BHEL DRG. No. 1-PV-100-U0061

DWG. NO. B016-RUF-LT-504-MS-CA-BHEL(1)-02351

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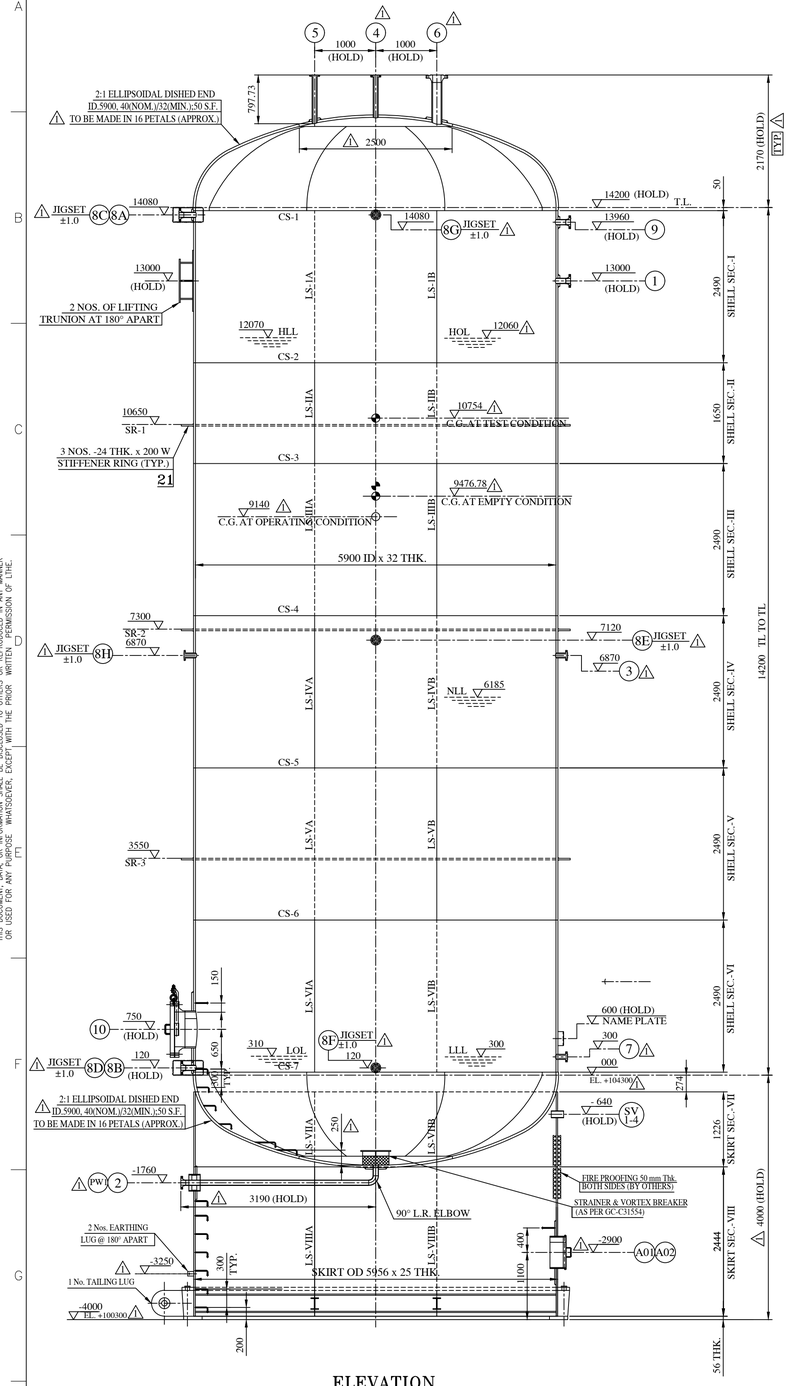
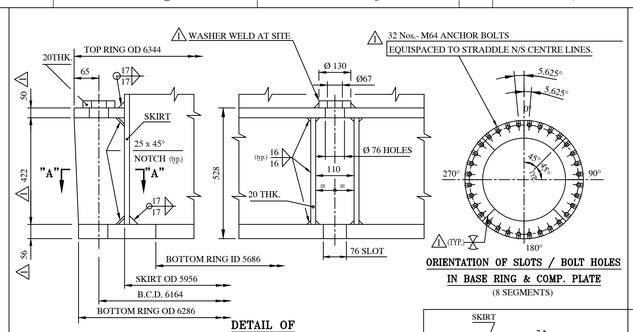


ELEVATION

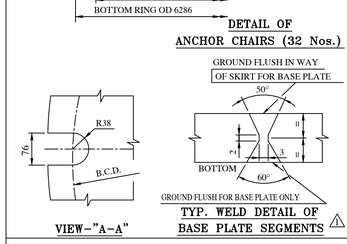
NOTE:

PLEASE NOTE THAT NOZZLE CONNECTIONS ARE 8A,8B,8C & 8D ARE FOULING WITH SHELL TO DISHED END SEAM. KINDLY REVIEW.



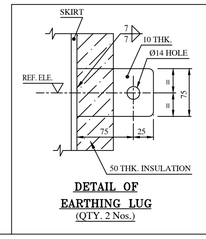
DETAIL OF ANCHOR CHAIRS (32 Nos.)

ORIENTATION OF SLOTS / BOLT HOLES IN BASE RING & COMP. PLATE (8 SEGMENTS)

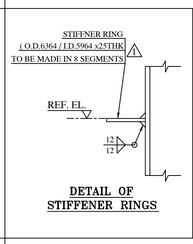


VIEW–"A–A"

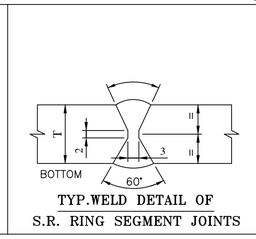
TYP. WELD DETAIL OF BASE PLATE SEGMENTS



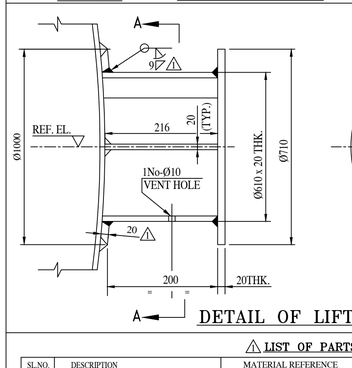
DETAIL OF EARTHING LUG (QTY. 2 Nos.)



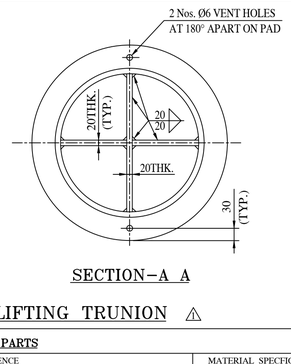
DETAIL OF STIFFENER RINGS



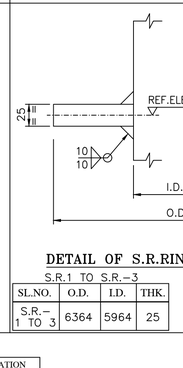
TYP.WELD DETAIL OF S.R. RING SEGMENT JOINTS



DETAIL OF LIFTING TRUNION



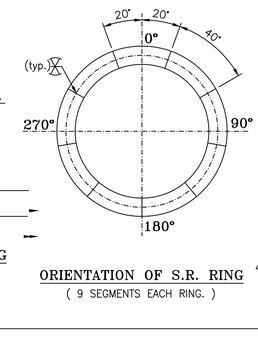
SECTION–A A



DETAIL OF S.R.RING

S.R.1 TO S.R.–3

SL.NO.	O.D.	I.D.	THK.
S.R.– 1 TO 3	6364	5964	25



ORIENTATION OF S.R. RING (9 SEGMENTS EACH RING.)

LIST OF PARTS

SL.NO.	DESCRIPTION	MATERIAL REFERENCE	MATERIAL SPECFICATION
01	SHELL, D'END	CARBON STEEL (REFER NOTE A)	SA516GR.70
02	NOZZLE - 10	FAB. NOZZLE (CARBON STEEL) (REFER NOTE A)	SA516GR.70
03	NOZZLE- 1,2,6,8A-D & 9	SEAMLESS PIPE (CARBON STEEL) (REFER NOTE A)	SA 106 GR.B
04	NOZZLE-3,4,5,7 & 8E-H	FORGED NOZZLE (LWN/RF (CARBON STEEL) (REFER NOTE A)	SA105
05	NOZZLE FLANGES	FORGED (CARBON STEEL) (REFER NOTE A)	SA105
06	INTERNALS	CARBON STEEL (REFER NOTE A)	SA516 GR.70/ SA106 GRB
07	EXTERNAL ATTACHMENT	CARBON STEEL (REFER NOTE A)	SA516 GR.70
08	GASKET	SS 316 SPIRAL WOUND GRAFIL FILED WITH SS316 INNER RING & CS OUTER RING	ASME B16.20
09	EXTERNAL BOLTING	ALLOY STEEL (REFER NOTE A)	SA193 GR.B7M / SA194 GR.2HM
10	BOLTING (INT)	STAINLESS STEEL	SS 304
11	PIPE FITTINGS(INT. & EXT.)	CARBON STEEL (REFER NOTE A)	SA234WPB
12	SKIRT TOP / SKIRT BOTTOM,AO1-2,PW1	CARBON STEEL (REFER NOTE A)	SA516 GR.70 / IS 2062 E250 GR. BR/BO
13	SKIRT VENT (SV1-4)	CARBON STEEL (REFER NOTE A)	SA106 GRB
14	LIFTING TRUNION	CARBON STEEL (REFER NOTE A)	SA 516 GR 70
15	TAILING LUG	CARBON STEEL	IS 2062 E 250 GR. BR/BO
16	FIRE PROOFING NUTS	CARBON STEEL	SA 36
17	EARTHING LUG	STAINLESS STEEL	SA 240 TYP 304
18	ANCHOR CHAIR AND BOLTS (BY LTHE)	CARBON STEEL	IS 2062 E 250 GR. BR/BO

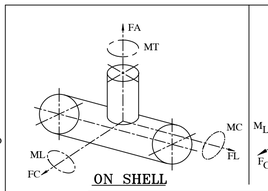
NOTE A : INDICATE NACE

APPLICABLE STANDARDS :

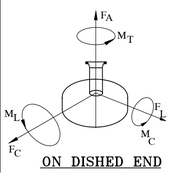
1. ASME BOILER & PRESSURE VESSEL CODE SEC VIII DIV 1 : ED-2019
2. ASME BOILER & PRESSURE VESSEL CODE SEC II PART A, C & D : ED-2019
3. ASME BOILER & PRESSURE VESSEL CODE SEC V : ED-2019
4. ASME BOILER & PRESSURE VESSEL CODE SEC IX ED-2019
5. ASME B16.5 ED-2013-STANDARD FOR PIPE FLANGES AND FLANGED FITTINGS.
6. ASME B16.11 ED-2016 FORGED STEEL FITTINGS, SOCKET WELDED & THREADED
7. ASME B36.10M ED-2018 WELDED AND SEAMLESS WROUGHT STEEL PIPE
8. ASME B1.20.1 ED2013 PIPE THREADS, GENERAL PURPOSE (INCH)

LIST OF HOLDS AS ON DATE

01. ELEVATION OF NOZZLES-1, 8A-D, 8E-H, 9, 10, ~~SV1-4, A01, A02, PW1~~
~~02. SIZES OF INSTRUMENTATION NOZZLES - 8A-D, 8E-H~~
03. ORIENTATION OF NAME PLATE
04. PIPE SUPPORT AND PLATFORM CLEATS
05. ORIENTATION OF LIFTING & TAILING LUG
06. OFFSET DISTANCE OF TOP NOZZLES -5, 6
07. PROJECTION OF NOZZLES - 2, 4, 5, 6



ON SHELL



ON DISHED END

9	3"	300	300	300	112	90	67
7	2"	200	200	200	50	40	30
6	6"	600	600	600	450	360	270
4	2"	200	200	200	50	40	30
3	2"	200	200	200	50	40	30
2	3"	300	300	300	112	90	67
1	3"	300	300	300	112	90	67
Nozzle Mark	NB	FA (kgf)	FL (kgf)	FC (kgf)	MT (kgf-m)	ML (kgf-m)	MC (kgf-m)

Max. Nozzle Load

WELD JOINT TOLERANCES

TABLE – 1

Sl.No.	TOLERANCE APPLICABLE	TOLERANCE
01.	BEVEL ANGLE / INCLUDING ANGLE	
	a). > 35°	± 5°
	b). 20° - 35°	± 2°
	c). < 20°	± 1°
02.	ROOT GAP	
	a). < 3	± 1
	b). 1 < ROOT GAP < 3	± 0.5
	c). < 1	+ 0.5 -0.0

LOAD DATA

SHEAR AT BASE	(KG.)	
	EMPTY	IN OPERATION
DUE TO SEISMIC	-	121450(DBE)/ 53096 (MCE)
DUE TO WIND	-	22405
MOMENT AT BASE	**(KG–M)**	
DUE TO SEISMIC	-	1772650(DBE)/ 858090 (MCE)
DUE TO WIND	-	266458

L-SEAM OF SECTION I,III,V & VII

L-SEAM OF SECTION II,IV,VI & VIII

NO. OF CIRCUMFERENTIAL SEAMS: 8

NO. OF LONGITUDINAL SEAMS: 2 PER SECTION

FOR GENERAL NOTES & OTHER APPLICABLE STD. PLEASE REFER DRG. NO: B016-RUF-LT-504-MS-FD-BHEL(1)-02360

PW1	1	PIPE WAY FOR NOZ. "2"	250 (10")		40 9.27	--	--	--	--	
A01–A02	2	ACCESS OPENING	--	ID.500	- 14	250 x 24	--	--	--	W/COVER
SV1–SV4	4	SKIRT VENT	100 (4")	102.26	40 6.02	--	--	--	--	
10	1	MANWAY+B.F.+DAVIT	600 (24")	577.6	- 16	300 x 32	300	WN/R.F.	3290	
9	1	CALIBRATION NOZZLE	80 (3")	66.64	160 11.13	45 x 32	300	WN/R.F.	3190	
8E-8H	4	LEVEL TAPS (MAGNETIC) (HOLD)	50 (2")	50.8	- 16.6	--	300	LWN/R.F.	3140	
8A-8D	4	LEVEL TAPS (DIAPHRAGM) (HOLD)	80 (3")	66.64	160 11.13	45x32	300	WN/R.F.	3190	
7	1	STEAM OUT	50 (2")	50.8	- 16.6	--	600	LWN/R.F.	3140	
6	1	PRESSURE RELIEF	150 (6")	139.76	120 14.27	85x32	600	WN/R.F.	AS PER DRAWING	
5	1	VENT	50 (2")	50.8	- 16.6	45x32	300	LWN/R.F.	AS PER DRAWING	
4	1	GAS BLANKENTING	50 (2")	50.8	- 16.6	--	600	LWN/R.F.	AS PER DRAWING	
3	1	MIN FLOW	50 (2")	50.8	- 16.6	--	600	LWN/R.F.	3140	
2	1	OUTLET	80 (3")	66.64	160 11.13	45x32	300	WN/R.F.	AS PER DRAWING	
1	1	INLET	80 (3")	66.64	160 11.13	45x32	300	WN/R.F.	3190	
MARK NO.	QTY.	SERVICE	NB (N.P.S)	I.D.	SCH. THK.	R.F.PAD WIDTH x THK.	RATING CLASS	TYPE/ FACE	PROJE. FROM C.L	REMARKS

NOZZLES

TABLE OF NOZZLES AND FLANGES

DESIGN DATA

SERVICE	SULFIDING CHEMICAL DRUM		
DESIGN PRESSURE (INTL. / EXTERNAL) MPa / (kg/cm²) (g)	1.03 (10.5)	0.103 (1.055) AT TOP	
MAXIMUM ALLOWABLE WORKING PRESSURE MPa / (kg/cm²) (g)	1.03 (10.5)		
MAXIMUM ALLOWABLE PRESSURE MPa (kg/cm²) (g)	1.471 (15.0)		
MAXIMUM ALLOWABLE EXT. WORKING PRESSURE MPa / (kg/cm²) (g)	0.103 (1.055)		
MAXIMUM ALLOWABLE CORROSION ALLOWANCE (mm)	0		
DESIGN TEMPERATURE (°C) INT / EXT	260 / 260		
OPERATING PRESSURE MPa / (kg/cm²) (g)	0.343 (3.5)		
OPERATING TEMPERATURE (°C)	AMBIENT		
STEAM OUT CONDITON MPa (kg/cm²) (g)	0.05 (0.5) @ 170 °C		
PNEUMATIC TEST PRESSURE MPa / (kg/cm²) (g)	-NIL-		
HYD.TEST PRESSURE MPa / (kg/cm²) (g) AS PER UG 99c	1.87 (19.11) AT 16 °C (MIN) / 48 °C(MAX) (HORIZONTAL, AT TOP-AT SHOP)		
HYD.TEST PRESSURE MPa / (kg/cm) (g) AS PER UG 99c	1.89 (19.299) AT 16 °C (MIN) / 48 °C(MAX) (VERTICAL, AT TOP-AT SITE)		
CORROSION ALLOWANCE mm 9 (FIXED INTERNALS)	7 (REMOVABLE CS INTERNSLS)	3 (SKIRT)	4.5 (SHELL / HEAD)
CAPACITY (m³)	443.42	CLAD (mm)	NIL
RADIOGRAPHY:	SHELL: 100% | HEAD: 100% (RT1)		
JOINT EFFICIENCY	SHELL: 1.0 | HEAD: 1.0	FAB. WEIGHT (Kg.) :	114944
IMPACT TESTING = EXEMPTED (AS PER UCS-66(c), & NOTE (4) OF FIG UCS-66)		WEIGHT (EMPTY) (Kg.) :	136172
OTHER LOADINGS : YES AS PER UG-22(a), (b), (c), (d), (2), (f), (i), (j)		OPERATION WEIGHT (Kg.) :	466089
INSULATION : NIL FIRE PROOFING : 50 (BOTH SIDES) BY OTHERS		TEST WEIGHT (Kg.) :	577965
DENSITY OF FLUID: Kg./ m³	1030	SPECIAL SERVICE : NO	
POST WELD HEAT TREATMENT (AS PER UW-2, UCS-56, UCS68)	YES	CYCLIC SERVICE : NO	
MINIMUM DESIGN METAL TEMPERATURE °C	12.5	VESSEL SL.NO :	26667
CODE STAMP REQUIRED	☒ YES NO ☐	CONSIGNMENT SIZE : ODC/~~ORDINARY~~	
NB CODE STAMP REQUIRED	☐ YES ☒ NO	POSITION OF VESSEL : VERTICAL	
ASME CERTIFICATION MARK : YES WITH 'U' DESIGNATOR	U	HYDROTEST POSITION : HORIZONTAL IN SHOP	
CODE: ASME BPVC.VIII.1: ED-2019		INSPECTION: AUTHORISED INSPECTION:	M/s CEIL / TUV/BV ONE CIS INSURANCE CO.
NOZZLE LOAD DATA	APPLICABLE	STAGE WISE & THIRD PARTY INSPCTION:	YES
WIND SPECIFICATION: IS 875, PART:3 - 2015	WIND SPEED: 52 m/sec	NATIONAL BOARD REGISTRATION	NOT REQUIRED
WIND ZONE: 6	RISK FACTOR: 1	TERRAIN CATEGORY: 3	TOPOGRAPHY FACTOR : 1
EARTHQUAKE SPECIFICATION: IS 1893 (PART 4) -2015 & SITE SPECTRA		SEISMIC ZONE : 3	IMPORTANCE FACTOR : 2
EQUIPMENT CATEGORY : 1			
POST FORMING HEAT TREATMENT	NO		
LOCATION OF INSTALLATION	M/s. HPCL - VISAKHAPATNAM, A.P. INDIA		

*DISHED ENDS SHALL BE COLD FORMED FOLLOWED BY HEAT TREATMENT CYCLE AS BELOW.

HEAT TREATMENT

Part	Procedure	Loading Temperature (°C)	Holding Temperature (°C)	Heating Rate (°C/hr)	Holding Time (min)	Cooling Rate °C/hr	Remarks
DISHED ENDS	STRESS RELIEVING/PWHT	<400°C	610±15°C	130°C/hr	100 minutes	165°C/hr	Unloading at 400°C
COMPLETE EQUIPMENT	STRESS RELIEVING/PWHT	<425°C	630±10°C	110°C/hr	190 minutes	140°C/hr	Unloading at 425°C

MDMT : 12.5° C @ MAWP : 10.5 kg/cm2(g)
LOWEST ALLOWABLE MDMT : -30° C @ COINCIDENT MAXIMUM PRESSURE : 10.5 kg/cm2(g)
HYD.TEST PRESSURE MPa / (kg/cm2) (g) AS PER UG 99B(CORRODED PRESSURE TEST) : 1.338 (13.65) AT 16 °C (MIN) / 48 °C(MAX) (HORIZONTAL, AT TOP-AT SHOP)

REFERENCE DRAWNGS LIST :

2-PV-100-U0022	B016-RUF-LT-504-MS-FD-BHEL(1)-02361	TRANSPORTATION ARRANGEMENT DETAILS FOR SULFIDING CHEMICAL DRUM (504-V-315)	--
PPPV-2438-PV-100-001	B016-RUF-LT-504-MS-CL-BHEL(1)-02351	MECHANICAL DESIGN CALCULATIONS FOR SULFIDING CHEMICAL DRUM (504-V-315)	--
3-PV-100-U0115	B016-RUF-LT-504-MS-FD-BHEL(1)-02360	GENERAL NOTES FOR SULFIDING CHEMICAL DRUM (504-V-315)	--
3-PV-100-U0114	B016-RUF-LT-504-MS-FD-BHEL(1)-02359	NAME PLATE DETAILS FOR SULFIDING CHEMICAL DRUM (504-V-315)	--
3-PV-100-U0113	B016-RUF-LT-504-MS-FD-BHEL(1)-02358	FOUNDATION TEMPLATE FOR SULFIDING CHEMICAL DRUM (504-V-315)	--
2-PV-100-U0021	B016-RUF-LT-504-MS-FD-BHEL(1)-02357	DETAILS OF PIPE DAVIT FOR SULFIDING CHEMICAL DRUM (504-V-315)	--
3-PV-100-U0112	B016-RUF-LT-504-MS-FD-BHEL(1)-02356	DETAILS OF MANWAY DAVIT FOR SULFIDING CHEMICAL DRUM (504-V-315)	--
0-PV-100-U0003	B016-RUF-LT-504-MS-FD-BHEL(1)-02355	SHELL DEVELOPMENT OF SULFIDING CHEMICAL DRUM (504-V-315)	--
3-PV-100-U0163	B016-RUF-LT-504-MS-FD-BHEL(1)-02362	FIRE PROOFING DETAILS FOR SULFIDING CHEMICAL DRUM (504-V-315)	--
1-PV-100-U0063	B016-RUF-LT-504-MS-FD-BHEL(1)-02354	EXTERNAL ATTACHMENTSS OF SULFIDING CHEMICAL DRUM (504-V-315)	--
3-PV-100-U0111	B016-RUF-LT-504-MS-FD-BHEL(1)-02353	ORIENTATION OF SULFIDING CHEMICAL DRUM (504-V-315)	--
1-PV-100-U0062	B016-RUF-LT-504-MS-FD-BHEL(1)-02352	ASSEMBLY DETAILS OF SULFIDING CHEMICAL DRUM (504-V-315)	--
BHEL DRAWING NO.	CLIENT DOCUMENT NO.	DRAWING TITLE	* REV.

* LATEST REVISION NO. TO BE UPDATED IN ASBUILT DRAWING

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- ☐ 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.

XXX.XXXX.XXXX.XXXX XXX X

DRAWING NO. DRAWING TITLE REV

REFERENCE DOCUMENTS / DRAWINGS

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

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☐ AS BUILT ☐ INFORMATION

☐ CONSTRUCTION ☐ REVIEW

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SIGN: DATE:

	NAME	DICIPLINE	SIGN.	DATE
01 REVISED SUBMISSION	PSK	SKM	PKS		05.10.20
00 FIRST SUBMISSION	TRK	SKM	PKS		28.05.20
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 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 DT:18.03.2020

VENDOR DWG. NO: 1–PV–100–U0061, REV.0

DATE	28.05.20	SCALE	1 : 50
DEPT:	HT ENGG.		
DRN BY:	TRK		
CHK BY:	SKR		
APP BY:	PKS		

TITLE: GENERAL ASSEMBLY OF SULFIDING CHEMICAL DRUM ITEM NO. 504–V–315

PROJECT:

DRG. NO.: B016–RUF–LT–504–MS–GA–BHEL(1)–02351

SH. 01 of 01

PWO NO.:

REV. 01

CAD FILE: THIS DRG. USING CAD SYSTEM ONLY

DWG. NO. B016-RUF-LT-504-MS-FD-BHEL(1)-02352

BHEL DRG. No. 1-PV-100-U0137

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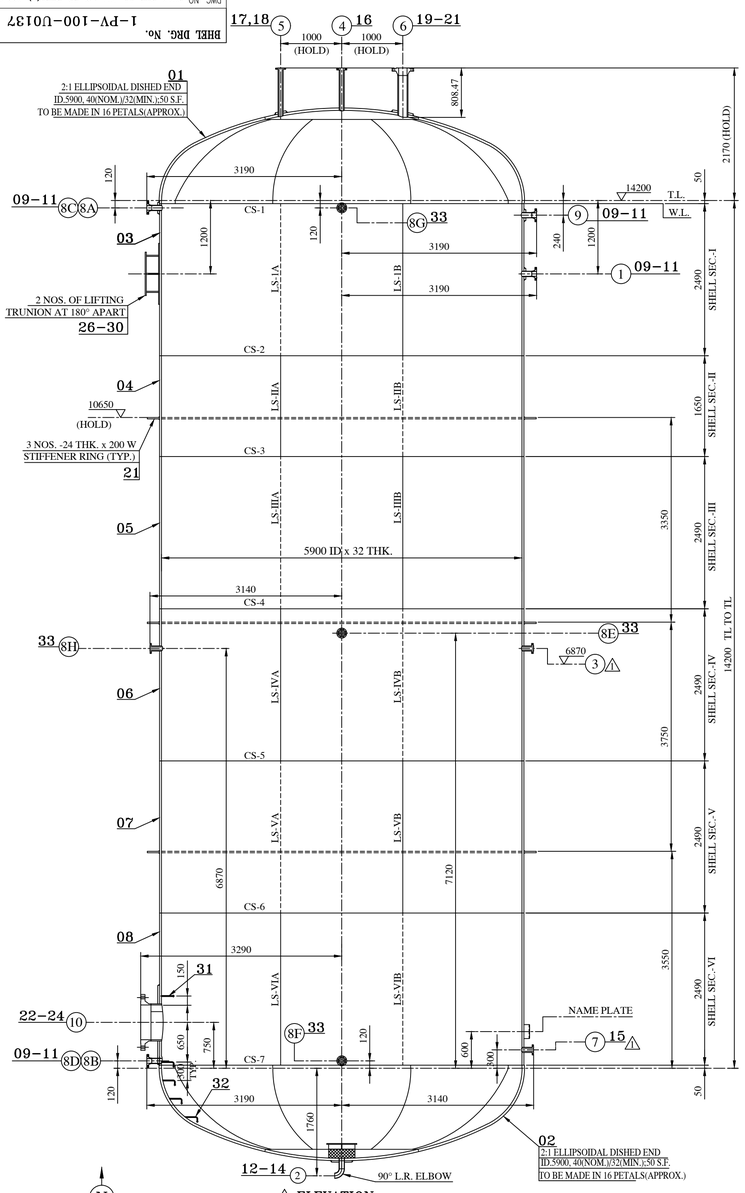
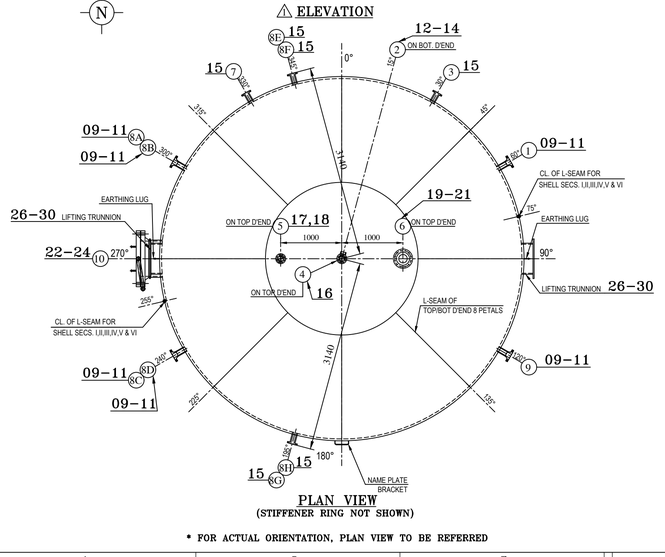
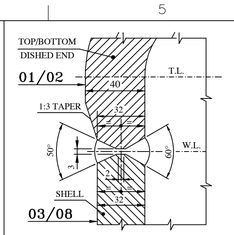


⚠ ELEVATION

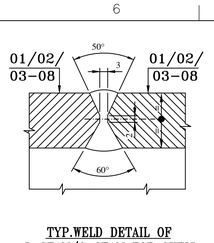


PLAN VIEW
(STIFFENER RING NOT SHOWN)

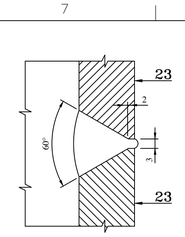
* FOR ACTUAL ORIENTATION, PLAN VIEW TO BE REFERRED



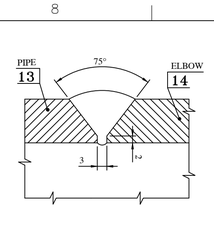
WELD DETAIL OF C-SEAM BETWEEN SHELL TOP/BOTTOM DISHED END



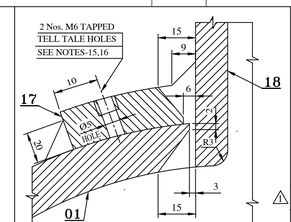
TYP.WELD DETAIL OF L-SEAM/C-SEAM FOR SHELL SECS. I TO VI & PETAL TO PETAL JOINT OF TOP & BOTTOM D'END



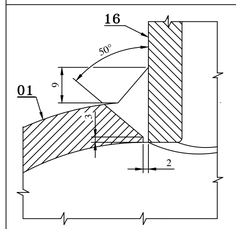
WELD DETAIL OF L-SEAM FOR FAB. NOZZLE-10



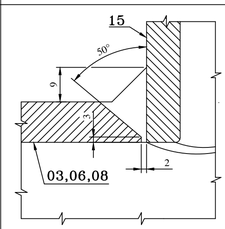
TYP. WELD DETAIL OF PIPE TO ELBOW



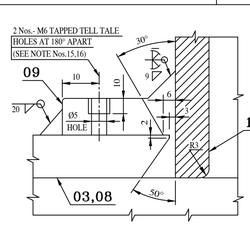
WELD DETAIL OF TOP D'END TO OFFSET LWN FLANGE-5 WITH R.F. PAD



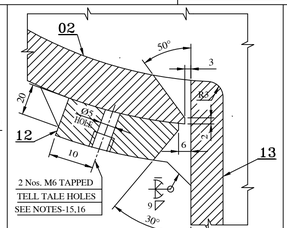
WELD DETAIL OF TOP DISHED END TO RADIAL LWN FLANGE-4



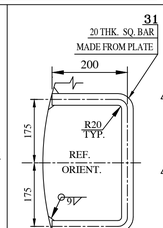
TYP. WELD DETAIL OF SHELL TO RADIAL LWN FLANGE-3,7,8E to 8H



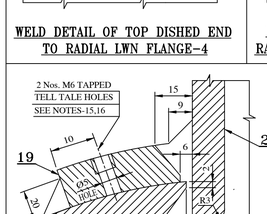
TYP. WELD DETAIL OF SHELL TO RADIAL NOZZLE WITH R.F. PAD
(FOR NOZZLES - 1, 8A to 8D & 9)



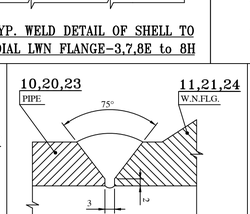
WELD DETAIL OF BOTTOM DISHD END TO RADIAL NOZZLE-2



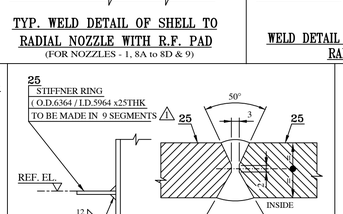
DETAIL OF HAND GRIP
FOR NOZZLE 10 ⚠



WELD DETAIL OF TOP D'END TO OFFSET NOZZLE-6 WITH R.F. PAD

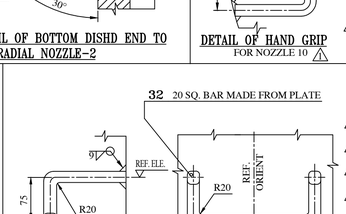


TYP. WELD DETAIL OF PIPE TO W.N. FLANGE

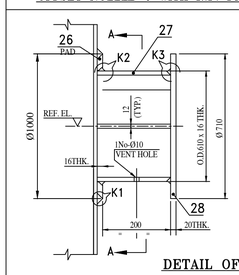


DETAIL OF STIFFENER RINGS

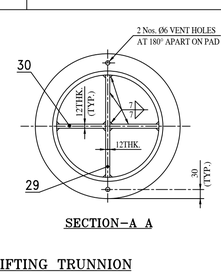
TYP. WELD DETAIL OF SEGMENT JOINT FOR STIFFENER RINGS



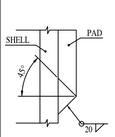
DETAIL OF LADDER RUNG
SHARP CORNERS TO BE ROUNDED OFF FOR NOZZLE 10 ⚠



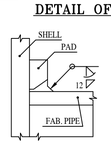
DETAIL OF LIFTING TRUNNION



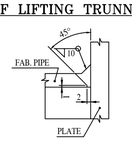
SECTION-A A



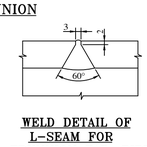
DETAIL-K1



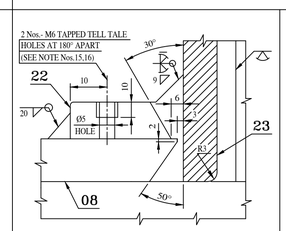
DETAIL-K2



DETAIL-K3



WELD DETAIL OF L-SEAM FOR TRUNNION FAB. PIPE



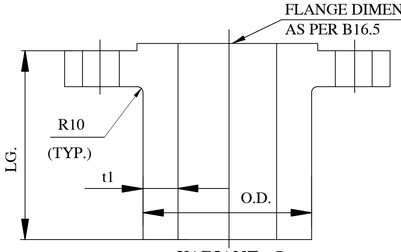
TYP. WELD DETAIL OF SHELL TO RADIAL NOZZLE WITH R.F. PAD
(FOR NOZZLE - 10)

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

ITEM NUMBER	DESCRIPTION	SHEQ	DRAWING NUMBER	ITEM-NO / VAR-NO	MATERIAL CODE / MATERIAL SPECN	A/C/P	UNIT WEIGHT / QUANTITY
33	L.W.N. FLANGE - 8E-8H 50NB x 300#, R.F., BORE = 76.2, L = 190		PPPV-2438-PV-100-001	--	--		13.000
					SA 105		4
32	LADDER RUNG 20 x 20 x 900 LG.			XXX	--		2.826
					SA 516 GR.70		4
31	HAND GRIP 20 x 20 x 750LG.			XXX	--		2.355
					SA 516 GR.70		1
30	RIBS - LIFTING TRUNION 12 THK. x 216 x 283			XXX	--		5.758
					IS 2062 E250B		4
29	RIB - LIFTING TRUNION 12 THK. x 216 x 578			XXX	--		11.761
					IS 2062 E250B		2
28	COVER - LIFTING TRUNION Ø710 x 20THK.			XXX	--		62.160
					IS 2062 E250B		2
27	LIFTING TRUNION 16 THK. x 216 x 1866 LG.			XXX	--		50.624
					IS 2062 E250B		2
26	PAD - LIFTING TRUNION Ø1000 x 20 THK.			XXX	--		98.650
					SA 516 GR.70		2
25	STIFFENING RING O.D.6364 x I.D.5964 x 25THK			XXX	--		729.660
					SA 516 GR.70		3
24	W.N.FLANGE-10 600NBx300#, R.F.,BORE=577.60			--	--		247.000
					SA 105		1
23	PIPE FOR NOZL-10 600NB x 16 THK.x197 LG. (16 THK.x188x1865)			--	--		44.034
					SA 106 GR.B		1
22	RF PAD NOZL-10 OD 1210 x ID 622 x 32 THK.			--	--		212.530
					SA 516 GR.70		1
21	W.N.FLANGE-6 150NBx600#, R.F.,BORE=139.76			--	--		19.000
					SA 105		1
20	PIPE FOR NOZL-6 150NB x SCH.120 x 685 LG.			--	--		38.780
					SA 106 GR.B		1
19	RF PAD NOZL-6 OD 338 x ID 198 x 32 THK.			--	--		14.800
					SA 516 GR.70		1
18	L.W.N. FLANGE - 5 50NB x 300#, R.F., BORE = 50.8, L = 198		PPPV-2438-PV-100-001	--	--		30.100
					SA 105		1
17	RF PAD NOZL-5 OD 179 x ID 101 x 32 THK.			--	--		4.310
					SA 516 GR.70		1
16	L.W.N. FLANGE - 4 50NB x 600#, R.F., BORE = 50.8, L = 705		PPPV-2438-PV-100-001	--	--		24.200
					SA 105		1
15	L.W.N. FLANGE - 3 & 7 50NB x 600#, R.F., BORE = 50.8, L = 190		PPPV-2438-PV-100-001	--	--		13.000
					SA 105		2
14	90° LR ELBOW-2 80NB x SCH.160			--	--		3.842
					SA 234 GR.WPB		1
13	PIPE FOR NOZL-2 80NB x SCH.160 x 171 LG.			--	--		3.650
					SA 106 GR.B		1
12	RF PAD NOZL-2 OD 179 x ID 101 x 32 THK.			--	--		4.310
					SA 516 GR.70		1
11	W.N.FLANGE-1,8A-8D & 9 80NBx300#, R.F.,BORE=66.64			--	--		7.000
					SA 105		6
10	PIPE FOR NOZL-1,8A-8D & 9 80NB x SCH.160 x 240 LG.			--	--		3.436
					SA 106 GR.B		6
09	RF PAD NOZL-1,8A-8D & 9 OD 179 x ID 101 x 32 THK.			--	--		4.310
					SA 516 GR.70		6
08	SHELL SECTION-VI 32 THK. x 2400 x 9318			--	--		5828.29
					SA 516 GR.70		2
07	SHELL SECTION-V 32 THK. x 2490 x 9318			1560 2078 0000	--		5828.29
					SA 516 GR.70		2
06	SHELL SECTION-IV 32 THK. x 2490 x 9318			1560 2078 0000	--		5828.29
					SA 516 GR.70		2
05	SHELL SECTION-III 32 THK. x 2490 x 9318			1560 2078 0000	--		5828.29
					SA 516 GR.70		2
04	SHELL SECTION-II 32 THK. x 1650 x 9318			1560 2078 0000	--		3862.12
					SA 516 GR.70		2
03	SHELL SECTION-I 32 THK. x 2490 x 9318			1560 2078 0000	--		5828.29
					SA 516 GR.70		2
02	BOTTOM DISHED END 40 THK. x ID 5900		3-PV-010-U0104	1560 2078 0000	--		12344.47
					SA 516 GR.70		1
01	TOP DISHED END 40 THK. x ID 5900		3-PV-010-U0104	1560 2078 0000	--		12344.47
					SA 516 GR.70		1

01	ISSUED FOR APPROVAL		PSK	SKM	PKS		06.10.20
00	ISSUED FOR APPROVAL		KKR	SKM	PKS		30.06.20
REV.	DESCRIPTION		DRN	CHECKED	APPROVED	REVIEWED	APPROVED DATE

FLANGE DIMENSIONS AS PER B16.5



VARIANT–2
FOR ITEM Nos. 15,16,18,33

LWN NOZZLE DETAILS								
ITEM NO.	NOZZLE MARK.	SIZE (INCH)	CLASS	O.D	THK. (t1)	LG.	VAR.	QTY.
15	3	2	600	84	16.6	190	2	1
16	4	2	600	84	16.6	705	2	1
18	5	2	300	84	16.6	798	2	1
15	7	2	600	84	16.6	190	2	1
33	8 E-H	2	300	84	16.6	190	2	4

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.

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 ☐
FINAL FOR CODE-1 ☐ AS BUILT ☐
ISSUED FOR
AS BUILT ☐ INFORMATION ☐
CONSTRUCTION ☐ REVIEW ☐

SIGN: DATE:

☐ 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

	NAME	DICIPLINE	SIGN.	DATE

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED
VISAKH REFINERY MODERNIZATION PROJECT
EPCC–03 PACKAGE FOR RESIDUE UP–GRADATION FACILITY (RUF)

PMC: इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम) 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 DT:18.03.2020
VENDOR DWG. NO: 1-PV-100-U0137, REV.0

DATE: 30.06.20	SCALE: 1 : 50	TITLE:	SHELL ASSEMBLY DETAILS FOR SULFIDING CHEMICAL DRUM ITEM NO. 504-V-315
DEPT:	HT ENGG.		
DRN BY:	TRK	PROJECT:	CUSTOMER REF. DRG. NO.: B016-RUF-LT-504-MS-FD-BHEL(1)-02352
CHK BY:	SKR	PWO NO.:	SH. 02 of 05 REV. 01
APP BY:	PKS	CAD FILE:	

THIS DRG. USING CAD SYSTEM ONLY

BHEL DRG. NO.	DRG. NO.
3-PV-100-U0115	B016-RUF-LT-504-MS-FD-BHEL(1)-02360

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED.
2. ALL FLANGE STUD/BOLT HOLES AND ANCHOR BOLT HOLES TO STRADDLE CENTER LINES AS PER E.I.L.STD.No. 7-12-0015. UNLESS OTHERWISE INDICATED.
3. FOR NOZZLES ON SHELL, PROJECTIONS ARE REFERRED FROM VESSEL CENTER LINE TO FLANGE CONTACT FACE AND FOR NOZZLES ON HEAD, PROJECTS ARE REFERRED FROM HEAD T.L TO FLANGE CONTACT FACE.
4. DIMENSIONS OF FLANGES FOR NOZZLES UPTO 600 NB (24") SHALL BE AS PER ASME B16.5 AND FOR NOZZLE ABOVE 600 NB (24") SHALL BE AS PER ASME B16.47 SERIES 'B' UNLESS SPECIFIED OTHERWISE. FLANGE GASKET FACE SHALL HAVE 3.2 – 6.3 MICRONS (125~250 AARH FINISH.)
5. NOZZLES 50 NB AND BELOW SHALL BE STIFFENED WITH 2 NOS. FLATS 90° APART. SIZE OF STIFFENERS SHALL BE 50 MM WIDE X 8 MM THICK.
6. ALL REMOVABLE INTERNALS SHALL BE SIZED SO AS TO PASS THROUGH MANHOLE. (I.D.556MM)
7. WELD EDGE TO EDGE DISTANCE SHALL BE AS PER CL. 4.7.5 OF GENERAL SPECIFICATION FOR PRESSURE VESSEL 6-12-0001.
8. EQUIPMENT TOLERANCE SHALL BE IN ACCORDANCE WITH EIL STD. 7-12-001 OR GA-C1267 OR DESIGN CODE WHICH EVER IS STRINGENT. TOLERANCES INDICATED IN THE DRAWING ARE NON CUMULATIVE.
9. ALL MATERIAL WELDED DIRECTLY TO PRESSURE RETAINING ENVELOPE SHALL BE MATERIAL OF THE SAME P NUMBER AND GROUP NUMBER IN THE APPLICABLE TABLE IN ASME SECTION II PART-D.
10. ALL INTERNAL BOLTS SHALL BE PROVIDED WITH DOUBLE NUTS.
11. WHEREVER INSULATION SUPPORT RINGS ARE COMING IN WAY OF OTHER ATTACHMENTS, THE INSULATION SUPPORT RING MAY BE SUITABLY MODIFIED.
12. PROTECT ALL MACHINED SURFACES AND THREADED CONNECTIONS WITH RUST PREVENTIVE IMMEDIATELY AFTER MACHINING. INSTALL WOOD OR STEEL PROTECTORS FOR FITTINGS IMMEDIATELY AFTER TESTING.
13. DESIGN PRESSURE AT BOTTOM INCLUDES TOP DESIGN PRESSURE + OPERATING LIQUID HEAD + PRESSURE DROP ACROSS THE COLUMN.
14. FURNACE FACE FINISH SHALL COMPLY WITH THE FOLLOWING.
    -FOR SPIRAL WOUND GASKETS: 3.2-6.3 µm RA (125-250 AARH)
15. NO WELDING IS TO BE DONE ON THE COLUMN AFTER HEAT TREATMENT UNLESS OTHERWISE PERMITTED BY CODE/SPECIFICATION/ APPROVED BY L&T
16. ALL SHARP CORNERS ARE TO BE ROUNDED OFF.
17. ID OF WELD NECK FLANGES SHALL MATCH WITH CORRESPONDING I.D. OF NOZZLE PIPE.
18. ALL WELDS OF PRESSURE PARTS & LOAD BEARING PARTS SHALL BE FULL PENETRATION TYPE.
19. KNUCKLE PORTION OF DISHED ENDS BOTH INSIDE AND OUTSIDE SHALL BE D.P.CHECKED.
20. THE GASKETS USED DURING HYDRAULIC TEST SHALL BE OF SAME SPECIFICATION AS SERVICE GASKETS.
21. GASKET SEATING SURFACE OF ALL EXTERNAL FLANGES SHALL HAVE SMOOTH FINISH TO 125 TO 250 AARH AND ALL INTERNAL FLANGES SHALL HAVE CONCENTRIC SERRATIONS.
22. ALL FITTINGS SHALL BE OF SEAMLESS CONSTRUCTION.
23. COMPLETE EQUIPMENT INCLUDING AT LEAST TOP 1 METER OF SKIRT SUPPORT SHALL BE STRESS RELIEVED. HARDNESS OF ALL PLATE, WELDS HAZ AFTER PWHT SHALL BE LIMITED TO 200 BHN. SHALL BE CARRIED BEFORE HYDROTEST.
24. SURFACE PREPARATION AND PAINTING SHALL BE AS PER SURFACE PREPARATION & PAINTING PROCEDURE (DOC. NO. B016-RUF-LT-504-MS-QD-BHEL(1)-02004) AND SHALL COMPLY ALL REQUIREMENTS OF B016-000-79-41-PLS-01, REV.1.
25. FILLET WELD SIZES INDICATED SHOWS THE LEG SIZE AND ARE MINIMUM.
26. NORTH DIRECTION WHEREVER SHOWN IS WITH RESPECT TO PLAN VIEW.
27. THE INDICATED THICKNESS IS MINIMUM ACCEPTABLE AFTER CONSTRUCTION.
28. WELD SEAMS OF FORMED ENDS SHALL BE FULLY RADIOGRAPHED AFTER FORMING & HEAT TREATMENT IF ANY.
29. LIFTING OF EQUIPMENT SHALL BE BY USE OF SPREADER BEAM ONLY.
30.
31. AFTER HYDROTEST, EQUIPMENT SHALL BE THOROUGHLY DRAINED & DRIED OUT, ALL THE NOZZLE OPENINGS SHALL BE CLOSED WITH SUITABLE STEEL COVERS.
32. EARTHING LUGS ARE NOT TO BE PAINTED OR GALVANISED.
33. ALL MAIN WELD SEAMS SHALL BE CLEAR OF NOZZLES, R.F.PADS, INTERNALS AND STIFFENING RINGS BY 50 mm MIN. (WELD EDGE TO WELD EDGE).
    A) IN CASE OF FOULING OF ANY NOZZLE OPENING WITH COLUMN WELD SEAMS (i) GRIND FILLET OF NOZZLE TO SHELL/D'HEAD WELDING TO A SMOOTH CONCAVE RADIUS AND (ii) RE-RADIOGRAPH (100%) THE ADJACENT WELD SEAMS UPTO A DISTANCE OF 300 mm BEYOND EDGE OF NOZZLE ON EACH SIDE BEFORE WELDING THE R.F.PAD.
    B) WHEREVER RF PADS / PADS OF OTHER ATTACHMENTS CROSS OVER WELD SEAMS OF VESSEL, THE WELD SEAM IS TO BE GROUND FLUSH AND FULLY RADIOGRAPHED UPTO 150 mm ON EAITHER SIDE OF PADS BEFORE WELDING THE ATTACHMENTS.
    C) ALL WELDS SHALL BE DYE PENETRATE EXAMINED.
    WHEREVER PADS ARE COMING OVER C-SEAM OF DIFFERENTIAL THICKNESS, BOTTOM SIDE OF PAD SHALL BE GROUND TO SUIT AND WELD OVER THE C-SEAM.
34. ALL BUTT JOINTS (LONGITUDINAL & CIRCUMFERENTIAL) INCLUDING NOZZLE FLANGE TO NECK JOINT SHALL BE FULLY RADIOGRAPHED.
35. ALL BOLTS/STUDS SHALL HAVE ISO THREADING UNLESS OTHERWISE SPECIFIED. STUDS SHALL EXTEND BEYOND NUTS ATLEAST BY 2 THREADS & STUDS SHALL BE THREADED TO FULL LENGTH. BOLTS/STUDS (TO BE TIGHTENED BY HYDRAULIC BOLT TENSIONER) SHALL BE LONGER THAN NORMAL LENGTH BY MINIMUM 1 NUT DIAMETER.
36. ALL INSPECTION REQUIREMENTS SHALL BE AS PER INSPECTION & TEST PLAN DOC. NO. B016-RUF-LT-504-MS-QD-BHEL(1)-02001
37. ALL NOZZLES FABRICATED FROM PLATE SHALL BE 100% RADIOGRAPHED.
38. TAILING LUG SHALL BE PROVIDED AT 90° TO LIFTING LUGS / TRUNION.
39. SUITABLE SLOT SHALL BE CUT IN COMPRESSION RING IN WAY OF TAILING LUG AND COMPRESSION RING WELDED TO TAILING LUG.(IF REQUIRED)
40. ALL HEAT TREATMENTS SHALL BE AS PER FORMING AND HEAT TREATMENT PROCEDURES DOC. NO. B016-RUF-LT-504-QA-QD-BHEL(1)-02010
41. ALL LEVEL INSTRUMENT NOZZLES SHALL BE JIG SET WITHIN TOLERANCE OF +/- 1.0 MM.
42. ALL BUTT WELDS OF PRESSURE PARTS ARE FULL PENETRATION TYPE.
43. EQUIPMENT SHALL BE TRANSPORTED TO SITE IN SINGLE PIECE.
44. ALL DIMENSIONS ARE FROM BOTTOM TANGENT LINE UNLESS OTHERWISED SPECIFIED.
45. ALL ADDITIONAL INDICATIONS SUCH AS NOTCH/EAST/SOUTH/WEST ALONG WITH CG SHALL BE CLEARLY MARKED WITH WHITE PAINT.
46. ALL FILLET WELDS INTERNAL AND EXTERNAL TO PRESSURE CONTAINING COMPONENTS SHALL BE GROUND TO A SMOOTH AND GENEROUS COCAVE CONTOUR.
47. ANCHOR CHAIR WASHER SHALL BE SUPPLIED IN TACKWELD AT SHOP AND THE SAME TO BE FULL WELDED AT SITE AFTER ANCHOR BOLT ARE IN POSITION.
48. HARDNESS MEASUREMENT SHALL BE DONE ON BASE METAL, WELD METAL, WELDS & HAZ AND RESTRICTED TO 200 BHN AFTER PWHT BUT BEFORE HYDRO TEST.
49. R.F.PADS SHALL BE PNEUMATICALLY TESTED FOR LEAK TIGHTNESS TO 1.05 Kg./Sq.Cm BEFORE DEPOSITING S.S WELD METAL IN CLAD ZONE WITH SOAP SOLUTION ON ALL ATTACHMENT WELDS.
50. R.F. PAD IS TO BE WELDED TO SHELL SUCH THAT ONE TELL TALE HOLE WILL BE AT THE BOTTOM OF THE PAD IN THE ASSEMBLED POSITION OF THE COLUMN.
51. TOTAL CORROSION ALLOWANCE:
    FIXED / WELDED CS INTERNALS : 4.5 mm
    ALL REMOVABLE CS INTERNALS : 4.5 mm
    SKIRT : 3 mm

PMC REFERENCE SPECIFICATIONS	
1. GENERAL SPEC. FOR PRESSURE VESSELS	6-12-0001, REV.5
2. SUPP. SPEC. FOR CS VESSELS	6-12-0002, REV.7
3. STD. SPEC. FOR BQCS PLATE	6-12-0011, REV.8
4. STD. SPEC. FOR STRUCTURAL QUALITY PLATES	6-12-0014, REV.6
5. STD. SPC. FOR HARDNESS REQU. STATIC EQUIPMENTS	6-15-0091, REV.3
6. MATERIAL REQU. FOR CS COMPO.USED IN SOUR SERVICE	6-79-0013, REV.1
7. STD. SPC. FOR PMI AT SUPPLIER'S WORK	6-81-0001, REV.3
8. JOB SPECIFICATION (EQUIPMENT DIVISION)	B016-504-80-43-SP-9509, Rev.D
9. SITE SPECIFIC SEISMIC SPECTRA	B016-000-16-54-DB-0001, Rev.0
10. JOB SPEC. FOR SURFACE PREPARATION & PROTECTIVE COATING	B016-000-79-41-PLS-01, Rev.1
11. TECHNICAL NOTES FOR GASKETS	6-44-0056
12. TECHNICAL NOTES FOR BOLTS AND NUTS	6-44-0057
13. BASIC ENGINEERING DESIGN BASIS (PART-B)	A758-999-02-41-00B-1001_BEDB
14. VENDOR DATA REQUIREMENTS	B016-504-80-43-SP-9509
15. SITE SPECIFIC SEISMIC SPECTRA	B016-000-16-54-DB-0001
16. MANDATORY SPARES	B016-504-80-43-SL-9509

LICENSOR SPECIFICATIONS	STD. NO.:
1. DESIGN AND FABRICATION OF CARBON STEEL PRESSURE VESSEL	PVM-SU-4750-H
2. DESIGN AND FAB. OF PRESSURE VESSEL WITH HIGH-ALLOY CLADDING OR OVER LAY	PVM-SU-1322-H.1
3. GENERAL SPECIFICATION FOR MATERIAL OF CONSTRUCTION	BA-175858

PMC REFERENCE STANDARDS	STD. NO.:
1. VESSEL TOLERANCES	7-12-0001, REV.6
2. SKIRT BASE DETAILS	7-12-0004, REV.7
3. SKIRT OPENING DETAILS	7-12-0005, REV.6
4. MANHOLE WITH DAVIT	7-12-0010, REV.7
5. LADDER RUNGS FOR MANHOLE/DEMISTER	7-12-0011, REV.6
6. NOZZLE REINFORCEMENT AND PROJECTION	7-12-0013, REV.6
7. STANDARD BOLT HOLE ORIENTATION	7-12-0015, REV.6
8. ALLOY LINER DETAILS	7-12-0016, REV.6
9. INTERNAL FLANGES	7-12-0018, REV.6
10. VORTEX BREAKERS	7-12-0019, REV.6
11. INLET DEFLECTOR BAFFLE	7-12-0020, REV.6
12. SUPPORT RING AND BOLTING BAR	7-12-0021, REV.6
13. PIPE DAVIT	7-12-0023, REV.7
14. EIL NAME PLATE	7-12-0027, REV.6
15. MANUFACTURER NAME PLATE	7-12-0028, REV.6
16. BRACKET FOR NAME PLATE	7-12-0029, REV.6
17. SUPPORTS FOR INTERNAL FEED PIPE	7-12-0032, REV.5
18. ALLOWABLE NOZZLE LOADS	7-12-0038, REV.0

LICENSOR STANDARDS	STD. NO.:
1. VESSEL TOLERANCES (VERTICAL)	GA-C1267
2. STRAINER AND VORTEX BREAKER	GC-C13354
3. CONN. & WELDING DETAILS FOR CLAD STEEL VESSEL	GD-C99663
4. PRESSURE VESSEL NOZZLES	GF-C14311
5. MANWAY COVER DAVITS & HINGES	GF-C87280
6. PROCESS DATASHEET	B016-RUF-LT-504-PC-DS-0247

LTC STANDARDS	STD. NO.:
1. ALLOWABLE NOZZLE LOADS	LTC-001
2. SKIRT TEMPLATE STANDARD	LTC-D0A-040

PIP STANDARDS	STD. NO.:
1. VESSEL GROUNDING LUG	VEFV-1103
2. VERTICAL VESSEL INSULATION AND FIREP ROOFING	VEFV-1123

EXTERNAL PRESSURE : 'e' kg/cm2(g) : 1.055

B016-RUF-LT-504-MS-FD-BHEL(1)-02360	GENERAL ASSEMBLY OF SULFIDING CHEMICAL DRUM (504-V-315)
DRAWING NO.	DRAWING TITLE

REV

REFERENCE DOCUMENTS / DRAWINGS

DRG. CATEGORY: (USE TICK MARK) [R] [I]
SCH. DATE OF SUBMISSION

EIL REVIEW/APPROVAL CODE:

VPTL NO.:

DOCUMENT STATUS
STATEMENT OF SUB: [1st] [2nd] [3rd]
☐ FINAL FOR CODE-1 ☐ AS BUILT

ISSUED FOR
☐ AS BUILT ☐ INFORMATION
☐ CONSTRUCTION ☐ REVIEW

SIGN: DATE:

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☐ 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	DICIPLINE	SIGN.	DATE

REV.	DESCRIPTION	DRN	CHECKED	APPROVED	REVIEWED	APPROVED	DATE
00	ISSUED FOR APPROVAL	KKR	SKM	PKS			30.05.20

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED
VISAKH REFINERY MODERNIZATION PROJECT
EPCC-03 PACKAGE FOR RESIDUE UP-GRADATION FACILITY (RUF)

PMC : इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उद्यम) 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: HPCL RUF-STA-NGU-0010 DT:18.03.2020

VENDOR DWG. NO: 3-PV-100-U0115, REV. A

DATE 30.05.20 | SCALE N.T.S

TITLE: GENERAL NOTES FOR SULFIDING CHEMICAL DRUM (ITEM NO. 504-V-315)

DEPT: HT ENGG.
DRN BY: K.K.RAO
CHK BY: S.K.M
APP BY: P.K.S.

PROJECT:
DRG. NO.: B016-RUF-LT-504-MS-FD-BHEL(1)-02360
PWO NO.:
SH. 1 OF 1
REV. 00

CAD REVISE THIS DRG. USING CAD SYSTEM ONLY FILE:

L&T - CHIYODA LIMITED

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☐ 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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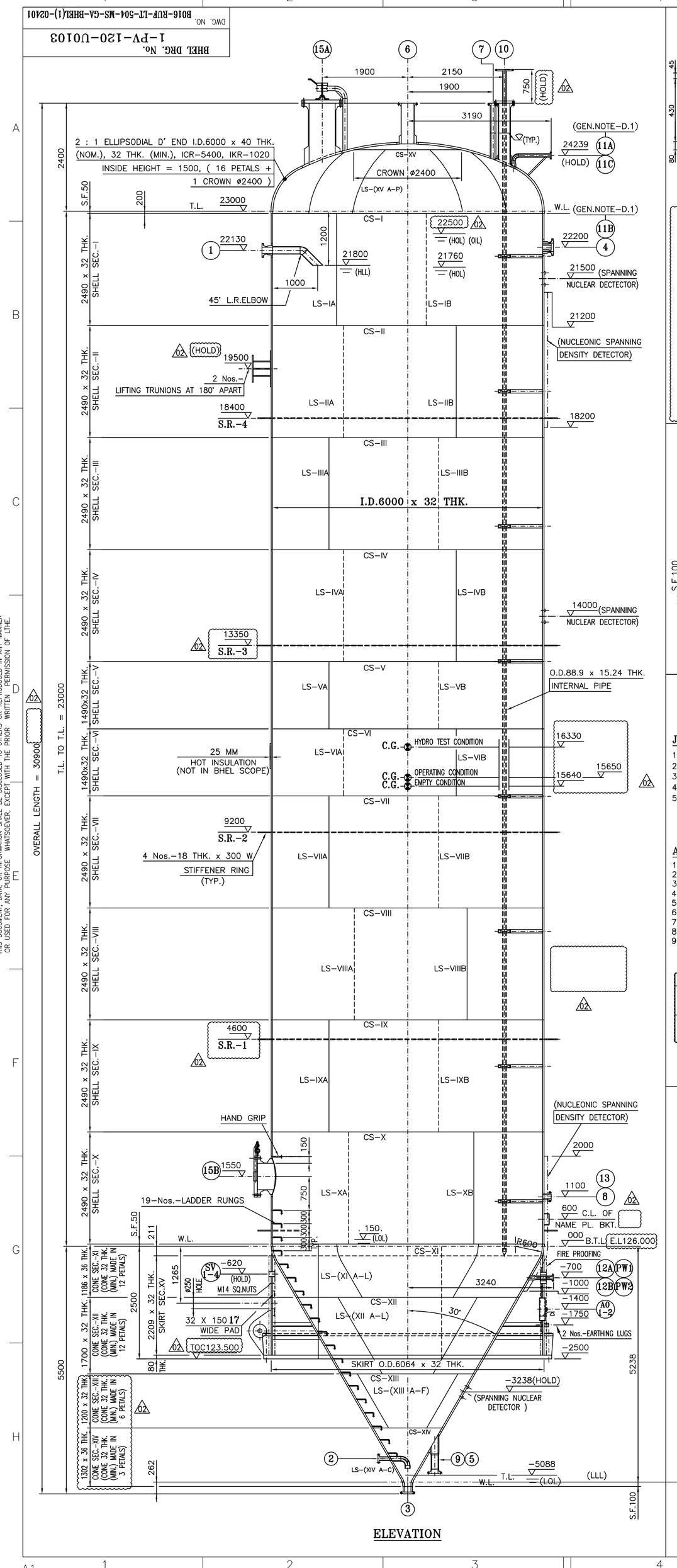
BHEL DRG. No. 1-PV-120-U0103

DWG. NO. B016-RUF-LT-504-MS-CA-BHEL(1)-02401



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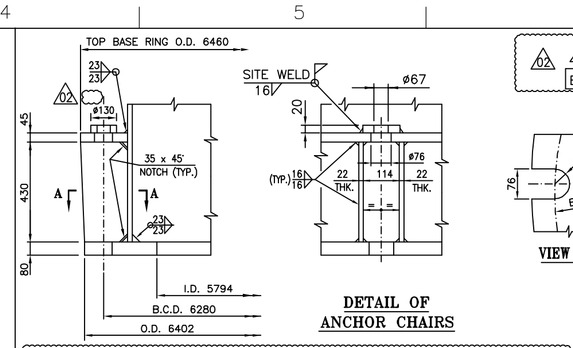
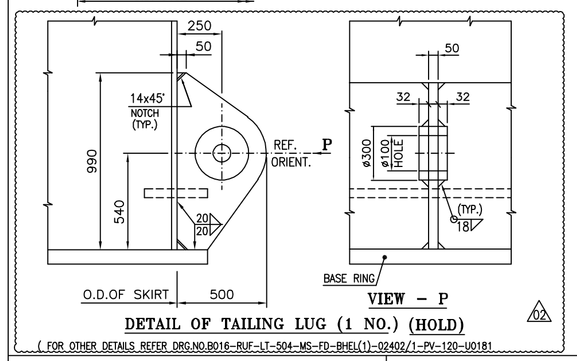
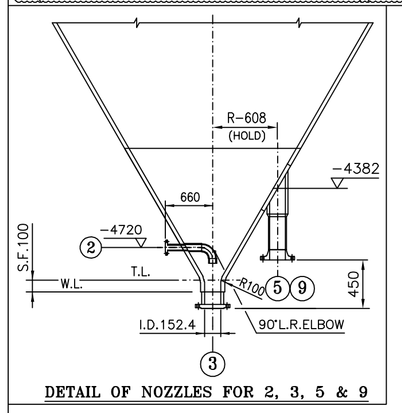
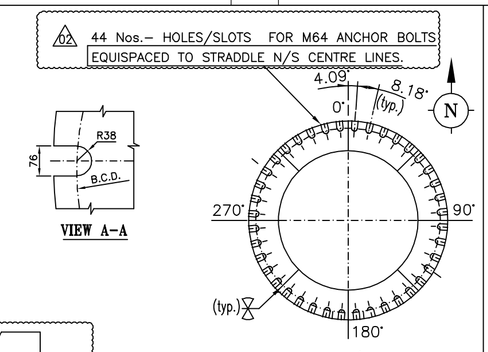
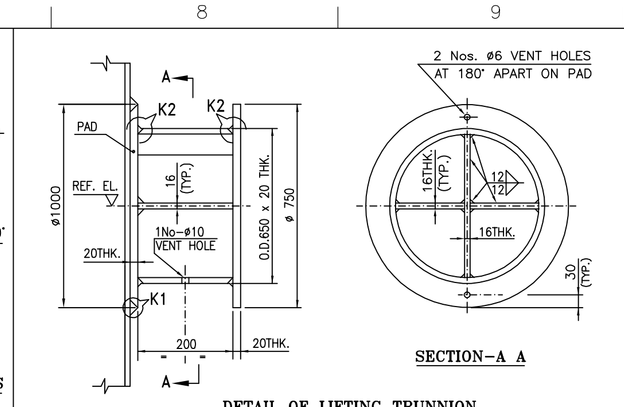


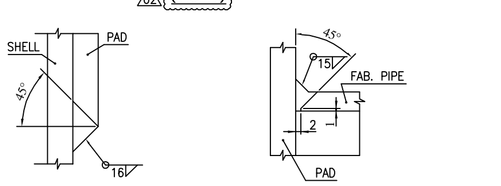


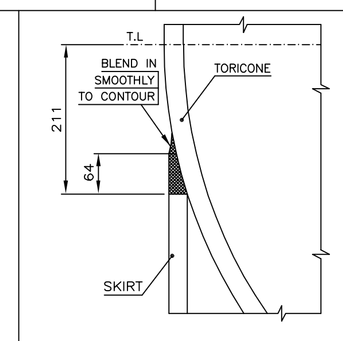


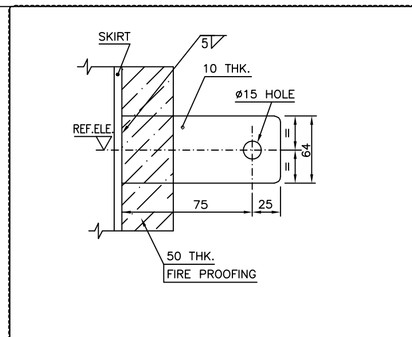
44 Nos.– HOLES/SLOTS FOR M64 ANCHOR BOLTS EQUISPACED TO STRADDLE N/S CENTRE LINES.











DESIGN DATA

SERVICE	--				
DESIGN PRESSURE (INTL. | EXTERNAL) MPa (kg/cm^2) (g)	0.343 (3.5)	0.103 (FV(1.055)) AT TOP			
MAXIMUM ALLOWABLE WORKING PRESSURE MPa (kg/cm^2) (g)	0.343 (3.5) | MAWEP: 0.103 (1.055)				
MAXIMUM ALLOWABLE PRESSURE (MAP) MPa (kg/cm^2)	1.32 (13.42)				
DESIGN TEMPERATURE (°C) (INTERNAL / EXTERNAL)	280 / 280				
OPERATING PRESSURE MPa (kg/cm^2) (g)	0.196 (2.0)				
OPERATING TEMPERATURE (°C)	55				
STEAM OUT CONDITON MPa (kg/cm^2) (g)	0.05 (0.5) @ 170 °C				
MAXIMUM ALLOWABLE CORROSION ALLOWANCE (MACA):(mm)	0				
HYDROTEST PRESSURE AS PER UG-99 (C) (AT SHOP - HORIZONTAL POSITION) MPa (kg/cm^2) (g)	1.61 (16.37)				
HYDROTEST PRESSURE AS PER UG-99 (b) (AT SITE - VERTICAL POSITION) MPa (kg/cm^2) (g)	0.45 (4.6) (NOTE–4)				
CORROSION ALLOWANCE mm (SHELL, SKIRT, INTERNAL)	3 .0 (NOTE: 1)				
CAPACITY (m^3)	~732	CLADING (mm)	NIL		
RADIOGRAPHY:	SHELL: 100% | HEAD: 100%				
JOINT EFFICIENCY	SHELL: 1.0 | HEAD: 1.0	FABRICATED WEIGHT (Kg.) : ~165000 (HOLD)			
IMPACT TESTING = EXEMPTED, (AS PER UCS-66) & NOTE-4 OF FIG. UCS-66M		WEIGHT (EMPTY) (Kg.) : ~171500			
OTHER LOADINGS : YES AS PER UG-22(a), (b), (c), (d), (2), (f), (j)		OPERATION WEIGHT (Kg.) : ~1300000			
INSULATION :- 25 mm (HOT) | FIRPROOFING = 50mm (BOTH SIDES)		TEST WEIGHT (Kg.) : ~900000			
DENSITY OF FLUID: Kg./ m^3	1600 (MAX.)	SPECIAL SERVICE : SUPPLIMENTARY–B OF PVM–SU–4750–H			
POST WELD HEAT TREATMENT (AS PER UW-2,UCS-56,UCS-68,UCL-34(a))	-YES-	CYCLIC SERVICE : NO			
MINIMUM DESIGN METAL TEMPERATURE °C	12.5	VESSEL SL.NO : -26669/26670/26671 (QTY.3 Nos.)			
CODE STAMP REQUIRED	☒ YES NO☐	CONSIGNMENT SIZE : ODC/ORDINARY			
NB CODE STAMP REQUIRED	☐ YES ☒ NO	POSITION OF VESSEL : VERTICAL			
ASME CERTIFICATION MARK	U	HYDROTEST POSITION : HORIZONTAL IN SHOP			
CODE: ASME BPVC.VIII.1: ED-2019		INSPECTION: AUTHORISED INSPECTION:	M/s – CEIL / TUV		
NOZZLE LOAD DATA	APPLICABLE	STAGE WISE & THIRD PARTY INSPECTION:	YES		
WIND SPEED	52 M/SEC	NATIONAL BOARD REGISTRATION	NOT REQUIRED		
EARTHQUAKE SPECIFICATION: IS 1893(PART-4):2015 ED (NOTE–3)		WIND SPECIFICATION:	IS 875-PART-3,2015 (NOTE–2)		
POST FORMING HEAT TREATMENT	-NO-				
LOCATION OF INSTALLATION	M/s HPCL-VISAKHAPATNAM, A.P, INDIA				

LIST OF PARTS

SL.NO.	DESCRIPTION	MATERIAL REFERENCE	MATERIAL SPECIFICATION
01.	SHELL, D'END, CONE	CARBON STEEL	SA516GR.70
02.	NOZZLE FLANGES/FORGINGS	FORGED (CARBON STEEL))	SA105
03.	INTERNALS (REMOVABLE/NON-REM), EARTHING LUG	STAINLESS STEEL	SS316 / SS316L
04.	EXTERNAL ATTACHMENT(DIRECTLY WELDED)	CARBON STEEL	SA516 GR.70
05.	GASKET (EXTERNAL)	SS 316 SPIRAL WOUND GRAFIL FILED WITH SS316 INNER RING & CS OUTER RING	ASME B16.20
06.	FASTNERS (EXTERNAL)	ALLOY STEEL	SA193 GR.B7M/SA194 GR.2HM
07.	FASTNERS (INTERNAL)	STAINLESS STEEL	SS 316
08.	PIPE FITTINGS(INT., EXT.)	STAINLESS STEEL | CARBON STEEL	SS316L / SA234 Gr.WPB
09.	SKIRT, LIFTING LUG	CARBON STEEL	SA516 GR.70
10.	SKIRT VENT	CARBON STEEL	SA106 Gr.B
11.	GASKET (INTERNAL)		COMPRESSED NON ASBESTOS FIBER
12.	ANCHOR CHAIR & BOLTS, TAILING LUG	CARBON STEEL	IS 2062 E250 BR/BO
13.	FIREPROFFING NUTS	CARBON STEEL	SA–36

3-PV-120-U0170	B016-RUF-LT-504-MS-CL-BHEL(1)-02401	GENERAL NOTES FOR CATALYST INVENTORY HOLDING BINS (504-V-607A/B/C)	--
2-PV-120-U0041	B016-RUF-LT-504-MS-DW-BHEL(1)-02412	TRANSPORTATION ARRANGEMENT DETAILS FOR CATALYST INVENTORY HOLDING BINS (504-V-607A/B/C)	--
3-PV-120-U0170	B016-RUF-LT-504-MS-FD-BHEL(1)-02411	GENERAL NOTES FOR CATALYST INVENTORY HOLDING BINS (504-V-607A/B/C)	--
3-PV-120-U0169	B016-RUF-LT-504-MS-FD-BHEL(1)-02410	NAME PLATE DETAILS FOR CATALYST INVENTORY HOLDING BINS (504-V-607A/B/C)	--
3-PV-120-U0168	B016-RUF-LT-504-MS-FD-BHEL(1)-02409	FOUNDATION TEMPLATE FOR CATALYST INVENTORY HOLDING BINS (504-V-607A/B/C) TEMPLATE FOR HOT OIL SURGE DRUM (504-V-703)	--
2-PV-120-U0042	B016-RUF-LT-504-MS-FD-BHEL(1)-02408	DETAILS OF PIPE DAVIT FOR CATALYST INVENTORY HOLDING BINS (504-V-607A/B/C)	--
3-PV-120-U0167	B016-RUF-LT-504-MS-FD-BHEL(1)-02407	DETAILS OF MANWAY DAVIT FOR CATALYST INVENTORY HOLDING BINS (504-V-607A/B/C)	--
0-PV-120-U0015	B016-RUF-LT-504-MS-FD-BHEL(1)-02406	SHELL DEVELOPMENT OF CATALYST INVENTORY HOLDING BINS (504-V-607A/B/C)	--
1-PV-120-U0106	B016-RUF-LT-504-MS-FD-BHEL(1)-02405	INSULATION & FIRE PROOFING SUPPORT DETAILS FOR CATALYST INVENTORY HOLDING BINS (504-V-607A/B/C	--
1-PV-120-U0105	B016-RUF-LT-504-MS-FD-BHEL(1)-02404	EXTERNAL ATTACHMENTS OF CATALYST INVENTORY HOLDING BINS (504-V-607A/B/C)	--
3-PV-120-U0164,165,166	B016-RUF-LT-504-MS-FD-BHEL(1)-02403	ORIENTATION OF CATALYST INVENTORY HOLDING BINS (504-V-607A/B/C	--
1-PV-120-U0104	B016-RUF-LT-504-MS-FD-BHEL(1)-02402	ASSEMBLY DETAILS OF CATALYST INVENTORY HOLDING BINS (504-V-607A/B/C)	--
BHEL DRAWING NO.	L & T HCE DOCUMENT NO.	DRAWING TITLE	REV.

THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE ABOVE DRAWINGS

JOHNSON TYPE SCREEN:–

1. LIQUIDOUTLET – 6"–0.0645^{2}m
2. DRAW OFF – 4"–0.452 ^{2}m
3. SLOT WIDTH – 0.4 mm
4. SCREEN MATERIAL – SS316L
5. DESIGN PRESSURE (dp : 30 Kg/Sq.cm)

APPLICABLE STANDARDS:–

1. ASME BOILER & PRESSURE VESSEL CODE SEC VIII DIV 1 : ED–2019
2. ASME BOILER & PRESSURE VESSEL CODE SEC II PART A, C & D : ED–2019
3. ASME BOILER & PRESSURE VESSEL CODE SEC V : ED–2019
4. ASME BOILER & PRESSURE VESSEL CODE SEC IX ED–2019
5. ASME B16.5 ED–2013–STANDARD FOR PIPE FLANGES AND FLANGED FITTINGS.
6. ASME B16.11 ED–2016 FORGED STEEL FITTINGS, SOCKET WELDED & THREADED
7. ASME B36.10M ED–2018 WELDED AND SEAMLESS WROUGHT STEEL PIPE
8. ASME B1.20.1 ED2013 PIPE THREADS, GENERAL PURPOSE (INCH)
9. ASME B16.20–ED–2017 STANDARD FOR METALLIC GASKETS FOR PIPE FLANGES.

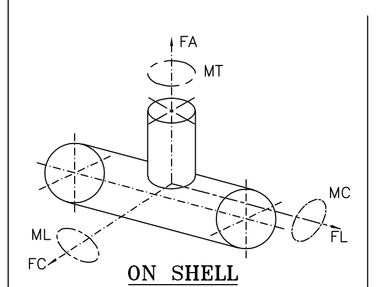
HEAT TREATMENT							
PART	PROCEDURE	LOADING TEMP °C	HOLDING TEMP. °C	HEATING RATE °C/hr	HOLDING TIME min	COOLING RATE °C/hr	REMARKS
COMPLETE EQUIPMENT	STRESS RELIEVING/ PWHT	<425°C	630±10°C	110°C/hr	100 minutes	140°C/hr	Unloading at 425°C

CIVIL LOAD DATA		
	IN OPERATION (D.B.E)	IN OPERATION (M.C.E)
MAXIMUM SHEAR FORCE AT BASE (KG)		
DUE TO SEISMIC	2,38,359	2,96,200
DUE TO WIND	33,355	33,355
MAXIMUM MOMENT AT BASE (KG–M)		
DUE TO SEISMIC	42,15,292	51,55,330
DUE TO WIND	4,80,600	4,80,600

PW1, PW2	2	PIPE WAY FOR NOZ.–12A, 12B	200 (8")	219.1	40 / 8.2	–	–	–	–
SV1–4	4	SKIRT VENTS	100 (4")	114.3	40 / 6.02	–	–	–	–
A01, A02	2	ACCESS OPENING	I.D.500	–	– / 14.0	250 x 32	–	–	–
15B	1	MANWAY + B.F. + DAVIT	600 (24")	610.0	– / 14.0	LIP	300	SRN/R.F.	3340
15A	1	MANWAY + B.F. + DAVIT	600 (24")	610.0	– / 14.0	LIP	300	SRN/R.F.	SEE DRG.
~~14~~	~~1~~	~~GAUGE HATCH + B.F.~~	150 (6")	168.3	– / 12.0	LIP	300	SRN/R.F.	SEE DRG.
13	1	UTILITY CONNECTION	50 (2")	50.8 I.D	– / 16.6	–	300	LWN/R.F.	3190
12A, 12B	2	TEMP. TAPS	50 (2")	50.8 I.D	– / 16.6	–	300	LWN/R.F.	3240
11B	1	LEVEL TAPS	50 (2")	50.8 I.D	– / 16.6	–	300	LWN/R.F.	3190
11A, 11C	2	LEVEL TAPS	50 (2")	50.8 I.D	– / 16.6	–	300	LWN/R.F.	SEE DRG.
10	1	NUCLEAR SOURCE WELL	150 (6")	168.3	– / 16.0	LIP	300	SRN/R.F.	SEE DRG.
9	1	SPARE DUMP NOZZLE	150 (6")	168.3	– / 12.0	LIP	300	SRN/R.F.	SEE DRG.
8	1	STEAM OUT	50 (2")	50.8 I.D	– / 16.6	–	300	LWN/R.F.	3190
7	1	VENT	50 (2")	84.1	– / 16.6	–	300	LWN/R.F.	SEE DRG.
6	1	GAS BLANKETING / RELIEF	350 (14")	355.6	– / 16.0	LIP	300	SRN/R.F.	SEE DRG.
5	1	DRAWOFF	150 (6")	168.3	– / 12.0	LIP	300	SRN/R.F.	SEE DRG.
4	1	LIQUID OUTLET	200 (8")	219.1	– / 14.0	LIP	300	SRN/R.F.	3240
3	1	OUTLET	150 (6")	152.4	– / 26.8	–	300	LWN/R.F.	SEE DRG.
2	1	DILUTION OIL INLET	80 (3")	76.2 I.D	– / 20.6	–	300	LWN/R.F.	SEE DRG.
1	1	INLET	150 (6")	168.3	– / 14	LIP	300	SRN/R.F.	3240

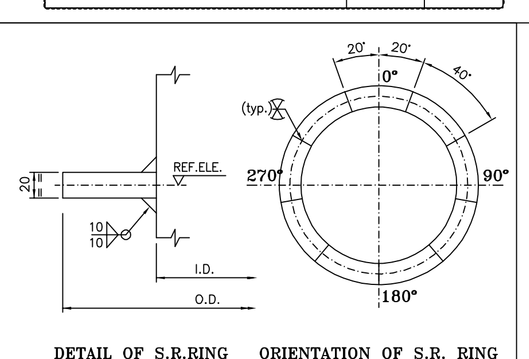
MARK NO.	QTY.	SERVICE	NB (N.P.S)	O.D.	SCH. THK.	R.F.PAD WIDTH x THK	RATING CLASS	TYPE/ FACE	PROJE. SEE NOTE-3	REMARKS
NOZZLES										

TABLE OF NOZZLES AND FLANGES

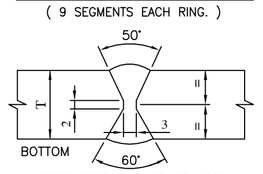


Nozzle Mark	NB	FA (kgf)	FL (kgf)	FC (kgf)	MT (kgf-m)	ML (kgf-m)	MC (kgf-m)
10	6/10"	1000	1000	1000	1250	1000	750
8	2"	200	200	200	50	40	30
6	14"	1400	1400	1400	2450	1960	1470
5,9	6"	600	600	600	450	360	270
4	8"	800	800	800	800	640	480
3	6"	600	600	600	450	360	270
2	3"	300	300	300	112	90	67
1	6"	600	600	600	450	360	270

Max. Nozzle Load



SL.NO.	O.D.	I.D.	THK.	P.NO.
S.R.–1 TO 4	6664	6064	20	46



NOTE:

1. CORROSION ALLOWANCE
   a. FIXED INTERNALS : 3 MM (ON EACH SIDE)
   b. REMOVABLE INTERNALS : 1.5 MM (ON EACH SIDE)
2. WIND ZONE–6; RISK FACTOR–1; BASIC WIND SPEED=52 m/sec; TERRAIN CATEGORY–3, TOPOGRAPHY FACTOR–1
3. SEISMIC ZONE=III; IMPORTANCE FACTOR=2; EQUIPMENT CATEGORY=1 & SITE SPECIFIC SEISMIC SPECTRA
4. HYDROTEST PRESSURE AS PER UG–99(C) 1.42 (14.48) MPa (kg/cm^2) (g) AT SITE– VERTICAL POSITION.

LIST OF HOLDS AS ON DATE

01. PIPE SUPPORT AND PLATFORM CLEATS
02. ORIENTATION & ELEV. OF LIFTING TRUNIONS
03. ELEVATION OF STIFFENING RINGS
04. ELEV. OF SPANNING NUCLEAR DETECTOR
05. ELEV. OF NUCLEAR POINT DETECTOR
06. SIZE & QTY. OF LEVEL TAPS

FOR GENERAL NOTES & OTHER APPLICABLE STD. PLEASE REFER DRG. NO: B016-RUF-LT-504-MS-DW-BHEL(1)-0016

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.

DRG. NO.	DRAWING TITLE	REV
.	.	.

REFERENCE DOCUMENTS / DRAWINGS

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

ISSUED FOR

☐ AS BUILT ☐ INFORMATION

☐ CONSTRUCTION ☐ REVIEW

SIGN: DATE:

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☐V-VOID

	NAME	DISCIPLINE	SIGN.	DATE

REV.	DESCRIPTION	DRN	CHECKED	APPROVED	REVIEWED	APPROVED	DATE
02	M/s LTHE COMMENTS INCORPORATED	SSNM	DS	DS			30.09.2020
01	ISSUED FOR APPROVAL	SSNM	DS	YPK			18.07.2020
00	ISSUED FOR APPROVAL	SSNM	DS	YPK			08.06.2020

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: 1–PV–120–U0103, Rev.02

DATE	SCALE
30.05.20	1:60

TITLE: GENERAL ASSEMBLY OF CATALYST INVENTORY HOLDING BINS (ITEM NO. 504–V–607 A/B/C)

DEPT: P.P.ENGG.

DRN BY: J.J.N.Murthy

CHK BY: D.SATISH

APP BY: Y.P.KUMAR

PROJECT:

DRG. NO.: B016–RUF–LT–504–MS–GA–BHEL(1)–02401

SH. 01 of 01

PWO NO.:

REV. 02

CAD REVISE THIS DRG. USING CAD SYSTEM ONLY FILE:

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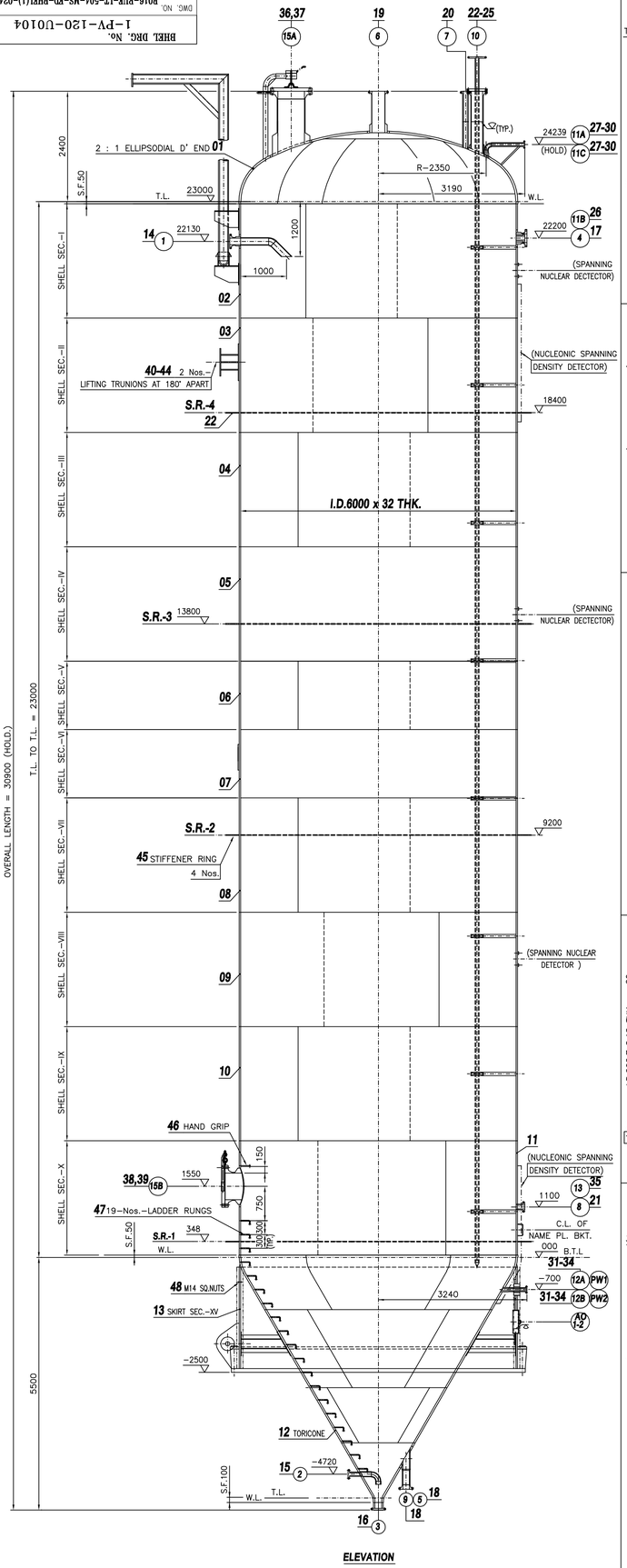
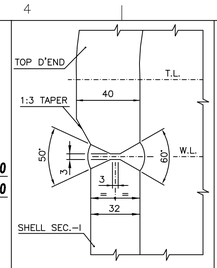
DWG. NO. B016-RUF-LT-504-MS-FD-BHEL(1)-02402

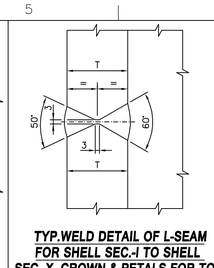
BHEL DRG. No. 1-PV-120-U0104



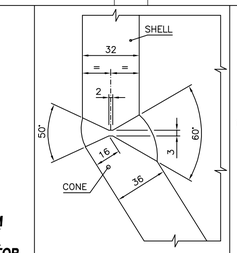
ELEVATION



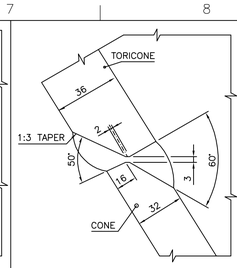
WELD DETAIL OF C-SEAM BETWEEN TOP D'END & SHELL SEC.-I (JOINT NO.CS-I) (Fig. UW-13.1(I))



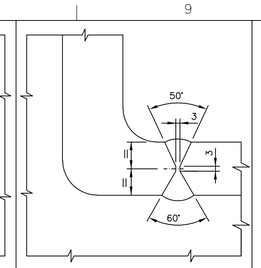
TYP.WELD DETAIL OF L-SEAM FOR SHELL SEC.-I TO SHELL SEC.-X, CROWN & PETALS FOR TOP D'END, AND C-SEAM FOR SHELL SECS.I TO X, CONE SECS.-XI-XIV, SKIRT SEC.XV (JOINT NOS.CS-II TO X, CS-XIII,XVI) (LS-I TO XV)



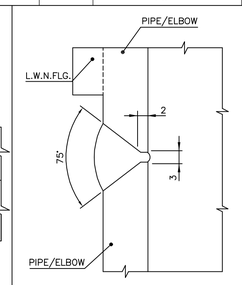
WELD DETAIL OF C-SEAM BETWEEN SHELL SEC.-X AND TORICONE BIG END (JOINT NOS.CS-XI)



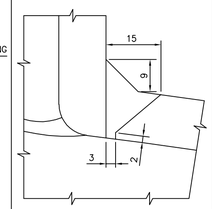
WELD DETAIL OF C-SEAM BETWEEN SHELL SEC.-X AND CONICAL SEC.-XI (JOINT NOS.CS-XII & CS-XIV)



TYP. WELD DETAIL OF LIP S. R. FORGING TO SHELL FOR NOZZLES

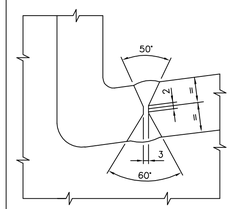


TYP.WELD DETAIL OF PIPE TO PIPE / ELBOW / LWN TO FLANGE

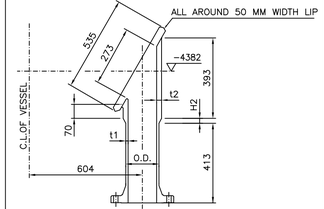


TYP. WELD DETAIL OF D' END / OFFSET NOZLS. WITHOUT R.F. PAD

(FOR NOZLS. – V)

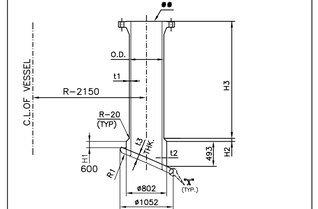


DETAIL OF LIP W.N/ LWN TO D' END



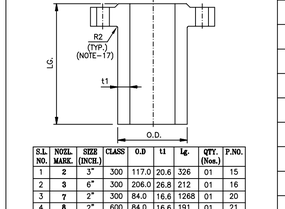
S.L. NO.	NOZL. MARK.	SIZE (INCH.)	CLASS	O.D	⌀B	t1	t2	t3	H1	H2	H3	R1	QTY.	P.NO.
1	5 & 9	6	300	168.3	–	16	25	36	–	25	–	TORICONE	02	18

DETAIL OF OFFSET S.R. NECK FOR NOZL.-5 & 9



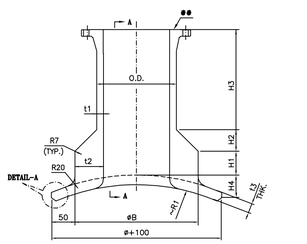
S.L. NO.	NOZL. MARK.	SIZE (INCH.)	CLASS	O.D	⌀B	t1	t2	t3	H1	H2	H3	R1	QTY.	P.NO.
1	10	6	300	168.3	–	16	50	40	60	50	1148	5400	01	22

DETAIL OF OFFSET S.R. NECK FOR NOZL.-10



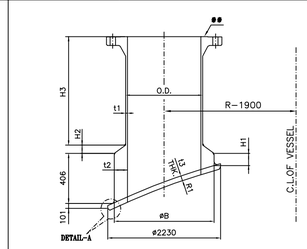
S.L. NO.	NOZL. MARK.	SIZE (INCH.)	CLASS	O.D	t1	Lg.	QTY. (Nos.)	P.NO.
1	2	3"	300	117.0	20.6	326	01	15
2	3	6"	300	206.0	26.8	212	01	16
3	7	2"	300	84.0	16.6	1268	01	20
4	8	2"	600	84.0	16.6	191	01	21
5	11B	2"	300	84.0	16.6	191	01	26
6	13	2"	600	84.0	16.6	191	01	35
7	11A-C,	2"	300	84.0	16.6	764 (HOLD)	02	29

DETAIL OF LWN FLANGES FOR NOZL.-2, 3, 7, 8, 11A-C



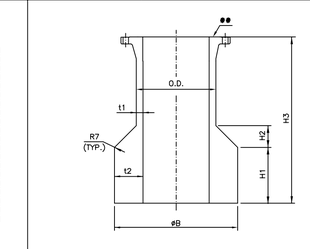
S.L. NO.	NOZL. MARK.	SIZE (INCH.)	CLASS	O.D	⌀B	t1	t2	t3	H1	H2	H3	R1	QTY.	P.NO.
1	1	6	300	168.3	196.3	16	30	32	70	20	118	3000	01	14
2	4	8	300	219.1	267.1	16	40	32	60	20	127	3000	01	17
3	6	14	300	355.6	453.6	16	65	40	70	40	612	5400	01	19
4	15B	24	300	610.0	778	16	100	32	75	60	212	3000	01	38

DETAIL OF S.R. NECKS FOR NOZZLES 1, 4, 6, & 15B



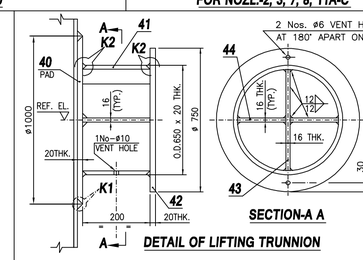
S.L. NO.	NOZL. MARK.	SIZE (INCH.)	CLASS	O.D	⌀B	t1	t2	t3	H1	H2	H3	R1	QTY.	P.NO.
1	15A	24	300	610.0	818	16	120	40	100	65	909	5400	01	36

DETAIL OF OFFSET S.R. NECK FOR NOZL.-15A

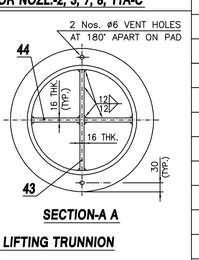


S.L. NO.	NOZL. MARK.	SIZE (INCH.)	CLASS	O.D	⌀B	t1	t2	t3	H1	H2	H3	R1	QTY.	P.NO.
1	12A-B	2"	300	84	101	16.6	25	–	160	25	580	–	02	31

DETAIL OF S.R NECK FOR NOZL.-12A-B



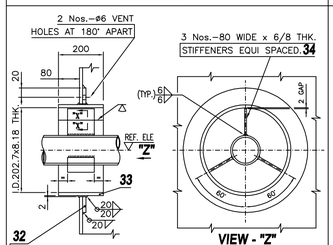
DETAIL OF LIFTING TRUNNION



SECTION-A A

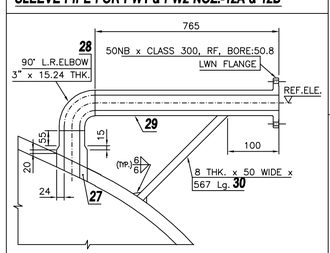
DETAIL-K1

DETAIL-K2

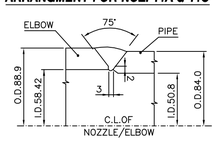


DETAIL OF SLEEVE PIPE FOR PW1 & PW2 NOZ.-12A & 12B

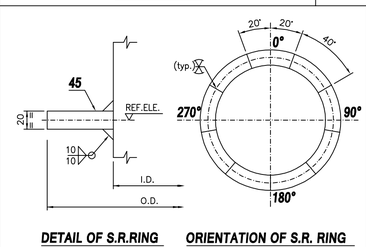
VIEW - "Z"



DETAIL OF STIFFENER ARRANGMENT FOR NOZ.-11A & 11C



TYP.WELD DETAIL OF PIPE TO ELBOW



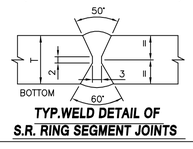
DETAIL OF S.R.RING

S.R.1 TO S.R.–4

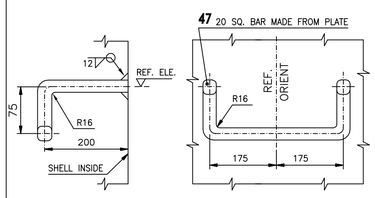
ORIENTATION OF S.R. RING

(9 SEGMENTS EACH FOR P.NO.46.)

SL.NO.	O.D.	I.D.	THK.	P.NO.
S.R.– 1 TO 4	6664	6064	20	45



TYP.WELD DETAIL OF S.R. RING SEGMENT JOINTS



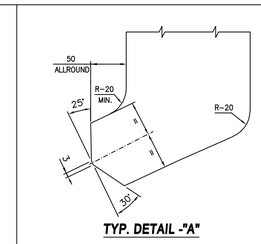
SHARP CORNERS TO BE ROUNDED OFF

DETAIL OF LADDER RUNG

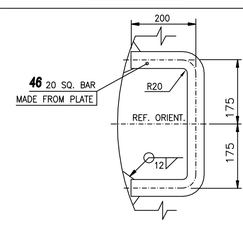
●● 1. FLANGE DIMENSIONS INCLUDING R.F. SHALL BE AS PER ASME B16.5–2013

NOTE:-

1. CUSTOMER DRG.NO. B016–RUF–LT–504–MS–FD–BHEL(1)–*



TYP. DETAIL -"A"



SHARP CORNERS TO BE ROUNDED OFF

DETAIL OF HAND GRIP

ITEM NUMBER	DESCRIPTION	SNO	DRAWING NUMBER	ITEM-NO / VAR-NO	MATERIAL CODE / MATERIAL SPECN	A/C/P	QTY	UNIT WEIGHT / QUANTITY
48	INSULATION & FIRE PROOFING DETAILS FOR CATALYST INVENTORY HOLDING BINS		1–PV–120–U0106 *02405(REF.NOTE–1)		WELDMENT / –			– / –
47	LADDER RUNGS 20 x 20 x 950				– / SA 516 GR.70 (NACE)			4.59 / 19
46	HAND GRIP 20 THK X 20 X 750 Lg.				– / SA 516 GR.70 (NACE)			3.29 / 1
45	STIFFENING RING: 1–4 I.D.6064 x O.D.6664 x 20 THK				– / SA 516 GR.70 (NACE)			4.80 / 1
44	RIBS – LIFTING TRUNION I.D.6064 x O.D.6664 x 18 THK				– / SA 516 GR.70			5.23 / 1
43	RIB – LIFTING TRUNION 16 THK. x 215 x 476				– / SA 516 GR.70			12.85 / 1
42	COVER – LIFTING TRUNION ⌀750 x 20 THK.				– / SA 516 GR.70			69.36 / 1
41	LIFTING TRUNION 16 THK. x 215 x 1545 Lg.				– / SA 516 GR.70			41.72 / 1
40	PAD – LIFTING TRUNION ⌀1000 x 20 THK.				– / SA 516 GR.70 (NACE)			123.3 / 1
39	BLIND FLANGE (NOZL–15B) 24NPS x CLASS 300		3–PV–120–U0167 *02407(REF.NOTE–1)		– / SA 105 (NACE)			358.0 / 1
38	S.R. NOZZLE–24NPS(NOZL–15B) O.D.610.0 (APD.)				– / SA 105 (NACE)			538.0 / 1

37	BLIND FLANGE (NOZL–15A) 24NPS x CLASS 300		3–PV–120–U0221 *02407(REF.NOTE–1)		– / WELDMENT			358.0 / –
36	S.R. NOZZLE–24NPS (NOZL–15A) O.D.610.0 (APD.)				– / SA 105 (NACE)			980.0 / 1
35	LWN FLANGE (NOZL–13) 2NPS×CLASS 300, RF, BORE:50.8				– / SA 105 (NACE)			8.6 / 1
34	RIBS (NOZL–12A , 12B) 80 x 57 x 6 THK. (APD.)				– / SA 516 GR.70 (NACE)			0.32 / 2
33	PIPE (NOZL–12A , 12B) O.D.219.1 x 8.18 x 200 Lg. (APD.)				– / SA 106 Gr.B			8.52 / 2
32	PAD (NOZL–12A , 12B) 32 x ID224 x OD550 (APD.)				– / SA 516 Gr.70			4.43 / 2
31	S.R. NOZZLE–2NPS (NOZL–12A ,12B) O.D.84.1 x 16.60 (APD.)				–– / SA 105 (NACE)			22.0 / 2
30	STIFFENER (NOZL–11A, C) 8 THK. x 50 x 505 Lg.				– / SA 516 GR.70 (NACE)			1.6 / 2
29	LWN FLANGE (NOZL–11A, C) 2NPS×CLASS 300, RF, BORE:50.8				–– / SA 105 (NACE)			0.20 / 2
28	90° L.R. ELBOW (NOZL–11A, C) O.D.88.9 x 15.24				– / SA 234 Gr.WPB(NACE)			– / 2
27	S.R. FORGING (NOZL–11A, C) (APD.)				–– / SA 105 (NACE)			8.0 / 2
26	LWN FLANGE (NOZL–11B) 2NPS×CLASS 300, RF, BORE:50.8				–– / SA 105 (NACE)			8.0 / 1
25	HEX.HD. BOLT WITH NUT 3/4" x 10 UNC x 135 Lg.				– / SA193GR.B7M / SA194GR.2HM			48.0 / 2
24	GASKET 24NPS x CLASS 300				– / SS316 SPW GRAPH. FILLED WITH 316 INNER RING & CS OUTER RING			– / 1
23	BLIND FLANGE (NOZL–10) 6NPS x CLASS 300, RF.				–– / SA 105 (NACE)			56.7 / 1
22	S.R. NOZZLE–6NPS (NOZL–10) O.D.168.3 (APD.)				–– / SA 105 (NACE)			215.0 / 1
21	LWN FLANGE (NOZL–8) 2NPS×CLASS 300, RF, BORE:50.8				–– / SA 105 (NACE)			8.6 / 1
20	LWN FLANGE (NOZL–7) 2NPS×CLASS 300, RF, BORE:50.8				–– / SA 105 (NACE)			27.3 / 1
19	S.R. NOZZLE–14NPS (NOZL–6) O.D.355.6 x 14.0 (APD.)				–– / SA 105 (NACE)			235.0 / 1
18	S.R. NOZZLE–6NPS (NOZL–5, 9) O.D.168.3 (APD.)				–– / SA 105 (NACE)			79.0 / 2
17	S.R. NOZZLE–8NPS (NOZL–4) O.D.219.1 (APD.)				–– / SA 105 (NACE)			175.0 / 1
16	LWN FLANGE (NOZL–3) 6NPS×CLASS 300, RF,BORE:152.0				–– / SA 105 (NACE)			56.0 / 1
15	LWN FLANGE (NOZL–2) 3NPS×CLASS 300, RF,BORE:75.8				–– / SA 105 (NACE)			19.5 / 1
14	S.R. NOZZLE–6NPS (NOZL–1) O.D.168.3 (APD.)				–– / SA 105 (NACE)			85.0 / 1
13	SKIRT SEC.–XV 32 x HT.2209 x DEV. Lg. 18950				–– / SA 516 GR.70 (NACE)			10515.4 / 1
12	TORICONE I.D.6000 X I.D.224 X 32 THK.(MIN.) HT. 5338		1–PV–120–U0180		–– / SA 516 GR.70 (NACE)			– / 1
11	SHELL SECTION–X 32 x HT.2490 x DEV. Lg. 18950				–– / SA 516 GR.70 (NACE)			11853.0 / 1
10	SHELL SECTION–IX 32 x HT.2490 x DEV. Lg. 18950				–– / SA 516 GR.70 (NACE)			11853.0 / 1
09	SHELL SECTION–VIII 32 x HT.2490 x DEV. Lg. 18950				–– / SA 516 GR.70 (NACE)			11853.0 / 1
08	SHELL SECTION–VII 32 x HT.2490 x DEV. Lg. 18950				–– / SA 516 GR.70 (NACE)			11853.0 / 1
07	SHELL SECTION–VI 32 x HT.1490 x DEV. Lg. 18950				–– / SA 516 GR.70 (NACE)			7093.0 / 1
06	SHELL SECTION–V 32 x HT.1490 x DEV. Lg. 18950				–– / SA 516 GR.70 (NACE)			7093.0 / 1
05	SHELL SECTION–IV 32 x HT.2490 x DEV. Lg. 18950				–– / SA 516 GR.70 (NACE)			11853.0 / 1
04	SHELL SECTION–III 32 x HT.2490 x DEV. Lg. 18950				–– / SA 516 GR.70 (NACE)			11853.0 / 1
03	SHELL SECTION–II 32 x HT.2490 x DEV. Lg. 18950				–– / SA 516 GR.70 (NACE)			11853.0 / 1
02	SHELL SEC.–I 32 x HT.2490 x DEV. Lg. 18950		–		–– / SA 516 GR.70 (NACE)			11853.0 / 1
01	TOP DISHED END I.D.6000 x 40 THK. (NOM.)		3–PV–120–U0097		–– / SA 516 GR.70 (NACE)			8878.0 / 1

00	ISSUED FOR APPROVAL	SSNM	SD	SD				22.09.2020
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: इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उद्यम) ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

LSTK CONTRACTOR: L&T Hydrocarbon Engineering

DETAILED ENGINEERING CENTER: 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 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.

VENDOR: Bharat Heavy Electricals Limited
UNIT: HEAVY PLATES & VESSELS PLANT
VISAKHAPATNAM–530012

VENDOR PO NO: REFINERY/75000–66912/NG., DATE:18.03.2020, REV.01

VENDOR DWG. NO: 1–PV–120–U0104

DRAWING NO. | DRAWING TITLE | REV
–

REFERENCE DOCUMENTS / DRAWINGS

DRG. CATEGORY: (USE TICK MARK) R I
SCH. DATE OF SUBMISSION
EIL REVIEW/APPROVAL CODE:
VPTL NO.:

DOCUMENT STATUS
STATEMENT OF SUB: 1st 2nd 3rd
☐ FINAL FOR CODE–1 ☐ AS BUILT
ISSUED FOR
☐ AS BUILT ☐ INFORMATION
☐ CONSTRUCTION ☐ REVIEW

☐ REVIEW CODE 1 – NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE DOCUMENT.
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☐ V–VOID

SIGN: DATE:

	NAME	DICIPLINE	SIGN.	DATE

DATE 22.09.20 SCALE 1 : 60
DEPT: P.P.ENGG.
DRN BY: J.J.N.Murthy
CHK BY: D.SATISH
APP BY: D.SATISH

TITLE: ASSEMBLY DETAILS OF CATALYST INVENTORY HOLDING BINS (ITEM NO. 504–V–607 A/B/C)

PROJECT:
PWO NO.:
DRG. NO.: B016–RUF–LT–504–MS–FD–BHEL(1)–02402
SH. 01 of 02
REV. 01

CAD REVISE THIS DRG. USING CAD SYSTEM ONLY FILE:

BHEL DWG. NO. 1-PV-120-U0170

DWG. NO. B016-RUF-LT-504-MS-FD-BHEL(1)-02411

A. GENERAL:-

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED.
2. ALL INTERNAL BOLTS SHALL BE PROVIDED WITH DOUBLE NUTS.
3. DESIGN PRESSURE AT BOTTOM INCLUDES TOP DESIGN PRESSURE + OPERATING LIQUID HEAD + PRESSURE DROP ACROSS THE VESSEL.
4. NO WELDING IS TO BE DONE ON THE VESSEL AFTER HEAT TREATMENT UNLESS OTHERWISE PERMITTED BY CODE/SPECIFICATION/APPROVED BY L & T
5. ALL SHARP CORNERS ARE TO BE ROUNDED OFF.
6. NORTH DIRECTION WHEREVER SHOWN IS WITH RESPECT TO PLAN VIEW.
7. ISO THREADING SHALL BE USED FOR ALL BOLTS / STUDS. STUDS SHALL EXTEND BEYOND NUTS ATLEAST BY 2 THREADS & STUDS SHALL BE THREADED TO FULL LENGTH.
8. ALL ADDITIONAL INDICATION SUCH AS NORTH / EAST / WEST / SOUTH ALONG WITH C.G SHALL BE CLEARLY MARKED WITH THE PAINT.

B. MATERIAL:

1. DIMENSIONS OF FLANGES FOR NOZZLES UPTO 600 NB (24") SHALL BE AS PER ASME B16.5 AND FOR NOZZLE ABOVE 600 NB (24") SHALL BE AS PER ASME B16.47 SERIES 'B' UNLESS SPECIFIED OTHERWISE. FLANGE GASKET FACE SHALL HAVE 3.2 – 6.3 MICRONS (125~250 AARH FINISH.)
2. THE GASKETS USED DURING HYDRAULIC TEST SHALL BE OF SAME SPECIFICATION AS SERVICE GASKETS.
3. ALL MATERIALS WELDED DIRECTLY TO THE PRESSURE RETAINING ENVELOP SHALL BE MATERIAL OF THE SAME P.NUMBER AND GROUP NUMBER IN THE APPLICABLE TABLE IN ASME CODE SECTION-II PART-D.

C. FABRICATION:

1. FABRICATION, INSPECTION REQUIREMENT SHALL BE COMPLIED WITH SPECIFICATION NO. 6-79-0013
2. FOR NOZZLES ON SHELL, PROJECTIONS ARE REFERRED FROM VESSEL CENTER LINE TO FLANGE CONTACT FACE AND FOR NOZZLES ON HEAD, PROJECTS ARE REFERRED FROM HEAD T.L TO FLANGE CONTACT FACE.
3. NOZZLES 50 NB AND BELOW SHALL BE STIFFENED WITH 2 NOS. FLATS 90° APART. SIZE OF STIFFENERS SHALL BE 50 MM WIDE X 8 MM THICK.
4. WELD EDGE TO EDGE DISTANCE SHALL BE AS PER CL. 4.7.5 OF GENERAL SPECIFICATION FOR PRESSURE VESSEL 6-12-0001.
5. ALL WELDS OF PRESSURE PARTS & LOAD BEARING PARTS SHALL BE FULL PENETRATION TYPE.
6. THE GASKETS USED DURING HYDRAULIC TEST SHALL BE OF SAME SPECIFICATION AS SERVICE GASKETS. GASKET SEATING SURFACE OF ALL EXTERNAL FLANGES SHALL HAVE SMOOTH FINISH TO 125 TO 250 AARH AND ALL INTERNAL FLANGES SHALL HAVE CONCENTRIC SERRATIONS.
7. FILLET WELD SIZES INDICATED SHOWS THE LEG SIZE AND ARE MINIMUM.
8. THE INDICATED THICKNESS IS MINIMUM ACCEPTABLE AFTER CONSTRUCTION.
9. ALL BUTT WELDS OF PRESSURE PARTS ARE FULL PENETRATION TYPE.
10. ALL FLANGE STUD/BOLT HOLES AND ANCHOR BOLT HOLES TO STRADDLE CENTER LINES AS PER EIL STD. NO.7-12-0015, UNLESS OTHERWISE INDICATED.
11. ALL MAIN WELD SEAMS SHALL BE CLEAR OF NOZZLES, INTERNALS AND STIFFENING RINGS BY 50 mm MIN. (WELD EDGE TO WELD EDGE).
    A) IN CASE OF FOULING OF ANY NOZZLE OPENING WITH VESSEL WELD SEAMS, (i) GRIND FILLET OF NOZZLE TO SHFII/DFND WELDING TO A SMOOTH CONCAVE RADIUS. (ii) RE-RADIOGRAPH (100%) THE ADJACENT WELD SEAMS UP TO A DISTANCE OF 300MM BEYOND EDGE OF NOZZLE ON EACH SIDE.
    B) ALL WELDS SHALL BE DYE PENETRATE EXAMINED.

D. TOLERANCE:

1. ALL LEVEL INSTRUMENT NOZZLES SHALL BE JIG SET WITHIN TOLERANCE OF +/- 1.0 MM.
2. EQUIPMENT TOLERANCE SHALL BE IN ACCORDANCE WITH EIL STD. 7-12-001 OR GA-C1266 OR DESIGN CODE WHICH EVER IS STRINGENT. TOLERANCES INDICATED IN THE DRAWING ARE NON CUMULATIVE.

E. TESTING:

1. WATER USED FOR HYDRAULIC TESTING SHALL BE CLEAN & POTABLE HYDROTEST SHALL BE CARRIED OUT AS PER DOC. NO B016-RUF-LT-504-QC-QD-BHEL(1)-02014/(BHEL DOC.NO HPVP-QA-2438-HYDROTEST-01)
2. ALL INSPECTION REQUIREMENTS SHALL BE AS PER INSPECTION & TEST PLAN DOC. NO. B016-RUF-LT-504-QC-QD-BHEL(1)-02001/(BHEL DOC.NO. HPVP-QA-2438-QAP-01)

F. NDE:

1. KNUCKLE PORTION OF DISHED ENDS BOTH INSIDE AND OUTSIDE SHALL BE D.P.CHECKED.
2. ALL HEAT TREATMENTS SHALL BE AS PER FORMING AND HEAT TREATMENT PROCEDURES DOC. NO. B016-RUF-LT-504-QC-QD-BHEL(1)-02019/(BHEL DOC.NO. HPVP-WT-2438-QAP-19)

G. SURFACE PREPARATION AND PROTECTION:

1. SURFACE PREPARATION AND PAINTING SHALL BE AS PER SURFACE PREPARATION & PAINTING PROCEDURE (DOC. NO. B016-RUF-LT-504-MS-QD-BHEL(1)-02013/(BHEL DOC.NO. HPVP-2438-PAINT-01) AND SHALL COMPLY ALL REQUIREMENTS OF B016-000-79-41-PLS-01, REV.1.
2. ALL SS / CLAD SURFACES AND WELDMENTS SHALL BE PICKLED & PASSIVATED AS PER ASTM A-380 AFTER HYDRAULIC TESTING.
3. PROTECT ALL MACHINED SURFACES AND THREADED CONNECTIONS WITH RUST PREVENTIVE IMMEDIATELY AFTER MACHINING. INSTALL WOOD OR STEEL PROTECTORS FOR FITTINGS IMMEDIATELY AFTER TESTING.
4. EARTHING LUGS ARE NOT TO BE PAINTED OR GALVANISED.

H. SHIPMENT AND HANDLING:

1. ALL REMOVABLE INTERNALS SHALL BE SIZED SO AS TO PASS THROUGH MANHOLE. (I.D.578MM)
2. AFTER HYDROTEST, EQUIPMENT SHALL BE THOROUGHLY DRAINED & DRIED OUT. ALL THE NOZZLE OPENINGS SHALL BE CLOSED WITH SUITABLE STEEL COVERS.
3. EQUIPMENT SHALL BE TRANSPORTED TO SITE IN SINGLE PIECE.
4. LIFTING OF EQUIPMENT SHALL BE DONE USING SPREADER BEAM ONLY.

PMC REFERENCE SPECIFICATIONS	STD. NO. :
1. GENERAL SPEC. FOR PRESSURE VESSELS	6-12-0001, REV.5
2. SUPP. SPEC. FOR CS VESSELS	6-12-0002, REV.7
3. STD. SPEC. FOR BQCS PLATE	6-12-0011, REV.8
4. STD. SPEC. FOR STRUCTURAL QUALITY STEEL PLATES	6-12-0014, REV.6
5. STD. SPC. FOR HARDNESS REQU. STATIC EQUIPMENTS	6-15-0091, REV.3
6. MATERIAL REQU. FOR CS COMPO.USED IN SOUR SERVICE	6-79-0013, REV.1
7. BASIC ENGINEERING DESIGN BASIS (PART-B)	A758-999-02-41-ODB-1001_BEDB, REV.2
8. TECHNICAL NOTES FOR GASKETS	6-44-0056, REV.5
9. TECHNICAL NOTES FOR BOLTS AND NUTS	6-44-0057, REV.5
10. MANDATORY SPARES	B016-504-80-43-SL-9509, REV.A
11. STD. SPC. FOR PMI AT SUPPLIER'S WORK	6-81-0001, REV.3
12. ENGINEERING DESIGN BASIS STATIC EQUIPMENT	A758-999-16-46-EDB-1001,
13. JOB SPECIFICATION (EQUIPMENT DIVISION)	B016-504-80-43-SP-9509,
14. SITE SPECIFIC SEISMIC SPECTRA	B016-000-16-54-DB-0001,
15. JOB SPEC. FOR SURFACE PREPARATION & PROTECTIVE COATING	B016-000-79-41-PLS-01,

LICENSOR SPECIFICATIONS	STD. NO. :
1. DESIGN AND FABRICATION OF CARBON STEEL PRESSURE VESSEL	PVM-SU-4750-H
2. GENERAL SPECIFICATION FOR MATERIAL OF CONSTRUCTION	BA-175858
3. PROCESS DATA SHEET	B016-RUF-LT-504-MS-GA-BHEL(1)-02401

PMC REFERENCE STANDARDS	STD. NO. :
1. VESSEL TOLERANCES	7-12-0001, REV.6
2. MANHOLE WITH DAVIT	7-12-0010, REV.7
3. LADDER RUNGS FOR MANHOLE/DEMISTER	7-12-0011, REV.6
4. NOZZLE REINFORCEMENT AND PROJECTION	7-12-0013, REV.6
5. STANDARD BOLT HOLE ORIENTATION	7-12-0015, REV.6
6. EIL NAME PLATE	7-12-0027, REV.6
7. MANUFACTURER NAME PLATE	7-12-0028, REV.6
8. BRACKET FOR NAME PLATE	7-12-0029, REV.6
9. SUPPORT FOR HORIZONTAL VESSEL	7-12-0002, REV.6

LICENSOR STANDARDS	STD. NO. :
1. VESSEL TOLERANCES (HORIZONTAL)	GA-C1266, REV.1
2. STRAINER AND VORTEX BREAKER	GC-C31554, REV.13
3. PRESSURE VESSEL NOZZLES	GF-C1030, REV.4
4. GASKET SPECIFICATION	GA-L1264, REV.6

INSPECTION DOCUMENTS	STD. NO. :
1. INSPECTION & TEST PLAN FOR GASKETS	6-81-0008, REV. 3
2. INSPECTION & TEST PLAN FOR PR VESSEL & CS COLUMN	6-81-0011, REV. 3

TEMPLATE	STD. NO. :
1. ALLOWABLE NOZZLE LOADS	LTC-001
2. SETTING BOLTS	LTC-EQ-DOA-042

PIP STANDARD	STD. NO. :
1. VESSEL GROUNDING LUG	VEFV-1103
2. VESSEL VORTEX BREAKERS	VEFV-1124

L&T - CHIYODA LIMITED

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- ☐ V-VOID

COMMENTED BY	REVIEWED BY	APPROVED BY	DATE

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1-PV-020-U0103	B016-RUF-LT-504-MS-GA-BHEL(1)-02401	GENERAL ASSEMBLY OF CATALYST INVENTORY HOLDING BINS (ITEM NO. 504-V-607 A/B/C)	**
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]
SCH. DATE OF SUBMISSION

DOCUMENT STATUS
STATEMENT OF SUB: [1st] [2nd] [3rd]
☐ FINAL FOR CODE-1 ☐ AS BUILT

ISSUED FOR
☐ AS BUILT ☐ INFORMATION
☐ CONSTRUCTION ☐ REVIEW

SIGN: DATE:

EIL REVIEW/APPROVAL CODE: VPTL NO.:

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- ☐ V-VOID

NAME	DICIPLINE	SIGN.	DATE

REV.	DESCRIPTION	DRN	CHECKED	APPROVED	REVIEWED	APPROVED	DATE
00	ISSUED FOR APPROVAL	SSNM	SATISH	YPR	--	--	09.06.20

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED
VISAKH REFINERY MODERNIZATION PROJECT
EPCC-03 PACKAGE FOR RESIDUE UP-GRADATION FACILITY (RUF)

PMC: इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम) 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

BHEL PO NO: REFINERY/75000-66912/NG ; DATED : 18-03-2020

BHEL DWG. NO: 1-PV-120-U0170, REV.00

DATE	SCALE
13 MAY '20	N.T.S

TITLE: GENERAL NOTES FOR CATALYST INVENTORY HOLDING BINS (ITEM NO. 504-V-607 A/B/C)

DEPT. P.NOG
DRN. BY SSN.Murty
CHK. BY SATISH
APP. BY Y.P.K

PROJECT
DWG. NO: B016-RUF-LT-504-MS-FD-BHEL(1)-02411
SH 1 OF 1
REV. 00

CAUTION: THIS DRG. CONTAINS CLASSIFIED INFO. FOR OFFICIAL USE ONLY

P1 (Nace).
M.1.1.30

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DWG. NO. B016-RUF-LT-504-MS-CA-BHEL(1)-02501

BHEL DRG. No. 1-PV-150-U0111

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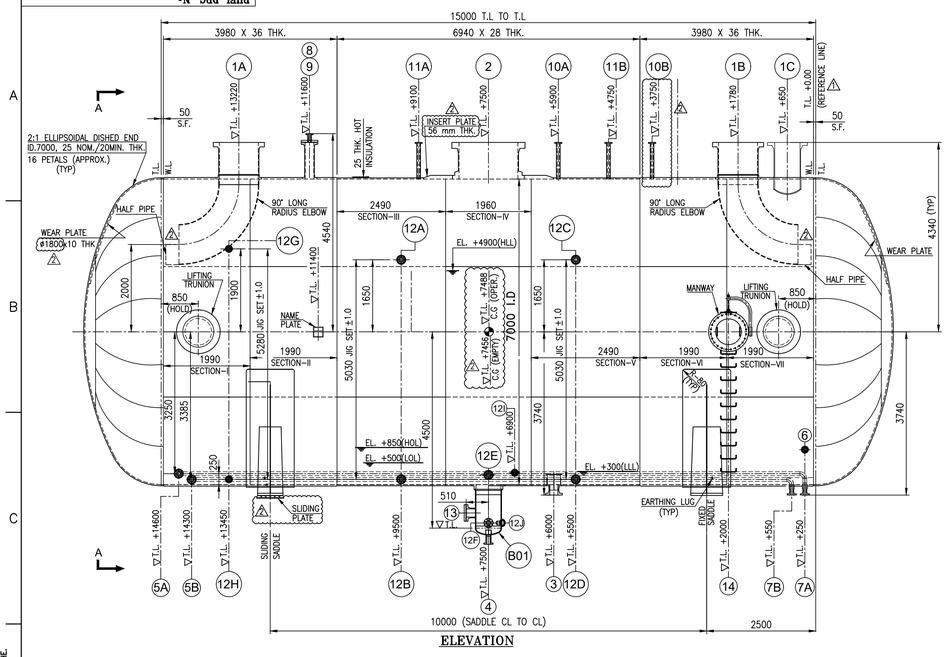
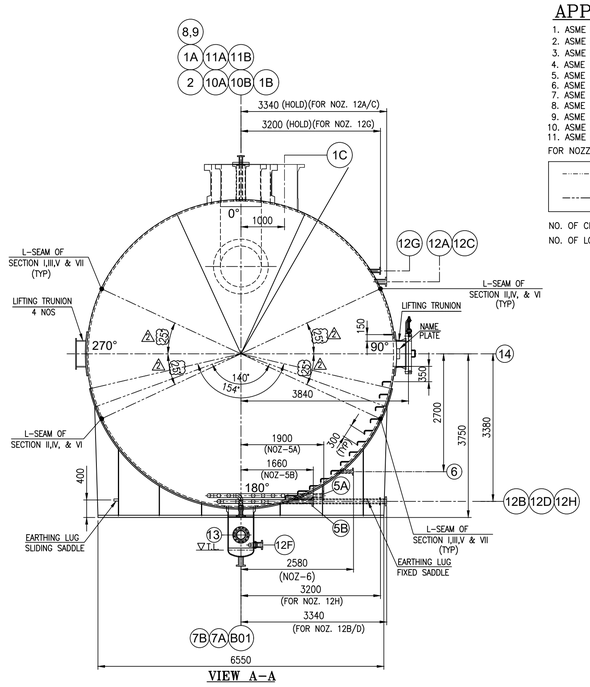




APPLICABLE STANDARDS

1. ASME BOILER & PRESSURE VESSEL CODE SEC VIII DIV 1 : ED-2019
2. ASME BOILER & PRESSURE VESSEL CODE SEC II PART A, C & D : ED-2019
3. ASME BOILER & PRESSURE VESSEL CODE SEC V : ED-2019
4. ASME BOILER & PRESSURE VESSEL CODE SEC IX ED-2019
5. ASME B16.5 ED-2013-STANDARD FOR PIPE FLANGES AND FLANGED FITTINGS.
6. ASME B16.47 ED-2017-STANDARD FOR LARGE DIAMETER STANDARD FLANGES
7. ASME B16.11 ED-2016 FORGED STEEL FITTINGS, SOCKET WELDED & THREADED
8. ASME B36.10M ED-2018 WELDED AND SEAMLESS WROUGHT STEEL PIPE
9. ASME B1.20.1 ED2013 PIPE THREADS, GENERAL PURPOSE (INCH)
10. ASME B16.20 ED2017 METALLIC GASKETS FOR PIPE FLANGES
11. ASME B36.19M ED2018 STAINLESS STEEL PIPE

FOR NOZZLE DETAILS, REFER DRG. PPPV-2438-PV-150-001

L-SEAM OF SECTION II,IV, & VI

L-SEAM OF SECTION I,III,V & VII

NO. OF CIRCUFERENTIAL SEAMS: 8

NO. OF LONGITUDINAL SEAMS: 2 PER SECTION △1

DESIGN DATA

SERVICE	HYDRO CARBON
DESIGN PRESSURE (INTL. | EXTERNAL) MPa (kg/cm²)(g)	0.3923 (4.0) | NIL AT HIGHEST POINT
MAXIMUM ALLOWABLE WORKING PRESSURE MPa (kg/cm²)(g)	0.3923 (4.0)
MAXIMUM ALLOWABLE PRESSURE MPa (kg/cm²)(g)	0.7875 (8.03)
MAXIMUM ALLOWABLE EXTERNAL WORKING PRESSURE MPa (kg/cm²)(g)	0.0883 (0.9)
DESIGN TEMPERATURE (INTERNAL | EXTERNAL) (°C)	275 | NIL △1
OPERATING PRESSURE MPa (kg/cm²)(g)	0.0196 (0.2)
OPERATING TEMPERATURE (°C)	AMBIENT TO 101
STEAM OUT CONDITION MPa (kg/cm²)(g)	0.05 (0.5) @ 170 °C
STEAM COIL DESIGN PRESSURE (INTL. | EXTERNAL) MPa (kg/cm²)(g)	0.5394 (5.5) / (FULL VACUUM) 0.3923 (4.0)
STEAM COIL DESIGN TEMPERATURE (INTL. | EXTERNAL)(°C): 190	STEAM COIL AREA (m²): 40 △1
STEAM COIL HYDRO TEST PRESSURE MPa (kg/cm²)(g): 0.8963 (9.14)	
PNEUMATIC TEST PRESSURE MPa (kg/cm²) (g)	-NIL-
HYD.TEST PRESSURE AS PER UG-99(c) (AT SHOP) MPa (kg/cm²)(g)	0.9552 (9.74) AT 16 °C (MIN) / 48 °C(MAX) (HORIZONTAL, AT HIGHEST POINT)
HYD.TEST PRESSURE AS PER UG-99(b) (AT SITE) MPa (kg/cm²)(g)	0.5141 (5.242) AT 16 °C (MIN) / 48 °C(MAX) (HORIZONTAL, AT HIGHEST POINT)
CORROSION ALLOWANCE mm	△6 (FIXED INTERNAL) | 3 (REMOVABLE)] 3 (SHELL & HEADS)
BOOT CORROSION ALLOWANCE mm: 4.5	MAXIMUM ALLOWABLE CORROSSION ALLOWANCE: 5 mm
CAPACITY (m³) 667.43	CLADDING (mm) NOT APPLICABLE
RADIOGRAPHY: SHELL: 100% | HEAD: 100% (RT1)	JOINT EFFICIENCY SHELL: 1.0 | HEAD: 1.0
IMPACT TESTING = EXEMPTED (AS PER UCS-66(c), & NOTE (4) OF FIG UCS-66)	FABRICATED WEIGHT (Kg.) : ~126188
OTHER LOADINGS : YES AS PER UG-22(a), (b), (c), (d), (2), (f), (i), (j)	WEIGHT (EMPTY) (Kg.) : ~138648 △3
INSULATION (THK/TYP): 25 mm/HOT △4 FIRE PROOFING: NA	OPERATION WEIGHT (Kg.) : ~475607
DENSITY OF FLUID: Kg./ m³ 665	TEST WEIGHT (Kg.) : ~805450
POST WELD HEAT TREATMENT (AS PER UW-2,UCS-56,UCS-68,UCL-34(a)) YES	SPECIAL SERVICE: SUPPLIMENT C (REFER NOTE-B1) △5
MINIMUM DESIGN METAL TEMPERATURE °C 12.5	VESSEL SL.NO : 26674 CYCLIC SERVICE : NO
CODE STAMP REQUIRED ☒ YES ☐ NO	CONSIGNMENT SIZE : ODC/~~ORDINARY~~
NB CODE STAMP REQUIRED ☐ YES ☒ NO	POSITION OF VESSEL : HORIZONTAL
ASME CERTIFICATION MARK: YES WITH 'U' DESIGNATOR U	HYDROTEST POSITION : HORIZONTAL IN SHOP
CODE: ASME BPVC.VIII.1: ED-2019	INSPECTION: AUTHORISED INSPECTION: M/s TUV
NOZZLE LOAD DATA APPLICABLE	STAGE WISE & THIRD PARTY INSPCTION: YES
	NATIONAL BOARD REGISTRATION NOT REQUIRED

WIND CODE: IS 875, PART-3: 2015; WIND ZONE-6; RISK FACTOR-1; BASIC WIND SPEED=52 m/sec; TERRAIN CATEGORY-3; TOPOGRAPHY FACTOR-1

SEISMIC CODE: IS 893, PART-4: 2015 ED; SEISMIC ZONE-III; IMPORTANCE FACTOR=2; EQUIPMENT CATEGORY=1 & SITE SPECIFIC SEISMIC SPECTRA

POST FORMING HEAT TREATMENT	YES, AS PER THE CYCLE GIVEN BELOW*
LOCATION OF INSTALLATION	M/S HPCL-VISAKHAPATNAM, A.P, INDIA

*DISHED ENDS SHALL BE COLD FORMED FOLLOWED BY HEAT TREATMENT CYCLE AS BELOW.

HEAT TREATMENT △

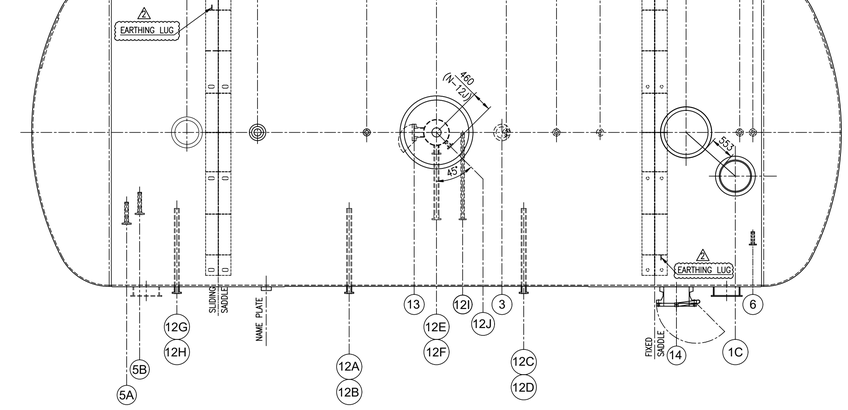
Part	Procedure	Loading Temperature (°C)	Holding Temperature (°C)	Heating Rate (°C/hr)	Holding Time (min)	Cooling Rate (°C/hr	Remarks
DISHED ENDS (SHELL)	STRESS RELIEVING/PWHT	<400°C	610±15°C	210°C/hr	70 minutes	270°C/hr	Unloading at 400°C
DISHED ENDS (BOOT)	STRESS RELIEVING/PWHT	<400°C	610±15°C	210°C/hr	40 minutes	270°C/hr	Unloading at 400°C
COMPLETE EQUIPMENT	STRESS RELIEVING/PWHT	<425°C	630±10°C	110°C/hr	105 minutes	140°C/hr	Unloading at 425°C

LIST OF PARTS

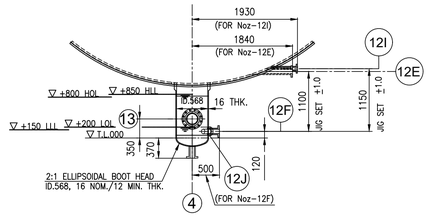
SL.NO	DESCRIPTION	MATERIAL REFERENCE	MATERIAL SPECIFICATION	TDC REFERENCE △
01	SHELL, DISHED END, BOOT	BQ PLATE CS △	SA 516 GR.70	PV-PL-TDC-014
02	NOZZLES WITH INTEGRAL FLANGES	FORGED STEEL △	SA 105	PV-FL-TDC-006
03	SADDLE WRAPPER PL, TRUNNION PAD	BQ PLATE (CS)	SA 516 GR.70	PV-PL-TDC-014
04	SADDLE SUPPORT, TRUNNION	CS	IS 2062 E250B	
05	VORTEX BREAKER	(CS) △	SA 516 GR.70 / SA 106 GR.B	
06	GASKET	SS 316 SPIRAL WOUND GRAFIL FILED WITH SS 316 INNER RING & CS OUTER RING	AS PER ASME B16.20	
07	BOLTS & NUTS (EXT.)	ALLOY STEEL	SA193 GR.B7M/SA194 GR.2HM	
08	BOLTS & NUTS (INT.)	STAINLESS STEEL	(SS 304L) △	
09	PIPE FITTINGS	CS △	SA 234 GR.WPB	PV-PF-TDC-006
10	EXTERNAL ATTACHMENTS	BQ PLATE (CS)	SA 516 GR.70	
11	WEAR PLATE, EARTHING LUG, SLIDING PLATE	STAINLESS STEEL	SA 240 TYP.304	
12	STEAM COIL	CS	SA 106 GR.B	
13	ANCHOR BOLT (LTHE SCOPE)	CS	IS 2062 E250 BR/B0	

FOR GENERAL NOTES & OTHER APPLICABLE STD. PLEASE REFER DRG. NO: B016-RUF-LT-504-MS-FD-BHEL(1)-02511

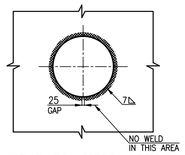
PPPV-2438-PV-150-001	B016-RUF-LT-504-MS-CL-BHEL(1)-02501	MECHANICAL DESIGN OF LP FLARE KO DRUM (504-V-802)
2-PV-150-U0044	B016-RUF-LT-504-MS-DW-BHEL(1)-02512	TRANSPORTATION ARRANGEMENT DETAILS FOR LP FLARE KO DRUM (504-V-802)
3-PV-150-U0178	B016-RUF-LT-504-MS-FD-BHEL(1)-02511	GENERAL NOTES FOR LP FLARE KO DRUM (504-V-802)
4-PV-150-U0052	B016-RUF-LT-504-MS-LS-BHEL(1)-03023	SCHEDULE OF MANDATORY SPARES & COMMISSIONING SPARES (504-V-802)
3-PV-150-U0177	B016-RUF-LT-504-MS-FD-BHEL(1)-02509	NAME PLATE DETAILS FOR LP FLARE KO DRUM (504-V-802)
3-PV-150-U0176	B016-RUF-LT-504-MS-FD-BHEL(1)-02508	FOUNDATION TEMPLATE FOR LP FLARE KO DRUM (504-V-802)
3-PV-150-U0175	B016-RUF-LT-504-MS-FD-BHEL(1)-02507	DETAILS OF MANWAY DAVIT FOR LP FLARE KO DRUM (504-V-802)
0-PV-150-U0017	B016-RUF-LT-504-MS-FD-BHEL(1)-02506	SHELL DEVELOPMENT OF LP FLARE KO DRUM (504-V-802)
1-PV-150-U0114	B016-RUF-LT-504-MS-FD-BHEL(1)-02505	INSULATION SUPPORT DETAILS FOR LP FLARE KO DRUM (504-V-802)
1-PV-150-U0113	B016-RUF-LT-504-MS-FD-BHEL(1)-02504	EXTERNAL ATTACHMENTS OF LP FLARE KO DRUM (504-V-802)
1-PV-150-U0112	B016-RUF-LT-504-MS-FD-BHEL(1)-02502	ASSEMBLY DETAILS OF LP FLARE KO DRUM (504-V-802)
BHEL DRAWING NO.	CLIENT DOCUMENT NO.	DRAWING TITLE REV.



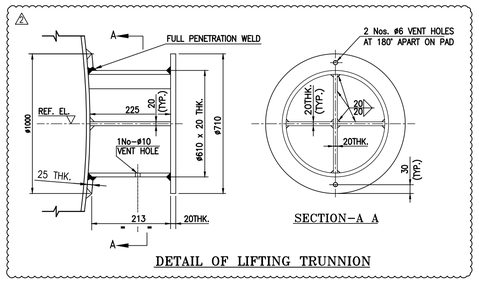
△ PLAN



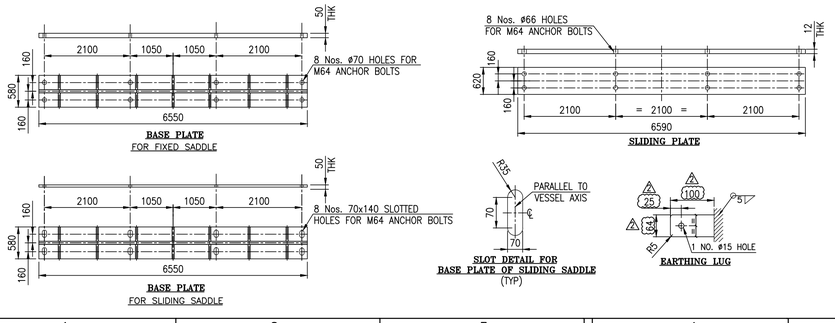
BOOT DETAIL

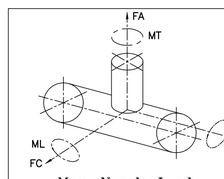


WEAR PL. WELD DETAIL



DETAIL OF LIFTING TRUNNION





Max. Nozzle Load

Nozzle Mark No.	NB	FA (kgf)	FL (kgf)	FC (kgf)	MT (kgf-m)	ML (kgf-m)	MC (kgf-m)
6	2"	200	200	200	50	40	30
4,5A,5B,7A,7B	3"	300	300	300	112	90	67
3	8"	800	800	800	800	640	480
2	54"	22500	5500	5500	36500	29500	35000
1C	24"	2400	2400	2400	7200	5760	4320
1A & 1B	36"	3600	3600	3600	16200	12960	9720

WELD JOINT TOLERANCES

TABLE – 1

Sl.No.	TOLERANCE APPLICABLE	TOLERANCE
01.	BEVEL ANGLE / INCLUDING ANGLE	
	a). > 35°	± 5°
	b). 20° – 35°	± 2°
	c). < 20°	± 1°
02.	ROOT GAP	
	a). < 3	± 1
	b). 1 < ROOT GAP < 3	± 0.5
	c). ≤ 1	+ 0.5 – 0.0

△ LOAD DATA

	EMPTY	AS PER CALCULATION
SHEAR AT BASE (kgs)		
DUE TO SEISMIC	–	71042(DBE)/92444(MCE)
DUE TO WIND	–	18009.7
MOMENT AT BASE (kg-m)		
DUE TO SEISMIC	–	266406(DBE)/ 346665(MCE)
DUE TO WIND	–	67536.3

LIST OF HOLDS AS ON DATE

01. PIPE SUPPORT & PLATFORM SUPPORT CLEATS
02. TRUNNION

REFERENCE DOCUMENT LIST

**–REVISION NO. SHALL BE MENTIONED WHILE MAKING THE AS BUILT DRAWING.

B01	1	BOOT	–	ID.568	– / 16		LIP TYPE	–	SR/–	AS PER DRAWING
14	1	MANWAY+B.F.+DAVIT	600 (24")	610	– / 16		LIP TYPE	300	SRWN/R.F.	AS PER DRAWING
13	1	HAND HOLE+B.F.+HING	200 (8")	219.1	– / 14		LIP TYPE	300	SRWN/R.F.	AS PER DRAWING
12I,12J	2	LEVEL TAPS (MAGNETIC)	50 (2")	84	– / 16.6	50.8	––	300	LWN/R.F.	AS PER DRAWING
12G,12H	2									
12F	1	LEVEL TAPS (DIAPHRAGM)	80 (3")	117	– / 20.4	76.2	––	300	LWN/R.F.	AS PER DRAWING
12A,12C	2									
12B,12D	2									
12E	1									
11A	1	TEMPERATURE TAP	50 (2")	84	– / 16.6	50.8	––	300	LWN/R.F.	AS PER DRAWING
11B	1									
10A & 10B	2	PRESSURE GAUGE (PI/PT)	50 (2")	84	– / 16.6	50.8	––	300	LWN/R.F.	AS PER DRAWING
9	1	VENTILATION	200 (8")	219.1	– / 12		LIP TYPE	300	SRWN/R.F.	AS PER DRAWING + Noz-8 WITH BLIND
8	1	VENT	50 (2")	84	– / 16.6		––	300	LWN/R.F.	AS PER DRAWING
7A,7B	1	CONDENSATE OUTLET	80 (3")	88.9	– / 14		–– △	300	SRWN/R.F.	AS PER DRAWING
6	1	STEAM OUTLET	50 (2")	84	– / 16.6		––	300	LWN/R.F.	AS PER DRAWING
5B	1	STEAM INLET	80 (3")	88.9	– / 15		––	300	SRWN/R.F.	AS PER DRAWING
5A	1	STEAM INLET	80 (3")	88.9	– / 15		––	300	SRWN/R.F.	AS PER DRAWING
4	1	WATER OUTLET	80 (3")	117	– / 20.4		––	300	LWN/R.F.	AS PER DRAWING
3	1	OIL OUTLET	200 (8")	219.1	– / 16		LIP TYPE	300	SRWN/R.F.	AS PER DRAWING △
2	1	VAPOUR OUTLET	1350 (54")	1379.5	– / (25) △		LIP TYPE WITH INSERT PL	300	SRWN/R.F.	AS PER DRAWING FLANGE AS PER ASME-16.47 SERIES-B
1C	1	FEED INLET LP FLARE ROSE UNIT	600 (24")	610	– / 16		LIP TYPE	300	SRWN/R.F.	AS PER DRAWING △
1A & 1B	2	FEED INLET	900 (36")	920.8	(25) △		LIP TYPE	300	SRWN/R.F.	AS PER DRAWING FLANGE AS PER ASME-16.47 SERIES-B
MARK NO.	QTY.	SERVICE	NB (N.P.S)	O.D.	SCH. / THK.	I.D.	R.F.PAD WIDTH x THK.	RATING CLASS	TYPE/ FACE	PROJE. SEE NOTE-3 REMARKS

TABLE OF NOZZLES AND FLANGES

XXX.XXXX.XXXX.XXXX	XXX					X
DRAWING NO.	DRAWING TITLE					REV

REFERENCE DOCUMENTS / DRAWINGS

DRG. CATEGORY: (USE TICK MARK) [R] [I]
EIL REVIEW/APPROVAL
VPTL NO.:
CODE:
SCH. DATE OF SUBMISSION

DOCUMENT STATUS
STATEMENT OF SUB: [1st] [2nd] [3rd]
☐ FINAL FOR CODE–1 ☐ AS BUILT

ISSUED FOR
☐ AS BUILT ☐ INFORMATION
☐ CONSTRUCTION ☐ REVIEW

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

SIGN: DATE:

	NAME	DICIPLINE	SIGN.	DATE

REV.	DESCRIPTION	DRN	CHECKED	APPROVED	REVIEWED	APPROVED	DATE
02	COMMENTS ON REV-01 INCORPORATED	MK	AVR	TK			12.09.20
01	COMMENTS OF L&T INCORPORATED	MK	AVR	TK			13.07.20
00	ISSUED FOR APPROVAL	MK	AVR	TK			06.06.20

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: 1-PV-150-U0111, REV.B

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☐ 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.

DATE 11.07.20 | SCALE 1:70 | TITLE: GENERAL ASSEMBLY OF LP FLARE KO DRUM ITEM NO. 504-V-802

DEPT: HT ENGG.

DRN BY: MUNAYYA K | PROJECT: | DRG. NO.: B016-RUF-LT-504-MS-GA-BHEL(1)-02501 | SH. 01 of 01 | REV. 02

CHK BY: A.V.RAO | PWO NO.:

APP BY: K.TARAKESH | CAD HERE THIS DRG. USING CID SYSTEM ONLY FILE:

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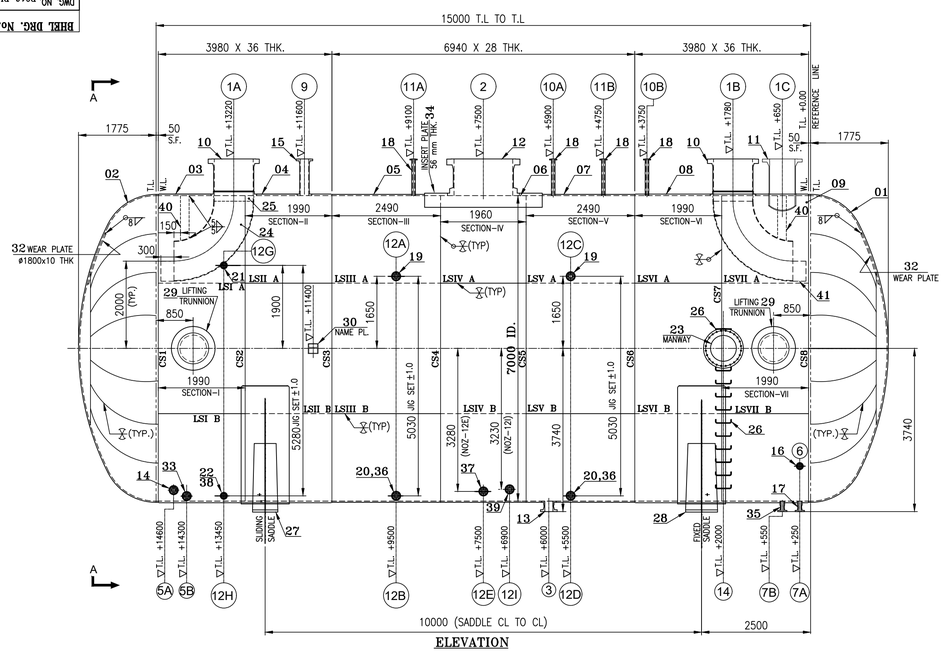
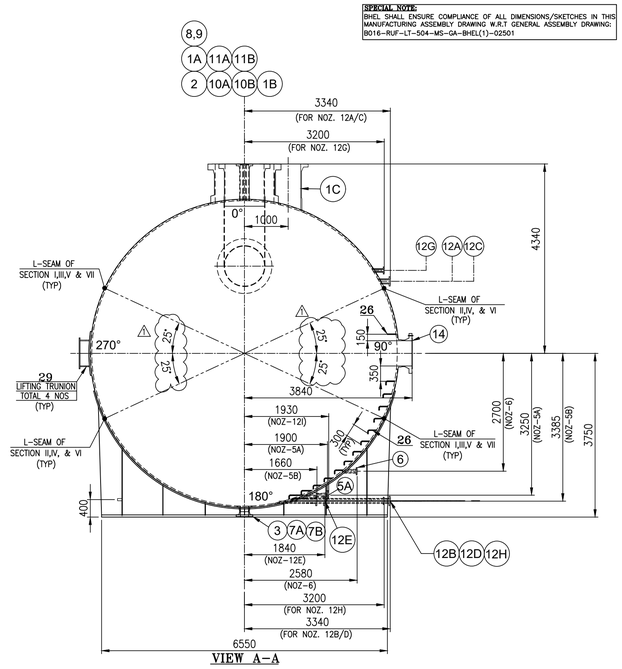
BHEL DRG. No. 1-PV-150-U064

DWG. NO. B016-RUF-LT-504-MS-FD-BHEL(1)-02507

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)-02501

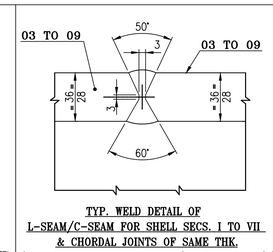


ELEVATION

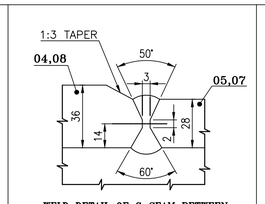


VIEW A–A

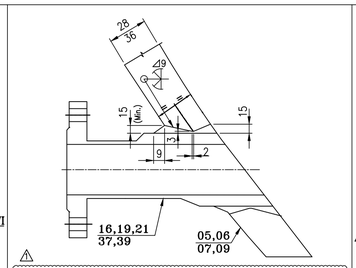
TYP. WELD DETAIL FOR LIP TO SHELL JOINT
(FOR NOZZLE MARK Nos. – 1A, 1B, 1C, 3, 9 & 14)



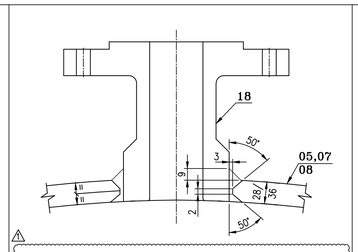
TYP. WELD DETAIL OF L-SEAM/C-SEAM FOR SHELL SECS. I TO VII & CHORDAL JOINTS OF SAME THK.
(CS2, CS4, CS5, CS7 & LSI A/B TO LSVI1 A/B)



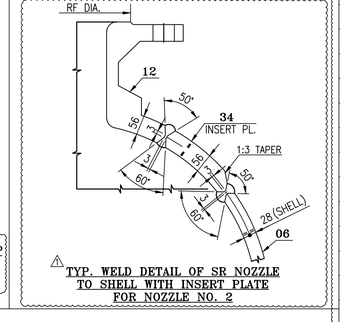
WELD DETAIL OF C-SEAM BETWEEN SHELL SECTION II & III AND SECTION V & VI OF DIFFERENT THK.
(CS1, CS3, CS6 & CS8)



TYP. WELD DETAIL OF SRN TO SHELL WITHOUT LIP (OFFSET NOZZLE)
(FOR NOZZLE Nos. 6, 12A, 12C, 12E, 12G & 12I)



TYP. WELD DETAIL OF SRN TO SHELL WITHOUT LIP (RADIAL NOZZLE)
(FOR NOZZLE MARK Nos. 10A, 10B, 11A & 11B)



TYP. WELD DETAIL OF SR NOZZLE TO SHELL WITH INSERT PLATE FOR NOZZLE NO. 2

ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO / VAR NO	MATERIAL CODE / MATERIAL SPECIFICATION	QTY/P / QTY	UNIT WEIGHT / QUANTITY
39	LW NOZZLE – 12I NPS 2"x300# RF; L=CUT AS PER PROJECTION				SA 105 (NACE+HIC)	1	21.56
38	LWN SPOOL–12H NPS 2"x300# RF; L=CUT AS PER PROJECTION				SA 105 (NACE+HIC)	4	13.80
37	LW NOZZLE – 12E NPS 3"x300# RF; L=CUT AS PER PROJECTION				SA 105 (NACE+HIC)	1	43.45
36	LWN SPOOL – 12B & 12D NPS 3"x300# RF; L=CUT AS PER PROJECTION				SA 105 (NACE+HIC)	8	24.30
35	SRWN NOZZLE – 7B NPS 3" x 300# RF				SA 105 (NACE+HIC)	1	17.08
34	INSERT PLATE FOR NOZZLE–2 3000 x 3000 x 56 THK CUT HOLE TO SUIT NOZZLE LIP				SA 516 GR70 (NACE+HIC)	1	3113.00
33	SRWN NOZZLE – 5B NPS 3" x 300# RF;				SA 105 (NACE+HIC)	1	53.20
32	WEAR PLATES ø1800 x 10 THK.				SA 240 TYP. 304	2	203.58
31	STIFFENER PL. FOR NOZ–12B, 12D & 12H 50 x 6 THK. ; 15 METRE				SA 516 GR70 (NACE+HIC)	1	35.33
30	NAME PLATE BRACKET		3–PV–150–U0177		WELDMENT	1	5.50
29	LIFTING TRUNNION		1–PV–150–U0165		WELDMENT	4	417.14
28	FIXED SADDLE SUPPORT ASSEMBLY		1–PV–150–U0165		WELDMENT	1	4980.38
27	SLIDING SADDLE SUPPORT ASSEMBLY		1–PV–150–U0165		WELDMENT	1	5354.60
26	LADDER RUNGS & HAND GRIP					1	25.65
25	PIPE 900 NB x 12.7 THK. 130 LG.				SA 106 GR. B (NACE+HIC)	2	36.70
24	90° LR ELBOW 900 NB–12.7 THK.				SA 234 GR. WPB (NACE+HIC)	2	625.00
23	SRWN NOZZLE – 14 NPS 24" x 300# RF; LIP				SA 105 (NACE+HIC)	1	358.00
22	LW NOZZLE – 12H NPS 2" x 300# RF; L=600				SA 105 (NACE+HIC)	1	19.21
21	LW NOZZLE – 12G NPS 2" x 300# RF; L=AS PER PROJECTION.				SA 105 (NACE+HIC)	1	10.55
20	LW NOZZLE –12B & 12D NPS 3" x 300# RF; L=800				SA 105 (NACE+HIC)	2	43.98
19	LW NOZZLE – 12A & 12C NPS 3" x 300# RF; L=AS PER PROJECTION.				SA 105 (NACE+HIC)	2	18.96
18	LWN NOZZLE – 10A~B,11A~B NPS 2" x 300# RF;				SA 105 (NACE+HIC)	4	25.78
17	SRWN NOZZLE – 7A NPS 3" x 300# RF				SA 105 (NACE+HIC)	2	17.77
16	LW NOZZLE – 6 NPS 2" x 300#				SA 105 (NACE+HIC)	1	13.77
15	SRWN NOZZLE – 9 NPS 8" x 300#, R.F. LIP				SA 105 (NACE+HIC)	1	96.00
14	SRWN NOZZLE – 5A NPS 3" x 300# RF				SA 105 (NACE+HIC)	1	39.56
13	SRWN NOZZLE – 3 NPS 8" x 300# RF LIP				SA 105 (NACE+HIC)	1	61.00
12	SRWN NOZZLE – 2 NPS 54" x 300# RF LIP				SA 105 (NACE+HIC)	1	2014.00
11	SRWN NOZZLE – 1C NPS 24" x 300# RF LIP				SA 105 (NACE+HIC)	1	560.37
10	SRWN NOZZLE – 1A & 1B NPS 36" x 300# RF LIP				SA 105 (NACE+HIC)	2	894.00
09	SHELL SECTION–VII 11052 x 1990 X 36 THK				SA 516 GR70 (NACE+HIC)	2	6215.43
08	SHELL SECTION–VI 11052 x 1990 X 36 THK				SA 516 GR70 (NACE+HIC)	2	6215.43
07	SHELL SECTION–V 11039.6 x 2490 X 28 THK				SA 516 GR70 (NACE+HIC)	2	6042.00
06	SHELL SECTION–IV 11039.6 x 1960 X 28 THK				SA 516 GR70 (NACE+HIC)	2	4755.95
05	SHELL SECTION–III 11039.6 x 2490 X 28 THK				SA 516 GR70 (NACE+HIC)	2	6042.00
04	SHELL SECTION–II 11052 x 1990 X 36 THK				SA 516 GR70 (NACE+HIC)	2	6215.43
03	SHELL SECTION–I 11052 x 1990 X 36 THK				SA 516 GR70 (NACE+HIC)	2	6215.43
02	LEFT SIDE DISHED END 25 THK (NOM.)		3–PV–010–U0104		SA 516 GR70 (NACE+HIC)	1	10618.00
01	RIGHT SIDE DISHED END 25 THK (NOM.)		3–PV–010–U0104		SA 516 GR70 (NACE+HIC)	1	10618.00

TOTAL WEIGHT: 127024 Kg

ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO / VAR NO	MATERIAL CODE / MATERIAL SPECIFICATION	QTY/P / QTY	UNIT WEIGHT / QUANTITY
41	HALF PIPE 900 NB x 12.7 THK. L=300 mm				SA 106 GR. B (NACE+HIC)	2	42.35
40	SUPPORT PL. FOR FEED INLET ELBOW 8 THK. x 200 x 1025				SA 516 GR70 (NACE+HIC)	2	12.88

3–PV–150–U0178	B016–RUF–LT–504–MS–FD–BHEL(1)–02511	GENERAL NOTES FOR LP FLARE KO DRUM ITEM No. 504–V–802	**
1–PV–150–U0111	B016–RUF–LT–504–MS–GA–BHEL(1)–02501	GENERAL ASSEMBLY OF LP FLARE KO DRUM ITEM No. 504–V–802	**

BHEL DRAWING No.	CLIENT DRAWING No.	DRAWING TITLE	REV

REFERENCE DOCUMENTS / DRAWINGS (** LATEST REVISION No. TO BE UPDATED IN ASBUILT DRAWING)

DRG. CATEGORY: (USE TICK MARK) [R] [I]
EIL REVIEW/APPROVAL
VPTL NO.:
SCH. DATE OF SUBMISSION
CODE:

DOCUMENT STATUS
STATEMENT OF SUB: [1st] [2nd] [3rd]
☐ FINAL FOR CODE–1 ☐ AS BUILT

ISSUED FOR
☐ AS BUILT ☐ INFORMATION
☐ CONSTRUCTION ☐ 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:

NAME DISCIPLINE SIGN. DATE

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

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

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.

VENDOR: Bharat Heavy Electricals Limited
UNIT: HEAVY PLATES & VESSELS PLANT
VISAKHAPATNAM–530012

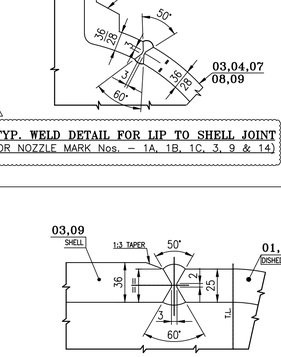
VENDOR PO NO: Refinery/75000–66912/NG; DATE:18.03.2020
VENDOR DWG. NO: 1–PV–150–U0164, REV.0

DATE 15.07.20 | SCALE 1 : 70
DEPT: HT ENGG.
DRN BY: MUNAYYA K
CHK BY: A V RAO
APP BY: TARAKESH K

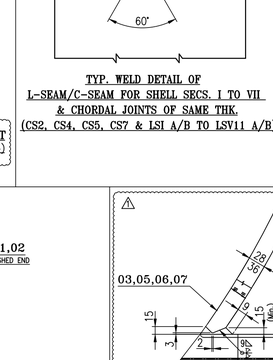
TITLE: SHELL ASSEMBLY DETAILS OF LP FLARE KO DRUM ITEM NO. 504–V–802

PROJECT: CUSTOMER DRAWING No. B016–RUF–LT–504–MS–FD–BHEL(1)–02502
SH. 02 of 08
PWO NO.:
REV. 01

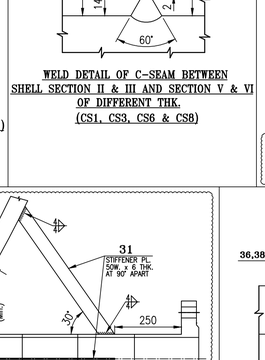
CAD REFERENCE THIS DRG. USING OID SYSTEM ONLY FILE:



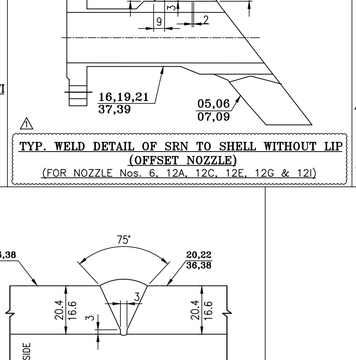
TYP. WELD DETAIL FOR LIP TO SHELL JOINT
(FOR NOZZLE MARK Nos. – 1A, 1B, 1C, 3, 9 & 14)



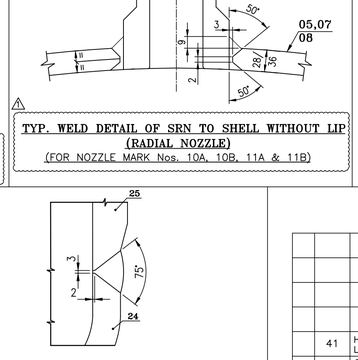
TYP. WELD DETAIL OF L-SEAM/C-SEAM FOR SHELL SECS. I TO VII & CHORDAL JOINTS OF SAME THK.
(CS2, CS4, CS5, CS7 & LSI A/B TO LSVI1 A/B)



WELD DETAIL OF C-SEAM BETWEEN SHELL SECTION II & III AND SECTION V & VI OF DIFFERENT THK.
(CS1, CS3, CS6 & CS8)

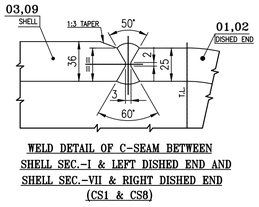


TYP. WELD DETAIL OF SRN TO SHELL WITHOUT LIP (OFFSET NOZZLE)
(FOR NOZZLE Nos. 6, 12A, 12C, 12E, 12G & 12I)

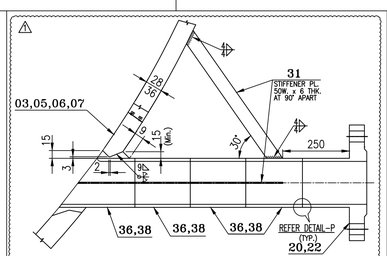


TYP. WELD DETAIL OF SRN TO SHELL WITHOUT LIP (RADIAL NOZZLE)
(FOR NOZZLE MARK Nos. 10A, 10B, 11A & 11B)

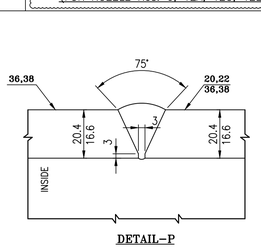
TYP. WELD DETAIL OF SR NOZZLE TO SHELL WITH INSERT PLATE FOR NOZZLE NO. 2



WELD DETAIL OF C-SEAM BETWEEN SHELL SEC.–I & LEFT DISHED END AND SHELL SEC.–VII & RIGHT DISHED END
(CS1 & CS8)

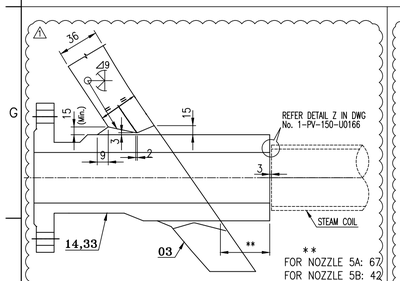


TYP. WELD DETAIL OF LWN FLANGED NOZZLES TO SHELL
FOR NOZZLE NOS 12B, 12D, 12H

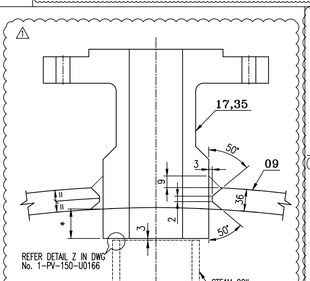


DETAIL–P

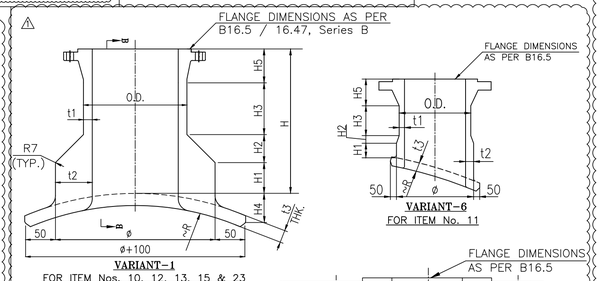
WELDING DETAIL BETWEEN ITEM 24 & 25



TYP. WELD DETAIL OF SRN TO SHELL WITHOUT LIP
(FOR NOZZLE Nos. 5A, 5B)



TYP. WELD DETAIL OF SRN TO SHELL WITHOUT LIP
(FOR NOZZLE Nos. 7A, 7B)



VARIANT–1
FOR ITEM Nos. 10, 12, 13, 15 & 23

VARIANT–6
FOR ITEM No. 11

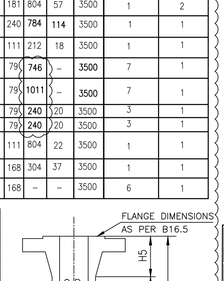
VARIANT–2
FOR ITEM Nos. 16, 18, 19, 20, 21, 22, 37 & 39

SR NOZZLE DETAILS

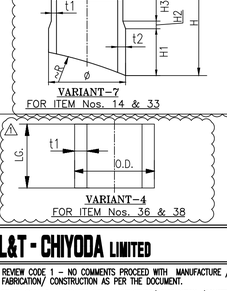
ITEM NO.	NOZZLE MARK.	SIZE (NPS) (IN)	CLASS	O.D	ø	t1	t2	t3	H1	H2	H3	H5	H	H4	R	VARIANT NO	QTY.
10	1A & 1B	36	300	920.8	934.8	25	32	36	80	20	523	181	804	57	3500	1	2
12	2	54	300	1379.5	1449.5	25	60	56	150	35	359	240	784	114	3500	1	1
13	3	8	300	219.1	237.1	16	25	28	50	25	26	111	212	18	3500	1	1
14	5A	3	300	88.9	108.9	15	25	–	478	20	169	79	746	–	3500	7	1
33	5B	3	300	88.9	108.9	15	25	–	743	20	169	79	1011	–	3500	7	1
17	7A	3	300	88.9	111	14	25	36	87	25	49	79	240	20	3500	3	1
35	7B	3	300	88.9	111	14	25	36	87	25	49	79	240	20	3500	3	1
15	9	8	300	219.1	235.1	12	20	36	50	20	623	111	804	22	3500	1	1
23	14	24	300	610	628	16	25	36	50	20	66	168	304	37	3500	1	1
11	1C	24	300	610	628	16	25	36	75	25	603	168	–	–	3500	6	1

LWN NOZZLE DETAILS

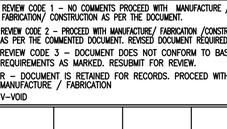
ITEM NO.	NOZZLE MARK.	SIZE (NPS) (IN)	CLASS	O.D	THK. (t1)	LG.	VAR.	QTY.
16	6	2	300	84	16.6	405	2	1
18	10A,10B, & 11A,11B	2	300	84	16.6	840	2	4
19	12A & 12C	3	300	117	20.4	286	2	2
20	12B & 12D	3	300	117	20.4	675	2	2
37	12E	3	300	117	20.4	789	2	1
21	12G	2	300	84	16.6	288	2	1
22	12H	2	300	84	16.6	454	2	1
39	12I	2	300	84	16.6	688	2	1
36	12B, 12D	3	300	117	20.4	500	4	8
38	12H	2	300	84	16.6	500	4	4



VARIANT–3
FOR ITEM Nos. 17 & 35



VARIANT–7
FOR ITEM Nos. 14 & 33



VARIANT–4
FOR ITEM Nos. 36 & 38

BHEL DRG. NO.	DRG. NO.
3-PV-150-U0178	B016-RUF-LT-504-MS-PD-BHEL(1)-02511

A. GENERAL:

1. ALL DIMENSIONS AND ELEVATIONS ARE IN MM UNLESS OTHERWISE STATED.
2. DESIGN PRESSURE AT BOTTOM INCLUDES TOP DESIGN PRESSURE + OPERATING LIQUID HEAD + PRESSURE DROP ACROSS THE VESSEL
3. NORTH DIRECTION WHEREVER SHOWN IS WITH RESPECT TO PLAN VIEW.
4. ALL ADDITIONAL INDICATIONS SUCH AS NORTH/EAST/SOUTH/WEST ALONG WITH CG SHALL BE CLEARLY MARKED WITH WHITE PAINT.
5. ALL INTERNAL BOLTS SHALL BE PROVIDED WITH DOUBLE NUTS.
6. ALL DIMENSIONS ARE FROM REFERENCE TANGENT LINE, UNLESS OTHERWISE INDICATED.
7. ALL FITTINGS SHALL BE OF SEAMLESS CONSTRUCTION.
8. FOR NOZZLES ON SHELL, PROJECTIONS ARE REFERRED FROM VESSEL CENTER LINE TO FLANGE CONTACT FACE AND FOR NOZZLES ON HEAD, PROJECTIONS ARE REFERRED FROM HEAD T.L TO FLANGE CONTACT FACE.
9. THE INDICATED THICKNESS IS MINIMUM ACCEPTABLE AFTER CONSTRUCTION.
10. ALL REMOVABLE INTERNALS SHALL BE DESIGNED SO AS TO PASS THROUGH MAN HOLE (I.D. 578 mm). ⚠1

B. MATERIAL:

1. SHALL MEET NACE MR0103 AND PVM-SU-4750 SUPPLEMENT C REQUIREMENT. SEE GN-9 IN MATERIAL OF CONSTRUCTION SELECTION.
2. ALL BOLTS/STUDS SHALL HAVE ISO THREADING UNLESS OTHERWISE SPECIFIED. STUDS SHALL EXTEND BEYOND NUTS ATLEAST BY 2 THREADS & STUDS SHALL BE THREADED TO FULL LENGTH. BOLTS OR NUTS (TO BE TIGHTENED BY HYDRAULIC BOLT TENSIONER) SHALL BE LONGER THAN NORMAL LENGTH BY MINIMUM 1 NUT DIAMETER.
3. FLANGE DIMENSIONS FOR NOZZLES UPTO 600 NB (24") SHALL BE AS PER ASME B16.5 AND FOR NOZZLE ABOVE 600 NB (24") SHALL BE AS PER ASME B16.47 SERIES 'B'.
4. I.D. OF WELD NECK FLANGES SHALL MATCH WITH CORRESPONDING I.D. OF NOZZLE PIPE.
5. FLANGE FACE FINISH SHALL COMPLY WITH THE FOLLOWING:
   - FOR SPIRAL WOUND GASKETS: 3.2-6.3 μm RA (125-250 μinch AARH)
6. GASKET SHALL BE AS PER ASME B 16.20. HARDNESS OF GASKET SHALL BE LESS THAN HARDNESS OF FLANGE.
7. ALL MATERIALS WELDED DIRECTLY TO THE PRESSURE-RETAINING ENVELOPE SHALL BE MATERIAL OF THE SAME P NUMBER AND GROUP NUMBER IN THE APPLICABLE TABLE IN ASME CODE, SECTION II, PART D."

C. FABRICATION:

1. ALL MAIN WELD SEAMS SHALL BE CLEAR OF NOZZLES, R.F.PADS, INTERNALS AND STIFFENING RINGS BY 50 mm MIN. (WELD EDGE TO WELD EDGE).
   A) IN CASE OF FOULING OF ANY NOZZLE OPENING WITH COLUMN WELD SEAMS (i) GRIND FILLET OF NOZZLE TO SHELL/D'HEAD WELDING TO A SMOOTH CONCAVE RADIUS AND (ii) RE-RADIOGRAPH (100%) THE ADJACENT WELD SEAMS UPTO A DISTANCE OF 300 mm BEYOND EDGE OF NOZZLE ON EACH SIDE BEFORE WELDING THE R.F.PAD.
   PROTECT ALL MACHINED SURFACES AND THREADED CONNECTIONS WITH RUST PREVENTIVE IMMEDIATELY AFTER MACHINING. INSTALL WOOD OR STEEL PROTECTORS FOR FITTINGS IMMEDIATELY AFTER TESTING.
   B) WHEREVER RF PADS / PADS OF OTHER ATTACHMENTS CROSS OVER WELD SEAMS OF VESSEL, THE WELD SEAM IS TO BE GROUND FLUSH AND FULLY RADIOGRAPHED UPTO 150 mm ON EITHER SIDE OF PADS BEFORE WELDING THE ATTACHMENTS.
   C) ALL WELDS SHALL BE DYE PENETRATE EXAMINED.
   WHEREVER PADS ARE COMING OVER C-SEAM OF DIFFERENTIAL THICKNESS, BOTTOM SIDE OF PAD SHALL BE GROUND TO SUIT AND WELD OVER THE C-SEAM.
2. ALL WELDS OF PRESSURE PARTS & LOAD BEARING PARTS SHALL BE FULL PENETRATION TYPE.
3. FILLET WELD SIZES INDICATED SHOWS THE LEG SIZE AND ARE MINIMUM.
4. WELD EDGE TO EDGE DISTANCE SHALL BE AS PER CL. 4.7.5 OF GENERAL SPECIFICATION FOR PRESSURE VESSEL 6-12-0001.
5. ALL SHARP CORNERS ARE TO BE ROUNDED OFF.
6. ALL FILLET WELDS INTERNAL AND EXTERNAL TO PRESSURE CONTAINING COMPONENTS SHALL BE GROUND TO A SMOOTH AND GENEROUS COCAVE CONTOUR.
7. TELL TALE HOLES SHALL NOT BE PLUGGED AND SHALL BE FILLED WITH HARD GREASE ONLY.
8. ALL FLANGE STUD/BOLT HOLES AND ANCHOR BOLT HOLES TO STRADDLE CENTER LINES AS PER E.I.L. STD.No. 7-12-0015. UNLESS OTHERWISE INDICATED.
9. NOZZLES 50 NB AND BELOW SHALL BE STIFFENED WITH 2 NOS. FLATS 90° APART. SIZE OF STIFFENERS SHALL BE 50 MM WIDE X 6 MM THICK.
10. WHEREVER INSULATION SUPPORT RINGS ARE COMING IN WAY OF OTHER ATTACHMENTS, THE INSULATION SUPPORT RING MAY BE SUITABLY MODIFIED.
11. ALL HEAT TREATMENTS SHALL BE AS PER FORMING AND HEAT TREATMENT PROCEDURES DOC. NO. B016-RUF-LT-504-QA-QD-BHEL(1)-02010
12. COMPLETE EQUIPMENT UP TO WRAPPER PLATE SHALL BE STRESS RELIEVED. HARDNESS OF ALL PLATE, WELDS, HAZ AFTER PWHT SHALL BE LIMITED TO 200 BHN. SHALL BE CARRIED BEFORE HYDROTEST.
13. NO WELDING IS TO BE DONE ON THE VESSEL AFTER HEAT TREATMENT UNLESS OTHERWISE PERMITTED BY CODE/SPECIFICATION/ APPROVED BY L&T

D. TOLERANCE:

1. ALL LEVEL INSTRUMENT NOZZLES SHALL BE JIG SET WITHIN TOLERANCE OF +/- 1.0 MM.
2. THE UPPER & LOWER NOZZLE CONNECTIONS FOR ANY LEVEL INSTRUMENT SHALL BE IN THE SAME PLANE.
3. EQUIPMENT TOLERANCE SHALL BE IN ACCORDANCE WITH EIL STD. 7-12-001 OR GA-C1266 OR DESIGN CODE WHICH EVER IS STRINGENT.
4. TOLERANCES INDICATED IN THE DRAWING ARE NON CUMULATIVE.

E. NDE AND TESTING:

1. ALL INSPECTION REQUIREMENTS SHALL BE AS PER INSPECTION & TEST PLAN DOC. NO. B016-RUF-LT-504-MS-QD-BHEL(1)-02001
2. KNUCKLE PORTION OF DISHED ENDS BOTH INSIDE AND OUTSIDE SHALL BE D.P.CHECKED.
3. WELD SEAMS OF FORMED ENDS SHALL BE FULLY RADIOGRAPHED AFTER FORMING AND HEAT TREATMENT IF ANY.
4. ALL BUTT JOINTS SHALL BE 100% RADIOGRAPHED.
5. ALL SS SURFACES AND WELDMENTS SHALL BE PICKLED & PASSIVATED AS PER ASTM A-380 AFTER HYDRAULIC TESTING.
6. HARDNESS MEASUREMENT SHALL BE DONE ON BASE METAL, WELD METAL, WELDS & HAZ AND RESTRICTED TO 200 BHN AFTER PWHT BUT BEFORE HYDRO TEST.
7. THE GASKETS USED DURING HYDRAULIC TEST SHALL BE OF SAME SPECIFICATION AS SERVICE GASKETS.
8. WATER USED FOR HYDRAULIC TESTING SHALL BE CLEAN & POTABLE AND HYDRO TEST SHALL BE CARRIED OUT AS PER DOC. NO B016-RUF-LT-504-MS-QD-BHEL(1)-02005.
9. AFTER HYDROTEST, EQUIPMENT SHALL BE THOROUGHLY DRAINED & DRIED OUT, ALL THE NOZZLE OPENINGS SHALL BE CLOSED WITH SUITABLE STEEL COVERS.
10. ALL WELD JOINTS OF COIL INSIDE PRESSURE VESSEL SHALL BE 100% RADIOGRAPHED.

F. SURFACE PREPARATION AND PROTECTION:

1. SURFACE PREPARATION AND PAINTING SHALL BE AS PER SURFACE PREPARATION & PAINTING PROCEDURE (DOC. NO. B016-RUF-LT-504-MS-QD-BHEL(1)-02004) AND SHALL COMPLY ALL REQUIREMENTS OF B016-000-79-41-PLS-01, REV.1.
2. EARTHING LUGS ARE NOT TO BE PAINTED OR GALVANISED.

G. SHIPMENT AND HANDLING:

1. EQUIPMENT SHALL BE TRANSPORTED TO SITE IN SINGLE PIECE.
2. LIFTING OF EQUIPMENT SHALL BE BY USE OF SPREADER BEAM ONLY.

PMC REFERENCE SPECIFICATIONS	STD. NO. :
1. GENERAL SPEC. FOR PRESSURE VESSELS	6-12-0001, REV.5
2. SUPP. SPEC. FOR CS VESSELS	6-12-0002, REV.7
3. STD. SPEC. FOR BQCS PLATE	6-12-0011, REV.8
4. STD. SPEC. FOR STRUCTURAL QUALITY PLATES	6-12-0014, REV.6
5. STD. SPC. FOR HARDNESS REQU. STATIC EQUIPMENTS	6-15-0091, REV.3
6. MATERIAL REQU. FOR CS COMPONENTS USED IN SOUR SERVICE	6-79-0013, REV.1
7. STD. SPC. FOR PMI AT SUPPLIER'S WORK	6-81-0001, REV.3
8. SPECIFICATION FOR SS PLATE	6-12-0020, REV.8
9. HOT INSULATION SPECIFICATION	6-44-0002, REV.5
10. TECHNICAL NOTES FOR GASKETS	6-44-0056, REV.5
11. TECHNICAL NOTES FOR BOLTS & NUTS	6-44-0057, REV.5
12. BASIC ENGINEERING DESIGN BASIS (PART-B)	A758-999-02-41-ODB-1001_BEDB, REV.2
13. ENGINEERING DESIGN BASIS STATIC EQUIPMENT	A758-999-16-46-EDB-1001, REV.0
14. JOB SPECIFICATION (EQUIPMENT DIVISION)	B016-504-80-43-SP-9509, REV.D
15. SITE SPECIFIC SEISMIC SPECTRA	B016-000-16-54-DB-0001, REV.0
16. JOB SPEC. FOR SURFACE PREPARATION & PROTECTIVE COATING	B016-000-79-41-PLS-01, REV.1
17. HOT INSULATION	B016-000-80-44-IL-S001, REV.A
18. VENDOR DATA REQUIREMENTS	B016-504-80-43-VDR-9509, REV.A
19. MANDATORY SPARES	B016-504-80-43-SL-9509, REV.A

P1 (N+HIC) M.1.1-30.

⚠ LICENSOR SPECIFICATIONS	STD. NO. :
1. PROCESS DATA SHEET FOR LP FLARE KO DRUM (504-V-802)	BD-175334
2. GENERAL SPECIFICATION FOR MATERIAL OF CONSTRUCTION	BA-175858

⚠ EXTERNAL TEMPLATE	VALUE
1. 'e' VALUE	28 mm
2. CHORDAL LENGTH	2822 mm

PMC REFERENCE STANDARDS	STD. NO. :
1. VESSEL TOLERANCES	7-12-0001, REV.6
2. MANHOLE WITH DAVIT	7-12-0010, REV.7
3. LADDER RUNGS FOR MANHOLE/DEMISTER	7-12-0011, REV.6
4. NOZZLE REINFORCEMENT AND PROJECTION	7-12-0013, REV.6
5. STANDARD BOLT HOLE ORIENTATION	7-12-0015, REV.6
6. INTERNAL FLANGES	7-12-0018, REV.6
7. EIL NAME PLATE	7-12-0027, REV.6
8. MANUFACTURER NAME PLATE	7-12-0028, REV.6
9. BRACKET FOR NAME PLATE	7-12-0029, REV.6
10. SUPPORTS FOR INTERNAL FEED PIPE	7-12-0032, REV.5
⚠ 11. SUPPORT FOR HORIZONTAL VESSEL	7-12-0002, REV.6

LICENSOR STANDARDS ⚠	STD. NO. :
1. VESSEL FABRICATION TOLERANCES (VERTICAL)	GA-C1266, REV.1
2. GASKET SPECIFICATIONS AND ACCEPTABLE BRANDS	GD-L1264, REV.6
⚠ 3. STANDARD NOZZLES AND HAND HOLES FOR THICK WALL OR HIGH TEMPERATURE PRESSURE VESSELS	GF-C1030, REV.4
4. VORTEX BREAKER FOR VESSEL LIQUID OUTLET	GA-C99913
5. STRAINER FOR BOTTOM NOZZLE	GC-C31554, REV.13

INSPECTION DOCUMENTS ⚠	STD. NO. :
1. INSPECTION & TEST PLAN FOR GASKETS	6-81-0008, REV. 3
2. INSPECTION & TEST PLAN FOR PR VESSEL & CS COLUMN	6-81-0011, REV. 3

LIC STANDARDS	STD. NO. :
1. TEMPLATE FOR HORIZONTAL EQUIPMENT	LTC-EQ-DOA-038, REV.0
2. ALLOWABLE NOZZLE LOADS	LTC-001

PIP STANDARDS	STD. NO. :
1. HORIZONTAL VESSEL INSULATION SUPPORTS	VEFV-1122
2. VESSEL GROUNDING LUG	VEFV-1103

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.

1-PV-150-U0111	B016-RUF-LT-504-MS-GA-BHEL(1)-02501	GENERAL ASSEMBLY OF LP FLARE KO DRUM (504-V-802)	01
DRAWING NO.	⚠CLIENT DRAWING NO.	DRAWING TITLE	REV. NO.

DRG. CATEGORY: (USE TICK MARK) [R] [I]
SCH. DATE OF SUBMISSION

EIL REVIEW/APPROVAL CODE: VPTL NO.:

DOCUMENT STATUS
STATEMENT OF SUB: [1st] [2nd] [3rd]
☐ FINAL FOR CODE-1 ☐ AS BUILT

ISSUED FOR
☐ AS BUILT ☐ INFORMATION
☐ CONSTRUCTION ☐ REVIEW

SIGN: DATE:

- ☐ REVIEW CODE 1 - NO COMMENTS PROCEED WITH MANUFACTURE / FABRICATION/ CONSTRUCTION AS PER THE DOCUMENT.
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- ☐ V-VOID

NAME DISCIPLINE SIGN. DATE

REV.	DESCRIPTION	DRN	CHECKED	APPROVED	REVIEWED	APPROVED	DATE
01	REVISED AS PER COMMENTS	MK	AVR	TK			13.07.20
00	ISSUED FOR APPROVAL	MK	AVR	TK			06.06.20

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-U0178, REV. B

DATE	SCALE	TITLE: GENERAL NOTES FOR LP FLARE KO DRUM (ITEM NO. 504-V-802)	
06.06.20	N.T.S		
DEPT: HT ENGG.			
DRN BY: MUNAYYA K		PROJECT:	DRG. NO.: B016-RUF-LT-504-MS-FD-BHEL(1)-02511 / SH. 1 OF 1
CHK BY: A.V.RAO		PWO NO.:	REV. 01
APP BY: K.TARAKESH		CAD IMAGE THIS DRG. USING CAD SYSTEM ONLY	FILE:

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BHEL DRG. No. 1-PV-180-U0119

DMC. NO. B016-RUF-LT-504-MS-GA-BHEL(1)-02651

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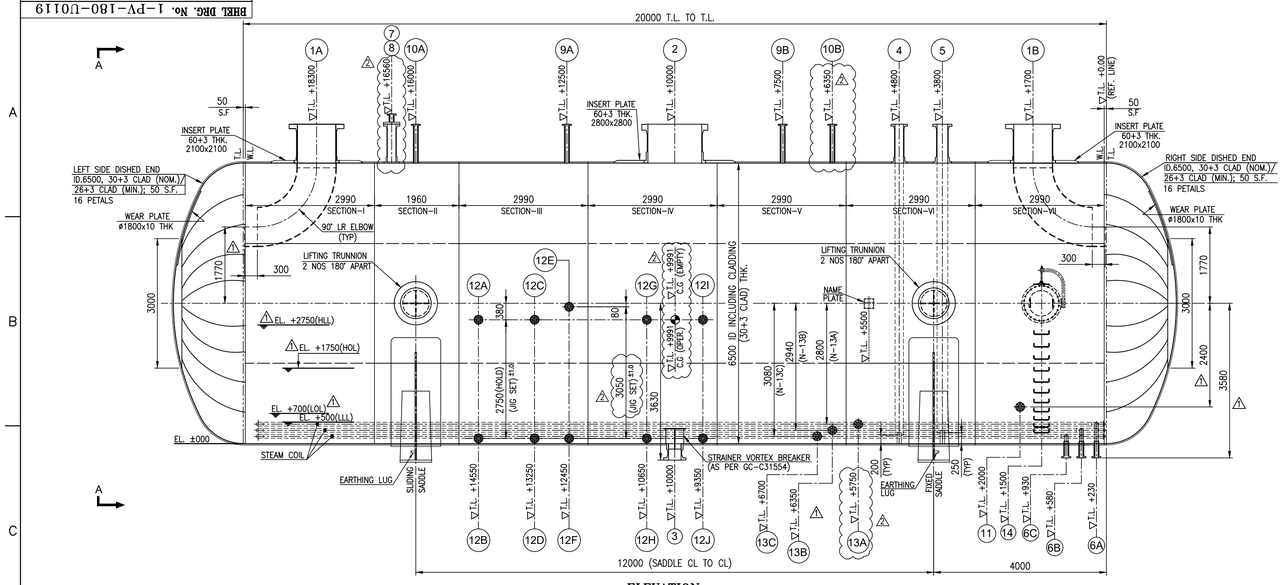

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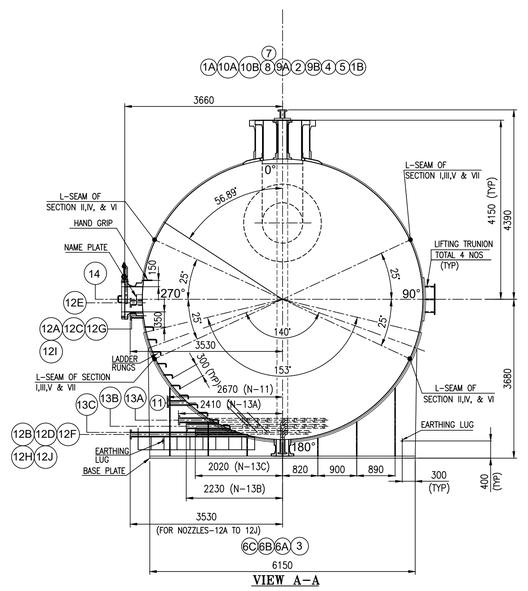
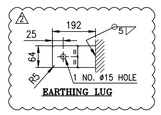
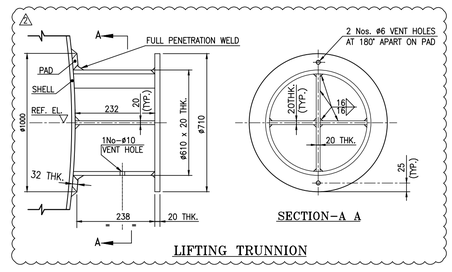


VIEW A–A



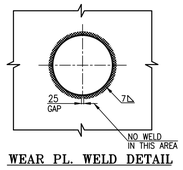
EARTHING LUG



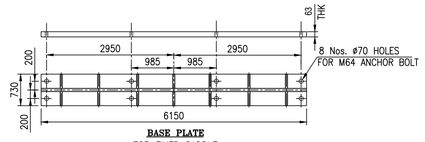
LIFTING TRUNNION

SECTION–A A

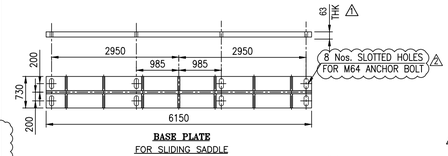
PLAN



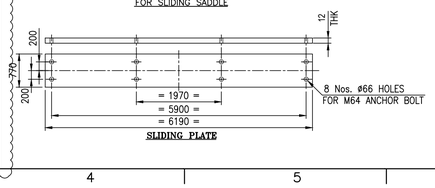
WEAR PL. WELD DETAIL



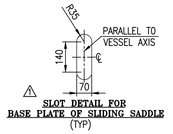
BASE PLATE FOR FIXED SADDLE



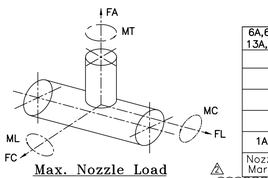
BASE PLATE FOR SLIDING SADDLE



SLIDING PLATE



SLOT DETAIL FOR BASE PLATE OF SLIDING SADDLE (TYP)



Max. Nozzle Load

Nozzle Mark	NB	FA (kgf)	FL (kgf)	FC (kgf)	MT (kgf-m)	ML (kgf-m)	MC (kgf-m)
6A,6B,6C,11, 13A,13B,13C	3"	300	300	300	112	90	67
5	10"	1000	1000	1000	1250	1000	2100
4	8"	800	800	800	800	640	480
3	12"	1500	3000	1500	2000	4500	1500
2	50"	19000	10000	14500	92500	25000	29000
1A & 1B	36"	3600	3600	3600	16200	12960	9720

WELD JOINT TOLERANCES

TABLE – 1

Sl.No.	TOLERANCE APPLICABLE	TOLERANCE
01.	BEVEL ANGLE / INCLUDING ANGLE	
	a). > 35°	± 5°
	b). 20° – 35°	± 2°
	c). < 20°	± 1°
02.	ROOT GAP	
	a). ⩽ 3	± 1
	b). 1 < ROOT GAP < 3	± 0.5
	c). ⩽ 1	+ 0.5 – 0.0

LOAD DATA		
SHEAR AT BASE (kgs)		
	EMPTY	IN OPERATION
DUE TO SEISMIC	–	65548(DBE)/85295(MCE)
DUE TO WIND	–	21811
MOMENT AT BASE (kg-m)		
DUE TO SEISMIC	–	241215(DBE)/ 313884(MCE)
DUE TO WIND	–	80263

DESIGN DATA

SERVICE	HYDRO CARBON		
DESIGN PRESSURE (INTL. | EXTERNAL) MPa (kg/cm²)(g)	0.3432 (3.5)	NIL	AT HIGHEST POINT
MAXIMUM ALLOWABLE WORKING PRESSURE MPa (kg/cm²)(g)	0.3432 (3.5)		
MAXIMUM ALLOWABLE PRESSURE MPa (kg/cm²)(g)	1.3533 (13.8)		
MAXIMUM ALLOWABLE EXTERNAL WORKING PRESSURE MPa (kg/cm²)(g)	0.0601 (0.613)		
DESIGN TEMPERATURE (INTL. | EXTERNAL) (°C)	415 (NIL) ⚠		
OPERATING PRESSURE MPa (kg/cm²)(g)	0.118 (1.2)		
OPERATING TEMPERATURE (°C)	310 – 396		
STEAM OUT CONDITON MPa (kg/cm²)(g)	0.05 (0.5) @ 170 °C		
STEAM COIL DESIGN PRESSURE (INTL. | EXTERNAL) MPa (kg/cm²)(g)	0.5394 (5.5) / (FULL VACUUM) 0.3432 (3.5)	STEAM COIL AREA (m²)	80
STEAM COIL DESIGN TEMPERATURE (INTL. | EXTERNAL)(°C)	190 | 415	STEAM COIL MAWP MPa (kg/cm²)(g)	0.5394 (5.5)
STEAM COIL HYDRO TEST PRESSURE MPa (kg/cm²)(g)	0.712 (7.26)	STEAM COIL MAEWP MPa (kg/cm²)(g)	1.639 (16.713)
PNEUMATIC TEST PRESSURE MPa (kg/cm²) (g)	–NIL–		
HYD.TEST PRESSURE AS PER UG-99(c) (AT SHOP) MPa (kg/cm²)(g)	1.468 (14.97) AT 16 °C (MIN) / 48 °C(MAX)	(AT HIGHEST POINT)	
HYD.TEST PRESSURE AS PER UG-99(b) (AT SITE) MPa (kg/cm²)(g)	0.490 (5.001) AT 16 °C (MIN) / 48 °C(MAX)	(AT HIGHEST POINT)	
CORROSION ALLOWANCE mm: 1.5 (EXTERNAL) | 3 CLAD/WOL (SHELL & HEAD) | 3 (FIXED INTERNALS) | 1.5 (REMOVABLE INTERNALS) ⚠			
MAXIMUM ALLOWABLE CORROSION ALLOWANCE (MACA) mm: 0 ⚠			
CAPACITY (m³)	737.935	CLADDING (mm)	3
RADIOGRAPHY: (RT1) SHELL: 100% | HEAD: 100%	JOINT EFFICIENCY: SHELL: 1.0 | HEAD: 1.0		
IMPACT TESTING = EXEMPTED (AS PER NOTE-3 OF FIG. UCS-66)		FABRICATED WEIGHT (Kg.) : ~149230.2	
OTHER LOADINGS : YES AS PER UG-22(a), (b), (c), (d), (2), (f), (i), (j)		WEIGHT (EMPTY) (Kg.) : ~190989.7	
INSULATION: (THK./HOT): 115 mm/HOT | FIRE PROOFING: NA		OPERATION WEIGHT (Kg.) : ~438824.8 ⚠	
DENSITY OF FLUID: Kg./ m³	835	TEST WEIGHT (Kg.) : ~923613.2	
POST WELD HEAT TREATMENT (AS PER UW-2,UCS-56,UCS-68,UCL-34(a))	YES	SPECIAL SERVICE : NO | CYCLIC SERVICE : NO	
MINIMUM DESIGN METAL TEMPERATURE °C	12.5	VESSEL SL.NO : 26677	
CODE STAMP REQUIRED	☒ YES ☐ NO	CONSIGNMENT SIZE : ODC/~~ORDINARY~~	
NB CODE STAMP REQUIRED	☐ YES ☒ NO	POSITION OF VESSEL : HORIZONTAL	
ASME CERTIFICATION MARK: YES WITH 'U' DESIGNATOR		HYDROTEST POSITION : HORIZONTAL IN SHOP	
CODE: ASME BPVC.VIII.1: ED–2019	INSPECTION: AUTHORISED INSPECTION: M/s CEIL/TUV/BV one CIS Insurance company		
NOZZLE LOAD DATA: APPLICABLE	STAGE WISE & THIRD PARTY INSPCTION: YES		
WIND SPEED: 52 M/SEC	NATIONAL BOARD REGISTRATION	NOT REQUIRED	
EARTHQUAKE SPECIFICATION: IS 1893 (PART 4)–2015 ED	WIND SPECIFICATION:	IS 875, PART–3: 2015 ED ⚠	
EQUIMENT CATEGORY=1 & SITE SPECIFIC SEISMIC SPECTRA ⚠	WIND ZONE: 6	RISK FACTOR : 1	
IMPORTANCE FACTOR : 2	SEISMIC ZONE : 3 | TERRAIN CATEGORY: 3	TOPOGRAPHY FACTOR : 1	
POST FORMING HEAT TREATMENT	YES, AS PER THE CYCLE GIVEN BELOW✱		
LOCATION OF INSTALLATION	HPCL–VISAKHAPATNAM, A.P, INDIA		

✱DISHED ENDS SHALL BE COLD FORMED FOLLOWED BY HEAT TREATMENT CYCLE AS BELOW.

HEAT TREATMENT ⚠

Part	Procedure	Loading Temperature (°C)	Holding Temperature (°C)	Heating Rate (°C/hr)	Holding Time (min)	Cooling Rate °C/hr	Remarks
DISHED ENDS (SHELL)	STRESS RELIEVING/PWHT	<400°C	690±15°C	160°C/hr	90 minutes	200°C/hr	Unloading at 400°C
COMPLETE EQUIPMENT	STRESS RELIEVING/PWHT	<425°C	690±10°C	110°C/hr	150 minutes	140°C/hr	Unloading at 425°C

LIST OF PARTS

SL.NO.	DESCRIPTION	MATERIAL REFERENCE	MATERIAL SPECFICATION
01	SHELL, D'END	LAS PLATE WITH CLADDING	SA 387 GR.22 CL.2 + SS 347
02	NOZZLES WITH INTEGRAL FLANGES	FORGED STEEL + WOL	SA 182 GR.F22 CL.3 + SS 347
03	SADDLE WRAPPER PLATE	BQ PLATE (LAS)	SA 387 GR.22 CL.2
04	SADDLE SUPPORT & TRUNNION BASE PLATE	BQ PLATE (CS)	SA 516 GR.70
05	INTERNALS	STAINLESS STEEL	SA 240 TYP.347
06	GASKET	SS 316 SPIRAL WOUND GRAFIL FILED WITH SS316 INNER RING & CS OUTER RING ⚠	SS316 SPIRAL WOUND
07	BOLTS & NUTS (EXT.)	ALLOY STEEL	SA 453 GR.660 CL.A ⚠
08	BOLTS & NUTS (INT.)	STAINLESS STEEL	SA 193 GR B8CA/ SA 194 GR 8CA
09	PIPE & PIPE FITTINGS	STAINLESS STEEL	SA312TP347, SA403WP347
10	EXTERNAL ATTACHMENTS	BQ PLATE (LAS)	SA387GR.22 CL.2
11	WEAR PLATE & STEAM COIL SUPPORT	STAINLESS STEEL	SA240TYP347
12	STEAM COIL	ALLOY 625	ALLOY 625
13	EARTHING LUG, VORTEX BREAKER	STAINLESS STEEL	SA240 TYP347

FOR GENERAL NOTES & OTHER APPLICABLE STD. PLEASE REFER DRG. NO: B016-RUF-LT-504-MS-FD-BHEL(1)-02660

2–PV–180–U0047	B016–RUF–LT–504–MS–DW–BHEL(1)–02661	TRANSPORTATION ARRANGEMENT DETAILS FOR HT FLARE KO DRUM (504–V–805A)	•
3–PV–180–U0190	B016–RUF–LT–504–MS–FD–BHEL(1)–02660	GENERAL NOTES FOR HT FLARE KO DRUM (504–V–805A)	•
3–PV–180–U0189	B016–RUF–LT–504–MS–FD–BHEL(1)–02659	NAME PLATE DETAILS FOR HT FLARE KO DRUM(504–V–805A)	•
3–PV–180–U0188	B016–RUF–LT–504–MS–FD–BHEL(1)–02658	FOUNDATION TEMPLATE FOR HT FLARE KO DRUM (504–V–805A)	•
3–PV–180–U0187	B016–RUF–LT–504–MS–FD–BHEL(1)–02657	DETAILS OF MANWAY DAVIT FOR HT FLARE KO DRUM (504–V–805A)	•
0–PV–180–U0021	B016–RUF–LT–504–MS–FD–BHEL(1)–02656	SHELL DEVELOPMENT OF HT FLARE KO DRUM (504–V–805A)	•
1–PV–180–U0122	B016–RUF–LT–504–MS–FD–BHEL(1)–02655	INSULATION SUPPORT DETAILS FOR HT FLARE KO DRUM (504–V–805A)	•
1–PV–180–U0121	B016–RUF–LT–504–MS–FD–BHEL(1)–02654	EXTERNAL ATTACHMENTS OF HT FLARE KO DRUM (504–V–805A)	•
1–PV–180–U0120	B016–RUF–LT–504–MS–FD–BHEL(1)–02652	ASSEMBLY DETAILS OF HT FLARE KO DRUM (504–V–805A)	•
BHEL DRAWING NO.	CLIENT DOCUMENT NO.	DRAWING TITLE	REV.

REFERENCE DOCUMENT LIST

* REVISION NO. SHALL BE MENTIONED WHILE MAKING THE AS BUILT DRAWING.

14	1	MANWAY+B.F.+DAVIT	600 (24")	610	– 14+W.O	576	LIP TYPE	300	SRN/R.F.	AS PER DRG.
13A,B,C	3	STEAM INLET	80 (3")	117	– 20.4+W.O	70.2	––	300	LWN/R.F.	AS PER DRG.
12B,D, F,H&J	5	LEVEL TAPS	80 (3")	117	– 20.4+W.O	70.2	––	300	LWN/R.F.	AS PER DRG.
12A,C, E,G&I	5	LEVEL TAPS	80 (3")	117	– 20.4+W.O	70.2	––	300	LWN/R.F.	AS PER DRG.
11	1	STEAM OUT	80 (3")	117	– 20.4+W.O	70.2	––	300	LWN/R.F.	AS PER DRG.
10B	1	TEMPERATURE CONTROL (TI)	80 (3")	117	– 20.4+W.O	70.2	––	300	LWN/R.F.	AS PER DRG.
10A	1	TEMPERATURE CONTROL (TI)	80 (3")	117	– 20.4+W.O	70.2	––	300	LWN/R.F.	AS PER DRG.
9A & 9B	2	PRESSURE GAUGE (PT/PI)	80 (3")	117	– 20.4+W.O	70.2	––	300	LWN/R.F.	AS PER DRG.
8	1	VENTILATION	200 (8")	219.1	– 12+W.O	189.1	LIP TYPE	300	SRN/R.F.	AS PER DRG.
7	1	VENT	80 (3")	117	– 20.4+W.O	70.2	––	300	LWN/R.F.	AS PER DRG.
6A,B,C	3	CONDENSATE OUTLET	80 (3")	117	– 20.4+W.O	70.2	––	300	LWN/R.F.	AS PER DRG.
5	1	COLD SRVGO	250 (10")	273	– 12+W.O	243	LIP TYPE	300	SRN/R.F.	AS PER DRG.
4	1	PUMP MIN. FLOW	200 (8")	219.1	– 12+W.O	189.1	LIP TYPE	300	SRN/R.F.	AS PER DRG.
3	1	OIL OUTLET	300 (12")	323.8	– 16+W.O	285.8	LIP TYPE	600 ⚠	SRN/R.F.	AS PER DRG.
2	1	VAPOUR OUTLET	1250 (50")	1277.9	– 16+W.O	1239.9	LIP TYPE	300	SRN/R.F.	AS PER DRG.
1A & 1B	2	FEED INLET	900 (36")	920.8	– 16+W.O	882.8	LIP TYPE	300	SRN/R.F.	AS PER DRG.
MARK NO.	QTY.	SERVICE	NB (N.P.S)	O.D.	SCH. THK.	ID. AFTER CLADDING	R.F.PAD WIDTH x THK.	RATING CLASS	TYPE/ FACE	PROJ. SEE. NOTE–3 ⚠	REMARKS ⚠

TABLE OF NOZZLES AND FLANGES

LIST OF HOLDS AS ON DATE ⚠
01. PIPE SUPPORT & PLATFORM SUPPORT CLEATS.

⚠ APPLICABLE STANDARDS

1. ASME BOILER & PRESSURE VESSEL CODE SEC VIII DIV 1 : ED–2019
2. ASME BOILER & PRESSURE VESSEL CODE SEC II PART A, C & D : ED–2019
3. ASME BOILER & PRESSURE VESSEL CODE SEC V : ED–2019
4. ASME BOILER & PRESSURE VESSEL CODE SEC IX ED–2019
5. ASME B16.5 ED–2013–STANDARD FOR PIPE FLANGES AND FLANGED FITTINGS.
6. ASME B16.47 ED–2017–STANDARD FOR LARGE DIAMETER STANDARD FLANGES
7. ASME B16.11 ED–2016 FORGED STEEL FITTINGS, SOCKET WELDED & THREADED
8. ASME B36.10M ED–2018 WELDED AND SEAMLESS WROUGHT STEEL PIPE
9. ASME B1.20.1 ED–2013 PIPE THREADS, GENERAL PURPOSE (INCH)
10. ASME B16.20 ED–2017 METALLIC GASKETS FOR PIPE FLANGES
11. ASME B36.19M ED–2018 STAINLESS STEEL PIPE

⚠ No. OF CIRCUMFERENTIAL SEAMS FOR SHELL: 8
No. OF LONGITUDINAL SEAMS: 2 PER SECTION

XXX.XXXX.XXXX.XXXX | XXX | X
DRAWING NO. | DRAWING TITLE | REV

REFERENCE DOCUMENTS / DRAWINGS

DRG. CATEGORY: (USE TICK MARK) [R] [I]
SCH. DATE OF SUBMISSION
VPTL NO.:
EIL REVIEW/APPROVAL CODE:

DOCUMENT STATUS
STATEMENT OF SUB: [1st] [2nd] [3rd]
☐ FINAL FOR CODE–1 ☐ AS BUILT
ISSUED FOR
☐ AS BUILT ☐ INFORMATION
☐ CONSTRUCTION ☐ 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:

NAME DICIPLINE SIGN. DATE

REV.	DESCRIPTION	DRN	CHECKED	APPROVED	REVIEWED	APPROVED	DATE
02	COMMENTS ON REV–01 INCORPORATED	MK	AVR	TK			17.10.20
01	COMMENTS OF L&T INCORPORATED	MK	AVR	TK			07.07.20
00	ISSUED FOR APPROVAL	MK	AVR	TK			22.05.20

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: 1–PV–180–U0119, REV.0

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.

DATE 07.07.20 | SCALE 1 : 70 | TITLE: GENERAL ASSEMBLY OF HIGH TEMPERATURE FLARE KNOCK OUT DRUM ITEM NO. 504–V–805A
DEPT: HT ENGG.
DRN BY: MUNAYYA K | PROJECT: | DRG. NO.: B016–RUF–LT–504–MS–GA–BHEL(1)–02651 | SH. 01 of 01 | REV. 02
CHK BY: A V RAO | PWO NO.:
APP BY: TARAKESH K | CAD REMEE THIS DRG. USING CAD SYSTEM ONLY | FILE:

BHEL DRG. No. 1-PV-180-U0145

DMC. NO. B016-RUF-LT-504-MS-FD-BHEL(1)-02652

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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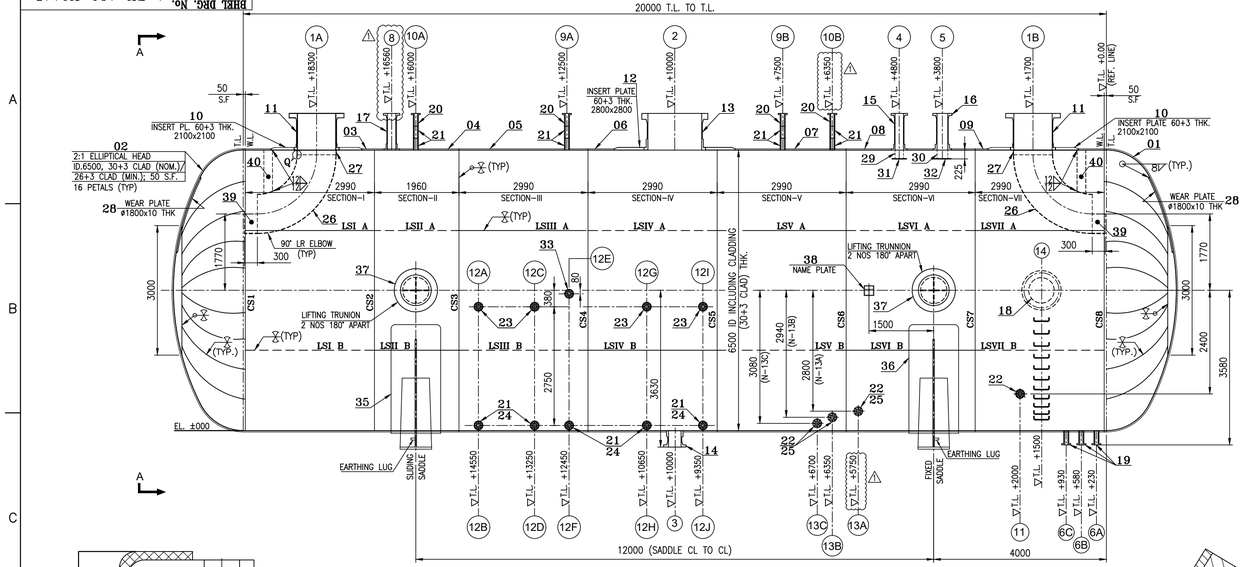
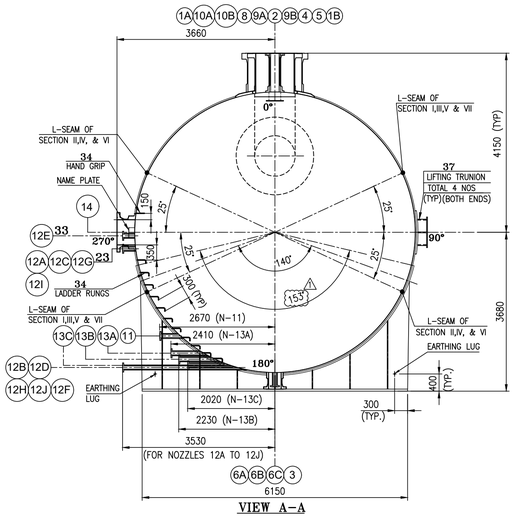
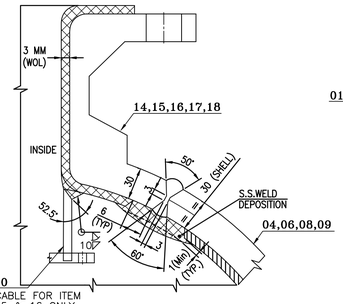


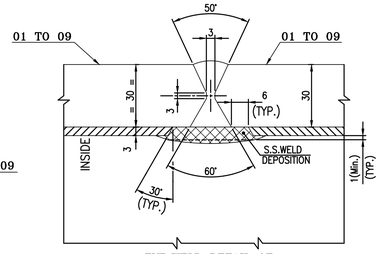
ELEVATION



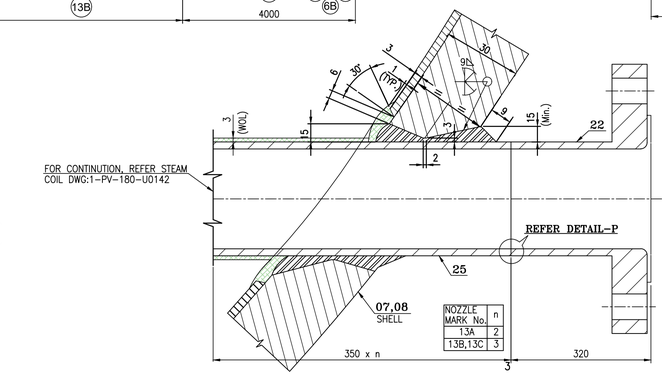
VIEW A-A



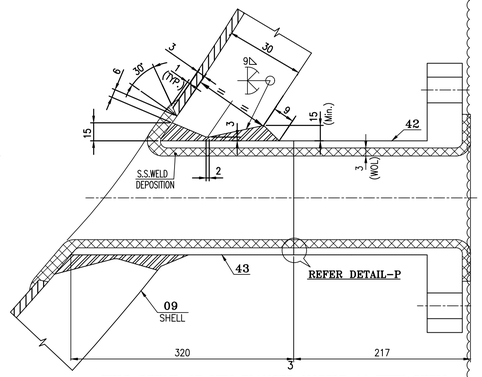
TYP.WELD DETAIL OF SR NOZZLE (LIP TYPE) TO SHELL
(FOR NOZZLE MARK Nos. 3,4,5,8,& 14)



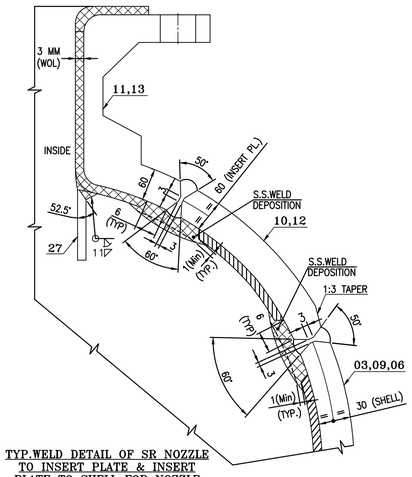
TYP.WELD DETAIL OF L-SEAM/C-SEAM FOR SHELL SECS. I TO VII & PETAL JOINTS OF LEFT & RIGHT DISHED ENDS



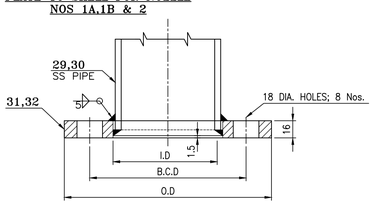
TYP.WELD DETAIL OF LWN FLANGED NOZZLES TO SHELL FOR NOZZLE NOs. 13A, 13B & 13C



WELD DETAIL OF LWN FLANGED NOZZLE 11 WITH SHELL

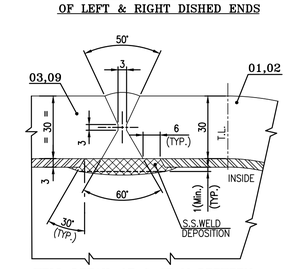


TYP.WELD DETAIL OF SR NOZZLE TO INSERT PLATE & INSERT PLATE TO SHELL FOR NOZZLE NOS 1A,1B & 2

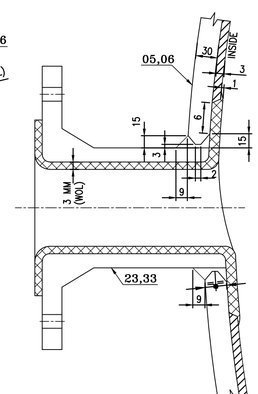


INTERNAL PIPE-FLANGE DETAIL FOR NOZZLE-1A,1B,4 & 5

ITEM NO.	PIPE SIZE	I.D	B.C.D	O.D
31	200NB	222	290	340
32	250NB	276	350	400

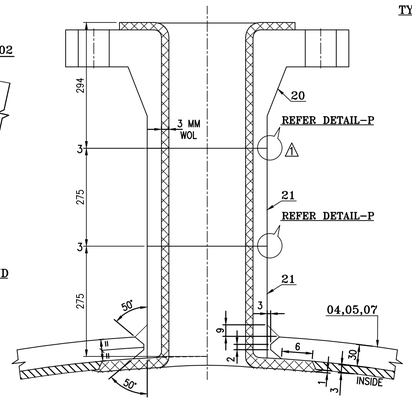


WELD DETAIL OF C-SEAM BETWEEN SHELL SEC.-I & LEFT DISHED END AND SHELL SEC.-VII & RIGHT DISHED END

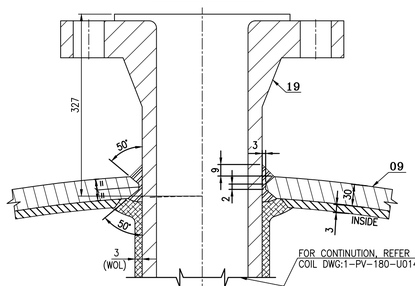


TYP.WELD DETAIL OF LWN FLANGED NOZZLES TO SHELL FOR NOZZLE NOS 12A,12C,12E,12G & 12I

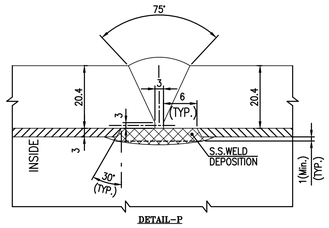
(ITEM No.23 SHALL BE CUT SUITABLY TO ACHIEVE THE DESIRED PROJECTION LENGTH FOR DIFFERENT NOZZLES)



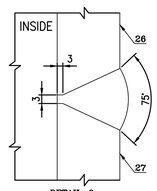
TYP.WELD DETAIL OF LWN FLANGED NOZZLES TO SHELL FOR NOZZLE NOS 9A,9B,10A, & 10B



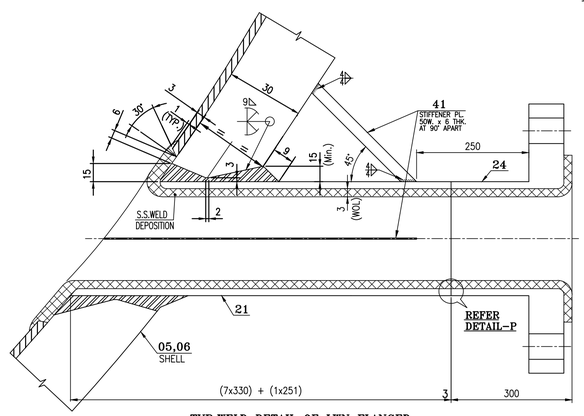
⚠ TYP.WELD DETAIL OF LWN FLANGED NOZZLES TO SHELL FOR NOZZLE NOS 6A, 6B & 6C



DETAIL-P



DETAIL-Q



TYP.WELD DETAIL OF LWN FLANGED NOZZLES TO SHELL FOR NOZZLE NOS 12B,12D,12F,12H & 12J

(ITEM No. 24 & 33 SHALL BE CUT SUITABLY TO ACHIEVE THE DESIRED PROJECTION LENGTH FOR DIFFERENT NOZZLES)

TOTAL WEIGHT: 160697.1

	43	SPOOL FOR LWN NOZZLE – 11 OD. 117x20.4; L=CUT SUITABLY			SA182Gr.F22CL.3+3mm UNS S34700 WOL			17.175
					SA182Gr.F22CL.3+3mm UNS S34700 WOL			1
	42	LWN NOZZLE – 11 NPS 3" x 300# RF; L=CUT SUITABLY			A243 81PV 1800 1011			20.815
					SA182Gr.F22CL.3+3mm UNS S34700 WOL			1
	41	STIFFENER PL. FOR NOZ–12B,12D,12F,12H & 12J; 50 x 6 THK. ; 30 METRE			SA 387 GR.22 CL.2			70.650
								1
	40	SUPPORT PL. FOR FEED INLET ELBOW 16 THK. x 200 x 1010			SA 312 TP 347			25.856
								2
	39	HALF PIPE (PL. FORMED) OD.914 x 16 THK. ; L=300 mm			SA 312 TP 347			56.097
								2
⚠	38	NAME PLATE BRACKET	3–PV–180–U0189		WELDMENT			8.522
								1
	37	LIFTING TRUNNION	1–PV–180–U0148		WELDMENT			301.118
								4
⚠	36	FIXED SADDLE SUPPORT ASSEMBLY	1–PV–180–U0148		WELDMENT			6908.055
								1
⚠	35	SLIDING SADDLE SUPPORT ASSEMBLY	1–PV–180–U0148		WELDMENT			7324.220
								1
⚠	34	LADDER RUNGS & HAND GRIP	1–PV–180–U0148					22.024
								1
⚠	33	LWN NOZZLE – 12E NPS 3" x 300# RF; L=280 (CUT SUITABLY)			A243 81PV 1800 1014			18.852
					SA182Gr.F22CL.3+3mm UNS S34700 WOL			1
⚠	32	INTERNAL FLANGE FOR PIPE 250NB ID: 276 x OD: 400 x 16 THK.			SA 240 TP 347			8.427
								1
⚠	31	INTERNAL FLANGE FOR PIPE 200NB ID: 222 x OD: 340 x 16 THK.			SA 240 TP 347			6.667
								1
⚠	30	PIPE OD 273 x 15.09 THK. 250 LG.			SA 312 TP 347			21.526
								1
⚠	29	PIPE OD 219.1 x 15.09 THK 250 LG.			SA 312 TP 347			17.022
								1
⚠	28	WEAR PLATES (ø1800) x 10THK			SA 240 TP 347			203.575
								2
⚠	27	PL. FORMED PIPE OD 914x16 THK. 108 LG.			SA 240 TP 347			40.390
								2
⚠	26	90° LR ELBOW; OD.914x15.88 THK.			SA 403 WP 347			795.000
								2
⚠	25	LWN SPOOL – 13A,13B & 13C OD. 117x20.4; L=CUT SUITABLY FOR 13B						17.175
					SA182Gr.F22CL.3+3mm UNS S34700 WOL			8
⚠	24	LWN NOZZLE – 12B,12D,12F,12H & 12J NPS 3" x 300# RF; L=300 (CUT SUITABLY)			A243 81PV 1800 1013			12.891
					SA182Gr.F22CL.3+3mm UNS S34700 WOL			1
⚠	23	LWN NOZZLE – 12A,12C,12G & 12I NPS 3" x 300# RF; L=307 (CUT SUITABLY)			A243 81PV 1800 1012			20.177
					SA182Gr.F22CL.3+3mm UNS S34700 WOL			4
⚠	22	LWN NOZZLE – 13A,13B,13C NPS 3" x 300# RF; L=320			A243 81PV 1800 1011			20.815
					SA182Gr.F22CL.3+3mm UNS S34700 WOL			3
⚠	21	LWN SPOOL – OD.117x20.4 THK 12B,12D,12F,12H & 12J; L=(CUT AS PER DWG.) 9A, 9B, 10A & 10B; L=275 (CUT SUITABLY)			A243 81PV 1800 1014			14.108
					SA182Gr.F22CL.3+3mm UNS S34700 WOL			53
⚠	20	LWN NOZZLE – 9A,9B,10A & 10B NPS 3"x300# RF; L=CUT SUITABLY			A243 81PV 1800 1010			19.834
					SA182Gr.F22CL.3+3mm UNS S34700 WOL			4
⚠	19	LWN NOZZLE – 6A,6B,6C NPS 3"x300# RF; L=CUT SUITABLY FOR 6C			A243 81PV 1800 1008			21.160
					SA182Gr.F22CL.3+3mm UNS S34700 WOL			3
	18	SR NOZZLE – 14 NPS 24" x 300#; RF LIP			A243 81PV 1800 1007			530.000
					SA182Gr.F22CL.3+3mm UNS S34700 WOL			1
	17	SR NOZZLE – 8 NPS 8" x 300#; RF LIP			A243 81PV 1800 1006			109.116
					SA182Gr.F22CL.3+3mm UNS S34700 WOL			1
	16	SR NOZZLE – 5 NPS 10" x 300#; RF LIP			A243 81PV 1800 1005			152.500
					SA182Gr.F22CL.3+3mm UNS S34700 WOL			1
	15	SR NOZZLE – 4 NPS 8" x 300#; RF LIP			A243 81PV 1800 1004			108.100
					SA182Gr.F22CL.3+3mm UNS S34700 WOL			1
	14	SR NOZZLE – 3 NPS 12" x 600#; RF LIP ⚠			A243 81PV 1800 1003			149.000
					SA182Gr.F22CL.3+3mm UNS S34700 WOL			1
	13	SR NOZZLE – 2 NPS 50" x 300#; RF LIP			A243 81PV 1800 1002			1441.000
					SA182Gr.F22CL.3+3mm UNS S34700 WOL			1
	12	INSERT PLATE FOR NOZZLE–2 (60+3 CLAD) x 2800 x 2800			1560 1897 0000			3071.847
					SA 387 GR.22 CL.2+UNS S34700			1
	11	SR NOZZLE – 1A & 1B NPS 36" x 300#; RF LIP			A243 81PV 1800 1001			933.000
					SA182Gr.F22CL.3+3mm UNS S34700 WOL			2
	10	INSERT PLATE FOR NOZZLE 1A&1B (60+3 CLAD) x 2100 x 2100			1560 1897 0000			1759.270
					SA 387 GR.22 CL.2+UNS S34700			2
	09	SHELL SECTION–VII (30+3 CLAD) x 2900 x 10262			1560 2087 0000			7948.530
					SA 387 GR.22 CL.2+UNS S34700			2
	08	SHELL SECTION–VI (30+3 CLAD) x 2900 x 10262			1560 2087 0000			7948.530
					SA 387 GR.22 CL.2+UNS S34700			2
	07	SHELL SECTION–V (30+3 CLAD) x 2900 x 10262			1560 2087 0000			7948.530
					SA 387 GR.22 CL.2+UNS S34700			2
	06	SHELL SECTION–IV (30+3 CLAD) x 2900 x 10262			1560 2087 0000			7948.530
					SA 387 GR.22 CL.2+UNS S34700			2
	05	SHELL SECTION–III (30+3 CLAD) x 2900 x 10262			1560 2087 0000			7948.530
					SA 387 GR.22 CL.2+UNS S34700			2
	04	SHELL SECTION–II (30+3 CLAD) x 1960 x 10262			1560 2087 0000			5210.410
					SA 387 GR.22 CL.2+UNS S34700			2
	03	SHELL SECTION–I (30+3 CLAD) x 2900 x 10262			1560 2087 0000			7948.530
					SA 387 GR.22 CL.2+UNS S34700			2
	02	LEFT SIDE DISHED END (30+3 CLAD)	3–PV–010–U0102		1560 2087 0000			12411.000
					SA 387 GR.22 CL.2+UNS S34700			1
	01	RIGHT SIDE DISHED END (30+3 CLAD)	3–PV–010–U0102		1560 2087 0000			12411.000
					SA 387 GR.22 CL.2+UNS S34700			1
VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM-NO / VAR-NO	MATERIAL CODE / MATERIAL SPECIFICATION	A/U/P	UNIT WEIGHT / QUANTITY

XXX.XXXX.XXXX.XXXX	XXX X
DRAWING NO.	DRAWING TITLE REV

REFERENCE DOCUMENTS / DRAWINGS

DRG. CATEGORY: (USE TICK MARK) [R] [I]
SCH. DATE OF SUBMISSION
DOCUMENT STATUS
STATEMENT OF SUB: [1st] [2nd] [3rd]
☐ FINAL FOR CODE–1 ☐ AS BUILT
ISSUED FOR
☐ AS BUILT ☐ INFORMATION
☐ CONSTRUCTION ☐ REVIEW
SIGN: DATE:

EIL REVIEW/APPROVAL VPTL NO.:
CODE:
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☐ V–VOID

NAME	DICIPLINE	SIGN.	DATE

REV.	DESCRIPTION	DRN	CHECKED	APPROVED	REVIEWED	APPROVED	DATE
01	COMMENTS OF L&T INCORPORATED	MK	AVR	TK			16.10.20
00	ISSUED FOR APPROVAL	MK	AVR	TK			07.07.20

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

L&T - CHIYODA LIMITED

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☐ 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.

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: 1–PV–180–U0145, REV.0

DATE 07.07.20 | SCALE 1 : 70
DEPT: HT ENGG.
DRN BY: MUNAYYA K
CHK BY: A V RAO
APP BY: TARAKESH K

TITLE: SHELL ASSEMBLY DETAILS OF HT FLARE KO DRUM ITEM NO. 504–V–805A

PROJECT:
CUSTOMER REFERENCE DRG. NO.: B016–RUF–LT–504–MS–FD–BHEL(1)–02652
PWO NO.:
SH. 02 of 07
REV. 00

CAD REFERENCE THIS DRG. USING CAD SYSTEM ONLY FILE:

BHEL DRG. No.	DRG. NO.
3-PV-180-U0190	B016-RUF-LT-504-MS-FD-BHEL(1)-02660

A. GENERAL:

1. ALL DIMENSIONS & ELEVATIONS ARE IN MM UNLESS OTHERWISE STATED.
2. DESIGN PRESSURE AT BOTTOM INCLUDES TOP DESIGN PRESSURE + OPERATING LIQUID HEAD + PRESSURE DROP ACROSS THE VESSEL.
3. NORTH DIRECTION WHEREVER SHOWN IS WITH RESPECT TO PLAN VIEW.
4. ALL ADDITIONAL INDICATIONS SUCH AS NORTH/EAST/SOUTH/WEST ALONG WITH CG SHALL BE CLEARLY MARKED WITH WHITE PAINT.
5. ALL INTERNAL BOLTS SHALL BE PROVIDED WITH DOUBLE NUTS.
6. ALL STUD / BOLTS SHALL BE FULLY THREADED WITH 2 NOS. OF HEAVY HEXAGONAL NUTS. THREADS SHALL BE UNC ACCORDING TO ASME B1.1 COURSE THREADS FOR STUDS / BOLTS UP TO 1"AND 8UN THREADS PER INCH FOR SIZES LARGER THAN 1".
7. DIMENSIONS OF FLANGES FOR NOZZLES UPTO 600 NB (24") SHALL BE AS PER ASME B16.5 AND FOR NOZZLE ABOVE 600 NB (24") SHALL BE AS PER ASME B16.47 SERIES 'B' UNLESS SPECIFIED OTHERWISE. FLANGE GASKET FACE SHALL HAVE 3.2 – 6.3 MICRONS (125~250 AARH FINISH.)
8. ALL FITTINGS SHALL BE OF SEAMLESS CONSTRUCTION.

B. MATERIAL:

1. DIMENSIONS OF FLANGES FOR NOZZLES UPTO 600 NB (24") SHALL BE AS PER ASME B16.5 AND FOR NOZZLE ABOVE 600 NB (24") SHALL BE AS PER ASME B16.47 SERIES 'B' UNLESS SPECIFIED OTHERWISE. FLANGE GASKET FACE SHALL HAVE 3.2 – 6.3 MICRONS (125~250 AARH FINISH.)
2. THE GASKETS USED DURING HYDRAULIC TEST SHALL BE OF SAME SPECIFICATION AS SERVICE GASKETS.
3. IN CLAD FLANGES THE THICKNESS OF FLANGES SHALL BE INCREASED EQUAL TO GROOVE DEPTH. THE W.O.L THICKNESS OF THE FACING SHALL BE MIN. 3MM AFTER MACHINING.
4. ALL MATERIALS WELDED DIRECTLY TO THE PRESSURE–RETAINING ENVELOPE SHALL BE MATERIAL OF THE SAME P NUMBER AND GROUP NUMBER IN THE APPLICABLE TABLE IN ASME CODE, SECTION II, PART D.
5. 3 THK. CLAD / W.O.L CONSIDER CORROSION ALLOWANCE.
6. IN CLAD PART OF VESSEL, WELD OVERLAY SHOULD BE MIN. 3mm UNDILUTED MATERIAL HAVING SAME CHEMISTRY AS THAT OF SPECIFIED CLAD MATERIAL.
7. THE WELD OVERLAY SHOULD BE MINIMUM TWO LAYER CONSTRUCTION. THE THICKNESS OF LAYER CONFIRMING TO THE SPECIFIED COMPOSITION, EXCLUDING ANY ALLOWANCE FOR GRINDING OR MACHINING SHALL NOT BE LESS THAN 1.5MM PER LAYER.
8. HARDNESS OF GASKET SHALL BE LESS THAN HARDNESS OF FLANGE.
9. GASKET SHALL BE AS PER ASME B 16.20

C. FABRICATION:

1. THE INDICATED THICKNESS IS MINIMUM ACCEPTABLE AFTER CONSTRUCTION.
2. ALL SHARP CORNERS ARE TO BE ROUNDED OFF.
3. FOR NOZZLES ON SHELL, PROJECTIONS ARE REFERRED FROM VESSEL CENTER LINE TO FLANGE CONTACT FACE AND FOR NOZZLES ON HEAD, PROJECTIONS ARE REFERRED FROM HEAD T.L TO FLANGE CONTACT FACE.
4. ALL FLANGE STUD/BOLT HOLES AND ANCHOR BOLT HOLES TO STRADDLE CENTER LINES AS PER E.I.L.STD.No. 7–12–0015. UNLESS OTHERWISE INDICATED.
5. NOZZLES IN CLADDED SECTION SHALL BE CLADDED / WELD OVERLAYED.
6. GASKET SEATING SURFACE OF ALL EXTERNAL FLANGES SHALL HAVE SMOOTH FINISH TO 125 TO 250 AARH AND ALL INTERNAL FLANGES SHALL HAVE CONCENTRIC SERRATIONS.
7. ALL MAIN WELD SEAMS SHALL BE CLEAR OF NOZZLES, R.F.PADS, INTERNALS AND STIFFENING RINGS BY 50 mm MIN. (WELD EDGE TO WELD EDGE).
   A) IN CASE OF FOULING OF ANY NOZZLE OPENING WITH VESSEL WELD SEAMS (i) GRIND FILLET OF NOZZLE TO SHELL/D'HEAD WELDING TO A SMOOTH CONCAVE RADIUS AND (ii) RE–RADIOGRAPH (100%) THE ADJACENT WELD SEAMS UPTO A DISTANCE OF 300 mm BEYOND EDGE OF NOZZLE ON EACH SIDE BEFORE WELDING THE R.F.PAD.
   B) WHEREVER RF PADS / PADS OF OTHER ATTACHMENTS CROSS OVER WELD SEAMS OF VESSEL, THE WELD SEAM IS TO BE GROUND FLUSH AND FULLY RADIOGRAPHED UPTO 150 mm ON EAITHER SIDE OF PADS BEFORE WELDING THE ATTACHMENTS.
   C) ALL WELDS SHALL BE DYE PENETRATE EXAMINED.
   WHEREVER PADS ARE COMING OVER C–SEAM OF DIFFERENTIAL THICKNESS, BOTTOM SIDE OF PAD SHALL BE GROUND TO SUIT AND WELD OVER THE C–SEAM.
8. ALL WELDS OF PRESSURE PARTS & LOAD BEARING PARTS SHALL BE FULL PENETRATION TYPE.
9. WELD EDGE TO EDGE DISTANCE SHALL BE AS PER CL. 4.7.5 OF GENERAL SPECIFICATION FOR PRESSURE VESSEL 6–12–0001.
10. FILLET WELD SIZES INDICATED SHOWS THE LEG SIZE AND ARE MINIMUM.
11. ALL FILLET WELDS INTERNAL AND EXTERNAL TO PRESSURE CONTAINING COMPONENTS SHALL BE GROUND TO A SMOOTH AND GENEROUS COCAVE CONTOUR.
12. WHEREVER INSULATION SUPPORT RINGS ARE COMING IN WAY OF OTHER ATTACHMENTS, THE INSULATION SUPPORT RING MAY BE SUITABLY MODIFIED.
13. R.F. PAD IS TO BE WELDED TO SHELL SUCH THAT ONE TELL TALE HOLE OF DIA. 8MM WILL BE AT THE BOTTOM OF THE PAD IN THE ASSEMBLED POSITION OF THE VESSEL.
14. NO WELDING IS TO BE DONE ON THE VESSEL AFTER HEAT TREATMENT UNLESS OTHERWISE PERMITTED BY CODE/SPECIFICATION/ APPROVED BY L&T
15. RADIOGRAPH THE WELD ON THE BASE MATERIAL BEFORE CARRYING OUT WELD ON THE CLAD SIDE.
16. COMPLETE EQUIPMENT UP TO WRAPPER PLATE SHALL BE STRESS RELIEVED. HARDNESS OF ALL PLATE, WELDS HAZ AFTER PWHT SHALL BE LIMITED TO 200 BHN. SHALL BE CARRIED BEFORE HYDROTEST.
17. ALL HEAT TREATMENTS SHALL BE AS PER FORMING AND HEAT TREATMENT PROCEDURES DOC. NO. B016–RUF–LT–504–QA–QD–BHEL(1)–02010
18. TELL TALE HOLES SHALL NOT BE PLUGGED AND SHALL BE FILLED WITH HARD GREASE ONLY.
19. IN CLAD FLANGES THE THICKNESS OF FLANGES SHALL BE INCREASED EQUAL TO GROOVE DEPTH. THE W.O.L THICKNESS OF THE FACING SHALL BE MIN. 3MM AFTER MACHINING.

D. TOLERANCE:

1. ALL LEVEL INSTRUMENT NOZZLES SHALL BE JIG SET WITHIN TOLERANCE OF +/– 1.0 MM.
2. THE UPPER & LOWER NOZZLE CONNECTIONS FOR ANY LEVEL INSTRUMENT SHALL BE IN THE SAME PLANE.
3. EQUIPMENT TOLERANCE SHALL BE IN ACCORDANCE WITH EIL STD. 7–12–001 OR GA–C1266 OR DESIGN CODE WHICH EVER IS STRINGENT.
4. TOLERANCES INDICATED IN THE DRAWING ARE NON CUMULATIVE.

E. NDE AND TESTING:

1. ALL INSPECTION REQUIREMENTS SHALL BE AS PER INSPECTION & TEST PLAN DOC. NO. B016–RUF–LT–504–MS–QD–BHEL(1)–02001
2. CLADDED DISHED END SHALL BE ULTRASONICALLY TESTED AFTER FORMING AS PER A 578, LEVEL–C.
3. KNUCKLE PORTION OF DISHED ENDS BOTH INSIDE AND OUTSIDE SHALL BE D.P.CHECKED.
4. ALL WELDED PIPES OF SS 347 MATERIAL SHALL BE 100% DP CHECKED BOTH INSIDE AND OUTSIDE.
5. ON FORMED PIPE OF SS 347 MATERIAL, HARDNESS MEASUREMENT IN BASE METAL AND HAZ SHALL BE CARRIED OUT AFTER WELDING. THE MAXIMUM HARDNESS SHALL BE LIMITED TO 88 RB. OTHERWISE NECCESSARY HEAT TREATMENT SHALL BE CARRIED OUT TO BRING THE HARDNESS WITHIN THE LIMITS. ANNEALING PROCEDURE SHALL BE ESTABLISHED TO CONTROL HARDNESS.
6. ALL NOZZLES FABRICATED FROM PLATE SHALL BE 100% RADIOGRAPHED.
7. WATER USED FOR HYDRAULIC TESTING SHALL BE CLEAN & POTABLE AND HT SHALL BE CARRIED OUT AS PER DOC. NO B016–RUF–LT–504–MS–QD–BHEL(1)–02005.

F. SURFACE PREPARATION AND PROTECTION:

1. SURFACE PREPARATION AND PAINTING SHALL BE AS PER SURFACE PREPARATION & PAINTING PROCEDURE (DOC. NO. B016–RUF–LT–504–MS–QD–BHEL(1)–02004) AND SHALL COMPLY ALL REQUIREMENTS OF B016–000–79–41–PLS–01, REV.1.
2. ALL SS / CLAD SURFACES AND WELDMENTS SHALL BE PICKLED & PASSIVATED AS PER ASTM A–380 AFTER HYDRAULIC TESTING.
3. PROTECT ALL MACHINED SURFACES AND THREADED CONNECTIONS WITH RUST PREVENTIVE IMMEDIATELY AFTER MACHINING. INSTALL WOOD OR STEEL PROTECTORS FOR FITTINGS IMMEDIATELY AFTER TESTING.
4. EARTHING LUGS ARE NOT TO BE PAINTED OR GALVANISED.

G. SHIPMENT AND HANDLING:

1. ALL REMOVABLE INTERNALS SHALL BE SIZED SO AS TO PASS THROUGH MANHOLE. (I.D.582MM)
2. AFTER HYDROTEST, EQUIPMENT SHALL BE THOROUGHLY DRAINED & DRIED OUT, ALL THE NOZZLE OPENINGS SHALL BE CLOSED WITH SUITABLE STEEL COVERS.
3. EQUIPMENT SHALL BE TRANSPORTED TO SITE IN SINGLE PIECE.
4. LIFTING OF EQUIPMENT SHALL BE DONE USING SPREADER BEAM ONLY.

4.

PMC REFERENCE SPECIFICATIONS	STD. NO. :
1. GENERAL SPEC. FOR PRESSURE VESSELS	6–12–0001, REV.5
2. SUPP. SPEC. FOR LAS VESSELS	6–12–0003, REV.4
3. SUPP. SPEC. FOR SS CLAD VESSELS	6–12–0007, REV.4
4. STD. SPEC. FOR BQCS PLATE	6–12–0011, REV.8
5. STD. SPEC. FOR STRUCTURAL QUALITY PLATES	6–12–0014, REV.6
6. STD. SPEC. FOR CLAD PLATES	6–12–0015, REV.4
7. STD. SPEC. FOR 2.25%Cr–1% Mo PLATES	6–12–0018, REV.4
8. STD. SPC. FOR HARDNESS REQU. STATIC EQUIPMENTS	6–15–0091, REV.3
9. HOT INSULATION SPECIFICATION	6–44–0002, REV.5
10. TECHNICAL NOTES FOR GASKETS	6–44–0056, REV.5
11. TECHNICAL NOTES FOR BOLTS & NUTS	6–44–0057, REV.5
12. MATERIAL REQU. FOR CS COMPO.USED IN SOUR SERVICE	6–79–0013, REV.1
13. STD. SPC. FOR PMI AT SUPPLIER'S WORK	6–81–0001, REV.3
14. BASIC ENGINEERING DESIGN BASIS (PART–B)	A758–999–02–41–ODB–1001 BEDB, REV.2
15. ENGINEERING DESIGN BASIS STATIC EQUIPMENT	A758–999–16–46–EDB–1001, Rev.0
16. JOB SPECIFICATION (EQUIPMENT DIVISION)	B016–504–80–43–SP–9509, Rev.D
17. VENDOR DATA REQUIREMENTS	B016–504–80–43–VDR–9509, REV.A
18. MANDATORY SPARES	B016–504–80–43–SL–9509, REV.A
19. SCOPE OF WORK	B016–504–80–43–SOW–9509, REV.C
20. SITE SPECIFIC SEISMIC SPECTRA	B016–000–16–54–DB–0001, Rev.0
21. JOB SPEC. FOR SURFACE PREPARATION & PROTECTIVE COATING	B016–000–79–41–PLS–01, Rev.1

INSPECTION DOCUMENTS	STD. NO. :
1. INSPECTION & TEST PLAN FOR GASKETS	6–81–0008, REV. 3
2. INSPECTION & TEST PLAN FOR PR VESSEL & CS COLUMN	6–81–0011, REV. 3
3. INSPECTION & TEST PLAN PR. VESSEL, COLUMN, REACTORS–SS CLAD	6–81–0013, REV. 3

LICENSOR SPECIFICATIONS	STD. NO. :
1. HYDROPROCESSING REACTORS AND HIGH PRESSURE VESSELS MANUFACTURED FROM 2¼Cr–1Mo AND 2¼Cr–1Mo–¼V LOW–ALLOY STEELS	PVM–SU–5004–I
2. DESIGN AND FAB. OF PRESSURE VESSEL WITH HIGH–ALLOY CLADDING OR OVERLAY	PVM–SU–1322–H.1
3. GENERAL SPECIFICATION FOR MATERIAL OF CONSTRUCTION	BA–175858

PMC REFERENCE STANDARDS	STD. NO. :
1. VESSEL TOLERANCES	7–12–0001, REV.6
2. MANHOLE WITH DAVIT	7–12–0010, REV.7
3. LADDER RUNGS FOR MANHOLE/DEMISTER	7–12–0011, REV.6
4. NOZZLE REINFORCEMENT AND PROJECTION	7–12–0013, REV.6
5. STANDARD BOLT HOLE ORIENTATION	7–12–0015, REV.6
6. ALLOY LINER DETAILS	7–12–0016, REV.6
7. INTERNAL FLANGES	7–12–0018, REV.6
8. EIL NAME PLATE	7–12–0027, REV.6
9. MANUFACTURER NAME PLATE	7–12–0028, REV.6
10. BRACKET FOR NAME PLATE	7–12–0029, REV.6
11. SUPPORTS FOR INTERNAL FEED PIPE	7–12–0032, REV.5

LTC STANDARDS	STD. NO. :
1. TEMPLATE FOR HORIZONTAL EQUIPMENT	LTC–EQ–DOA–038, REV.0
2. ALLOWABLE NOZZLE LOADS	LTC–001

PIP STANDARDS	STD. NO. :
1. HORIZONTAL VESSEL INSULATION SUPPORTS	VEFV–1122
2. VESSEL GROUNDING LUG	VEFV–1103

LICENSOR STANDARDS	STD. NO. :
1. HORIZONTAL VESSEL – FAB. TOLERANCES	GA–C1266, REV.1
2. STRAINER AND VORTEX BREAKER FOR BOTTOM OUTLET NOZZLES	GC–C13354, REV.13
3. STANDARD CONNECTIONS & WELDING DETAILS FOR CLAD STEEL VESSELS	GD–C99663, REV.17
4. STANDARD NOZZLES AND HAND HOLES FOR THICK WALL OR HIGH TEMPERATURE PRESSURE VESSELS	GF–C1030, REV.4
5. GASKET SPECIFICATIONS AND ACCEPTABLE BRANDS	GD–L1264, REV.6

P8
P5A

EXTERNAL TEMPLATE	VALUE
1. 'e' VALUE	33 mm
2. CHORDAL LENGTH	2955 mm

1-PV-180-U0019	B016-RUF-LT-554-MS-GA-BHEL(1)-02651	GENERAL ASSEMBLY OF HT FLARE KO DRUM (504-V-805A)	01
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

STATEMENT OF SUB: [1st] [2nd] [3rd]

☐ FINAL FOR CODE–1 ☐ AS BUILT

ISSUED FOR

☐ AS BUILT ☐ INFORMATION

☐ CONSTRUCTION ☐ REVIEW

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NAME DICIPLINE SIGN. DATE

REV.	DESCRIPTION	DRN	CHECKED	APPROVED	REVIEWED	APPROVED	DATE
01	REVISED AS PER L&T COMMENTS	VAR	AVR	K.T			07.07.20
00	ISSUED FOR APPROVAL	VAR	AVR	K.T			01.06.20

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–180–U0190, REV. B

DATE 01.06.20 | SCALE N.T.S

TITLE: GENERAL NOTES FOR HT FLARE KO DRUM (ITEM NO. 504–V–805A)

DEPT: HT ENGG.

DRN BY: V.A.RAO

CHK BY: A.V.RAO

APP BY: K.TARAKESH

PROJECT:

PWO NO.:

DRG. NO.: B016–RUF–LT–504–MS–FD–BHEL(1)–02660

SH. 1 OF 1

REV. 01

CAD REVISE THIS DRG. USING CAD SYSTEM ONLY FILE:

L&T - CHIYODA LIMITED

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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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	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-201, 315, 607 A/B/C, 801, 802) **Doc. No.: B016-RUF-LT-504-QC-QD-BHEL (1)-02001**		**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 (HOS PRODUCT DRUM,SULFIDING CHEMICAL DRUM, CATALYST INVENTORY HOLDING BIN, HP FLARE KO DRUM,LP FLARE KO DRUM)**
EQUIPMENT TAG	:	**504-V-201, 315, 607 A/B/C, 801, 802**
P. R. NO	:	**B016-RUF-LT-504-MS-PR-0007**
VENDOR NAME	:	**BHARAT HEAVY ELECTRICALS LIMITED**
VENDOR DOCUMENT NO.	:	**CQP 2505**

DOCUMENT SUBMISSION STATUS – LTHE/VENDOR	**1.1.1.1 REVIEW STATUS**	
	LTHE	**EIL**
DOC. CATEGORY: (USE TICK MARK) ☐ 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.
ISSUED FOR ☐ REVIEW ☐ INFORMATION ☐ CONSTRUCTION ☐ AS BUILT	☐ **REVIEW 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 ☐ **R**– DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION ☐ **V**- VOID	☐ **REVIEW 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 ☐ **R**– DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION ☐ **V**- VOID
Reviewed & Commented 05.10.2020	QA-QC / VR / 7.10.2020	
	DISCIPLINE / SIGN / DATE	DISCIPLINE / SIGN / DATE

Rev.	Description	Prepared By	Reviewed By	Approved By	Approved Date
0	INSPECTION & TEST PLAN	P.G Kishore	A.K Mandal	A.K Mandal	01-10-2020

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	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 1 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

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			

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		

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.

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	QUALITY ASSURANCE PLAN	Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara
BHEL-VISAKHAPATNAM or Approved Sub Contractor.	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 with PTC	Offset & weld geometry	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	-		Refer Note-1
5.4	100% ~~PT~~ WFMT IN ALL STAGES 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

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	H	H	-		along with complete Equipment
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

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

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	-		

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.

MANUFACTURER'S NAME & ADDRESS	QUALITY ASSURANCE PLAN	...dara
BHEL-VISAKHAPATNAM or Approved Sub Contractor.	QAP NO: **B016-RUF-LT-504-QC-QD-BHEL (1) 02001** Rev.0 Date : 01-10-2020 Page 9 of 12 BHEL SO: 2438; Internal CQP No: 2505	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		
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 Cl. No.: 9.5 - TO BE COMPLY AND ADDED IN INSPECTION STAGE ACTIVITY FOR TAG NO.- 504-V-315 AND 504-V-607A/B/C.

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

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	-		

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**

HP / ENGINEERS INDIA LIMITED	**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**	
	LTHE	**EIL**
DOC. CATEGORY: (USE TICK MARK) ☐ A ☐ R ☐ I	☐ **REVIEW CODE 1** – NO COMMENTS. PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE DOCUMENT. ☑ **REVIEW CODE 2** – ~~PROCEED WITH MANUFACTURE/FABRICATION/CONSTRU CTION AS~~ PER COMMENTED DOCUMENT. REVISED DOCUMENT REQUIRED. ☐ **REVIEW CODE 3** – DOCUMENT DOES REQUIREMENTS AS MARKED. RESUBMIT ☐ **R**– DOCUMENT IS RETAINED FOR RECORDS. PROCEED WITH MANUFACTURE / FABRICATION ☐ **V**- VOID	☐ **REVIEW CODE 1** – NO COMMENTS. PROCEED WITH MANUFACTURE / FABRICATION / CONSTRUCTION AS PER THE DOCUMENT. ☐ **REVIEW CODE 2** – PROCEED WITH MANUFACTURE/FABRICATION/CONSTRUCTI ENTED DOCUMENT. IT REQUIRED. **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
ISSUED FOR ☐ REVIEW ☐ INFORMATION ☐ CONSTRUCTION ☐ AS BUILT Reviewed & Commented 09.09.2020	For LTHE, EIL & TPIA approval QA_QC / VR / 09.09.20 DISCIPLINE / SIGN / DATE	DISCIPLINE / SIGN / DATE

Total Comments-32

Rev.	Description	Prepared By	Reviewed By	Approved By	Approved Date
0	INSPECTION & TEST PLAN	P.G Kishore	A.K Mandal		

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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** 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**	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

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	QUALITY ASSURANCE PLAN	Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara
BHEL-VISAKHAPATNAM or Approved Sub Contractor.	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	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~~		
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

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** 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	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		
	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 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	QUALITY ASSURANCE PLAN	Purchaser : L & T Hydrocarbon Engineering Ltd (LTHE), Vadodara
BHEL-VISAKHAPATNAM or Approved Sub Contractor.	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	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		
5.0	**Fabrication of Dished Ends**									
5.1	Transfer of Marking and Heat Number for Plates	Material Spec & Heat Number	Drawing & TDC	Inspection Report	H	R	~~R~~ W			6-Add one activity as per note - 6 & 7 for all plates before cutting
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	-			7- & WFMT
	Clad restoration on L-seam weld	Welding parameters	WPS	-	H	R	-			Refer Note-1 8- Refer Note-4
	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
	~~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.

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

9-Delete from all stage activity

MANUFACTURER'S NAME & ADDRESS	QUALITY ASSURANCE PLAN	
BHEL-VISAKHAPATNAM or Approved Sub Contractor.	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	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		
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	- R			

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** 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	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		
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	-			
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	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

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	- R			
	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 15-& WFMT s	Detection of	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

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	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
8.5	Clad restoration on C-seam weld	Welding parameters	WPS	-	H	R	-			Refer Note-1

17-Refer comment no-9

18-& WFMT s

19- Refer Note-4

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	-			

20-Refer comment no-9

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
					21-Accessible portion of overlay					
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.
					22-Not Possible					
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	-			
					23-6-12-0007: Clause No.: 5.1.5 shall be comply					
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

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	-		24-100% RT of insert plate to shell and insert plate to SR nozzle as applicable nozzles SR nozzle o shell as applicable nozzles	
11.7	Pneumatic test on RF pads	Detection of leakage	Drawing	Inspection Report	H	RW	-			

25-PI. check applicability

S. No	Description	Type of Checks	Reference Documents and Acceptance Criteria	Format of Record	Inspection				EIL	Remarks
					M	TUV	AI	LTHE		
12.0	**Fabrication of Internal attachments**									
12.1	Welding of Internal attachments	Location & Dimensions	Drawing	Inspection Report	H	-	-			
12.2	NDE for Internal attachments weld	Detection of flaws	Drawing	Inspection Report	H	-	-			
13.0	**Saddle fabrication and Assembly**									
13.1	Fit up and Welding of saddle, saddle with Vessel	Offset & weld geometry	ASME Sec VIII Div.1 & Drawing	Inspection Report	H	R	-			
13.2	100% PT on welds	Detection of flaws	Drawing	Inspection Report	H	R	-			27-Refer Note - 9
13.3	Dimensional inspection of Saddle	Dimensions	Drawing	Inspection Report	H	R	-			W-During Final Inspection
14.0	Final Dimensional inspection	Dimensions & orientations	Drawing	Inspection Report	H	H	~~R~~ W			Complete Equipment Visual inspection of both Internal & External
14.1	PMI Check	Chemical	PVM-SU-1322-H.1 Cl.No. 9.3.1	Inspection Report	H	RW	R			
14.2	Ferrite Number	% delta ferrite	PVM-SU-1322-H.1 Cl.No. 9.3.2	Inspection Report	H	RW	-			

26-Entire inside Surface

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 14 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		
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~~ Witness			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~~ HOLD			
21.0	Spot PT after Hydro testing	Detection of flaws	Drawing	Inspection Report	H	W	-			
22.0 30-inside	Pickling & Passivation of 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~~ 31-Pickling & Passivation	No iron contamination	Approved procedure	Inspection Report	H	RW	-			

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 15 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		
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** 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	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		

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

BHARAT HEAVY ELECTRICALS LIMITED

HEAVY PLATES & VESSELS PLANT-VISAKHAPATNAM-530012

WELDING TECHNOLOGY

WELDING PROCEDURE SPECIFICATION

WPS No.	: M.1.1.09	Date	: 05 / 08 / 2015	Supporting	
Rev No.	: 00	Date	:	PQR No.	3509

Welding Process : SMAW Type : Manual (Auto/Semi-Auto/Manual/Machine)

Application : Groove welding of IS 2062 Gr.B carbon steel components with IS 2062 Gr.B carbon steel components & For all Fillet welds of IS 2062 Gr.B materials.

JOINTS (QW-402)

Joint Design : (Groove) or (Fillet) or (Groove + Fillet) as per Production drawing

Backing (Yes/No) : GTAW : No SMAW : Yes

Backing Material (Type) : GTAW : Nil SMAW : Weld Metal

(Metal/Non fusing metal/ Non metallic/Others)

BASE METAL (QW-403)

P. No. : IS 2062 Gr.B Group No : --- TO P. No. : IS 2062 Gr.B Group No : ---

Spec. Type & Grade : N.A.

Chem. Analysis & Mech. Prop : N.A.

Thickness Range (T) Groove : 5 to 200 mm Fillet : N.A.

Maximum Pass Thickness≤13mm(Yes): Yes (No): _____

Others : Nil

FILLER METALS (QW-404)

		SMAW			
AWS No. (Class)	:	E7018/E7018A1	Size of filler metal	:	3.15, 4.0, 5.0mm
Specn. No. (SFA)	:	5.1	Filler Metal Product Form	:	N.A.
F. No.	:	4	Flux trade name	:	N.A.
A. No.	:	1	Electrode-flux (Class)	:	N.A.
			Consumable insert	:	N.A.

Deposited weld metal thickness range (t)

Groove : Max.200mm (Max.4mm/pass)

Fillet : All

Others : None

POSITION (QW-405)

Position(s) of Groove : All

Position(s) of Fillet : All

Weld Progression : Vertical Up

Others : Nil

PREHEAT (QW-406)

Preheat Temp. (min) : 15°C Upto 25mm
95°C≥25mm & Above

Interpass Temp. (max) : 150 ^{0}C

Preheat Maintenance : During Welding

Others: : Nil

HPVP-VIZAG

PWHT (QW-407)

Temp. Range : As per S.R cycle
Time Range : As per S.R cycle
Others : Nil

GAS (QW - 408)

	Gases	Mix %	Flow Rt.(lpm)
Shielding	N.A.	----	----
Trailing	N.A.	----	----
Backing	N.A.	----	----

ELECTRICAL CHARACTERISTICS (QW – 409)

Current (AC/DC) : Refer Table
Polarity : Refer Table
Amps (Range) : Refer Table
Volts : Refer Table
Tungsten Electrode type and size : N.A.
Mode of Metal transfer for GMAW : N.A.
Electrode wire feed speed range : N.A.
Pulsing current (GTAW) : N.A.
Heat input (Max.) : N.A.

TECHNIQUES (QW-410)

String or Weave Bead : String / Weave (Max. 3 times of the core wire diameter of electrode)
Oscillation : N.A.
Initial and Interpass Cleaning : Chipping, Wire brushing & Grinding
Method of Back Gouging : Grinding (or) Air arc gouging & sound metal weld when required.
Orifice or Gas cup size : N.A
Contact tube to work distance : N.A
Multiple or single pass (per side) : Multiple
Multiple or single Electrode : Single
Electrode spacing : N.A
Travel Speed Range : N.A.
Peening : None
Use of thermal processes : None
Others : Nil

Weld Layer(s)	Process	Filler Metal		Current		Volt Range	ROL/ Travel speed Range	Others
		Class	Dia. (mm)	Type	Amps.	V		
Root (L1)	SMAW	E7018/ E7018A1	3.15	DCEP	120-140	24-28	200mm minimum/electrode	Nil
L2	SMAW	E7018/ E7018A1	4.0	DCEP	160-180	24-28	225mm minimum/electrode	Nil
L3	SMAW	E7018/ E7018A1	5.0	DCEP	180-220	24-28	250mm minimum/electrode	Nil
Subsequent	SMAW	E7018/ E7018A1	5.0	DCEP	180-220	24-28	250mm minimum/electrode	Nil

Prepared by:

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BHARAT HEAVY ELECTRICALS LIMITED

HEAVY PLATES & VESSELS PLANT-VISAKHAPATNAM-530012

WELDING TECHNOLOGY

WELDING PROCEDURE SPECIFICATION

WPS No.	: M.1.1.30	Date	: 16 / 02 / 2016	Supporting	
Rev No.	: 00	Date	:	PQR No.	3591

Welding Process : SMAW Type : Manual (Auto/Semi-Auto/Manual/Machine)

Application : Groove welding of P1 Group 1 or 2 Carbon steel components with P1 Group 1 or 2 Carbon steel components & For all Fillet welds of P1 materials.

JOINTS (QW-402)

Joint Design : Groove as per Production drawing

Backing (Yes/No) : GTAW : No SMAW : Yes

Backing Material (Type) : GTAW : Nil SMAW : Metal

(Metal/Non fusing metal/ Non metallic/Others)

BASE METAL (QW-403)

P. No. : 1 Group No : 1 TO P. No. : 1 Group No : 1

Spec. Type & Grade : N.A.

Chem. Analysis & Mech. Prop : N.A.

Thickness Range (T) Groove : 5 to 40.0mm Fillet : All

Maximum Pass Thickness ≤13mm (Yes): Yes (No): _____

Others : Nil

FILLER METALS (QW-404)

		SMAW			
AWS No. (Class)	:	E7018 (N)	Size of filler metal	:	Ref. Table
Specn. No. (SFA)	:	5.1	Filler Metal Product Form	:	N.A.
F. No.	:	4	Flux trade name	:	N.A.
A. No.	:	1	Electrode-flux (Class)	:	N.A.
			Consumable insert	:	N.A.

Deposited weld metal thickness range (t)

Groove : Max.40.0mm (Max.4mm/pass)

Fillet : All

Others : None

POSITION (QW-405)

Position(s) of Groove : All

Position(s) of Fillet : N.A.

Weld Progression : Uphill

Others : Nil

PREHEAT (QW-406)

Preheat Temp. (min) : 15°C Upto 25mm
95°C≥25mm & Above

Interpass Temp. (max) : 150 ^{0}C

Postheat Maintenance : N.A

Others: : Nil

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PWHT (QW-407)

Temp. Range : As per S.R cycle
Time Range : As per S.R cycle
Others :

GAS (QW - 408)

	Gases	Mix %	Flow Rt.(lpm)
Shielding	N.A	---	---
Trailing	N.A.	----	----
Backing	N.A.	----	----

ELECTRICAL CHARACTERISTICS (QW – 409)

Current (AC/DC) : Refer Table
Amps (Range) : Refer Table
Tungsten Electrode type and size : N.A.
Mode of Metal transfer for GMAW : N.A.
Electrode wire feed speed range : N.A.
Pulsing current (GTAW) : N.A.
Heat input (Max.) : N.A.

Polarity : Refer Table
Volts : Refer Table

TECHNIQUES (QW-410)

String or Weave Bead : String / Weave (Max. 3 times of the core wire diameter of electrode)
Oscillation / Weaving : N.A.
Initial and Interpass Cleaning : Chipping, Wire brushing & Grinding
Method of Back Gouging : Grinding or Air arc gouging & sound metal weld when required.
Orifice or Gas cup size : N.A
Contact tube to work distance : N.A
Multiple or single pass (per side) : Multiple
Multiple or single Electrode : Single
Electrode spacing : N.A
Travel Speed Range : N.A.
Peening : None
Use of thermal processes : None
Others : Nil

Weld Layer(s)	Process	Filler Metal		Current		Volt Range	ROL/ Travel speed Range	Others
		Class	Dia.(mm)	Type	Amps.	V		
Root (L1)	SMAW	E7018 (N)	3.15	DCEP	120-140	24-28	200mm minimum/electrode	Nil
L2	SMAW	E7018 (N)	4.0	DCEP	160-180	24-28	225mm minimum/electrode	Nil
L3	SMAW	E7018 (N)	5.0	DCEP	180-220	24-28	250mm minimum/electrode	Nil
Subsequent	SMAW	E7018 (N)	5.0	DCEP	180-220	24-28	250mm minimum/electrode	Nil

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