as follows:

- Above 425°C, the rate of heating shall be not greater than 222°C/hr divided by the maximum metal thickness of the shell or head plate in inches, but in no case more than 222°C/hr.
 - Above 425°C, cooling shall be done in a closed furnace (or) cooling chamber at a rate not greater than 280°C/hr divided by the maximum metal thickness of the shell or head plate in inches, but in no case more than 280°C/hr. From 425°C the vessel may be cooled in still air.
- o. Lead (or) Sulfur containing substances such as oil, grease, thread lubricants and paint shall be removed from vessel surfaces prior to heat treatment.
 - p. Wherever practicable, heat the vessel as a whole in an enclosed furnace.
 - q. The overlap of 1.5m heated section shall be provided, if vessel is heated in more than one heat in a furnace.
 - r. The heat treatment technology chart is sent to technology section of P&T department for necessary action.
 - s. The heat treatment methodology for loading in furnace and control of heat treatment parameters as per given heat treatment technology chart (Exhibit-02) is under Incharge/press shop scope.

6.2 POST FORMING HEAT TREATMENT:

6.2.1 GENERAL REQUIREMENTS:

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- After receipt of requisition (Exhibit-01) of post forming heat treatment of all carbon and low alloy steel materials as per the drawing, from technology section, heat treatment technology sheet/chart as per relevant part UG-79 of ASME Sec VIII Div.1 Edition 2019 will be prepared by Welding Technology.
- Sr. Engineer (QC) shall check the identification of items before sending for heat treatment and after receiving the items from heat treatment.
- The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- Thermocouples shall be placed such that the entire component (including the anticipated (hottest and coldest zones) is covered.
- During Hot pressing & subsequent Normalising operation, Thermocouple (TC) shall be tack welded to the blank plate (or) dished end on consultation with shop inspector / inspection agency and location of thermocouple shall be recorded in sketch and the same TC shall be removed by grinding.
- Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- The maximum distance between any two thermocouples shall not exceed 4.5 metres.
- The temperature difference between any two thermocouples during heating and cooling cycles shall not exceed 70°C.
- Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.
- Location, type of thermocouples, method of TC attachment, heating control system details to be recorded along with sketch by QC-shop (or) QC-OS for review by TPI/Customer.
- Methods used to support the vessel (or) part assembly & Bracing used to prevent distortion to be recorded by QC-shop (or) QC-OS for review by TPI/Customer.
- The heat treatment technology chart is sent to technology section of P&T department for necessary action.
- The heat treatment methodology for loading in furnace and control of heat treatment parameters as per given heat treatment technology chart (Exhibit-03) is under Incharge/press shop scope.

6.2.2 COLD FORMING:

- For Cold Formed (forming temperatures are in the range of 120deg.C to 480 deg.C) vessel shell sections, heads and other pressure parts of all carbon and low alloy steel materials shall be heat treated to a condition equal to mill flat plate supply condition, if the extreme fiber elongation determined as per below equation (1) / (2) exceeds 5% and nominal part thickness is greater than 16mm.

For cylinders Formed from Plate:

$$\text{Forming strain, } \epsilon_f = \left(\frac{50t}{R_f} \right) \left(1 - \frac{R_f}{R_o} \right) \dots\dots \text{Eq. (1)}$$

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For Double curvature (heads):

$$\text{Forming strain, } \varepsilon_f = \left(\frac{75t}{R_f} \right) \left(1 - \frac{R_f}{R_o} \right) \dots\dots \text{Eq. (2)}$$

- b. To release Post Forming Heat Treatment with Normalising (or) Normalising + Tempering (or) Stress relieving requirements, the supply condition of the plate shall be reviewed as per material Technical Delivery Conditions (TDC) in tender stage & Material Test certificate (MTC) for receipt materials.
- c. For cold forming with nominal part thickness less than (or) equal to 16mm, stress relieving shall be carried out and can also be clubbed with final equipment stress relieving cycle.

6.2.3 HOT FORMING:

- a. The Forming operation such as Hot Pressing shall be completed at temperatures above 800°C to avoid normalising operation. If hot pressed below 800°C, subsequent normalising heat treatment shall be performed.
- b. The recommended hot pressing soaking temperatures for carbon steel and low alloy steel materials are 925 to 955 deg.C.
- c. The number of blanks for hot pressing to be loaded in furnace charge shall be calculated based on the soaking times specified in such a way that last blank/PTC in the charge is removed for hot forming within the maximum soaking time specified.
- d. If QAP/GMS/DRAWING mentions PTC requirement, then Production Test Coupon (PTC) shall be loaded in furnace during hot pressing operation and the same shall be loaded for post forming heat treatment operation and is located close to the formed dished end and must be recorded in sketch.

6.3 LOCAL PWHT (or) REPAIR WELD STRESS RELIEVING:

- a. Local heat treatment shall be followed for circumferential weld seams, complicated welds, weld repairs, if the vessel is not practicable to heat treat the complete vessel (or) as a whole (or) in two (or) more heats by appropriate means like electrical resistance heating assuring the required uniformity
- b. For Nozzle (or) attachment welds (or) pipes (or) tubes (or) nozzle attachments on double curvature/ellipsoidal dished ends/spherical shells, the soak band shall be uniformly heated to required temperatures and holding times with soaking band extending edge of attachment welds with 1t (or) 50mm, whichever is less. Where t is nominal weld thickness.
- c. The portion outside the soak band shall be protected so that the temperature gradient is not harmful.
- d. Insulation details & location, type of thermocouples, method of TC attachment must be provided along with sketch by QC-shop (or) OS for review by TPI/Customer
- e. Heat treatment parameters and Thermocouple attachments are as per section 7.1 of this procedure.

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6.4 INTERMEDIATE STRESS RELIEF OR DEHYDROGENATION HEAT TREATMENT: (Applicable for 2¼Cr-1Mo & 1¼Cr-0.5Mo low alloy steel Pressure Vessels of all thicknesses)

6.4.1 INTERMEDIATE STRESS RELIEF

- For 2¼ Cr-1 Mo & 1¼Cr-0.5Mo steel, the preheat for nozzle weld joints shall be maintained until PWHT, or until an ISR can be performed at greater than 600°C for 2 hours minimum before cooling to ambient.
 - ISR shall be required for all nozzle to shell attachment welds, areas of weld build-up, and other welds having high restraint.
 - All other welds may have DHT performed.
 - ISR shall be performed in a furnace or local ISR treatment may be used, provided circumferential heating band that includes the full circumference of the shell is utilized.
- When ISR is required, it shall also be used for all weld repairs.
- Temperature gradients shall be maintained in a manner that are not harmful to the vessel during heating and cooling.

6.4.2 DEHYDROGENATION HEAT TREATMENT

- If preheat is not to be maintained until PWHT and if ISR is not performed, welds shall be performed DHT.
- DHT shall be performed at 300°C for a duration of one hour minimum.

7.0 ADDITIONAL PRECAUTIONS (FOR CLAD MATERIALS):

- The clad material should not be exposed to a direct flame if gas or oil is used as fuel.
- Stainless steel clad vessel require a neutral or oxidizing atmosphere during heating.
- Maximum sulphur content in fuel should not exceed 0.5%.
- Marking paint and protective oil should be removed completely from the clad side before heating.

8.0 DOCUMENTATION:

- Sr. Engineer (QC) shall verify the heat treatment chart for compliance.
- The heat treatment chart shall be offered to TPI/Customer as per the approved ITP and necessary clearance shall be obtained.

9.0 EXHIBITS USED

Exhibit No.	Format No	Format Description
1	HT/001	Requisition for heat treatment procedure (for both welding & forming)
2	HT/002	Heat treatment technology chart (for welding operation)
3	HT/004	Heat treatment technology sheet (for forming operation)
4	HT/003	Requisition for clubbing of heat treatment charts/loading chart

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Table 1: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-101

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-010	PV-010
Part No.'s		
Equipment Name	VR FEED SURGE DRUM	VR FEED SURGE DRUM
Tag No.	504-V-101	504-V-101
Drawing no. with rev. no.	3-PV-010-U0098 REV.0	1-PV-010-U0076 REV.A
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA516Gr.70 + SS317L	SA516Gr.70 + SS317L
Nominal Weld Thickness	24+3	24+3 / 25 / 58.363
Type of heat treatment	Normalising + SR	Stress relieving / PWHT
HT parameters	NR	SR*
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	630 ± 10°C
Soaking time, minutes	55 minutes	65 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

Note: *1. this stress relieving operation after Normalising can be clubbed with complete equipment stress relieving cycle.

2. Above HT parameters are arrived based on data presented against drawings.

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Table 2: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-105

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-020	PV-020
Part No.'s		
Equipment Name	VR/MP/HT SEPARATOR	VR/MP/HT SEPARATOR
Tag No.	504-V-105	504-V-105
Drawing no. with rev. no.	3-PV-010-U0103 REV.0	1-PV-020-U0072 REV.A
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA387Gr11Cl2 + SS347	SA387Gr11Cl2 + SS347
Nominal Weld Thickness	63+3	54+3 / 63+3
Type of heat treatment	Normalising + Tempering	
HT parameters	NR	Tempering
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	700 ± 10°C
Soaking time, minutes	135 minutes	160 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

Note: 1. Above HT parameters are arrived based on data presented against drawings.

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Table 3: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-109

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-030	PV-030
Part No.'s		
Equipment Name	DAO MP/HT SEPARATOR	DAO MP/HT SEPARATOR
Tag No.	504-V-109	504-V-109
Drawing no. with rev. no.	3-PV-010-U0101 REV.0	1-PV-030-U0080 REV.A
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA387Gr.22Cl2 + SS347	SA387Gr.22Cl2 + SS347
Nominal Weld Thickness	48+3 / 48+6	42+3 / 48+3 / 48+6
Type of heat treatment	Normalising + Tempering	
HT parameters	NR	SR
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	730 ± 10°C
Soaking time, minutes	110 minutes	130 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

Note: 1. Above HT parameters are arrived based on data presented against drawings.

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Table 4: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-110

Details	1	2	
Sale order No.	2438	2438	
PGMA NO	PV-040	PV-040	
Part No.'s			
Equipment Name	LC MAX MP/MT SEPARATOR	LC MAX MP/MT SEPARATOR	
Tag No.	504-V-110	504-V-110	
Drawing no. with rev. no.	3-PV-010-U0105 REV.0	1-PV-040-U0084 REV.A	
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment	
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts	
Material spec.	SA387Gr.11Cl2	SA387Gr.11Cl2	
Nominal Weld Thickness	25	22 / 25 / 31.363	
Type of heat treatment	Normalising + Tempering		Stress relieving / PWHT
HT parameters	NR	Tempering	SR
loading temp. °C	<300°C	<425°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	700 ± 10°C	670 ± 10°C
Soaking time, minutes	50 minutes	60 minutes	80 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C	at 425°C

Note: 1. Above HT parameters are arrived based on data presented against drawings.

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Table 5: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-122

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-050	PV-050
Part No.'s		
Equipment Name	SEAL OIL RESERVOIR	SEAL OIL RESERVOIR
Tag No.	504-V-122	504-V-122
Drawing no. with rev. no.	3-PV-010-U0099 REV.0	1-PV-050-U0088 REV.A
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA516Gr.70 + SS304L	SA516Gr.70 + SS304L
Nominal Weld Thickness	28+3	24+3 / 28+3 / 61.363
Type of heat treatment	Normalising + SR	
HT parameters	NR	SR*
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	630 ± 10°C
Soaking time, minutes	65 minutes	75 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

Note: *1. this stress relieving operation after Normalising can be clubbed with complete equipment stress relieving cycle.

2. Above HT parameters are arrived based on data presented against drawings.

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Table 6:Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-126

Details	1	2	
Sale order No.	2438	2438	
PGMA NO	PV-060	PV-060	
Part No.'s			
Equipment Name	VR BOOSTER FEED DRUM	VR BOOSTER FEED DRUM	
Tag No.	504-V-126	504-V-126	
Drawing no. with rev. no.	3-PV-010-U0098 REV.0	1-PV-060-U0057 REV.A	
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment	
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts	
Material spec.	SA516Gr.70 + SS317L	SA516Gr.70 + SS317L	
Nominal Weld Thickness	24+3	24+3 / 25 / 58.363	
Type of heat treatment	Normalising + SR		Stress relieving / PWHT
HT parameters	NR	SR*	SR
loading temp. °C	<300°C	<425°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	630 ± 10°C	630 ± 10°C
Soaking time, minutes	55 minutes	65 minutes	140 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C	at 425°C

Note: *1. this stress relieving operation after Normalising can be clubbed with complete equipment stress relieving cycle.

2. Above HT parameters are arrived based on data presented against drawings.

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Table 7: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-201

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-070	PV-070
Part No.'s		
Equipment Name	HOS PRODUCT DRUM	HOS PRODUCT DRUM
Tag No.	504-V-201	504-V-201
Drawing no. with rev. no.	3-PV-010-U0096 REV.0	1-PV-070-U0092 REV.B
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA516Gr.70 (Nace + HIC)	SA516Gr.70 (Nace + HIC)
Nominal Weld Thickness	20	16 / 20 / 28.484
Type of heat treatment	Normalising + SR*	Stress relieving / PWHT
HT parameters	NR	SR*
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	630 ± 10°C
Soaking time, minutes	40 minutes	60 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

Note: *1. this stress relieving operation after Normalising can be clubbed with complete equipment stress relieving cycle.

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Table 8: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-306

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-080	PV-080
Part No.'s		
Equipment Name	PRODUCT MP/MT SEPARATOR	PRODUCT MP/MT SEPARATOR
Tag No.	504-V-306	504-V-306
Drawing no. with rev. no.	3-PV-010-U0101 REV.0	1-PV-080-U0098 REV.B
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA387Gr.22Cl2 + SS347	SA387Gr.22Cl2 + SS347
Nominal Weld Thickness	42+3	36+3 / 42+3 / 51.363
Type of heat treatment	Normalising + Tempering	
HT parameters	NR	Tempering
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	730 ± 10°C
Soaking time, minutes	90 minutes	120 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

Note: 1. Above HT parameters are arrived based on data presented against drawings.

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Table 9: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-313

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-090	PV-090
Part No.'s		
Equipment Name	FRACTIONOR FEED DRUM	FRACTIONOR FEED DRUM
Tag No.	504-V-313	504-V-313
Drawing no. with rev. no.	3-PV-010-U0101 REV.0	1-PV-090-U0099 REV.A
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA387Gr.22Cl2 + SS347	SA387Gr.22Cl2 + SS347
Nominal Weld Thickness	38+3	34+3 / 38+3 / 47.363
Type of heat treatment	Normalising + Tempering	
HT parameters	NR	SR
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	730 ± 10°C
Soaking time, minutes	85 minutes	120 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

Note: 1. Above HT parameters are arrived based on data presented against drawings.

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Table 10: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-315

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-100	PV-100
Part No.'s		
Equipment Name	SULFIDING CHEMICAL DRUM	SULFIDING CHEMICAL DRUM
Tag No.	504-V-315	504-V-315
Drawing no. with rev. no.	3-PV-010-U0104 REV.0	1-PV-100-U0061 REV.A
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA516Gr.70	SA516Gr.70
Nominal Weld Thickness	40	32 / 40 / 78.363
Type of heat treatment	Normalising + SR*	Stress relieving / PWHT
HT parameters	NR	SR*
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	630 ± 10°C
Soaking time, minutes	80 minutes	100 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

Note: *1. this stress relieving operation after Normalising can be clubbed with complete equipment stress relieving cycle.

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Table 11: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-602

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-110	PV-110
Part No.'s		
Equipment Name	CATALYST TRANSFER VESSEL	CATALYST TRANSFER VESSEL
Tag No.	504-V-602	504-V-602
Drawing no. with rev. no.	3-PV-010-U0100 REV.0	1-PV-110-U0064 REV.0
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA516Gr.70 + SS410	SA516Gr.70 + SS410
Nominal Weld Thickness	24+3	24+3 / 58.363
Type of heat treatment	Normalising + SR	
HT parameters	NR	SR*
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	630 ± 10°C
Soaking time, minutes	55 minutes	65 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

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Table 12: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-607A/B/C

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-120	PV-120
Part No.'s		
Equipment Name	CATALYST INVENTORY HOLDING BIN	CATALYST INVENTORY HOLDING BIN
Tag No.	504-V-607A/B/C	504-V-607A/B/C
Drawing no. with rev. no.	3-PV-120-U0097 REV.0	1-PV-120-U0103 REV.0
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA516Gr.70	SA516Gr.70
Nominal Weld Thickness	40	32 / 40
Type of heat treatment	Normalising + SR	
HT parameters	NR	SR*
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	630 ± 10°C
Soaking time, minutes	80 minutes	100 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

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Table 13: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-703

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-130	PV-130
Part No.'s		
Equipment Name	HOT OIL SURGE DRUM	HOT OIL SURGE DRUM
Tag No.	504-V-703	504-V-703
Drawing no. with rev. no.	3-PV-010-U0095 REV.0	1-PV-130-U0068 REV.A
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA516Gr.70	SA516Gr.70
Nominal Weld Thickness	28	28 / 34.363
Type of heat treatment	Normalising + SR	Stress relieving / PWHT
HT parameters	NR	SR*
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	630 ± 10°C
Soaking time, minutes	60 minutes	70 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

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Table 14: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-801

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-140	PV-140
Part No.'s		
Equipment Name	HP FLARE KO DRUM	HP FLARE KO DRUM
Tag No.	504-V-801	504-V-801
Drawing no. with rev. no.	3-PV-010-U0097 REV.0	1-PV-140-U0107 REV.B
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA516Gr.70 (Nace + HIC)	SA516Gr.70 (Nace + HIC), IS2062Gr.B
Nominal Weld Thickness	25	20 / 25 / 26.363
Type of heat treatment	Normalising + SR	
HT parameters	NR	SR*
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	630 ± 10°C
Soaking time, minutes	50 minutes	60 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

Note: *1. this stress relieving operation after Normalising can be clubbed with complete equipment stress relieving cycle.

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Table 15: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-802

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-150	PV-150
Part No.'s		
Equipment Name	LP FLARE KO DRUM	LP FLARE KO DRUM
Tag No.	504-V-802	504-V-802
Drawing no. with rev. no.	3-PV-010-U0104 REV.0	1-PV-150-U0111 REV.B
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA516Gr.70 (Nace + HIC)	SA516Gr.70 (Nace + HIC), SA516Gr.70
Nominal Weld Thickness	25	36 / 42.363
Type of heat treatment	Normalising + SR	
HT parameters	NR	SR*
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	630 ± 10°C
Soaking time, minutes	50 minutes	60 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

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Table 16: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-803

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-160	PV-160
Part No.'s		
Equipment Name	CLOSED BLOWDOWN DRUM	CLOSED BLOWDOWN DRUM
Tag No.	504-V-803	504-V-803
Drawing no. with rev. no.		1-PV-160-U0115 REV.0
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA516Gr.70	SA516Gr.70
Nominal Weld Thickness	28	28
Type of heat treatment	Normalising + SR	Stress relieving / PWHT
HT parameters	NR	SR*
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	630 ± 10°C
Soaking time, minutes	60 minutes	70 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

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Table 17: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-804

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-170	PV-170
Part No.'s		
Equipment Name	AMINE BLOWDOWN DRUM	AMINE BLOWDOWN DRUM
Tag No.	504-V-804	504-V-804
Drawing no. with rev. no.		1-PV-170-U0118 REV.A
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA516Gr.70	SA516Gr.70
Nominal Weld Thickness	28	28
Type of heat treatment	Normalising + SR	Stress relieving / PWHT
HT parameters	NR	SR*
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	630 ± 10°C
Soaking time, minutes	60 minutes	70 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

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Table 18: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-805A

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-180	PV-180
Part No.'s		
Equipment Name	HT FLARE KO DRUM	HT FLARE KO DRUM
Tag No.	504-V-805A	504-V-805A
Drawing no. with rev. no.	3-PV-010-U0102 REV.0	1-PV-180-U0119 REV.B
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA387Gr.22Cl2 + SS347	SA387Gr.22Cl2 + SS347
Nominal Weld Thickness	30+3	30+3 / 39.363
Type of heat treatment	Normalising + Tempering	Stress relieving / PWHT
HT parameters	NR	Tempering
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	730 ± 10°C
Soaking time, minutes	70 minutes	120 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

Note: 1. Above HT parameters are arrived based on data presented against drawings.

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Table 19: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-807

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-190	PV-190
Part No.'s		
Equipment Name	HOT OIL BLOWDOWN DRUM	HOT OIL BLOWDOWN DRUM
Tag No.	504-V-807	504-V-807
Drawing no. with rev. no.		1-PV-190-U0123 REV.A
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA516Gr.70	SA516Gr.70
Nominal Weld Thickness	28	28
Type of heat treatment	Normalising + SR	Stress relieving / PWHT
HT parameters	NR	SR*
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	630 ± 10°C
Soaking time, minutes	60 minutes	70 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

Note: *1. this stress relieving operation after Normalising can be clubbed with complete equipment stress relieving cycle.

2. Above HT parameters are arrived based on data presented against drawings.

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		L&T- CHIYODA LIMITED
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Table 20: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-809

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-200	PV-200
Part No.'s		
Equipment Name	CLOSED BLOWDOWN DRUM-2	CLOSED BLOWDOWN DRUM-2
Tag No.	504-V-809	504-V-809
Drawing no. with rev. no.		1-PV-200-U0125 REV.A
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA516Gr.70	SA516Gr.70
Nominal Weld Thickness	28	28
Type of heat treatment	Normalising + SR	Stress relieving / PWHT
HT parameters	NR	SR*
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	630 ± 10°C
Soaking time, minutes	60 minutes	70 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

Note: *1. this stress relieving operation after Normalising can be clubbed with complete equipment stress relieving cycle.

2. Above HT parameters are arrived based on data presented against drawings.

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		L&T- CHIYODA LIMITED
Title: FORMING & POST WELD HEAT TREATMENT PROCEDURE for ODC & CrMo Vessels Doc. No.: B016-RUF-LT-504-QC-QD-BHEL(1)-02019		Rev. No.: 0 Page 30 of 34

Table 21: Heat Treatment Parameters with Stage of Manufacturing for TAG No. 504-V-811

Details	1	2
Sale order No.	2438	2438
PGMA NO	PV-210	PV-210
Part No.'s		
Equipment Name	PITCH SOLVENT DRUM	PITCH SOLVENT DRUM
Tag No.	504-V-811	504-V-811
Drawing no. with rev. no.	3-PV-010-U0098 REV.0	1-PV-210-U0127 REV.A
Component details (Dished End/Shell)	Top & Bottom Dished End	Complete Equipment
Stage of Heat treatment	After Cold forming from blank welded plate	After Assembly and welding of all parts
Material spec.	SA516Gr.70 + SS37L	SA516Gr.70 + SS37L
Nominal Weld Thickness	56+3	52+3 / 56+3 / 65.363
Type of heat treatment	Normalising + SR	Stress relieving / PWHT
HT parameters	NR	SR*
loading temp. °C	<300°C	<425°C
Rate of heating (°C/hr) max.	220°C/hr	110°C/hr
Soaking temp. °C	900 ±10°C	630 ± 10°C
Soaking time, minutes	120 minutes	145 minutes
Rate of cooling (°C/hr) max.	Unload at the end of soaking time & cool in still air upto room temp.	140°C/hr
Unloading temp. °C	Unload at the end of soaking time & cool in still air upto room temp	at 425°C

Note: *1. this stress relieving operation after Normalising can be clubbed with complete equipment stress relieving cycle.

2. Above HT parameters are arrived based on data presented against drawings.

	Residue Upgradation Facility (RUF) EPCC-3 Package for Visakh Refinery Modernization Project (VRMP)	 L&T Hydrocarbon Engineering
 ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)		L&T- CHIYODA LIMITED
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EXHIBIT: 01

BHARAT HEAVY ELECTRICALS LIMITED				
HPVP-VISAKHAPATNAM 530012				
REQUISITION FOR HEAT TREATMENT PROCEDURE				
DEPARTMENT NAME		REQ.NO.	TECH/HT/YEAR/NO.	
SECTION NAME		DATE		
S.O. NO.	PART NO.	DRAWING NO.	DESCRIPTION	
MATERIAL SPECIFICATION	CODE OF CONSTRUCTION	DESIGN PRESSURE	DESIGN TEMPERATURE	CUSTOMER'S NAME
MANUFACTURING PROCEDURE ADOPTED AND STAGE OF HEAT TREATMENT REQUIRED		TYPE OF HEAT TREATMENT AND PURPOSE FOR WHICH IT IS REQUIRED		
CUSTOMERS SPECIAL REQUIREMENT, IF ANY		ANY OTHER REMARKS		
REQUISITION BY (NAME OF REQUISITIONER)				
		TO- INCHARGE /WT		

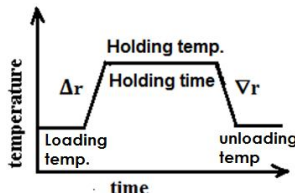
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		L&T- CHIYODA LIMITED
Title: FORMING & POST WELD HEAT TREATMENT PROCEDURE for ODC & CrMo Vessels Doc. No.: B016-RUF-LT-504-QC-QD-BHEL(1)-02019		Rev. No.: 0 Page 32 of 34

EXHIBIT: 02

		BHARAT HEAVY ELECTRICALS LIMITED HPVP-VISAKHAPATNAM 530012 DEPARTMENT OF WELDING TECHNOLOGY							
HEAT TREATMENT TECHNOLOGY CHART					HT CYCLE NO.		H-XXX-YY		
					DATE				
Name of the Equipment		S.O.No.		Assembly		Drawing no.		Customer	
Part Name		Part No.		Material Spec.		Principle Dimensions (mm)		DESIGN PRESSURE	
						OD ID THK		As per Drawing	
								As per Drawing	
CODE: As per drawing					INSPN. AGENCY: As per drawing				
NOMINAL WELD THICKNESS =									
TYPE OF HEAT TREATMENT									
TEXT ON STAGE OF HEAT TREATMENT									
1) Load the job on suitable supports in furnace at below 425°C. 2) Heat at the rate of (heating rate) deg.C/hr (Max.) up to the temperature of (soaking temperature)°C. 3) Soak at (holding temperature) deg.C for (holding time) minutes 4) Cool in closed furnace at the rate of (cooling rate) deg. C/hr (Max.) up to 425°C and controlled cooling rates are not applicable from 425°C.									
GENERAL PRECAUTIONS:									
1.									
2.									
3.									
Prepared by: Heat treatment section Incharge (WT)					Approved by: Incharge (WT)				
CC TO: In charge (TECH)									

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	Residue Upgradation Facility (RUF) EPCC-3 Package for Visakh Refinery Modernization Project (VRMP)	 L&T Hydrocarbon Engineering
		L&T- CHIYODA LIMITED
Title: FORMING & POST WELD HEAT TREATMENT PROCEDURE for ODC & CrMo Vessels Doc. No.: B016-RUF-LT-504-QC-QD-BHEL(1)-02019		Rev. No.: 0 Page 33 of 34

EXHIBIT: 03

	BHARAT HEAVY ELECTRICALS LIMITED HPVP-Visakhapatnam 530012 WELDING TECHNOLOGY DEPARTMENT				
HEAT TREATMENT TECHNOLOGY SHEET	FORMING OPERATION (MENTION TYPE OF FORMING)				
H-T PROCEDURE NO: H-0XX-YY		DATE: DD/MM/YYYY			
S.O.NO.:	P.NO.:	PRINCIPLE DIMENSIONS (mm)			
PART NAME:	QTY.:	I.D.:			
DRG NO.:	REV.NO.:	I.C.R: I.K.R:			
MATL SPEC. :	PROJECT:	THICKNESS:			
CODE:		INSPECTION: AS PER DRAWING			
OTHER DETAILS: _____					
1. FORMING OPERATION: (MENTION TYPE OF FORMING)					
a) Loading Temperature(°C) : b) Rate of heating (°C/hr) : c) Holding temperature(°C) : d) Minimum soaking time : e) Maximum soaking time of last blank in the charge : f) Cooling after forming : g) Temperature above which pressing is to be completed : h) Loading temp. for subsequent charge : i) Stabilizing time for second and subsequent charge :					
2. SUBSEQUENT HEAT TREATMENT:					
Operation	Loading Temp.	Rate of Heating(Maximum)	Holding Temp.°C	Soaking Time	Cooling Medium
GENERAL PRECAUTIONS: _____ _____ _____ _____					
PREPARED BY: Heat treatment section Incharge (WT) CC TO: Incharge (TECH)			APPROVED BY: Incharge (WT)		

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		L&T- CHIYODA LIMITED
Title: FORMING & POST WELD HEAT TREATMENT PROCEDURE for ODC & CrMo Vessels Doc. No.: B016-RUF-LT-504-QC-QD-BHEL(1)-02019		Rev. No.: 0 Page No: 34 of 34

EXHIBIT: 04



BHARAT HEAVY ELECTRICALS LIMITED, HEAVY PLATES & VESSELS PLANT
VISAKHAPATNAM 530012

REQUISITION FOR CLUBBING OF HEAT TREATMENT CHARTS/LOADING CHART

FROM:		CHARGE NO.	DATE:.....
SL.No.	S.O. No.	DESCRIPTION (H.T CYCLE NO.)	QTY. SEQUENCE OF OPERATION
			LOADING TEMP.
			RATE OF HEATING
			SOAKING TEMP.
			SOAKING TIME
			RATE OF COOLING
			UNLOADING TEMP.
			INSPECTION BY
		REQ. BY	ISSUED BY

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