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MECHANICAL DETAILS

ITEM NO 500-EE-AT-001 TEMA CLASS R 2023 EDITION. ASME SEC.VIII DIV.1 2023 EDITION	1
SIZE 925/1425x5500 TYPE NKN (H) ; CONNECTED IN - - STACKING - NO	2
DUTY/UNIT 6.0x1.2 MMKcal/hr SURFACE AREA / SHELL 276 Sqm NO. OF UNITS- ONE SHELLS/UNIT- ONE	3
[NO. OF STACKS] - [SHELLS/STACK] -	

DESCRIPTION	MATERIAL	DETAILS	Wt(Kg)
SHELL	SA240Gr304L	[S.O.D.] = 1449 ; [S.THK] = 12	4
SHELL CONE	SA240Gr304L	O.D. = 949/1449 ; SC.THK = 12	5
SHELL PORT	SA240Gr304L	O.D. = 945 ; THK = 10	6
CHANNEL	SA240Gr304L	[C.O.D.] = 945 ; [C.THK] = 10	7
CHANNEL CONE	SA240Gr304L	O.D. = 609.6/945 ; THK = 10	8
CHANNEL PORT	SA240Gr304L	O.D. = 609.6 ; THK = 10	9
TUBES	SA213TP304L	O.D. = 20 ; THK = 1.6 MIN. LENGTH = 5500 NO=852 PITCH (NOTE4)	10
TUBE SHEET	SA965F304L	DETAIL = Q (REFER SHT.-1) [T/STHK] = 45 F = 19 F1 = 19	11
BAFFLES	SA240Gr304L	TYPE= SUPP. PLATE ; THK= 10 ; NO REQD.=6 ; CUT = (NOTE 4)	12

FLANGE NO.	TYPE	MATERIAL	A	BCD	B	Go	G1	H	T	GASKET DATA			BOLT DATA		Wt (Kg)
										O.D.(D)	WIDTH	TYPE	NO	BOLT DIA	
5	2	SA965F304L	1068	1020	925	10	15	32	70	980	13	1	56	M20	14
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15
															16
															17

** STRAINED HARDENED

DESCRIPTION	GASKET MATL.	BOLTING MATERIAL.	DESCRIPTION	MATERIAL	REMARKS	Wt(Kg)
FLANGE 1-2	-	-	CHANNEL COVER	SA240Gr304L	DETAIL- 7 ; THK,T1 = 60	18
FLANGE 3	-	-	BACKING RING	-	DETAIL-1 ; T1= - E= -	19
FLANGE 4	-	-	CONN. PIECE	-	DETAIL-13 T2 = -	20
FLANGE 5	5 THK KAMM PROFILE (NOTE6)	SA320Gr.B8**/SA194Gr.8	PARTITION PL.	-	THK = - T1= - T2= - DETAIL-15	21
FL.HD. FLANGE	-	-	IMP. PLATE	SA240Gr304L	THK = 8	22
SHELL NOZZLES.	SS304L P.WD. (NOTE5)	SA193GrB7/SA194Gr2H	SUPPORT PL.	-	THK = -	23
CHANNEL NOZZ.	SS304L SP.WD. (NOTE5)	SA320GrB8CL2/SA194Gr8	TIE RODS	SS304L	DIA = (NOTE4) NOS.= (NOTE4)	24
	SHELL SIDE.	CHANNEL SIDE.	Wt(Kg) SPACERS	SA213TP304L	O.D. = (NOTE4) THK.= (NOTE4)	25
NOZZLE NECK	SA312TP304L	SA312TP304L/SA182F304L	SEALING STRIPS	-	WIDTH = - THK = - NO = -	26
NOZZLE FLGS.	SA182F304L	SA182F304L	SUPPORT STRIPS	SA240Gr304L	WIDTH=(NOTE-4) THK=(NOTE-4) NO=(NOTE-4)	27
PAD/WRAPPER PL	SA240Gr304L	SA240Gr304L	SADDLE PLATE	SA240Gr304L	DETAIL AS PER EIL STD 7-15-0004	28
GUSSET/LUGS	SA240Gr304L	SA240Gr304L	NAME PL /BKT.	SS/SA240Gr304L	DETAIL=1 AS PER EIL STD 7-15-0017	29
COUPLING/PLUGS	-	-	EYEBOLT/PLUG.	-	SIZE: - NOS.= -	30
			PIPE DAVIT	SA312 TP 304L	DETAIL AS PER EIL STD 7-15-0014	31
			WARNING PLATE	SS/SA240Gr304L	DETAIL AS PER EIL STD 7-15-0018(NOTE7)	32
			SUPPORT BLOCK/ SUPPORT BEAM	SA240Gr304L	REFER SHEET-4	33

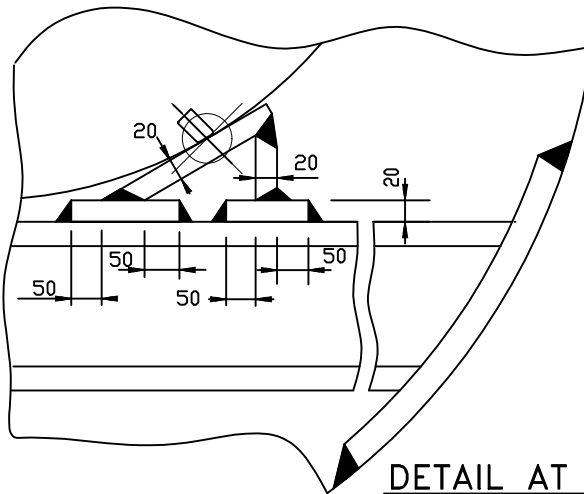
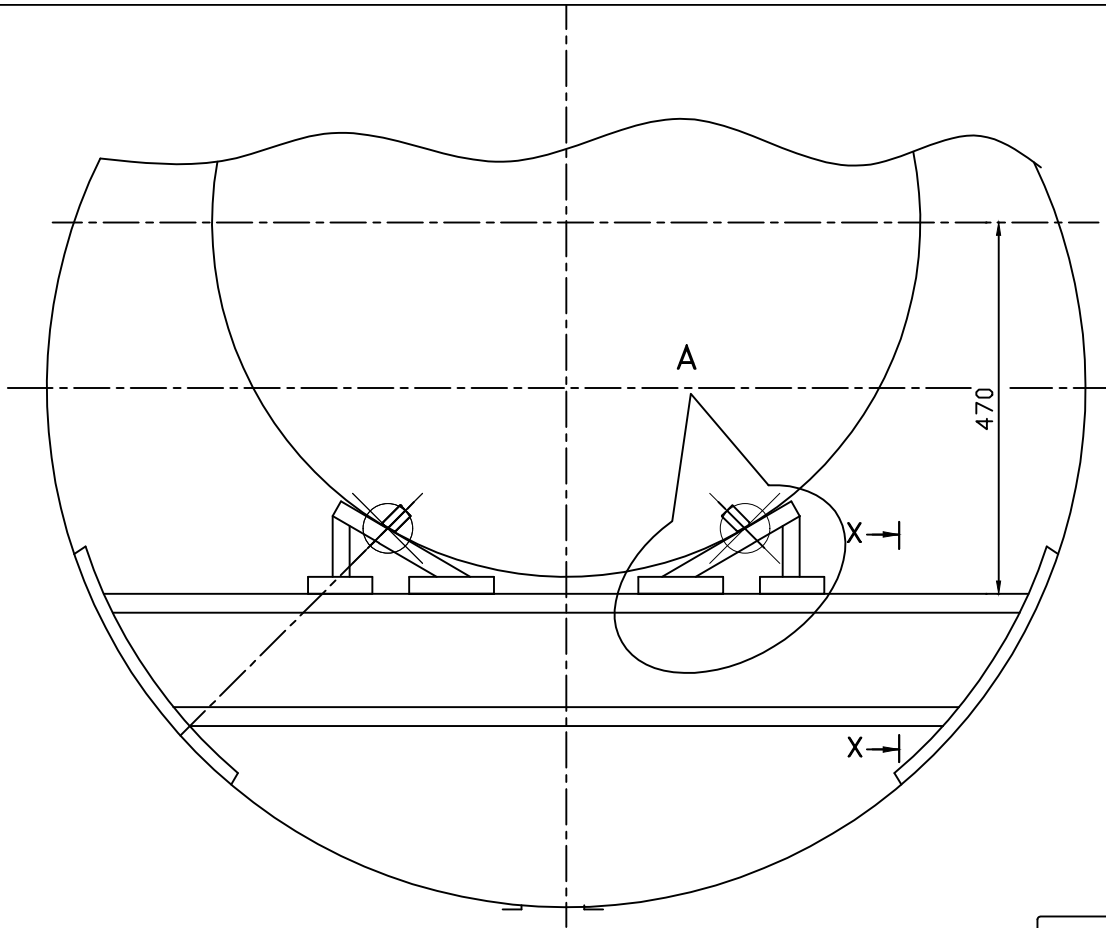
NOTES:-

- 1 ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE STATED
- 2 FOR CONSTRUCTIONAL DETAIL AND NOMENCLATURE REFER STD. 7-15-0001,7-15-0002
- 3 ALL OVER ∇ FINISH REQUIRED UNLESS OTHERWISE STATED.
- 4 REFER GUIDELINES FOR PREPARING TUBE LAYOUT AND TUBE LAYOUT DRG NO. B957-500-80-45-4001.
- 5 SPIRAL WOUND GASKETS FOR NOZZLES SHALL BE 4.5 THK WITH GRAFOIL FILLER AND 3.2 THK SS304L OUTER RING. DIMENSIONS AS PER ASME B16.20.
- 6 SS 304L KAMMPROFILE GASKET SHALL BE PROVIDED WITH 4MM WIDE INTEGRAL OUTER RING.
- 7 TUBE TO TUBESHEET JOINT SHALL BE 'STRENGTH WELDED (AS PER FIG. 3 OF 6-15-0003) & EXPANDED WITH TWO GROOVES'.
- 8 'm' AND 'y' VALUES OF KAMMPROFILE GASKET SHALL BE EQUIVALENT TO SPWD GASKET i.e. 'm' = 3 and 'y' = 10000 psi. THESE VALUES SHALL BE DULY APPROVED BY GASKET SUPPLIER (REFER JOB SPEC.).

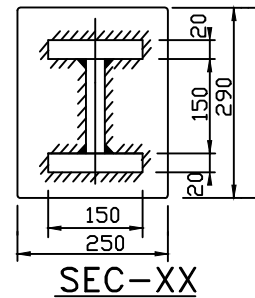
B	26.12.2025	SHT.1 REVISED & ISSUED FOR BIDS/ENGG.	SUNIL	GK/KRK	AT	
A	21.11.2025	ISSUED FOR BIDS/ENGG.	Vinay	GK/KRK	AT	
NO.	DATE	REVISION	BY	CHKD	APPROVALS	

ENGINEERS INDIA LTD. STATIC & MACHINERY EQUIPMENT DEPT. NEW DELHI	SECTION DRAWING FOR ITEM NO. 500-EE-AT-001 PROJECT : BPREP CLIENT : BPCL UNIT : OFFSITES	DRAWING NO. B957-500-80-42-DS-4011 SHEET 2 OF 3	REV. B
	ENGINEERS INDIA LTD.		

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 EIL 1641-540 REV. 0 A4-210X297



DETAIL AT 'A'



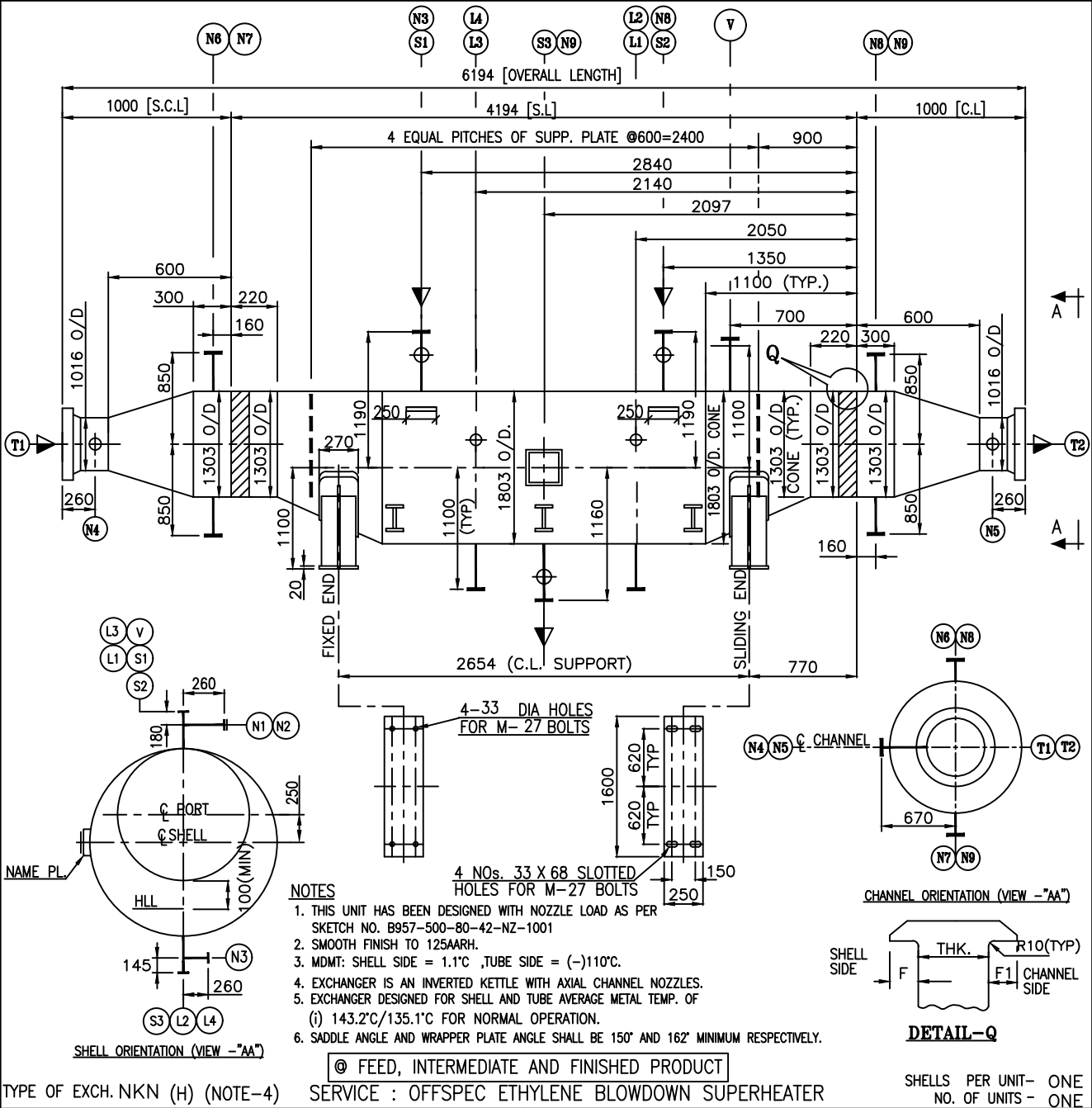
SEC-XX

NOTES:-

1. VENDOR SHALL CONSIDER ABOVE DETAIL AS MINIMUM. IT IS VENDORS RESPONSIBILITY TO DESIGN & DEVELOP THE DETAIL OF TUBE BUNDLE SUPPORTING ARRANGEMENT WHICH SHALL BE SUITABLE FOR TUBE BUNDLE LOAD.
2. VENDOR SHALL ADJUST THE ELEVATION OF SUPPORT I-BEAMS AND SUPPORTING BLOCK. MINIMUM 3NDS. OF SUPPORT BEAM SHALL BE PROVIDED.
3. SUPPORTING BLOCK SHALL BE COVERED MAXIMUM LENGTH OF TUBE.

B	26.12.2025	SHT.1 REVISED & ISSUED FOR BIDS/ENGG.	SUNIL	GK/KRK	AT			
A	21.11.2025	ISSUED FOR BIDS/ENGG.	Vinay	GK/KRK	AT			
NO.	DATE	REVISION	BY	CHKD	APPROVALS			
ENGINEERS INDIA LTD. STATIC & MACHINERY EQUIPMENT DEPT. NEW DELHI				TUBE BUNDLE SUPPORT DETAIL FOR ITEM NO. 500-EE-AT-001 PROJECT : BPREP CLIENT : BPCL UNIT : OFFSITES		DRAWING NO. B957-500-80-42-DS-4011 SHEET 3 OF 3		REV. B

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 F-0540-101 REV. 2 44-210X297 [THERMAL D/S REF. NO.] B957-500-80-45-DS-002 REV-1



DESIGN DATA		NOZZLE DATA									
	SHELL SIDE	TUBE SIDE	NOZZLE MARK	SIZE N.B./O.D. (INCH/mm)	ASME CLASS	SCH /THK (mm)	TYPE FACING	PAD W X T (mmXmm)	FLG. FACE FINISH	DESIGNATION	
DESIGN PRESSURE Kgf/cm ² g	7/FV	5.5	S1/S2	8	150	80S	WNRF	60x14	NOTE2	SHELL SIDE INLET	
DESIGN TEMPERATURE °C (NOTE-3)	240	(-)110/65	S3	3	150	160S	WNRF	40x14	NOTE2	SHELL SIDE OUTLET	
HYD. TEST PRESSURE Kgf/cm ² g	10.07	7.02	T1	40	150	12	WNRF	-	NOTE2	TUBE SIDE INLET	
FLUID CIRCULATED	LP STEAM	ETHYLENE	T2	40	150	12	WNRF	-	NOTE2	TUBE SIDE OUTLET	
NO. OF PASSES	ONE	ONE	L1-2	2.0	300	160S	WNRF	-	NOTE2	LEVEL INSTRUMENT	
WORKING PRESSURE Kgf/cm ² g	3.0	0.2	L3-4	2.0	300	160S	WNRF	-	NOTE2	LEVEL GAUGE	
WORKING TEMP. (IN/OUT) °C	143.2/143.1	(-)102/5	V	2.0	300	160S	WNRF	-	NOTE2	VENT + BF	
CORROSION ALLOWANCE mm	-	-	N1~N3	1.5	150	160S	WNRF	-	NOTE2	MP CONN. + BF	
STRESS RELIEVING	-	-	N4-N5	1.5" I.D.	150	13.45	LWNRF	-	NOTE2	MP CONN. + BF	
RADIOGRAPHY (NOTE-5)	SPOT	100%	N6/N8	1.5" I.D.	150	13.45	LWNRF	-	NOTE2	CHANNEL VENT+BF	
JOINT EFFICIENCY	0.85	1.0	N7/N9	1.5" I.D.	150	13.45	LWNRF	-	NOTE2	CHANNEL DRAIN+BF	
INSULATION (mm)	65 (H)	PP									

B	26.12.2025	REVISED & ISSUED FOR BIDS/ENGG.	SUNIL	DN/KRK	AT					
A	21.11.2025	ISSUED FOR BIDS/ENGG.	Vinoy	DN/KRK	AT					EMPTY WEIGHT [KG] ~ 12000 p.shell
NO.	DATE	REVISION	BY	CHKD.	APPROVALS					WT. FULL OF WATER [KG] ~ 22000 p.shell

ENGINEERS INDIA LTD.
 STATIC & MACHINERY EQUIPMENT DEPT.
 NEW DELHI

SETTING PLAN FOR
 ITEM NO. 500-EE-AT-004
 PROJECT : BPREP CLIENT : BPCL UNIT : @

DRAWING NO. **B957-500-80-42-DS-4004**
 SHEET 1 OF 3
 REV. **B**

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MECHANICAL DETAILS

ITEM NO 500-EE-AT-004 TEMA CLASS R 2023 EDITION. ASME SEC.VIII DIV.1 2023 EDITION	1
SIZE 1275/1775 X 4200 TYPE NKN (H) ; CONNECTED IN - STACKING -	2
DUTY/UNIT 4.3 x 1.1 MMKcal/hr SURFACE AREA / SHELL 205 Sqm NO. OF UNITS- ONE SHELLS/UNIT- ONE	3
[NO. OF STACKS] - [SHELLS/STACK] -	

DESCRIPTION	MATERIAL	DETAILS	Wt(Kg)
SHELL	SA240Gr304L	[S.O.D.] = 1803 ; [S.THK] = 14	5
SHELL CONE	SA240Gr304L	[SC.O.D.] = 1303/1803; [SC.THK] = 14	6
SHELL PORT	SA240Gr304L	O.D. = 1303 ; THK = 14	7
CHANNEL	SA240Gr304L	[C.O.D.] = 1303 ; [C.THK] = 12	8
CHANNEL CONE	SA240Gr304L	O.D. = 1016/1303 ; THK = 12	9
CHANNEL PORT	SA240Gr304L	O.D. = 1016 ; THK = 12	10
TUBES	SA213TP304L	O.D. = 40 ; [T/s THK] = 2 MIN. LENGTH = 4200 NO= 431 PITCH(NOTE4)	11
TUBE SHEET	SA965F304L	DETAIL = Q (REFER SHT.-1) THK = 50 F = 21 F1 = 19	12
BAFFLES	SA240Gr304L	TYPE= SUPP. PLATE ; THK= 12 ; NO REQD.= 5 ; CUT = (NOTE 4)	13

FLANGE NO.	TYPE	MATERIAL	A	BCD	B	Go	G1	H	T	GASKET DATA			BOLT DATA		Wt (Kg)	
										O.D.(D)	WIDTH	TYPE	NO	BOLT DIA		
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	
																16
																17
																18
																19

DESCRIPTION	GASKET MATL.	BOLTING MATERIAL.	DESCRIPTION	MATERIAL	REMARKS	Wt(Kg)
FLANGE 1-2	-	-	CHANNEL COVER	-	DETAIL = - ; THK,T1 = -	20
FLANGE 3	-	-	BACKING RING	-	DETAIL-1 ; T1= - E= -	21
FLANGE 4	-	-	CONN. PIECE	-	DETAIL= - T2 = -	22
FLANGE 5&5A	-	-	PARTITION PL.	-	THK = - T1= - T2= - DETAIL-15	23
FL.HD. FLANGE	-	-	IMP. PLATE	SA240Gr304L	THK = 12	24
SHELL NOZZLES.	SS304L SP.WD. NOTES	SA193GrB7/SA194Gr2H	SUPPORT PL.	-	THK = -	25
CHANNEL NOZZ.	SS304L SP.WD. NOTES	SA320GrB8/SA194Gr8	TIE RODS	SS304L	DIA = (NOTE4) NOS= (NOTE4)	26
	SHELL SIDE.	CHANNEL SIDE.	SPACERS	SA213TP304L	O.D. = (NOTE4) THK= (NOTE4)	27
NOZZLE NECK	SA312TP304L	SA240Gr304L/SA182F304L	SEALING STRIPS	-	WIDTH = - THK = - NO = -	28
NOZZLE FLGS.	SA182F304L	SA182F304L	SUPPORTING STRIPS	SA240Gr304L	WIDTH=(NOTE-4) THK=(NOTE-4) NO=(NOTE-4)	29
PAD/WRAPPER PL	SA240Gr304L	SA240Gr304L	SADDLE PLATE	SA240Gr304L	DETAIL AS PER EIL STD 7-15-0004	30
GUSSET/LUGS	SA240Gr304L	SA240Gr304L	NAME PL /BKT.	SS/SA240Gr304L	DETAIL AS PER EIL STD 7-15-0017	31
COUPLING/PLUGS	-	-	EYEBOLT/PLUG.	-	SIZE: - NOS.= -	32
			WARN PL./BRT.	SA240Gr304L	EIL STD. 7-15-0018 (NOTE-7)	33
			SUPPORTING BLOCK/ SUPPORT BEAM	SA240Gr304L	REFER SHEET-3	34

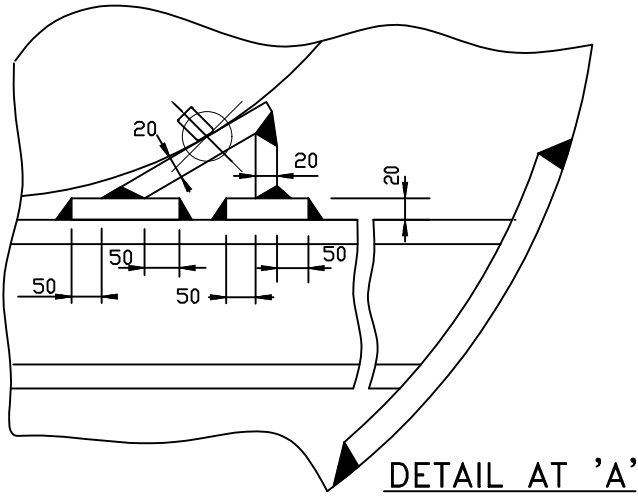
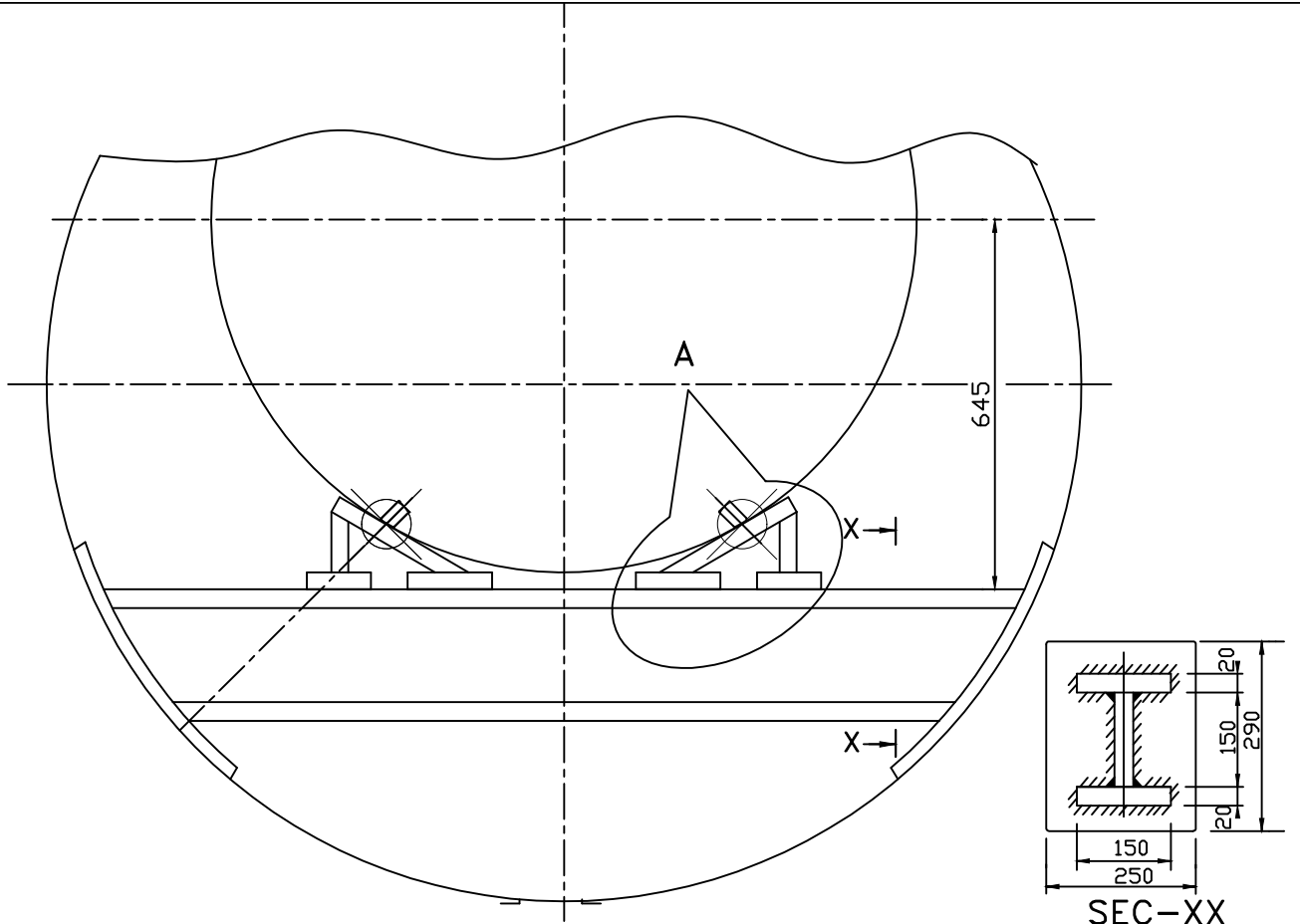
TEST RING- NO TEST FLANGE- NO TUBE TO TUBE SHEET JOINT- STRENGTH WELDED AND EXPANDED WITH TWO GROOVES(NOTE-8)

NOTES:-
 1 ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE STATED
 2 FOR CONSTRUCTIONAL DETAIL AND NOMENCLATURE REFER STD. 7-15-0001,7-15-0002
 3 ALL OVER ∇ FINISH REQUIRED UNLESS OTHERWISE STATED.
 4 REFER GUIDELINES FOR PREPARING TUBE LAYOUT AND TUBE LAYOUT DRG NO. B957-500-80-45-004.
 5 SPIRAL WOUND GASKETS FOR NOZZLES SHALL BE 4.5 THK WITH GRAFOIL FILLER AND 3.2 THK SS OUTER RING. DIMENSIONS AS PER ASME B16.20.
 6 TUBE SIDE IS IN LOW TEMPERATURE SERVICE.
 7 WARNING PLATE SHALL BE PROVIDED. FOLLOWING SHALL BE MENTIONED IN WARNING PLATE.
 I) DO NOT RUN THIS HEAT EXCHANGER ON TUBE SIDE WITHOUT SHELL SIDE FLUID.
 8 TUBE TO TUBESHEET JOINT SHALL BE 'STRENGTH WELDED (AS PER FIG. 2 OF 6-15-0003) & EXPANDED WITH TWO GROOVES'. FOR GROOVES DETAIL REFER 7-15-0006.
 9 ALL NOZZLE FLANGES UP TO 24" SHALL BE AS PER ASME B16.5 & GREATER THAN 24" SHALL BE AS PER ASME B16.47 SERIES-B.

B	26.12.2025	SHT.1 REVISED & ISSUED FOR BIDS/ENGG.	SUNIL	DN/KRK	AT	
A	21.11.2025	ISSUED FOR BIDS/ENGG.	Vinay	DN/KRK	AT	
NO.	DATE	REVISION	BY	CHKD	APPROVALS	

	ENGINEERS INDIA LTD.	SECTION DRAWING FOR	DRAWING NO.	REV.
	STATIC & MACHINERY EQUIPMENT DEPT.	ITEM NO. 500-EE-AT-004	B957-500-80-42-DS-4004	B
	NEW DELHI	PROJECT : BPREP CLIENT : BPCL UNIT : @	SHEET 2 OF 3	

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 EIL 1641-540 REV. 0 A4-210X297



NOTES:-

- VENDOR SHALL CONSIDER ABOVE DETAIL AS MINIMUM. IT IS VENDORS RESPONSIBILITY TO DESIGN & DEVELOP THE DETAIL OF TUBE BUNDLE SUPPORTING ARRANGEMENT WHICH SHALL BE SUITABLE FOR TUBE BUNDLE LOAD.
- VENDOR SHALL ADJUST THE ELEVATION OF SUPPORT I-BEAMS AND SUPPORTING BLOCK. MINIMUM 3NDS. OF SUPPORT BEAM SHALL BE PROVIDED.
- SUPPORTING BLOCK SHALL BE COVERED MAXIMUM LENGTH OF TUBE.

B	26.12.2025	SHT.1 REVISED & ISSUED FOR BIDS/ENGG.	SUNIL	DN/KRK	AT		
A	21.11.2025	ISSUED FOR BIDS/ENGG.	Vinay	DN/KRK	AT		
NO.	DATE	REVISION	BY	CHKD	APPROVALS		

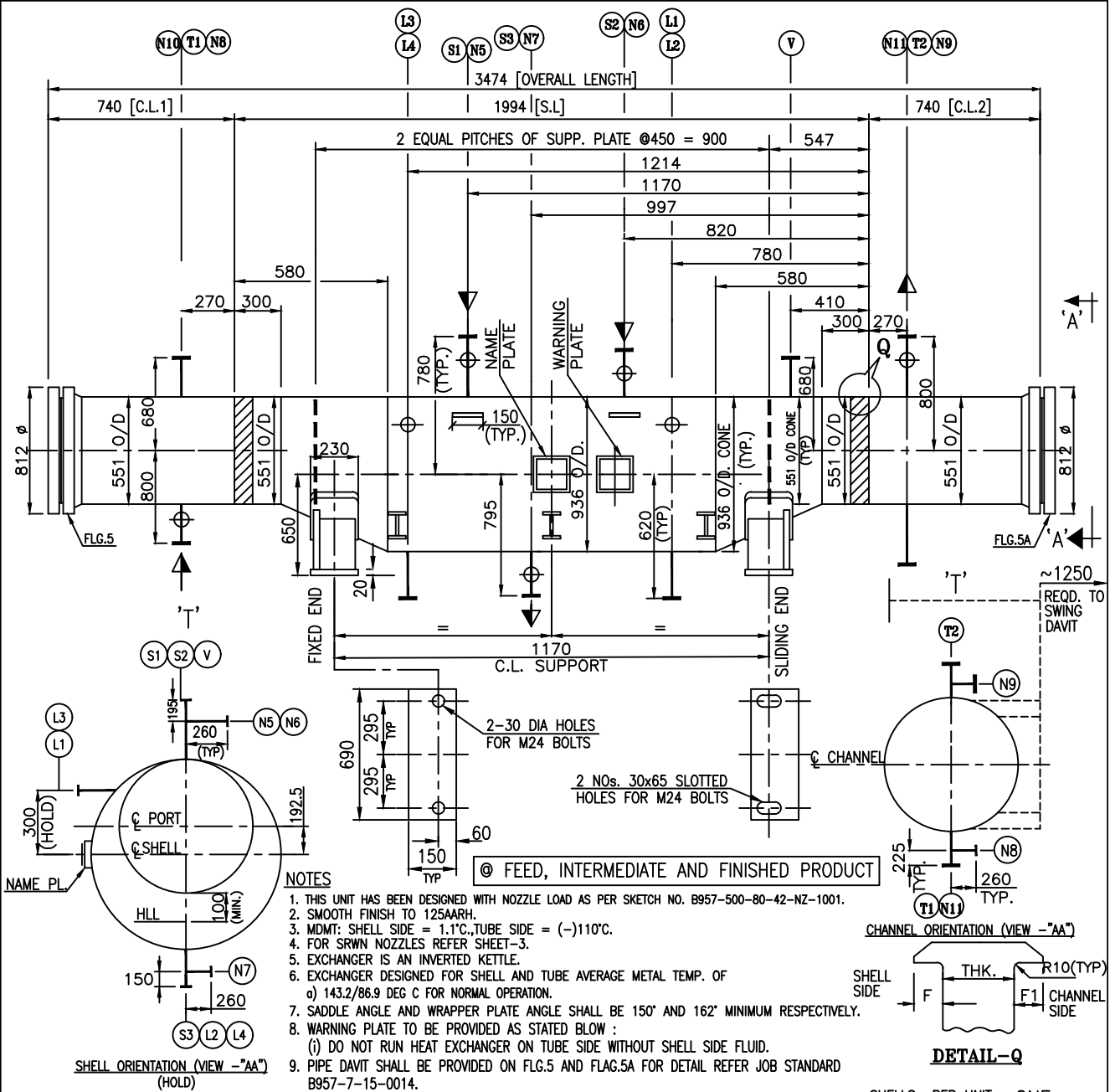


ENGINEERS INDIA LTD.
 STATIC & MACHINERY EQUIPMENT DEPT.
 NEW DELHI

TUBE BUNDLE SUPPORT DETAIL FOR
 ITEM NO. 500-EE-AT-004
 PROJECT : BPREP CLIENT : BPLC UNIT : @

DRAWING NO.	REV.
B957-500-80-42-DS-4004	B
SHEET 3 OF 3	

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 F-0540-101 REV. 2 44-210X297 [THERMAL D/S REF. NO.] B957-500-80-45-DS-003 REV-1



- NOTES**
- THIS UNIT HAS BEEN DESIGNED WITH NOZZLE LOAD AS PER SKETCH NO. B957-500-80-42-NZ-1001.
 - SMOOTH FINISH TO 125AARH.
 - MDMT: SHELL SIDE = 1.1°C, TUBE SIDE = (-)110°C.
 - FOR SRWN NOZZLES REFER SHEET-3.
 - EXCHANGER IS AN INVERTED KETTLE.
 - EXCHANGER DESIGNED FOR SHELL AND TUBE AVERAGE METAL TEMP. OF
 a) 143.2/86.9 DEG C FOR NORMAL OPERATION.
 - SADDLE ANGLE AND WRAPPER PLATE ANGLE SHALL BE 150° AND 162° MINIMUM RESPECTIVELY.
 - WARNING PLATE TO BE PROVIDED AS STATED BLOW :
 (i) DO NOT RUN HEAT EXCHANGER ON TUBE SIDE WITHOUT SHELL SIDE FLUID.
 - PIPE DAVIT SHALL BE PROVIDED ON FLG.5 AND FLAG.5A FOR DETAIL REFER JOB STANDARD B957-7-15-0014.

TYPE OF EXCH. NKN (H) (NOTE-5) SERVICE : ETHYLENE START-UP HEATER

SHELLS PER UNIT - ONE
 NO. OF UNITS - ONE

	DESIGN DATA		NOZZLE DATA									
	SHELL SIDE	TUBE SIDE	NOZZLE MARK	SIZE N.B./O.D. (INCH/mm)	ASME CLASS	SCH / THK (mm)	TYPE FACING	PAD W X T (mmXmm)	FLG. FACE FINISH	DESIGNATION		
DESIGN PRESSURE Kgf/cm ² g	49.5	64	S1/S2	4"	600	80S	WNRF	50x38	NOTE2	SHELL SIDE INLETS		
DESIGN TEMPERATURE °C (NOTE-3)	240	(-)110/65	S3	2"	600	80S	WNRF	-	NOTE2	SHELL SIDE OUTLET		
HYD. TEST PRESSURE Kgf/cm ² g	71.18	83.2	T1	6"	600	80S	SRWNRF	NOTE4	NOTE2	TUBE SIDE INLET		
FLUID CIRCULATED	LP STEAM	ETHYLENE	T2	6"	600	80S	SRWNRF	NOTE4	NOTE2	TUBE SIDE OUTLET		
NO. OF PASSES	ONE	ONE	L1-L2	2.0"	600	80S	WNRF	-	NOTE2	LEVEL TRANSMITTER		
WORKING PRESSURE Kgf/cm ² g	3.0	49	L3-L4	2.0"	600	80S	WNRF	-	NOTE2	LEVEL GAUGE		
WORKING TEMP. (IN/OUT) °C	143.2/143.0	(-)98/(-)35	N5-N7	1.5"	600	80S	WNRF	-	NOTE2	MP CONN. + BF		
CORROSION ALLOWANCE mm	-	-	N8-N9	1.5"ID	600	-	LWNRF	-	NOTE2	MP CONN. + BF		
STRESS RELIEVING	AS PER CODE	AS PER CODE	N10	1.5"ID	600	-	LWNRF	-	NOTE2	CHANNEL VENT+BF		
RADIOGRAPHY	100%	100%	N11	1.5"ID	600	-	LWNRF	-	NOTE2	CHANNEL DRAIN+BF		
JOINT EFFICIENCY	1.0	1.0	V	2"	600	80S	WNRF	-	NOTE2	SHELL VENT + B.F		
INSULATION (mm)	65(IH)	225(IC)										

A	19.12.2025	ISSUED FOR BIDS/ENGG.	Vinoy	DN/KRK	AT	EMPTY WEIGHT [KG]	~ 5000	p.shell
NO.	DATE	REVISION	BY	CHKD.	APPROVALS	WT. FULL OF WATER [KG]	~ 6000	p.shell

ENGINEERS INDIA LTD.
 STATIC & MACHINERY EQUIPMENT DEPT.
 NEW DELHI

SETTING PLAN FOR
 ITEM NO. 500-EE-AT-003
 PROJECT : BPREP CLIENT : BPCL UNIT : @

DRAWING NO. **B957-500-80-42-DS-4003**
 SHEET 1 OF 4

REV. **A**

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MECHANICAL DETAILS

ITEM NO 500-EE-AT-003 TEMA CLASS R 2023 EDITION. ASME SEC.VIII DIV.1 2023 EDITION	1
SIZE 475/860x2000 TYPE NKN (H) ; CONNECTED IN - - STACKING - NO	2
DUTY/UNIT 1.1x1.1 MMKcal/hr SURFACE AREA / SHELL 9.4 Sqm NO. OF UNITS- ONE SHELLS/UNIT- ONE	3

[NO. OF STACKS] - [SHELLS/STACK] -

DESCRIPTION	MATERIAL	DETAILS	Wt(Kg)
SHELL	SA240Gr304L	[S.O.D.] = 936 ; [S.THK] = 38	4
SHELL CONE	SA240Gr304L	O.D. = 551/936 ; SC.THK = 38	5
SHELL PORT	SA240Gr304L	O.D. = 551 ; THK = 38	6
CHANNEL	SA240Gr304L	[C.O.D.] = 551 ; [C.THK] = 24	7
CHANNEL CONE	-	O.D. = - ; THK = -	8
CHANNEL PORT	-	O.D. = - ; THK = -	9
TUBES	SA213TP304L	O.D. = 20 ; THK = 1.6 MIN. LENGTH = 2000 NO=96 PITCH (NOTE4)	10
TUBE SHEET	SA965F304L	DETAIL = Q (REFER SHT.-1) [T/STHK] = 130 F = 50 F1 = 36	11
BAFFLES	SA240Gr304L	TYPE= SUPP. PLATE ; THK= 10 ; NO REQD.= 3 ; CUT = (NOTE 4)	12

FLANGE NO.	TYPE	MATERIAL	A	BCD	B	Go	G1	H	T	GASKET DATA			BOLT DATA		Wt (Kg)
										O.D.(D)	WIDTH	TYPE	NO	BOLT DIA	
5&5A	2	SA965F304L	812	706	503	24	36	36	115	641	13	1	20	M45	(NOTE-9)
															14
															15
															16
															17

** STRAINED HARDENED

DESCRIPTION	GASKET MATL.	BOLTING MATERIAL.	DESCRIPTION	MATERIAL	REMARKS	Wt(Kg)
FLANGE 1-2	-	-	CHANNEL COVER	SA965Gr304L	DETAIL- 7 ; THK,T1 = 115	18
FLANGE 3	-	-	BACKING RING	-	DETAIL-1 ; T1= - E= -	19
FLANGE 4	-	-	CONN. PIECE	-	DETAIL-13 T2 = -	20
FLANGE 5	5 THK KAMM PROFILE (NOTE6)	SA320Gr.B8**/SA194Gr.8	PARTITION PL.	-	THK = - T1= - T2= - DETAIL-15	21
FL.HD. FLANGE	-	-	IMP. PLATE	SA240Gr304L	THK = 8	22
SHELL NOZZLES.	SS304L P.WD. (NOTE5)	SA193GrB7/SA194Gr2H	SUPPORT PL.	-	THK = -	23
CHANNEL NOZZ.	SS304L SP.WD. (NOTE5)	SA320GrB8CL2/SA194Gr8	TIE RODS	SS304L	DIA = (NOTE4) NOS.= (NOTE4)	24
	SHELL SIDE.	CHANNEL SIDE.	SPACERS	SA213TP304L	O.D. = (NOTE4) THK.= (NOTE4)	25
NOZZLE NECK	SA312TP304L	SA312TP304L/SA182F304L	SEALING STRIPS	-	WIDTH = - THK = - NO = -	26
NOZZLE FLGS.	SA182F304L	SA182F304L	SUPPORT STRIPS	SA240Gr304L	WIDTH=(NOTE-4) THK=(NOTE-4) NO=(NOTE-4)	27
PAD/WRAPPER PL	SA240Gr304L	SA240Gr304L	SADDLE PLATE	SA240Gr304L	DETAIL AS PER EIL STD 7-15-0004	28
GUSSET/LUGS	SA240Gr304L	SA240Gr304L	NAME PL /BKT.	SS/SA240Gr304L	DETAIL=1 AS PER EIL STD 7-15-0017	29
COUPLING/PLUGS	-	-	EYEBOLT/PLUG.	-	SIZE: - NOS.= -	30
TEE	SA403TP304L	SIZE=2"x1.5"SCH.80S QTY.=1	PIPE DAVIT	SA312 TP 304L	DETAIL AS PER EIL STD 7-15-0014	31
			WARNING PLATE	SS/SA240Gr304L	DETAIL AS PER EIL STD 7-15-0018	32
			SUPPORT BLOCK/ SUPPORT BEAM	SA240Gr304L	REFER SHEET-4	33

TEST RING- NO TEST FLANGE- NO TUBE TO TUBE SHEET JOINT-WELDED AND EXPANDED WITH TWO GROOVES (NOTE7)

NOTES:-

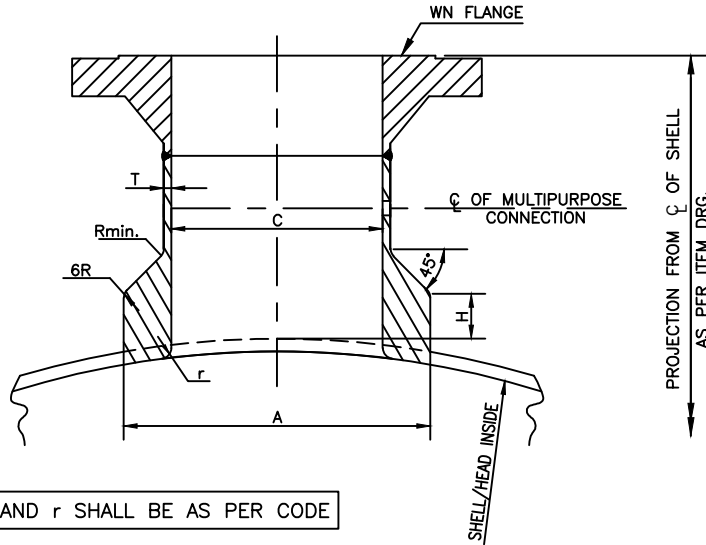
- 1 ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE STATED
- 2 FOR CONSTRUCTIONAL DETAIL AND NOMENCLATURE REFER STD. 7-15-0001,7-15-0002
- 3 ALL OVER ∇ FINISH REQUIRED UNLESS OTHERWISE STATED.
- 4 REFER GUIDELINES FOR PREPARING TUBE LAYOUT AND TUBE LAYOUT DRG NO. B957-500-80-45-003.
- 5 SPIRAL WOUND GASKETS FOR NOZZLES SHALL BE 4.5 THK WITH GRAFOIL FILLER AND 3.2 THK SS304L OUTER RING. DIMENSIONS AS PER ASME B16.20.
- 6 SS 304L KAMMPROFILE GASKET SHALL BE PROVIDED WITH 4MM WIDE INTEGRAL OUTER RING.
- 7 TUBE TO TUBESHEET JOINT SHALL BE 'STRENGTH WELDED (AS PER FIG. 3 OF 6-15-0003) & EXPANDED WITH TWO GROOVES'. FOR GROOVES DETAIL REFER 7-15-0006.
- 8 'm' AND 'y' VALUES OF KAMMPROFILE GASKET SHALL BE EQUIVALENT TO SPWD GASKET i.e. 'm' = 3 and 'y' = 10000 psi. THESE VALUES SHALL BE DULY APPROVED BY GASKET SUPPLIER (REFER JOB SPEC.).
- 9 TORQUE WRENCHES & BTD SHALL BE REQUIRED FOR BOLT TIGHTING AS PER CLAUSE 3.3.3 OF 6-15-0001.

@ FEED, INTERMEDIATE AND FINISHED PRODUCT

A	19.12.2025	ISSUED FOR BIDS/ENGG.	Vinay	DN/KRK	AT	
NO.	DATE	REVISION	BY	CHKD	APPROVALS	

ENGINEERS INDIA LTD. STATIC & MACHINERY EQUIPMENT DEPT. NEW DELHI	SECTION DRAWING FOR ITEM NO. 500-EE-AT-003 PROJECT : BPREP CLIENT : BPCL UNIT : @	DRAWING NO. B957-500-80-42-DS-4003 SHEET 2 OF 4	REV. A
			A

DETAIL OF SELF REINFORCED NOZZLE



Rmin. AND r SHALL BE AS PER CODE

(FOR NOZZLE NO. T1/T2)

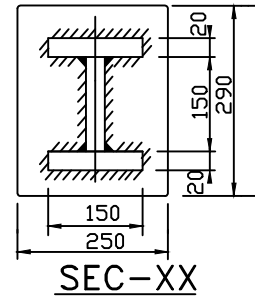
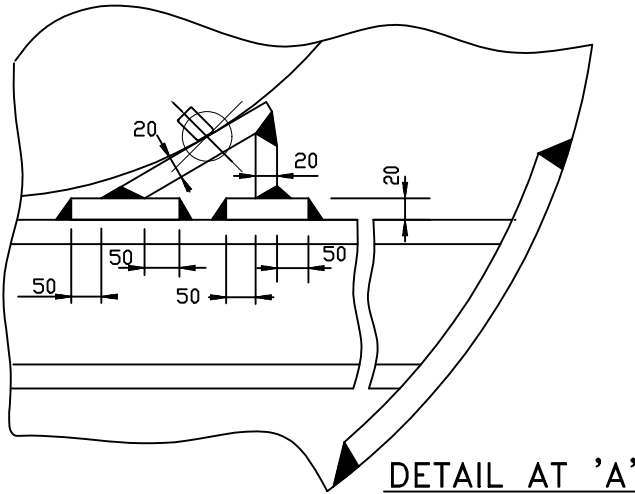
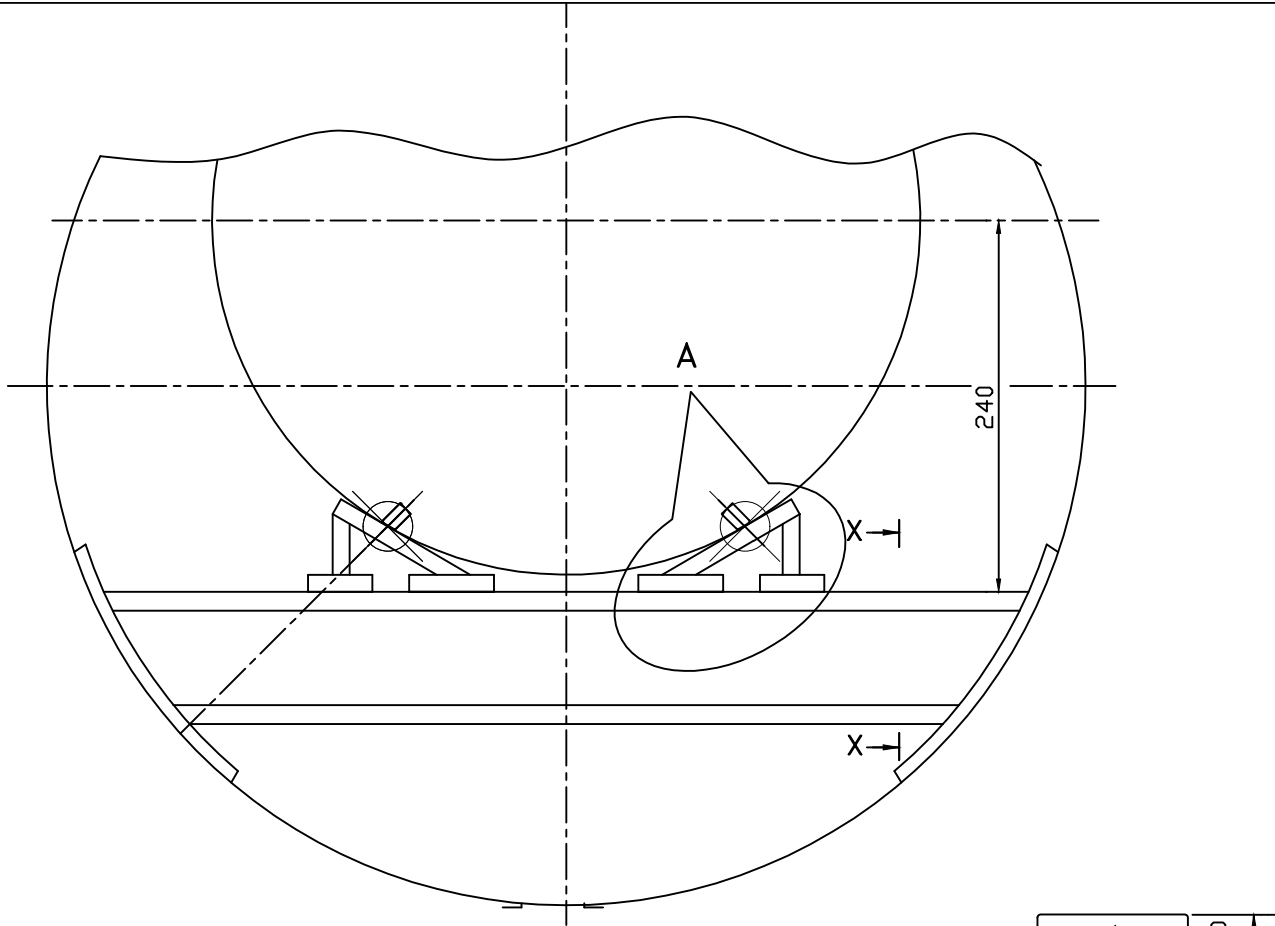
NOZZLE MARK	SIZE (INCH)	A (MM)	C (MM)	H (MM)	T (MM)
T1&T2	6"	230	146.36	70	SCH.80S

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 EIL 1641-540/REV. 0, A4-210X297

A	19.12.2025	ISSUED FOR BIDS/ENGG.	Vinay	DN/KRK	AT		
NO.	DATE	REVISION	BY	CHKD	APPROVALS		
ENGINEERS INDIA LTD. STATIC & MACHINERY EQUIPMENT DEPT. NEW DELHI		DETAIL OF SELF REINFORCED NOZZLE ITEM NO. 500-EE-AT-003 PROJECT : BPREP CLIENT : BPCL UNIT : @			DRAWING NO. B957-500-80-42-DS-4003 SHEET 3 OF 4		REV. A

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 EIL 1641-540 REV. 0 A4-210X297



NOTES:-

1. VENDOR SHALL CONSIDER ABOVE DETAIL AS MINIMUM. IT IS VENDORS RESPONSIBILITY TO DESIGN & DEVELOP THE DETAIL OF TUBE BUNDLE SUPPORTING ARRANGEMENT WHICH SHALL BE SUITABLE FOR TUBE BUNDLE LOAD.
2. VENDOR SHALL ADJUST THE ELEVATION OF SUPPORT I-BEAMS AND SUPPORTING BLOCK. MINIMUM 3NDS. OF SUPPORT BEAM SHALL BE PROVIDED.
3. SUPPORTING BLOCK SHALL BE COVERED MAXIMUM LENGTH OF TUBE.



@ FEED, INTERMEDIATE AND FINISHED PRODUCT

A	19.12.2025	ISSUED FOR BIDS/ENGG.	Vinay	DN/KRK	AT	
NO.	DATE	REVISION	BY	CHKD	APPROVALS	
ENGINEERS INDIA LTD. STATIC & MACHINERY EQUIPMENT DEPT. NEW DELHI			TUBE BUNDLE SUPPORT DETAIL FOR ITEM NO. 500-EE-AT-003 PROJECT : BPREP CLIENT : BPCL UNIT : @		DRAWING NO. B957-500-80-42-DS-4003	REV. A
					SHEET 4 OF 4	

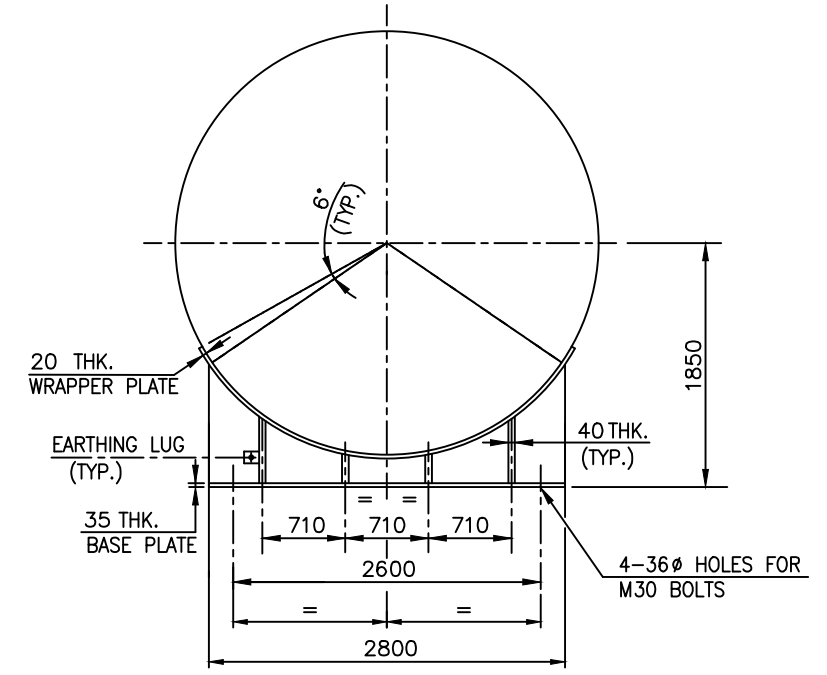
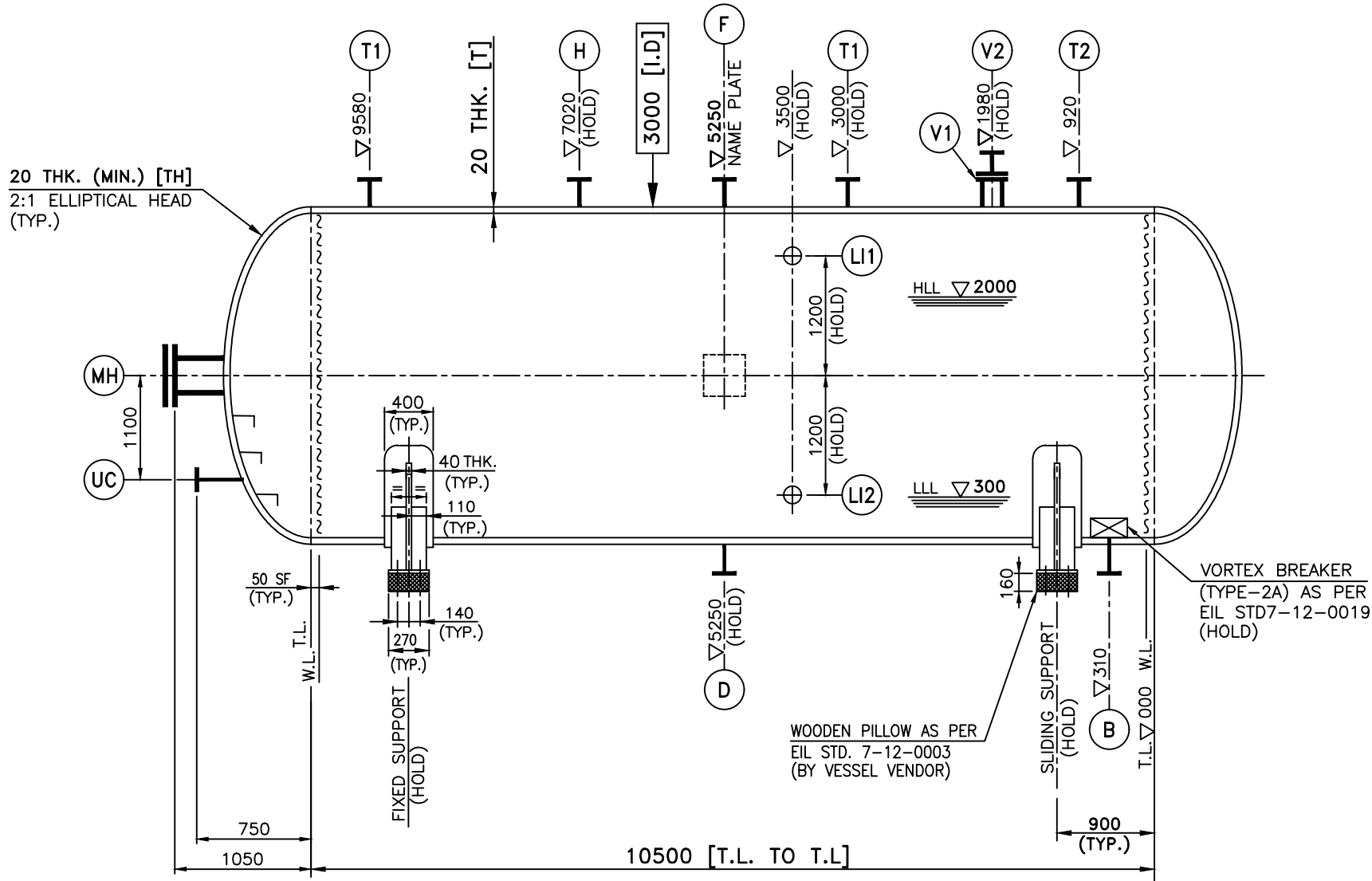
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NOZZLES AND CONNECTIONS (नोजल व कनेक्शन)									GENERAL NOTES (जनरल नोट्स)			SPECIFICATIONS (स्पेसिफिकेशन्स)			DESIGN DATA (डिजाइन डाटा)																																																		
MARK	QTY	NOM. DIA	SCH./THK.	FLANGES			PROJECTI ON NOTE-4	PAD W x T	SERVICE	UNLESS STATED OTHERWISE			X DENOTES APPLICABILITY		CODE	ASME SECTION VIII DIV-1 EDITION 2023																																																	
मार्क	क्यान्टीटी	नॉमिनल डाया	सक/थक	क्लास	टाइप	फेसिंग	प्रोजेक्शन	पैड	सर्विस	1	2	3	4 (A)	4 (B)	5	6	7	8	9	10	11	12	13	14	15	16	MATERIAL OF CONSTRUCTION (मैटेरियल ऑफ कन्स्ट्रक्शन) (AS PER ASME / IS OR EQUIVALENT)																																						
F	1	1200	20 THK	150	WN	RF	1950	550X T	FEED	1	2	3	4 (A)	4 (B)	5	6	7	8	9	10	11	12	13	14	15	16	SHELL / BOOF SA 240 GR. 304L																																						
T	2	850	20 THK	150	WN	RF	1950	370X T	TOP OUTLET	2	3	4 (A)	4 (B)	5	6	7	8	9	10	11	12	13	14	15	16	REINFORCEMENT PAD / INSERT-PAD SA 240 GR. 304L																																							
B	1	200	14 THK	150	WN	RF	1730	95X T	BOTTOM OUTLET	3	4 (A)	4 (B)	5	6	7	8	9	10	11	12	13	14	15	16	17	18	HEADS SA 240 GR. 304L																																						
H	1	600	14 THK	150	WN	RF	1950	255X T	VAPOR RETURN	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	SHELL FLANGES -																																						
D	1	80	80S	300	WN	RF	1730	40X T	DRAIN	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	NOZZLE FLANGES SA 182 F 304L																																						
V2	1	50	80S	600	WN	RF	SEE DWG.	-	VENT (NOTE-14)	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	NOZZLE NECK UPTO 150 NB SA 312 TP 304L																																						
UC	1	50	80S	600	WN	RF	SEE DWG.	-	UTILITY CONNECTION	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	NOZZLE NECK ABOVE 150 NB SA 240 GR. 304L																																						
LI	2	50(H)	80S	300	WN	RF	930	-	LEVEL INSTRUMENT	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	PIPE FITTINGS SA 403 WP 304L (SEAMLESS)																																						
TI	1	50(H)	80S	300	WN	RF	SEE DWG.	-	TEMPERATURE INSTRUMENT (NOTE-15)	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	GASKET EXTERNAL SPIRAL WOUND GASKET WITH SS 304L WINDING AND GRAFOIL FILLER MATERIAL WITH SS 304L INNER AND OUTER RING AS PER ASME B16.20.																																						
MH	1	600	14 THK	150	WN	RF	SEE DWG.	300X T	MANHOLE + BF + HINGED	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	GASKET INTERNAL COMPRESSED FIBRE ASBESTOS FREE																																						
V1	1	200	14 THK	150	WN	RF	1920	95X T	VENTILATION NOZZLE (NOTE-14)	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	EXTERNAL STUDS/BOLTS/NUTS SA 320 GR.B8 CL.2 (STRAIN HARDENED) / SA 194 GR.8																																						
'T' DENOTES CORRESPONDING SHELL/DISH END NOMINAL THICKNESS									12			13			14			15			16			17			18			19			20			21			22			23			24			25			26			27			28			29			30		
'H' DENOTES (HOLD)									13			14			15			16			17			18			19			20			21			22			23			24			25			26			27			28			29			30					

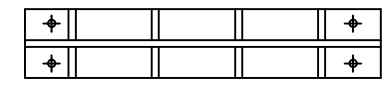
LICENSOR'S SPECIFICATION				FOUNDATION LOADING DATA (OPERATING CONDITION)			
लाइसेंसर स्पेसिफिकेशन्स				फाउंडेशन लोडिंग डाटा (ऑपरेटिंग कन्डिशन)			
TYPE		MAX. MOMENT AT BASE (M) (kgm)		MAX. SHEAR FORCE AT BASE (H) (kg)			
SEISMIC (DB)		-		-			
SEISMIC (MC)		-		-			
WIND		-		-			

 ENGINEERS INDIA LIMITED NEW DELHI इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम)	 BHARAT PETROLEUM CORP. LTD. BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)	DESIGN DATA			डिजाइन डाटा			DRAWING NUMBER			REV
		COLD BLOWDOWN KNOCK OUT DRUM			कोल्ड ब्लोडाउन नॉक आउट ड्रम			B957-500-80-42-DS-3211			A
A		08.12.2025	ISSUED FOR BIDS / ENGG.	ROHIT	SA/VIVEK	PB	ITEM NO. 500-VV-HI-004			SHEET 1 OF 2	
REV		DATE	REVISION	BY	CHECKED	APPROVED	आइटम नम्बर 500-वीवी-एचआय-004			FORM NO. 3-8042-0501 REV.0 (28.02.2024) A3-420 X 297	

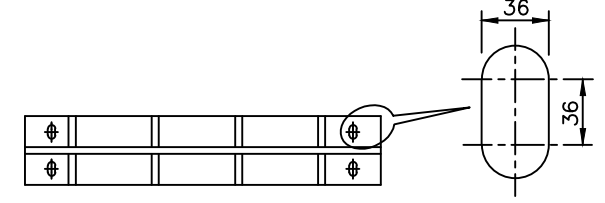
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END VIEW
(NOZZLES NOT SHOWN)
(ALL OTHER DIMENSIONS AS PER EIL STD.)



HOLES FOR FIXED SUPPORT



HOLES FOR SLIDING SUPPORT

ENGINEERS INDIA LIMITED NEW DELHI	BHARAT PETROLEUM CORP. LTD. BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)									VESEL DESIGN DATA वेसेल डिजाइन डाटा COLD BLOWDOWN KNOCK OUT DRUM कोल्ड ब्लोडाउन नॉक आउट ड्रम आइटम नम्बर 500-वीवी-एनआय-004	DRAWING NO. B957-500-80-42-DS-3211	REV. A
		REV. A DATE 08.12.2025 ISSUED FOR BIDS/ENGG.	REVISION	BY ROHIT	CHK SA/VIVEK	APPROVED PB	APPROVED	ITEM NO. 500-VV-HI-004	SHEET 2 OF 2	1-1641-0503 REV.0 A3-420x297		

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NOZZLES AND CONNECTIONS (नोजल व कनेक्शन)										GENERAL NOTES (जनरल नोट्स)		SPECIFICATIONS (स्पेसिफिकेशन्स)		DESIGN DATA (डिजाइन डाटा)	
MARK	QTY	NOM. DIA	SCH./THK.	FLANGES			PROJECTI ON NOTE	PAD W x T	SERVICE						
मार्क	क्वान्टिटी	नामिनल डाया	शकल व थिकनेस	क्लास	टाइप	फेसिंग	प्रोजेक्शन	पैड	सर्विस						
F	1	100	120	300	WN	RF	720	@	FEED						
B	1	50	160	300	WN	RF	SEE DWG.	45x6	BOTTOM OUTLET						
T	1	100	120	300	WN	RF	SEE DWG.	90x6	TOP OUTLET						
MH	1	500	12 THK.	150	WN	RF	760	215xT	MANHOLE + BF + DAVIT						
V	1	50	160	300	WN	RF	SEE DWG.	45x6	VENT						
UC	1	50	160	300	WN	RF	670	90x6	UTILITY CONNECTION						
SP 1-2	2	50	160	300	WN	RF	670	-	STAND PIPE						
LT 1-2	2	50	160	300	WN	RF	670	-	LEVEL INSTRUMENT						
PI	1	50	160	300	WN	RF	670	-	PRESSURE INSTRUMENT						
SV	1	50 (H)	160	300 (H)	WN	RF	670	90x6	SAFETY VALVE						

UNLESS STATED OTHERWISE

1 ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED.
2 ALL ANCHOR BOLT HOLES TO STRADDLE N/S CENTRE LINE.
3 NORTH DIRECTION WHEREVER SHOWN IS WITH RESPECT TO PLAN VIEW.
4 (A) FOR NOZZLES ON SHELL PROJECTIONS ARE REFERRED FROM VESSEL CENTER LINE TO FLANGE CONTACT FACE.
4 (B) FOR NOZZLES ON HEAD PROJECTIONS ARE REFERRED FROM HEAD T.L TO FLANGE CONTACT FACE.
5 THE INDICATED THICKNESS IS THE MINIMUM ACCEPTABLE AFTER CONSTRUCTION.
6 FLANGE GASKET FACE SHALL HAVE 12S AARH FINISH.
7 DIMENSIONS OF FLANGES FOR NOZZLES UPTO 600NB SHALL BE AS PER ASME B16.5 AND FOR NOZZLE ABOVE 600NB SHALL BE AS PER ASME B16.47 SERIES B UNLESS SPECIFIED OTHERWISE.
8 ID OF WELD NECK FLANGES SHALL MATCH WITH CORRESPONDING ID OF NOZZLE PIPE/SHELL.
9 NOZZLES 50NB AND BELOW SHALL BE STIFFENED WITH 2 NOS. 40 x 6 THK FLATS 90° APART.
10 SURFACE PREPARATION, SHOP PRIMER & FINISH PAINT AS PER JOB SPECIFICATION FOR SURFACE PREPARATION AND PROTECTIVE COATING IS IN VENDOR'S SCOPE.
11 ALL FABRICATED NOZZLES SHALL BE 100% RADIOGRAPHED.
12 NOZZLE SHOWN WITH BLIND FLANGES SHALL BE PROVIDED WITH BOLTS/NUTS AND GASKET.
13 VESSEL SHALL BE SUBJECTED TO STEAM OUT CONDITIONS OF 0.5 Kg/Cm²(g) AT 190°C
14 VENDOR SHALL CARRY OUT SIZING OF DEMISTER AS PER PROCESS DATA FURNISHED IN PDS & SUBMIT THE SAME FOR EIL REVIEW AND SAME SHALL BE INCLUDED IN QUOTED PRICE. PERFORMANCE GUARANTEE OF DEMISTER SHALL BE BY VESSEL VENDOR.

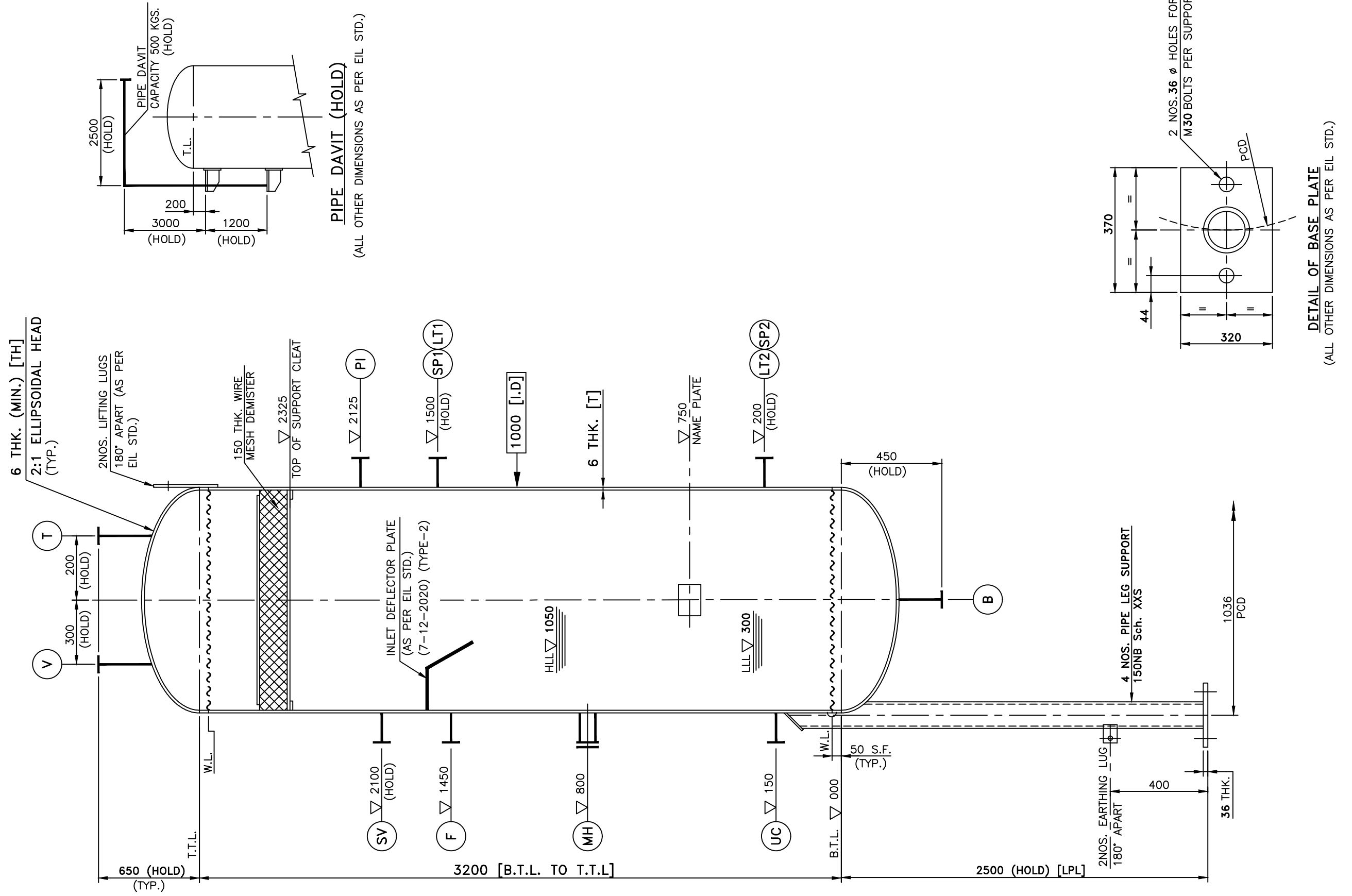
STANDARDS (स्टैण्डर्ड्स)				
<input checked="" type="checkbox"/>	VESSEL TOLERANCES	7-12-0001	HEAT TREATMENT	
<input checked="" type="checkbox"/>	SUPPORT FOR HORIZONTAL VESSEL	7-12-0002	OPERATING MEDIUM	
	WOODEN PILLOWS FOR SADDLE SUPPORT	7-12-0003	SP. GRAVITY	
	SKIRT BASE DETAILS	7-12-0004	WIND SPECIFICATION	
	SKIRT OPENING DETAILS	7-12-0005	SEISMIC	
	ANGLE LEG SUPPORT	7-12-0006	CAPACITY (M ³)	
<input checked="" type="checkbox"/>	PIPE LEG SUPPORT	7-12-0007	PAINTING/CLEANING	
	BRACKET SUPPORT FOR VERTICAL VESSEL	7-12-0008	INSULATION THICKNESS (mm)	
	MANHOLE WITH HINGED COVER	7-12-0009	FIRE PROOFING CLEATS	
<input checked="" type="checkbox"/>	MANHOLE WITH DAVIT	7-12-0010	HYDROSTATIC TEST (kg/cm2g)	
<input checked="" type="checkbox"/>	LADDER RUNGS FOR MANHOLE/DEMISTER	7-12-0011	PRESSURE (NEW & COLD)	
	RETAINING PLATE	7-12-0012	INSPECTION BY	
<input checked="" type="checkbox"/>	NOZZLE REINFORCEMENT AND PROJECTION	7-12-0013	MATERIAL OF CONSTRUCTION (मैटेरियल ऑफ कन्स्ट्रक्शन) (AS PER ASME / IS OR EQUIVALENT)	
	PAD NOZZLES FOR VESSELS	7-12-0014		
<input checked="" type="checkbox"/>	STANDARD BOLT HOLE ORIENTATION	7-12-0015		
	ALLOY LINER DETAILS	7-12-0016	SHELL	
	SIGHT GLASSES FOR PRESSURE VESSELS	7-12-0017	REINFORCEMENT PAD	
	INTERNAL FLANGES	7-12-0018	HEADS	
	VORTEX BREAKERS	7-12-0019	SHELL FLANGES	
<input checked="" type="checkbox"/>	INLET DEFLECTOR BAFFLE	7-12-0020	NOZZLE FLANGES / LWN	
	SUPPORT RING AND BOLTING BAR	7-12-0021	NOZZLE NECK UPTO 250 NB	
	SUPPORT RING SIZES FOR PACKED TOWERS	7-12-0022	NOZZLE NECK ABOVE 250 NB	
<input checked="" type="checkbox"/>	PIPE DAVIT	7-12-0023	PIPE FITTINGS	
<input checked="" type="checkbox"/>	LIFTING LUG TOP HEAD TYPE	7-12-0024	GASKET EXTERNAL	
<input checked="" type="checkbox"/>	FIRE PROOFING AND INSULATION SUPPORTS	7-12-0025	SPIRAL WOUND GASKET WITH SS 304 METAL WINDING AND GRAFOIL FILLER MATERIAL WITH CS OUTER & SS 304 INNER RING AS PER ASME B 16.20.	
<input checked="" type="checkbox"/>	EARTHING LUG	7-12-0026		
<input checked="" type="checkbox"/>	NAME PLATE	7-12-0027		
<input checked="" type="checkbox"/>	MANUFACTURER NAME PLATE	7-12-0028	GASKET INTERNAL	
<input checked="" type="checkbox"/>	BRACKET FOR NAME PLATE	7-12-0029	EXTERNAL STUDS/BOLTS/NUTS	
	NAME PLATE FOR SMALL EQUIPMENT	7-12-0030	INTERNAL STUDS/BOLTS/NUTS	
	DETAILS OF FORGED NOZZLES	7-12-0031	SKIRT/SUPPORT	
	SUPPORTS FOR INTERNAL FEED PIPE	7-12-0032	SKIRT/SUPPRT BASE	
	HOT INSULATION SUPPORT FOR HORIZONTAL VESSEL	7-12-0033	INTERNAL PARTS (WELDED)	
	PIPE DAVIT SUPPORT FOR COLD INS. VESSELS	7-12-0034	INTERNAL PARTS (BOLTED)	
<input checked="" type="checkbox"/>	TYP. DETAILS OF WIRE MESH DEMISTER SUPPORTS	7-12-0036	CLIPS & ATTACHMENTS (EXTERNAL)	
	S.R NOZZLE NECK	7-12-0037	DIRECTLY WELDED OVER VESSEL	
<input checked="" type="checkbox"/>	ALLOWABLE NOZZLE LOADS	7-12-0038	CLIPS & ATTACHMENTS (EXTERNAL) WELDED OVER PAD	
			WRAPPER PLATE	
			DEMISTER/GRID	
			PAD FOR EXTERNAL ATTACHMENTS	
			LIFTING LUG	

REFERENCE DRAWINGS (रेफरेन्स ड्राइंग)				
NOZZLE ORIENTATIONS		PLATFORM & PIPE CLIP NOT TO BE SUPPORTED ON THE EQUIPMENT.		
LADDERS/PLATFORM CLEATS				
PIPE SUPPORT CLEATS				
TRAY SUPPORT AND BOLTING BARS				
<input checked="" type="checkbox"/>	DEMISTER DATA SHEET	NOT APPLICABLE		
		B957-500-79-41-DS-1906		
HOLD UPS (होल्ड अप्स)				
NOZZLE ORIENTATIONS		APPROXIMATE WEIGHT (kgs) (PER ITEM) (एप्रोक्सिमेट वजन) (HOLD)		
<input checked="" type="checkbox"/>	NOZZLE ELEVATIONS (AS MARKED)	PIPE SUPPORT CLEATS		
<input checked="" type="checkbox"/>	SUPPORT HEIGHT	LADDER/PLATFORM CLEATS		
	DETAILS OF INTERNALS	TRAY SUPPORT/BOLTING BARS	ERECTION	OPERATING
		PIPE DAVIT	HYDROTEST (SHOP)	HYDROTEST (FIELD)
		PACKING SUPPORT	6500	6500
			NUMBER OF ITEMS :	ONE
STATUTORY REGULATIONS (स्टैचुअरी रेगुलेशन्स)				
HOLD UPS (होल्ड अप्स)				
INDIAN BOILER REGULATIONS (IBR)				
DEPARTMENT OF EXPLOSIVES, NAGPUR (CCOE)				

 ENGINEERS INDIA LIMITED NEW DELHI इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम)	 BHARAT PETROLEUM CORP. LTD. BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)	DESIGN DATA		डिजाइन डाटा		DRAWING NUMBER		REV
		BUTENE-1 UNLOADING COMP. SUCTION KOD		ब्यूटेन-1 अनलोडिंग कंप. सक्शन कोड		B957-500-80-42-DS-3210		
		ITEM NO. 500-VV-VI-003		आइटम नम्बर 500-वीवी-वीआई-003		SHEET 1 OF 2		
B	21.11.2025	REVISED & REISSUED FOR BIDS / ENGG.	AS	SM/VIVEK	PB			
A	30.10.2025	ISSUED FOR BIDS / ENGG.	AS	SM/VIVEK	PB			
REV	DATE	REVISION	BY	CHECKED	APPROVED			

FORMAT NO. 3-8042-0501 REV.0 (28.02.2024) A3-420 X 297

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ENGINEERS INDIA LIMITED NEW DELHI	BHARAT PETROLEUM CORP. LTD. BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)	B 21.11.2025 REVISED & REISSUED FOR BIDS/ENGG. AS SM/VIVEK PB	VESSEL DESIGN DATA BUTENE-1 UNLOADING COMP. SUCTION KOD		वेसेल डिजाइन डाटा ब्यूटेन-1 अनलोडिंग कंप. सक्शन कोड	DRAWING NO. B957-500-80-42-DS-3210	REV. B
		A 30.10.2025 ISSUED FOR BIDS/ENGG. AS SM/VIVEK PB	ITEM NO. 500-VV-VI-003		आइटम नम्बर 500-वीवी-वीआई-003	SHEET 2 OF 2	REV. B
		REV. DATE REVISION BY CHK APPROVED APPROVED	1-1641-0503 REV.0 A3-420x297				

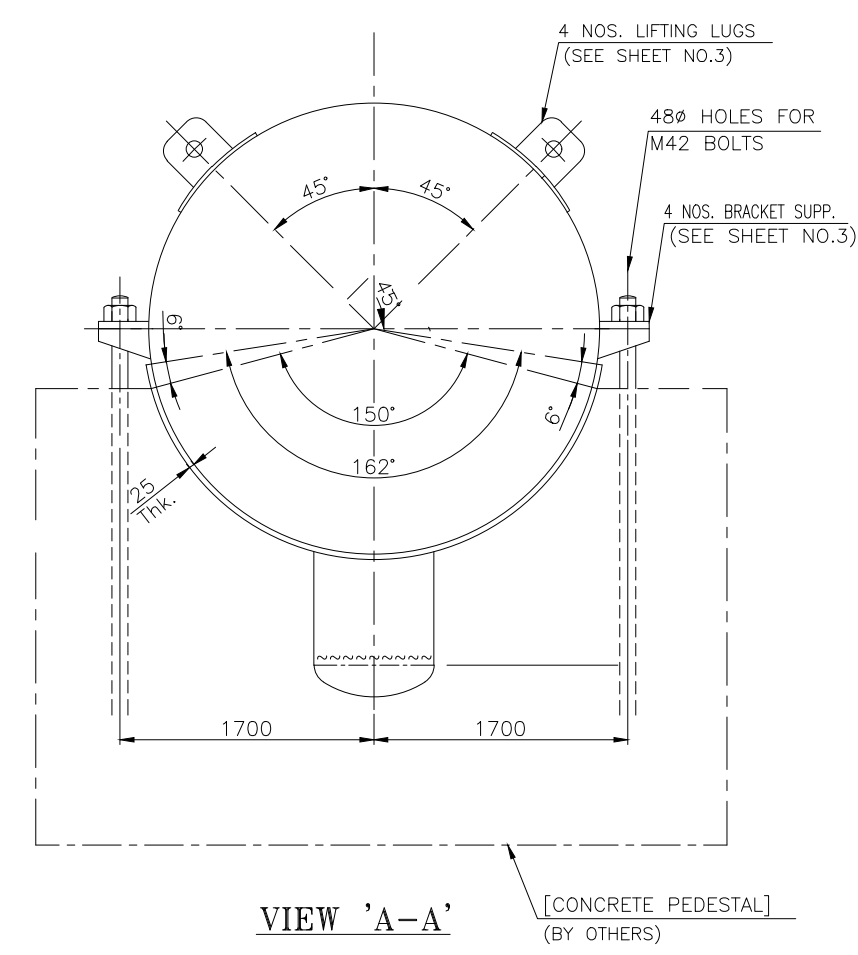
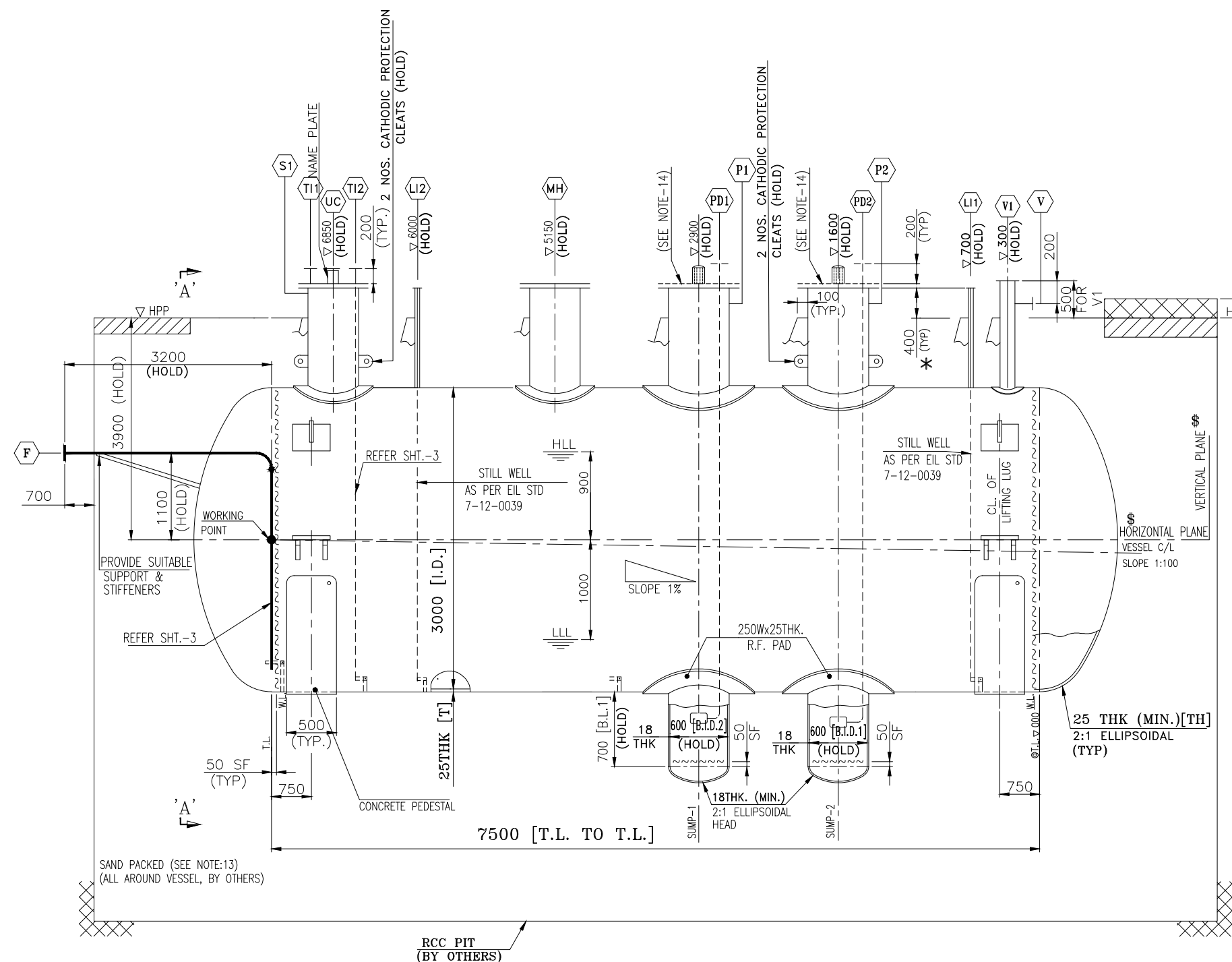
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NOZZLES AND GASKET FACE OF FLANGES SHALL BE PARALLEL TO VERTICAL PLANE/HORIZONTAL PLANE. TOP SURFACE OF SUPPORT BRACKET SHALL BE PARALLEL TO HORIZONTAL PLANE.

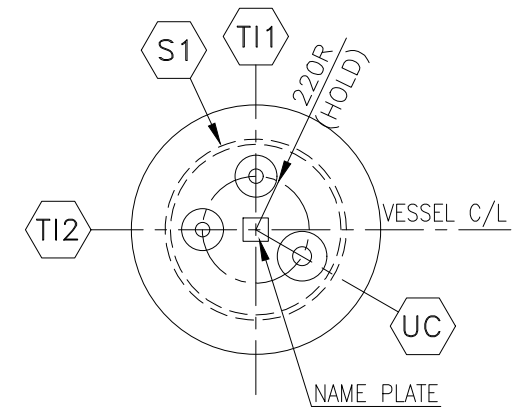
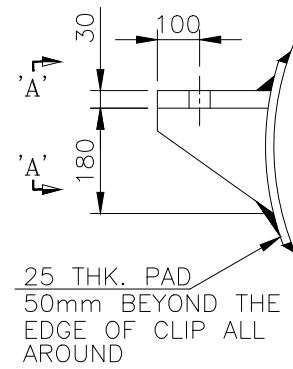
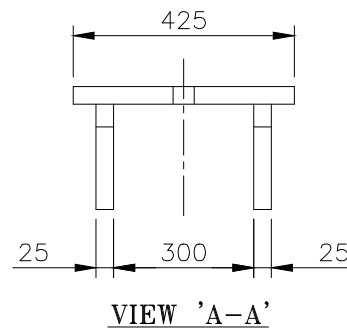
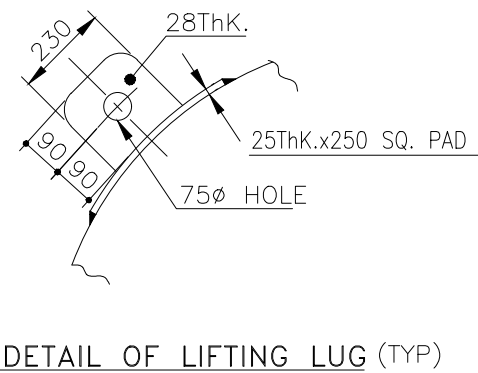
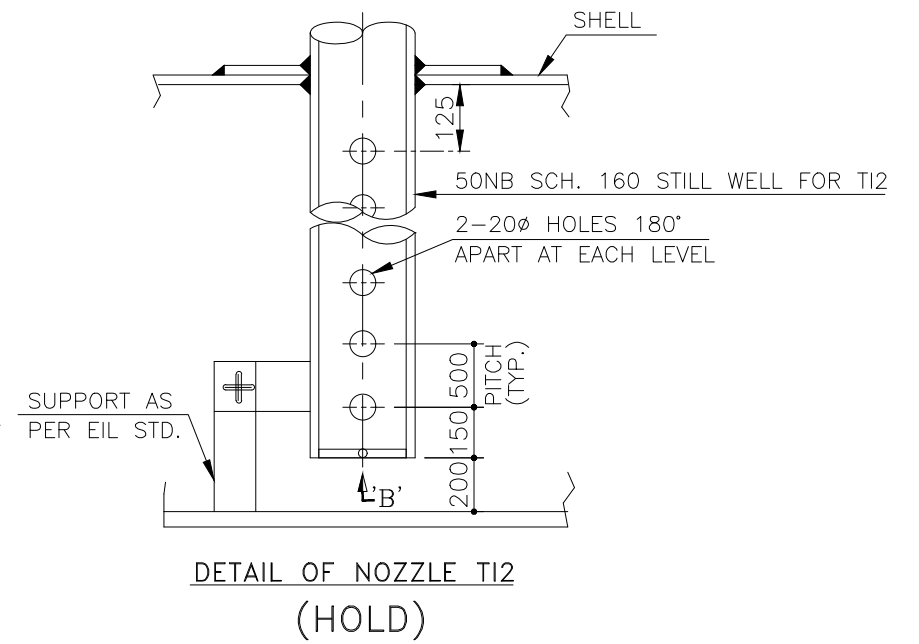
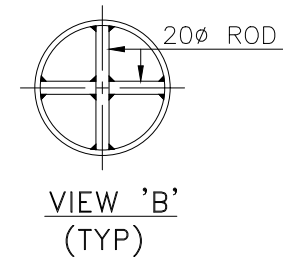
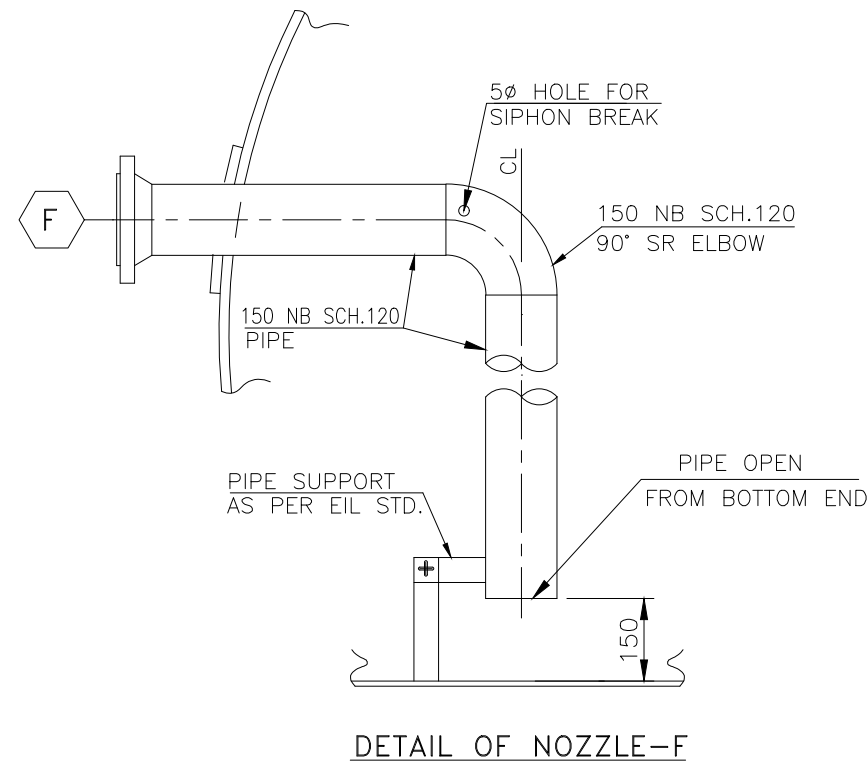
* NOZZLES MAY BE SUITABLY CUT WITH WELD EDGE PREPARATION (WITH SUITABLE COVER) FOR TRANSPORTATION. SUITABLE CUTTING ALLOWANCE IN NOZZLES SHALL BE CONSIDERED TO MAINTAIN THE GIVEN PROJECTION. FINAL ASSEMBLY OF NOZZLES AT SITE SHALL BE BY OTHERS (NOT BY VESSEL FABRICATOR)

NOZZLE/SUMP LOCATION ONE WITH RESPECT TO VERTICAL PLANE



<p>ENGINEERS INDIA LIMITED NEW DELHI</p>	<p>BHARAT PETROLEUM CORP. LTD. BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)</p>	<p>A 08.10.2025 ISSUED FOR BIDS/ENGG.</p>	<p>AS RR/VIVEK PB</p>	<p>VESEL DESIGN DATA START-UP ETHYLENE CONDENSATE RECOVERY DRUM ITEM NO. 500-VV-HI-009</p>		<p>वेसेल डिजाइन डाटा स्टार्ट अप एथलीन कन्डेन्सेट रिकवरी ड्रम आइटम नम्बर 500-वीवी-एचआई-009</p>	<p>DRAWING NO. B957-500-80-42-DS-3209</p>	<p>REV. A</p>
		<p>REV. DATE REVISION</p>	<p>BY CHK APPROVED APPROVED</p>	<p>SHEET 2 OF 3</p>	<p>1-1641-0503 REV.0 A3-420x297</p>			

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<p>ENGINEERS INDIA LIMITED NEW DELHI</p>	<p>BHARAT PETROLEUM CORP. LTD. BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)</p>	REV.	DATE	ISSUED FOR BIDS/ENGG.	AS	RR/VIVEK	PB	VESSEL DESIGN DATA START-UP ETHYLENE CONDENSATE RECOVERY DRUM ITEM NO. 500-VV-HI-009	वेसेल डिजाइन डाटा स्टार्ट अप एथलीन कन्डेन्सेट रिकवरी ड्रम आइटम नम्बर 500-वीवी-एचआई-009	DRAWING NO.	REV.
		A	09.10.2025	ISSUED FOR BIDS/ENGG.	AS	RR/VIVEK	PB			B957-500-80-42-DS-3209	A
										SHEET 3 OF 3	

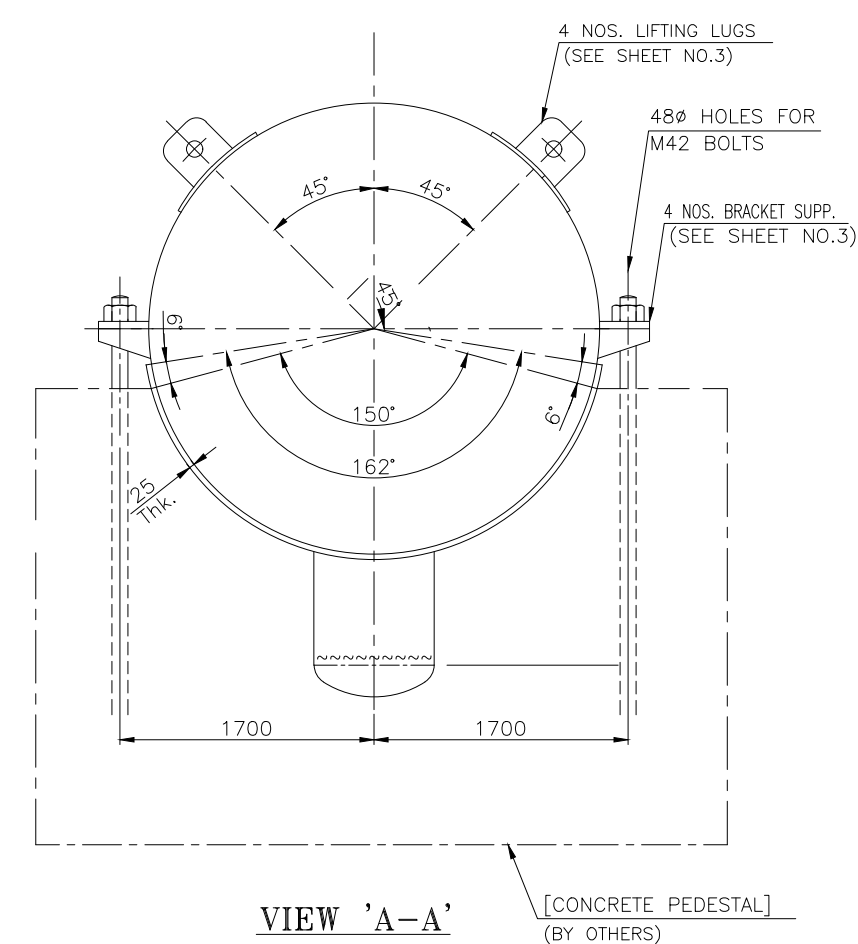
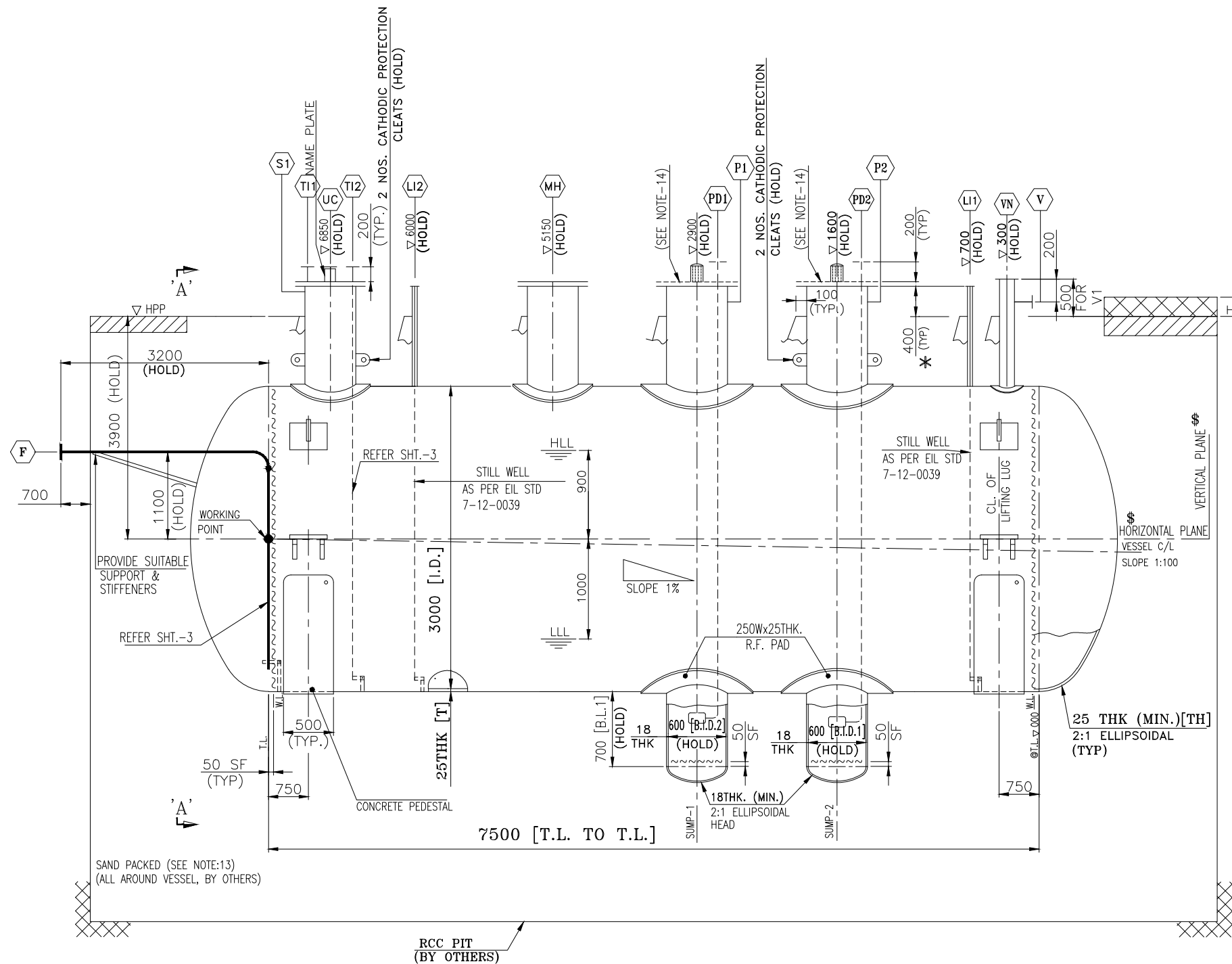
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NOZZLE/SUMP LOCATION ONE WITH RESPECT TO VERTICAL PLANE



ENGINEERS INDIA LIMITED
NEW DELHI

BHARAT PETROLEUM CORP. LTD.
BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)

REV.	A	09.10.2025	ISSUED FOR BIDS/ENGG.	AS	RR/VIVEK	PB	
			REVISION	BY	CHK	APPROVED	APPROVED

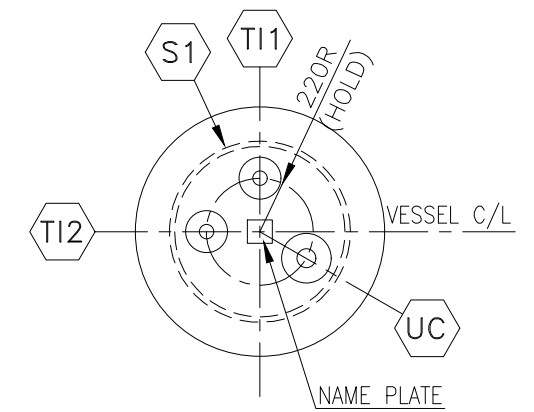
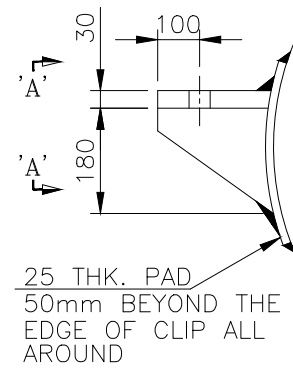
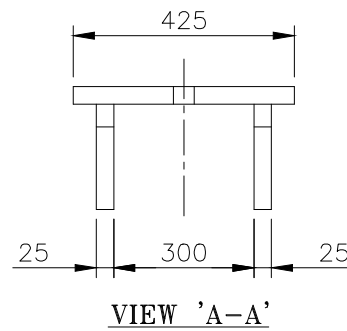
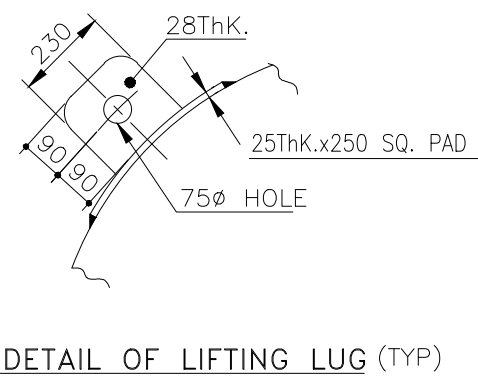
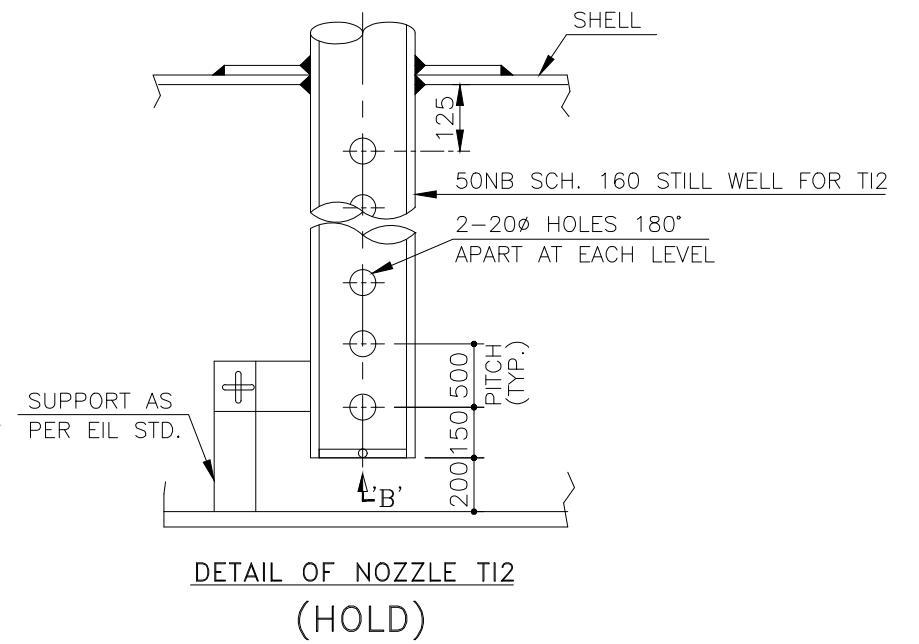
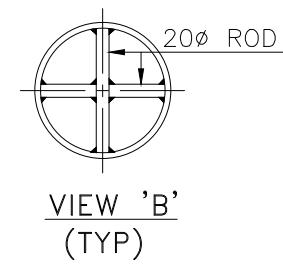
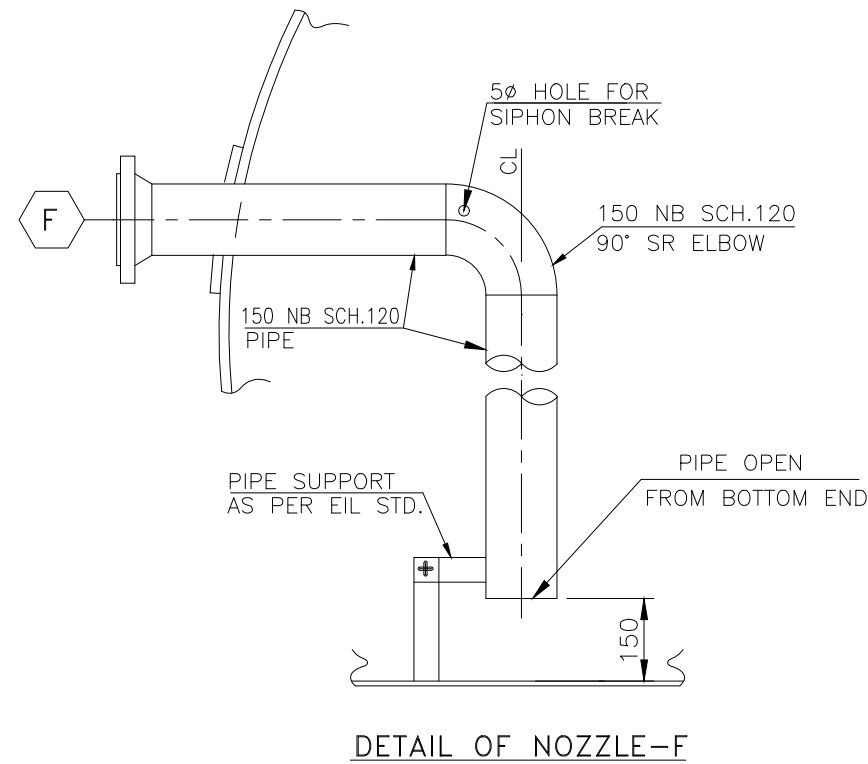
VESSEL DESIGN DATA
OFF-SPEC ETHYLENE
B/D COND. RECOVERY
DRUM
ITEM NO. 500-VV-HI-008

वैसेल डिजाइन डाटा
ऑफ स्पेक एथलीन
बी/डी कन्डन.
रिकवरी ड्रम
आइटम नम्बर 500-वीवी-एचआई-008

DRAWING NO. **B957-500-80-42-DS-3208** REV. **A**

SHEET 2 OF 3

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ENGINEERS INDIA LIMITED
NEW DELHI

BHARAT PETROLEUM CORP. LTD.
BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)

REV.	DATE	REVISION	BY	CHK	APPROVED	APPROVED
A	09.10.2025	ISSUED FOR BIDS/ENGG.	AS	RR/VIVEK	PB	

VESSEL DESIGN DATA
OFF-SPEC ETHYLENE
B/D COND. RECOVERY
DRUM
ITEM NO. 500-VV-HI-008

वेसेल डिजाइन डाटा
ऑफ स्पेक एथलीन
बी/डी कन्डेन.
रिकवरी ड्रम
आइटम नम्बर 500-वीवी-एचआई-008

DRAWING NO. B957-500-80-42-DS-3208
REV. A

SHEET 3 OF 3

1-1641-0503 REV.0 A3-420x297

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NOZZLES AND CONNECTIONS (नोजल व कनेक्शन) GENERAL NOTES (जनरल नोट्स) SPECIFICATIONS (स्पेसिफिकेशन्स) DESIGN DATA (डिजाइन डाटा)

ENGINEERS INDIA LIMITED NEW DELHI इंडीयन पेट्रोलेमियम BHARAT PETROLEUM CORP. LTD. BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP) DESIGN DATA AROMATIC BLOWDOWN VESSEL-1 (TF-20) 500-VV-HI-006

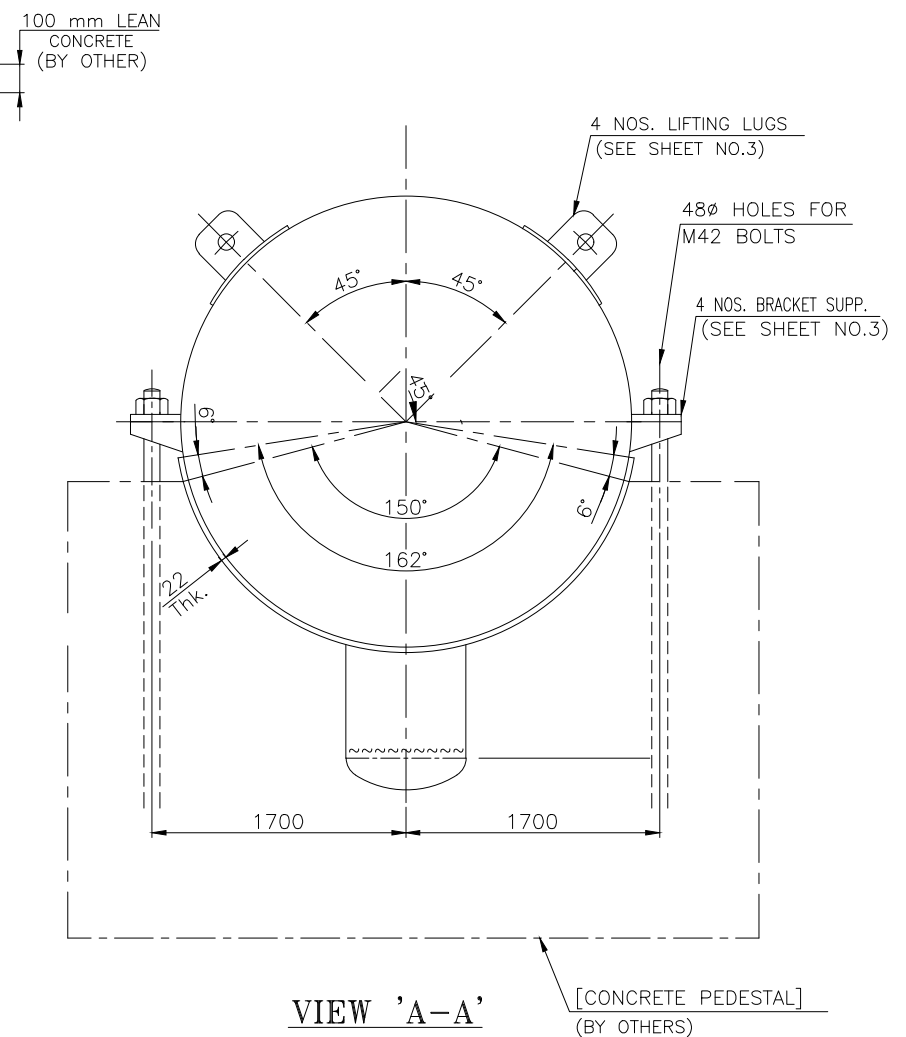
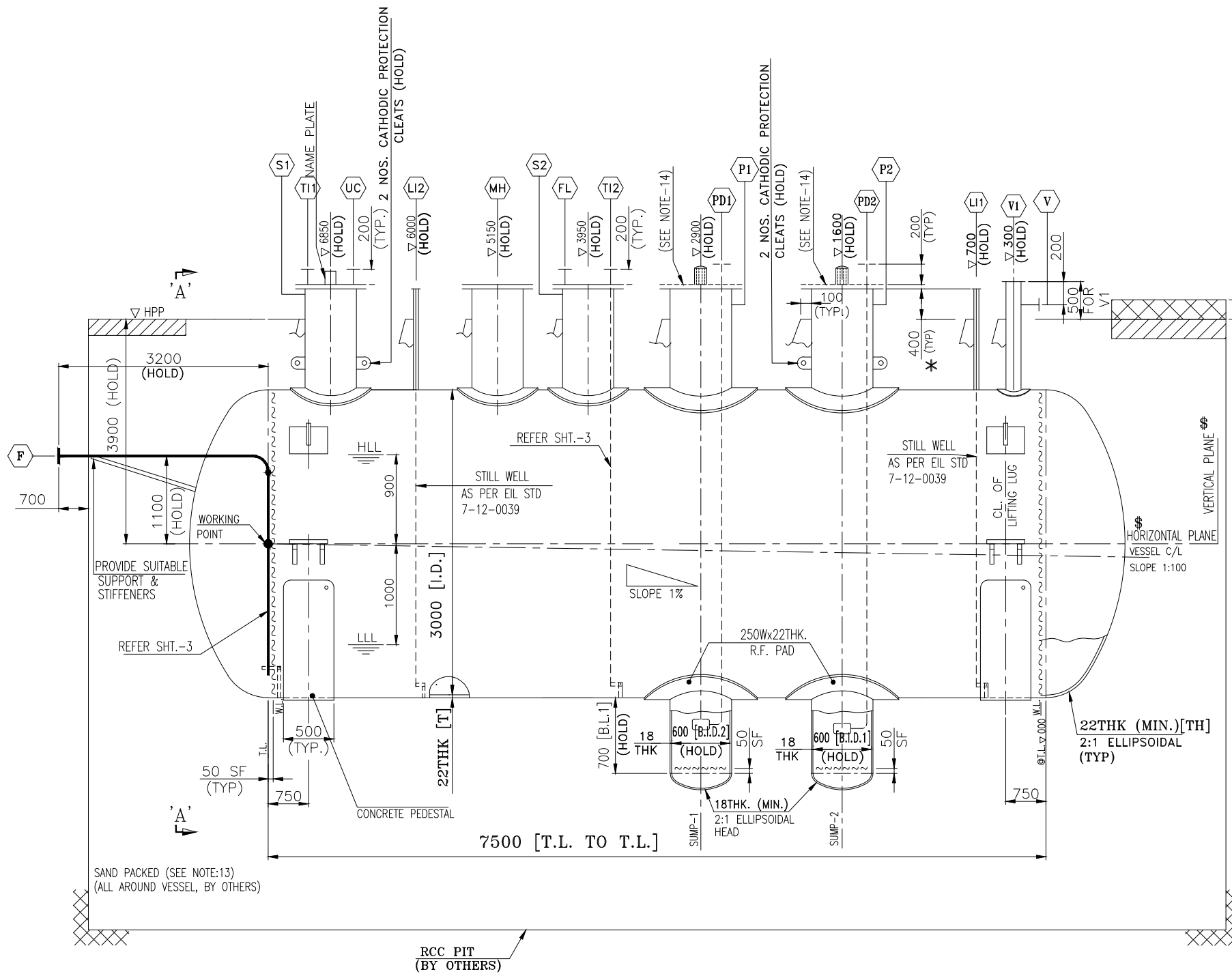
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NOZZLE/SUMP LOCATION ONE WITH RESPECT TO VERTICAL PLANE



ENGINEERS INDIA LIMITED
NEW DELHI

BHARAT PETROLEUM CORP. LTD.
BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)

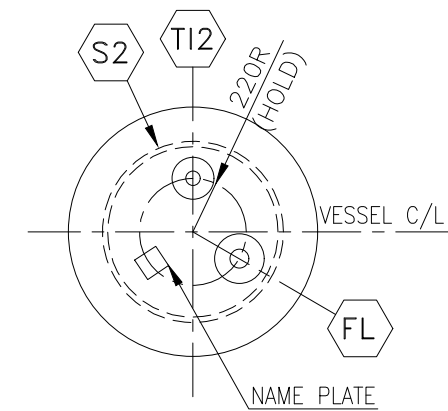
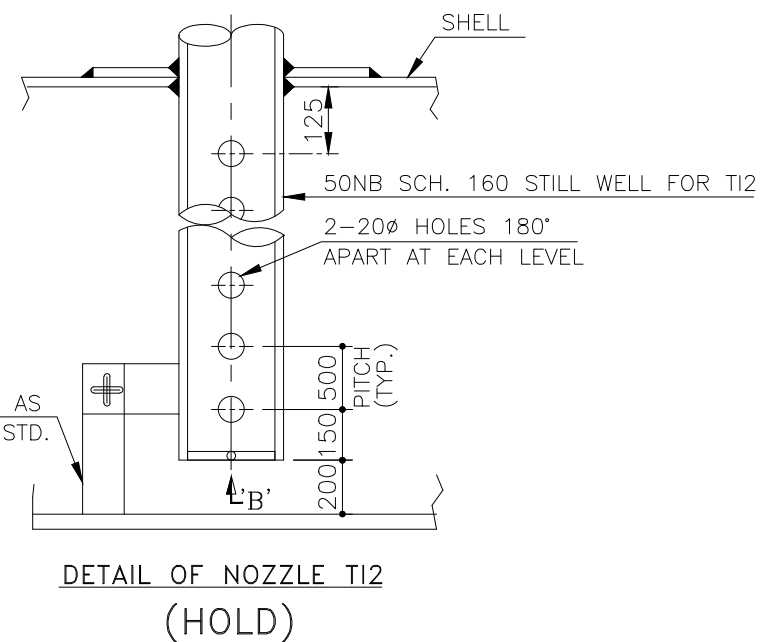
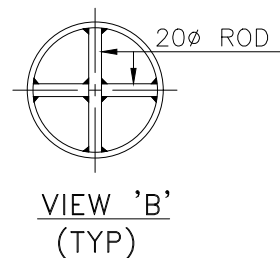
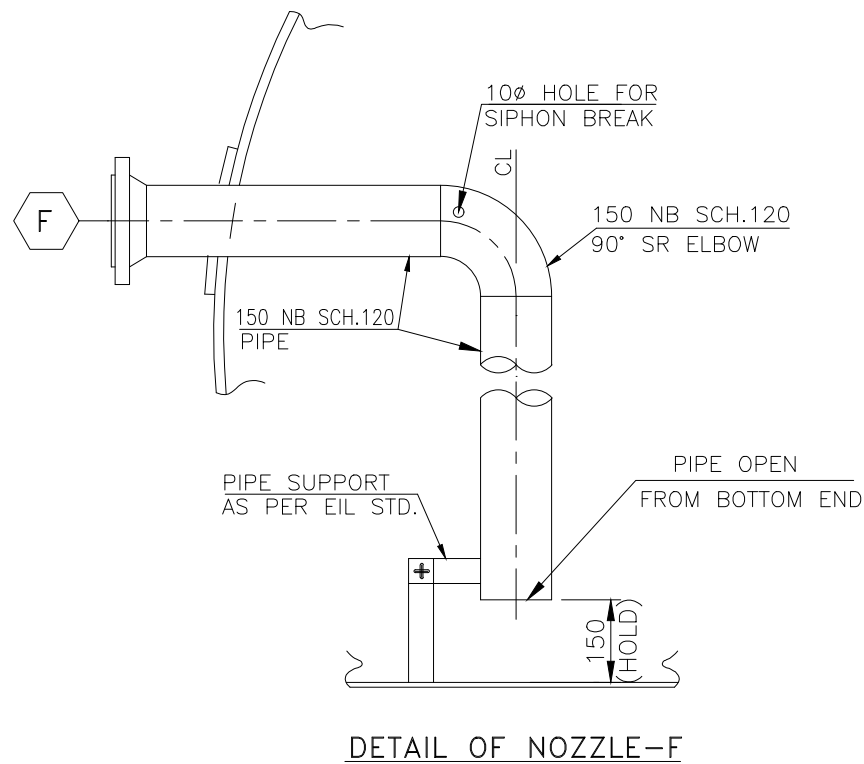
REV.	DATE	ISSUED FOR BIDS/ENGG.	BY	CHK	APPROVED	APPROVED
A	09.10.2025	ISSUED FOR BIDS/ENGG.	AS	RR/VIVEK	PB	

VESEL DESIGN DATA
AROMATIC BLOWDOWN
VESSEL-1 (TF-20)
ITEM NO. 500-VV-HI-006

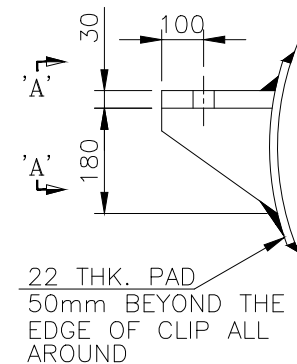
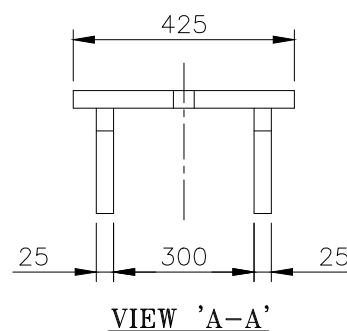
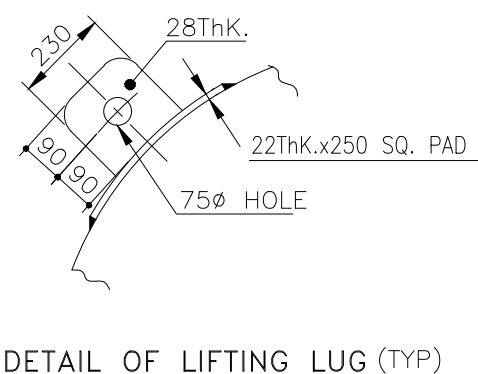
वेसेल डिजाइन डाटा
एरोमेटिक ब्लोडाउन
वेसेल-1 (टीएफ-20)
आइटम नम्बर 500-वीवी-एचआई-006

DRAWING NO.	REV.
B957-500-80-42-DS-3206	A
SHEET 2 OF 3	

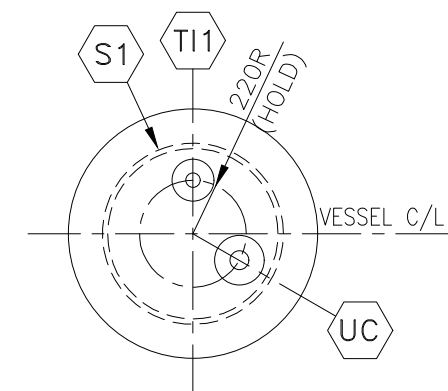
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PLAN FOR MOUNTING NOZZLE S2 (HOLD)
(FOLLOW AS PER NOZZLE ORIENTATION)



DETAIL OF BRACKET SUPPORT (TYP)



PLAN FOR MOUNTING NOZZLE S1 (HOLD)
(FOLLOW AS PER NOZZLE ORIENTATION)



REV.	DATE	REVISION	BY	CHK	APPROVED	APPROVED
A	09.10.2025	ISSUED FOR BIDS/ENGG.	AS	RR/VIVEK	PB	

VESEL DESIGN DATA
AROMATIC BLOWDOWN
VESSEL-1 (TF-20)
ITEM NO. 500-VV-HI-006

वेसेल डिजाइन डाटा
एरोमेटिक ब्लोडाउन
वेसेल-1 (टीएफ-20)
आइटम नम्बर 500-वीवी-एचआई-006

DRAWING NO.	REV.
B957-500-80-42-DS-3206	A
SHEET 3 OF 3	

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NOZZLES AND CONNECTIONS (नोजल व कनेक्शन)											GENERAL NOTES (जनरल नोट्स)	SPECIFICATIONS (स्पेसिफिकेशन्स)				DESIGN DATA (डिजाइन डाटा)										
MARK	QTY	NOM. DIA	SCH./THK.	FLANGES			PROJECTI ON NOTE	PAD W X T	SERVICE			UNLESS STATED OTHER WISE				DENOTES APPLICABILITY		CODE		ASME SEC.-VIII DIV.-1 EDITION 2023						
मार्क	कवान्टिटी	नॉमिनल डाया	शटल व थिकनेस	क्लास	टाइप	फेसिंग	प्रोजेक्शन	पैड	सर्विस																	
F	1	150	120	300	WN	RF	SEE DWG.	85 X T	FEED			1	ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED.				<input checked="" type="checkbox"/>	GENERAL SPEC. FOR PRESSURE VESSELS	6-12-0001	WORKING PRESSURE (kg/cm ² g)	ATM-0.1					
V	1	50	160	300	WN	RF	SEE DWG.	-	VENT			2	ALL-ANCHOR-BOLT HOLES TO STRADDLE N/S CENTRE-LINE.				<input checked="" type="checkbox"/>	STD. SPEC. FOR CS VESSELS	6-12-0002	DESIGN PRESSURE (kg/cm ² g)	INT. 3.5	EXT.	F.V.			
UC	1	50	160	300	WN	RF	SEE DWG.	-	UTILITY CONNECTION			3	NORTH DIRECTION WHEREVER SHOWN IS WITH RESPECT TO PLAN VIEW.				<input checked="" type="checkbox"/>	STD. SPEC. FOR BQCS PLATE	6-12-0011	WORKING TEMPERATURE (°C)	90-102					
LI 1-2	2	150 (H)	120	300	WN	RF	SEE DWG.	70XT	LEVEL INSTRUMENT + STILL WELL			4 (A)	FOR NOZZLES ON SHELL PROJECTIONS ARE REFERRED FROM VESSEL CENTER-LINE TO FLANGE CONTACT FACE.				<input checked="" type="checkbox"/>	SPEC. FOR SURFACE PREPARATION & PROTECTIVE COATING	B957-000-06-42-PLS-01	DESIGN TEMPERATURE (°C)	120					
TI1	1	50	160	300	WN	RF	SEE DWG.	-	TEMPERATURE INSTRUMENT			4 (B)	FOR NOZZLES ON HEAD PROJECTIONS ARE REFERRED FROM HEAD T.L TO FLANGE CONTACT FACE.													
TI2	1	50	160	300	WN	RF	SEE DWG.	-	TEMPERATURE INSTRUMENT + STILL WELL			5	THE INDICATED THICKNESS IS THE MINIMUM ACCEPTABLE AFTER CONSTRUCTION.													
MH	1	600	14 THK.	150	WN	RF	SEE DWG.	250X T	MANHOLE+BF+GASKET+BOLTING+HINGE			6	FLANGE GASKET FACE SHALL HAVE 125 AARH FINISH.													
PD 1-2	2	100 (H)	BY PUMP VENDOR						PUMP DISCHARGE			7	DIMENSIONS OF FLANGES FOR NOZZLES UPTO 600NB SHALL BE AS PER ASME B16.5 AND FOR NOZZLE ABOVE 600NB SHALL BE AS PER ASME B16.47 SERIES-B UNLESS SPECIFIED OTHERWISE.				<input checked="" type="checkbox"/>	VESSEL TOLERANCES	7-12-0001	HEAT TREATMENT	HEAD: AS PER CODE /SPEC.					
P 1-2	2	600 (H)	14 THK.	150	WN	RF	SEE DWG.	250X T	PUMP NOZZLE			8	ID OF WELD NECK FLANGES SHALL MATCH WITH CORRESPONDING ID OF NOZZLE PIPE/SHELL.				<input checked="" type="checkbox"/>	SUPPORT FOR HORIZONTAL VESSEL	7-12-0002	OPERATING MEDIUM	PURE CONDENSATE					
VN	1	150	120	150	WN	RF	SEE DWG.	70XT	VENTILATION + BF GASKET + BOLTING			9	NOZZLES SHALL BE STIFFENED WITH 4 NOS. 100 x 10 THK FLATS AT 90 DEG.APART. MANHOLE,PUMP NOZZLE AND MOUNTING NOZZLES SHALL BE STIFFENED WITH 8 NOS 10THKx R.F PAD WIDE FLATS EQUISPACED.					WOODEN PILLOWS FOR SADDLE SUPPORT	7-12-0003	SP. GRAVITY	0.956 TO 0.965					
S1	1	600	14 THK.	150	WN	RF	SEE DWG.	250XT	MOUNTING NOZZLE BF + GASKET + BOLTING FOR UC, TI1 & TI2			10	ALL FABRICATED NOZZLES SHALL BE 100% RADIOGRAPHED.				<input checked="" type="checkbox"/>	MANHOLE WITH HINGED COVER	7-12-0009	FIRE PROOFING CLEATS	<input type="checkbox"/>	YES	<input checked="" type="checkbox"/>	NO		
												11	NOZZLES SHOWN WITH BLIND FLANGES / REDUCING FLANGES SHALL BE PROVIDED WITH BOLTS/NUTS AND GASKETS.					MANHOLE WITH DAVIT	7-12-0010	HYDROSTATIC TEST (kg/cm2g)	HORIZONTAL	/-VERTICAL-	(AT TOP)			
												12	SURFACE PREPARATION, SHOP PRIMER & FINISH PAINT AS PER JOB SPECIFICATION FOR SURFACE PREPARATION AND PROTECTIVE COATING IS IN VENDOR'S SCOPE. EXTERNAL COATING SHALL BE AS PER TABLE 10.2 OF JOB SPECIFICATION.				<input checked="" type="checkbox"/>	LADDER RUNGS FOR MANHOLE/DEMISTER	7-12-0011	PRESSURE (NEW & COLD)	4.55					
												13	THE VESSEL SHALL BE LOCATED IN RCC PIT AND SAND PACKED WITH VIBRO COMPRESSION WITH 100mm THK OF LEAN CONCRETE ON TOP (BY OTHERS).				<input checked="" type="checkbox"/>	RETAINING PLATE	7-12-0012	INSPECTION BY	<input checked="" type="checkbox"/>	EIL	<input type="checkbox"/>	CIB	<input type="checkbox"/>	TPIA
												14 (a)	SIZE OF SUMP1-2 & NOZZLE P1-2 IS UNDER HOLD & SHALL BE AS CONFIRMED BY PUMP VENDOR.				<input checked="" type="checkbox"/>	NOZZLE REINFORCEMENT AND PROJECTION	7-12-0013	MATERIAL OF CONSTRUCTION (मेटिरियल ऑफ कन्स्ट्रक्शन) (AS PER ASME / IS OR-EQUIVALENT)						
												14 (b)	PUMP NOZZLE COVER / BLIND FLANGE WITH PUMP ASSEMBLY, NOZZLES PD1-2,BOLTING & GASKET SHALL BE SUPPLIED BY PUMP SUPPLIER.					PAD NOZZLES FOR VESSELS	7-12-0014							
												15	CATHODIC PROTECTION IS BY OTHERS. HOWEVER,CLIP FOR THE SAME TO BE PROVIDED BY VENDOR.					STANDARD BOLT HOLE ORIENTATION	7-12-0015							
												16	UNLESS OTHERWISE SPECIFIED MINIMUM THICKNESS OF WELDED/BOLTED CS INTERNAL SHALL BE 12mm. IN CASE OF PIPE AND PIPE FITTINGS SCHEDULE TO BE SELECTED ACCORDINGLY.				<input checked="" type="checkbox"/>	ALLOY LINER DETAILS	7-12-0016	SHELL/BOOT	SA 516 Gr.70					
												17	LIFTING LUG FOR HANDLING OF VESSEL SHALL BE DESIGNED (CONSIDERING IMPACT FACTOR 1.5) AND PROVIDED BY VENDOR. INDICATIVE DETAILS ARE FURNISHED ON SHEET-3.				<input checked="" type="checkbox"/>	SIGHT GLASSES FOR PRESSURE VESSELS	7-12-0017	REINFORCEMENT PAD	SA 516 Gr.70					
																</										

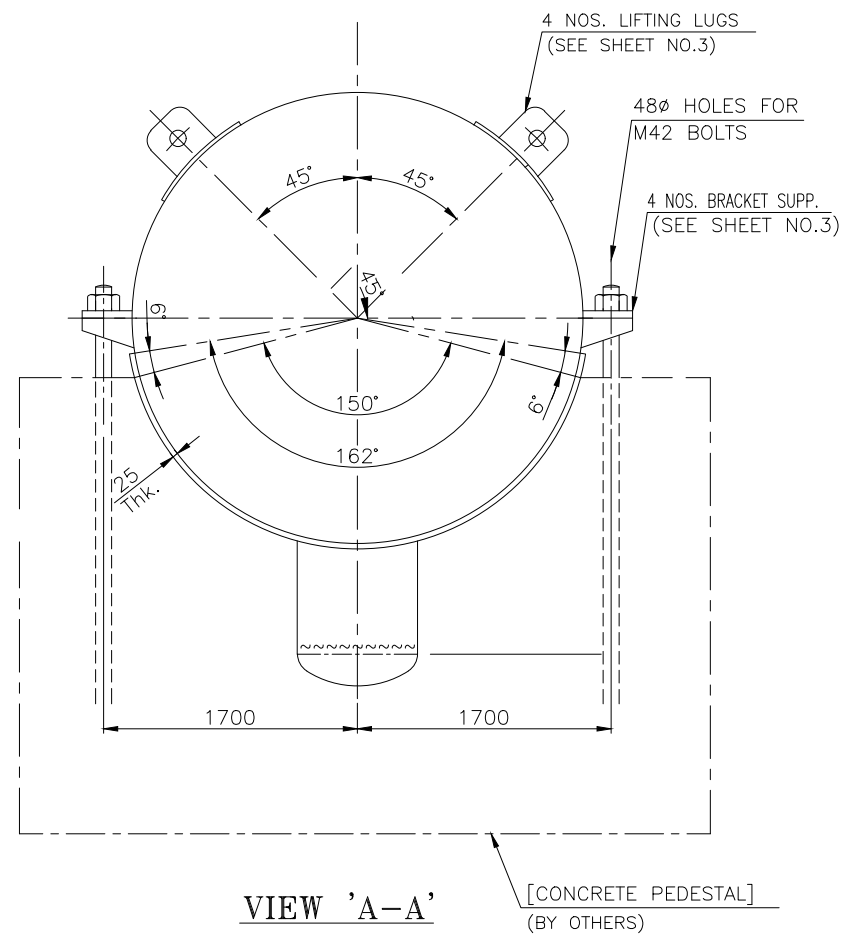
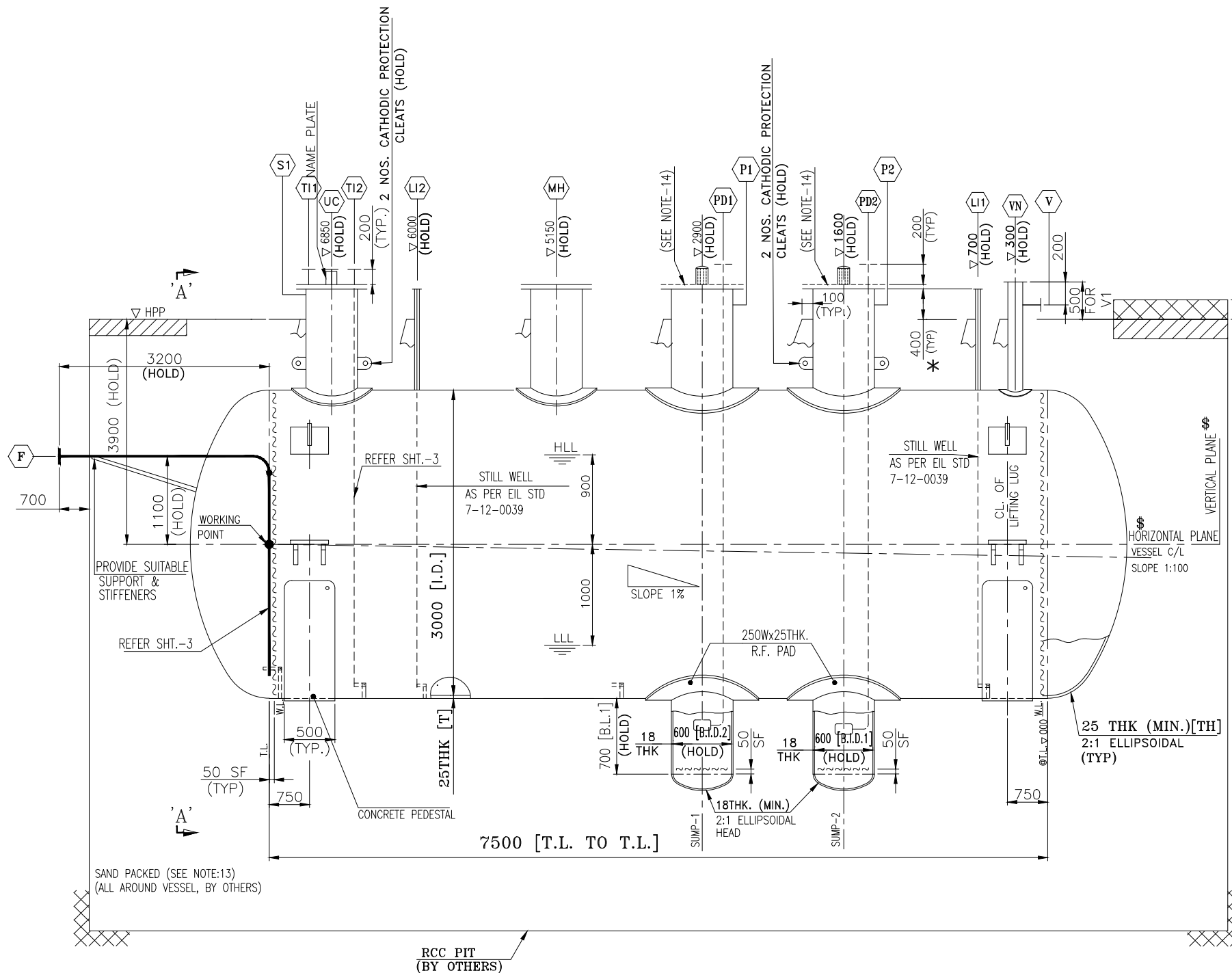
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STRUCTURE SHALL NOTE THAT VESSEL HAS SLOPE OF 1% (1 IN 100) CONCRETE SADDLE HEIGHT SHALL BE MAINTAINED SUCH THAT THE ABOVE SLOPE IS ACHIEVED WHEN VESSEL IS INSTALLED ON CONCRETE SADDLE. FOUNDATION BOLTS (IN SADDLE) SHALL BE PARALLEL TO VERTICAL PLANE.

NOZZLES AND GASKET FACE OF FLANGES SHALL BE PARALLEL TO VERTICAL PLANE/HORIZONTAL PLANE. TOP SURFACE OF SUPPORT BRACKET SHALL BE PARALLEL TO HORIZONTAL PLANE.

* NOZZLES MAY BE SUITABLY CUT WITH WELD EDGE PREPARATION (WITH SUITABLE COVER) FOR TRANSPORTATION. SUITABLE CUTTING ALLOWANCE IN NOZZLES SHALL BE CONSIDERED TO MAINTAIN THE GIVEN PROJECTION. FINAL ASSEMBLY OF NOZZLES AT SITE SHALL BE BY OTHERS (NOT BY VESSEL FABRICATOR)

NOZZLE/SUMP LOCATION ONE WITH RESPECT TO VERTICAL PLANE



ENGINEERS INDIA LIMITED
NEW DELHI

BHARAT PETROLEUM CORP. LTD.
BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)

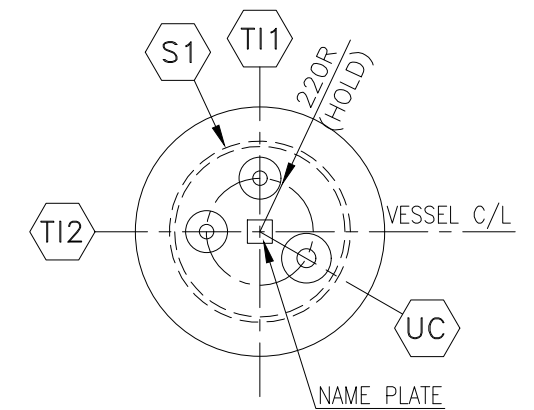
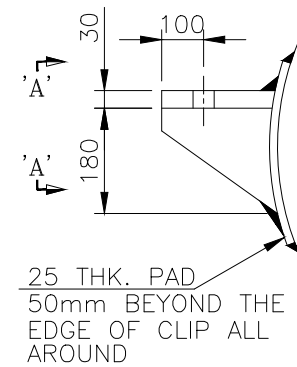
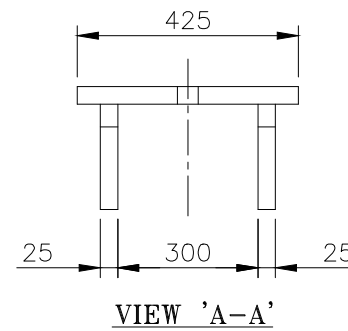
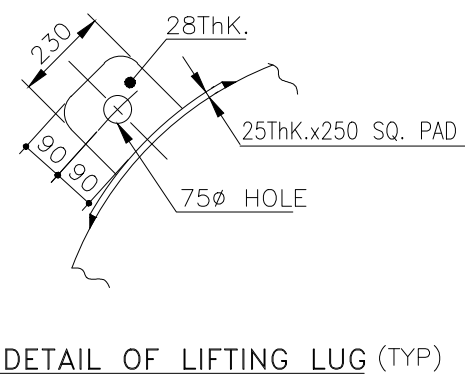
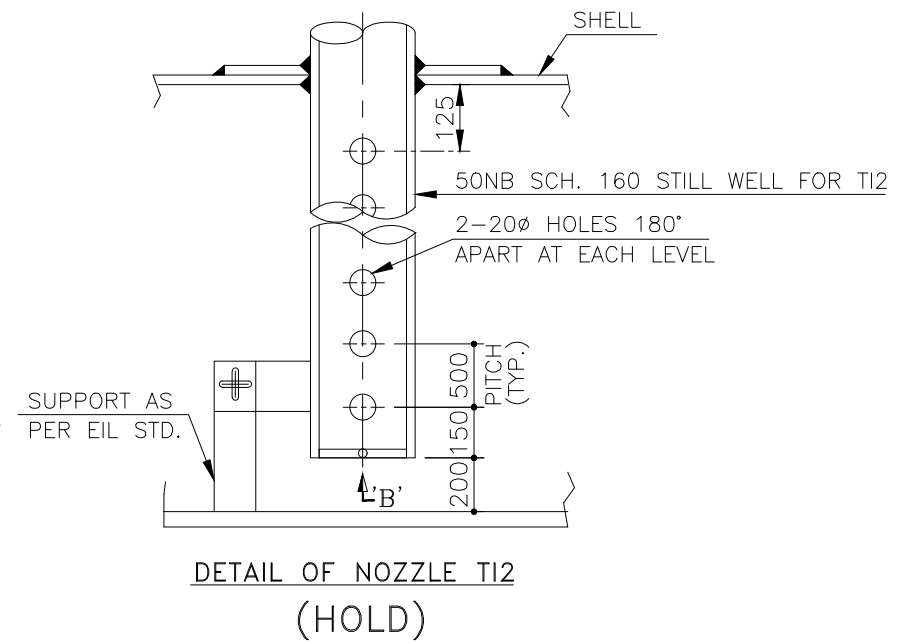
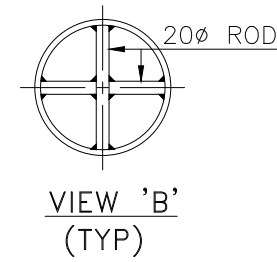
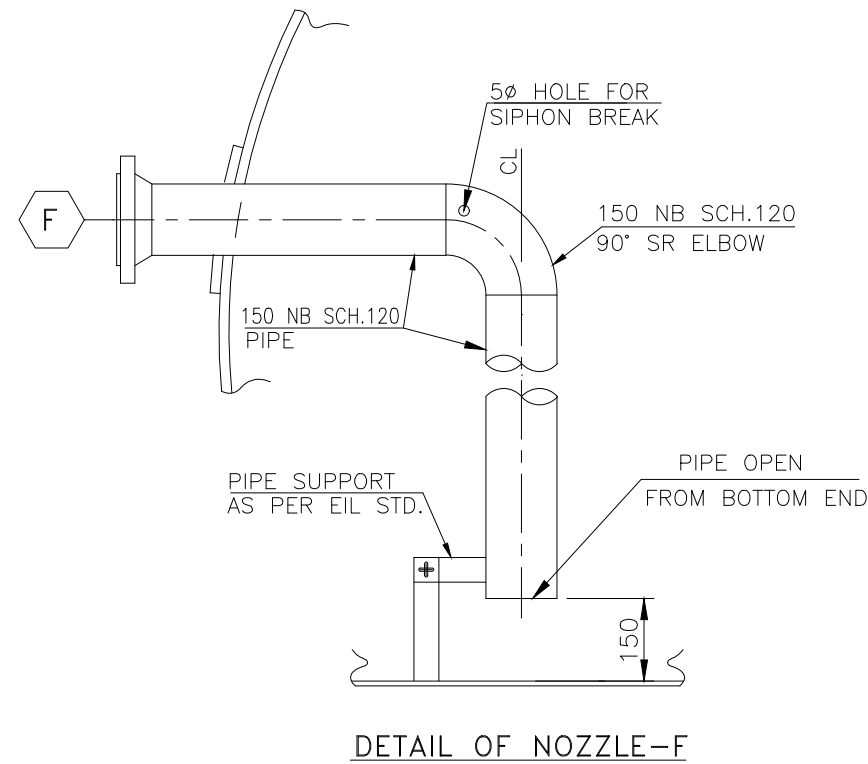
REV.	DATE	ISSUED FOR BIDS/ENGG.	AS	RR/VIVEK	PB
A	09.10.2025	ISSUED FOR BIDS/ENGG.	BY	CHK	APPROVED
		REVISION			APPROVED

VESSEL DESIGN DATA
COLD CONDENSATE RECOVERY DRUM
ITEM NO. 500-VV-HI-005

वेसेल् डिजाइन डेटा
कॉल्ड कन्डेन्सेट रिकवरी ड्रम
आइटम नम्बर 500-वीवी-एचआइ-005

DRAWING NO. B957-500-80-42-DS-3205
REV. A
SHEET 2 OF 3

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ENGINEERS INDIA LIMITED
NEW DELHI

BHARAT PETROLEUM CORP. LTD.
BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)

REV.	DATE	ISSUED FOR BIDS/ENGG.	AS	RR/VIVEK	PB		
		REVISION	BY	CHK	APPROVED	APPROVED	

VESSEL DESIGN DATA
COLD CONDENSATE RECOVERY DRUM
ITEM NO. 500-VV-HI-005

वेसेल डिजाइन डाटा
कोल्ड कन्डेन्सेट रिकवरी ड्रम
आइटम नम्बर 500-वीवी-एचआई-005

DRAWING NO.	REV.
B957-500-80-42-DS-3205	A
SHEET 3 OF 3	

1	EIL JOB NO.		B957	
2	Unit No.		Package Tag	
3	Service of Unit	Maintenance	CUSTOMER	BPCL
			PROJECT	BPREP
			LOCATION	Bina, Madhya Pradesh, India
4	Item no.	*	Quantity	
5	Manufacturer:	*	Model no. :	*
6	<input checked="" type="checkbox"/>	Denotes Applicability		
7	Applicable Specification : IS 3832 along with ammendment Dec 2005 & EIL spec 6-61-0015			
8	Applicable to	Proposal	<input type="checkbox"/>	Purchase
			<input checked="" type="checkbox"/>	As Built
9	OPERATING DATA			
10	Mounting Type:	Hook	<input checked="" type="checkbox"/>	Lug push Trolley
			<input checked="" type="checkbox"/>	Geared Trolley
11	Capacity (T) :	*		
12	Mechanism Class :	M1	<input type="checkbox"/>	M2
			<input checked="" type="checkbox"/>	M3
			<input type="checkbox"/>	M4
13	Factor of Safety:	Min.4		
14	Location :			
15	Area classification :			
16	Overtravel restraint :	Required	<input checked="" type="checkbox"/>	Not required
			<input type="checkbox"/>	
17	Distance between operating level and suspension level,m:	*		
18	Hoist lifting height (minimum) ,m :	*		
19	Headroom(maximum) ,m :	*		
20	Chain pull for hoisting and traversing ,kgs:	*		
21	Location of Lowest point of hand chain loop	0.4 m above operating level		
22	Bottom hook swivelling with thrust bearing:	Yes	<input type="checkbox"/>	No
			<input type="checkbox"/>	
23	MANUFACTURER DATA:			
24	Capacity(T) :	*		
25	Velocity ratio :	*		
26	Range of lift ,m :	*		
27	Headroom ,m:	*		
28	Pull for hoisting under full load ,kgs :	*		
29	Pull for traversing under full load ,kgs :	*		
30	No. of falls (load chain) :	*		
31	Type of Gear :	Spur Gear	<input checked="" type="checkbox"/>	Worm gear
			<input type="checkbox"/>	
32	Type of automatic mechanical load brake :	*		
33	Size and no. of trolley wheel	*		
34	Base material of trolley wheel	*		
35	Hardness (BHN) of trolley wheel base and rim	*		
36	Diameter	*		
37	Bottom hook :	As per IS 15560		
38	Top hook :	As per IS 15560		
39	Load chain trough (Type) :	*		
40	Length of hand chain (hoist and traverse separately) ,m :	For hoist :	*	For traverse :
			*	*
41	Hardness of Ratchet	*		
42	Hardness of pawl	*		
43	F.O.S on load chain :	*		
44	Load chain :	Pitched	<input checked="" type="checkbox"/>	Polished
			<input type="checkbox"/>	
45	Hand Chain :	Pitched	<input checked="" type="checkbox"/>	Polished
			<input type="checkbox"/>	
46	Safety latches on bottom hook :	Required	<input checked="" type="checkbox"/>	Not required
			<input type="checkbox"/>	
47	Safety latches on top hook :	Required	<input checked="" type="checkbox"/>	Not required
			<input type="checkbox"/>	
48	Total weight,kg :	*		
49	MONORAIL DETAILS:	APPLICABLE	<input type="checkbox"/>	NOT APPLICABLE
			<input type="checkbox"/>	
50	Mono Rail Size	*		
51	MATERIALS OF CONSTRUCTION:			
52	Load chain (Hoist) ,T(8) as per IS 6216 :	*		
53	Hand chain (Hoist) , L(3) as per IS 2429 (part 1) :	*		
54	Hand chain (Traverse) :	*		
55	Load chain wheel :	*		
56	Gear (hoist) :	*		
57	Gear (Traverse) :	*		
58	Ratchet wheel, chain guides :	*		
59	Pawl :	*		
60	Hand chain wheel (hoist) :	*		
61	Hand chain wheel (traverse) :	*		
62	Bottom hook :	*		
64	Load chain trough:	*		

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NOZZLES AND CONNECTIONS (नोजल व कनेक्शन)										GENERAL NOTES (जनरल नोट्स)					SPECIFICATIONS (स्पेसिफिकेशन्स)				DESIGN DATA (डिजाइन डाटा)			
MARK	QTY	NOM. DIA	SCH./THK.	FLANGES			PROJECT ON NOTE-4	PAD W x T	SERVICE		1 ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED.	X DENOTES APPLICABILITY					CODE ASME SEC.-VIII DIV.-1 EDITION 2023					
				CLASS	TYPE	FACING			सर्विस	सर्विस												
माक	क्वांटिटी	नामिनल डांघा	शाद्ल व थिकनेस	क्लास	टाईप	फेसिंग	प्रोजेक्शन	पैड	सर्विस	सर्विस												
F	1	150	120	300	WN	RF	SEE DWG.	85 X T	FEED													
V	1	50	160	300	WN	RF	SEE DWG.	-	VENT													
UC	1	50	160	300	WN	RF	SEE DWG.	-	UTILITY CONNECTION													
LI 1-2	2	150 (H)	120	300	WN	RF	SEE DWG.	70XT	LEVEL INSTRUMENT + STILL WELL													
TI1	1	50	160	300	WN	RF	SEE DWG.	-	TEMPERATURE INSTRUMENT													
TI2	1	50	160	300	WN	RF	SEE DWG.	-	TEMPERATURE INSTRUMENT + STILL WELL													
MH	1	600	14 THK.	150	WN	RF	SEE DWG.	250X T	MANHOLE+BF+GASKET+BOLTING+HINGE													
PD 1-2	2	(H)	BY PUMP VENDOR							PUMP DISCHARGE												
P 1-2	2	600 (H)	14 THK.	150	WN	RF	SEE DWG.	250X T	PUMP NOZZLE													
FL	1	50(H)	160	300	WN	RF	SEE DWG.	-	VAPOR CONNECTION TO VRV													
V1	1	150	120	150	WN	RF	SEE DWG.	70XT	VENTILATION + BF GASKET + BOLTING													
S1	1	500	14 THK.	150	WN	RF	SEE DWG.	215xT	MOUNTING NOZZLE BF + GASKET + BOLTING FOR UC, TI1													
S2	1	450	14 THK.	150	WN	RF	SEE DWG.	195xT	MOUNTING NOZZLE BF + GASKET + BOLTING FOR FL, TI2													

T' DENOTES CORRESPONDING SHELL/DISH END NOMINAL THICKNESS									
H' DENOTES (HOLD)									

LICENSOR'S SPECIFICATION					FOUNDATION LOADING DATA (OPERATING CONDITION)				
लाईसेन्सर स्पेसिफिकेशन्स					फाउंडेशन लोडिंग डाटा (ऑपरेटिंग कन्डिशन)				
TYPE		MAX MOMENT AT BASE (M) (kgm)			MAX. SHEAR FORCE AT BASE (H) (kg)				
SEISMIC (DB)		-			-				
WIND		-			-				

UNLESS STATED OTHER WISE										
1 ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED.										
2 ALL ANCHOR BOLT HOLES TO STRADDLE N/S CENTRE LINE.										
3 NORTH DIRECTION WHEREVER SHOWN IS WITH RESPECT TO PLAN VIEW.										
4 (A) FOR NOZZLES ON SHELL PROJECTIONS ARE REFERRED FROM VESSEL CENTER LINE TO FLANGE CONTACT FACE.										
4 (B) FOR NOZZLES ON HEAD PROJECTIONS ARE REFERRED FROM HEAD T.L TO FLANGE CONTACT FACE.										
5 THE INDICATED THICKNESS IS THE MINIMUM ACCEPTABLE AFTER CONSTRUCTION.										
6 FLANGE GASKET FACE SHALL HAVE 125 AARH FINISH.										
7 DIMENSIONS OF FLANGES FOR NOZZLES UPTO 600NB SHALL BE AS PER ASME B16.5 AND FOR NOZZLE ABOVE 600NB SHALL BE AS PER ASME B16.47 SERIES-B UNLESS SPECIFIED OTHERWISE.										
8 ID OF WELD NECK FLANGES SHALL MATCH WITH CORRESPONDING ID OF NOZZLE PIPE/SHELL.										
9 NOZZLES SHALL BE STIFFENED WITH 4 NOS. 100 x 10 THK FLATS AT 90 DEG.APART. MANHOLE,PUMP NOZZLE AND MOUNTING NOZZLES SHALL BE STIFFENED WITH 8 NOS 10THKx R.F PAD WIDE FLATS EQUISPACED.										
10 ALL FABRICATED NOZZLES SHALL BE 100% RADIOGRAPHED.										
11 NOZZLES SHOWN WITH BLIND FLANGES / REDUCING FLANGES SHALL BE PROVIDED WITH BOLTS/NUTS AND GASKETS.										
12 SURFACE PREPARATION, SHOP PRIMER & FINISH PAINT AS PER JOB SPECIFICATION FOR SURFACE PREPARATION AND PROTECTIVE COATING IS IN VENDOR'S SCOPE.EXTERNAL COATING SHALL BE AS PER TABLE 10.2 OF JOB SPECIFICATION.										
13 THE VESSEL SHALL BE LOCATED IN RCC PIT AND SAND PACKED WITH VIBRO COMPRESSION WITH 100mm THK OF LEAN CONCRETE ON TOP (BY OTHERS).										
14 (a) SIZE OF SUMP1-2 & NOZZLE P1-2 IS UNDER HOLD & SHALL BE AS CONFIRMED BY PUMP VENDOR.										
14 (b) PUMP NOZZLE COVER / BLIND FLANGE WITH PUMP ASSEMBLY, NOZZLES PD1-2,BOLTING & GASKET SHALL BE SUPPLIED BY PUMP SUPPLIER.										
15 CATHODIC PROTECTION IS BY OTHERS. HOWEVER,CLIP FOR THE SAME TO BE PROVIDED BY VENDOR.										
16 UNLESS OTHERWISE SPECIFIED MINIMUM THICKNESS OF WELDED/BOLTED CS INTERNAL SHALL BE 12mm. IN CASE OF PIPE AND PIPE FITTINGS SCHEDULE TO BE SELECTED ACCORDINGLY.										
17 VESSEL SHALL BE SUBJECTED TO STEAM OUT CONDITIONS OF 0.5 Kg/Cm ² (g) AT 190 °C.										
18 LIFTING LUG FOR HANDLING OF VESSEL SHALL BE DESIGNED (CONSIDERING IMPACT FACTOR 1.5) AND PROVIDED BY VENDOR. INDICATIVE DETAILS ARE FURNISHED ON SHEET-3.										
19 VESSEL CONTAIN BENZENE, TOLUENE AND XYLENE.										
20 COMPLETE EQUIPMENT SHALL BE POST WELD HEAT TREATED. HARDNESS OF BASE METAL, WELDS AND HAZ AFTER PWHT SHALL BE LIMITED TO VALUES SPECIFIED IN 6-15-0091.										
21 ALL BUTT WELD (CIRCUMFERENTIAL AND LONGITUDINAL SEAMS) IN PRESSURE PART INCLUDING NOZZLE NECK TO FLANGE, PIPE TO PIPE, PIPE TO PIPE FITTING SHALL BE 100% RADIOGRAPHED.										



STANDARDS (स्टैण्डर्ड्स)			
X VESSEL TOLERANCES	7-12-0001		
X SUPPORT FOR HORIZONTAL VESSEL	7-12-0002		
WOODEN PILLOWS FOR SADDLE SUPPORT	7-12-0003		
SKIRT BASE DETAILS	7-12-0004		
SKIRT OPENING DETAILS	7-12-0005		
ANGLE LEG SUPPORT	7-12-0006		
PIPE LEG SUPPORT	7-12-0007		
BRACKET SUPPORT FOR VERTICAL VESSEL	7-12-0008		
X MANHOLE WITH HINGED COVER	7-12-0009		
MANHOLE WITH DAVIT	7-12-0010		
LADDER RUNGS FOR MANHOLE/DEMISTER	7-12-0011		
RETAINING PLATE	7-12-0012		
X NOZZLE REINFORCEMENT AND PROJECTION	7-12-0013		
PAD NOZZLES FOR VESSELS	7-12-0014		
X STANDARD BOLT HOLE ORIENTATION	7-12-0015		
ALLOY LINER DETAILS	7-12-0016		
SIGHT GLASSES FOR PRESSURE VESSELS	7-12-0017		
INTERNAL FLANGES	7-12-0018		
VORTEX BREAKERS	7-12-0019		
INLET DEFLECTOR BAFFLE	7-12-0020		
SUPPORT RING AND BOLTING BAR	7-12-0021		
SUPPORT RING SIZES FOR PACKED TOWERS	7-12-0022		
PIPE DAVIT	7-12-0023		
LIFTING LUG TOP HEAD TYPE	7-12-0024		
FIRE PROOFING AND INSULATION SUPPORTS	7-12-0025		
X EARTHING LUG	7-12-0026		
X NAME PLATE	7-12-0027		
X MANUFACTURER NAME PLATE	7-12-0028		
X BRACKET FOR NAME PLATE	7-12-0029		
NAME PLATE FOR SMALL EQUIPMENT	7-12-0030		
DETAILS OF FORGED NOZZLES	7-12-0031		
X SUPPORTS FOR INTERNAL FEED PIPE	7-12-0032		
HOT INSULATION SUPPORT FOR HORIZONTAL VESSEL	7-12-0033		
PIPE DAVIT SUPPORT FOR COLD INS. VESSELS	7-12-0034		
TYP. DETAILS OF WIRE MESH DEMISTER SUPPORTS	7-12-0036		
S.R NOZZLE NECK	7-12-0037		
X ALLOWABLE NOZZLE LOADS	7-12-0038		
X STILL WELL FOR LEVEL TRANSMITTER (RADAR TYPE) FOR BURIED VESSEL	7-12-0039		

REFERENCE DRAWINGS (रेफरन्स ड्राइंग)	
NOZZLE ORIENTATIONS	
LADDERS/PLATFORM CLEATS	NOT APPLICABLE
PIPE SUPPORT CLEATS	NOT APPLICABLE
TRAY SUPPORT AND BOLTING BARS	NOT APPLICABLE
DEMISTER DATA SHEET	NOT APPLICABLE

CATHODIC PROTECTION REQUIRED	
@ WITHOUT PUMP ASSEMBLY	
SPECIAL SERVICE : BENZENE, TOLUENE, XYLENE	

HOLD UPS (होल्ड अप्स)			
X NOZZLE ORIENTATIONS	X SIZE OF NOZZLES (AS MARKED)		
X NOZZLE ELEVATIONS (AS MARKED)	PIPE SUPPORT CLEATS		
SUPPORT HEIGHT	LADDER/PLATFORM CLEATS		
DETAILS OF INTERNALS	TRAY SUPPORT/BOLTING BARS		
X STILL WELL FOR LI 1-2 & TI2	PIPE DAVIT		
X SUMP DIAMETER, LENGTH	PACKING SUPPORT		
X BURIED HEIGHT			

INDIAN BOILER REGULATIONS (IBR)		DEPARTMENT OF EXPLOSIVES, NAGPUR (CCOE)	
APPROXIMATE WEIGHT (kgs) (PER ITEM) (एप्रोक्सिमेट वजन)			
ERECTION	26000@	OPERATING	70600@
HYDROTEST(SHOP)	86100@	HYDROTEST (FIELD)	86100@
NUMBER OF ITEMS :	ONE		

	ENGINEERS INDIA LIMITED NEW DELHI इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम)		BHARAT PETROLEUM CORP. LTD. BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)																	
	DESIGN DATA			डिजाइन डाटा			DRAWING NUMBER			REV										
AROMATIC BLOWDOWN VESSEL-II													B957-500-80-42-DS-3201			A				
ITEM NO. 500-VV-HI-001													500-वीवी-एचआई-001			SHEET 1 OF 3				

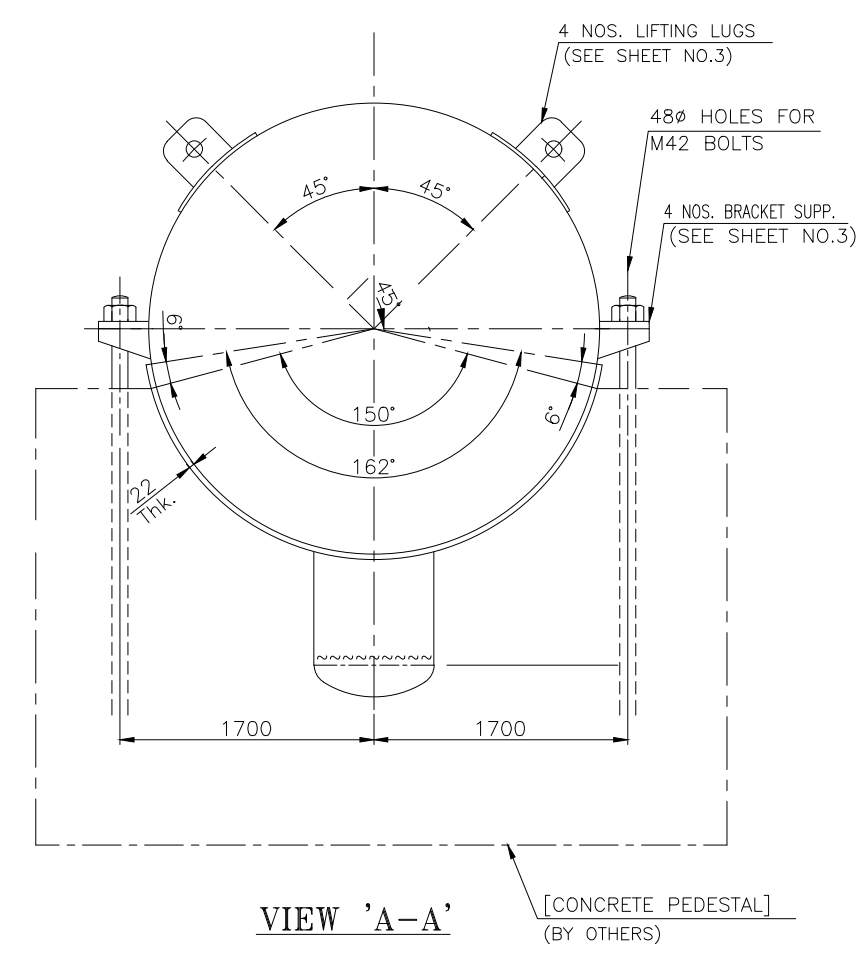
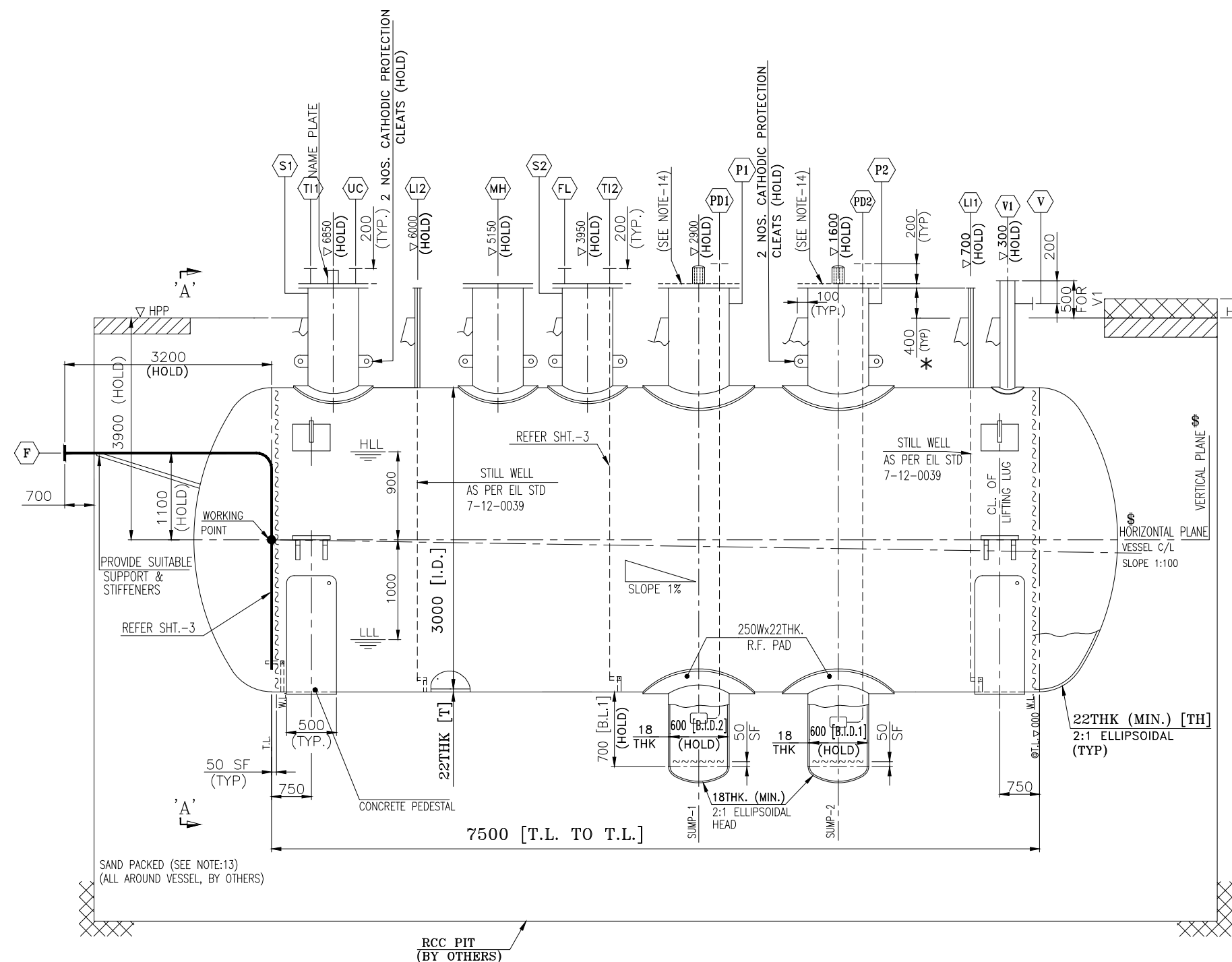
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STRUCTURE SHALL NOTE THAT VESSEL HAS SLOPE OF 1% (1 IN 100) CONCRETE SADDLE HEIGHT SHALL BE MAINTAINED SUCH THAT THE ABOVE SLOPE IS ACHIEVED WHEN VESSEL IS INSTALLED ON CONCRETE SADDLE. FOUNDATION BOLTS (IN SADDLE) SHALL BE PARALLEL TO VERTICAL PLANE.

NOZZLES AND GASKET FACE OF FLANGES SHALL BE PARALLEL TO VERTICAL PLANE/HORIZONTAL PLANE. TOP SURFACE OF SUPPORT BRACKET SHALL BE PARALLEL TO HORIZONTAL PLANE.

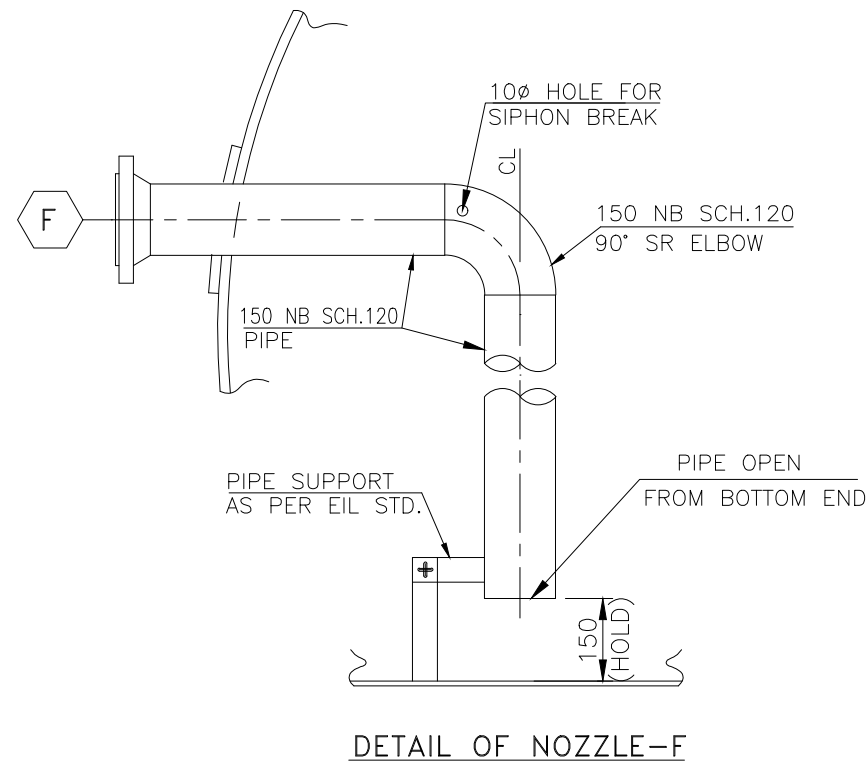
* NOZZLES MAY BE SUITABLY CUT WITH WELD EDGE PREPARATION (WITH SUITABLE COVER) FOR TRANSPORTATION. SUITABLE CUTTING ALLOWANCE IN NOZZLES SHALL BE CONSIDERED TO MAINTAIN THE GIVEN PROJECTION. FINAL ASSEMBLY OF NOZZLES AT SITE SHALL BE BY OTHERS (NOT BY VESSEL FABRICATOR)

NOZZLE/SUMP LOCATION ONE WITH RESPECT TO VERTICAL PLANE

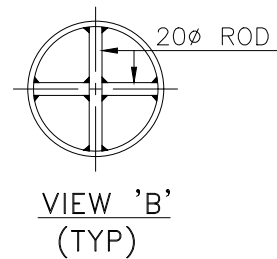


<p>ENGINEERS INDIA LIMITED NEW DELHI</p>	<p>BHARAT PETROLEUM CORP. LTD. BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)</p>	<p>A 09.10.2025 ISSUED FOR BIDS/ENGG.</p>	<p>AS RR/VIVEK</p>	<p>PB</p>	<p>VESEL DESIGN DATA AROMATIC BLOWDOWN VESSEL-II</p>	<p>वेसेल डिजाइन डाटा एरोमैटिक ब्लोडाउन वेसल-II</p>	<p>DRAWING NO. B957-500-80-42-DS-3201</p>	<p>REV. A</p>
		<p>REV. DATE REVISION</p>	<p>BY CHK APPROVED APPROVED</p>	<p>ITEM NO. 500-VV-HI-001</p>	<p>आइटम नम्बर 500-वीवी-एचआई-001</p>	<p>SHEET 2 OF 3</p>	<p>1-1641-0503 REV.0 A3-420x297</p>	

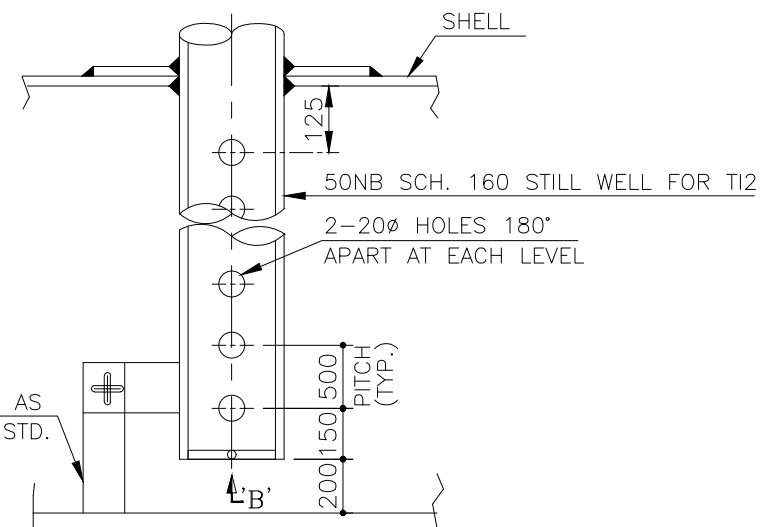
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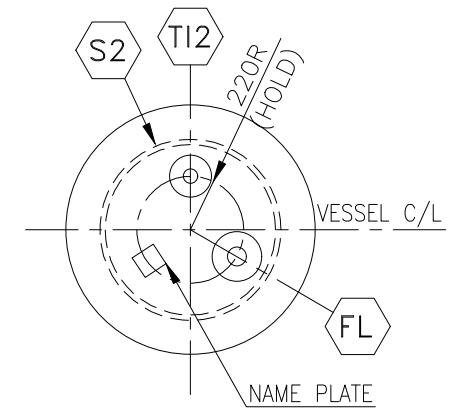
DETAIL OF NOZZLE-F



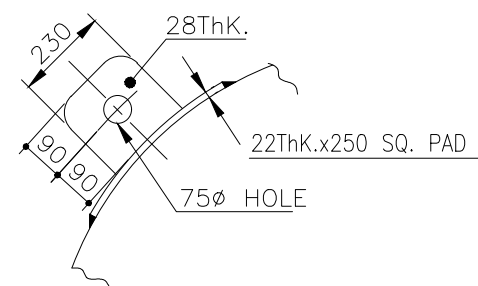
VIEW 'B'
(TYP)



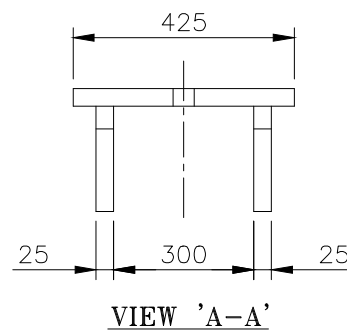
DETAIL OF NOZZLE T12
(HOLD)



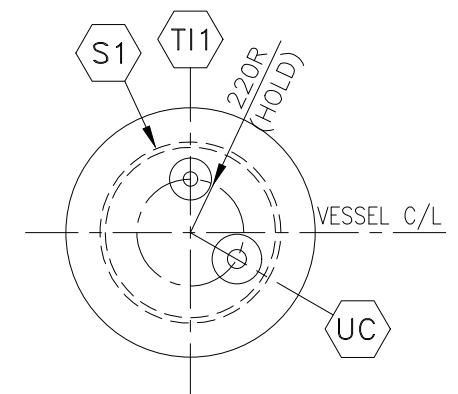
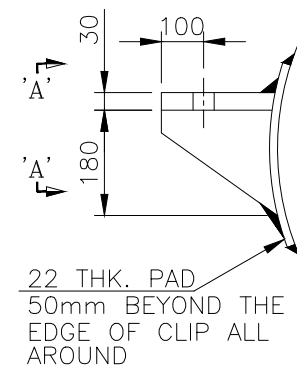
PLAN FOR
MOUNTING NOZZLE S2 (HOLD)
(FOLLOW AS PER NOZZLE ORIENTATION)



DETAIL OF LIFTING LUG (TYP)



DETAIL OF BRACKET SUPPORT (TYP)



PLAN FOR
MOUNTING NOZZLE S1 (HOLD)
(FOLLOW AS PER NOZZLE ORIENTATION)



REV.	DATE	ISSUED FOR BIDS/ENGG.	AS	RR/VIVEK	PB		
		REVISION	BY	CHK	APPROVED	APPROVED	
A	09.10.2025						

VESEL DESIGN DATA
 AROMATIC BLOWDOWN
 VESSEL-II
 ITEM NO. 500-VV-HI-001

वेसेल डिजाइन डाटा
 एरोमैटिक ब्लोडाउन
 वेसल-II
 आइटम नम्बर 500-वीवी-एचआई-001

DRAWING NO.	REV.
B957-500-80-42-DS-3201	A
SHEET 3 OF 3	

Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP	Client	BPCL
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Unit	Bulk Procurement	Location		Job No.	B957	Unit No.	000
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PURCHASER'S DATA

A. Site Conditions			
1.	Maximum Ambient Temperature	°C	48
2.	Minimum Ambient Temperature	°C	1.1
3.	Design Ambient Temperature	°C	45
4.	Relative Humidity	%	86
5.	Altitude Above MSL	mm	<1000
6.	Environment		Hot, humid & corrosive
B. Operating Conditions			
1.	Voltage	kV	6.6 +/- 10 %
2.	Frequency	Hz	50 +/- 5 %
3.	No of phases		Three
4.	System fault level	kA	40
5.	System earthing		Resistance Earthing
6.	Auxiliary supply		
	AC	V	240 +/- 10 %
	DC	V	110 +/- 10 % DC
C. Electrical Data			
1.	Busbar current rating (inside panel at design temp.)		As per Job Specification
2.	1 sec. Short Circuit withstand capacity	kA	40
3.	System Breaking capacity	kA	40
	% D.C. Component		As per IEC
4.	System making capacity	kA(peak)	100
5.	Type of Circuit Breaker		VCB
	Shunt Trip Coil-1 :	V	110 DC
	Shunt Trip Coil-2 :	V	230V AC (Refer Note-3) AC
6.	Duty Cycle of C.B.		O-3min-CO-3min-CO
7.	Suitability for Cap. Switching		Required
8.	Surge supressor for Motor Feeder.		Yes
9.	Provision of earthing		
	Earthing truck		Required
	Earthing switch		Not Required
D. Miscellaneous			
1.	Interface with ECS		Required
2.	Incoming Power Entry		Cable/Bus Duct
3.	Cable Entry		Bottom
4.	Separate bolted removable gland palte for cable entry		Reqd.(Gland Plate Drilled at side)
5.	Cable glands and lugs for cable termination		Included
6.	Paint shade		RAL-7032
7.	Windows at the rear side of panels for thermography		Not Required

MANUFACTURER'S DATA

A. Switchboards			
1.	Make		

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
B	05-DEC-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	20-NOV-2024	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR

Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP		Client BPCL			
Unit Bulk Procurement	Location	Job No. B957	Unit No. 000		
2.	Type designation				
3.	Degree of protection				
4.	Max. overall weight of C.B. panel	Kg			
5.	Overall dimensions of C.B. panel				
	Width	mm			
	Depth	mm			
	Height	mm			
6.	Overall dimensions of dummy /gland palte for cable entry				
	Width	mm			
	Depth	mm			
	Height	mm			
7.	Overall weight and dimensions of largest shipping section				
	Weight	Kg			
	Width	mm			
	Depth	mm			
	Height	mm			
8.	Overall dimensions of each swbd. including all dummy/adaptor/rear extension panels				
	Width	mm			
	Depth	mm			
	Height	mm			
9.	Recommended clearances				
	Front	mm			
	Rear	mm			
	Above	mm			
10.	Shock loading on foundation				
11.	Max. size/no. of cables that can be terminated inside the panel				
	without rear extension panel				
	with rear extension panel				
	size of rear extension panel				
12.	Clearance in air				
	Phase to Phase (min.)	mm			
	Phase to Earth (min.)	mm			
13.	Busbar current rating at design ambient temperature	A			
14.	Busbar (separately for each swbd)				
	(a).Horizontal main busbar size (No. of flats x size of each flat)				
	(b).Horizontal main busbar size as tested at CPRI for full short ckt withstand as per specification requirement (No. of flats x size of each flat)				
	(c).Vertical dropper size (No. of flats x size of each flat)				
15.	Horizontal main busbar/Vertical busbar material				
16.	Insulating material (Busbar supports)				
17.	Earth busbar size				
18.	Earth busbar material				
19.	1 min. power frequency withstand voltage (rms)	kV			
	Over voltage factor for PTs				
20.	Impuse withsatnd voltage (peak)	kV			
B	05-DEC-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	20-NOV-2024	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP			Client	BPCL
Unit	Bulk Procurement	Location		Job No.	B957
				Unit No.	000
	Wave shape of impulse voltage				
21.	1 sec. short ckt. Withstand capacity		kA		
22.	Peak dynamic withstand capacity		kA		
23.	Safety Features				
	(a).Heat shrinkable sleeves, rated to withstand the system line to line voltage for one min., provided on busbar				
	(b).Removable FRP shrouds for all busbar joints and tap-off connections provided				
	(c).Arc propagation barrier in busbar compartment provided				
	(d).Breaker service, test and draw-out position provided				
	(e).Distinct overall lockable door for breaker compartment provided				
	(f).Automatic safety shutter provided				
	(g).Independent pressure release flaps provided for all HV compartments				
	(h).Wire mesh for all louvered openings provided				
	(i).Suitable interlocks to prevent faulty operation as per Cl. 4.4.10 of spec. 6-51-0001 provided				
B.	Circuit Breaker				
1.	Type				
	2nd shunt trip coil for VFD feeders				
2.	Make				
3.	Type Designation				
4.	Circuit Breaker mounting in panel				
5.	No. of poles/phase				
6.	Current rating (in free air)		A		
7.	Current rating inside the panel at specified design temperature		A		
8.	Short time rating (1sec.)		kA		
9.	Symmetrical breaking capacity		kA		
9.1	% D.C. Component				
10.	Peak making current		kA		
11.	1 min. dry withstand voltage (power frequency)		kV		
12.	Duty Cycle				
13.	Total opening time		m sec.		
14.	Total closing time		m sec.		
15.	Power required for opening		W/VA		
16.	Power required for closing		W/VA		
17.	Power required for spring charging motor		W/VA		
18.	Breaker is trip free				
19.	Closing mechanism				
20.	Provision of manual spring charging provided				
21.	Mechanical Trip PB provided				
B	05-DEC-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	20-NOV-2024	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP		Client	BPCL	
Unit	Bulk Procurement	Location	Job No.	B957	Unit No. 000
22.	Mech. On/Off indicator provided				
23.	Operation counter provided				
24.	Time taken for spring charging			sec.	
25.	No. of aux. contacts and their current ratings				
26.	Interrupter				
	(a).Make				
	(b).Pressure switch for monitoring of SF6 gas pressure provided				
	(c).Re-filling arrangement of SF6				
27.	LOTO (Lock-Out Tag-Out) Provision for mechanical locking arrangement				
28.	Supressor				
	Type designation				
	Make				
27.	Derating reqd. for Cap. Switching				
29.	Earthing System				
30.	Copies of following test certificates enclosed				
	For each type of offered circuit breaker panel with breake				
	(a).Short Circuit tests (Peak and 1 sec.withstand)				
	(b).Heat run test				
	(c).Internal arc test				
	(d).Impulse and power freq. withstand				
	For each type of offered circuit breaker (in panel)				
	(a).Short Circuit test duties				

Eil Notes

- Numerical Relays shall be provided. However, wherever specifically mentioned in the MR, electromechanical type relays shall also be provided.
- Vendor shall furnish the dimensins of various types/ratings of swbds., CB panels and dummy/adaptor panels separately.
- For all HV Circuit Breakers feeding HV VFDs, two nos. trip coil shall be provided. 1no. trip coil shall operate on 110V DC supply and other trip coil shall operate on 230V AC UPS supply
- All offered switchboards shall have IAC rating of AFLR 40 kA for 1 Sec
- Variation/ Clarification against the standard specification for HV switchboards 6-51-0001, shall be as per the MoU agreed with EIL by respective HV switchboard manufacturer. No further deviations to tender requirements shall be entertained.

B	05-DEC-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	20-NOV-2024	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

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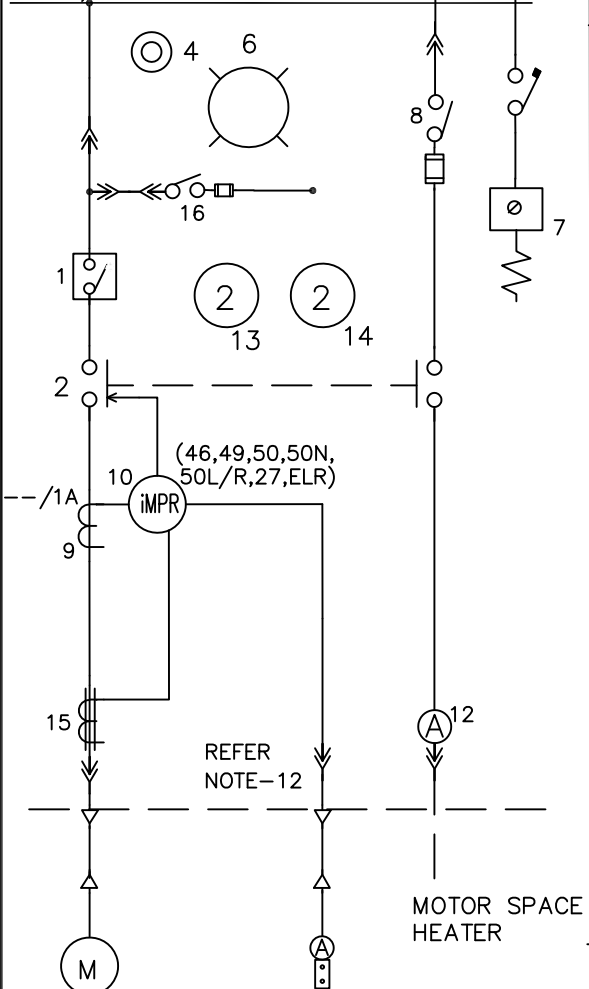
PROJECT: BPREP PROJECT
 CLIENT: M/S BPCL - BINA

REV	DATE	PURPOSE	BY	CHKD	APPRV
C	20.01.2026	ISSUED WITH MR/TENDER	SM	RSR	RSR
B	26.06.2025	ISSUED WITH MR/TENDER	SKANU	MKM	RSR

110 V DC CONTROL SUPPLY BUS
 PT BUS

240V,1PH AC AUX SUPPLY BUS

415V,50HZ TPN BUS



EQUIPMENT DATA			
ITEM NO.	NEMA NO.	QTY.	DESCRIPTION
1	-	1	MCCB WITH SHORT CIRCUIT RELEASE
2	-	1	AIR BREAK CONTACTOR, DUTY-AC3 WITH 2NO+2NC AUXILIARY CONTACTS.
3	-	-	-
4	-	1	STOP PUSH BUTTON
5	-	-	-
6	-	AS REQD	INDICATING LAMPS - LED TYPE
7	-	1	PANEL SPACE HEATER WITH MCB AND THERMOSTAT
8	-	1	DP SWITCH & FUSE FOR MOTOR SPACE HEATER
9	-	3	PROTECTION CT CL-5P20
10	iMPR	1	INTELLIGENT MOTOR PROTECTION RELAY
11	-	AS REQD	AUX.CONTACTORS WITH MIN.2NO+2NC CONTACTS
12	(A)	1	Ammeter
13	2	1	OFF DELAY TIMER (3s-3min)
14	2	1	ON DELAY TIMER (3s-3min) [SEE NOTE-8]
15	-	1	CORE BALANCE CURRENT TRANSFORMER
16	-	1	CONTROL SUPPLY ISOLATION SWITCH & FUSE

NOTES:

1. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN RESPECTIVE JOB SPECIFICATION/STANDARD SPECIFICATION SHALL BE IN VENDOR'S SCOPE.
2. COMPONENT RATING SHALL BE AS PER MV SWITCHBOARD COMPONENT DATA SHEET
3. NO. OF CONTROL TERMINALS PROVIDED SHALL INCLUDE 20% SPARE TERMINALS
4. VA BURDEN OF CTs (EXCEPT METERING CT) SHALL BE DECIDED BY THE SWITCHBOARD VENDOR.
5. INTELLIGENT MOTOR PROTECTION RELAY SHALL BE SUITABLE FOR 110V DC CONTROL SUPPLY.
6. MOTOR FEEDER SHALL BE PROVIDED WITH 4-20mA CURRENT/VOLTAGE/POWER DUAL OUTPUT TRANSDUCERS (AS REQUIRED) FOR FEEDBACK TO DCS.
7. NUMBER OF TIMERS SHALL BE PROVIDED AS PER THE REACCELERATION SCHEME REQUIREMENT
8. iMPR SHALL BE TYPE-2 COORDINATED WITH THE OTHER MV COMPONENTS IN THE FEEDER.
9. iMPR SHALL BE SUITABLE FOR IE-3 MOTORS.
10. DMPR SHALL BE USED IN PLACE OF IMPR FOR FIXED TYPE SWITCHBOARD.
11. SEPARATE CONTROL SWITCH & CONTROL FUSE FOR ISOLATION OF CONTROL SUPPLY IN ALL THE MOTOR FEEDERS SHALL BE PROVIDED. SEPARATE CONTROL SUPPLY FACILITY FROM SPACE HEATER BUS FOR CHECKING MODULE HEALTHINESS IN TEST POSITION SHALL NOT BE PROVIDED.
12. TWO NOS 4-20mA SIGNAL SHALL BE PROVIDED FOR ALL INTELLIGENT MOTOR FEEDERS FOR FIELD AMMETER & DCS EITHER THROUGH INTELLIGENT MOTOR PROTECTION RELAY OR THROUGH SEPARATE CT (IN Y-PHASE) WITH DUAL OUTPUT TYPE CURRENT TRANSDUCER.



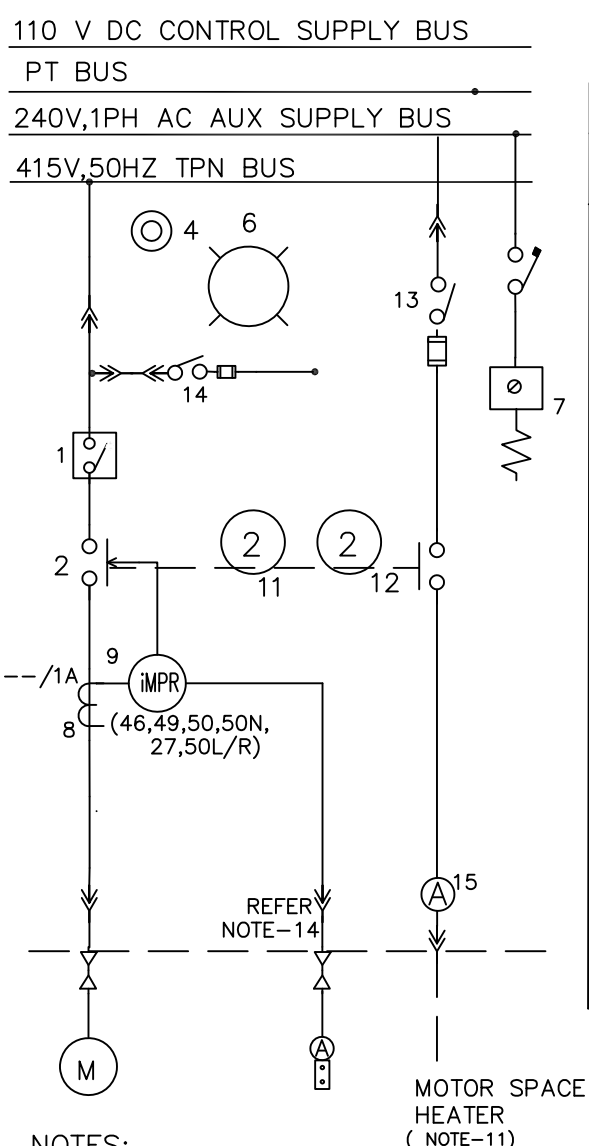
MV SWITCHBOARD DATASHEET
 CONTACTOR CONTROLLED MOTOR FEEDER WITH REACCELERATION FEATURE (FOR MOTORS RATED >30kW & <=45kW)

DATA SHEET	REV
B957-000-16-50-DS-1829	C

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PROJECT: BPREP PROJECT
 CLIENT: M/S BPCL - BINA

REV	DATE	PURPOSE	BY	CHKD	APPRV
C	20.01.2026	ISSUED WITH MR/TENDER	SM	RSR	RSR
B	26.06.2025	ISSUED WITH MR/TENDER	SKANU	MKM	RSR



EQUIPMENT DATA			
ITEM NO.	NEMA NO.	QTY.	DESCRIPTION
1	-	1	MCCB WITH SHORT CIRCUIT RELEASE
2	-	1	AIR BREAK CONTACTOR, DUTY-AC3 WITH 2NO+2NC AUXILIARY CONTACTS.
3	-	-	-
4	-	1	STOP PUSH BUTTON
5	-	-	-
6	-	AS REQD	INDICATING LAMPS - LED TYPE
7	-	1	PANEL SPACE HEATER WITH MCB AND THERMOSTAT
8	-	3	PROTECTION CT CL-5P20
9	iMPR	1	INTELLIGENT MOTOR PROTECTION RELAY
10	-	AS REQD	AUX.CONTACTORS WITH MIN.2NO+2NC CONTACTS
11	2	1	OFF DELAY TIMER (3s-3min)
12	2	1	ON DELAY TIMER (3s-3min)
13	-	1	DP SWITCH & FUSE FOR MOTOR SPACE HEATER
14	-	1	CONTROL SUPPLY ISOLATION SWITCH & FUSE
15	(A)	1	Ammeter

[SEE NOTE-8]

NOTES:

1. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN RESPECTIVE JOB SPECIFICATION/STANDARD SPECIFICATION SHALL BE IN VENDOR'S SCOPE.
2. COMPONENT RATING SHALL BE AS PER MV SWITCHBOARD COMPONENT DATA SHEET
3. NO. OF CONTROL TERMINALS PROVIDED SHALL INCLUDE 20% SPARE TERMINALS
4. VA BURDEN OF CTs (EXCEPT METERING CT) SHALL BE DECIDED BY THE SWITCHBOARD VENDOR.
5. INTELLIGENT MOTOR PROTECTION RELAY SHALL BE SUITABLE FOR 110V DC CONTROL SUPPLY.
6. FIELD AMMETER SHALL BE PROVIDED FOR ALL MOTORS.
7. MOTOR FEEDER SHALL BE PROVIDED WITH 4-20mA CURRENT/VOLTAGE/ POWER DUAL OUTPUT TRANSDUCERS (AS REQUIRED) FOR FEEDBACK TO DCS.
8. NUMBER OF TIMERS SHALL BE PROVIDED AS PER THE REACCELERATION SCHEME REQUIREMENT
9. iMPR SHALL BE TYPE-2 COORDINATED WITH THE OTHER MV COMPONENTS IN THE FEEDER.
10. iMPR SHALL BE SUITABLE FOR IE-3 MOTORS.
11. MOTOR SPACE HEATER CKT. TO BE PROVIDED FOR MOTORS RATED 30kW AND ABOVE.
12. DMPR SHALL BE USED IN PLACE OF IMPR FOR FIXED TYPE SWITCHBOARD.
13. SEPARATE CONTROL SWITCH & CONTROL FUSE FOR ISOLATION OF CONTROL SUPPLY IN ALL THE MOTOR FEEDERS SHALL BE PROVIDED. SEPARATE CONTROL SUPPLY FACILITY FROM SPACE HEATER BUS FOR CHECKING MODULE HEALTHINESS IN TEST POSITION SHALL NOT BE PROVIDED.
14. TWO NOS 4-20mA SIGNAL SHALL BE PROVIDED FOR ALL INTELLIGENT MOTOR FEEDERS FOR FIELD AMMETER & DCS EITHER THROUGH INTELLIGENT MOTOR PROTECTION RELAY OR THROUGH SEPARATE CT (IN Y-PHASE) WITH DUAL OUTPUT TYPE CURRENT TRANSDUCER.



MV SWITCHBOARD DATASHEET
 CONTACTOR CONTROLLED MOTOR FEEDER WITH REACCELERATION FEATURE (FOR MOTORS RATED <=30kW)

DATA SHEET	REV
B957-000-16-50-DS-1828	C

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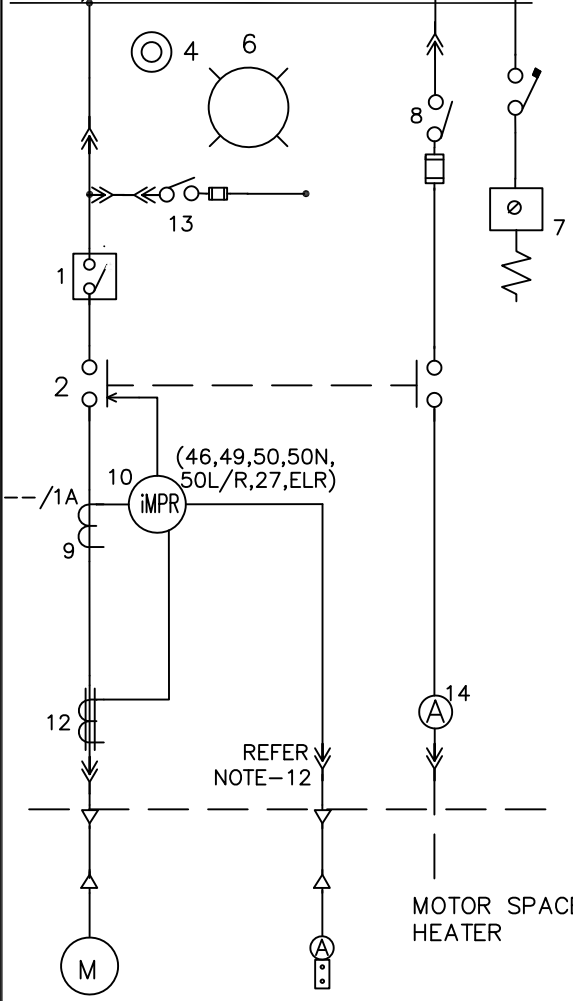
PROJECT: BPREP PROJECT
 CLIENT: M/S BPCL - BINA

REV	DATE	PURPOSE	BY	CHKD	APPRV
C	20.01.2026	ISSUED WITH MR/TENDER	SM	RSR	RSR
B	26.06.2025	ISSUED WITH MR/TENDER	SKANU	MKM	RSR

110V DC CONTROL SUPPLY BUS
 PT BUS

240V,1PH AC AUX SUPPLY BUS

415V,50HZ TPN BUS



EQUIPMENT DATA			
ITEM NO.	NEMA NO.	QTY.	DESCRIPTION
1	-	1	MCCB WITH SHORT CIRCUIT RELEASE
2	-	1	AIR BREAK CONTACTOR, DUTY-AC3 WITH 2NO+2NC AUXILIARY CONTACTS.
3	-	-	-
4	-	1	STOP PUSH BUTTON
5	-	-	-
6	-	AS REQD	INDICATING LAMPS - LED TYPE
7	-	1	PANEL SPACE HEATER WITH MCB AND THERMOSTAT
8	-	1	DP SWITCH & FUSE FOR MOTOR SPACE HEATER
9	-	3	PROTECTION CT CL-5P20 OR CURRENT SENSOR PART OF iMPR MODULE
10	iMPR	1	INTELLIGENT MOTOR PROTECTION RELAY
11	-	AS REQD	AUX.CONTACTORS WITH MIN.2NO+2NC CONTACTS
12	-	1	CORE BALANCE CURRENT TRANSFORMER
13	-	1	CONTROL SUPPLY ISOLATION SWITCH & FUSE
14	(A)	1	Ammeter

NOTES:

1. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN RESPECTIVE JOB SPECIFICATION/STANDARD SPECIFICATION SHALL BE IN VENDOR'S SCOPE.
2. COMPONENT RATING SHALL BE AS PER MV SWITCHBOARD COMPONENT DATA SHEET
3. NO. OF CONTROL TERMINALS PROVIDED SHALL INCLUDE 20% SPARE TERMINALS
4. VA BURDEN OF CTs (EXCEPT METERING CT) SHALL BE DECIDED BY THE SWITCHBOARD VENDOR.
5. INTELLIGENT MOTOR PROTECTION RELAY SHALL BE SUITABLE FOR 110V DC CONTROL SUPPLY.
6. MOTOR FEEDER SHALL BE PROVIDED WITH 4-20mA CURRENT/VOLTAGE/POWER DUAL OUTPUT TRANSDUCERS (AS REQUIRED) FOR FEEDBACK TO DCS.
7. iMPR SHALL BE TYPE-2 COORDINATED WITH THE OTHER MV COMPONENTS IN THE FEEDER.
8. iMPR SHALL BE SUITABLE FOR IE-3 MOTORS.
9. DMPR SHALL BE USED IN PLACE OF IMPR FOR FIXED TYPE SWITCHBOARD.
10. FIELD AMMETER SHALL BE PROVIDED FOR ALL MOTORS.
11. SEPARATE CONTROL SWITCH & CONTROL FUSE FOR ISOLATION OF CONTROL SUPPLY IN ALL THE MOTOR FEEDERS SHALL BE PROVIDED. SEPARATE CONTROL SUPPLY FACILITY FROM SPACE HEATER BUS FOR CHECKING MODULE HEALTHINESS IN TEST POSITION SHALL NOT BE PROVIDED.
12. TWO NOS 4-20mA SIGNAL SHALL BE PROVIDED FOR ALL INTELLIGENT MOTOR FEEDERS FOR FIELD AMMETER & DCS EITHER THROUGH INTELLIGENT MOTOR PROTECTION RELAY OR BUS FOR CHECKING MODULE HEALTHINESS IN TEST POSITION SHALL NOT BE PROVIDED.



MV SWITCHBOARD DATASHEET
 CONTACTOR CONTROLLED MOTOR FEEDER
 (FOR MOTORS RATED >30kW & <=45kW)

DATA SHEET	REV
B957-000-16-50-DS-1827	C

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PROJECT: BPREP PROJECT
 CLIENT: M/S BPCL - BINA

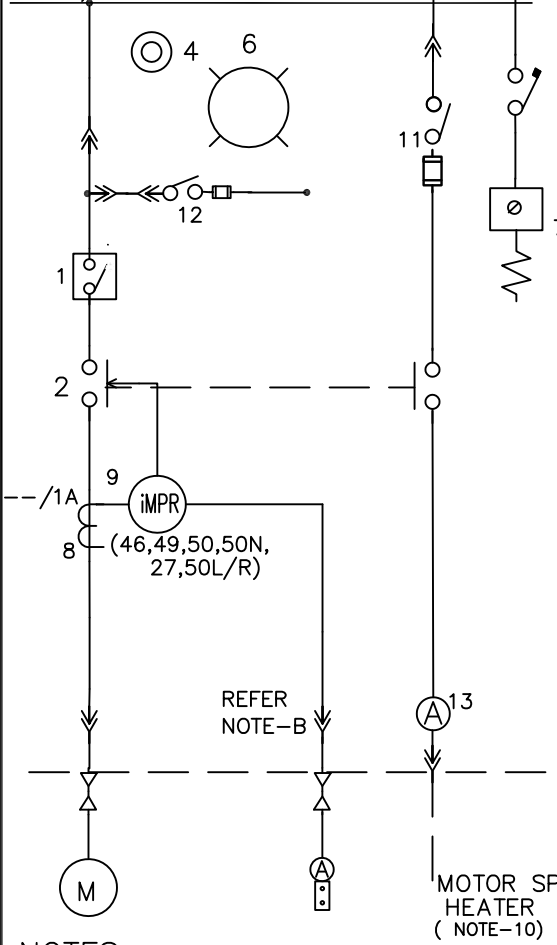
REV	DATE	PURPOSE	BY	CHKD	APPRV
C	20.01.2026	ISSUED WITH MR/TENDER	SM	RSR	RSR
B	26.06.2025	ISSUED WITH MR/TENDER	SKANU	MKM	RSR

110V,DC CONTROL SUPPLY BUS

PT BUS

240V,1PH AC AUX SUPPLY BUS

415V,50HZ TPN BUS



EQUIPMENT DATA			
ITEM NO.	NEMA NO.	QTY.	DESCRIPTION
1	-	1	MCCB WITH SHORT CIRCUIT RELEASE
2	-	1	AIR BREAK CONTACTOR, DUTY-AC3 WITH 2NO+2NC AUXILIARY CONTACTS.
3	-	-	-
4	-	1	STOP PUSH BUTTON
5	-	-	-
6	-	AS REQD	INDICATING LAMPS - LED TYPE
7	-	1	PANEL SPACE HEATER WITH MCB AND THERMOSTAT
8	-	3	PROTECTION CT CL-5P20 OR CURRENT SENSOR (CAN BE PART OF IMPR MODULE)
9	iMPR	1	INTELLIGENT MOTOR PROTECTION RELAY
10	-	AS REQD	AUX.CONTACTORS WITH MIN.2NO+2NC CONTACTS
11	-	1	DP SWITCH & FUSE FOR MOTOR SPACE HEATER
12	-	1	CONTROL SUPPLY ISOLATION SWITCH & FUSE
13	(A)	1	AMMETER

NOTES:

1. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN RESPECTIVE JOB SPECIFICATION/STANDARD SPECIFICATION SHALL BE IN VENDOR'S SCOPE.
2. COMPONENT RATING SHALL BE AS PER MV SWITCHBOARD COMPONENT DATA SHEET
3. NO. OF CONTROL TERMINALS PROVIDED SHALL INCLUDE 20% SPARE TERMINALS
4. VA BURDEN OF CTs (EXCEPT METERING CT) SHALL BE DECIDED BY THE SWITCHBOARD VENDOR.
5. INTELLIGENT MOTOR PROTECTION RELAY SHALL BE SUITABLE FOR 110V DC CONTROL SUPPLY.
6. FIELD AMMETER SHALL BE PROVIDED FOR ALL MOTORS.
7. MOTOR FEEDER SHALL BE PROVIDED WITH 4-20mA CURRENT/VOLTAGE/ POWER DUAL OUTPUT TRANSDUCERS (AS REQUIRED) FOR FEEDBACK TO DCS.
8. IMPR SHALL BE TYPE-2 COORDINATED WITH THE OTHER MV COMPONENTS IN THE FEEDER.
9. IMPR SHALL BE SUITABLE FOR IE-3 MOTORS.
10. MOTOR SPACE HEATER CKT. TO BE PROVIDED FOR MOTORS RATED 30kW AND ABOVE.
11. DMPR SHALL BE USED IN PLACE OF IMPR FOR FIXED TYPE SWITCHBOARD.
12. SEPARATE CONTROL SWITCH & CONTROL FUSE FOR ISOLATION OF CONTROL SUPPLY IN ALL THE MOTOR FEEDERS SHALL BE PROVIDED. SEPARATE CONTROL SUPPLY FACILITY FROM SPACE HEATER BUS FOR CHECKING MODULE HEALTHINESS IN TEST POSITION SHALL NOT BE PROVIDED.
13. TWO NOS 4-20mA SIGNAL SHALL BE PROVIDED FOR ALL INTELLIGENT MOTOR FEEDERS FOR FIELD AMMETER & DCS EITHER THROUGH INTELLIGENT MOTOR PROTECTION RELAY OR THROUGH SEPARATE CT (IN Y-PHASE) WITH DUAL OUTPUT TYPE CURRENT TRANSDUCER.



MV SWITCHBOARD DATASHEET
 CONTACTOR CONTROLLED MOTOR FEEDER
 (FOR MOTORS RATED <=30kW)

DATA SHEET	REV
B957-000-16-50-DS-1826	C

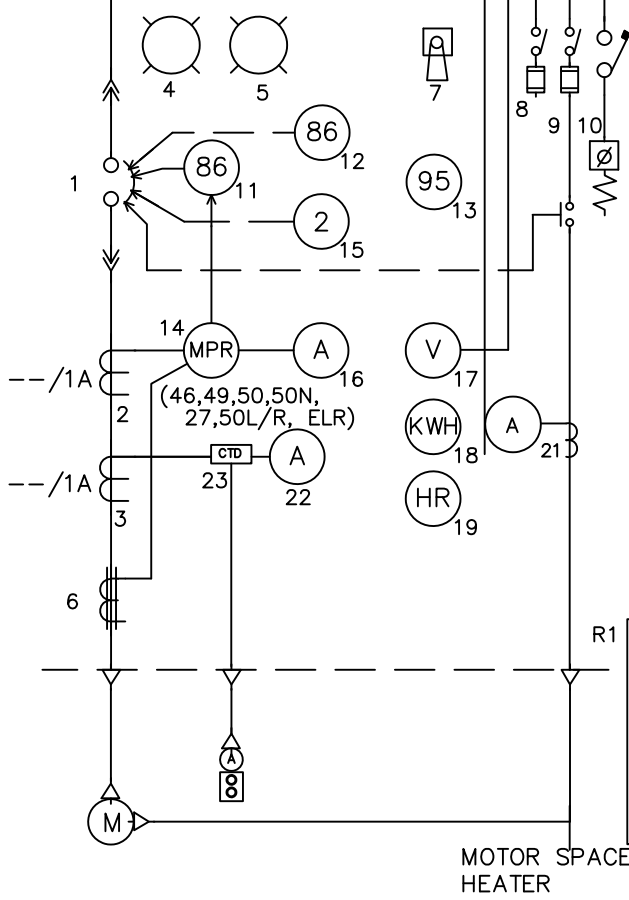
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PROJECT: BPREP PROJECT
CLIENT: M/S BPCL - BINA

REV	DATE	PURPOSE	BY	CHKD	APPRV
C	20.01.2026	ISSUED WITH MR/TENDER	SM	RSR	RSR
B	26.06.2025	ISSUED WITH MR/TENDER	SKANU	MKM	RSR

PT BUS

D.C POWER SUPPLY BUS (110V)
240V, 1PH AC AUX. SUPPLY BUS
415V, 50Hz TPN BUS



EQUIPMENT DATA

ITEM NO.	NEMA NO.	QTY.	DESCRIPTION
1	52	1	AIR CIRCUIT BREAKER
2	-	3	PROTECTION CT CL-5P10
3	-	1	METERING CT CL-1.0 15VA
4	-	AS REQ	INDICATING LAMPS (LED TYPE) AND CUBICLE LAMP
5	-	1	TRIP CKT. HEALTHY INDICATION LAMP LAMP(LED TYPE)
6	-	1	CORE BALANCE CURRENT TRANSFORMER
7	52C/S	1	BREAKER CONTROL SWITCH CLOSE-NEUTRAL -TRIP (LOCKABLE WITH SPRING RETURN TO NEUTRAL)
8	-	1	DP SWITCH FUSE 10A FOR DC SUPPLY
9	-	1	DP SWITCH & FUSE FOR MOTR SPACE HEATER SUPPLY THROUGH BREAKER AUXILLARY CONTACT
10	-	1	PANEL SPACE HEATER WITH MCB & THERMOSTAT
11	86	1	TRIPPING RELAY (VAJH)
12	86	1	TRIPPING RELAY FOR TRIP THROUGH PROCESS SIGNAL. (VAJS)
13	95	1	TRIP CIRCUIT SUPERVISION RELAY
14	MPR	1	MOTOR PROTECTION RELAY WITH ELR & TIMER
15	2	2	ON DELAY AND OFF DELAY TIMERS FOR AUTO REACCELERATION
16	-	1	AMMETER
17	-	1	VOLTMETER
18	-	1	KWH METER
19	-	1	HOUR RUN METER
20	-	AS REQ	AUXILLIARY RELAYS
21	-	1	AMMETER FOR MOTOR SPACE HEATER WITH CL-1 CT
22	-	1	ANALOG AMMETER WITH 4 WAY SELECTOR SWITCH DUAL TYPE CURRENT TRANSDUCER & ACCESSORIES FOR CURRENT INDICATION IN LCS AMMETER & DCS/PLC (Y-PHASE)
23	-	1Set	

R1 -PART OF NUMERICAL RELAY-1

NOTES:

- ANTIPUMPING RELAY USED, IF ANY, SHALL BE CONSIDERED AS PART OF BREAKER MECHANISM.
- THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN SPECIFICATION 6-51-18 SHALL BE IN VENDOR'S SCOPE.
- FOR THE OTHER REQUIREMENTS OF RELAYS AND METERS, REFER JOB SPECIFICATION.
- ALL PROTECTIVE RELAYS (EXCEPT TRIPPING RELAYS [86] AND TRIP CIRCUIT SUPERVISION RELAY [95]) SHALL BE NUMERICAL TYPE OF APPROVED MAKES. METERING SHALL BE A PART OF NUMERICAL RELAY.
- AUTO REACCELERATION FEATURE WITH INHIBIT TO BE PROVIDED AS STANDARD.
- VA BURDEN OF CTs (EXCEPT METERING CT) SHALL BE DECIDED BY THE SWITCHBOARD VENDOR.
- MOTOR FEEDER SHALL BE PROVIDED WITH 4-20mA CURRENT/VOLTAGE/POWER DUAL OUTPUT TRANSDUCERS (AS REQUIRED) FOR FEEDBACK TO DCS.
- THERE SHALL BE ONE COMMON CONTROL SWITCH FOR ALL CONTROL SUPPLY FEEDER. SEPARATE FUSES FOR FOLLOWING BRANCH CIRCUIT SHALL BE PROVIDED:
 - SPRING CHARGING CIRCUIT
 - CLOSING CIRCUIT
 - TRIPPING, CONTACT MULTIPLIER & DIGITAL INPUT CIRCUIT
 - INDICATION CIRCUIT
 - NUMERICAL RELAY SUPPLY (INCOMING OF NUMERICAL RELAY SUPPLY FUSE SHALL BE TAPPED BEFORE THE CONTROL SUPPLY SWITCH)
- METERING FACILITIES SHALL BE PROVIDED IN SWITCHBOARD PANELS FOR SPACE HEATER CURRENT.



ENGINEERS INDIA LIMITED
NEW DELHI

M.V. SW. BD. DATA SHEET
BREAKER CONTROLLED
MOTOR FEEDER

(FOR MOTOR RATED >=55kW AND <=132kW)

DATA SHEET

B957-000-16-50-DS-1825
Sheet 1 of 1

REV

C

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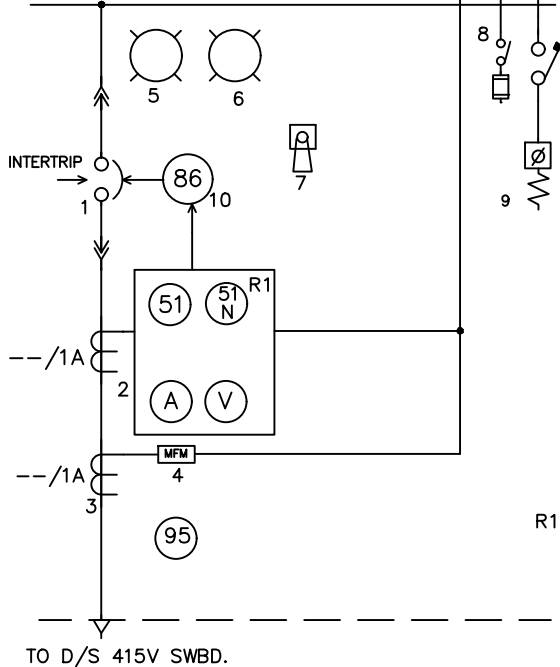
PROJECT: BPREP PROJECT	REV	DATE	PURPOSE	BY	CHKD	APPRV
CLIENT: M/S BPCL - BINA	A	20.11.2024	ISSUED WITH MR/TENDER	SONALI	SK	RSR

PT BUS

D.C POWER SUPPLY BUS (110V)

240V, 1PH AC AUX. SUPPLY BUS

415V, 50Hz TPN BUS



EQUIPMENT DATA

ITEM NO.	NEMA NO.	QTY.	DESCRIPTION
1	52	1	AIR CIRCUIT BREAKER
2	-	3	PROTECTION CT CL-5P20
3	-	3	METERING CT CL-1.0 Δ B
4	-	1	MULTIFUNCTION METER (MFM)
5	-	AS REQ	INDICATING LAMP AND CUBICLE LAMPS, (LED TYPE)
6	-	1	TRIP CKT. HEALTHY INDICATION LAMP LAMP(LED TYPE)
7	52C/S	1	BREAKER CONTROL SWITCH CLOSE-NEUTRAL -TRIP(LOCKABLE WITH SPRING RETURN TO NEUTRAL)
8	-	1	DP SWITCH FUSE 10A FOR DC SUPPLY
9	-	1	PANEL SPACE HEATER WITH MCB & THERMOSTAT
10	86	1	TRIPPING RELAY (VAJH TYPE)
11	95	1	TRIP CIRCUIT SUPERVISION RELAY
12	51 & 51N	1	IDMTL O/C RELAY
13	-	1	AMMETER
14	-	1	VOLTMETER
15	-	AS REQD.	AUXILLIARY RELAYS

R1 -PART OF NUMERICAL RELAY-1

NOTES:

- ANTIPUMPING RELAY USED, IF ANY, SHALL BE CONSIDERED AS PART OF BREAKER MECHANISM.
- THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN SPECIFICATION 6-51-18 SHALL BE IN VENDOR'S SCOPE.
- FOR THE OTHER REQUIREMENTS OF RELAYS AND METERS, REFER JOB SPECIFICATION
- FOR THE REQUIREMENTS OF ECS INTERFACE, REFER I/O LIST ENCLOSED SEPARATELY IN M.R/TENDER.
- ALL PROTECTIVE RELAYS SHALL BE NUMERICAL, COMMUNICABLE TYPE OF APPROVED MAKES. METERING SHALL BE PART OF NUMERICAL RELAY. EXCEPT TRIPPING RELAY [86] AND TRIP CIRCUIT SUPERVISION RELAY [95].
- VA BURDEN OF CTs SHALL BE DECIDED BY THE SWITCHBOARD VENDOR.
- THERE SHALL BE ONE COMMON CONTROL SWITCH FOR ALL CONTROL SUPPLY FEEDER. SEPARATE FUSES FOR FOLLOWING BRANCH CIRCUIT SHALL BE PROVIDED:
 - SPRING CHARGING CIRCUIT
 - CLOSING CIRCUIT
 - TRIPPING, CONTACT MULTIPLIER & DIGITAL INPUT CIRCUIT
 - INDICATION CIRCUIT
 - NUMERICAL RELAY SUPPLY (INCOMING OF NUMERICAL RELAY SUPPLY FUSE SHALL BE TAPPED BEFORE THE CONTROL SUPPLY SWITCH)



ENGINEERS INDIA LIMITED
NEW DELHI

M.V. SW. BD. DATA SHEET
OUTGOING BREAKER
FEEDER

DATA SHEET

B957-000-16-50-DS-1824
Sheet 1 of 1

REV

A

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**TYPICAL INTERCONNECTION-MV
SYSTEM**


(B957-000-16-50-DS-1805)

PROJECT: BPREP

CLIENT: M/s BPCL- BINA REFINERY

Notes

- a.) Typical interconnection details has been indicated. Vendor shall furnish detailed interconnection details in line with MR requirements during detailed engineering.

Rev.	Date	Subject	Prepared By	Checked	Approved
A	25.11.2024	Issued With MR	SK	MKM	RSR
		Project : BPREP Client : M/s BPCL-BINA	Typical MV Interconnection Details		Rev A

Interconnection for Incomer, LPT, BPT, Bus Coupler Feeder										
S. No.	CABLE TAG	FROM			SIZE	CORE	TO			REMARKS / PURPOSE
		SWBD	PNL	TERMINAL			SWBD	PNL	TERMINAL	
1	Incomer from Transformer	Upstream Trafo feeder		@@	12Px2.5	1P-1	MV switchboard incomer		---	64R + 51G Operated in I/C
				@@		1P-2			---	
				@@		2P-1			---	Upstream Close Permissive (Breaker shall Close if I/C ACB off in service)
				@@		2P-2			---	
				@@		3P-1			---	Intertrip (Upstream Breaker off shall trip I/C VCB)
				@@		3P-2			---	
				@@		4P-1			---	Incomer shall close only if Upstream is ON
				@@		4P-2			---	
				@@		5P-1			---	Trip Upstream breaker from Trip Switch in I/C Switchboard
				@@		5P-2			---	
				@@		6P-1			---	86 Operated in I/C
				@@		6P-2			---	
				@@		7P-1			---	Upstream ON Indication to I/C Switchboard
				@@		7P-2			---	
				@@		8P-1			---	Upstream OFF Indication to I/C Switchboard
				@@		8P-2			---	
				@@		9P-1			---	86 Operated in Upstream Indication to I/C Switchboard
				@@		9P-2			---	
				@@		10P-1			---	Transformer Trouble Indication to I/C Switchboard
				@@		10P-2			---	
---	11P-1	---	Spare							
---	11P-2	---								
---	12P-1	---	Spare							
---	12P-2	---								
2	Incomer from Transformer	SWBD Tag	@@	@@	3P X 2.5	1P-1	Transformer	MBCC	---	64R CT Signal
				@@		1P-2			---	
				@@		2P-1			---	Spare
				@@		2P-2			---	
				---		3P-1			---	Spare
				---		3P-2			---	

Interconnection for Incomer, LPT, BPT, Bus Coupler Feeder											
S. No.	CABLE TAG	FROM			SIZE	CORE	TO			REMARKS / PURPOSE	
		SWBD	PNL	TERMINAL			SWBD	PNL	TERMINAL		
3	Incomer from Transformer	SWBD Tag	@@	@@	3P X 2.5	1P-1	ECSIFP		##	Breaker OFF in Service	
				@@		1P-2			##		
				@@		2P-1			##		Breaker ON in Service
				@@		2P-2			##		
				@@		3P-1			##		
				@@		3P-2			##		
4	Incomer from Transformer	SWBD Tag	@@	@@	3P X 2.5	1P-1	ECSIRP		##	Trip from ECS	
				@@		1P-2			##		
				@@		2P-1			##	Close Inhibit due to load shedding	
				@@		2P-2			##		
				---		3P-1			---	Spare	
				---		3P-2			---		
5	Incomer from Transformer	SWBD Tag	@@	@@	1P X 2.5	1P-1	ECSIFP		##	Line PT MCB Off	
				@@		1P-2			##		
6	Bus coupler	SWBD Tag	@@	@@	12P x 2.5	1P-1	ECSIFP		##	Breaker OFF in Service	
				@@		1P-2			##		
				@@		2P-1			##	Breaker ON in Service	
				@@		2P-2			##		
				@@		3P-1			##	Spare	
				@@		3P-2			##		
				@@		4P-1			##	A-I-M selector in auto mode	
				@@		4P-2			##		
				@@		5P-1			##	A-I-M selector in independent mode	
				@@		5P-2			##		
				@@		6P-1			##	A-I-M selector in manual mode	
				@@		6P-2			##		
				@@		7P-1			##	DC control supply #1 Failed	
				@@		7P-2			##		
				@@		8P-1			##	DC control supply #2 Failed	
				@@		8P-2			##		
				@@		9P-1			##	Spare	
				@@		9P-2			##		
				@@		10P-1			##	AC space heater supply #1 Failed	
				@@		10P-2			##		
				@@		11P-1			##	AC space heater supply #2 Failed	
				@@		11P-2			##		
				@@		12P-1			##	Spare	
				@@		12P-2			##		

Interconnection for Incomer, LPT, BPT, Bus Coupler Feeder										
S. No.	CABLE TAG	FROM			SIZE	CORE	TO			REMARKS / PURPOSE
		SWBD	PNL	TERMINAL			SWBD	PNL	TERMINAL	
1	Bus coupler	SWBD Tag	@@	@@	4P X 2.5	1P-1	ECSIRP		##	Trip from ECS
				@@		1P-2			##	
				@@		2P-1			##	Close Inhibit due to load shedding
				@@		2P-2			##	
				---		3P-1			---	Spare
				---		3P-2			---	
2	Bus PT	SWBD Tag	@@	@@	2P X 2.5	1P-1	ECSIFP		##	Bus PT-A MCB Off
				@@		1P-2			##	
3	Bus PT	SWBD Tag	@@	@@	2P X 2.5	1P-1	ECSIFP		##	Bus PT-B MCB Off
				@@		1P-2			##	

S. No.	CABLE TAG	FROM			SIZE	CORE	TO			REMARKS / PURPOSE							
		SWBD	PNL	TERMINAL			SWBD	PNL	TERMINAL								
INTERCONNECTION DRAWING FOR PCC O/G FEEDER																	
1	OG ACB feeder	SWBD Tag	@@	@@	3P X 2.5	1P-1	ECSIFP		##	Breaker OFF in Service							
				@@		1P-2			##								
				@@		2P-1			##		Breaker ON in Service						
				@@		2P-2			##								
				@@		3P-1			##			86 Operated					
				@@		3P-2			##								
2	OG ACB feeder	SWBD Tag	@@	@@	3P X 2.5	1P-1	ECSIRP		##	ECS Trip							
				@@		1P-2			##								
				@@		2P-1			##		Close Inhibit due to load shedding						
				@@		2P-2			##								
				@@		3P-1			##			Spare					
				@@		3P-2			##								
3	OG ACB feeder	SWBD Tag	@@	@@	3P X 2.5	1P-1	Downstream swbd tag		@@	Upstream Close permissive							
				@@		1P-2			@@								
				@@		2P-1			@@	upstream Off trip							
				@@		2P-2			@@								
				@@		3P-1			@@	Downstream Close permissive							
				@@		3P-2			@@								
				@@		4P-1			@@	Downstream 86 Not Operated							
				@@		4P-2			@@								
				---		5P-1			---	Spare							
				---		5P-2			---								
				---		6P-1			---	Spare							
				---		6P-2			---								
				INTERCONNECTION DRAWING FOR LIGHTING FEEDER													
				1		LTGTR feeder			SWBD Tag	@@	@@	1P X 2.5	1P-1	LTGTR	MB	\$\$	Over Temperature Trip
@@	1P-2	\$\$															

S. No.	CABLE TAG	FROM			SIZE	CORE	TO			REMARKS / PURPOSE
		SWBD	PNL	TERMINAL			SWBD	PNL	TERMINAL	

INTERCONNECTION DRAWING FOR MV MOTOR (PCC)										
1		@@	@@	@@	6P X 2.5	1P-1	TO MOTOR	LCS	1	Stop
				@@		1P-1			2	
				@@		2P-1			3	
				@@		2P-2			4	
				@@		3P-1			15	
				@@		3P-2			16	
				@@		4P-1			5	
				@@		4P-2			6	
				@@		5P-1			7	
				---		5P-2			---	
				---		6P-1			---	
				---		6P-2			---	
				---					---	
				---					---	
2		@@	@@	@@	6P X 2.5	1P-1	ECSIFP		##	Breaker OFF in Service
				@@		1P-2			##	
				@@		2P-1			##	
				@@		2P-2			##	
				@@		3P-1			##	
				@@		3P-2			##	
				@@		4P-1			##	
				@@		4P-2			##	
				---		5P-1			---	
				---		5P-2			---	
				---		6P-1			---	
				---		6P-2			---	
				---					---	
				---					---	
3		@@	@@	@@	3P X 2.5	1P-1	ECSIFP		##	Trip from ECS
				@@		1P-2			##	
				@@		2P-1			##	
				@@		2P-2			##	
				---		3P-1			---	
				---		3P-2			---	
				---					---	
				---					---	
4		@@	@@	@@	3P X 2.5	1P-1	DCS STATUS		##	Run Status
				@@		1P-2			##	
				@@		2P-1			##	
				@@		2P-2			##	
				---		3P-1			---	
				---		3P-2			---	
				---					---	
				---					---	

S. No.	CABLE TAG	FROM			SIZE	CORE	TO			REMARKS / PURPOSE
		SWBD	PNL	TERMINAL			SWBD	PNL	TERMINAL	
5		@@	@@	@@	3P X 2.5	1P-1	DCS COMMAND	##		Stop from DCS
				@@		1P-2		##		
				@@		2P-1		##		Start from DCS
				@@		2P-2		##		
				@@		3P-1		##		Start Permissive from DCS
				@@		3P-2		##		
6		@@	@@	@@	2Px2.5	1P-1	DCS	##		4-20mA current indication
				@@		1P-2		##		
				@@		2P-1		##		Start Permissive from DCS
				@@		2P-2		##		
7		@@	@@	@@	2C X 2.5	1	Space Heater	\$\$		Space Heater
				@@		2		\$\$		

INTERCONNECTION DRAWING FOR MV MOTOR (MCC)

1		@@	@@	@@	6P X 2.5 / 4Px2.5	1P-1	TO MOTOR	LCS	1		Stop
				@@		1P-1			2		
				@@		2P-1			3		Start
				@@		2P-2			4		
				@@		3P-1			15		Ammeter
				@@		3P-2			16		
				@@		4P-1			5		Local Selection
				@@		4P-2			6		Common
				@@		5P-1			7		Remote Selection
				---		5P-2			---		SPARE
				---		6P-1			---		
				---		6P-2			---		
				---					---		
				2					@@		@@
@@	1P-2	##									
@@	2P-1	##	ON in Service Indication								
@@	2P-2	##									
@@	3P-1	---	SPARE								
@@	3P-2	---									

S. No.	CABLE TAG	FROM			SIZE	CORE	TO			REMARKS / PURPOSE
		SWBD	PNL	TERMINAL			SWBD	PNL	TERMINAL	
3		@@	@@	@@	3P X 2.5	1P-1	ECSIFP		##	Trip from ECS
				@@		1P-2			##	
				@@		2P-1			##	ON inhibit from ECS
				@@		2P-2			##	
				@@		3P-1			---	SPARE
				@@		3P-2			---	
4		@@	@@	@@	3P X 2.5	1P-1	DCS STATUS		##	Run Status
				@@		1P-2			##	
				@@		2P-1			##	Fault / Trip Indication
				@@		2P-2			##	
				@@		3P-1			---	SPARE
				@@		3P-2			---	
5		@@	@@	@@	3P X 2.5	1P-1	DCS COMMAND		##	Stop from DCS
				@@		1P-2			##	
				@@		2P-1			##	Start from DCS
				@@		2P-2			##	
				@@		3P-1			---	Start Permissive
				@@		3P-2			---	
6				---	1P X 2.5	1P-1	Emergency Push button		---	Emergency Push button
				---		1P-2			---	
7		@@	@@	@@	2C X 2.5	1	Space Heater		1	Space Heater
				@@		2			2	

S. No.	FROM			CABLE SIZE	CABLE NO.	CORE NO.	TO		WINDOW DESCRIPTION
	SWBD. NO.	PANEL. NO.	TERMINAL NO.				MB NO.	TERMINAL NO.	
1	LDB	@@	'@@	3Px2.5		1P-1	ECSIRP	##	LIGHTING ON
			'@@			1P-2		##	
			'@@			2P-1		##	LIGHTING OFF
			'@@			2P-2		##	
			'@@			3P-1		---	Spare
			'@@			3P-2		---	
2	LDB feeder	@@	'@@	1Px2.5		1P-1	ECSIFP	##	LIGHTING ON STATUS
			'@@			1P-2		##	
3	LDB	@@	'@@	3Px2.5		1P-1	LIGHTING PUSH BUTTON	\$\$	SWGR HALL LIGHT REMOTE ON
			'@@			1P-2		\$\$	
			'@@			2P-1		\$\$	SWGR HALL REMOTE OFF
			'@@			2P-2		\$\$	
			'@@			3P-1		---	Spare
			'@@			3P-2		---	

TYPICAL ECS & SCAP I/O LIST FOR ELECTRICAL CONTROL SYSTEM MV SWITCHBOARD

PROJECT : BPREP PROJECT
OWNER : M/s BPCL.
EPMC : ENGINEERS INDIA LTD.

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	05-11-2024	ISSUED WITH MR/TENDER	SK	MKM	RSR

ECS I/O list for the 415V PCC/EPCC/MCC in substations

ECS I/O List

Typ e	Pt type	Description	Set condition	Reset condition	Interface	
Incomer (from transformer) I/O signals						
AI	A	R phase current			RELAY LAN	
AI	A	Y phase current			RELAY LAN	
AI	A	B phase current			RELAY LAN	
AI	W	3-phase real power			RELAY LAN	
AI	R	3-phase reactive power			RELAY LAN	
AI		Power factor			RELAY LAN	
DI	S	CB in service & Closed	Closed	Not closed	Hardwired	
DI	S	CB in service & Open	Open	Not open	Hardwired	
DO	C	Trip from ECS	Activated	Reset	Hardwired	
DO	C	Close Inhibit (From ECS)	Operated	Reset	Hardwired	
DI	D	Relay 95	Operated	Reset	RELAY LAN	
DI	D	Trip on under-voltage	Activated	Reset	RELAY LAN	
DI	D	Numerical Relays	Unhealthy	Healthy	RELAY LAN	
DI	S	Transformer trouble	Activated	Reset	RELAY LAN	
DI	D	Relay 86	Operated	Reset	Hardwired	
DI	D	Over Temperature monitoring system	Operated	Reset	Hardwired	
Line PT I/O signals						
AI	V	R-Y line voltage			RELAY LAN	
AI	V	Y-B line voltage			RELAY LAN	
AI	V	B-R line voltage			RELAY LAN	
DI	D	Line VT MCB	Open	Closed	Hardwired	
Incomer from other switchboards I/O signals						
AI	A	R phase current			RELAY LAN	
AI	A	Y phase current			RELAY LAN	
AI	A	B phase current			RELAY LAN	
AI	W	3-phase real power			RELAY LAN	
AI	R	3-phase reactive power			RELAY LAN	
AI		Power factor			RELAY LAN	
DI	S	CB in service & Closed	Closed	Not closed	Hardwired	
DI	S	CB in service & Open	Open	Not open	Hardwired	
DO	C	Trip from ECS	Activated	Reset	Hardwired	

Typ e	Pt type	Description	Set condition	Reset condition	Interface	
DO	C	Close Inhibit (From ECS)	Operated	Reset	Hardwired	
DI	D	Relay 95	Operated	Reset	RELAY LAN	
DI	D	Trip on under-voltage	Activated	Reset	RELAY LAN	
DI	D	Numerical Relay	Unhealthy	Healthy	RELAY LAN	
DI	D	Relay 86	Operated	Reset	Hardwired	
DI	D	Over Temperature monitoring system	Operated	Reset	Hardwired	
Bus coupler I/O signals						
AI	A	R phase current			RELAY LAN	
AI	A	Y phase current			RELAY LAN	
AI	A	B phase current			RELAY LAN	
AI	W	3-phase Real power			RELAY LAN	
AI	R	3-phase Reactive power			RELAY LAN	
AI		Power factor			RELAY LAN	
DI	S	CB in service & Closed	Closed	Not closed	Hardwired	
DI	S	CB in service & Open	Open	Not open	Hardwired	
DO	C	Trip from ECS	Activated	Reset	Hardwired	
DO	C	Close Inhibit (From ECS)	Operated	Reset	Hardwired	
DI	D	Relay 95	Operated	Reset	RELAY LAN	
DI	D	Auto-changeover	Blocked	Not blocked	RELAY LAN	
DI	D	Numerical Relay	Unhealthy	Healthy	RELAY LAN	
DI	D	Trip from under voltage	Activated	Reset	RELAY LAN	
DI	S	Switchboard (A-I-M selector switch)	In auto mode	Not in auto mode	Hardwired	
DI	S	Switchboard (A-I-M selector switch)	In independent mode	Not in indep mode	Hardwired	
DI	S	Switchboard (A-I-M selector switch)	In manual mode	Not in manual mode	Hardwired	
DI	D	DC control supply #1	Failed	Healthy	Hardwired	
DI	D	DC control supply #2	Failed	Healthy	Hardwired	
DI	D	AC space heater supply #1	Failed	Healthy	Hardwired	
DI	D	AC space heater supply #2	Failed	Healthy	Hardwired	
DI	D	Relay 86	Operated	Reset	Hardwired	
Bus PT I/O signals						
AI	V	R-Y bus voltage			RELAY LAN	
AI	V	Y-B bus voltage			RELAY LAN	
AI	V	B-R bus voltage			RELAY LAN	

Typ e	Pt type	Description	Set condition	Reset condition	Interface	
DI	D	Bus PT MCB	Open	Closed	Hardwired	
DI	D	UF & df/dt Signal	Open	Closed	Hardwired (4 Nos)	
Outgoing ACB feeder I/O signals						
AI	A	R phase current			RELAY LAN	
AI	A	Y phase current			RELAY LAN	
AI	A	B phase current			RELAY LAN	
AI	W	Real power			RELAY LAN	
AI	R	Reactive Power			RELAY LAN	
AI		Power factor			RELAY LAN	
DI	S	CB in service & Closed	Closed	Not closed	Hardwired	
DI	S	CB in service & Open	Open	Not open	Hardwired	
DI	C	Trip from ECS	Activated	Reset	Hardwired	
DO	C	Close Inhibit (From ECS)	Operated	Reset	Hardwired	
DI	D	Relay 95	Operated	Reset	RELAY LAN	
DI	D	Numerical Relay	Unhealthy	Healthy	RELAY LAN	
DI	D	Trip from under voltage	Activated	Reset	RELAY LAN	
DI	D	Relay 86	Operated	Reset	Hardwired	
Outgoing ACB motor feeder I/O signals						
AI	A	R phase current			RELAY LAN	
AI	A	Y phase current			RELAY LAN	
AI	A	B phase current			RELAY LAN	
AI	W	Real power			RELAY LAN	
AI	R	Reactive Power			RELAY LAN	
AI		Power factor			RELAY LAN	
DI	S	Ready To Close			RELAY LAN	
DI	S	49T/50/50LR			RELAY LAN	
DI	S	Earth Fault			RELAY LAN	
DI	S	Unbalance			RELAY LAN	
DI	S	Under voltage Trip			RELAY LAN	
DI	S	Re-Acceleration			RELAY LAN	
DI	S	Reverse Blocking activated			RELAY LAN	
DI	S	Process Trip	Operated	Reset	RELAY LAN	
DI	S	CB in service & Closed	Closed	Not closed	Hardwired	
DI	S	CB in service & Open	Open	Not open	Hardwired	
DI	S	Motor Trip from Process	Operated=1		Hardwired	
DO	C	Trip from ECS	Activated	Reset	Hardwired	

Typ e	Pt type	Description	Set condition	Reset condition	Interface	
DO	C	Close Inhibit (From ECS)	Operated	Reset	Hardwired	
DI	D	Relay 86	Operated	Reset	Hardwired	
Central Lighting Control (For each LDB/ELDB)						
DO	C	Lighting feeder ' ON'	Activated	Reset	Hardwired	
DO	C	Lighting feeder ' OFF'	Activated	Reset	Hardwired	
UPS System						
DI	D	UPS Charger – 1/1	Failure	Normal	Hardwired	
DI	D	UPS Inverter – 1/1	Failure	Normal	Hardwired	
DI	S	UPS load on Invertor – 1/1	Operated	Reset	Hardwired	
DI	D	UPS Fan Failure - 1/1	Fault	Normal	Hardwired	
DI	D	UPS Fault – 1/1	Fault	Normal	Hardwired	
AI	A	UPS Current – 1/1			Hardwired	4-20mA through transducers in UPS
AI	V	UPS Voltage – 1/1			Hardwired	
DI	D	UPS Charger – 1/2	Failure	Normal	Hardwired	
DI	D	UPS Inverter – 1/2	Failure	Normal	Hardwired	
DI	S	UPS load on Invertor – 1/2	Operated	Reset	Hardwired	
DI	D	UPS Fan Failure - 1/2	Fault	Normal	Hardwired	
DI	D	UPS Fault – 1/2	Fault	Normal	Hardwired	
AI	A	UPS Current – 1/2			Hardwired	4-20mA through transducers in UPS
AI	V	UPS Voltage – 1/2			Hardwired	
DI	S	UPS load on bypass supply – 1	Operated	Reset	Hardwired	
DI	D	UPS Battery – 1	Discharged	Normal	Hardwired	
DI	D	UPS Battery – 1	Isolated	Normal	Hardwired	
DI	D	UPS Battery Bank Monitoring System Alarm – 1	Operated	Reset	Hardwired	
DI	D	UPS Charger – 2/1	Failure	Normal	Hardwired	
DI	D	UPS Inverter – 2/1	Failure	Normal	Hardwired	
DI	S	UPS load on Invertor – 2/1	Operated	Reset	Hardwired	
DI	D	UPS Fan Failure - 2/1	Fault	Normal	Hardwired	
DI	D	UPS Fault – 2/1	Fault	Normal	Hardwired	
AI	A	UPS Current – 2/1			Hardwired	4-20mA through transducers in UPS
AI	V	UPS Voltage – 2/1			Hardwired	
DI	D	UPS Charger – 2/2	Failure	Normal	Hardwired	
DI	D	UPS Inverter – 2/2	Failure	Normal	Hardwired	
DI	S	UPS load on Invertor – 2/2	Operated	Reset	Hardwired	
DI	D	UPS Fan Failure – 2/2	Fault	Normal	Hardwired	
DI	D	UPS Fault – 2/2	Fault	Normal	Hardwired	
AI	A	UPS Current – 2/2			Hardwired	4-20mA through transducers in UPS
AI	V	UPS Voltage – 2/2			Hardwired	
DI	S	UPS load on bypass supply – 2	Operated	Reset	Hardwired	
DI	D	UPS Battery – 2	Discharged	Normal	Hardwired	
DI	D	UPS Battery – 2	Isolated	Normal	Hardwired	
DI	D	UPS Battery Bank Monitoring System Alarm –	Operated	Reset	Hardwired	

Typ e	Pt type	Description	Set condition	Reset condition	Interface	
		2				
DC System						
DI	D	DC supply Charger – 1	Failure	Normal	Hardwired	
DI	D	Battery discharged – 1	Discharged	Charged	Hardwired	
DI	D	Battery set Isolated – 1	Isolated	Connected	Hardwired	
DI	D	Charger Boost Charging – 1	Boost charging	Float Charging	Hardwired	
DI	D	DC Battery Bank Monitoring System Alarm – 1	Operated	Reset	Hardwired	
DI	D	DC Earth Fault relay DCDB Bus – 1	Failure	Normal	Hardwired	
DI	D	DC supply Charger – 2	Failure	Normal	Hardwired	
DI	D	Battery discharged – 2	Discharged	Charged	Hardwired	
DI	D	Battery set Isolated – 2	Isolated	Connected	Hardwired	
DI	D	Charger Boost Charging – 2	Boost charging	Float Charging	Hardwired	
DI	D	DC Battery Bank Monitoring System Alarm – 2	Operated	Reset	Hardwired	
DI	D	DC Earth Fault relay DCDB Bus – 2	Failure	Normal	Hardwired	
VFD System (Non Redundant)						
Di	S	VFD Running			Hardwired	
DI	S	VFD Trip			Hardwired	
AI	A	VFD R phase current			Serial	
AI	A	VFD Y phase current			Serial	
AI	A	VFD B phase current			Serial	
AI	W	VFD 3-Phase Real Power			Serial	
AI	R	VFD 3-Phase Reactive Power			Serial	
AI		VFD Speed			Serial	
AI	A	Excitation Current Channel-1 (For Sync Motor with excitation system)			Serial	
AI	A	Excitation Current Channel-2 (For Sync Motor with excitation system)			Serial	
VFD System (Redundant)						
Di	S	VFD Running - 1			Hardwired	
DI	S	VFD Trip - 1			Hardwired	
DI	S	VFD Ready to start - 1			Hardwired	
Di	S	VFD Running – 2			Hardwired	
DI	S	VFD Trip – 2			Hardwired	
DI	S	VFD Ready to start – 2			Hardwired	
DI	D	PLC Status – 1	Unhealthy	Healthy	Hardwired	

Typ e	Pt type	Description	Set condition	Reset condition	Interface	
DI	D	PLC Status – 2	Unhealthy	Healthy	Hardwired	
AI	A	Running VFD R phase current			Serial	
AI	A	Running VFD Y phase current			Serial	
AI	A	Running VFD B phase current			Serial	
AI	W	Running VFD 3-Phase Real Power			Serial	
AI	R	Running VFD 3-Phase Reactive Power			Serial	
AI		Running VFD Speed			Serial	
AI	A	Excitation Current Channel-1 (For Sync Motor with excitation system)			Serial	
AI	A	Excitation Current Channel-2 (For Sync Motor with excitation system)			Serial	
Building HVAC System						
DI	D	Building VAM System Common Alarm	Operated	Reset	Hardwired	
AI	T	Switchgear Hall/Battery Charger Room/UPS Room/VFD Room Temperature			Hardwired 4-20mA through transducers/transmitter	
Common Signals						
DO	C	Load Shedding	Operated	Reset	Hardwired	
DO	S	Load Shedding operated	Operated	Reset	Serial Interface signal for DCS	

Notes

- 1.0 Acquisition of input/output (I/O) signals as hardwired or software:
 - a) All numerical relays shall be connected to ECS-RTU. ECS shall acquire relay and metering status I/O signals of the relays. These I/O signals have been indicated as “relay and metering LAN” in the typical I/O list above.
 - b) All other I/Os shall be acquired hardwired and have been indicated as “hardwired” in the typical I/O list above. All hardwired signals shall be wired and terminated in respective panels.
 - c) In case any of these data cannot be acquired over the relay LAN, these signals have to be provided as hardwired. For requirement of numerical relays, refer Electrical part of contract document.
- 2.0 This I/O list is indicative only. Any other I/O required for meeting the contract requirements shall be identified and provided by CONTRACTOR.
- 3.0 Transformer oil temperature and transformer winding temperature shall be acquired hardwired from 66kV power transformers only. These I/Os shall be acquired as a 4-20 mA signal from the

transformer.

Guidelines for ECS I/O Interface Design

Analogue Input Signals	<p>Signal transducers for hard-wired analogue inputs shall have accuracy class 0.1 for the range 0-120%. All transducers shall be externally-powered types. External power supply shall be 230V AC UPS.</p> <p>For all measurements for I, V, MW, MVAR, Hz, obtained on the relay and metering LAN, maximum possible accuracy shall be ensured</p>
Digital Input Signals	
Alarm (D)	<p>Alarm is a signal which requires operator to be alerted such as VT circuit MCB (closed, open), relays 86 & 95 (operated, reset), auto-changeover (blocked, not blocked), DC control supply (healthy, failed), line voltage (unhealthy, healthy), bus voltage (unhealthy, healthy), motor trip from process, under-voltage trip. This shall be hardwired / on relay LAN as specified.</p> <p>For hardwired signal, potential free contacts of rating 1 A, 110V DC or 240 V AC, make to alarm (NO) preferred. CONTRACTOR shall specifically indicate if NC contact is being provided in place of NO contact.</p> <p>Generally a hardwired alarm point is put under "sequence of event" monitoring</p>
Status (S)	<p>For hardwired signal, potential free contacts of rating 1 A, 110V DC or 240 V AC, make to alarm (NO) required</p>
Digital Output Signals	
Command (C)	<p>Hardwired through potential free changeover type contact of interposing relay, contact rating 5 A, 240 V AC and/or 4 A, 110V DC. Coil rating shall be 24 V DC</p>

FEEDER TYPE	MOTOR RATING KW	COMPONENT RATING (A)			
		DMPR	CT RATIO	MCCB	CONTACTOR
FVNR-15 FVR-15 FVNR-15HD	≤5.5	DMPR (46,50,49,27,50N & 50LR)	15/1	32	15
FVNR-30 FVR-30 FVNR-30HD	5.5 < KW ≤11	DMPR (46,50,49,27,50N & 50LR)	30/1	63	30
FVNR-60 FVR-60 FVNR-60HD	11 < KW ≤22	DMPR (46,50,49,27,50N & 50LR)	60/1	125	60
FVNR-100 FVR-100 FVNR-100HD	22 < KW ≤45	DMPR (46,50,49,27,50N,50LR & ELR)	100/1 (See note-1)	250	100
FVNR-150 FVR-150 FVNR-150HD	45 < KW ≤55	MOTOR PROTECTION RELAY (46,50,49,27,50N,50LR & ELR)	150/1	ACB	
ACB Feeder	55 < KW ≤160	MOTOR PROTECTION RELAY (46,50,49,27,50N,50LR & ELR)	200/1, 300/1	ACB	
MCCB with shunt trip -32A	MCCB	32A MCCB WITH O/C, S/C & E/F RELEASES	-	16/32	--
MCCB, Contactor - 32A	MCCB	32A MCCB WITH O/C & S/C RELEASES	-	16/32	32
MCCB with shunt trip -63A	MCCB	63A MCCB WITH O/C, S/C & E/F RELEASES	-	63	--
MCCB, Contactor, -63A	MCCB	63A MCCB WITH O/C & S/C RELEASES	-	63	63
MCCB, Contactor, -125A	MCCB	125A MCCB WITH O/C & S/C RELEASES	-	125	125
MCCB, Contactor, -160A	MCCB	160A MCCB WITH O/C & S/C RELEASES	--	160	160
MCCB, Contactor, CBCT & ELR -250A	MCCB	250A MCCB WITH O/C & S/C RELEASES	250/1	250	250
MCCB, Contactor, CBCT & ELR -400A	MCCB	400A MCCB WITH O/C & S/C RELEASES	400/1	400	400

NOTES:

1. CBCT + ELR SHALL BE PROVIDED FOR MOTORS RATED ABOVE 30 KW TO 45 KW.
2. CT FOR FIELD AMMETERS SHALL BE PROVIDED IN Y PHASE.
3. CT FOR METERING SHALL BE PROVIDED FOR ALL MOTOR RATINGS.
4. DIGITAL MPR SHALL BE PROVIDED FOR ALL MOTORS
5. DMPR PROVIDED FOR MOTORS SHALL BE OF NON-COMMUNICABLE TYPE.
6. TYPICAL MCCB & CONTACTOR RATING ARE SPECIFIED ABOVE FOR MOTOR FEEDERS RATED UPTO 45KW. FINAL MCCB RATINGS, CONTACTOR RATING AND BIMETAL RANGE (DMPR) SHALL BE SELECTED BY THE MANUFACTURER MEETING THE TYPE -2 CO-ORDINATION AS PER IS/IEC-60947.
7. MAJOR COMPONENTS ARE SHOWN ABOVE, ALL OTHER ITEMS AS SPECIFIED IN EQUIPMENT DATA SHEET AND SPECIFICATION: 6-51-0012 SHALL ALSO BE IN VENDOR'S SCOPE.
8. MULTIFUNCTION METER SHALL BE PROVIDED IN ALL FEEDERS & SHALL BE NON-COMMUNICABLE TYPE.
9. RCCB SHALL BE PROVIDED IN OUTGOING FEEDERS OF LDB/ ASB FOR LP/ PP.

B	06.08.2025	REVISED & ISSUED WITH MR/TENDER	SM	RSR	RSR
A	20.11.2024	ISSUED WITH MR/TENDER	SK	RSR	RSR
Rev. No	Date	Purpose	Prepared by	Checked by	Approved by

DATA SHEET FOR MEDIUM VOLTAGE SWITCHBOARD COMPONENTS						
FEEDER TYPE	MOTOR RATING KW	MAX. CABLE SIZE	COMPONENT RATING (A)			
			IMPR	CT RATIO	MCCB	CONTACTOR
FVNR-15 FVR-15 FVNR-15HD	≤5.5	3*16	IMPR (46,50,49,27,50N & 50LR)	15/1	32	15
FVNR-30 FVR-30 FVNR-30HD	5.5 < KW ≤11	3*35	IMPR (46,50,49,27,50N & 50LR)	30/1	63	30
FVNR-60 FVR-60 FVNR-60HD	11 < KW ≤22	3*70	IMPR (46,50,49,27,50N & 50LR)	60/1	125	60
FVNR-100 FVR-100 FVNR-100HD	22 < KW ≤45	3*150	IMPR (46,50,49,27,50N,50LR & ELR)	100/1 (See note-1)	250	100
ACB Feeder	45 < KW ≤55	3*185	MOTOR PROTECTION RELAY (46,50,49,27,50N,50LR & ELR)	150/1	ACB	
ACB Feeder	55 < KW ≤132	3*3*240	MOTOR PROTECTION RELAY (46,50,49,27,50N,50LR & ELR)	200/1, 300/1	ACB	
MCCB with shunt trip -32A	MCCB	3.5*50	32A MCCB WITH O/C, S/C & E/F RELEASES	-	16/32	--
MCCB, Contactor - 32A	MCCB	3.5*50	32A MCCB WITH O/C & S/C RELEASES	-	16/32	32
MCCB with shunt trip -63A	MCCB	3.5*95	63A MCCB WITH O/C, S/C & E/F RELEASES	-	63	--
MCCB, Contactor, -63A	MCCB	3.5*95	63A MCCB WITH O/C & S/C RELEASES	-	63	63
MCCB, Contactor, -125A	MCCB	2*3.5*120	125A MCCB WITH O/C & S/C RELEASES	-	125	125
MCCB, Contactor, -160A	MCCB	2*3.5*185	160A MCCB WITH O/C & S/C RELEASES	--	160	160
MCCB, Contactor, CBCT & ELR -250A	MCCB	2*3.5*300	250A MCCB WITH O/C & S/C RELEASES	250/1	250	250
MCCB, Contactor, CBCT & ELR -400A	MCCB	3*3.5*300	400A MCCB WITH O/C & S/C RELEASES	400/1	400	400

NOTES:

1. CBCT + ELR SHALL BE PROVIDED FOR MOTORS RATED ABOVE 30 KW TO 45 KW.
2. CT WITH DUAL TYPE CURRENT TRANSDUCER (FOR 4-20MA CURRENT SIGNAL) FOR FIELD AMMETER TO BE PROVIDED FOR ALL ACB FED MOTORS. FURTHER, 4-20MA SIGNAL SHALL BE ALSO PROVIDED FOR ALL INTELLIGENT MOTOR FEEDERS FOR FIELD AMMETER EITHER THROUGH MOTOR RELAY AS PART OF INTELLIGENT MODULE OR SEPARATE CT WITH DUAL TYPE CURRENT TRANSDUCER. CT FOR FIELD AMMETERS SHALL BE PROVIDED IN Y PHASE.
3. INTELLIGENT MPR SHALL BE PROVIDED FOR ALL MOTORS
4. IMPR PROVIDED FOR MOTORS SHALL BE OF COMMUNICABLE TYPE.
5. TYPICAL MCCB & CONTACTOR RATING ARE SPECIFIED ABOVE FOR MOTOR FEEDERS RATED UPTO 45KW. FINAL MCCB RATINGS, CONTACTOR RATING AND BIMETAL RANGE (DMPR) SHALL BE SELECTED BY THE MANUFACTURER MEETING THE TYPE -2 CO-ORDINATION AS PER IS/IEC-60947.
6. MAJOR COMPONENTS ARE SHOWN ABOVE, ALL OTHER ITEMS AS SPECIFIED IN EQUIPMENT DATA SHEET AND SPECIFICATION: 6-51-0018 SHALL ALSO BE IN VENDOR'S SCOPE.
7. MULTIFUNCTION METER SHALL BE PROVIDED IN ALL FEEDERS & SHALL BE COMMUNICABLE TYPE.
8. RCCB SHALL BE PROVIDED IN OUTGOING FEEDERS OF LDB/ ASB FOR LP/ PP.

B	22.01.2026	ISSUED WITH TENDER	SKANU	MKM	RSR
A	13.11.2024	ISSUED WITH TENDER	SK	RSR	RSR
Rev. No	Date	Purpose	Prepared by	Checked by	Approved by

Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP	Client	BPCL
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Unit	Bulk Procurement	Location		Job No.	B957	Unit No.	000
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PURCHASER'S DATA

A. Site Conditions		
1.	Maximum Ambient Temperature	°C 48
2.	Minimum Ambient Temperature	°C 1.1
3.	Design Ambient Temperature	°C 45
4.	Relative Humidity	% 86
5.	Altitude Above MSL	m <1000
6.	Environment	Hot, humid & corrosive
B. Operating Conditions		
1.	Voltage	V 415 +/- 10 TPN
2.	Frequency	Hz 50 +/- 5 %
3.	No of phases	Three
4.	System fault level	kA 65 (for LDB, refer Note-9)
5.	System earthing	Solidly Earthed
6.	Auxiliary supply	
	AC	V 240 +/- 10 % SPN
	DC	V 110 +/- 10 % DC
7.	Power supply for spring charging motor	V 110 DC
C. Electrical Data		
1.	Short circuit withstand capacity for 1 sec.	kA 65 kA (for LDB, refer Note-9)
2.	Busbar current rating inside panel at specified ambient	As per Job Spec
3.	Busbars	Heat shrunk PVC sleeved
4.	System breaking capacity	kA 65 (for LDB, refer note-9)
5.	System making capacity	kA(peak) 143
6.	Circuit breaker	
	Type	ACB
	Duty cycle	0-3 min-CO-3 min-CO
	Rating	Refer job spec.
7.	Incoming power entry	Busduct/Cable
8.	Cable entry (I/C & O/G)	Bottom
9.	Bus duct entry	Top
10.	Cable gland/lugs	Included
11.	Painting/paint shade	RAL-7032
12.	Feeder arrangement & Execution	Double Front, Drawout type
13.	Minimum motor starter module size	240 mm
14.	Minimum switchfuse module size	200 mm
15.	Floor fixing	Integral base frame & tack welding to the floor channel
16.	Seperate bolted removable gland plate	Reqd.(Gland Plate Drilled at side)
17.	Minimum MCCB module	Vendor standard

MANUFACTURER'S DATA

A. Switchboards		
1.	Tag no.:	
2.	Make	
3.	Type designation	

B	31-JAN-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	20-NOV-2024	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP **Client** BPCL

Unit Bulk Procurement **Location** **Job No.** B957 **Unit No.** 000

4.	Degree of protection	
5.	CB panel	
	Overall weight	
	Incomer	
	Outgoing	
	Overall dimensions	
	Length*Depth*Height	
6.	Overall dimensions of MCC/ contactor controlled feeder panel	
	Length*Depth*Height	
7.	Overall dimensions of each PCC	
	Length*Depth*Height	
8.	Overall dimensions of each PMCC/ EPMCC	
	Length*Depth*Height	
9.	Overall dimensions of each MCC	
	Length*Depth*Height	
10.	Overall dimensions of each ASB	
	Length*Depth*Height	
11.	Overall dimensions of each LDB	
	Length*Depth*Height	
12.	Largest shipping section:	
	Max. overall weight	
	Length*Depth*Height	
13.	Recommended clearances for SWBD	
	Front*Rear*Above	
14.	Shock loading on foundation	
15.	Max. size/no. of cables that can be terminated	
	with rear extension	
	without rear extension	
16.	Size of rear extension panel	
17.	Clearance in air	
	Phase to Phase	
	Phase to Earth	
18.	Main horizontal bus bar	
	Bus bar current rating at	
	design ambient temp.	
	Main bus bar size	
	Main bus bar material	
	Main bus bar location	
19.	Vertical bus bars	
	Bus bar current rating at	
	design ambient temp.	
	Bus bar size	
	Bus bar material	
	Bus bar location	
20.	Insulating material	

B	31-JAN-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
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Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP **Client** BPCL

Unit Bulk Procurement **Location** **Job No.** B957 **Unit No.** 000

21.	Earth bus bar size	
	Material	
22.	1min power freq voltage	
23.	Short circuit	
	1 second	
	Peak dynamic	
24.	Whether adaptor panel required	
	between PCC/MCC panel	
	If Yes, furnish dimensions	
B. Circuit breaker		
1.	Type designation	
2.	Make	
3.	Mounting	
4.	No. of poles/phases	
5.	Current rating (in air)	
6.	Current rating (inside panel at design temperature)	
7.	Short time rating (1 sec)	
8.	Sym breaking capacity % DC component	
9.	Peak making capacity	
10.	Power frequency withstand	
11.	Impulse withstand voltage	
12.	Duty cycle	
13.	Total opening time	
14.	Total closing time	
15.	Power requirement Opening Closing Spring charge motor	
16.	Time for spring charging	
17.	Breaker is trip free	
18.	Closing mechanism	
19.	Provision of manual spring charging	
20.	Tripping mechanism	
21.	Mechanical trip PB provided	
22.	Mechanical ON/OFF indicator provided	
23.	Operation counter provided	
24.	Time taken for spring charging	
25.	No. of auxiliary contacts	
26.	Derating required for capacitor switching	
C. Contractor		
1.	Type designation	
2.	Make	
3.	Rated Voltage	
4.	Rated current	

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Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP			Client	BPCL
Unit	Bulk Procurement	Location		Job No.	B957
				Unit No.	000
	AC-3 Duty				
	AC-4 Duty				
5.	Thermal rating				
6.	Making capacity				
7.	Breaking capacity				
8.	Switching frequency				
9.	Life				
	Electrical				
	Mechanical				
10.	Coil consumption				
	Pick up				
	Hold on				
11.	Closing time				
12.	Opening time				
13.	No of aux. contacts				
14.	Maximum permitted back up fuse rating				
	D. Switch				
1.	Rated voltage				
2.	Rated current				
3.	AC 23 rating				
4.	Rated making capacity				
5.	Rated breaking capacity				
6.	Rated short circuit withstand current with max. permissible rated fuses				
7.	Mechanical life				
8.	Maximum permitted back up fuse rating				
	E. Thermal Overload Relay				
1.	Make				
2.	Type				
3.	Setting range				
4.	Single phasing preventor				
5.	Type of operation				
6.	Maximum permitted back up fuse rating				
	F. Fuses				
1.	Make				
2.	Type				
3.	Current rating				
	G. Electronic Motor protection relay				
1.	Make				
2.	Type				
3.	Setting range				
4.	Single phasing preventor				
5.	Type of operation				
6.	Maximum permitted back up fuse rating				
7.	Earth fault protection available				
	H. MCCB/MCB				
1.	Make				
B	31-JAN-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	20-NOV-2024	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP	Client	BPCL
Unit	Bulk Procurement	Location	
		Job No.	B957
		Unit No.	000

2.	Type	
3.	Rated voltage	
4.	Rated current	
5.	Rated frequency	
6.	No. of poles	
7.	Derating factor for operation under site conditions	
8.	Rated 10 sec short time rating	
9.	Rated breaking capacity at service voltage	
10.	No. of operations at full fault	
11.	No. of operations at partial fault	
12.	No. of guaranteed mech. operations	
13.	1 min dry p.f with stand voltage	
14.	Shunt trip feature (for MCCB only)	
15.	Operating voltage range for MCCB shunt trip	

Eil Notes

- Vendor shall furnish dimensions of various switchboards, CB panels and dummy/adaptor panels separately.
- Vendor shall furnish technical particulars of various switchboards separately.
- All offered MV switchboards shall be provided with Form-4b type as per IEC 61439-2 of separation with test and disconnected operations with door closed position. Type test certificate shall be furnished in support of same post order during drawing review/approval stage
- Switchboard offered shall be of proven design and shall have been successfully type tested. Type test certificates for an exactly identical design of offered switchboard shall be furnished by bidders. These test reports shall be not more than 5 years old, as on the final bid due date. In case these type tests have not been conducted during the last 5 years, bidder shall conduct these type tests on the offered design on switchboard before dispatch without any extra cost and delivery impact
- Nickel plated brass cable glands (single compression) and tinned copper lugs/ bimetallic lugs/ aluminum lugs for all incoming and outgoing cables shall be supplied by vendor.
- In case different material are provided for bus bar of switchboards/ transformers and bus ducts, bimetallic washer/ plates shall be provided.
- Switchboards upto 4000 Amps rating shall be naturally cooled. No force cooling shall be accepted.
- Breaker panels shall be in Drawout, Single Front Execution.
- Fault level for LDB shall be 25kA.

B	31-JAN-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	20-NOV-2024	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

UTILITY CONSUMPTION DATA

NOTES: -

1. Vendor shall fill the details of all motors, which are included in the scope of this MR and submit with the offer.

ENGINEERS INDIA LIMITED NEW DELHI	Project: BPREP Client: M/s BPCL - BINA	Utility Consumption Data	DOCUMENT NO.	Date	Rev
			B957-000-16-50-DS-1015	06.09.24	A



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MOTOR

S.NO	TAG NO.	SERVICE	Make	Type of Cooling (Air/Water)	Water Quantity m ³ /hr	Type of enclosure Ex(p)	For Ex (p) Motors		
							Air Quantity (Start up) Nm ³ /hr	Duration of Purging (Start up) min	Air Quantity (Continuous) Nm ³ /hr

ENGINEERS INDIA LIMITED NEW DELHI	Project: BPREP Client: M/s BPCL - BINA	Utility Consumption Data	DOCUMENT NO.	Date	Rev
			B957-000-16-50-DS-1015	06.09.24	A



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MOTORS

S.NO	TAG NO.	SERVICE	Make	Type of Cooling Air/Water	Water Quantity m ³ /hr	Type of enclosure Ex(p)/Ex(n)	For Ex (p) Motors		
							Air Quantity (Start up) Nm ³ /hr	Duration of Purging (Start up) min	Air Quantity (Continuous) Nm ³ /hr

ENGINEERS INDIA LIMITED NEW DELHI	Project: BPREP Client: M/s BPCL - BINA	Utility Consumption Data	DOCUMENT NO.	Date	Rev
			B957-000-16-50-DS-1015	06.09.24	A



DATA SHEET - HIGH MAST LIGHTING SYSTEM
Part-I (Data to be filled in by purchaser)

A. Site Conditions

1. Maximum temp. : 48 °C
2. Design ambient temp. : 45°C
3. Humidity : 90%
4. Atmosphere : Dusty, tropical & corrosive
5. Altitude above MSL : Less than 1000 m
6. Location : Bina, Madhya Pradesh

B. System conditions

The equipment and materials to be supplied by the vendor shall be designed for the following power supply conditions

1. Input supply Voltage : 415V ± 10% TPN
2. Lighting fixture voltage : 240V Phase-Neutral
3. Frequency : 50Hz ± 3%
4. Fault level : 50KA for 1 second
5. Neutral grounding : Solidly grounded

C. General requirements

1. Height of the mast : 30 Meters
2. Method of operation winch : Both manual and electrical motor
3. Type of fixture : Min. 400W LED (Dimmable)
4. Lumen output : Min. 400000 lumens @ 100 lumen/watt.
5. No. of fixtures on each mast : 24 nos.
6. No. of layer for fixture arrangement : 2
7. No. of fixtures in each layer : 12 nos.
8. No. of aviation fixtures on each mast : 2 nos.
9. Type and rating of aviation fixture : Medium intensity flashing LEDs
11. Feeder pillar loop in loop out facility : Yes
12. Area classification : Safe and Hazardous area (Zone-2, IIA/IIB & T3)
13. Lightning protection down conductor : Yes
14. Applicable specification : 6-51-0039
15. Type of drivers : Dimmable
16. Dimming controller : Yes (on top of Highmast)
16. Type of feeder pillar : Smart

D. Structural design data (Refer structural data for construction power)

1. Maximum basic wind speed : m/s.
2. Dynamic loading of high mast for wind load : As per IS: 875 Part-3
3. Factor of safety for foundation : 1.5
4. Soil load bearing capacity : After award

A	24.11.25	ISSUED WITH TENDER	SK	RSR	HK
Rev. No	Date	Purpose	Prepared	Checked	Approved

DATA SHEET FOR HIGH MAST LIGHTING SYSTEM
PART-II (to be filled in by vendor and submitted with bid)

1. HIGH MAST STRUCTURE

- a) Height of mast : Meters
Type :
Make :
b) Material of construction :
c) Cross section of mast : Polygonal
d) Length of individual section : Top Middle Bottom
e) Thickness of individual section : Top Middle Bottom
f) Base and top diameter :
g) Type of joints :
h) Length of overlap joint :
i) Type of metal protection : Hot dip Galvanized treatment
j) Thickness of galvanization : Minimum
k) Size of door opening :
l) Thickness of base plate : mm
m) Size of anchor plate and thickness :
n) Weight of mast including base plate, door, head frame etc. : Kg
o) Lightning protection final : Yes

2. LANTERN CARRIAGE

- a) Material of construction :
b) Diameter of carriage ring (mm) :
c) Buffer arrangement between carriage and masts. :
d) Load carrying capacity :
e) Total weight of assembly with fittings :

3. WINCH

- a) Make of winch :
b) Number of drums per winch :
c) Gear ratio/material :
d) Capacity :
e) Operating speed :
f) Time to raise/lower :
g) Method of operation :
h) Type of Lubrication arrangement :
i) Type of lubricants :
j) Tested load per drum (kg.) :
k) Factor of safety :
l) Positive locking :

4. STAINLESS STEEL WIRE ROPE

- a) Make :
b) Grade :
c) Number of ropes :
d) Material and Construction :
e) Diameter (mm) :
f) Braking load capacity :
g) Factor of safety :

5. HIGH MAST TRAILING CABLE

- a) Type :
- b) Make :
- c) Conductor size and insulation :
- d) Reference code :
- e) Current carrying capacity :
- f) No. of cores :
- g) No. of circuits :
- h) Earthing conductor size :

6. POWER TOOL

- a) Model :
- b) Make :
- c) Input supply :
- d) Power rating :
- e) Operating speed :
- f) Remote control switch PB station :
- g) Size and Length of control cable :
- h) Time taken for Raising /Lowering :

Each high mast shall be provided with a dedicated power tool.

7. TORQUE LIMITER

- a) Model :
- b) Make :
- c) Lifting capacity :
- d) Type of tripping device :

8. Expected designed life of the mast in years :

9. Proven track record for the offered mast : Furnished / Not Furnished

NOTE:

1. For make of equipments/components refer job specification.
2. Complete control wiring associated with dimming circuit shall be provided. i.e. between smart feeder pillar to dimming controller and dimming controller to various dimmable drivers.

LIGHTING FIXTURE SCHEDULE

PROJECT : BINA PETROCHEMICAL & REFINERY EXPANSION
PROJECT
OWNER : BPCL-BINA
PMC : ENGINEERS INDIA LIMITED
EIL JOB No. : B957

B	19.06.25	REVISED AND RE-ISSUED WITH TENDER	SKANU	SK	RSR
A	05.11.24	ISSUED WITH TENDER	SK	RSR	RSR
Rev	Date	Purpose	Prepared By	Checked By	Approved By

S. No.	Light Fixture - Description	Makes & Catalogue Nos.
1.	LED IND-1: Surface mounted / Pendant Type LED Tube Lights for Office or Commercial Buildings – completely integral with in-built linear SMD LEDs/ electronic drivers / length of 1200 mm (4 Feet) for a minimum rating of 20 Watts.	<ul style="list-style-type: none"> Bajaj : BLRB 18W LED XE Crompton : LSDL –20- CDL ; Philips : TMC501 With TLED 1X18W/4FT Master LED Tube Pyrotech: PC-14-D-L-WXOA/18W <p>Or Equivalent Models.</p>
2.	LED IND-2: Surface mounted / Pendant Type Integral LED Tube Lights for Industrial Warehouses /Workshops / Sub-Stations – completely integral with in-built linear SMD LEDs / electronic drivers / length of 1200 mm (4 Feet) for a minimum rating of 36 Watts. An alternative solution for conventional 2x28 W/2x36 W fluorescent Battens.	<ul style="list-style-type: none"> Philips : TMC 501 With TLED 2X18W/4FT Master LED Tube Crompton : LDL -36 – CDL; Bajaj : BLRB 218W LED XE Pyrotech: PC-14-D-L-WXOA/36W <p>Or Equivalent Models</p>
3.	LED IND-3: Surface mounted / Pendant Type Integral LED Tube Lights for industrial outdoor /weatherproof applications & IP-65 Ingress Protection – completely integral with in-built linear SMD LEDs / electronic drivers / length of 1200 mm (4 Feet) for a minimum rating of 36 Watts.	<ul style="list-style-type: none"> Bajaj : Linea Excel {BIPC 40W LED XE}; Crompton : Shield {IPFC1LT8/16 & 2X LGT8-20-865-2}; Philips : Endura LED Waterproof – 42 Watts; WT550 C LED 40S CW PSU S1 PC; <p>Or Equivalent Models.</p>
4.	LED IND-4: Surface mounted / Pendant Type Integral LED Tube Lights for Industrial Warehouses /Workshops / Sub-Stations – completely integral with in-built linear SMD LEDs / electronic drivers / length of 1200 mm (4 Feet) for a minimum rating of 36 Watts. An alternative solution for conventional 2x28 W/2x36 W fluorescent Battens.(Suitable for Mounting on Metsec Channel with white enameled reflector)	<ul style="list-style-type: none"> Crompton: Master LED tube 1200mm-18W 869 T8 Bajaj: BLRB 218W LED XE <p>Or Equivalent Models.</p>
5.	LED-1: Recess mounted, compact / slim panel / tile light in square shape – suitable for mounting in 2 Feet X 2 Feet Grid type False Ceiling with minimum 35 Watts rating & White Color – with built-in driver & all mounting accessories.	<ul style="list-style-type: none"> Bajaj : ““Armstorme” {BZRSQ 36W WH GZi}; Crompton : LCTRLNI-36-FO-CDL Philips : RC 420B LED 35S PSU W60L60 Pyrotech: PB-12-D-L-WXOA/36W <p>Or Equivalent Models.</p>

6.	LED-2: Recess mounted, compact / slim panel / tile light in square shape – suitable for mounting in 2 Feet X 2 Feet Grid type False Ceiling White Color – with built-in driver & all mounting accessories.	<ul style="list-style-type: none"> • Crompton: LCTRLN-50-FO-CDL • Bajaj: BZRSQ 43W LED GZi WH <p>Or Equivalent Models.</p>
7.	LED -3: Recess mounted, compact / flat, round or square shaped LED down-lighter in white finish – suitable for mounting in gypsum / Armstrong type false ceiling – with minimum 18 Watts rating & White Color – with built-in driver and all mounting accessories.	<ul style="list-style-type: none"> • Bajaj : SLEEK Round / Square {BGSLO Sleek 18W WH RD / SQ}; • Crompton : QUARTZ Round / Square {LCDE or LSDE-18W-CDL/NW}; • Philips : Green LEDi {DN 195B LED 20S – 6500PSU WHS1}; • Pyrotech: PB-12-D-L-WXOA/18W <p>Or Equivalent Models.</p>
8.	LED -4: Recess Mounted Adjustable / Swivel LED spot-light / COB Light with tilting (Gimbal) feature and a minimum rating of 20 Watts & golden yellow / white color light – with white round / square frame, built-in driver, suitable for mounting on gypsum false-ceiling & all mounting accessories.	<ul style="list-style-type: none"> • Philips : ECO Accent Recessed Adjustable {RS271B LED 20/850 PSU-E WB WH}; • Bajaj : KLASS Series COB {BRDCSL 16 W WW}; QUADRA SERIES COB{BLDRS24W} • Crompton : AQUA COB LED {LR-RAD-20- CDL/NDL-24/50D}; <p>Or Equivalent Models.</p>
9.	LED -5: Surface Mounted – Ceiling Tile LED Fixture of dimensions 2 Feet X 2 Feet – suitable for direct ceiling mounting - with minimum 35 Watts rating & White Color – with built-in driver & all mounting accessories.	<ul style="list-style-type: none"> • Crompton : ORION-I – LCTLSN-36-CDL • Bajaj : SKYLITE-BCTBLS-36 WZTWH • Philips : CIRRUS – SM365C LED33-6500 PSU-OD WH • Pyrotech: PB-12-D-L-WXOA/36W <p>Or Equivalent Models.</p>
10.	LED -6 : Surface mounted round or square shaped LED down-lighter in white finish – suitable for direct ceiling mounting – with minimum 18 Watts rating & White Color – with built-in driver and all mounting accessories.	<ul style="list-style-type: none"> • Crompton : Pearl II – Round / Square {LCDSPLN- R-18-CDL / LCDSPLN-S-18-CDL}; • Bajaj : Sleek – Round / Square– BGSLO Sleek Surface 18 W WH RD / BGSLO Sleek Surface 18W WH SQ}; • Philips : Cirrus Mini {SM5 18C LED 16S 6500PSU OD WH} • Pyrotech: PB-13-D-L-WXOA/18W <p>Or Equivalent Models.</p>

11.	LED -7: Surface mounted round or square shaped LED Dome -lights – suitable for direct wall mounting – with minimum 18 Watts rating & White Color – with built-in driver and all mounting accessories.	<ul style="list-style-type: none"> Philips : CoreLine Wall-Mounted {WL120V LED12S / 840 PSR WH}; Bajaj : TARA Round Shaped Surface Mounted {BGCML 18095WH} Crompton : Orbit {LCDSPLN-R-18-CDL}; <p>Or Equivalent Models.</p>
12.	LED -8: Rechargeable Lantern type LED Fixtures of minimum 4 Watts rating - with inbuilt sealed rechargeable Battery / Cell suitable for operation at 240 Volts AC and with a minimum battery back-up time of 2 hours.	<ul style="list-style-type: none"> Philips – Ujjwal Plus LED Lantern; Bajaj LED Glow 648 LR Rechargeable Lantern; Crompton - CG-LL30 LED Rechargeable Lantern; <p>Or Equivalent Models.</p>
13.	LED -9: Rechargeable Lantern type LED Fixtures of minimum 4 Watts rating - with inbuilt sealed rechargeable Battery / Cell suitable for operation at 240 Volts AC and with a minimum battery back-up time of 2 hours.	<ul style="list-style-type: none"> Philips – Ujjwal Plus LED Lantern; Bajaj LED Glow 648 LR Rechargeable Lantern; Crompton - CG-LL30 LED Rechargeable Lantern; <p>Or Equivalent Models.</p>
14.	LED-RSD-10: LED Fixture suitable for 110V/220V DC complete with 18W LED Lamp, driver, including other materials as applicable for installation (Recess mounted)	<ul style="list-style-type: none"> Pyrotech (PB-13-P-L-WXOA/18W) <p>Or Equivalent Models.</p>
15.	LED-SFD-12: LED Fixture suitable for 110V/220V DC complete with 18W LED Lamp, driver, including other materials as applicable for installation (Surface mounted)	<ul style="list-style-type: none"> Pyrotech (PB-13-P-L-WXOB/18W) <p>Or Equivalent Models.</p>
16.	LED -LB-1: Indoor Industrial Low Bay LED Luminaires - with high pressure die-cast aluminum housing, mirror / lens optics (heat- resistant) for symmetric light distribution and high system efficacy for a rating of 80 Watts up to 100 Watts – complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories.	<ul style="list-style-type: none"> Bajaj : Duranto Highbay Luminaire 100 Watts{BGHB 100W LED GV}; Crompton : SURROUND -II LHB11-70-CDL/60 - 70Watts; Philips : GreenPerform Highbay G2 – 80 Watts{BY689P LED 90/NW PSU S-NB}; Pyrotech: PD-17-D-L-WXOA/90W <p>Or Equivalent Models.</p>

17.	<p>LED –HB1: Indoor Industrial Medium Bay LED Luminaires - with high pressure die-cast aluminum housing, mirror / lens optics (heat- resistant) for symmetric light distribution and high system efficacy for a rating of 120 Watts up to 150 Watts – complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories.</p>	<ul style="list-style-type: none"> • Bajaj : Duranto Highbay Luminaire 150 Watts{BGHB 150W LED}; • Crompton : SURROUND-II {LHB11-110-CDL/60 -110 Watts}; • Philips : GreenPerform Highbay G2 – 130 Watts{BY688P LED 140/NW PSR S-NB}; • Pyrotech: PD-17-D-L-WXOA/150W <p>Or Equivalent Models.</p>
18.	<p>LED –HB2: Indoor Industrial High Bay LED Luminaires - with high pressure die-cast aluminum housing, mirror / lens optics (heat- resistant) for symmetric light distribution and high system efficacy for a rating above 180 Watts – complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories.</p>	<ul style="list-style-type: none"> • Bajaj : Duranto Highbay Luminaire 200 Watts{BGHB 200W LED}; • Crompton : Crompton : LHB11-180-CDL/60- 180Watts; • Philips : Green Perform Highbay G2 – 200 Watts{BY687P LED200/NW PSR S-WB L3000}; • Pyrotech: PD-17-D-L-WXOA/180W <p>Or Equivalent Models.</p>
19.	<p>LED RCD-03 Recess mounted circular LED downlighter White powder coated recess mounting pressure die-cast aluminium housing. Specially designed COB LED die-cast aluminium carriage assembly. Die-cast aluminium carriage assembly provided with heat sink for efficient dissipation of heat – important for LED luminaires.2 nos., spring loaded MS mounting brackets to suit false ceiling – easy to install & maintain. Constant current output driver. fixture should have minimum system lumen of 5000lm & minimum efficacy at System level >100lumens/ watt with max 50W, Life of fixture : 50K Hrs. @ L70B50 Lumen maintenance, CCT up to 5700 CRI >80, THD <10%@ 240v ac. An operating Voltage Range of 140 - 270 V. Minimum Internal Surge Protection 3kv, IP 40. BIS certification is required for LED Driver & Luminaire, Luminaire manufacture shall provide LM79 report from in house NABL accredited lab & LM80 report issued by LED manufacturer.</p>	<ul style="list-style-type: none"> • BAJAJ:- BRDCSL 50W LED WH - 50W <p>Or Equivalent models.</p>
20.	<p>LED RSD-10A LED Fixture suitable for 110V/220V DC complete with 40W LED Lamp, driver,</p>	<p>Equivalent Models.</p>

	including other materials as applicable for installation (Recess mounted)	
21.	LED –TECH1: Surface mounted cylindrical share LED downlight- with pressure die-cast aluminum housing and high system efficacy for a rating of 30 Watts and minimum luminous efficacy of 100 lumens/watt – complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories.	<ul style="list-style-type: none"> Havells: Uneco <p>Or Equivalent Models.</p>
22.	LED –TECH2: Wall/Ceiling mounted Integrated Batten LED in white finish with rating of 40 Watts and minimum luminous efficacy of 100 lumens/watt - complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories.	<ul style="list-style-type: none"> Havells: Dura batten LT Cane 43W 5700K LED Surface Linear Troffer <p>Or Equivalent Models</p>
23.	LED –TECH3: Recessed downlight, linear 4ft luminaire in white finish with rating of 36 Watts and minimum luminous efficacy of 100 lumens/watt - complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories.	<ul style="list-style-type: none"> Havells: Destello <p>Or Equivalent Models</p>
24.	LED –TECH4: Surface suspended 400mm dia LED light in white finish with rating of 25 Watts and minimum luminous efficacy of 100 lumens/watt - complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories.	<ul style="list-style-type: none"> Havells: Mondo <p>Or Equivalent Models</p>
25.	LED –TECH5: Suspended LED downlighter luminaire with Dimmable driver, and rating of 24-25 Watts and minimum luminous efficacy of 100 lumens/watt - complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories.	<ul style="list-style-type: none"> Havells: Destello50LP/ S25WLED857SPMMAWH Philips: SP780 LED26S-6500 PSU W6L112 OD SI <p>Or Equivalent Models</p>
26.	LED –TECH6: Suspended decorative LED light of Round Donut shape in white finish, with rating of 25 Watts and minimum luminous efficacy of 100 lumens/watt - complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories.	<ul style="list-style-type: none"> Havells: Torus <p>Or Equivalent Models</p>

27.	LED –TECH7: Recessed mounted 9-10W/m flexible LED strip with lumen output of 4000 lumens, suitable for mounting in cove for indirect lighting. Each strip shall be 5 meters - complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories.	<ul style="list-style-type: none"> Havells: FLEXISTIP <p>Or Equivalent Models</p>
28.	LED –TECH8: Deep recessed COB LED downlighter - with high pressure die-cast aluminum housing for a rating of 30 Watts and lumen output of 3000 lumens - complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories.	<ul style="list-style-type: none"> Havells: Sparkle Fix <p>Or Equivalent Models</p>
29.	LED –TECH15 60W LED Ring Type Postop, made of Pressure die-cast aluminum circular top and 2 nos. of curved arms resting on spigot. High quality injection molded, single piece PC (Poly Carbonate) opal diffuser, IP 66 protection Lumen efficacy of LED >140 lm/W, System Lumen 4000Lm, CCT 3000K/5700K.	<p>Cat Reh: Havells Rink</p> <p>Or Equivalent Models</p>
30.	LED –TECH16 7-8W LED Recessed LED Step Light, Pressure die-cast aluminium housing grey finish, lumen efficacy of 130lm/W, IP65, Lumen:180, CCT:3000K.	<ul style="list-style-type: none"> Havells Cat Ref: Radiant Philips Cat Ref: BWG150 <p>Or Equivalent Models</p>
31.	LED –TECH18 Recessed mounted 12W Round Shape Downlighter with high performance LEDs, suitable for mounting with Armstrong/Grid ceiling. pressure die-cast aluminium heat sink & PC diffuser in white powder coated finish with integral electronic low THD (<10%) LED driver. LED package in integral module with lumen efficacy of >110 lm/W . Color temperature 5700K, Input Supply Voltage Range:140-270 V, Frequency :50 HZ;	<ul style="list-style-type: none"> Havells Cat Ref:Havells INTEGRA <p>Or Equivalent Models</p>
32.	LED –TECH19 Recessed mounted 18W Round Shape Downlighter with LEDs, suitable for mounting with Armstrong/Grid ceiling. pressure die-cast aluminium heat sink & PC diffuser in white powder coated finish with integral electronic low THD (<10%) LED driver.High efficiency long life LED package in integral module with lumen efficacy of >110 lm/W	<ul style="list-style-type: none"> Havells Cat Ref:Havells INTEGRA, <p>Or Equivalent Models</p>

33.	<p>LED –TECH20: Exterior up-down facade lighting Vertical up & Down light 10Watt Mirror light(3000K/4000K) Surface mounted Outdoor type UP & Down Lighter with glass optics, fixture should have minimum net efficiency at System level (Not chip level)>75 lumens/watt. Minimum nominal system lumen of 750lumens. Life of fixture 50000hrs@L70LUMEN MAINTENANCE, cct, cri>70,pf>0.9, IP-65(min) and suitable for 230V AC,50HZ supply, suitable internal surge protection. The fixtures should comply with parameters as per IS10322 and IEC-60598, EMC/EMI compliance and LED driver shall be BIS registered & luminaire manufacture shall provide LM79 report from NABL accredited lab & LM80 report issued by LED manufacturer</p>	Equivalent Models
34.	<p>LED –TECH 21-Blue: Exterior signage lighting Outdoor flexible neon tubes/Outdoor Linear outline tubes, Led type, 10W, IP-65(min), suitable for 230V AC,50Hz power supply, in Blue colour</p>	Bajaj-Stamo/Bent Or equivalent models.
35.	<p>LED –TECH 21-Red: Exterior signage lighting Outdoor flexible neon tubes/Outdoor Linear outline tubes, Led type, 10W, IP-65(min), suitable for 230V AC,50Hz power supply, in Red colour</p>	Bajaj-Stamo/Bent Or equivalent models.
36.	<p>LED –TECH 21-White: Exterior signage lighting Outdoor flexible neon tubes/Outdoor Linear outline tubes, Led type, 10W, IP-65(min), suitable for 230V AC,50Hz power supply, in White colour</p>	Bajaj-Stamo/Bent Or equivalent models.
37.	<p>Type LED-Round Ceiling (Static) Fixtures: High performance LED downlighter with high system efficacy for good quality and uniform lighting. Conforms to general lighting norms for office and other indoor applications. 1) Colour Temperature (K)- 3000 K / 4000 K / 5700K (as per site conditions) 2) LED Efficacy (lm/W) – 100 to 160 3) CRI >70 4) Power Consumption 6W to 24W 5) LED's life >25,000 hours @ L70</p>	Equivalent Models

38.	<p>Type LED-Baffle Ceiling (Static) Fixtures:</p> <p>It integrates a LED light source into a traditional fluorescent form factor. Its unique design creates a perfectly uniform visual appearance which cannot be distinguished from traditional fluorescent. For those that are looking for value for money within limited budget and re-lamping efforts for better light effect and lifetime. 1) Lumen Output - 2000 – 3000 2) Colour Temperature (K)- 3000 K / 4000K / 6500K (as per site conditions) 3) LED's life >25,000 hrs @ L70 4) CRI >70 5) Input Voltage Range (V) 150 - 270 6) LED Efficacy (lm/W) >150 7) Power Consumption (W) 20W to 32W</p>	Equivalent Models
39.	<p>Type LED-Cove Light Fixtures:</p> <p>It will be a continuous rail of LED light, high brightness, neutral, or warm white with wall washing applications. Its slim profile and simple daisy-chain system allows high design flexibility to form long.</p> <p>1) Light source: LED 2) Lumen output: 500 lm/m 3) Light color: 6500K 4) Power consumption: 3W/m to 5W/m 5) Operating Voltage Range (V) 100 – 300 6) Operating Frequency (Hz) 50 ± 3% 7) Colour: White 8) Lifetime: 15000 burning hrs. (At L70)</p>	Equivalent Models

OUTDOOR LED LIGHT FIXTURES		
40.	LED BK -1: Outdoor Surface Mounted Bulkhead LED Lights – with die-cast aluminum housing / toughened glass lens and minimum IP -65 ingress protection of minimum 10 watts rating – complete with integral type electronic drivers & all mounting accessories.	<ul style="list-style-type: none"> Bajaj : Wee Plus {BIBWP 10 W LED} Crompton : Sunrise LED Bulkhead {LBH-10- CDL}; Philips : Vista Glow WT140W LED7S CW PSU S1 PC; Pyrotech: PP-11-D-L-WXOA/10W <p>Or Equivalent Models.</p>
41.	LED BK -2: Outdoor Surface Mounted Bulkhead LED Lights – with die-cast aluminum housing / toughened glass lens and minimum IP -65 ingress protection of minimum 30 watts rating – complete with integral type electronic drivers & all mounting accessories.	<ul style="list-style-type: none"> Pyrotech: PP-11-D-L-WXOA/30W <p>Or Equivalent Models.</p>
42.	LED BK -3: Outdoor Surface Mounted Bulkhead LED Lights – with die-cast aluminum housing / toughened glass lens and minimum IP -65 ingress protection of minimum 60 watts rating – complete with integral type electronic drivers & all mounting accessories.	<ul style="list-style-type: none"> Pyrotech: PP-11-D-L-WXOA/60W Or Equivalent Models.
43.	LED ST-4 : LED Street Light Fixtures with Leaf / Sleek Type design & SMD or COB Type LEDs for high system efficacy & rating of 80 Watts to 100 Watts – having powder coated Pressure Die-Cast Aluminum Body & toughened glass visor fitted in a frame & completely integral – with all mounting accessories. The fixture enclosure shall have minimum IP 65 ingress protection.	<ul style="list-style-type: none"> Bajaj : EDGE Streetlight – 100 Watts {BRLEP 90W LED}; Crompton : NEXUS STAR - 90 Watts {LSTP-90-CDL}; Philips : Green Line V2 BRP410 LED 092 CW HE NR FG S2 PSU GR; Pyrotech: PP-11-D-L-WXOA/10W <p>Or Equivalent Models.</p>
44.	LED ST-10 : LED Street Light Fixtures with Leaf / Sleek Type design & SMD or COB Type LEDs for high system efficacy & rating of 120 Watts having powder coated Pressure Die-Cast Aluminum Body & toughened glass visor fitted in a frame & completely integral – with all mounting accessories. The fixture enclosure shall have minimum IP 65 ingress protection.	<ul style="list-style-type: none"> Crompton: LSTP120 CDL Bajaj:- BRTFG 120W LED <p>Or Equivalent Models.</p>
45.	LED ST-11: LED Street Light Fixtures with Leaf / Sleek Type design & SMD or COB Type LEDs for high system efficacy & rating of 120 Watts to 150 Watts – having powder coated Pressure Die-Cast	<ul style="list-style-type: none"> Bajaj : Edge Streetlight – 150 Watts {BRTFG 135W LED}; Crompton : 135 Watts {LSTP-135-CDL};; Philips : Greenline Extra BRP322 LED 122 CW HE MR PC S3 XT;

	Aluminum Body & toughened glass visor fitted in a frame & completely integral – with all mounting accessories. The fixture enclosure shall have minimum IP 65 ingress protection.	<ul style="list-style-type: none"> Pyrotech: PE-11-D-L-WXOA/150W <p>Or Equivalent Models.</p>
46.	<p>LED FD-1: LED Flood-Light Fixtures with COB or SMD Type LEDs and high system efficacy for a rating of 80 Watts up to 110 Watts – complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories – suitable for outdoor installation & having a minimum IP 65 ingress protection. The Flood-Light fixtures shall have powder-coated pressure die-cast & Aluminum Body & toughened glass front cover.</p>	<ul style="list-style-type: none"> Philips : Uniflood 2 Series Flood Light - 110Watts {BVP122 LED110 CW FLNB FG XTFC}; Crompton : OMEGA LED Flood Light – 110 Watts{LFLN11-110-CDL/60}; Bajaj : Force Flood Light – 100 Watts {BJFL 100W LED I}; Pyrotech: PD-17-D-L-WXOA/110W <p>Or Equivalent Models.</p>
47.	<p>LED FD-2: LED Flood-Light Fixtures with COB or SMD Type LEDs and high system efficacy for a rating of 150 Watts up to 200 Watts – complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories – suitable for outdoor installation & having a minimum IP 65 ingress protection. The Flood-Light fixtures shall have powder-coated pressure die-cast & Aluminum Body & toughened glass front cover.</p>	<ul style="list-style-type: none"> Philips : Tempo Series LED Flood Lights – 172Watts { BVP410 LED 172 CW HE NB FG S3 XT}; Crompton : 200 Watts LED Flood Lights {LFLN11-200-CDL/60};; Bajaj : Turbo Flood Light – 200 Watts {BJFL 200W LED I}; Pyrotech: PD-17-D-L-WXOA/200W <p>Or Equivalent Models.</p>
48.	<p>LED FD-3: LED Flood-Light Fixtures with COB or SMD Type LEDs and high system efficacy for a rating of 250 Watts & above – complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories – suitable for outdoor installation & having a minimum IP 65 ingress protection. The Flood-Light fixtures shall have powder-coated pressure die-cast & Aluminum Body & toughened glass front cover.</p>	<ul style="list-style-type: none"> Philips : Tempo Series LED Flood Lights – 252Watts {BVP410 LED 252 CW HE AK55 FG S3XTFC}; Crompton : MAGPIE – 250 Watts LED Flood Lights{LFLPI-250-CDL/60}; Bajaj : Turbo Flood Light – 350 Watts {BJFL 350W LED I}; Pyrotech: PD-17-D-L-WXOA/250W <p>Or Equivalent Models.</p>
49.	<p>LED FD-9: LED Flood-Light Fixtures with COB or SMD Type LEDs and high system efficacy for a rating of 400 Watt & above – complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories – suitable for outdoor installation & having a minimum IP 65 ingress protection. The Flood-Light fixtures shall have powder-coated pressure die-cast & Aluminum Body & toughened glass front cover.</p>	<ul style="list-style-type: none"> Crompton: MAGPIE+ LFLPI-400-CDL/60 Bajaj: BJFL 400W LED IP66 Philips: Tango G3 BVP383 LED450/CW 400W 220-240V SWB IN; Pyrotech: PD-17-D-L-WXOA/500W <p>Or Equivalent Models</p>

50.	<p>LED BL-1: Integral decorative LED Bollard Luminaries with opal acrylic diffusers of minimum 8 Watts rating & suitable for landscape lighting with IP-65 Ingress Protection and anti-corrosive powder-coated die-cast aluminum housing – complete with all mounting accessories (anchor bolts / base-plates)</p>	<ul style="list-style-type: none"> • Bajaj : Tetris LED Bollard {BGBOS 600 9W LED}; • Crompton : Maya-III COB LED Bollard {LBLA3-10- CDL}; • Philips : City Cube Series LED Bollard - 8.5 Watts{BCP400 LED04 U CW PSU GR S1}; • Pyrotech: PD-15-D-L-WXOA <p>Or Equivalent Models.</p>
51.	<p>LED PT-1 LED Post Top Lantern type fixture. Lumen Output shall be equivalent to that of 80W HPMV</p>	<ul style="list-style-type: none"> • Bajaj BLTSP 25W NW LED (Globe) <p>Or Equivalent Models.</p>
52.	<p>LED TECH10: Recessed LED Step light- pressure die cast Aluminum housing & minimum IP-65 ingress protection with rating of 25 Watts and luminous efficacy of 70 lumens/watt & viewing angle of 120 degrees - complete with integral type electronic drivers & all mounting accessories.</p>	<ul style="list-style-type: none"> • Havells: Lycus <p>Or Equivalent Models</p>
53.	<p>Type LED-Spike Light fixtures. 5W Spike light made of Grey pure polyester powder coated, Pressure die-cast spike, snoot and aluminium IP66 protection for high reliability in outdoor applications. High efficiency long life COB LED mounted on MCPCB of fixture. Lumen efficacy of LED >140 lm/W. Operating temperature: -upto +50 °C, Operating voltage range: 140 V - 270 V, Average life L70B50: 35000 hours, Prismatic chrome plated reflector for controlled beam angle of 60°. High quality toughened glass in clear finish for uniform light distribution, CRI>70, THD<15%, PF>0.9, CCT 3000K/Red ,Blue, Green, IP 66, IK 07, Powered by an Built-In potted, electronic driver (SMPS based constant current supply) with lower THD, Output Open/ Short circuit protection, Surge voltage protection upto 4kV & other safety test as per IS:15885 Part 2/Sec 13. Cat</p>	<ul style="list-style-type: none"> • Havells irvine, Iguzzini, Ligman <p>Or equivalent models.</p>
54.	<p>LED TECH12: LED fixture in bollard housing made up of Aluminium pipe (OD- 100mm) along with mounting cats iron flange fixed to the ground, minimum IP-65 ingress protection for a rating</p>	<ul style="list-style-type: none"> • Havells: Bamboo <p>Or Equivalent Models</p>

	of 8 Watts and with luminous efficacy of 100 lumens/watt - complete with integral type electronic drivers & all mounting accessories.	
55.	HIGH MAST LED FIXTURE 500 Watt Flood light LED lighting fixture complete with LED lamp, LED driver, reflectors, mounting hardware, clamps & brackets etc. (Light Output i.e. LUMENS of fixture min. 100 LM/ Watt.)	Bajaj: AMPL F 650L WH NB-A5 TG SD <ul style="list-style-type: none">• Or Equivalent Models

OUTDOOR TYPE FIXTURES			
LIGHTING FIXTURE (Ex-d/Ex-de/Ex-n/Ex-nR) SUITABLE FOR ZONE-1 & ZONE-2 AREA			
Fixture type	Description	Wattage	Manufacturer Type Designation
Ex-LED-1A	Weatherproof, non-sparking restricted breathing type Ex nR well glass LED lighting fixture complete with LED lamp, driver accessories including other materials as applicable for installation suitable for Zone-2 classified areas, total lumen output in the range of 4000-4500 lumens, with minimum efficacy greater than 100 lumens/watt.		
Ex-LED-2A	Same as Ex-LED-1A but with total lumen output in the range of 6500-7000 lumens.		
Ex-LED-3A	Same as Ex-LED-1A but with total lumen output in the range of 10000-10500 lumens.		
Ex-LED-4	Weatherproof, non sparking restricted breathing type Ex nR floodlight LED lighting fixture complete with LED lamps, driver accessories, including other materials as applicable for installation, total lumen output in the range of 6500-7000 lumens with minimum efficacy greater than 100 lumens/watt.		
Ex-LED-5	Same as Ex-LED-4 but with lumen output in the range of 10000-10500 lumens.		
FLP-LED-1A	Flameproof and weatherproof Ex d/ Ex de type well glass LED lighting fixtures complete with LED, driver, accessories, including other materials as applicable for installation, suitable for gas group IIB temperature class T3, total lumen output in the range of 4000-4500 lumen with minimum efficiency greater than 100		
FLP-LED-2A	Same as FLP-LED-1A but with total lumen output in the range of 6500-7000		
FLP-LED-3A	Same as FLP-LED-1A but with total lumen output in the range of 10000-10500.		

FLP-LED-4A	Flameproof and weatherproof Ex d/ Ex de flood light LED fixture complete with LED lamp, driver, accessories, including other materials as applicable for installation, suitable for gas group IIB, temperature class T3, total lumen output in the range of 6500-7000 with minimum efficiency greater than 100 lumen/watt.		
FLP-LED-5A	Same as FLP-LED-4A but with lumen output in the range of 10000-10500 lumens.		
FLP-LED-6A	Flameproof and weather proof Ex-d/ Ex de well glass LED lamp, driver, accessories including other materials as applicable for installations, suitable for gas group IIB, temperature class T3, total lumen output in the range of 4000-4500 lumens with minimum efficiency greater than 100 lumens/watt and suitable for 220V/110V DC.		
FLP-LED-1A-IIC	Same as FLP-LED-1A but suitable for gas group IIC, temp. Class T3.		
FLP-LED-2A IIC	Same as FLP-LED-2A but suitable for gas group IIC, temp. Class T3.		
FLP-LED-3A-IIC	Same as FLP-LED-3A but suitable for gas group IIC temperature class T3.		
FLP-LED-4A-IIC	Same as FLP-LED-4A but suitable for gas group IIC temperature class T3.		
FLP-LED-5A-IIC	Same as FLP-LED-5A but suitable for gas group IIC temperature class T3.		
FLP-LED-6A-IIC	Same as FLP-LED-6A but suitable for gas group IIC temperature class T3.		
FLP-LED12	Ex proof Ex d/ Ex de type LED Fixtures complete with LED Lamp, driver, including other materials as applicable for installation.	52 W	Philips BCW216 Stahl EXLUX 6002 Eaton eLLK 92 LED 800 or
FLP-LED-12-IIC	Same as FLP-LED-12 but suitable for gas group IIC temperature class T3.		
CHEMICAL RESISTANT FIXTURES			
LED13	LED Chemical resistance Fixtures complete with LED Lamp, driver, including other materials as applicable for installation.	Up to 50W	Philips WT461C or equivalent
CM2	Chemical resistance fixture suitable for 2x36 W fluorescent lamp.	2x36 W	Philips TMX-95/236 Crompton IFV-1124HSB

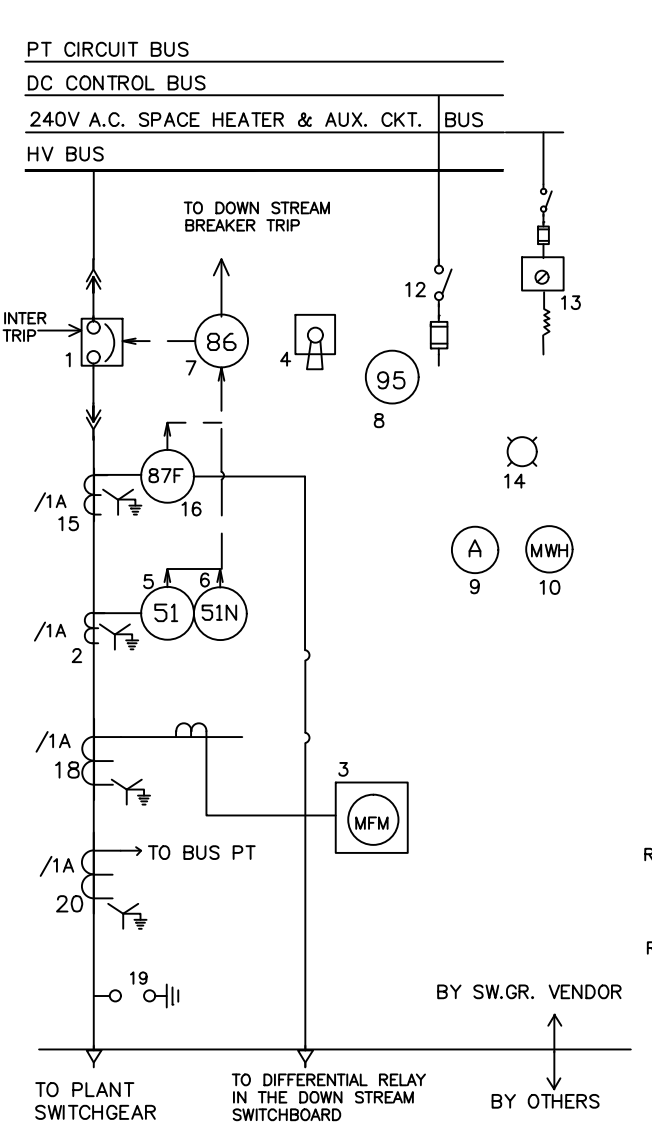
CM3	Similar to CM2 but suitable for 2x18W fluorescent lamps with reeded light stabilized clear acrylic cover (for use in indoor areas with high humidity and corrosive vapor).	2x18 W	Philips TDC-10/218 Bajaj BJI-218FG
CM4	Similar to CM3 but with 2x36W fluorescent lamps.	2x36 W	Philips TDC-10/236 Crompton IPFC-24HSB
CM5	Ceiling/pendent mounting drip proof and dust tight fixture suitable for 2x36 W fluorescent lamps with aluminum housing, stove enameled grey outside and white inside with gasketed clear acrylic cover.	2x36 W	Philips TPW-11/236 Crompton IDJ-1124HSB Bajaj BJI-236
CM6	Dust & Vapor proof fixture suitable for 1x40W fluorescent lamp with glass sheet cover.	1x40W	Crompton IPFC 14HSB Bajaj BJI-136FG

Notes:

1. All fixtures shall be latest energy efficient type.
2. All fixtures shall be complete with lamps.
3. All LED fixtures shall be supplied complete with LED lamp & drivers.
4. All LED fixtures shall have high power factor (Min. 0.95).
5. Manufacturer shall ensure that LED panels are sourced from reputed LED manufacturers.
6. The LED light fixtures should be tested for luminous lux level as per IES-LM-79. Type test certificates shall be furnished in compliance to same. Type test certificates for LM-79 for all fixtures shall be from a NABL (National Accreditation Board for Testing and Calibration Laboratories) accredited Lab or UL Laboratory.
7. The LED's used in the lighting fixtures should be tested for the service life as per IES-LM-80. Type test certificates shall be furnished in compliance to same.
8. The LED Driver shall comply with the requirement of IEC 61347-2-13.
9. Fixture life time (L70) shall be > 50000 hrs at ambient of 45 degree C.
10. Make of fixtures shall be embossed on the body of the lighting fixtures.
11. LED lamps shall be provided with highly translucent diffusers with advance optical system with high internal reflectivity material of excellent and smooth output for glare free light and no visibility of LED to eyes.
12. All lighting fixtures shall be supplied complete with associated LED lamp and driver.
13. All above Luminaries with controllers & drivers must be suitable for a working voltage range of 150 to 270 Volts – 50 Hz - AC.
14. In case any of the above referred models / makes are discontinued, prior approval from the engineer-in-charge has to be taken for supplying any alternate makes / models.
15. Retrofit type of flameproof LED fixtures will not be acceptable (implies LED bulbs fixed inside flameproof enclosures). All flameproof fixtures shall have integral panelled LED clusters (COB - Chip on Board or SMD - Surface mount Device).

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PROJECT: BPREP PROJECT CLIENT: M/S BPCL - BINA	REV.	DATE	PURPOSE	BY	CHKD	APPD.
	A	20.11.2024	ISSUED WITH MR/TENDER	SONALI	SK	RSR
	B	18.07.25	ISSUED WITH MR/TENDER	GKS	RSR	RSR



EQUIPMENT DATA			
ITEM NO	NEMA NO.	QTY.	DESCRIPTION
1	52	1	CIRCUIT BREAKER
2	-	1	METERING/PROTECTION C.T. CI.-1/5P10
3	-	1	DIGITAL MULTIFUNCTION METER
4	-	1	BREAKER CONTROL SWITCH CLOSE-NEUTRAL-TRIP (SPRING RETURN TO NEUTRAL)
R1	51	2	IDMTL O/C RELAY (50-200%)
6	51N	1	IDMTL E/F RELAY (10-40%)
7	86	1	TRIPPING RELAY (VAJH TYPE)
8	95	1	TRIP CKT SUPERVISION RELAY
R1	-	1	AMMETER (3 PHASE)
10	-	1	MWH METER
11	-	1	CUBICLE LAMP (CFL) WITH SWITCH AND FUSE
12	-	1	DP. SWITCH WITH FUSE FOR D.C. CONTROL SUPPLY
13	-	1	PANEL SPACE HEATER WITH SWITCH AND THERMOSTAT
14	-	AS REQD	CLUSTER LED TYPE INDICATING LAMPS
15	-	3	FEEDER DIFFERENTIAL CTs, CI.-PS
R2	87F	1SET	FEEDER DIFF RELAY TYPE 'HORM-4' WITH STABILISING RESISTOR & METROSIL.
R1	-	AS REQD.	AUX RELAY
18	-	3	METERING CT CLASS 1.0, 15VA
19	-	1 SET	METAL OXIDE TYPE SURGE ABSORBERS
20	-	3	PROTECTION C.T. FOR 87B PROT. CI.-PS

R1 PART OF NUMERICAL RELAY-1
R2 PART OF NUMERICAL RELAY-2

- NOTES:
1. ANTIPUMPING RELAY USED, IF ANY, SHALL BE CONSIDERED AS PART OF BREAKER MECHANISM.
 2. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER JOB SPEC., INSTRUCTIONS TO VENDOR AND IN SPECIFICATION 6-51-0001 SHALL BE IN VENDOR'S SCOPE.
 3. CT VA BURDEN (EXCEPT METERING CT) SHALL BE DECIDED BY VENDOR.
 4. ALL PROTECTION RELAYS SHALL BE NUMERICAL COMMUNICABLE TYPE SUITABLE FOR IEC61850 PROTOCOL.
 5. DIGITAL MULTIFUNCTION METERS SHALL BE PROVIDED WITH 1 NO. AMMETER (3PHASE), 1 NO. MWH METER. COMMUNICABLE MFM SHALL BE USED FOR METERING AND SHALL BE CONSIDERED WITH INTERCONNECTIVITY TO EXISTING ECS SYSTEM.
 6. FEEDER DIFFERENTIAL RELAY FOR RECEIVING END INCOMER SHALL BE LOOSE SUPPLIED BY THE SWITCHBOARD VENDOR/CONTRACTOR.
 7. REFER TO ITV FOR SCOPE RELATED TO FEEDER DIFFERENTIAL RELAY AND ACCESSORIES.
 8. THERE SHALL BE ONE COMMON CONTROL SWITCH FOR ALL CONTROL SUPPLY FEEDER. SEPARATE FUSES FOR FOLLOWING BRANCH CIRCUIT SHALL BE PROVIDED:
 - SPRING CHARGING CIRCUIT
 - CLOSING CIRCUIT
 - TRIPPING, CONTACT MULTIPLIER & DIGITAL INPUT CIRCUIT
 - INDICATION CIRCUIT
 - NUMERICAL RELAY SUPPLY (INCOMING OF NUMERICAL RELAY SUPPLY FUSE SHALL BE TAPPED BEFORE THE CONTROL SUPPLY SWITCH)



**6.6KV SWITCHBOARD
HARDWARE DATASHEET FOR
PLANT FEEDER (TYPE-1)**

DATA SHEET	REV
B957-000-16-50-DS-0124 SHT 1 OF 1	B

Annexure-1

FORMAT FOR SUBMISSION OF TYPE TEST REPORTS FOR SWITCHBOARDS														
TEST ON SWITCHBOARDS	SHORT CIRCUIT		INTERNAL ARC						HEAT RUN		POWER FREQUENCY AND IMPLUSE VOLTAGE WITHSTAND		DEGREE OF PROTECTION	
			CIRCUIT BREAKER COMPARTMENT		BUS BAR COMPARTMENT		CABLE COMPARTMENT							
Rating	OFFERED	TYPE TESTED	OFFERED	TYPE TESTED	OFFERED	TYPE TESTED	OFFERED	TYPE TESTED	OFFERED	TYPE TESTED	OFFERED	TYPE TESTED	OFFERED	TYPE TESTED
Model														
Fault Level														
Internal Arc Class														
Enclosure Dimension (LXBW)														
Main Bus Bar Centre Line Distance														
Vertical/Distributed Bus Bar Centre Line														
Bus Bar Material														
Insulator Type / Material														
Support Distance														
Enclosure / Partition Material														
Report No.														
Report Date														
Testing Agency														

Notes : -

Submit complete test report along with the format.

Annexure-2

FORMAT FOR SUBMISISON OF TYPE TEST REPORTS FOR BUS DUCTS								
TEST ON BUS DUCTS	SHORT CIRCUIT		HEAT RUN		POWER FREQUENCY AND IMPLUSE VOLTAGE WITHSTAND		DEGREE OF PROTECTION	
	OFFERED	TYPE TESTED	OFFERED	TYPE TESTED	OFFERED	TYPE TESTED	OFFERED	TYPE TESTED
Rating								
Fault Level								
Enclosure Dimension (LXBW)								
Bus Bar Centre Line Distance Phase to Phase								
Insulator Type / Material								
Enclosure Partition Material /								
Report No.								
Report Date								
Testing Agency								

Notes : -

Submit complete test report along with the format.


FORMAT FOR SUBMISISON OF TYPE TEST REPORTS FOR BREAKER

TEST ON VCB	SHORT CIRCUIT		BREAKER DUTY CYCLE		HEAT RUN		POWER FREQUENCY AND IMPLUSE VOLTAGE WITHSTAND	
	OFFERED	TYPE TESTED	OFFERED	TYPE TESTED	OFFERED	TYPE TESTED	OFFERED	TYPE TESTED
Rating								
Model								
Type (Cassette / truck mounted)								
Interrupter Type								
Report No.								
Report Date								
Testing Agency								

Notes : -

Submit complete test report along with the format.

ELECTRICAL LOAD DATA

B	07.01.2025	REVISED AND RE-ISSUED WITH TENDER	MKM	MKM	RSR	
A	13.09.2024	ISSUED WITH TENDER	MKM	MKM	RSR	
REV.	DATE	PURPOSE	PREPARED BY	CHECKED BY	APPROVED BY	
 ENGINEERS INDIA LIMITED <small>(A Govt. of India Undertaking)</small>		Plant : BPREP	ELECTRICAL LOAD DATA		DOCUMENT NO.	REV.
		Location : BINA REFINERY, BINA.			B957-000-16-50-9901	B
		Client : M/S BPCL				

Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP	Client	BPCL
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Unit	Bulk Procurement	Location		Job No.	B957	Unit No.	000
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PURCHASER'S DATA

A. Site Conditions	
1.	Maximum Ambient Temperature °C 48
2.	Minimum Ambient Temperature °C 1.1
3.	Design Ambient Temperature °C 45
4.	Relative Humidity % 86
5.	Altitude Above MSL m <1000
6.	Environment Hot, humid & corrosive
B. Technical Particulars	
1.	Nominal System Voltage kV 220
2.	Maximum System Voltage kV 245
3.	System Earthing Solidly Earthed
4.	System Fault Level kA 50
5.	Rated Arrestor Voltage kV 198
6.	Rated Frequency Hz 50
7.	Max. Continuous Operating Voltage kV 127
8.	Terminal Connector
	i. Busbar ACSR
	ii. Take off Vertical
9.	Nominal Discharge Current 10 kA, light duty
10.	Line Discharge Class Heavy duty
11.	Pressure Relief Class A
12.	High Current w.s Capacity kA 10
13.	Min. Cantilever strength-housing
14.	Total Creepage Distance mm/kV 31kV/mm
15.	Applicable Standard EIL std. 6-51-0096
16.	Installation Outdoor

MANUFACTURER'S DATA

1.	Make
2.	Rated Arrestor Voltage
3.	Max. Continuous Operating Voltage
4.	Max. Residual Voltage at Nominal Discharge Current
5.	Max. Residual Voltage at 1 kAp Switching Current
6.	Nominal Discharge Current
7.	Line Discharge Class
8.	Pressure Relief Class
9.	High Current withstand Capacity
10.	Temporary over-voltage Capacity
	for 0.1 sec
	for 1 sec
	for 10 sec
	for 100 sec
11.	Components of continuous leakage current at MCOV at specified ambient Temperature
	Ic

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	19-NOV-2024	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR

Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP
 Client BPCL

Unit	Bulk Procurement	Location	Job No.	Unit No.
	Ir		B957	000
12.	Housing Insulation Level			
13.	Impulse Withstand			
14.	Power Frequency			
	Wet			
	Dry			
15.	Weight			
16.	Height			
17.	G.A. Drawing			
18.	Clearance Diagram			
19.	Whether Offered LA type is Type Tested			

Eil Notes

- Lighting arrester sizing and selection shall be done by contractor based on insulation co-ordination study
- Contractor to obtain approval from MPPTCL also on Lightning arrester datasheet for Incoming line

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	19-NOV-2024	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR

**DATA SHEET – INTELLIGENT MOTOR PROTECTION RELAY
Part-I (Data to be filled in by purchaser)**

1. PROJECT DETAILS:

a)	Project	:	BPREP
b)	Client	:	BPCL
c)	Location	:	Bina, Madhya Pradesh
d)	Unit	:	Common

2. SITE CONDITIONS:

a)	Ambient temperature	:	Max. 48° C / Min. 1.1° C
b)	Design temperature	:	45° C
c)	Altitude	:	Less than 1000M above MSL
d)	Installation	:	Indoor
e)	Location	:	Substation

3. INPUT POWER SUPPLY SYSTEM CONDITIONS

a)	No. of phases	:	3
b)	AC input voltage	:	415 V
c)	Voltage fluctuation	:	± 10%
d)	Rated frequency	:	50 Hz
e)	Frequency fluctuation	:	± 5%
f)	System fault level	:	65kA

4. **Motor Type for which Intelligent Motor Protection relays are provided*:** IE3/IE4 type as per latest IS-12615/IEC-60034-30.

5.	Display Unit required	:	YES (for Each IMPR)
6.	Number of DI & DO	:	6 DI & 4 DO (Minimum)
7.	Current Measuring Module	:	Required
8.	Voltage Measuring Module	:	Not Required
9.	4-20mA output to field ammeters	:	Required
10.	DCS Interface requirement	:	MODBUS TCP/IP – for Status/feedback Hardwired – For Command

Notes:

- 110V ±10%, DC Auxiliary voltage (By owner) shall be given as input to the intelligent relay. Conversion of 110V DC power supply to any other voltage level or to AC power supply shall be taken care by vendor by providing suitable converter/inverter module inside panel.
- Earth leakage Protection required for motors rated 37kW and 45kW (setting range 1-16%).
- * Please refer Table-1, Table-2 & Table-3 of IS-12615 for values of performance characteristics of energy efficient motors. Accordingly Intelligent Motor protection relay shall be selected for each feeder.
- Following Minimum facilities on Instrument Plate (On front door) of each Intelligent Motor feeder Module shall be provided for ease of doing operation:**
 - ON/OFF control switch for Control supply
 - LCD Display having ON/OFF/TRIP Indications, 3-Phase Current Display.
 - ON/OFF control switch for Space Heater (for rated 30kW and above).
 - Test Push button.

B	31.01.2025	REVISED AND RE-ISSUED WITH MR/TENDER	SKANU	SK	RSR
A	18.11.2024	ISSUED WITH MR/TENDER	SK	RSR	RSR
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PART-II (to be filled in by vendor and submitted during detail engineering)

1. Make :
2. Model No. :
3. Rating :
4. Applicable code/standards :
5. Auxiliary voltage to be given as input to the intelligent relay :
6. Power consumption :
7. Network Communication Protocols
 - a) Communication Protocols :
 - b) Communication Method :
 - c) Range :
 - d) Communication Line :
8. Diagnosis Functions :
9. Auxiliary Functions :
10. Rated specification
 - a) Over current (A) Setting Range :
 - b) Under current (A) Setting Range :
 - c) Leakage ground current setting Range :
 - d) Operating time characteristics :
 - e) Control Power :
 - f) Output contact :
 - g) Display :
11. **Output short circuit capability and duration** :
12. **Auxiliary Power Requirement:**
 - a) KW :
 - b) Voltage :
13. **4-20mA Signal required for Remote Current Indication** : Yes (2 no. for each motor)
14. **Address of Manufacturing Location** :
15. Time Sync. Facility over SNTP protocol :
16. Number of DI /DO :
17. Number of AI/AO :
18. Range of current measuring module :



-
19. Conformal Coating as per IEC-60721-3-3 :
20. Earth Leakage protection provided (Separate or inbuilt) :

Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP **Client** BPCL

Unit Common **Location** Bina, Madhya Pradesh **Job No.** B957 **Unit No.** 000

PURCHASER'S DATA

A. Site Conditions			
1.	Maximum Ambient Temperature	°C	48
2.	Minimum Ambient Temperature	°C	1.1
3.	Design Ambient Temperature	°C	45
4.	Relative Humidity	%	86
5.	Altitude Above MSL	m	<1000
6.	Environment		Hot, humid & corrosive
B. RELAY SELECTION			
1. RELAY FUNCTION			
a	Only Protection		<input type="checkbox"/>
b	Protection and metering		<input type="checkbox"/>
c	Protection and metering and control		<input checked="" type="checkbox"/>
d	Ethernet communication		<input checked="" type="checkbox"/>
e	Password protection		
	a. For write		<input type="checkbox"/>
	b. For both read and write		<input checked="" type="checkbox"/>
2. CONSTRUCTION FEATURE			
a	Enclosure type		IP5X
b	Terminal size-sqmm for external wires		1.5 for Control, 4 for CT/PT
c	Mounting		Flush
d	Drawout feature		As per 6-51-0055
e	Display type		Alphanumeric/Graphical display as per 6-51-0055
3. SPECIAL REQUIREMENT IF ANY			
a	Applicable standards		IEC
b	Distance for cable capacitance for application where field contacts are directly wired to relay e.g. Motor start/ stop, intertrip	m	upto 4000
4. INPUT POWER SUPPLY			
a	Site selectable feature		<input checked="" type="checkbox"/>
b	Input supply	V	110V +15/-10% DC
5. CT/ PT INPUT TO RELAY			
a	Current operated relays		<input type="checkbox"/>
	a1 Main CT input		
	a2 CT for sensitive EF or back up EF		
b	Voltage operated relays		<input type="checkbox"/>
	b1 PT input		
c	Comprehensive relay		<input checked="" type="checkbox"/>
	c1 Main CT input		3CTs, 4 Wire
	c2 PT input		3 Phase, 4 Wire
	c3 CT for sensitive EF or back up EF		1 CT, 2 Wire for Incomer/Trafo feeder
d	CT Secondary current		1
C. RELAY PROTECTION/ METERING FUNCTIONS			
1. CURRENT OPERATED RELAYS			
a	3 phase O/C element (50, 51)		* I> <input checked="" type="checkbox"/> * I>> <input checked="" type="checkbox"/> * I>>> <input checked="" type="checkbox"/>
	Characteristics as per IEC		
	* Inverse (normal, very, extremely, long) and definite time for I > and I >>		

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Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP **Client** BPCL

Unit Common **Location** Bina, Madhya Pradesh **Job No.** B957 **Unit No.** 000

	* Definite time for I >>>				
b	E/F relay (50N, 51N, 51G)	* I>	<input checked="" type="checkbox"/>	* I>>	<input checked="" type="checkbox"/>
	Characteristics as per IEC				
	* Inverse (normal, very, extremely, long) and definite time for IO >, IO >>				
	* Definite time for IO>>>				
c	Metering/ event recording				
	3 phase/ line currents		<input checked="" type="checkbox"/>		
	Disturbance record		<input checked="" type="checkbox"/>		
	Breaker trip/ close status		<input checked="" type="checkbox"/>		
	Relay faults		<input checked="" type="checkbox"/>		
	Trip Values		<input checked="" type="checkbox"/>		
2	VOLTAGE OPERATED RELAYS				
a	3 phase O/V element with time delay (59+2)	* OV>	<input checked="" type="checkbox"/>	* OV>>	<input checked="" type="checkbox"/>
b	3 phase U/V element with time delay (27+2)	* UV>	<input checked="" type="checkbox"/>	* UV>>	<input checked="" type="checkbox"/>
	Characteristics as per IEC				
	* Inverse (normal, very, extremely, long) and definite time for UV>, UV>>				
c	Under/ Over Frequency element with time delay (81U/ 81O)				
	Settable under voltage restraint		<input checked="" type="checkbox"/>		
	df/dt element		<input checked="" type="checkbox"/>		
	Number of stages with u/f				During Detail Engg.
	Number of stages with df/dt				During Detail Engg.
d	Synchrocheck function		<input checked="" type="checkbox"/>		
e	Metering/ event recording				
	3 phase/ line Voltages		<input checked="" type="checkbox"/>		
	Disturbance record		<input checked="" type="checkbox"/>		
	Breaker trip/ close status		<input checked="" type="checkbox"/>		
	Relay faults		<input checked="" type="checkbox"/>		
	Trip Values		<input checked="" type="checkbox"/>		
3	MOTOR PROTECTION RELAY				
a	Protection elements				
	Thermal overload (49)		<input checked="" type="checkbox"/>		
	OC protection with doubling feature (50)		<input checked="" type="checkbox"/>		
	EF protection (50N)		<input checked="" type="checkbox"/>		
	Locked Rotor protection		<input checked="" type="checkbox"/>		
	Maximum start time		<input checked="" type="checkbox"/>		
	Maximum number of starts		<input checked="" type="checkbox"/>		
	Negative phase sequence		<input checked="" type="checkbox"/>		
	Under voltage delayed trip		<input checked="" type="checkbox"/>		
	EF Through CBCT		<input checked="" type="checkbox"/>		
	Single phasing		<input checked="" type="checkbox"/>		
b	Metering/ events				
	3 phase/ line current		<input checked="" type="checkbox"/>		
	Hour run		<input checked="" type="checkbox"/>		
	KW, KWH, pf		<input checked="" type="checkbox"/>		
	Disturbance record		<input checked="" type="checkbox"/>		
	Plot start characteristic		<input checked="" type="checkbox"/>		

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Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP			Client	BPCL
Unit	Common	Location	Bina, Madhya Pradesh	Job No.	B957
				Unit No.	000
	Trip values			<input checked="" type="checkbox"/>	
	Start time			<input checked="" type="checkbox"/>	
	Start current			<input checked="" type="checkbox"/>	
c	Control				
	Breaker close in test mode			<input checked="" type="checkbox"/>	
	Reacceleration logic			<input checked="" type="checkbox"/>	
	Breaker trip			<input checked="" type="checkbox"/>	
	RTD/BTD input			<input type="checkbox"/>	
4	COMPREHENSIVE NUMERICAL RELAY				
a	Current op elements (51, 50, 51N, 50N, 51G)				Required as per Hardware Datasheet
b	Voltage op elements (59, 27, 2, 81U, 81O)				Required as per Hardware Datasheet
c	Control function				
	Breaker close/ trip from relay				Required
	Breaker close/ trip on serial				Required
	PLC logic function for control scheme				Required
	Digital I/P & Digital O/P:				As per approved logic diagram with 20% spare
	Motor Feeder control function				Required
5	SPECIAL PROTECTION RELAYS (Refer Job Spec)				
	Part of main relay			<input type="checkbox"/>	
	Separate relay			<input checked="" type="checkbox"/>	
a	Differential relays			<input checked="" type="checkbox"/>	
	BUS				Refer Job Specification / Hardware datasheet
	Feeder				Refer Job Specification / Hardware datasheet
	Trafo				Refer Job Specification / Hardware datasheet
	Machine				Refer Job Specification / Hardware datasheet
b	Directional relays (67, 67N)			<input checked="" type="checkbox"/>	
c	Restricted EF (64R)			<input checked="" type="checkbox"/>	
d	Generator protection			<input checked="" type="checkbox"/>	
e	Distance protection			<input type="checkbox"/>	
f	Reverse power relay			<input checked="" type="checkbox"/>	
6	OTHER RELAY FEATURES				
a	Analog inputs 4-20mA				
	RTD/ BTD-GPR				Not Required
	WTI/ OTI-Trafo relay				Not Required
	WTI= Winding temperature indicator				
	OTI= Oil temperature indicator				
b	Out put relays				
	Number of relays				As required
	Contact rating				2A, 110V DC
	Reset				Hand reset
	FUNCTIONS part of numerical relay				
c	Lock out function (86)			<input type="checkbox"/>	
d	Trip circuit supervision(95)			<input checked="" type="checkbox"/>	
e	Watch dog			<input checked="" type="checkbox"/>	
f	Time stamp			<input checked="" type="checkbox"/>	
g	Modular construction for easy and quick replacement of faulty PCB/circuit			<input checked="" type="checkbox"/>	
D	ETHERNET COMMUNICATION AND RELAY INTEGRATION				
A	13-SEP-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP **Client** BPCL

Unit Common **Location** Bina, Madhya Pradesh **Job No.** B957 **Unit No.** 000

1 RELAY INTEGRATION		
a	Communication ports at Relay	
	Relay front	RS 232/RJ45/USB as per 6-51-0055
	Relay back	Suitable for IEC61850 Interface
b	Protocol of relay LAN	IEC 61850
c	Requirment of Integration	
	Integrator with DC	<input type="checkbox"/>
	Directly to MMI	<input checked="" type="checkbox"/>
d	Topology	As per Job Specification
e	Data concentrators	Not Required
2 REDUNDANCY		
a	Relay LAN / serial	<input checked="" type="checkbox"/>
	Redundant (serial)	<input checked="" type="checkbox"/>
	Non redundant (star)	<input checked="" type="checkbox"/>
b.	From DC to MMI	<input type="checkbox"/>
	Redundant	<input type="checkbox"/>
	Non redundant	<input type="checkbox"/>
c	From DC to ECS-RTU	<input type="checkbox"/>
	Redundant	<input checked="" type="checkbox"/>
	Non redundant	<input type="checkbox"/>
3 REDUNDANCY REQUIREMENT FOR DC/ETHERNET SWITCH/MMI		
a	Ports at STAR coupler	
	For each relay	Non Redundant
	For DC/Ethernet Switch	Redundant
b	Data concentrator / Ethernet Switch	
	Power supply card	Redundant
	Communication port for each relay LAN	Redundant
	Communication Processor	Not Applicable
4 SERIAL COMMUNICATION FROM DC/ETHERNET SWITCH ONWARDS		
a	DC/Ethernet Switch to MMI	
	Topology	As per Specification
	Protocol	IEC 61850
b	DC to DCS	Not Applicable
c	DC/Ethernet Switch to ECS-RTU	IEC 61850
d	Scan time	As per Specification
5 OTHER REQUIREMENT		
a	Time synchronization	<input checked="" type="checkbox"/>
b	Remote relay parameterization	<input checked="" type="checkbox"/>
c	Annunciation at MMI	<input checked="" type="checkbox"/>

MANUFACTURER'S DATA

1. NUMERICAL RELAY TYPES						
Relay Make/Model	Serial Ports	Analogue Inputs	No of DI/DO	Protocal	Any Other Data	Remarks
A	Incomer					
B	Buscoupler					
A	13-SEP-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR	
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Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP			Client	BPCL
Unit	Common	Location	Bina, Madhya Pradesh	Job No.	B957
				Unit No.	000
C	Generator				
D	Transformer				
2 DATA CONCENTRATOR / ETHERNET SWITCH AND RELAY INTEGRATION					
a	Model no.				
	Make				
b	Input power supply				
	Voltage				
	Power reqt				
c	Redundancy				
	Power supply				
	Communication processor				
	Communication port				
	Relay LAN/ Serial communication				
	ECS-RTU interface				
	MMI interface				
d	Serial interface/ Relay LAN				
	Topology				
	Protocol				
	Nos of relay in each				
	Topology				
	Type of port				
	Cable type				
e	Serial interface- MMI				
	Topology				
	Protocol				
	Type of Port				
	Cable type				
f	Serial Interface -ECS-RTU				
	Topology				
	Protocol				
	Type of Port				
	Cable type				
g	Number of Digital Input/ Aanalogue Input (4-20mA)				
	DI for substation eqpt				
	Spare DI				
	AI as per project data sht				
	Spare AI				
h	Maximum Scan Time				
	Status				
A	13-SEP-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
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Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP **Client** BPCL

Unit Common **Location** Bina, Madhya Pradesh **Job No.** B957 **Unit No.** 000

	events	
	Data acquisition (analog)	
	Disturbance record download time	
i	Other features	
	Spare capacity for additional devices for relay LAN	
	Time synchronization options	
	Power walk in time	
	Restoration time of communication of DC with NR & MMI	

3 STANDARD FEATURES OF RELAY / SYSTEM ARCHITECTURE

Notes
1

A	13-SEP-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
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Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP	Client	BPCL
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Unit	Common	Location		Job No.	B957	Unit No.	000
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PURCHASER'S DATA

A. Site Conditions	
1. Maximum Ambient Temperature	°C 48
2. Minimum Ambient Temperature	°C 1.1
3. Design Ambient Temperature	°C 45
4. Relative Humidity	% 86
5. Altitude Above MSL	m <1000
6. Environment	Hot, humid & corrosive
B. Technical particulars	
1. Cable Type/Code	control & fire alarm cables
2. Embossing Details	Sequential marking/Metre
3. Details of Color Coding	Refer 6-51-0052
4. Details of Pairing	Refer 6-51-0052
5. Standard Drum Length	Refer Specification

MANUFACTURER'S DATA

A. Twisted Pair Unshielded Cables	
1. Name of Manufacturer	
2. Material Specifications	
Conductor dia.	mm
Insulation Thickness	mm
Inner Sheath Thickness	mm
Outer Sheath Thickness	mm
3. Performance Data	
Rated Voltage	V
Max. Resistance at 20°C	ohms
Max. Core-Core Capacitance	nF
Max. Inductance	mH
Nominal Impedance	ohms
4. Technical Particulars	
Approx. overall diameter	mm
Approx. dia. over armour	mm
Approx. dia. under armour	mm
Armour Galvanised Steel wire thickness	
Minimum outer sheath thickness	mm
B. Twisted Pair Shielded Cables	
1. Name of Manufacturer	
2. Material Specifications	
Conductor dia.	mm
Insulation Thickness	mm
Inner Sheath Thickness	mm
Outer Sheath Thickness	mm
3. Performance Data	
Rated Voltage	V
Max. Resistance at 20°C	ohms
Max. Core-Core Capacitance	nF

A	17-OCT-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
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Project		Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP		Client	BPCL
Unit	Common	Location		Job No.	B957
				Unit No.	000
	Max. Core-Screen Capacitance		nF		
	Maximum Inductance		mH		
	Nominal Impedance		ohms		
4.	Shielding Data				
	Material of Shielding				
	Minimum Thickness		mm		
	Coverage and Overlap				
5.	Drain Wire for Overall Sheath				
	Drain Wire Material				
	Area of Cross Section		mm sq		
	No. of Strands				
	Diameter		mm		
6.	Technical Particulars				
	Conductor Size		mm sq		
	Approx. overall diameter		mm		
	Approx. dia. over armour		mm		
	Approx. dia. under armour		mm		
	Armour Galvanised Steel wire thickness				
	Minimum outer sheath thickness		mm		

Eil Notes

A	17-OCT-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
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Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP	Client	BPCL
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Unit	Bulk Procurement	Location		Job No.	B957	Unit No.	000
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PURCHASER'S DATA

A. Site Conditions		
1.	Maximum Ambient Temperature	°C 48
2.	Minimum Ambient Temperature	°C 1.1
3.	Design Ambient Temperature	°C 45
4.	Relative Humidity	% 86
5.	Altitude Above MSL	mm <1000
6.	Environment	Hot, humid & corrosive
B. Technical particulars		
1.	System Voltage	
	Nominal	415 V
	Highest	500 V
	Voltage grade	650/1100V
2.	Frequency	Hz 50 +/- 5 %
3.	Conductor material	
	HV Power cable	Not Applicable
	MV Power cable	Copper & Aluminium
	MV control cable	Not Applicable
4.	Installation under DGMS jurisdiction (See Note)	No
5.	Applicable spec.	EIL spec 6-51-0051
6.	Insulation	XLPE
7.	PVC compound type	As per specification 6-51-0051
8.	Type of conductor	Stranded
9.	Conductor class	As per IS
10.	Types of cable	As per spec.
11.	Armour	
	Type	As per spec
	Size of armour	As per spec
12.	Type of drum	Steel

MANUFACTURER'S DATA

A. Technical particulars		
1.	Name of manufacturer	
2.	MR/PR item no.	
3.	Cable type/ code	
4.	Conductor material	
5.	Conductor semiconducting screen (HV cables)	
	Material	
	Thickness	mm
6.	Insulation	
	Type of compound	
	Thickness	mm
7.	Insulation semiconducting screen (HV cables)	
	Material	

B	30-JAN-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	01-OCT-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
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Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP			Client	BPCL
Unit	Bulk Procurement	Location		Job No.	B957
				Unit No.	000
	Thickness		mm		
8.	Copper tape				
	Thickness		mm		
9.	Inner sheath				
	Type of compound				
	Thickness		mm		
10.	Nominal dia under armour		mm		
11.	Calculated dia under armour		mm		
12.	Armour				
	Material				
	Type				
	Size				
13.	Nominal dia under outersheath		mm		
14.	Calculated dia under outersheath		mm		
15.	Outersheath				
	Type of compound				
	Thickness		mm		
16.	Nominal outer dia of cable		mm		
17.	Tolerance on outer dia		%		
18.	Weight of cable per km		kg		
19.	Maximum drum length		mtr.		
20.	Maximum DC resistance of conductor at 20 °C				
21.	AC resistance at 90 °C				
22.	Reactance of cable at 50 Hz				
23.	Capacitance of cable				
24.	Zero sequence impedance of cable				
25.	Capacitive charging current per km				

Notes

1

B	30-JAN-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	01-OCT-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP	Client	BPCL
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Unit	Common	Location		Job No.	B957	Unit No.	000
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PURCHASER'S DATA

A. Site Conditions		
1.	Maximum Ambient Temperature	°C 48
2.	Minimum Ambient Temperature	°C 1.1
3.	Design Ambient Temperature	°C 45
4.	Relative Humidity	% 86
5.	Altitude Above MSL	mm <1000
6.	Environment	Hot, humid & corrosive
B. Technical particulars		
1.	Rated voltage	Volts *
2.	Rated current (short time rating)	A *
3.	Short time rating	10 Sec.
4.	Continuous rating (10% of short time rating)	Not Required
5.	Resistance of NGR	Ohms
6.	Terminal connections	
6.1	Transformer neutral to NGR	Al Conductor
	Cable size	sq. mm.
	Voltage grade	kV (E/UE)
6.2	NGR to Earth	GI Strip
	Size	sq. mm.
	Voltage grade	kV (E/UE)
7.	Installation	Outdoor
8.	Cable connections	
8.1	Cable entry	Bottom
8.2	Separate bolted removable gland plate for cable entry	Required
8.3	Cable glands & lugs	Required
9.	Current transformer	Not Required
	Voltage grade	
	Ratio	
	Burden	
	Accuracy class	
10.	Painting/Painting shade	Epoxy & shade 631
11.	Degree of protection	IP31 for Enclosure
12.	Applicable EIL specification	6-51-0043

MANUFACTURER'S DATA

A. Technical particulars		
1.	Make	
2.	Resistor element	
	Material code	
	Specific resistance	ohm cm
	Temp. co-efficient	
	Resistance of banks	ohms
	No. of resistor banks	
	Series	nos.
	Parallel (Min.two)	nos..
3.	Separate canopy provided	

A	13-SEP-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

Project		Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP	Client	BPCL
Unit	Common	Location	Job No.	B957
			Unit No.	000
4.	Min. creepage distance			
	Total	mm		
	Protected	mm		
5.	P.f withstand voltage	kV (rms)		
6.	Overall dimensions			
	Width	mm		
	Depth	mm		
	Height	mm		
7.	Overall weight of panel	kg		
8.	Copies of type test certificates furnished			

Eil Notes

- * By vendor

A	13-SEP-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP **Client** BPCL

Unit Bulk Procurement **Location** **Job No.** B957 **Unit No.** 000

PURCHASER'S DATA

A. Site Conditions	
1. Maximum Ambient Temperature	°C 48
2. Minimum Ambient Temperature	°C 1.1
3. Design Ambient Temperature	°C 45
4. Relative Humidity	% 86
5. Altitude Above MSL	m <1000
6. Environment	Hot, humid & corrosive
B. Technical particulars	
1. Tag no.	Refer Job Specification
2. Duty	Continuous
3. Service	Lighting
4. No. of windings	Two
5. Type of cooling	AN
6. Rated MVA	Refer Job Specification
7. Rated voltage	
HV winding	kV 0.415
LV winding	kV 0.415
8. System earthing	
HV side	Solidly Earthed
LV side	Solidly Earthed
9. Rated frequency	Hz 50 +/- 5 %
10. No. of phases	Three
11. Fault level on HV side	kA 65
12. Connection	
HV side	Delta
LV side	Star
13. Vector group	Dyn11
14. Impedance at max. MVA	%
15. Insulation class	H
16. Insulation level	
P.f withstand	
HV winding	kV As per IS and CBIP
LV winding	kV As per IS and CBIP
Impulse withstand	
HV winding	kVp As per IS and CBIP
LV winding	kVp As per IS and CBIP
17. Winding insulation type	Cast Resin/VPI
18. Creepage distance	
Prim. winding	
total	As per IS and CBIP
protected	As per IS and CBIP
LV winding	
total	As per IS and CBIP
protected	As per IS and CBIP
19. Tab changer	

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
C	17-DEC-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
B	17-DEC-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	19-NOV-2024	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR

Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP **Client** BPCL

Unit	Bulk Procurement	Location	Job No.	B957	Unit No.	000
	Location		Primary Winding			
	Type		Offcircuit.			
	Range	%	± 7.5			
	No. of steps		7 at 2.5% each			
20.	Normal load	%	30-40			
21.	Max efficiency at 0.8 p.f		As per latest ECBC			
22.	Load at which max eff. occurs	% MVA	By Vendor			
23.	Power flow		Unidirectional			
24.	Terminal location					
	HV side		Larger side			
	LV w.r.t HV	°	180			
25.	Terminal connection					
	HV side		Cable box			
	LV side		Cable box			
26.	Cable Size/Type					
	HV side		During Detail Engg			
	LV side		During Detail Engg			
27.	Neutral CT specification					
	51G		Not Required			
	64R		Not Required			
	Vk	A	Not Applicable			
	Im at Vk/2	mA	Not Applicable			
	RCT	ohm	Not Applicable			
28.	Installation		Indoor			
29.	Painting & colour		RAL-7032			
30.	AC Auxiliary voltage	V	240 +/- 10 % TPN			
31.	DC Auxiliary voltage	V	110 +/- 10 % %			
32.	Bidirectional roller type		Flat			
33.	ϕ distance of flat rollers	mm	By Vendor			
34.	Applicable specifications		EIL std. 6-51-42			
35.	Loss Capitalization		Not Applicable			
a.	Rate for copper loss Rs./kW		Not Applicable			
b.	Rate for iron loss Rs./kW		Not Applicable			
36.	Accessories requirement		Yes			
	Two temp. sensing devices in each limb		Yes			
	Marshalling box(IP-55)		Yes			
	Temp. sensing relay		Yes			
	Channels, towing lugs :		Yes			
	Rollers		Yes			
	Neutral bushing outside terminal box		Yes			
	with connector assembly					
	Indicating platinum resistance type		Yes			
	thermometer with contacts					

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
C	17-DEC-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
B	17-DEC-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	19-NOV-2024	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR

Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP **Client** BPCL

Unit	Bulk Procurement	Location	Job No.	Unit No.
			B957	000
		Busduct flange on LV	Not Required	
		Lugs and cable glands	Required	
37.		Tests requirements		
		Impulse test	Required (Test Certificate)	
		Heat run test	Required	
38.		Partial discharge test (cast resin)	Required (Test Certificate)	
		Short circuit test	Required (Test Certificate)	
		Acoustic sound	Required (Test Certificate)	

MANUFACTURER'S DATA

1.	Make	
2.	Rated power at ambient temperature of	
	25 °C	
	30 °C	
	35 °C	
	40 °C	
	45 °C	
	50 °C	
3.	Insulation type	
B. Performance		
1.	No load loss at	
	100% voltage	kW
	110% voltage	kW
2.	Full load copper loss at 75 °C	kW
3.	No load current at	
	100% voltage	A
	100% voltage	A
4.	Efficiency at full load at 75 °C	
	at 0.8 p.f	%
	at 1.0 p.f	%
5.	Eff. at half load at 75 °C	
	at 0.8 p.f	%
	at 1.0 p.f	%
6.	Load at which max eff. occurs	MVA
7.	Regulation at 75 0 C	
	at 0.8 p.f	%
	at 1.0 p.f	%
8.	Maximum efficiency	%
C. Mechanical data		
1.	Core & winding weight	kgs.
2.	Total weight	kgs.
3.	Wheel gauge	
4.	Overall dimensions	
	Length	mm
	Breadth	mm
	Height	mm

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
C	17-DEC-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
B	17-DEC-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	19-NOV-2024	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR

Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP

Client BPCL

Unit Bulk Procurement

Location

Job No. B957

Unit No. 000

Eil Notes

- 1 Heat run test shall be conducted on one transformer of each rating. Type test certificates are required to be furnished by Contractor for partial discharge tes
- 2 All unfilled data shall be filled in by Contractor/Vendor.
- 3 Losses shall be inclusive of positive tolerance and shall be at nominal tap

C	17-DEC-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
B	17-DEC-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	19-NOV-2024	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP **Client** BPCL

Unit Bulk Procurement **Location** **Job No.** B957 **Unit No.** 000

PURCHASER'S DATA

A. Site Conditions	
1. Maximum Ambient Temperature	°C 48
2. Minimum Ambient Temperature	°C 1.1
3. Design Ambient Temperature	°C 45
4. Relative Humidity	% 86
5. Altitude Above MSL	m <1000
6. Environment	Hot, humid & corrosive
B. HEATING AND PROCESS SYSTEM PARAMETERS (Refer else where in the tender document)	
C. ELECTRICAL SYSTEM PARAMETERS	
1. Input volt.	415 V+/- ± 10%TPN
2. Frequency	50 Hz +/- ± 5%
3. System fault level	65kA,1sec with MCCB
4. System earthing	Solidly Earthed
5. Utilization voltage for heater tape	240 V+/- ± 10% % ,1 Phase
D. ELECTRICAL EQUIPMENT DATA	
Local Distribution Panels (LDP's)	
1. Installation	Outdoor
2. Enclosure	IP55, FLP, Pedestal mtd. Outdoor
3. Painting	Shade 632 of IS-5
4. Cable Entry	Bottom
5. Incomer with rating	MCCB
Metering, Protection , Indication, Alarm outfits	
1. Ammeter with Sel. Switch	Yes
2. Indicating lamps	Yes
3. Voltmeter with Sel. Switch	Yes
4. Auxillary tip contact (Applicable for MCCB feeder)	As applicable
Optional accessories : (in each feeder)	
1. Contactor (where switch rating of thermostat contact is inadequate)	Yes
2. Ammeter	Yes
3. ON/OFF Indicating lamps	Yes
4. Aux. Contactor (for power supply monitoring)	Yes
5. Cable lugs & glands	Required
E. Cabling	
1. Power cables	Refer note
2. Control cables	Refer note
3. Method of laying	Overhead / Trench
4. Type of tray	Hot dipped galvanised

1.0 HEATER TAPE : (The particulars shall be furnished seperately for each type of heater tape offere	
A. Type	Catalogue no.
B. Max. withstand temperature during any plant operation/ shutdown	°C
C. T- Rating	°C

B	31-JAN-2025	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
A	17-OCT-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP **Client** BPCL

Unit Bulk Procurement **Location** **Job No.** B957 **Unit No.** 000

D.	Thermal output at 240V AC	°C
E.	Max. allowable circuit length	m
F.	In rush current at 240 V	Amp, at start-up condition (for self regulating tapes only)
G.	Voltage available at the end of allowable circuit length	V
H.	Tolerance of heater output	

1.1 The following test/ approval certificates shall be furnished , alongwith filled in datasheet with the offer, for all electrical equipment to installed in hazardous area (including heat tracer tape and accessories). Relevant particulars shall be filled-up in the following table:-

Equipment	Heater tape	Thermostat	Junction box	Connectors	Glands	lpd (FLP)	Others
Explosion protection class (as applicable)							
Type reference No. / Cat. No.							
Ref No. & date of CMRI/ other test certificates of recognised test authority							
Ref No. & date of CCE approval certificate							
Ref No. & date of DGFASLI approval certificate							
Ref No. & date of DGMS approval certificate							
BIS Licence No. & date							

1.2 Selection criteria for heat tracer tape:

Sr. No.	Type of Heat tracer tape and power rating	T-rating	Method of classification as per IEEE 515	
			Product classification approach	System approach
1				

1.3 LDP wise start-up load current (Considering switching at minimum ambient temperature)

S.No.	LDP Number	Start-up load current (Amperes)
1		

B	31-JAN-2025	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
A	17-OCT-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

Project Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP

Client BPCL

Unit Bulk Procurement

Location

Job No. B957

Unit No. 000

2.0 Typical format for MTO for heater tape (to be filled in by contractor)

Sl. No.	Line NO.	Heat loss/ M (W/m)	Heater tape type	Heater tape output at & minimum ambient	Heater tape length per metre of pipe (m)	Quantities for heater tape for					
						Pipes (m)	Valves incl. mating flange	Flanges excluding valves	Strainers, etc	Support	Total heater tape (m)
1											

Eil Notes

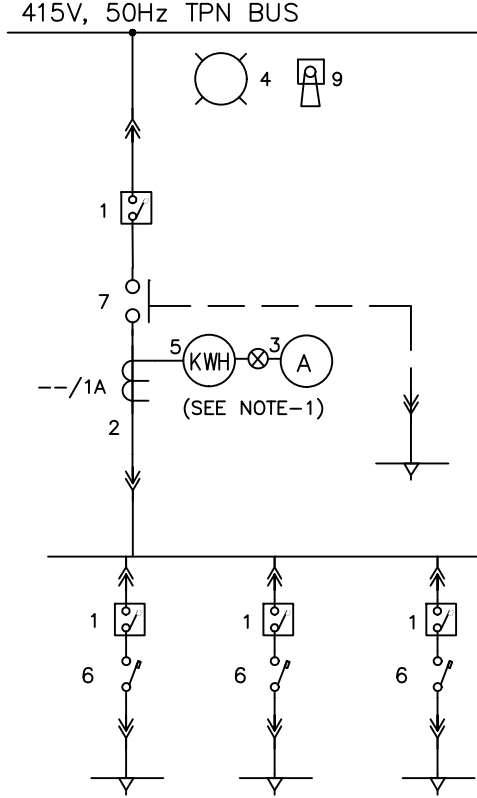
- 1 4 core, XLPE insulated, FRLS type, armoured, Aluminium (for 25 sqmm & above) / copper (upto 16 sqmm)
- 2 2.5 sq.mm (minimum), XLPE insulated, FRLS type, armoured, copper, paired, individual and overall shielded
- 3 Irrespective of Area Classification (hazardous area/ safe area), all PDB/LDP shall be Flameproof type, suitable for Zone-2, Temperature Class-T3. Gas group suitability shall be IIC or IIA/IIB as per area classification layout.
- 4 Contacts of incomer auxiliary trip contact of MCCB and auxiliary contacts of contactor for each outgoing feeder shall be wired in series & a net alarm contact shall be made available in each PDB/LDP for remote wiring. Communication cable shall be laid by others for taking the monitoring signals from each PDB/LDP to control room. Necessary ports for MODBUS TCP/IP protocol, controllers etc. as required for taking signals to Control room from PDB/LDPs shall be in the scope of contractor as defined elsewhere in the MR/tender.
- 5 Each outgoing feeder of PDB/LDP shall have RCCB.

B	31-JAN-2025	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
A	17-OCT-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

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PROJECT: BPREP PROJECT
CLIENT: M/S BPCL - BINA

REV	DATE	PURPOSE	BY	CHKD	APPRV
A	20.11.2024	ISSUED WITH MR/TENDER	SONALI	SK	RSR
B	26.06.2025	ISSUED WITH MR/TENDER	SKANU	MKM	RSR



EQUIPMENT DATA			
ITEM NO.	NEMA NO.	QTY.	DESCRIPTION
1	-	5	MCCB WITH SHUNT TRIP S/C & O/C RELEASE
2	-	3	METERING CT, CL-1
3	-	1	AMMETER WITH 4WAY SELECTOR SWITCH.
4	-	AS REQ	INDICATING LAMPS - LED TYPE
5	-	1	KWH METER WITH ACCURACY CL.1.0
6	-	4	RESIDUAL CURRENT CIRCUIT BREAKER
7	-	1	CONTACTOR
8	-	1	LOCAL-ECS SELECTOR SWITCH (NOTE-4)

NOTES:

- CT, AMMETER AND KWH METER SHALL BE PROVIDED FOR FEEDERS RATED 250A & ABOVE.
- THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN SPECIFICATION 6-51-0018 SHALL BE IN VENDOR'S SCOPE.
- FOR EACH OF THE LDB/ELDB PROVIDED IN A SUBSTATION, PROVISION FOR EMERGENCY BLACK-OUT FROM CENTRALISED LOCATION I.E., THROUGH A MAIN CONTACTOR SHALL BE PROVIDED. FOR THIS, ONE NO. POTENTIAL FREE CONTACTS EACH FOR "ON" & "OFF" OF ALL CONTACTOR FEEDERS WILL BE PROVIDED FOR EACH SUBSTATION FROM ECS. THIS CONTACT SHALL BE SUITABLY MULTIPLIED AND USED FOR ALL LDBS/ELDBS IN THE SUBSTATION
- LOCAL/ECS SELECTOR SWITCH SHALL BE PROVIDED ON EACH LDB/ELDB INCOMER FOR CENTRALISED CONTROL OF LIGHTING.
- VA BURDEN OF CTs SHALL BE DECIDED BY THE SWITCHBOARD VENDOR.
- MCCB SHALL BE SUITABLE FOR THE SYSTEM FAULT LEVEL 50kA/ 65kA (1 SEC).
- CONTROL SUPPLY FOR CONTACTOR FEEDER : TAPPING P-N OF RESPECTIVE FEEDER.



ENGINEERS INDIA LIMITED
NEW DELHI

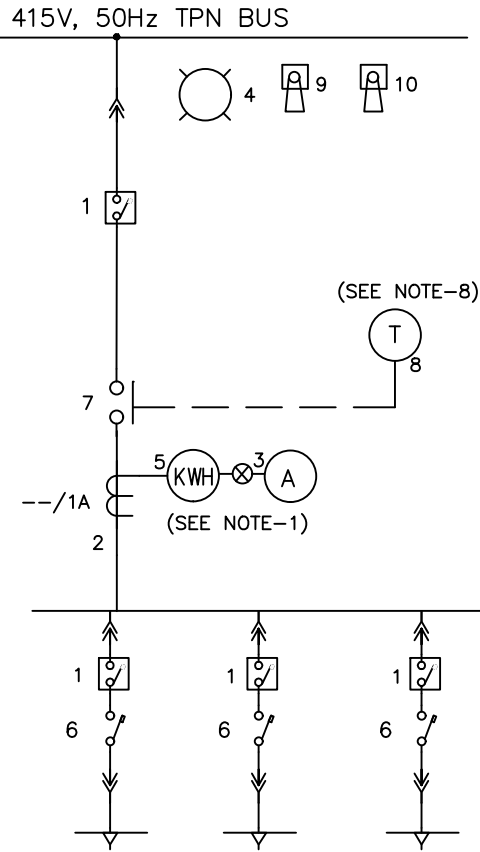
M.V. SW. BD. DATA SHEET
MCCB CONTACTOR INDOOR
LIGHTING FEEDER

DATA SHEET	REV
B957-000-16-50-DS-1838 Sheet 1 of 1	B

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PROJECT: BPREP PROJECT
CLIENT: M/S BPCL - BINA

REV	DATE	PURPOSE	BY	CHKD	APPRV
A	20.11.2024	ISSUED WITH MR/TENDER	SONALI	SK	RSR
B	26.06.2025	ISSUED WITH MR/TENDER	SKANU	MKM	RSR



EQUIPMENT DATA			
ITEM NO.	NEMA NO.	QTY.	DESCRIPTION
1	-	5	MCCB WITH SHUNT TRIP S/C & O/C RELEASE
2	-	3	METERING CT, CL-1
3	-	1	AMMETER WITH 4WAY SELECTOR SWITCH.
4	-	AS REQ	INDICATING LAMPS - LED TYPE
5	-	1	KWH METER WITH ACCURACY CL.1.0
6	-	4	RESIDUAL CURRENT CIRCUIT BREAKER
7	-	1	CONTACTOR
8	-	1	ASTRONOMICAL TYPE DIGITAL TIMER WITH PROGRAMMING OVER FULL YEAR
9	-	1	AUTO-MANUAL SELECTOR SWITCH (3-POSITION)
10	-	1	LOCAL-ECS SELECTOR SWITCH (NOTE-5)

NOTES:

- CT, AMMETER AND KWH METER SHALL BE PROVIDED FOR FEEDERS RATED 250A & ABOVE.
- THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN SPECIFICATION 6-51-0018 SHALL BE IN VENDOR'S SCOPE.
- SCHEME INDICATED IS FOR CENTRALISED CONTROL OF THE LIGHTING FEEDERS ie., SWITCHING 'ON' & 'OFF' THROUGH MAIN CONTACTOR WHICH SHALL BE ACTIVATED BY AN ASTRONOMICAL TIMER WITH PROGRAMMING OVER FULL YEAR.
- FOR EACH OF THE LDB/ELDB PROVIDED IN A SUBSTATION PROVISION FOR EMERGENCY BLACK-OUT FROM CENTRALISED LOCATION I.E., THROUGH A MAIN CONTACTOR SHALL BE PROVIDED. FOR THIS ONE NO. POTENTIAL FREE CONTACTS EACH FOR "ON" & "OFF" OF ALL CONTACTOR FEEDERS WILL BE PROVIDED FOR EACH SUBSTATION FROM ECS. THIS CONTACT SHALL BE SUITABLY MULTIPLIED AND USED FOR ALL LDBS/ELDBS IN THE SUBSTATION
- LOCAL/ECS SELECTOR SWITCH SHALL BE PROVIDED ON EACH LDB/ELDB INCOMER FOR CENTRALISED CONTROL OF LIGHTING.
- VA BURDEN OF CTs SHALL BE DECIDED BY THE SWITCHBOARD VENDOR.
- MCCB SHALL BE SUITABLE FOR THE SYSTEM FAULT LEVEL 50kA/ 65kA (1 SEC).
- LDB SHALL BE PROVIDED WITH ASTRONOMICAL TYPE DIGITAL TIMER WITH PROGRAMMING OVER FULL YEAR FOR OUTDOOR/PLANT LIGHTING AUTO CONTROL.
- CONTROL SUPPLY FOR CONTACTOR FEEDER : TAPPING P-N OF RESPECTIVE FEEDER.



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M.V. SW. BD. DATA SHEET
MCCB CONTACTOR OUTDOOR
LIGHTING FEEDER WITH
ASTRONOMICAL TYPE DIGITAL TIMER

DATA SHEET

B957-000-16-50-DS-1837
Sheet 1 of 1

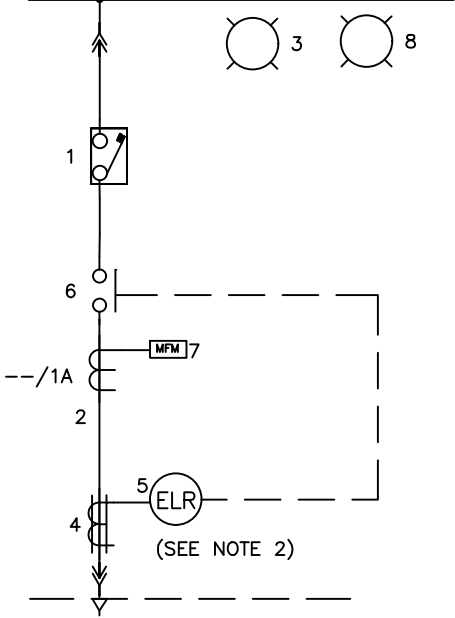
REV

B

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PROJECT: BPREP PROJECT CLIENT: M/S BPCL – BINA	REV	DATE	PURPOSE	BY	CHKD	APPRV
	A	20.11.2024	ISSUED WITH MR/TENDER	SONALI	SK	RSR
	B	26.06.2025	ISSUED WITH MR/TENDER	SKANU	MKM	RSR

240V,1PH AC AUX SUPPLY BUS
110V DC CONTROL SUPPLY BUS
415V, 50Hz, TPN BUS



EQUIPMENT DATA			
ITEM NO.	NEMA NO.	QTY.	DESCRIPTION
1	-	1	MCCB WITH S/C & O/C RELEASE
2	-	3	METERING CT, CL-1.0
3	-	3	INDICATING LAMPS – LED TYPE
4	-	1	CORE BALANCE CURRENT TRANSFORMER
5	-	1	EARTH LEAKAGE RELAY SETTING RANGE (1-16%) WITH BUILT-IN TIMER
6	-	1	CONTACTOR WITH 2NO+2NC AUXILIARY CONTACTS.
7	-	1	MULTIFUNCTION METER (MFM)
8	-	1	TRIP INDICATION LAMP LED TYPE

NOTES:

1. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN RESPECTIVE JOB/STANDARD SPECIFICATION SHALL BE IN VENDOR'S SCOPE.
2. ELR SHALL BE SUITABLE FOR 110V DC CONTROL SUPPLY.
3. VA BURDEN OF CTs SHALL BE DECIDED BY THE SWITCHBOARD VENDOR.
4. MCCB SHALL BE SUITABLE FOR THE SYSTEM FAULT LEVEL 50kA/ 65kA (1 SEC).
5. THIS HARDWARE DATASHEET IS APPLICABLE TO ALL OUTGOING FEEDERS RATED ABOVE 160A & UPTO 400A AND FOR AUXILIARY HEATER FEEDERS.
6. THIS HARDWARE DATASHEET IS APPLICABLE FOR CERTAIN OUTDOOR LIGHTING FEEDERS AS INDICATED IN FEEDER DETAILS DATASHEET. COMMON SYNCHRONOUS TIMER SHALL BE PROVIDED IN LDB INCOMER FOR ALL SUCH OUTDOOR LIGHTING FEEDERS.
7. CBCT+ ELR & CONTACTOR SHALL BE PROVIDED FOR ALL MCCB FEEDER FOR FEEDERS RATED 250A AND ABOVE.
8. CONTROL SUPPLY FOR CONTACTOR FEEDER : TAPPING P-N OF RESPECTIVE FEEDER.

ENGINEERS INDIA LIMITED
NEW DELHI

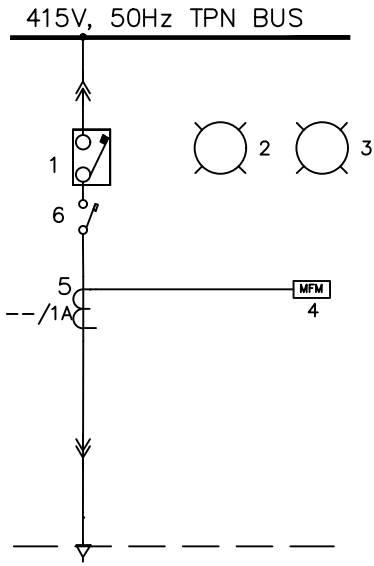
MV SWITCHBOARD
DATASHEET FOR
MCCB CONTACTOR FEEDER

DATA SHEET	REV
B957-000-16-50-DS-1831	B

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PROJECT: BPREP PROJECT
 CLIENT: M/S BPCL - BINA


REV	DATE	PURPOSE	BY	CHKD	APPRV
A	20.11.2024	ISSUED WITH MR/TENDER	SONALI	SK	RSR
B	26.06.2025	ISSUED WITH MR/TENDER	SONALI	MKM	RSR



EQUIPMENT DATA			
ITEM NO.	NEMA NO.	QTY.	DESCRIPTION
1	-	1	MCCB WITH SHUNT TRIP, S/C, O/C & E/F RELEASE
2	-	3	R,Y,B INDICATING LAMPS LED TYPE
3	-	1	TRIP INDICATION LAMP LED TYPE
4	-	1	MULTIFUNCTION METER (MFM)
5	-	3	METERING CT, CL-1.0
6	-	4	EARTH LEAKAGE CIRCUIT BREAKER

NOTES

1. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE . ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN RESPECTIVE JOB/STANDARD SPECIFICATION SHALL BE IN CONTRACTOR'S SCOPE.
2. MCCB SHALL BE SUITABLE FOR THE SYSTEM FAULT LEVEL 50KA/ 65KA (1 SEC).
3. VA BURDEN OF CT SHALL BE DECIDED BY THE SWITCHBOARD VENDOR.



ENGINEERS INDIA LIMITED
 NEW DELHI

MV SWITCHBOARD
 DATASHEET FOR
 MCCB O/G FEEDER (<=160A)

DATA SHEET	REV
B957-000-16-50-DS-1830	B

TYPICAL ECS & SCAP I/O LIST FOR ELECTRICAL CONTROL SYSTEM HV SWITCHBOARD

PROJECT : BPREP PROJECT, BINA REFINERY
OWNER : M/s BPCL
EPMC : ENGINEERS INDIA LTD.

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	05-11-2024	ISSUED WITH MR/TENDER	SK	MKM	RSR

This ECS I/O list is applicable for the 6.6kV HV Switchgear in substations

ECS I/O List

Type	Pt type	Description	Set condition	Reset condition	Interface	Remarks
INCOMER FROM TRANSFORMER						
DI	S	Ready to close			RELAY LAN	
DI	S	Synch. OK			RELAY LAN	
DI	D	Over Current			RELAY LAN	
DI	D	Earth Fault			RELAY LAN	
DI	D	51G Operated			RELAY LAN	
DI	D	Under Voltage			RELAY LAN	
DI	D	Reverse BLOCKING activated			RELAY LAN	
DI	D	64R Operated			RELAY LAN	
AI	A	R phase current			RELAY LAN	
AI	A	Y phase current			RELAY LAN	
AI	A	B phase current			RELAY LAN	
AI	W	3-Phase Real Power			RELAY LAN	
AI	R	3-Phase Reactive Power			RELAY LAN	
AI		Power Factor			RELAY LAN	
AI		Frequency			RELAY LAN	
DI	S	CB in service &	Closed	Not closed	HARDWIRED	
DI	S	CB in service &	Open	Not open	HARDWIRED	
DI	D	Relay 86	Operated	Reset	HARDWIRED	
DI	D	Relay 95	Operated	Reset	RELAY LAN	
DI	D	Trip on under voltage	Activated	Reset	RELAY LAN	
DI	D	Numerical Relays	Unhealthy	Healthy	RELAY LAN	
DO	C	Trip from ECS	Activated	Reset	HARDWIRED	
DO	C	Close Inhibit (From ECS)	Operated	Reset	HARDWIRED	
DI	D	Trafo Trouble Alarm (Buch., OTI,WTI)			RELAY LAN	
DI	D	Trafo Trouble Trip (Buch., OTI,WTI)			RELAY LAN	
AI	T	Oil Temperature			HARDWIRED	4-20mA through transducers in Trafo MB
AI	T	Winding Temperature			HARDWIRED	
DI	D	Transformer Differential	Operated=1		RELAY LAN	87T
DI	D	Over Temperature monitoring system	Operated	Reset	HARDWIRED	
INCOMER FROM ANOTHER SWITCHBOARD						
AI	A	R phase current			RELAY LAN	
AI	A	Y phase current			RELAY LAN	
AI	A	B phase current			RELAY LAN	
AI	W	3-Phase Real Power			RELAY LAN	
AI	R	3-Phase Reactive Power			RELAY LAN	

Type	Pt type	Description	Set condition	Reset condition	Interface	Remarks
AI		Power Factor			RELAY LAN	
AI		Frequency			RELAY LAN	
DI	S	CB in service &	Closed	Not closed	HARDWIRED	
DI	S	CB in service &	Open	Not open	HARDWIRED	
DI	D	Relay 86	Operated	Reset	HARDWIRED	
DI	D	Relay 95	Operated	Reset	RELAY LAN	
DI	D	Trip on undervoltage	Activated	Reset	RELAY LAN	
DI	D	Numerical Relays	Unhealthy	Healthy	RELAY LAN	
DO	C	Trip from ECS	Activated	Reset	HARDWIRED	
DO	C	Close Inhibit (From ECS)	Operated	Reset	HARDWIRED	
DI	D	Feeder Differential	Operated=1		RELAY LAN	87F
DI	D	Over Temperature monitoring system	Operated	Reset	HARDWIRED	
LINE PT						
AI	V	R-Y Line Voltage			RELAY LAN	
AI	V	Y-B Line Voltage			RELAY LAN	
AI	V	R-B Line Voltage			RELAY LAN	
DI	D	Line PT Secondary MCB	Tripped=1		HARDWIRED	
BUS COUPLER						
AI	A	R phase current			RELAY LAN	
AI	A	Y phase current			RELAY LAN	
AI	A	B phase current			RELAY LAN	
AI	W	3-Phase Real Power (Bi-directional)			RELAY LAN	
AI	R	3-Phase Reactive Power			RELAY LAN	
AI		Power Factor			RELAY LAN	
DI	S	CB in service &	Closed	Not closed	HARDWIRED	
DI	S	CB in service &	Open	Not open	HARDWIRED	
DI	D	Relay 86	Operated	Reset	HARDWIRED	
DI	D	Relay 95	Operated	Reset	RELAY LAN	
DI	D	Trip on undervoltage	Activated	Reset	RELAY LAN	
DI	D	Numerical Relays	Unhealthy	Healthy	RELAY LAN	
DO	C	Trip from ECS	Activated	Reset	HARDWIRED	
DO	C	Close Inhibit (From ECS)	Operated	Reset	HARDWIRED	
DI	D	Auto-changeover	Blocked	Not blocked	HARDWIRED	
DI	S	Switchboard (A-I-M selector switch)	Auto		HARDWIRED	
DI	S	Switchboard (A-I-M selector switch)	Independent		HARDWIRED	
DI	S	Switchboard (A-I-M selector switch)	Manual		HARDWIRED	
DI	D	AC control supply #1	Failed	Healthy	HARDWIRED	

Type	Pt type	Description	Set condition	Reset condition	Interface	Remarks
DI	D	AC control supply #2	Failed	Healthy	HARDWIRED	
DI	D	DC control supply #1	Failed	Healthy	HARDWIRED	
DI	D	DC control supply #2	Failed	Healthy	HARDWIRED	
DI	S	Ready to close			RELAY LAN	
DI	S	Synch. OK			RELAY LAN	
DI	D	Over Current / Earth Fault			RELAY LAN	
DI	D	Auto-changeover	Blocked	Not blocked	RELAY LAN	
DI	S	I/C-1 Under Voltage			RELAY LAN	
DI	S	I/C-2 Under Voltage			RELAY LAN	
DI	D	Reverse BLOCKING activated			RELAY LAN	
OUTGOING TRANSFORMER FEEDER						
AI	A	R phase current			RELAY LAN	
AI	A	Y phase current			RELAY LAN	
AI	A	B phase current			RELAY LAN	
AI	W	3-Phase Real Power			RELAY LAN	
AI	R	3-Phase Reactive Power			RELAY LAN	
AI		Power Factor			RELAY LAN	
AI		Frequency			RELAY LAN	
DI	S	CB in service &	Closed	Not closed	HARDWIRED	
DI	S	CB in service &	Open	Not open	HARDWIRED	
DI	D	Relay 86	Operated	Reset	HARDWIRED	
DI	D	Relay 95	Operated	Reset	RELAY LAN	
DI	D	Trip on undervoltage	Activated	Reset	RELAY LAN	
DI	D	Numerical Relay	Unhealthy	Healthy	RELAY LAN	
DO	C	Trip from ECS	Activated	Reset	HARDWIRED	
DO	C	Close Inhibit (From ECS)	Operated	Reset	HARDWIRED	
DI	D	Transformer Trouble	Operated=1		RELAY LAN	63TX, 51G, 64R
DO	C	Outgoing trafo fdr re-closing	Activated	Reset	HARDWIRED	
DI	S	Ready to close			RELAY LAN	
DI	D	Over Current			RELAY LAN	
DI	D	Earth Fault			RELAY LAN	
DI	D	Trafo Trouble Alarm (Buch., OTI,WTI)			RELAY LAN	
DI	D	Trafo Trouble Trip (Buch., OTI,WTI)			RELAY LAN	
DI	D	64R from Downstream			RELAY LAN	
DI	D	Reverse BLOCKING activated			RELAY LAN	
DI	D	51G from Downstream			RELAY LAN	
OUTGOING PLANT FEEDER						
AI	A	R phase current			RELAY LAN	

Type	Pt type	Description	Set condition	Reset condition	Interface	Remarks
AI	A	Y phase current			RELAY LAN	
AI	A	B phase current			RELAY LAN	
AI	W	3-Phase Real Power			RELAY LAN	
AI	R	3-Phase Reactive Power			RELAY LAN	
AI		Power Factor			RELAY LAN	
DI	S	CB in service &	Closed	Not closed	HARDWIRED	
DI	S	CB in service &	Open	Not open	HARDWIRED	
DI	D	Relay 86	Operated	Reset	HARDWIRED	
DI	D	Relay 95	Operated	Reset	RELAY LAN	
DI	D	Trip on under voltage	Activated	Reset	RELAY LAN	
DI	D	Numerical Relays	Unhealthy	Healthy	RELAY LAN	
DO	C	Trip from ECS	Activated	Reset	HARDWIRED	
DI	D	Feeder Differential	Operated=1		RELAY LAN	
DI	S	Ready to close			RELAY LAN	
DI	D	Over Current			RELAY LAN	
DI	D	Earth Fault			RELAY LAN	
DI	D	Reverse BLOCKING activated			RELAY LAN	
DI	D	Line Differential Operated			RELAY LAN	
OUTGOING CAPACITOR FEEDER						
AI	A	R phase current			RELAY LAN	
AI	A	Y phase current			RELAY LAN	
AI	A	B phase current			RELAY LAN	
AI	R	3-Phase Reactive Power			RELAY LAN	
AI	R	3-Phase Reactive Power			RELAY LAN	
AI		Power Factor			RELAY LAN	
DI	S	CB in service &	Closed	Not closed	HARDWIRED	
DI	S	CB in service &	Open	Not open	HARDWIRED	
DI	D	Relay 86	Operated	Reset	HARDWIRED	
DI	D	Relay 95	Operated	Reset	RELAY LAN	
DI	D	Trip on under voltage	Activated	Reset	RELAY LAN	
DI	D	Numerical Relay	Unhealthy	Healthy	RELAY LAN	
DO	C	Close from ECS	Activated	Reset	HARDWIRED	
DO	C	Trip from ECS	Activated	Reset	HARDWIRED	
DI	S	Local / ECS Selector Switch in	LOCAL	Not_Local	HARDWIRED	
DI	S	Local / ECS Selector Switch in	ECS	Not_ECS	HARDWIRED	
DI	S	Ready to close			RELAY LAN	
DI	D	Over Current			RELAY LAN	
DI	D	Earth Fault			RELAY LAN	
DI	D	Over Voltage			RELAY LAN	
DI	D	Under Voltage			RELAY LAN	

Type	Pt type	Description	Set condition	Reset condition	Interface	Remarks
DI	D	Reverse BLOCKING activated			RELAY LAN	
OUTGOING MOTOR FEEDER						
DI	D	Motor Differential Operated			RELAY LAN	Applicable for motors $\geq 1500\text{kW}$
AI	A	R phase current			RELAY LAN	
AI	A	Y phase current			RELAY LAN	
AI	A	B phase current			RELAY LAN	
AI	W	3-Phase Real Power			RELAY LAN	
AI	R	3-Phase Reactive Power			RELAY LAN	
AI		Power Factor			RELAY LAN	
DI	S	CB in service &	Closed	Not closed	HARDWIRED	
DI	S	CB in service &	Open	Not open	HARDWIRED	
DI	D	Relay 86	Operated	Reset	HARDWIRED	
DI	D	Relay 95	Operated	Reset	RELAY LAN	
DI	D	Trip on under voltage	Activated	Reset	RELAY LAN	
DI	D	Numerical Relays	Unhealthy	Healthy	RELAY LAN	
DO	C	Trip from ECS	Activated	Reset	HARDWIRED	
DO	C	Close Inhibit (From ECS)	Operated	Reset	HARDWIRED	
DI	D	Motor Trip from Process	Operated=1		HARDWIRED	
DI	S	Ready to close			RELAY LAN	
DI	D	49T/50/50LR			RELAY LAN	
DI	D	Earth Fault			RELAY LAN	
DI	D	Unbalance Trip			RELAY LAN	
DI	D	Under Voltage Trip			RELAY LAN	
DI	S	Re-Acceleration			RELAY LAN	
DI	D	Reverse BLOCKING activated			RELAY LAN	
DI	D	Process Trip			RELAY LAN	
BUS PT						
AI	V	R-Y Line Voltage			RELAY LAN	
AI	V	Y-B Line Voltage			RELAY LAN	
AI	V	R-B Line Voltage			RELAY LAN	
DI	D	Bus PT Secondary MCB	Tripped=1		HARDWIRED	
DI	S	Dead Bus (<40%)			RELAY LAN	
DI	D	Under Voltage (<80%)			RELAY LAN	
DI	D	BPT not in Service / PT MCB Unhealthy			RELAY LAN	
DI	D	UF & df/dt Signal	Operated	Reset	Hardwired (4 Nos)	
OUTGOING VFD TRANSFORMER FEEDER						
AI	A	R phase current			RELAY LAN	

Type	Pt type	Description	Set condition	Reset condition	Interface	Remarks
AI	A	Y phase current			RELAY LAN	
AI	A	B phase current			RELAY LAN	
AI	W	3-Phase Real Power			RELAY LAN	
AI	R	3-Phase Reactive Power			RELAY LAN	
AI		Power Factor			RELAY LAN	
DI	S	CB in service &	Closed	Not closed	HARDWIRED	
DI	S	CB in service &	Open	Not open	HARDWIRED	
DI	D	Relay 86	Operated	Reset	HARDWIRED	
DI	D	Relay 95	Operated	Reset	RELAY LAN	
DI	D	Trip on under voltage	Activated	Reset	RELAY LAN	
DI	D	Numerical Relay	Unhealthy	Healthy	RELAY LAN	
DO	C	Trip from ECS	Activated	Reset	HARDWIRED	
DO	C	Close Inhibit (From ECS)	Operated	Reset	HARDWIRED	
DI	D	Transformer Trouble	Operated=1		RELAY LAN	63TX, 51G, 64R
DI	S	Ready to close			RELAY LAN	
DI	D	Over Current			RELAY LAN	
DI	D	Earth Fault			RELAY LAN	
DI	D	Trafo Trouble Alarm (Buch., OTI, WTI)			RELAY LAN	
DI	D	Trafo Trouble Trip (Buch., OTI, WTI)			RELAY LAN	
DI	D	Trip from VFD			RELAY LAN	
DI	D	Reverse BLOCKING activated			RELAY LAN	
ISOLATING BREAKER PANEL						
AI	W	3-Phase Real Power			RELAY LAN	
AI	R	3-Phase Reactive Power			RELAY LAN	
AI		Power Factor			RELAY LAN	
DI	D	Line PT Secondary MCB	Tripped=1		HARDWIRED	
DI	S	CB in service &	Closed	Not closed	HARDWIRED	
DI	S	CB in service &	Open	Not open	HARDWIRED	
DI	D	Relay 86	Operated	Reset	HARDWIRED	
DI	D	Relay 95	Operated	Reset	RELAY LAN	
DI	D	Trip on under voltage	Activated	Reset	RELAY LAN	
DI	D	Numerical Relays	Unhealthy	Healthy	RELAY LAN	
DO	C	Trip from ECS	Activated	Reset	HARDWIRED	
DI	D	Feeder Differential	Operated=1		RELAY LAN	
DI	D	Transformer Trouble	Operated=1		RELAY LAN	63TX, 51G, 64R
DI	D	Trafo Trouble Alarm (Buch., OTI, WTI)	Operated=1		RELAY LAN	
DI	D	Trafo Trouble Trip (Buch., OTI, WTI)	Operated=1		RELAY LAN	
VFD TIE FEEDER						

Type	Pt type	Description	Set condition	Reset condition	Interface	Remarks
DI	S	CB in service &	Closed	Not closed	HARDWIRED	
DI	S	CB in service &	Open	Not open	HARDWIRED	
DI	D	Trip Circuit Supervision	Unhealthy	Healthy	HARDWIRED	

Notes

- 1.0 Acquisition of input/output (I/O) signals as hardwired or software:
 - a) All numerical relays shall be connected to ECS-RTU. ECS shall acquire relay and metering status I/O signals of the relays. These I/O signals have been indicated as "relay and metering LAN" in the typical I/O list above.
 - b) All other I/Os shall be acquired hardwired and have been indicated as "hardwired" in the typical I/O list above. All hardwired signals shall be wired and terminated in respective panels.
 - c) In case any of these data cannot be acquired over the relay LAN, these signals have to be provided as hardwired. For requirement of numerical relays, refer Electrical part of contract document.
- 2.0 This I/O list is indicative only. Any other I/O required for meeting the contract requirements shall be identified and provided by CONTRACTOR.
- 3.0 Transformer oil temperature and transformer winding temperature shall be acquired hardwired from 66kV power transformers only. These I/Os shall be acquired as a 4-20 mA signal from the transformer.

Guidelines for ECS I/O Interface Design

Analogue Input Signals Signal transducers for hard-wired analogue inputs shall have accuracy class 0.1 for the range 0-120%. All transducers shall be externally-powered types. External power supply shall be 230V AC UPS.

For all measurements for I, V, MW, MVAR, Hz, obtained on the relay and metering LAN, maximum possible accuracy shall be ensured

Digital Input Signals

Alarm (D) Alarm is a signal which requires operator to be alerted such as VT circuit MCB (closed, open), relays 86 & 95 (operated, reset), auto-changeover (blocked, not blocked), DC control supply (healthy, failed), line voltage (unhealthy, healthy), bus voltage (unhealthy, healthy), motor trip from process, under-voltage trip. This shall be hardwired / on relay LAN as specified.

For hardwired signal, potential free contacts of rating 1 A, 110V DC or 240 V AC, make to alarm (NO) preferred. CONTRACTOR shall specifically indicate if NC contact is being provided in place of NO contact.

Generally a hardwired alarm point is put under "sequence of event" monitoring

Status (S) For hardwired signal, potential free contacts of rating 1 A, 110V DC or 240 V AC, make to alarm (NO) required

Digital Output Signals

Command (C)

Hardwired through potential free changeover type contact of interposing relay, contact rating 5 A, 240 V AC and/or 4 A, 110V DC. Coil rating shall be 24 V DC

Sr No	Supplier Name	City	Phone	E-Mail	Remarks
Department : STRUCTURE - LIST OF APPROVED PRODUCTS					
Area of Experience: Other					
Item : A. INTEGRAL WATER-PROOFING COMPOUNDS FOR CONCRETE (AS PER IS:2645)					
1	Refer Remark	INDIA	,,	NA	All Integral Waterproofing Compounds for Concrete which carry "ISI" certification mark of BIS along with standard number "IS 2645" and the license number "CM/L**....*)" and listed at BIS website "https://www.bis.gov.in".
Item : B. CONCRETE ADMIXTURES -(AS PER IS:9103)					
1	Refer Remark	INDIA	,, 065050056051	NA	All Accelerating, Retarding, Water-reducing, Air-entraining & Super-plastizing Admixtures for Concrete which carry "ISI" certification mark of BIS along with standard number "IS 9103" and the license number "CM/L**....*)" and listed at BIS website "https://www.bis.gov.in".
Item : C. BI-POLAR CONCRETE PENETRATING CORROSION INHIBITING ADMIXTURE (AS PER EIL STD SPEC NO 6-68-0017)					
1	APPLE CHEMIE INDIA PVT LTD	NAGPUR	+91 9607001014, ,	www.applechemie.com	PRODUCT NAME-AC CORROGUARD-BP
2	BUILDPRO TECHNOLOGIES	HUBLI, KARNATAKA	+91 7045000315, +91 9324924396,	projects.buildprotechnologies@gmai l.com	PRODUCT NAME-CEBRICORR BP
3	CHRYSO INDIA PRIVATE LIMITED	NAVI MUMBAI	022 2768 5991, ,	info.india@chryso.com	BRAND NAME-CHRYSO CORROCRETE
4	CLEAN COATS PVT LTD	THANE	,,		PRODUCT NAME-CONPROOF IA (DOSAGE 1% W/W OF CEMENT)
5	FAIRMATE CHEMICALS PRIVATE LIMITED	VADODARA	, , 9879613004	nandan@fairmate.net	PRODUCT NAME- FAIRCRETE C
6	FOSROC CHEMICALS (INDIA) PVT LTD	BENGALURU	+91 8042521900, ,	enquiry.india@fosroc.com	BRAND NAME-AURAMIX BCI
7	HINDCON CHEMICALS LTD	KOLKATA	,,	NA	BRAND NAME- HIND CORROGUARD
8	KRISHNA CONCHEM PRODUCTS PVT LTD	NAVI MUMBAI	,,		PRODUCT NAME-EPKO KP-200 (DOSAGE 1% W/W OF CEMENT)
9	MASTER BUILDERS SOLUTIONS INDIA PVT LTD	NAVI MUMBAI	,,	NA	PRODUCT NAME- MASTERLIFE CI 220 (DOSAGE 1% W/W OF CEMENT)

Sr No	Supplier Name	City	Phone	E-Mail	Remarks
10	NORMET INDIA PVT LTD	NOIDA, U.P.	+91 120 4504800, ,	india.info@normet.com	PRODUCT NAME-TamCem BPCI
11	REDWOP CHEMICALS PVT. LTD.	RAJKOT, GUJARAT	0281 2576664, ,	ravi.ramani@redwop.net	PRODUCT NAME-PLASTCONE BPO
12	SP CONCARE PVT. LTD.	SANGLI	, ,	NA	BRAND NAME:ADDMIX 109 PCCI
13	STP LTD.	DELHI	, ,	NA	PRODUCT NAME-SHALIPLAST MCI (DOSAGE 1% W/W OF CEMENT)
14	SUNANDA SPECIALITY COATING PVT LTD	MUMBAI	, ,		PRODUCT NAME-POLYALK CP 293 (DOSAGE 1% W/W OF CEMENT)
Item : D. POLYSULPHIDE SEALANTS (TWO PART, AS PER IS:12118)					
1	APPLE CHEMIE INDIA PVT LTD	NAGPUR	+91 9607001014, ,	www.applechemie.com	PRODUCT NAME-AC POLYSEAL (PG)
2	CHOWKSEY CHEMICALS PVT LTD	MUMBAI	, ,		PRODUCT NAME-TECHSEAL 940/941
3	CICO TECHNOLOGIES LIMITED	DELHI	, ,		PRODUCT NAME-CICO SEAL T680
4	DON CONSTRUCTION CHEMICALS INDIA LTD	CHENNAI	, ,	NA	BRAND NAME- 1. FLEXSEAL PS660 (GUN GRADE) 2. FLEXSEAL PS660 (POUR GRADE)
5	DURA BUILD CARE PVT LTD	DELHI	, ,	NA	PRODUCT NAME- DURASIL PPS (POURING GRADE)
6	FOSROC CHEMICALS (INDIA) PVT LTD	BENGALURU	+91 8042521900, ,	enquiry.india@fosroc.com	PRODUCT NAME-THIOFLEX 600
7	HINDCON CHEMICALS LTD	KOLKATA	, ,	NA	BRAND NAME- 1. HIND SEALANT PS (POUR GRADE). 2. HIND SEALANT PS (GUN GRADE)
8	JAY CHEMICAL INDUSTRIES PVT LTD	AHMEDABAD	, ,	NA	PRODUCT NAME- K2 POLYSEAL 22P (POUR GRADE)
9	KANSAI NEROLAC PAINTS LIMITED	MUMBAI	9999100064, ,	preetirohatgi@nerolac.com	PRODUCT NAME- 1. PERMA POLYSEAL (GUN GRADE) 2. PERMA POLYSEAL (POUR GRADE)
10	PIDILITE INDUSTRIES LTD (DR. FIXIT)	MUMBAI	, ,	NA	PRODUCT NAME-1. PIDISEAL PS41G, 2. PIDISEAL PS42P
11	SIKA INDIA PVT LTD	KOLKATA	, ,		BRAND NAME- 1. SIKA POLYSULPHIDE (SIKALASTIC) 2. SIKAFLEX CONSTRUCTION 3. IGAS Ih
12	STP LIMITED	NEW DELHI	, ,		PRODUCT NAME- SHALISEAL PS

Sr No	Supplier Name	City	Phone	E-Mail	Remarks
13	ZZ-Refer Remarks (ZZ inserted to maintain the alphabetic chronology)	INDIA	,,	NA	All other Polysulphide Sealants (Two Parts) which carry "ISI" certification mark of BIS along with standard number "IS 12118" and the license number "CM/L**....*)" and listed at BIS website " https://www.bis.gov.in ".
Item : E. ANCHOR FASTENERS - CHEMICAL TYPE (EOTA / DIBt/ FM/ ICBO-ES APPROVED). Note- Design of post-installed Anchors and Rebars shall be provided/ verified by the approved manufacturer with installation instructions and execution shall be done by an applicator trained by the approved manufacturer (preferably in the presence of manufacturer for critical applications/ structures).					
1	FISCHER FIXING SYSTEMS(MICO) LTD	BENGALURU	,,		BRAND NAME-FISCHER ANCHORS
2	FOSROC CHEMICALS (INDIA) PVT LTD	BENGALURU	+91 8042521900, ,	enquiry.india@fosroc.com	CHEMICAL ANCHORING OF REBAR, BRANDS NAMES- LOKFIX E55, LOKFIX E77 & LOKFIX E45T
3	HILTI INDIA PVT LTD	DELHI	,,		BRAND NAME-HILTI ANCHORS
4	INDO SPARK CONSTRUCTION SERVICES	KOLHAPUR	,, 065050056051	NA	BRAND NAME-ICFS CM VESF, CM VESF TROPICAL, CM SH, CM SH TROPICAL, CM 585 PE PRO, CM 385 PE PRO, CM 400 PE, CM 650 PE
5	MASTER BUILDERS SOLUTIONS INDIA PVT LTD	NAVI MUMBAI	,,	NA	BRAND NAMES-MASTERFLOW 916 AN, 918 AN, 920 AN, 932 AN, 936 AN
6	MUNGO FIXINGS INDIA PVT LTD	BENGALURU	,,	NA	BRAND NAME-MIT 700 RE, MIT SE PLUS, MIT TROPICAL, MIT SP & MVA CAPSULE
7	POWERS FASTENERS(THROUGH M/S KRAFT SALES & SERVICES (I) LTD.)	PUNE	,,	NA	BRAND NAME-POWERS FASTENERS
8	UIP SYSTEMS (INDIA) PVT LTD	MUMBAI	,,	NA	UIP FASTENERS
9	WUERTH INDIA PVT LTD	DELHI	,,	NA	BRAND NAME-WUERTH ANCHORS
Item : F. ANCHOR FASTENERS - MECHANICAL TYPE (EOTA / DIBt/ FM/ ICBO-ES APPROVED). Note- Design of post-installed Anchors and Rebars shall be provided/ verified by the approved manufacturer with installation instructions and execution shall be done by an applicator trained by the approved manufacturer (preferably in the presence of manufacturer for critical applications/ structures).					
1	FISCHER FIXING SYSTEMS(MICO) LTD	BENGALURU	,,		BRAND NAME-FISCHER ANCHORS
2	HILTI INDIA PVT LTD	DELHI	,,		BRAND NAME-HILTI ANCHORS

Sr No	Supplier Name	City	Phone	E-Mail	Remarks
3	INDO SPARK CONSTRUCTION SERVICES	KOLHAPUR	,,	NA	BRAND NAME: (ICFS) INDO WEDGE ANCHOR IWA, IWA-A2, IWA-A4
4	MUNGO FIXINGS INDIA PVT LTD	BENGALURU	,,	NA	BRAND NAME-M1 POWER GRIP, M1r POWER GRIP, M1T, M2, M2r, MCS, MEA
5	POWERS FASTENERS(THROUGH M/S KRAFT SALES & SERVICES (I) LTD.)	PUNE	,,	NA	BRAND NAME-POWERS FASTENERS
6	UIP SYSTEMS (INDIA) PVT LTD	MUMBAI	,,	NA	UIP FASTENERS
7	WUERTH INDIA PVT LTD	DELHI	,,	NA	PRODUCT NAME- WUERTH ANCHORS
Item : G. ELECTRO-FORGED GALVANISED GRATINGS (AS PER EIL STD 7-68-0697, BS:4592)					
1	ABHYANT EFG & ENGINEERING PVT. LTD	RAIPUR	,,	NA	TYPE-I & TYPE-II
2	ANKIT ELECTROGRATING	RAIPUR	,,	NA	TYPE-I & TYPE-II
3	BHOLA RAM STEEL PVT LTD	PATNA	,,		BRAND NAME-BHOLARAM GRATINGS
4	CELL COM TELESERVICES PVT LTD	SIKANDRABAD	,,	NA	BRAND NAME-CELLCOM GRATINGS
5	FERROTECH STRUCTURALS (INDIA) PVT LTD	KANCHIPURAM & PUNE	+91 9840308880, ,	www.ferrotechindia.net	TYPE-I & TYPE-II
6	GREATWELD ENGINEERING PVT. LTD.	PUNE	+91 7350304304, ,	sumit.rungta@greatweld.com	BRAND NAME-GREATWELD GRATINGS, TYPE-I & TYPE-II
7	INDIANA GRATING PVT.LTD	MUMBAI	,,		BRAND NAME-INDIANA GRATINGS
8	IRONWELD ENGINEERING PVT LTD	PUNE	,,	NA	TYPE-I & TYPE-II
9	JACINTH ENGINEERING PVT LTD	MUMBAI	,,	NA	BRAND NAME-JACINTH GRATINGS
10	KANADE ANAND UDYOG PVT LTD	MUMBAI	,,		BRAND NAME-KANADE GRATINGS
11	LANCER VINIMAY PVT. LTD.	DURGAPUR, WB	+91 9331391910, ,	lancervinimay@gmail.com	TYPE-I & TYPE-II
12	LIONWELD MEISER LLC	DUBAI	,,	NA	TYPE-I & TYPE-II
13	MEET ENGINEERING	VADODARA	,,	NA	TYPE-I & TYPE-II
14	METALIC INDUSTRIES	VADODRA, GUJARAT	, , 9909255335	admin@metallic-industries.com	TYPE-I & TYPE-II
15	MKSD INDUSTRIES PVT. LTD.	NAVI MUMBAI	9930131143/44, , 9930131143	mkswdworks@gmail.com	BRAND NAME- MKSD GRATINGS TYPE-I & TYPE-II
16	OASIS METAL MANUFACTURING LLC	DUBAI, UAE	00971504531142, ,	info@oasismetall.com	TYPE-I & TYPE-II

Sr No	Supplier Name	City	Phone	E-Mail	Remarks
17	OMKAR GRATINGS PVT LTD	MUMBAI	, ,		BRAND NAME-OMKAR GRATINGS (FOR EIL TYPE-II GRATING ONLY)
18	PARCO ENGINEERS (MUMBAI) PVT LTD	Mumbai	9819278530, , 9819278530	info@parcoengineers.com	TYPE-I & TYPE-II
19	PINAX STEEL INDUSTRIES PVT LTD	KOLKATA	, ,		BRAND NAME-PINAX GRATINGS
20	PREMIER POWER PRODUCTS PVT LTD	KOLKATA	, ,		BRAND NAME-PREMIER GRATINGS
21	RATAN PROJECTS & ENGINEERING CO.PVT LTD.	KOLKATTA	, ,	sales@ratans.com	BRAND NAME- RATAN GRATINGS
22	SIGMA GALVANIZING PVT LTD	NAVI MUMBAI	, ,	NA	TYPE-I & TYPE-II
23	TECH-FAB INDUSTRIES	AMBERNATH (E) MAHARASHTRA	+91 7738995869, , 7738995869	sales@techfabind.com	BRAND NAME- TECH-FAB GRATINGS TYPE-I & TYPE-II
24	VINFAB GRATINGS	MUMBAI	, ,		BRAND NAME-VINFAB GRATINGS
25	WHEELS INDIA LTD	CHENNAI	, ,	NA	PRODUCT NAME-WHEELS GRATINGS
Item : H. INTEGRAL CRYSTALLINE ADMIXTURE FOR WATERPROOFING TREATMENT TO CONCRETE (AS PER CPWD SPECIFICATION 2019, CLAUSE 22.14)					
1	APPLE CHEMIE INDIA PVT LTD	NAGPUR	+91 9607001014, 6051	www.applechemie.com	PRODUCT NAME-AC CRSYTACRETE
2	CHRYSO INDIA PRIVATE LIMITED	NAVI MUMBAI	022 2768 5991, ,	info.india@chryso.com	PRODUCT NAME-CHRYSO CWA10
3	FOSROC CHEMICALS (INDIA) PVT LTD	BENGALURU	+91 8042521900, ,	enquiry.india@fosroc.com	PRODUCT NAME-CONPLAST CRYSTALLINE
4	KRYTON BUILDMAT CO PVT LTD	GURUGRAM	0124 4381 140, ,	info@kryton.in	PRODUCT NAME-KRYSTOL INTERNAL MEMBRANE "KIM"
5	PENETRON INFRA PRODUCTS PVT LTD	NAVI MUMBAI	+91 7738444041, ,	inquiry@penetron.co.in	PRODUCT NAME-PENETRON ADMIX
6	SHALIMAR SEAL & TAR PRODUCTS PVT LTD	JAIPUR	+91 9829065184, ,	ocrd@shalimartar.com	PRODUCT NAME-KAVASSU CRYSTALLOMIX-PG
7	XYPEX	GAUTAM BUDH NAGAR	0120-4090900, ,	info@xypex.in	PRODUCT NAME-XYPEX ADMIX C-2000 NF

Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13DD		Description : SOLID STATE DECOUPLER		
Approved Suppliers				
1	3939	KRISTRON CONTROLS & SYSTEMS PRIVATE LIMITED	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13EA		Description : ANODES FOR C P SYSTEM		
Approved Suppliers				
1	4148	SHAKTIANODES PRIVATE LIMITED	INDIA	
2	4102	VIJAY CORROSION TECHNOLOGY	INDIA	
3	3899	CONTROL PLUS OIL AND GAS SOLUTIONS PVT	INDIA	
4	27584	SEAL FOR LIFE INDUSTRIES MEXICO S. DE R. L. DE C.V.	MEXICO	
5	S245	SCIENTIFIC METAL ENGINEERS (P) LTD	INDIA	
6	E100	ELECTRO PROTECTION SERVICES INDIA P LTD	INDIA	
7	C133	CATHODIC CONTROL CO PVT. LTD.	INDIA	
8	E629	EMIRATES TECHNO CASTING LLC	UNITED ARAB EMIRATES	
9	D142	DE NORA INDIA LTD-FORMLY T-168	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13KE		Description : TRANSFORMER-RECTIFIER UNIT FOR C.P.S.		
Approved Suppliers				
1	K182	KRISTRON SYSTEMS	INDIA	
2	27519	BIN SARI SPECIALIZED TECHNOLOGIES	UNITED ARAB EMIRATES	
3	4179	RECTIFIERS AND CONTROL ELECTRONICS TECHNOLOGIES PRIVATE LIMITED	INDIA	
4	3939	KRISTRON CONTROLS & SYSTEMS PRIVATE LIMITED	INDIA	
5	C133	CATHODIC CONTROL CO PVT. LTD.	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13KF		Description : CATHODIC PROTECTION POWER SUPPLY MODULE		
Approved Suppliers				
1	3939	KRISTRON CONTROLS & SYSTEMS PRIVATE LIMITED	INDIA	
2	K182	KRISTRON SYSTEMS	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13MA		Description : JUNCTION BOXES (FLAME PROOF)		
Approved Suppliers				
1	3681	FCG POWER INDUSTRIES PVT LTD	INDIA	
2	R175	R STAHL PVT LTD	INDIA	
3	3706	PHOENIX MECANO INDIA PVT. LTD.	INDIA	
4	F036	FLAMEPROOF EQUIPMENTS PVT.LTD	INDIA	
5	S158	SUDHIR SWITCHGEARS PVT LTD	INDIA	
6	B024	BALIGA LIGHTING EQUIPMENTS (P) LIMITED	INDIA	
7	G159	PEPPERL & FUCHS MANUFACTURING (INDIA) PRIVATE LIMITED	INDIA	
8	F024	FLEXPRO ELECTRICALS PVT LTD	INDIA	
9	4364	SAI INDUSTRIES	INDIA	
10	4245	FCG HI-TECH PRIVATE LIMITED	INDIA	
11	K173	KAYSONS TECHNO EQUIPMENTS PVT. LTD.	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 130C		Description : CABLES-MEDIUM VOLTAGE-POWER-XLPE		
Approved Suppliers				
1	K190A	KEC ASIAN CABLES LIMITED	INDIA	
2	4163	KLJ PARAFLEX INDIA LIMITED	INDIA	
3	4261	TORTEK INDIA PRIVATE LIMITED	INDIA	
4	4262	K C POWERTRACKS	INDIA	
5	4263	TIRUPATI PLASTOMATICS PRIVATE LIMITED	INDIA	
6	4264	SURAJ CABLES (INDIA) PRIVATE LIMITED	INDIA	
7	4265	SVARN INFRATEL PRIVATE LIMITED	INDIA	
8	D012	DELTON CABLES LIMITED	INDIA	
9	4234	LASER POWER & INFRA PRIVATE LIMITED	INDIA	
10	3669	KEI INDUSTRIES LIMITED	INDIA	
11	3814	RR KABEL LIMITED	INDIA	
12	4298	SHRIRAM TELELINK	INDIA	
13	3602	Special Cables Pvt. Ltd.	INDIA	
14	K082	KEI INDUSTRIES LIMITED	INDIA	
15	U003	UNIVERSAL CABLES LTD	INDIA	
16	T124	TORRENT ELECTRICALS LIMITED	INDIA	
17	A132	ASSOCIATED FLEXIBLES & WIRES [P] LTD	INDIA	
18	C145	CORDS CABLE INDUSTRIES LTD	INDIA	
19	S025	SRIRAM CABLES PVT LTD	INDIA	
20	3731	POLYCAB INDIA LIMITED	INDIA	
21	3732	POLYCAB INDIA LIMITED	INDIA	
22	3722	POLYCAB INDIA LIMITED	INDIA	
23	G156	GEMSCAB INDUSTRIES LTD	INDIA	
24	H060	HAVELLS INDIA LTD	INDIA	
25	R203	LKB ENGINEERING PRIVATE LIMITED	INDIA	
26	3969	SHIVPRIYA CABLES PRIVATE LIMITED	INDIA	
27	3854	CHANDRESH CABLES LIMITED	INDIA	
28	S304	SUYOG ELECTRICALS LTD	INDIA	
29	U085	APAR INDUSTRIES LTD	INDIA	
30	4137	INSUCON CABLES AND CONDUCTORS PRIVATE LIMITED	INDIA	
31	4351	UNIVERSAL CABLE MANUFACTURING COMPANY	INDIA	
32	4281	SBEE CABLES INDIA LIMITED	INDIA	
33	4104	ZENIUM CABLES LIMITED	INDIA	
34	4105	ULTRACAB (INDIA) LIMITED	INDIA	
35	3781	POLYCAB INDIA LIMITED	INDIA	
36	3783	POLYCAB INDIA LIMITED	INDIA	
37	3796	PARAMOUNT COMMUNICATIONS LTD	INDIA	
38	4055	DYNAMIC CABLES LIMITED	INDIA	
39	3765	THERMO CABLES LTD.	INDIA	
40	4001	RAVI INDUSTRIES	INDIA	



Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 130C		Description : CABLES-MEDIUM VOLTAGE-POWER-XLPE		
41	4299	POLYVION CABLES PRIVATE LIMITED	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 130D		Description : CABLES-CONTROL (UNPAIRED)-XLPE		
Approved Suppliers				
1	K190A	KEC ASIAN CABLES LIMITED	INDIA	
2	4299	POLYVION CABLES PRIVATE LIMITED	INDIA	
3	3752	APAR INDUSTRIES LTD	INDIA	
4	4261	TORTEK INDIA PRIVATE LIMITED	INDIA	
5	4262	K C POWERTRACKS	INDIA	
6	4264	SURAJ CABLES (INDIA) PRIVATE LIMITED	INDIA	
7	4265	SVARN INFRATEL PRIVATE LIMITED	INDIA	
8	4221	BONTON CABLES (INDIA) PRIVATE LIMITED	INDIA	
9	4234	LASER POWER & INFRA PRIVATE LIMITED	INDIA	
10	3669	KEI INDUSTRIES LIMITED	INDIA	
11	4297	GOYOLENE FIBRES (INDIA) PRIVATE LIMITED	INDIA	
12	4298	SHRIRAM TELELINK	INDIA	
13	3602	Special Cables Pvt. Ltd.	INDIA	
14	3814	RR KABEL LIMITED	INDIA	
15	3724	CORDS CABLE INDUSTRIESLTD.	INDIA	
16	C145	CORDS CABLE INDUSTRIES LTD	INDIA	
17	U003	UNIVERSAL CABLES LTD	INDIA	
18	S304	SUYOG ELECTRICALS LTD	INDIA	
19	R203	LKB ENGINEERING PRIVATE LIMITED	INDIA	
20	A132	ASSOCIATED FLEXIBLES & WIRES [P] LTD	INDIA	
21	E063	ELKAY TELELINKS LTD.-	INDIA	
22	D012	DELTON CABLES LIMITED	INDIA	
23	3722	POLYCAB INDIA LIMITED	INDIA	
24	G156	GEMSCAB INDUSTRIES LTD	INDIA	
25	H060	HAVELLS INDIA LTD	INDIA	
26	S025	SRIRAM CABLES PVT LTD	INDIA	
27	T124	TORRENT ELECTRICALS LIMITED	INDIA	
28	A034	ASSOCIATED CABLES PVT LTD	INDIA	
29	E169	ECKO CABLES PVT LTD	INDIA	
30	T212	THERMO CABLES LTD (FORM. T-150)	INDIA	
31	3854	CHANDRESH CABLES LIMITED	INDIA	
32	4137	INSUCON CABLES AND CONDUCTORS PRIVATE LIMITED	INDIA	
33	4351	UNIVERSAL CABLE MANUFACTURING COMPANY	INDIA	
34	4281	SBEE CABLES INDIA LIMITED	INDIA	
35	4105	ULTRACAB (INDIA) LIMITED	INDIA	
36	3783	POLYCAB INDIA LIMITED	INDIA	
37	3784	POLYCAB INDIA LIMITED	INDIA	
38	3796	PARAMOUNT COMMUNICATIONS LTD	INDIA	
39	3765	THERMO CABLES LTD.	INDIA	
40	4001	RAVI INDUSTRIES	INDIA	

Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13OD		Description : CABLES-CONTROL (UNPAIRED)-XLPE		
41	4163	KLJ PARAFLEX INDIA LIMITED	INDIA	



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VENDOR LIST ELECTRICAL

**PROJECT : OVERALL PROJECT MANAGEMENT AS MPMC AND
 PMC/EPCM SERVICES FOR ETHYLENE CRACKER
 UNIT AND U&O FOR BPREP**

OWNER : BPCL

A	17.03.26	ISSUED WITH TENDER	SKANU	SK	RSR
Rev. No	Date	Purpose	Prepared by	Checked by	Approved by

GENERAL NOTES- VENDOR LIST PREAMBLE

- 1.0 CONTRACTOR shall procure all the material / equipment forming permanent part of the unit / plant from OWNER / PMC approved vendors enclosed elsewhere in the bidding document. This shall include sub- ordered items / components also. The “Approved Vendors” shall be item specific.
- 2.0 CONTRACTOR to procure material from any of OWNER / PMC approved vendors. However, current validity, holiday status and range of approval as per EIL enlistment letter need to be verified by the CONTRACTOR with vendor before placement of order.
 - i. CONTRACTOR shall also verify the work load, stability and solvency status of the vendor prior to placement of order.
 - ii. Vendors on OWNER/PMC holiday list shall not be considered for ordering, which need to be verified by the CONTRACTOR prior to placement of order. CONTRACTOR shall comply with this requirement without any time or cost implication to Owner.
 - iii. In case any vendor is registered with EIL as an approved vendor subsequent to the issue of this bidding document, the same may also be considered by the CONTRACTOR with prior intimation to OWNER/PMC and obtain their concurrence prior to placement of order.
 - iv. Wherever job specification calls for requisite proven track record, the same shall be complied and necessary documents to be submitted for BPCL/EIL approval prior to ordering. Licensor approval is required wherever necessary.
 - v. Vendors on OWNER / PMC holiday list shall not be considered for ordering.

CONTRACTOR shall comply with this requirement without any time or cost implication to the OWNER. If a vendor is put on OWNER / PMC’s holiday list subsequent to CONTRACTOR placing an order, it shall be CONTRACTOR’s responsibility to ensure quality work and timely supply from the vendor.

- 3.0 Wherever the nos. of approved vendors are less than 3 (three) CONTRACTORS may consider additional vendors with prior approval of OWNER / PMC. “Approval status” documents / credentials to be furnished by the vendors in such cases the CONTRACTOR shall be solely responsible. OWNER / PMC’s decision on approval shall be final and non-negotiable. Non-acceptance of a particular proposed vendor due to any reasons whatsoever shall not be a cause of schedule and cost implication. Delay in approval of additional vendor, if any, on account of non- submission of performance track record and other documents as per requirements is solely to contractor’s account and no time and cost implication implication(s) shall be entertained on account of additional vendor approval
- 4.0 For items not covered in the vendor list (covered elsewhere in bidding document), the vendor shall be approved by OWNER/ PMC prior to placement of order by CONTRACTOR. CONTRACTOR shall list down the proposed suppliers/vendors for such items and submit the One Vendor details for OWNER/PMC’s review / approval along with necessary documents/credentials. Non- acceptance of a particular proposed vendor due to any reasons whatsoever shall not be a cause of schedule and cost implication.

- 5.0 CONTRACTOR shall make an independent assessment of capability of all the vendors for timely deliveries of material / equipment. Any delays in deliveries by vendor(s) shall not be a cause of schedule and cost implication.
- 6.0 At any stage of the project, if it comes to the notice of OWNER / PMC that CONTRACTOR has procured material / equipment, intentionally or unintentionally whatsoever, from an unapproved vendor and/or items not falling in approved range of vendor(s), the same shall be rejected forthwith and CONTRACTOR shall be liable to replace such material / plant / machinery without any schedule and cost implication to the OWNER.
- 7.0 The vendor list provided by Process Licensor in any of the Licensor documents shall be considered. If Vendor for any item is not covered in this vendor list but appearing anywhere in the Licensor process package, Licensor vendor list will be followed.
Sub- Vendor list given in the job specifications attached with the tender shall be considered for respective items if not covered in this vendor list.
In case of any Mandatory /Proprietary items appearing in this vendor list as well as in the Licensor's process package, the vendors as recommended by the Process Licensor shall be followed.
- 8.0 It is understood that in few cases, name of the Vendor changes due to change in their Company or Corporate shareholding, OWNER may accept such Vendors under its new name with prior approval and submission of requisite supporting document.
Any such approval shall however, not absolve the CONTRACTOR from any of his obligations under the contract; neither shall any such approval signify nominations or instruction to use such a vendor. All approved vendors are deemed to have been freely chosen by the CONTRACTOR at his own risk.
- 9.0 The approved vendors list for fabricated equipment (Vessels, Column, Heat Exchangers, Ejectors etc.) is for fabrication alone. Where mechanical design of the equipment is included in CONTRACTOR'S scope, CONTRACTOR shall himself be responsible for designing and obtaining approval / review of Mechanical design calculations as per codes/specifications specified elsewhere in the Bid/Contractor document from OWNER / PMC.
- 10.0 Proposal of any new vendor based on its successful PTR is permissible only as special case. In case no quote is received from the bid specified approved vendors, substantial proof such as regret letters / E-mails from vendors etc. to be submitted for the same as documentary evidence. However, OWNER/PMC decision shall be final and binding on the contractor for which commercial implication (if any) shall not be entertained by the OWNER.

Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13BA		Description : SWITCHBOARD-MV (INDOOR) WITH VCB BREAKER		
Approved Suppliers				
1	C010	CG POWER AND INDUSTRIAL SOLUTIONS LIMITED	INDIA	
2	A309	ABB INDIA LTD (NASIK)	INDIA	
3	S003	SIEMENS LIMITED	INDIA	
4	3670	STELMEC LIMITED	INDIA	
5	B041A	BHARAT HEAVY ELECTRICALS LIMITED-BHOPAL	INDIA	
6	L088	LARSEN & TOUBRO LTD- TAMCO DIV.	MALAYSIA	
7	S109	SCHNEIDER ELECTRIC INFRA. LTD(FORM A347)	INDIA	
8	L103	SCHNEIDER ELECTRIC INDIA PRIVATE LIMITED	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13BB		Description : SWITCHBOARD-LV-MCC/ASB/LDB-FIXED TYPE		
Approved Suppliers				
1	S109	SCHNEIDER ELECTRIC INFRA. LTD(FORM A347)	INDIA	
2	3873	ABB INDIA LTD	INDIA	
3	L063	SCHNEIDER ELECTRIC INDIA PRIVATE LIMITED	INDIA	
4	B002	BCH ELECTRIC LTD	INDIA	
5	C024	CONTROLS AND SCHEMATICS PRIVATE LIMITED	INDIA	
6	4007	INTRELEC	INDIA	
7	M138	M.K. ENGINEERS & CONTROLS PVT. LTD.	INDIA	
8	C007	C & S ELECTRIC LTD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13BC		Description : SWITCHBOARD-LV-DRAWOUT WITH ACB		
Approved Suppliers				
1	L063	SCHNEIDER ELECTRIC INDIA PRIVATE LIMITED	INDIA	
2	3873	ABB INDIA LTD	INDIA	
3	4182	SIEMENS LIMITED	INDIA	
4	4181	SIEMENS LIMITED	INDIA	
5	S109	SCHNEIDER ELECTRIC INFRA. LTD(FORM A347)	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13BF		Description : LV SWITCHBOARD FIXED TYPE FOR PACKAGE EQUIPMENT		
Approved Suppliers				
1	N148	NITYA ELECTROCONTROLS PRIVATE LIMITED	INDIA	
2	4007	INTRELEC	INDIA	
3	M264	MAKTEL SYSTEMS	INDIA	
4	A212	ACCUSONIC CONTROLS PVT LTD	INDIA	
5	T114	TRICOLITE ELECTRICAL INDUSTRIES PVT LTD	INDIA	
6	Z011	ZENITH ENGINEERING CORP.	INDIA	
7	M138	M.K. ENGINEERS & CONTROLS PVT. LTD.	INDIA	
8	3780	POSITRONICS PVT LTD	INDIA	
9	3837	MILESTONES SWITCHGEARS PVT LTD	INDIA	
10	4203	ENGINEERS AND ENGINEERS (ELECTRICALS) PRIVATE LIMITED	INDIA	
11	V124	VIDHYUT CONTROL (INDIA) PVT LTD	INDIA	
12	P289	POPULAR SWITCHGEARS PVT LTD	INDIA	
13	E209	ELECTRO ALLIED PRODUCTS	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13BO		Description : CIRCUIT BREAKERS-VCB OUTDOOR (HV)		
Approved Suppliers				
1	4311	SIEMENS LIMITED	INDIA	
2	B041A	BHARAT HEAVY ELECTRICALS LIMITED-BHOPAL	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13GA		Description : CONTROL STATIONS- WEATHERPROOF		
Approved Suppliers				
1	S158	SUDHIR SWITCHGEARS PVT LTD	INDIA	
2	4012	TEKMEC SWITCHGEAR & CONTROLS	INDIA	
3	3681	FCG POWER INDUSTRIES PVT LTD	INDIA	
4	E111	ELECTRICAL EQUIPMENT CORPORATION	INDIA	
5	B002	BCH ELECTRIC LTD	INDIA	
6	T166	TEKNIC ELECTRIC (I) PVT. LTD.	INDIA	
7	G159	PEPPERL & FUCHS MANUFACTURING (INDIA) PRIVATE LIMITED	INDIA	
8	3706	PHOENIX MECANO INDIA PVT. LTD.	INDIA	
9	B024	BALIGA LIGHTING EQUIPMENTS (P) LIMITED	INDIA	
10	E024	EX-PROTECTA	INDIA	
11	F024	FLEXPRO ELECTRICALS PVT LTD	INDIA	
12	F036	FLAMEPROOF EQUIPMENTS PVT.LTD	INDIA	
13	4245	FCG HI-TECH PRIVATE LIMITED	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13GB		Description : CONTROL STATIONS-FLAME PROOF		
Approved Suppliers				
1	K173	KAYSONS TECHNO EQUIPMENTS PVT. LTD.	INDIA	
2	B024	BALIGA LIGHTING EQUIPMENTS (P) LIMITED	INDIA	
3	G159	PEPPERL & FUCHS MANUFACTURING (INDIA) PRIVATE LIMITED	INDIA	
4	F024	FLEXPRO ELECTRICALS PVT LTD	INDIA	
5	S158	SUDHIR SWITCHGEARS PVT LTD	INDIA	
6	4364	SAI INDUSTRIES	INDIA	
7	F036	FLAMEPROOF EQUIPMENTS PVT.LTD	INDIA	
8	4245	FCG HI-TECH PRIVATE LIMITED	INDIA	
9	3706	PHOENIX MECANO INDIA PVT. LTD.	INDIA	
10	3681	FCG POWER INDUSTRIES PVT LTD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13LA		Description : LIGHTING FIXTURE & ACCESSORIES-HAZARDOUS		
Approved Suppliers				
1	F036	FLAMEPROOF EQUIPMENTS PVT.LTD	INDIA	
2	F024	FLEXPRO ELECTRICALS PVT LTD	INDIA	
3	B024	BALIGA LIGHTING EQUIPMENTS (P) LIMITED	INDIA	
4	3681	FCG POWER INDUSTRIES PVT LTD	INDIA	
5	4245	FCG HI-TECH PRIVATE LIMITED	INDIA	
6	3990	SHREYA EX-TECH PRIVATE LIMITED	INDIA	
7	K173	KAYSONS TECHNO EQUIPMENTS PVT. LTD.	INDIA	
8	S158	SUDHIR SWITCHGEARS PVT LTD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13LC		Description : FLP ELECTRICAL FITTINGS (IMPORTED)		
Approved Suppliers				
1	V548	VICTOR PRODUCTS PLC	UNITED KINGDOM	
2	R506	R STAHL SCHALTGERATE GMBH	GERMANY	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13LD		Description : HIGH MAST LIGHTING SYSTEM		
Approved Suppliers				
1	B011	BAJAJ ELECTRICALS LTD	INDIA	
2	4110	UTKARSH INDIA LIMITED	INDIA	
3	3850	BAJAJ ELECTRICALS LTD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13MA		Description : JUNCTION BOXES (FLAME PROOF)		
Approved Suppliers				
1	4364	SAI INDUSTRIES	INDIA	
2	3681	FCG POWER INDUSTRIES PVT LTD	INDIA	
3	4245	FCG HI-TECH PRIVATE LIMITED	INDIA	
4	G159	PEPPERL & FUCHS MANUFACTURING (INDIA) PRIVATE LIMITED	INDIA	
5	R175	R STAHL PVT LTD	INDIA	
6	F036	FLAMEPROOF EQUIPMENTS PVT.LTD	INDIA	
7	K173	KAYSONS TECHNO EQUIPMENTS PVT. LTD.	INDIA	
8	S158	SUDHIR SWITCHGEARS PVT LTD	INDIA	
9	B024	BALIGA LIGHTING EQUIPMENTS (P) LIMITED	INDIA	
10	F024	FLEXPRO ELECTRICALS PVT LTD	INDIA	
11	3706	PHOENIX MECANO INDIA PVT. LTD.	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13MB		Description : LIGHTING & POWER PANELS (FLP)		
Approved Suppliers				
1	F024	FLEXPRO ELECTRICALS PVT LTD	INDIA	
2	4364	SAI INDUSTRIES	INDIA	
3	S158	SUDHIR SWITCHGEARS PVT LTD	INDIA	
4	3990	SHREYA EX-TECH PRIVATE LIMITED	INDIA	
5	B024	BALIGA LIGHTING EQUIPMENTS (P) LIMITED	INDIA	
6	F036	FLAMEPROOF EQUIPMENTS PVT.LTD	INDIA	
7	K173	KAYSONS TECHNO EQUIPMENTS PVT. LTD.	INDIA	
8	4245	FCG HI-TECH PRIVATE LIMITED	INDIA	
9	3706	PHOENIX MECANO INDIA PVT. LTD.	INDIA	
10	3681	FCG POWER INDUSTRIES PVT LTD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13MC		Description : PLUGS/SOCKETS/HANDLAMPS (FLAME PROOF)		
Approved Suppliers				
1	F036	FLAMEPROOF EQUIPMENTS PVT.LTD	INDIA	
2	S158	SUDHIR SWITCHGEARS PVT LTD	INDIA	
3	3815	VICTORY LUMINAIRES	INDIA	
4	3681	FCG POWER INDUSTRIES PVT LTD	INDIA	
5	F024	FLEXPRO ELECTRICALS PVT LTD	INDIA	
6	B024	BALIGA LIGHTING EQUIPMENTS (P) LIMITED	INDIA	
7	K173	KAYSONS TECHNO EQUIPMENTS PVT. LTD.	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13MD		Description : FLAMEPROOF POWER DISTRIBUTION BOARD		
Approved Suppliers				
1	K173	KAYSONS TECHNO EQUIPMENTS PVT. LTD.	INDIA	
2	F036	FLAMEPROOF EQUIPMENTS PVT.LTD	INDIA	
3	B024	BALIGA LIGHTING EQUIPMENTS (P) LIMITED	INDIA	
4	F024	FLEXPRO ELECTRICALS PVT LTD	INDIA	
5	S158	SUDHIR SWITCHGEARS PVT LTD	INDIA	
6	3706	PHOENIX MECANO INDIA PVT. LTD.	INDIA	
7	3681	FCG POWER INDUSTRIES PVT LTD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 130C		Description : CABLES-MEDIUM VOLTAGE-POWER-XLPE		
Approved Suppliers				
1	K082	KEI INDUSTRIES LIMITED	INDIA	
2	4299	POLYVION CABLES PRIVATE LIMITED	INDIA	
3	4265	SVARN INFRATEL PRIVATE LIMITED	INDIA	
4	T124	TORRENT ELECTRICALS LIMITED	INDIA	
5	C145	CORDS CABLE INDUSTRIES LTD	INDIA	
6	4262	K C POWERTRACKS	INDIA	
7	4263	TIRUPATI PLASTOMATICS PRIVATE LIMITED	INDIA	
8	A132	ASSOCIATED FLEXIBLES & WIRES [P] LTD	INDIA	
9	S025	SRIRAM CABLES PVT LTD	INDIA	
10	4001	RAVI INDUSTRIES	INDIA	
11	D012	DELTON CABLES LIMITED	INDIA	
12	4351	UNIVERSAL CABLE MANUFACTURING COMPANY	INDIA	
13	G156	GEMSCAB INDUSTRIES LTD	INDIA	
14	3969	SHIVPRIYA CABLES PRIVATE LIMITED	INDIA	
15	4055	DYNAMIC CABLES LIMITED	INDIA	
16	R203	LKB ENGINEERING PRIVATE LIMITED	INDIA	
17	3814	RR KABEL LIMITED	INDIA	
18	4105	ULTRACAB (INDIA) LIMITED	INDIA	
19	3796	PARAMOUNT COMMUNICATIONS LTD	INDIA	
20	4163	KLJ PARAFLEX INDIA LIMITED	INDIA	
21	3669	KEI INDUSTRIES LIMITED	INDIA	
22	4234	LASER POWER & INFRA PRIVATE LIMITED	INDIA	
23	3781	POLYCAB INDIA LIMITED	INDIA	
24	H060	HAVELLS INDIA LTD	INDIA	
25	4281	SBEE CABLES INDIA LIMITED	INDIA	
26	K190A	KEC ASIAN CABLES LIMITED	INDIA	
27	4104	ZENIUM CABLES LIMITED	INDIA	
28	3722	POLYCAB INDIA LIMITED	INDIA	
29	4264	SURAJ CABLES (INDIA) PRIVATE LIMITED	INDIA	
30	4298	SHRIRAM TELELINK	INDIA	
31	3783	POLYCAB INDIA LIMITED	INDIA	
32	4137	INSUCON CABLES AND CONDUCTORS PRIVATE LIMITED	INDIA	
33	U085	APAR INDUSTRIES LTD	INDIA	
34	3732	POLYCAB INDIA LIMITED	INDIA	
35	3854	CHANDRESH CABLES LIMITED	INDIA	
36	U003	UNIVERSAL CABLES LTD	INDIA	
37	3731	POLYCAB INDIA LIMITED	INDIA	
38	S304	SUYOG ELECTRICALS LTD	INDIA	
39	4261	TORTEK INDIA PRIVATE LIMITED	INDIA	
40	3602	Special Cables Pvt. Ltd.	INDIA	

Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 130C		Description : CABLES-MEDIUM VOLTAGE-POWER-XLPE		
41	3765	THERMO CABLES LTD.	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 130D		Description : CABLES-CONTROL (UNPAIRED)-XLPE		
Approved Suppliers				
1	3669	KEI INDUSTRIES LIMITED	INDIA	
2	3765	THERMO CABLES LTD.	INDIA	
3	A132	ASSOCIATED FLEXIBLES & WIRES [P] LTD	INDIA	
4	4264	SURAJ CABLES (INDIA) PRIVATE LIMITED	INDIA	
5	T124	TORRENT ELECTRICALS LIMITED	INDIA	
6	4351	UNIVERSAL CABLE MANUFACTURING COMPANY	INDIA	
7	3783	POLYCAB INDIA LIMITED	INDIA	
8	4105	ULTRACAB (INDIA) LIMITED	INDIA	
9	4299	POLYVION CABLES PRIVATE LIMITED	INDIA	
10	4001	RAVI INDUSTRIES	INDIA	
11	4137	INSUCON CABLES AND CONDUCTORS PRIVATE LIMITED	INDIA	
12	E169	ECKO CABLES PVT LTD	INDIA	
13	E063	ELKAY TELELINKS LTD.-	INDIA	
14	R203	LKB ENGINEERING PRIVATE LIMITED	INDIA	
15	4163	KLJ PARAFLEX INDIA LIMITED	INDIA	
16	3854	CHANDRESH CABLES LIMITED	INDIA	
17	K190A	KEC ASIAN CABLES LIMITED	INDIA	
18	4281	SBEE CABLES INDIA LIMITED	INDIA	
19	3752	APAR INDUSTRIES LTD	INDIA	
20	4261	TORTEK INDIA PRIVATE LIMITED	INDIA	
21	T212	THERMO CABLES LTD (FORM. T-150)	INDIA	
22	3796	PARAMOUNT COMMUNICATIONS LTD	INDIA	
23	4234	LASER POWER & INFRA PRIVATE LIMITED	INDIA	
24	S304	SUYOG ELECTRICALS LTD	INDIA	
25	3602	Special Cables Pvt. Ltd.	INDIA	
26	4298	SHRIRAM TELELINK	INDIA	
27	4297	GOYOLENE FIBRES (INDIA) PRIVATE LIMITED	INDIA	
28	S025	SRIRAM CABLES PVT LTD	INDIA	
29	A034	ASSOCIATED CABLES PVT LTD	INDIA	
30	U003	UNIVERSAL CABLES LTD	INDIA	
31	3722	POLYCAB INDIA LIMITED	INDIA	
32	G156	GEMSCAB INDUSTRIES LTD	INDIA	
33	4221	BONTON CABLES (INDIA) PRIVATE LIMITED	INDIA	
34	3724	CORDS CABLE INDUSTRIESLTD.	INDIA	
35	C145	CORDS CABLE INDUSTRIES LTD	INDIA	
36	3814	RR KABEL LIMITED	INDIA	
37	H060	HAVELLS INDIA LTD	INDIA	
38	D012	DELTON CABLES LIMITED	INDIA	
39	4265	SVARN INFRATEL PRIVATE LIMITED	INDIA	
40	4262	K C POWERTRACKS	INDIA	

Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13OD		Description : CABLES-CONTROL (UNPAIRED)-XLPE		
41	3784	POLYCAB INDIA LIMITED	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13OE		Description : CABLES-FIRE ALARM, COMMUNICATION AND CONTROL PAIRED		
Approved Suppliers				
1	D012	DELTON CABLES LIMITED	INDIA	
2	T212	THERMO CABLES LTD (FORM. T-150)	INDIA	
3	S304	SUYOG ELECTRICALS LTD	INDIA	
4	C145	CORDS CABLE INDUSTRIES LTD	INDIA	
5	3724	CORDS CABLE INDUSTRIESLTD.	INDIA	
6	E063	ELKAY TELELINKS LTD.-	INDIA	
7	3669	KEI INDUSTRIES LIMITED	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 13RA		Description : NEUTRAL GROUNDING RESISTORS-H.V.		
Approved Suppliers				
1	R062	RESITECH ELECTRICALS PVT LTD	INDIA	
2	S156	S.R. NARKHEDE ENGINEERING PVT LTD	INDIA	
3	R001	RSI SWITCHGEAR PVT LTD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14AA		Description : AIR CIRCUIT BREAKER		
Approved Suppliers				
1	A200B	ABB INDIA LTD	INDIA	
2	4312	SIEMENS LIMITED	INDIA	
3	G147	GE INDIA INDUSTRIAL PVT LTD	INDIA	
4	S450A	SCHNEIDER ELECTRIC INDIA P LTD-HYDERABAD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14AB		Description : AUXILIARY RELAYS		
Approved Suppliers				
1	A392	GE VERNOVA T&D INDIA LIMITED	INDIA	
2	4339	C & S ELECTRIC LTD	INDIA	
3	3642	M/S JVS ELECTRONICS PVT LTD	INDIA	
4	3860	HITACHI ENERGY INDIA LIMITED	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14BA		Description : BIMETAL RELAYS		
Approved Suppliers				
1	4312	SIEMENS LIMITED	INDIA	
2	A200B	ABB INDIA LTD	INDIA	
3	B002	BCH ELECTRIC LTD	INDIA	
4	S450A	SCHNEIDER ELECTRIC INDIA P LTD-HYDERABAD	INDIA	
5	G147	GE INDIA INDUSTRIAL PVT LTD	INDIA	
6	L103	SCHNEIDER ELECTRIC INDIA PRIVATE LIMITED	INDIA	
7	3791	C & S ELECTRIC LTD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14CA		Description : CABLE GLANDS (HAZARDOUS AREA)		
Approved Suppliers				
1	4364	SAI INDUSTRIES	INDIA	
2	3890	AKSHAR BRASS INDUSTRIES	INDIA	
3	4244	METALMECH ENGINEERING	INDIA	
4	27421	CMP PRODUCTS LIMITED	UNITED KINGDOM	
5	K173	KAYSONS TECHNO EQUIPMENTS PVT. LTD.	INDIA	
6	3704	METAL CRAFT INDUSTRIES	INDIA	
7	3681	FCG POWER INDUSTRIES PVT LTD	INDIA	
8	S375	STANDARD METAL INDUSTRIES	INDIA	
9	F024	FLEXPRO ELECTRICALS PVT LTD	INDIA	
10	C195	COMET BRASS PRODUCTS	INDIA	
11	B024	BALIGA LIGHTING EQUIPMENTS (P) LIMITED	INDIA	
12	S158	SUDHIR SWITCHGEARS PVT LTD	INDIA	
13	C205	COMET INDUSTRIES	INDIA	
14	4187	SIGMA INDUSTRIES	INDIA	
15	4360	CLEON OPTOBIZ PRIVATE LIMITED	INDIA	
16	4245	FCG HI-TECH PRIVATE LIMITED	INDIA	
17	F036	FLAMEPROOF EQUIPMENTS PVT.LTD	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14CB		Description : CABLE TERMINATION & JOINTING KIT		
Approved Suppliers				
1	3645	YAMUNA CABLE ACCESSORIES PVT. LTD.	INDIA	
2	4283	GALA SHRINK FIT	INDIA	
3	H168	HEATSHRINK TECHNOLOGIES LTD (FORM. R136)	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14CD		Description : CONTACTORS		
Approved Suppliers				
1	4312	SIEMENS LIMITED	INDIA	
2	B002	BCH ELECTRIC LTD	INDIA	
3	G147	GE INDIA INDUSTRIAL PVT LTD	INDIA	
4	3791	C & S ELECTRIC LTD	INDIA	
5	L103	SCHNEIDER ELECTRIC INDIA PRIVATE LIMITED	INDIA	
6	S450A	SCHNEIDER ELECTRIC INDIA P LTD-HYDERABAD	INDIA	
7	A200B	ABB INDIA LTD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14CE		Description : CONTROL SWITCHES (BREAKER)		
Approved Suppliers				
1	S373	SWITRON DEVICES	INDIA	
2	R159	RELIABLE ELECTRONIC COMPONENTS PVT LTD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14CF		Description : CONTROL SWITCHES / SELECTOR SWITCHES		
Approved Suppliers				
1	R159	RELIABLE ELECTRONIC COMPONENTS PVT LTD	INDIA	
2	4012	TEKMEC SWITCHGEAR & CONTROLS	INDIA	
3	H142	HOTLINE SWITCHGEAR & CONTROLS	INDIA	
4	4312	SIEMENS LIMITED	INDIA	
5	L103	SCHNEIDER ELECTRIC INDIA PRIVATE LIMITED	INDIA	
6	S373	SWITRON DEVICES	INDIA	
7	4002	P.P. INDUSTRIES	INDIA	
8	K143	KAYCEE INDUSTRIES LTD.	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14CJ		Description : CABLE TRAYS-FRP		
Approved Suppliers				
1	3934	MANISHA COMPOSITEK PRIVATE LIMITED	INDIA	
2	S113	SINTEX INDUSTRIES LTD	INDIA	
3	3868	ERCON COMPOSITES	INDIA	
4	4066	EPP COMPOSITES PVT LTD	INDIA	
5	G193	GENERAL COMPOSITES PRIVATE LIMITED	INDIA	
6	S099	SATYAM COMPOSITES PVT. LTD.	INDIA	
7	S112	SUMIP COMPOSITES PRIVATE LIMITED	INDIA	
8	4329	AERON COMPOSITE LIMITED	INDIA	
9	3932	TRIBENI TECHNOCOM LIMITED	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14FA		Description : FUSES		
Approved Suppliers				
1	G147	GE INDIA INDUSTRIAL PVT LTD	INDIA	
2	I013	NOVATEUR ELECTRICAL & DIGITAL SYSTEMS P	INDIA	
3	3790	C & S ELECTRIC LTD	INDIA	
4	4312	SIEMENS LIMITED	INDIA	
5	C194	EATON POWER QUALITY PRIVATE LIMITED	INDIA	
6	L103	SCHNEIDER ELECTRIC INDIA PRIVATE LIMITED	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14HA		Description : HEAVY DUTY SWITCHES		
Approved Suppliers				
1	4312	SIEMENS LIMITED	INDIA	
2	3790	C & S ELECTRIC LTD	INDIA	
3	L103	SCHNEIDER ELECTRIC INDIA PRIVATE LIMITED	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14HB		Description : ELECTRICAL HEAT TRACING SYSTEM		
Approved Suppliers				
1	27487	CHROMALOX INC.	UNITED STATES	
2	T207	THERMON INDIA PRIVATE LIMITED	INDIA	
3	3975	THERMOPADS PRIVATE LIMITED	INDIA	
4	B726	BARTEC GMBH	GERMANY	
5	27561	ELTHERM GMBH	GERMANY	
6	T758	nVent Thermal LLC	UNITED STATES	
7	27417	HEAT TRACE LIMITED	UNITED KINGDOM	
8	27514	SSTENERGOMONTAZH LLC	RUSSIAN FEDERATION	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14IA		Description : INSTRUMENT TRANSFORMERS CT & PT (MV)		
Approved Suppliers				
1	S372	SILKAANS ELECTRICALS MFG.CO.PVT.LTD	INDIA	
2	N119	NARAYAN POWERTECH PVT LTD	INDIA	
3	K149	KALPA ELEKTRIKAL PVT LTD	INDIA	
4	3901	NEWTEK ELECTRICALS	INDIA	
5	4160	RECO TRANSFORMERS PRIVATE LIMITED	INDIA	
6	P237	PRECISE ELECTRICALS	INDIA	
7	3789	PRAGATI ELECTRICALS PVT LTD	INDIA	
8	G135	GILBERT & MAXWELL ELECTRICALS PVT LTD	INDIA	
9	P228	PRAGATI ELECTRICALS PVT LTD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14IB		Description : INSTRUMENT TRANSFORMERS CT & PT (HV)		
Approved Suppliers				
1	3862	STRATON ELECTRICALS PRIVATE LIMITED	INDIA	
2	P228	PRAGATI ELECTRICALS PVT LTD	INDIA	
3	3859	HITACHI ENERGY INDIA LIMITED	INDIA	
4	K149	KALPA ELEKTRIKAL PVT LTD	INDIA	
5	K013	KAPPA ELECTRICALS	INDIA	
6	3730	GEMINI INSTRATECH LTD	INDIA	
7	3857	SCHNEIDER ELECTRIC INFRASTRUCTURE LIMITED	INDIA	
8	E144	ELECTRICAL CONTROLS & SYSTEMS	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14IF		Description : ISOLATORS/LOAD BREAK SWITCHES(HV INDOOR)		
Approved Suppliers				
1	P302	PANICKKER SWITCHGEAR PVT LTD(FORM D-022)	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14LA		Description : LIGHTNING ARRESTORS		
Approved Suppliers				
1	O009	OBLUM ELECTRICAL INDUSTRIES (P) LTD	INDIA	
2	C010	CG POWER AND INDUSTRIAL SOLUTIONS LIMITED	INDIA	
3	W035	W.S. INSULATOR OF INDIA	INDIA	
4	E091	ELPRO INTERNATIONAL LIMITED	INDIA	
5	4229	ELEKTROLITES (POWER) PRIVATE LIMITED	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14LB		Description : LIGHTING FIXTURE & ACCESSORIES-NON HAZARDOUS		
Approved Suppliers				
1	3986	HAVELLS INDIA LTD	INDIA	
2	4370	LEDURE LIGHTINGS LTD	INDIA	
3	3833	BAJAJ ELECTRICALS LTD	INDIA	
4	4214	CROMPTON GREAVES CONSUMER ELECTRICALS LIMITED	INDIA	
5	4068	FORTUNEART LED LIGHTING PVT LTD	INDIA	
6	4245	FCG HI-TECH PRIVATE LIMITED	INDIA	
7	4043	ORIENT ELECTRIC LIMITED	INDIA	
8	3687	PYROTECH TECHNOLOGIES PRIVATE LIMITED	INDIA	
9	3993	LIGHTING TECHNOLOGIES INDIA PRIVATE LIMITED	INDIA	
10	3834	BAJAJ ELECTRICALS LTD	INDIA	
11	4036	HALONIX TECHNOLOGIES PRIVATE LIMITED	INDIA	
12	4211	SURYA ROSHNI LTD	INDIA	

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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14LC		Description : LIGHTING & POWER PANELS (SAFE AREA)		
Approved Suppliers				
1	3825	HAVELLS INDIA LIMITED	INDIA	
2	A372	ABB INDIA LTD	INDIA	
3	I013	NOVATEUR ELECTRICAL & DIGITAL SYSTEMS P	INDIA	
4	C007	C & S ELECTRIC LTD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14LD		Description : DRY TYPE LIGHTING TRANSFORMERS		
Approved Suppliers				
1	G179	GUJARAT PLUG-IN DEVICES PVT LTD	INDIA	
2	A028	AUTOMATIC ELECTRIC LTD.	INDIA	
3	I054	INDCOIL TRANSFORMERS PVT LTD	INDIA	
4	V003	VOLTAMP TRANSFORMERS LTD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14MA		Description : MCB		
Approved Suppliers				
1	3824	HAVELLS INDIA LIMITED	INDIA	
2	1168	INDIANA CURRENT CONTROL LTD	INDIA	
3	3888	POLYCAB INDIA LIMITED	INDIA	
4	S393	STANDARD ELECTRICALS LTD	INDIA	
5	3793	C & S ELECTRIC LTD	INDIA	
6	A372	ABB INDIA LTD	INDIA	
7	4312	SIEMENS LIMITED	INDIA	
8	S450	SCHNEIDER ELECTRIC INDIA PVT LTD	INDIA	
9	L071	LEGRAND (INDIA) PVT. LTD (FORM. M-006)	INDIA	
10	3726	NOVATEUR ELECTRICAL & DIGITAL SYSTEMS PVT. LTD.	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14MB		Description : MCCB		
Approved Suppliers				
1	G147	GE INDIA INDUSTRIAL PVT LTD	INDIA	
2	S450A	SCHNEIDER ELECTRIC INDIA P LTD-HYDERABAD	INDIA	
3	4312	SIEMENS LIMITED	INDIA	
4	A200B	ABB INDIA LTD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14MC		Description : METERS		
Approved Suppliers				
1	S141	SECURE METERS LIMITED	INDIA	
2	3901	NEWTEK ELECTRICALS	INDIA	
3	R042	RISHABH INSTRUMENTS LIMITED	INDIA	
4	4233	ELMEASURE INDIA PRIVATE LIMITED	INDIA	
5	M239	MECO INSTRUMENTS PVT LTD	INDIA	
6	N130	NIPPEN ELECTRICAL INSTRUMENTS CO.	INDIA	
7	A028A	AUTOMATIC ELECTRIC LTD.	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14PA		Description : PROTECTION RELAYS		
Approved Suppliers				
1	S003B	SIEMENS LTD - GOA	INDIA	
2	S824	SCHWEITZER ENGINEERING LABORATORIES	UNITED STATES	
3	S450A	SCHNEIDER ELECTRIC INDIA P LTD-HYDERABAD	INDIA	
4	E143	EASUN REYROLLE LTD	INDIA	
5	A070	ABB INDIA LTD (BARODA)	INDIA	
6	A392	GE VERNOVA T&D INDIA LIMITED	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14PB		Description : PUSH BUTTON AND INDICATING LAMPS		
Approved Suppliers				
1	P291	PRECIFINE PRODUCTS PVT. LTD.	INDIA	
2	4012	TEKMEC SWITCHGEAR & CONTROLS	INDIA	
3	S450A	SCHNEIDER ELECTRIC INDIA P LTD-HYDERABAD	INDIA	
4	4002	P.P. INDUSTRIES	INDIA	
5	B002	BCH ELECTRIC LTD	INDIA	
6	4312	SIEMENS LIMITED	INDIA	
7	E173	ESSEN DEINKI	INDIA	
8	T166	TEKNIC ELECTRIC (I) PVT. LTD.	INDIA	
9	H142	HOTLINE SWITCHGEAR & CONTROLS	INDIA	
10	3791	C & S ELECTRIC LTD	INDIA	
11	S365	SHRI TULSI SWITCHGEARS PVT LTD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14SA		Description : FUSE SWITCH COMBINATION		
Approved Suppliers				
1	4312	SIEMENS LIMITED	INDIA	
2	3790	C & S ELECTRIC LTD	INDIA	
3	L103	SCHNEIDER ELECTRIC INDIA PRIVATE LIMITED	INDIA	
4	3825	HAVELLS INDIA LIMITED	INDIA	
5	I013	NOVATEUR ELECTRICAL & DIGITAL SYSTEMS P	INDIA	
6	G147	GE INDIA INDUSTRIAL PVT LTD	INDIA	
7	S393	STANDARD ELECTRICALS LTD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14TA		Description : TIMERS		
Approved Suppliers				
1	4312	SIEMENS LIMITED	INDIA	
2	E151	ELECTRONIC AUTOMATION PVT LTD	INDIA	
3	B002	BCH ELECTRIC LTD	INDIA	



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Sr No	Supplier Code	Supplier Name	Country	Holiday Description
Item Code : 14VA		Description : VACUUM INTERRUPTER		
Approved Suppliers				
1	3856	SCHNEIDER ELECTRIC INFRASTRUCTURE LIMITED	INDIA	
2	A365	ABB GLOBAL INDUSTRIES & SERVICES LTD	INDIA	
3	4202	CG POWER AND INDUSTRIAL SOLUTIONS LIMITED	INDIA	



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Additional BPCL Vendor List for Electrical Items (Refer Notes as per Vendor List Preamble)

	SUPPLIER CODE	SUPPLIER NAME	COUNTRY	HOLIDAY DESCRIPTION
Item Code: 13BD Description: RELAY & CONTROL PANEL				
1	BPCL VC 120295	R.STAHL (P) LTD.	INDIA	
1	BPCL VC 120325	ABB INDIA LIMITED	INDIA	
Item Code: 13HC Description: BATTERIES-LEAD ACID (VRLA)				
2	BPCL VC 138626	IGA TECH INDUSTRIAL ELECTRONICS	INDIA	
2	BPCL VC 161946	CUMMINS SALES & SERVICE PVT LTD.	INDIA	
Item Code: 13HD Description: BATTERIES-NICKLE CADMIUM				
3	BPCL VC 312982	SUN BATTERY SHOPPE	INDIA	
Item Code: 13KA Description: TRANSFORMERS-POWER-ABOVE 5MVA				
4	BPCL VC 139893	EMCO LIMITED	INDIA	
4	BPCL VC 101407	RAYCHEM RPG PRIVATE LIMITED	INDIA	
Item Code: 13KB Description: TRANSFORMERS-DISTRIBUTION-UPTO 5MVA				
5	BPCL VC 139893	EMCO LIMITED	INDIA	
5	BPCL VC 100270	BHARAT BIJLEE LIMITED	INDIA	
Item Code: 13LA Description: LIGHTING FIXTURE & ACCESSORIES-HAZARDOUS				
6	BPCL VC 132472	PYROTECH ELECTRONICS PRIVATE LIMITED	INDIA	
6	BPCL VC 168748	WM ENERGY & LIGHTING PRIVATE LIMITED	INDIA	
6	BPCL VC 120295	R.STAHL (P) LTD.	INDIA	
6	BPCL VC 162049	INDUSTRIAL ELECTRO CONTROLS	INDIA	
Item Code: 13LD Description: HIGH MAST LIGHTING SYSTEM				
7	BPCL VC 171084	CONTRACTING SYNDICATE	INDIA	
7	BPCL VC 300456	CHASHMITA ENGINEERS PRIVATE LIMITED	INDIA	
Item Code: 13MA Description: JUNCTION BOXES (FLAME PROOF)				
8	BPCL VC 162049	INDUSTRIAL ELECTRO CONTROLS	INDIA	
Item Code: 13NC Description: EPABX SYSTEM				
9	BPCL VC 167774	ASCENT NETWORKS PRIVATE LTD	INDIA	

Item Code: 13PA				
Description: CAPACITORS-HIGH VOLTAGE				
10	BPCL VC 120325	ABB INDIA LIMITED	INDIA	
Item Code: 14BB				
Description: BUS DUCTS (MV)				
11	BPCL VC 333082	CASYON ENGINEERS AND CONSULTANTS	INDIA	
Item Code: 14CB				
Description: CABLE TERMINATION & JOINTING KIT				
12	BPCL VC 300990	TRANS ELECTRICALS (33 KV UE END only)	INDIA	
Item Code: 14HB				
Description: HEAT TRACERS				
13	BPCL VC 101407	RAYCHEM RPG PRIVATE LIMITED	INDIA	

VENDOR DATA REQUIREMENTS FOR COMPOSITE TENDER U&O (ELECTRICAL)

A	17-MAR-2026	Issue with Tender	SKANU	SK	RSR
Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by

VENDOR DATA REQUIREMENTS

The following drawings/documents marked "✓" shall be furnished by the bidder.

COMMUNICATION FIRE ALARM CABLES

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	Schedule of Vendor Documents		✓			
2.	Data Sheets (Duly filled-in)		✓		✓	
3.	Dimensional Drawings : Cross sectional views of cables			✓	✓	
4.	Dimensional Drawings : Crossectional view of accessories			✓	✓	
5.	Inspection & Test Plan (ITP) -For review by Inspection Dept.		✓		✓	@
6.	Test Records			✓	✓	
7.	Type Test Certificate for similar cables			✓	✓	
8.	Data Books/ Manuals : Installation Manual			✓	✓	
9.	Data Books/ Manuals : Operating/ Maintenance Manual				✓	
10.	Data Books/ Manuals : Catalogues/ Brochures				✓	
11.	Equipment storage procedure at site				✓	

DRY TYPE LIGHTING TRANSFORMER

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	Schedule of Vendor Documents		✓		✓	
2.	Data Sheets (Duly filled-in)		✓		✓	
3.	Dimensional/Assembly Drawings : GA Drawing for Transformer		✓		✓	
4.	Dimensional/Assembly Drawings : GA Drawing for HV & LV Termination Bushing/Box			✓	✓	
5.	Dimensional/Assembly Drawings : GA Drawing for Marshalling Box			✓	✓	
6.	Dimensional/Assembly Drawings : Installation Plan/Mounting Details			✓	✓	
7.	Dimensional/Assembly Drawings : Nameplate Rating & Diagram			✓	✓	
8.	Dimensional/Assembly Drawings : List Of Accessories & Make			✓	✓	

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
9.	Electrical Wiring Drawings : Marshalling Box Wiring Diagram			✓	✓	
10.	Test Records			✓	✓	
11.	Inspection & Test Plan (ITP) -For review by Inspection Dept.		✓		✓	
12.	List of Maintenance Spares			✓	✓	
13.	List of Commissioning Spares			✓	✓	
14.	List of Mandatory Spares		✓		✓	
15.	List of Special Tools & Tackles			✓	✓	
16.	Data Books/ Manuals : Installation Manual				✓	
17.	Data Books/ Manuals : Operating/ Maintenance Manual				✓	
18.	Data Books/ Manuals : Catalogues/ Brochures				✓	

ELECTRICAL SURFACE HEATING SYSTEM

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	Schedule of Vendor Documents		✓			
2.	Confirmation of Technical Compliance					
3.	Data Sheets (Duly filled-in)		✓		✓	
4.	Dimensional Drawings : G.A. drawings of LDP		✓		✓	
5.	Dimensional Drawings : G.A. drawing of accessories			✓	✓	
6.	Dimensional Drawings : Cross-sectional view of surface heating cable			✓	✓	
7.	Dimensional Drawings : Cross-sectional view of accessories			✓	✓	
8.	Heat loss calculations		✓		✓	
9.	Electrical surface heating tape selection calculations		✓		✓	
10.	Power cable sizing, voltage drop calculations		✓		✓	
11.	Single line diagram(s) of LDP(s)		✓		✓	
12.	Circuit wise load list				✓	
13.	Block one line distribution diagram indicating each LDP, feeding source, LDP load & location, circuits		✓		✓	
14.	Wiring diagrams : LDP wiring diagrams			✓	✓	
15.	Wiring diagrams : Inter connection drawings			✓	✓	
16.	Cable schedule			✓	✓	

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
17.	Cable, Lighting, Earthing & Equipment layouts of LDP rooms (if applicable) OR outdoor Kiosk layout		✓		✓	
18.	Cable layout of LDPs in plant/ Unit (if applicable)		✓		✓	
19.	Earthing layout of LDPs in plant/ Unit (if applicable)		✓		✓	
20.	Inspection & Test Plan (ITP) -For review by Inspection Dept.		✓		✓	
21.	Type Test Certificate (For similar LDPs, Heat tracing Cables)				✓	
22.	CPRI test, CCE/ DGMS/ DGFASLI approval certificates & BIS license for equipment for hazardous area application				✓	
23.	List of Recommended Spares				✓	
24.	List of Commissioning Spares			✓	✓	
25.	List of Mandatory Spares		✓		✓	
26.	Field testing and commissioning procedure		✓		✓	
27.	Data Books/ Manuals : Installation Manual				✓	
28.	Data Books/ Manuals : Operating/ Maintenance Manual				✓	
29.	Data Books/ Manuals : Catalogues/ Brochures				✓	
30.	Equipment storage procedure at site				✓	

FLAMEPROOF CONTROL STATIONS

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	Schedule of Vendor Documents		✓		✓	
2.	Dimensional/Assembly Drawings : GA Drawings (For control station and canopy)		✓		✓	
3.	Dimensional/Assembly Drawings : Installation and mounting details			✓	✓	
4.	Wiring Diagram And Terminal Details			✓	✓	
5.	Type Test Certificate from Independent Test Lab			✓	✓	
6.	Statutory approval certificate			✓	✓	
7.	BIS Licence			✓	✓	
8.	List of Maintenance Spares			✓	✓	
9.	List of Special Tools & Tackles			✓	✓	
10.	Inspection & Test Plan (ITP) -For review by Inspection Dept.		✓		✓	@

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
11.	Test Records				✓	
12.	Data Books/ Manuals : Installation Manual				✓	
13.	Data Books/ Manuals : Operating/ Maintenance Manual				✓	
14.	Data Books/ Manuals : Catalogues/ Brochures				✓	
15.	Equipment storage procedure at site				✓	

FLAMEPROOF LIGHTING AND POWER PANELS

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	Schedule of Vendor Documents		✓		✓	
2.	Data Sheets (Duly filled-in)		✓		✓	
3.	Dimensional Drawings : G.A. Drawing		✓		✓	
4.	Dimensional Drawings : Cable gland, sealing plug drawings			✓	✓	
5.	Dimensional Drawings : Terminal details, wiring diagram			✓	✓	
6.	Test Records				✓	
7.	Inspection & Test Plan (ITP) -For review by Inspection Dept.		✓		✓	@
8.	Type Test Certificate from Independent Test Lab			✓	✓	
9.	Statutory approval certificate			✓	✓	
10.	BIS Licence			✓	✓	
11.	List of spares			✓	✓	
12.	List of Special Tools & Tackles			✓	✓	
13.	Data Books/ Manuals : Installation Manual				✓	
14.	Data Books/ Manuals : Operating/ Maintenance Manual				✓	
15.	Data Books/ Manuals : Catalogues/ Brochures				✓	
16.	Equipment storage procedure at site				✓	

FLAMEPROOF PLUG, SOCKET AND HANDLAMPS

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	Schedule of Vendor Documents		✓		✓	
2.	Dimensional/Assembly Drawings : GA Drawings			✓	✓	
3.	Dimensional/Assembly Drawings : Installation and mounting details			✓	✓	
4.	Wiring Diagram And Terminal Details			✓	✓	
5.	Type Test Certificate from Independent Test Lab			✓	✓	
6.	Statutory approval certificate			✓	✓	
7.	BIS Licence			✓	✓	
8.	List of spares			✓	✓	
9.	List of Special Tools & Tackles			✓	✓	
10.	Test Records				✓	
11.	Inspection & Test Plan (ITP) -For review by Inspection Dept.		✓		✓	@
12.	Data Books/ Manuals : Installation Manual				✓	
13.	Data Books/ Manuals : Operating/ Maintenance Manual				✓	
14.	Data Books/ Manuals : Catalogues/ Brochures				✓	
15.	Equipment storage procedure at site				✓	

HV SWITCHBOARD

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	Schedule of Vendor Documents		✓			
2.	Confirmation of Technical Compliance					
3.	Data Sheets (Duly filled-in)		✓		✓	
4.	Dimensional/Assembly Drawings : GA Drawings (Elevation and Plan) of switchboard including clearance requirements		✓		✓	
5.	Dimensional/Assembly Drawings : Installation Plan including foundation, cutout and mounting details			✓	✓	
6.	Dimensional/Assembly Drawings : Cross Sectional View			✓		
7.	Dimensional/Assembly Drawings : Bus Duct GA Drawing		✓		✓	
8.	Dimensional/Assembly Drawings : Bus Duct Termination Drawing		✓		✓	
9.	Dimensional/Assembly Drawings : Cubicle Arrangement Drawing			✓	✓	

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
10.	Dimensional/Assembly Drawings : Component Drawing			✓	✓	
11.	Dimensional/Assembly Drawings : Name Plate Drawing			✓	✓	
12.	Dimensional/Assembly Drawings : Arrangement of cable termination		✓		✓	
13.	Dimensional/Assembly Drawings : GA drawing of Data Concentrator, HMI			✓		
14.	Electrical Wiring Drawings : Single Line Diagram		✓		✓	
15.	Electrical Wiring Drawings : Logic Diagram		✓			
16.	Electrical Wiring Drawings : Control Schematics			✓	✓	
17.	Electrical Wiring Drawings : Wiring Diagram and Terminal Details			✓	✓	
18.	Electrical Wiring Drawings : Interpanel Wiring Diagram			✓	✓	
19.	Electrical Wiring Drawings : System Architecture		✓			
20.	Bill Of Material			✓	✓	
21.	Calculations for : CT/PT burdens, Vk, Im, RCT etc. for class PS CT's			✓	✓	
22.	Relay Characteristic Curve			✓	✓	
23.	Relay settings for motor protection relays			✓	✓	
24.	Auxiliary Power Requirement Data (AC & DC)			✓	✓	
25.	Inspection & Test Plan (ITP) -For review by Inspection Dept.		✓		✓	
26.	Test Records			✓	✓	
27.	Type Test Certificate for Panel, Breakers & Bus ducts			✓	✓	
28.	List of Mandatory Spares			✓		
29.	List of Maintenance Spares				✓	
30.	List of Commissioning Spares			✓		
31.	List of Special Tools & Tackles			✓	✓	
32.	Data Books/ Manuals : Installation Manual			✓	✓	
33.	Data Books/ Manuals : Operating/ Maintenance Manual				✓	
34.	Data Books/ Manuals : Catalogues/ Brochures			✓	✓	
35.	Equipment storage procedure at site				✓	
36.	Relay Parameterisation			✓		
37.	Data Mapping Details			✓		
38.	ECS I/O List			✓		

LIGHT FITTINGS FOR HAZARDOUS LOCATIONS

S. N O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	Schedule of Vendor Documents		✓		✓	
2.	Dimensional/Assembly Drawings : GA Drawings			✓	✓	
3.	Dimensional/Assembly Drawings : Installation Plan/Mounting Details			✓	✓	
4.	Dimensional/Assembly Drawings : Terminal Box Arrangement			✓	✓	
5.	Performance Curves : Polar Curves For Each Type Of Fixture			✓	✓	
6.	Performance Curves : Photometric Data For Each Type Of Fixture			✓	✓	
7.	Inspection & Test Plan (ITP) -For review by Inspection Dept.		✓			@
8.	Test Records				✓	
9.	Statutory approval certificate			✓	✓	
10.	Type Test Certificate from Independent Test Lab			✓	✓	
11.	List of Commissioning Spares			✓		
12.	List of Maintenance Spares			✓		
13.	List of Special Tools & Tackles			✓		
14.	Data Books/ Manuals : Installation Manual				✓	
15.	Data Books/ Manuals : Operating/ Maintenance Manual				✓	
16.	Data Books/ Manuals : Catalogues/ Brochures				✓	
17.	Equipment storage procedure at site				✓	

MEDIUM VOLTAGE SWITCHBOARD

S. N O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	Schedule of Vendor Documents		✓			
2.	Data Sheets (Duly filled-in)		✓		✓	
3.	Dimensional/Assembly Drawings : GA Drawings		✓		✓	
4.	Dimensional/Assembly Drawings : Installation Plan/Mounting Details			✓	✓	
5.	Dimensional/Assembly Drawings : Cross Sectional View			✓	✓	
6.	Dimensional/Assembly Drawings : Cubicle Arrangement Drawing			✓	✓	

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
7.	Dimensional/Assembly Drawings : Name Plate Drawing			✓	✓	
8.	Electrical Wiring Drawings : Single Line Diagram		✓		✓	
9.	Electrical Wiring Drawings : Block and Logic Diagrams			✓	✓	
10.	Electrical Wiring Drawings : Control Schematics			✓	✓	
11.	Electrical Wiring Drawings : Wiring Diagram and Terminal Details			✓	✓	
12.	Electrical Wiring Drawings : Interpanel Wiring Diagram			✓	✓	
13.	Bill Of Material			✓	✓	
14.	Relay Characteristic Curve			✓	✓	
15.	Auxiliary Power Requirement Data (AC & DC)		✓		✓	
16.	Test Records				✓	
17.	Inspection & Test Plan (ITP) -For review by Inspection Dept.		✓		✓	@
18.	Type Test Certificate for Panel, Breakers & Bus ducts				✓	
19.	List of Commissioning Spares			✓	✓	
20.	Data Books/ Manuals : Installation Manual				✓	
21.	Data Books/ Manuals : Operating/ Maintenance Manual				✓	
22.	Data Books/ Manuals : Catalogues/ Brochures				✓	
23.	Relay setting & parameterizations using software like ETAP or equivalent.			✓		
24.	Data Mapping Details					

NEUTRAL GROUNDING RESISTOR

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	Schedule of Vendor Documents		✓		✓	
2.	Data Sheets (Duly filled-in)		✓		✓	
3.	Dimensional/Assembly Drawings : GA Drawings (Elevation and Plan) of main enclosure including clearance requirements		✓		✓	
4.	Dimensional/Assembly Drawings : GA Drawing of main and space heater terminal box			✓	✓	
5.	Dimensional/Assembly Drawings : Installation plan including foundation and mounting details			✓	✓	
6.	Wiring Diagram And Terminal Details			✓	✓	

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
7.	Inspection & Test Plan (ITP) -For review by Inspection Dept.		✓		✓	
8.	Test Records			✓	✓	
9.	Type Test Certificates for similar equipment				✓	
10.	List of Maintenance Spares				✓	
11.	List of Special Tools & Tackles				✓	
12.	Data Books/ Manuals : Installation and Maintenance Manual				✓	
13.	Data Books/ Manuals : Catalogues/ Brochures				✓	
14.	Equipment storage procedure at site				✓	

POWER/ CONTROL CABLES AND ACCESSORIES

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	Schedule of Vendor Documents		✓			
2.	Data Sheets (Duly filled-in)			✓	✓	
3.	Dimensional Drawings : GA drawing for terminating kits and jointing kits			✓	✓	
4.	Dimensional Drawings : Cross sectional views of cables			✓	✓	
5.	Technical particulars of cables eg., impedance, inductance, resistance, current carrying capacity etc)			✓	✓	
6.	Inspection & Test Plan (ITP) -For review by Inspection Dept.		✓			@
7.	Test Records			✓	✓	
8.	Type Test Certificate for cable accessories			✓	✓	
9.	Calculation for selection of copper screen for HV cables		✓		✓	
10.	Data Books/ Manuals : Installation Manual				✓	
11.	Data Books/ Manuals : Operating/ Maintenance Manual				✓	
12.	Data Books/ Manuals : Catalogues/ Brochures				✓	
13.	Equipment storage procedure at site				✓	

OFFSITE PACKAGES

**VENDOR DATA REQUIREMENTS
FOR
COMPOSITE TENDER U&O (ELECTRICAL)**

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	Schedule of Vendor Documents		✓			
2.	Confirmation of Technical Compliance			✓		
3.	Guaranteed max. Power Consumption		✓		✓	
4.	Single line diagram		✓		✓	
5.	Electrical load data			✓	✓	
6.	Emergency power requirement			✓	✓	
7.	Control supply requirement			✓	✓	
8.	Area classification		✓		✓	
9.	Block Diagram- FA & PA		✓		✓	
10.	GA drawings of switchgear			✓		
11.	Equipment layout/Substation layout		✓		✓	
12.	Cable layout			✓	✓	
13.	Earthing & Lightning Protection Layout			✓	✓	
14.	Lighting layout			✓		
15.	Sizing calculation-lighting, cabling, earthing			✓	✓	
16.	Cable schedule			✓	✓	
17.	Interconnection diagram			✓	✓	
18.	Electrical interface with owner		✓		✓	
19.	Technical details/Data sheets for major equipment		✓		✓	
20.	Purchase reqn. for major equip.			✓		
21.	Schematic/Logic diagrams			✓	✓	
22.	Interconnection/Wiring diagrams			✓	✓	
23.	Bill Of Material			✓	✓	
24.	List of Mandatory Spares		✓		✓	
25.	List of recommended maintenance spares			✓	✓	
26.	Type Test certificates			✓	✓	
27.	Inspection & Test Plan (ITP) -For review by Inspection Dept.		✓		✓	
28.	Catalogues and brochures			✓	✓	
29.	Installation manual			✓	✓	
30.	Operation/maintenance manual			✓	✓	
31.	Motor Data Sheet/GA- Main & Auxiliary Motors			✓	✓	
32.	Curves for Motors			✓	✓	

Notes :

1. "TICK" denotes applicability.

**VENDOR DATA REQUIREMENTS
FOR
COMPOSITE TENDER U&O (ELECTRICAL)**

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2. Post order, drawing / document review shall commence only after approval of Document Control Index (DCI).
 3. All post order documents shall be submitted / approved through EIL eDMS portal.
 4. Bill of Material shall form part of the respective drawing.
 5. Contractor shall submit record category document directly to site with one copy through eDMS and shall proceed further without waiting for comments from EIL/Owner.
 6. All inspection related documents (QA/QC/ITP) shall be submitted to Third Party Inspection Agency (TPIA).
 7. All technical details and documents furnished with bids shall be treated as data for engineering. These shall however be subject to Purchaser's review after order placement and bidder shall comply to Tender requirements without any cost & time implication to EIL/Owner.
 8. All drawings & documents shall be submitted in A4 or A3 formats. Higher size documents shall be submitted in exceptional circumstances
 9. Final documentation shall be submitted to site in-charge in hard copy (Six prints) and soft (two CDs/DVDs) in addition to submission through EIL eDMS.
 10. Post order- The schedule of drawing / data submission shall be as defined elsewhere.
 11. For further details vendor shall refer following EIL Standard Specifications
- 6-78-0001: Specification for quality management system from Bidders.
6-78-0002: Specification for documentation requirements from Contractors.
6-78-0003: Specification for documentation requirement from Suppliers.

VENDOR DATA REQUIREMENTS FOR INSULATION OF HP,MP AND LP STEAM LINE

0	02-MAR-2026	Issued for Tender	VT	PP	PS
Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by

VENDOR DATA REQUIREMENTS

The following drawings/documents marked "✓" shall be furnished by the bidder.

VENDOR DATA REQUIREMENTS FOR INSULATION OF HP,MP AND LP STEAM LINE

S. N O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	Manufacturer's product and compliance datasheet for the insulation and ancillaries' materials		✓		✓	
2.	Insulation details drawing		✓		✓	
3.	Quality assurance plan of insulation application, inspection & test plan mentioning stage wise inspection etc.		✓		✓	
4.	Quality assurance plan of insulation materials from the manufacturer		✓		✓	
5.	Copies of all physical and chemical test certificates (duly endorsed by the inspection agency) for insulation and ancillaries' materials		✓		✓	
6.	Application procedures pertaining to insulation installation including HSE requirement.		✓		✓	
7.	Proven references for supply of insulation material used under similar condition.			✓	✓	

Notes :

- "TICK" denotes applicability.
- Post order, drawing / document review shall commence only after approval of Document Control Index (DCI).
- All post order documents shall be submitted / approved through EIL eDMS portal.
- Final documentation shall be submitted in hard copy (Six prints) and soft (two CDs/DVDs) in addition to submission through EIL eDMS.
- Refer - 6-78-0001: Specification for quality management system from Bidders.
- Refer - 6-78-0002: Specification for documentation requirements from Contractors.
- Refer - 6-78-0003: Specification for documentation requirement from Suppliers.
- All drawings & documents shall be submitted in A4 or A3 paper sizes. Documents in higher paper size shall be submitted in exceptional circumstances or as indicated in the MR/Tender.
- Post order- The schedule of drawing / data submission shall be mutually agreed between EIL & the bidder / contractor / supplier during finalization of Document Control Index (DCI).
- "@" indicates submission of documents to Inspection Agency.
- Bill of Material shall form part of the respective drawing.

VENDOR DATA REQUIREMENTS FOR COMPOSITE TENDER (SMED)

A	27-FEB-2026	ISSUED WITH TENDER	SS	PR	KCP
Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by

VENDOR DATA REQUIREMENTS

The following drawings/documents marked "✓" shall be furnished by the bidder.

CHAIN PULLEY BLOCK

S. N O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	GA Drawings showing major dimensions and MOC with individual equipment weight/load data		✓		✓	
2.	Installation, operation & maintenance manuals containing all certified drawings & documents			✓	✓	
3.	Quality Assurance Plan			✓	✓	@
4.	Test Certificates - Mechanical Performance Test Reports			✓		@
5.	Any other Test Report, as required			✓		@
6.	Test Certificates - Material Test Certificates			✓	✓	@
7.	Filled in Data Sheets		✓		✓	

Notes :

- "TICK" denotes applicability.
- Post order, drawing / document review shall commence only after approval of Document Control Index (DCI).
- All post order documents shall be submitted / approved through EIL eDMS portal.
- Final documentation shall be submitted in hard copy (Six prints) and soft (two CDs/DVDs) in addition to submission through EIL eDMS.
- Refer - 6-78-0001: Specification for quality management system from Bidders.
- Refer - 6-78-0002: Specification for documentation requirements from Contractors.
- Refer - 6-78-0003: Specification for documentation requirement from Suppliers.
- All drawings & documents shall be submitted in A4 or A3 paper sizes. Documents in higher paper size shall be submitted in exceptional circumstances or as indicated in the MR/Tender.
- Post order- The schedule of drawing / data submission shall be mutually agreed between EIL & the bidder / contractor / supplier during finalization of Document Control Index (DCI).
- "@" indicates submission of documents to Inspection Agency.
- Final documentation shall be submitted in hard copy (Six prints) and soft (three CDs/DVDs) in addition to submission through EIL eDMS and BPCL EPPDMS.

VENDOR DATA REQUIREMENTS FOR CP SYSTEM FOR PLANT

A	17-MAR-2026	ISSUED FOR TENDER (T-9501)	-AD-	-SD-	-RC-
Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by

VENDOR DATA REQUIREMENTS

The following drawings/documents marked "✓" shall be furnished by the bidder.

CATHODIC PROTECTION SYSTEM FOR VESSELS

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	Schedule of Vendor Documents		✓			
2.	Soil/Sand resistivity report			✓	✓	
3.	CP material Data Sheets MMO Wire/Tubular anode		✓		✓	
4.	CP material Data Sheets CPTR unit		✓		✓	
5.	CP material Data Sheets Remote Monitoring Unit for CP		✓		✓	
6.	CP material Data Sheets Reference cell, Surge Diverter and Polarisation Cell, CP cables		✓		✓	
7.	CP material Data Sheets CP Junction boxes (Anode Junction Box(AJB), Cathode Junction Box(CJB) and Monitoring Junction Box(MJB))		✓		✓	
8.	CP material Data Sheets CP Central monitoring system		✓		✓	
9.	CP material Vendor list		✓		✓	
10.	Inspection & Test Plan (ITP) -For review by Inspection Dept. (Refer Note-*)			✓	✓	
11.	CP Design Document		✓		✓	
12.	CP Drawings : MMO anode dimensional GA drawing			✓	✓	
13.	CP Drawings : Anode Bed/Arrangement GA drawings (Clearly showing the clear distance between Bullet surface to anode, clear distance between Mound wall surface to anode, inter anode spacing and reference cell positions etc.)		✓		✓	
14.	CP Drawings : AJB/CJB/MJB GA drawing			✓	✓	
15.	CP Drawings : CPTR Unit GA drawing			✓	✓	
16.	CP Drawings : RMCP Unit GA drawing			✓	✓	

S. N. O.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
17.	CP Drawings : CPTR Unit installation layout			✓	✓	
18.	CP Drawings : Overall CP system layout drawings indicating CPTR, RMCP, AJB, CJB, MJB Central Monitoring system location and Vessel location			✓	✓	
19.	CP Equipment Installation Procedures/QAPs			✓	✓	
20.	CP Commissioning procedure/QAPs			✓	✓	
21.	CP Commissioning reports			✓	✓	
22.	CP Material Test reports			✓	✓	
23.	List of Commissioning Spares			✓	✓	
24.	List of Mandatory Spares		✓		✓	
25.	Data Books/ Manuals : Operating/ Maintenance Manual/ CP Material Manufacturer catalogues				✓	
26.	Equipment storage procedure at site				✓	

Notes :

1. "TICK" denotes applicability.
2. Post order, drawing / document review shall commence only after approval of Document Control Index (DCI).
3. All post order documents shall be submitted / approved through EIL eDMS portal.
4. Final documentation shall be submitted in hard copy (Six prints) and soft (two CDs/DVDs) in addition to submission through EIL eDMS.
5. Refer - 6-78-0001: Specification for quality management system from Bidders.
6. Refer - 6-78-0002: Specification for documentation requirements from Contractors.
7. Refer - 6-78-0003: Specification for documentation requirement from Suppliers.
8. All drawings & documents shall be submitted in A4 or A3 paper sizes. Documents in higher paper size shall be submitted in exceptional circumstances or as indicated in the MR/Tender.
9. Post order- The schedule of drawing / data submission shall be mutually agreed between EIL & the bidder / contractor / supplier during finalization of Document Control Index (DCI).
10. "@" indicates submission of documents to Inspection Agency.
11. Bill of Material shall form part of the respective drawing.
12. Also refer other department's VDR :-
13. Electrical
14. Instrumentation
15. '*' indicates the following:
 - a. Equipments whose ITP is attached with Contract -ITP for respective equipment shall be followed. Therefore, no ITP is to be furnished for review for those equipments.
 - b. Equipments whose ITP is not attached with Contract-Manufacturer's ITP shall be submitted by Packager/ Vendor/Contractor to respective Regional Procurement Office (RPO) near to manufacturer's works for approval

by EIL Inspection.

16. All technical details and documents furnished with bids shall be treated as data for engineering. These shall however be subject to Purchasers review after order placement and bidder shall comply to MR/Tender requirements without any cost & time implication to EIL/Owner.

17. '*' indicates the following:

a. Equipments whose ITP is attached with Contract -ITP for respective equipment shall be followed. Therefore, no ITP is to be furnished for review for those equipments.

b. Equipments whose ITP is not attached with Contract-Manufacturer's ITP shall be submitted by Packager/ Vendor/Contractor to respective Regional Procurement Office (RPO) near to manufacturer's works for approval by EIL Inspection.

18. All technical details and documents furnished with bids shall be treated as data for engineering. These shall however be subject to Purchasers review after order placement and bidder shall comply to MR/Tender requirements without any cost & time implication to EIL/Owner.

19. '*' indicates the following:

a. Equipments whose ITP is attached with Contract -ITP for respective equipment shall be followed. Therefore, no ITP is to be furnished for review for those equipments.

b. Equipments whose ITP is not attached with Contract-Manufacturer's ITP shall be submitted by Packager/ Vendor/Contractor to respective Regional Procurement Office (RPO) near to manufacturer's works for approval by EIL Inspection.

20. All technical details and documents furnished with bids shall be treated as data for engineering. These shall however be subject to Purchasers review after order placement and bidder shall comply to MR/Tender requirements without any cost & time implication to EIL/Owner.



**TECHNICAL CONFIRMATION LIST
FOR CP SYSTEM**

**DOCUMENT No.
B957-000-06-45-TC-01
Rev. A
Page 1 of 2**

TECHNICAL CONFIRMATION LIST FOR CP SYSTEM

**PROJECT : MPMC AND PMC/EPCM SERVICES FOR ETHYLENE
CRACKER UNIT AND UTILITIES & OFFSITES RELATED TO
BINA PETCHEM & REFINERY EXPANSION PROJECT
(BPREP)**

OWNER : BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

PMC : ENGINEERS INDIA LIMITED (EIL)

JOB NO. : B957

A	19-03-2025	ISSUED FOR TENDER	AD	SD	RC
Rev. No	Date	Purpose	Prepared by	Checked by	Approved by



TECHNICAL COMPLIANCE

SL.NO	COMPLIANCE STATEMENT/ QUERRY	CONTRACTOR'S CONFIRMATION / ANSWER
1	Confirm contractor's compliance (without exception & deviation) with Cathodic Protection scope of work	
2	Confirm that deliverables as elaborated in scope of work shall be submitted by contractor.	
3	Confirm that the drawings for each item/equipment shall be submitted by the contractor in one lot so as to facilitate an overall systematic review.	
4	Confirm that design document, drawings and construction drawings shall be submitted and got reviewed by company/company's representative.	

Notes: -

1. The Contractor shall indicate his reply in the space provided in the Technical Questionnaire. In case space provided is not adequate, the reply may be furnished separately under suitably numbered annexure/ attachments duly referred against the comment/ query.
2. The Compliance Statements/ Queries are required to be categorically confirmed/ answered by the contractor and the completely filled in Tech questionnaire shall be submitted together with the Bid.

प्रेसर वेसल्स के सामान्य विनिर्देश

GENERAL SPECIFICATION FOR PRESSURE VESSELS

7	12.03.2024	REVISED AND REISSUED AS STD. SPEC.	PS	TKh	KA/NK	MN
6	28.08.2018	REVISED AND REISSUED AS STD. SPEC.	SK	TK	KJH	RKT
5	30.06.2010	REVISED AND REISSUED AS STD. SPEC.	KA	RKT	AKM/DM	N.DUARI
4	20.11.2009	REVISED & REISSUED AS STD. SPEC.	VB	RKG	AKM	N.DUARI
3	15.05.2000	REVISED AND REISSUED AS STD. SPECN.	RKT	AKM	CRMN	MI
2	15.12.1994	REVISED AND REISSUED AS STD. SPECN.	DD	AKM	VC	AS
Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
Approved by						

Abbreviations:

AI	:	Authorized Inspector
ASME	:	American Society of Mechanical Engineers
DNV	:	Det Norske Veritas
IBR	:	Indian Boiler Regulations
ISO	:	International Organisation for Standardisation
NB	:	Nominal Bore
PESO	:	Petroleum & Explosives Safety Organisation
PWHT	:	Post Weld Heat Treatment

Static Equipment Standards Committee

Convenor: Mr. Nalin Kumar

Members: Mr. K. Anjaneyulu (Co-Convenor)
Mr. Tarun Kumar (Emp. No. A328)
Mr. Tarun Khurana (Coordinator)
Mr. P V S Satyanarayana
Mr. Anish Trehan
Mr. P Barik
Mr. Saikat Chakraborty
Mr. Piyush Suryavanshi
Mr. Mittal Kumar Patel
Mr. Srikanth Karanam
Mr. Aasheesh Handa (Projects)
Mr. Prabhakar Choudhary (SMMS)
Mr. Avdhesh Agarwal (SCM-Inspection)

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1.0 SCOPE

1.1 This specification covers the general requirements for design, fabrication, workmanship, erection, inspection, testing and supply of unfired pressure vessels and is intended to supplement the minimum requirements of the applicable codes.

1.2 Supplementary specification indicating special or additional requirements shall form addenda to this specification and shall govern. Supplementary specification, when made addenda to this specification shall be referred to in the Material Requisition and / or Purchase Order. Following are the supplementary specifications:

- | | | |
|----|-----------|---|
| a) | 6-12-0002 | Supplementary specification for carbon steel vessels. |
| b) | 6-12-0003 | Supplementary specification for low alloy steel vessels. |
| c) | 6-12-0006 | Supplementary specification for austenitic stainless steel vessels. |
| d) | 6-12-0007 | Supplementary specification for stainless steel clad vessels. |
| e) | 6-12-0008 | Supplementary specification for 3½ %Ni steel pressure vessels. |

1.3 In case of conflict, the order of precedence shall be as follows:

- Statutory Requirement
- Engineering drawing
- Specifications and standards
- Codes

In general, the most stringent requirement out of the above shall govern. However, in such a case, vendor shall promptly refer the conflicts to client / EIL in writing to obtain client / EIL instruction before proceeding with manufacture. Decision of client / EIL shall be binding without any time and cost implication.

2.0 REFERENCES

2.1 Design Codes

The following codes in the edition and addenda referred to in the datasheet shall form the basis for design, fabrication, inspection, testing and acceptance of equipment:

- ASME Boiler and Pressure Vessel Code Section VIII Div. 1
- ASME Boiler and Pressure Vessel Code Section IX and Sec V.
- Indian Boiler Regulations- IBR (whenever applicable).
- The Static and Mobile Pressure Vessels (Unfired) Rules 2016 (whenever applicable).

2.2 Material Codes

Material to be used shall conform to:

- ASME Boiler and Pressure Vessel Code Sec. II.
- Indian Standard specification.

Other specifications of equivalent grade can be used only after written approval from EIL.

2.3 Regulations

National laws and regulations together with any local by-laws for the country or state wherever the vessels are to be used must be complied with by the fabricator.

3.0 DESIGN

3.1 Design Pressure

- 3.1.1 Design pressure specified shall be at the top of vertical vessel or at the highest point of horizontal vessel.
- 3.1.2 The design pressure at any lower point shall be determined by adding the maximum operating liquid head and any pressure gradient within the vessel.

3.2 Corrosion Allowance

- 3.2.1 Corrosion allowance shall be added to both sides of tray support rings and other fixed internal non-pressure parts.
- 3.2.2 Removable internal parts (with the exception of trays) which are bolted or clamped in place, shall be provided with extra thickness equal to half the specified corrosion allowance on each surface exposed to vessel contents.
- 3.2.3 Full corrosion allowance shall be added to the throat thickness necessary for strength or sealing in case of fillet and seal welds on internal attachments.

3.3 During fabrication or shop/site hydro-test conditions in horizontal position, the supports for shell shall be so provided that combined stresses in any shell component (based on corroded thickness for site test) do not exceed the following:

- (a) Tensile : 90% of ambient yield
- (b) Compressive: Code allowable stress

3.4 All conical reducers shall be designed as tori conical type with knuckle radius at each end as minimum 10% of the adjoining diameter, unless otherwise specified in requisition. 100% radiography shall be carried out for all weld seams of tori cone.

3.5 Statutory Approvals

- 3.5.1 For vessels coming under the purview of Indian Boiler Regulations, it shall be vendor's responsibility to get approval from IBR authorities pertaining to design, drawings, material of construction, fabrication, inspection and testing etc.
- 3.5.2 For vessels coming under the purview of Static and Mobile Pressure Vessel rules, it shall be vendor's responsibility to get approval from Petroleum & Explosives Safety Organization (PESO) pertaining to design, drawings, material of construction, fabrication, inspection and testing etc.

3.6 Internals

- 3.6.1 For support beams, allowable deflection shall be limited to $L/325$ where L is the length of the beam.
- 3.6.2 For plates, allowable deflection shall be limited to $T/2$ where T is the corroded thickness of plate.
- 3.6.3 Allowable stress at design temperature shall be as per applicable Code.

4.0 FABRICATION

4.1 Head/Dished Ends

- 4.1.1 Dished ends shall preferably be of seamless construction. However, dished ends with one chordal weld seam are acceptable. In such cases, the width of chordal plate shall not be less than one third of the blank diameter and chordal seam shall clear nozzle opening. Intermediate heat treatment, if considered necessary, shall be carried out by the fabricator.
- 4.1.2 Whenever a dished end is made of more than two plates, it must have a seamless crown plate. Whenever a nozzle or a manhole is positioned at the center of the dished end, the crown plate should be larger than the nozzle /manhole reinforcing pad.
- 4.1.3 Wherever hot forming and subsequent heat treatment is involved, adopted procedure shall not impair the mechanical properties of the material beyond the limits specified in respective material specification.

4.2 Nozzles, Manholes, Handholes and Attachments

- 4.2.1 Manhole cover shall be provided with a davit or hinge as per EIL standard and Handhole cover shall be provided with suitable lifting handles.
- 4.2.2 Inside edges of Manholes/Handholes shall be rounded off smooth with a minimum radius of 3mm.
- 4.2.3 All nozzles shall be set-in type, unless otherwise specified in requisition. Set on type nozzle for size 50 NB and below can be used with prior approval.
- 4.2.4 Reinforcing pads whenever required as per drawings or Code shall be of the same material or equivalent as the vessel component to which it is welded. All reinforcing pads shall be provided with two 1/8" (3 mm) NPT tapped holes located 180 apart for air soap solution test with a pressure of 1.25 kg/cm² (g). This test shall also be required to be carried out for slip on flanges. Higher test pressures are not recommended because of accompanying risks and also because the soap bubbles have a chance to blow off. Tell-tale holes in the reinforcing pads shall be plugged with hard grease unless otherwise indicated after the hydro test of the vessel.
- 4.2.5 Wrapper plates, reinforcing pads, saddle plates or stiffeners of higher thickness than specified can be used provided there is no change in basic dimensions and with the approval from Inspection Agency. No separate deviation permit is required for the same.

4.3 Flanges

- 4.3.1 When tongue and groove or male and female faced flanges are used, groove or female face shall be in nozzle flange. However, when the nozzle is located in the bottom, the groove or female face shall be in the cover.
- 4.3.2 Dimensions of flanges shall be as per ASME B16.5 for sizes up to 600 mm NB (24" NB) and as per ASME B 16.47 series 'B' for sizes greater than 600 mm NB (24" NB).

4.4 Fasteners and Gaskets

- 4.4.1 All bolts/studs shall have ISO threading unless otherwise specified. Studs shall extend beyond nuts at least 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.

Hydraulic bolt tensioner shall be used for following bolt sizes and conditions and shall be supplied by vendor unless otherwise specified in the Requisition:

Nominal Bolt Size	Conditions
All Sizes	When specified by Process Licensor/Project specifications
50 mm and Over	All flange joints
38 mm and to 50 mm	Class 600 and above
	Hydrogen service (Partial Pressure of Hydrogen > 7 Kg/cm ² g)
	Design Temperature above 370°C
	Inlet, outlet and quench nozzle flanges of reactors/separators (#)
25 mm to 38 mm	Design Temperature above 370°C
	Inlet, outlet and quench nozzle flanges of reactors/separators (#)

Applicable only for Hydrocracker/DHDT/DHDS/VGO-HDT Reactors and Hot & Cold Separators.

- 4.4.2 All internal bolts shall be provided with double nuts.
- 4.4.3 Threads on external bolting shall be lubricated with graphite grease for working temperature up to 200°C and with Molybdenum Di-sulphide for higher temperature.
- 4.4.4 In addition to stamping of the specifications & manufacturer's symbol as specified in ASME material specifications, size shall be clearly punch marked on one of the ends of the stud. Similarly, the nuts shall have the size punch marked on one of the faces. In case of tapped hole the size shall be punch marked near the hole without disturbing the gasket seating area. Further for all alloy/SS metallurgy bolts & nuts shall also be identified by distinct color marking at the stud end/bolt side face.
- 4.4.5 Gaskets shall conform to ASME B16.20 and ASME B 16.21.
- 4.5 Internals and Externals**
- 4.5.1 All removable internals shall pass through the manhole.
- 4.5.2 Internal baffles, tray support beams or other internals spanning a chord or diameter of the vessel shall be provided with means to allow differential thermal expansion between the part and the vessel shell.
- 4.5.3 Internal pressure piping shall be seamless and of same specification as the external connected piping. However internal non-pressure piping can be either seamless or welded type.
- 4.5.4 Internal flanges for pressure piping shall be forged flanges. However internal flanges for non-pressure piping can be fabricated from plate.
- 4.5.5 Tray/seal pan support rings, downcomer bolting bars and all internals, beam supports welded to the vessel shall be supplied and welded by vessel fabricator in accordance with the details furnished by EIL.
- 4.5.6 The internal baskets, mesh screens, support grid, distributor/mixing trays, distributor pipes, outlet collector etc. of equipment shall be fitted at shop unless otherwise specified in requisition. Equipment shall be transported along with internals fitted. Temporary wedges (if required) shall be provided for supporting the internals which shall be removed by mechanical contractor at site under vendor's supervision unless otherwise specified. Additionally, manway panels shall be provided for mesh screens, support grids, distributor/mixing trays etc. to ensure accessibility for future inspection, loading/unloading of catalyst/inert balls etc.

In case the internals are to be supplied loose as per requisition, the internal baskets, mesh screens, support grid, distributor/mixing trays, distributor pipes, outlet collector etc. of equipment shall be trial fitted,

then removed and crated for dispatch with vessel. These items should be tagged for field identification and installation.

- 4.5.7 All externals shall be supplied and welded by vessel fabricator in accordance with the details furnished by EIL.
- 4.5.8 Internal perforated plate inside the vessel shall be removable type unless specified otherwise and should be able to pass through nearest manhole.
- 4.5.9 Unless specified otherwise, Full support rings shall be provided below catalyst bed to support same.

4.6 Name Plate

Each vessel shall be supplied with EIL name plate and manufacturer name plate as per EIL Standards.

4.7 Welding

- 4.7.1 Flame cut edges shall be ground by the fabricator as required to remove slag, detrimental discoloration and non-uniformity of edges.
- 4.7.2 All pressure bearing butt welds shall be full penetration, double welded joints. When second side welding is not possible due to inaccessibility, single welded butt joints with root run by Tungsten Inert Gas Process (TIG) can be used to ensure full penetration. Backing strip can be used only after obtaining prior approval from EIL. For sub-zero temperatures, backing strips shall not be used.
- 4.7.3 Nozzles and Manways and their reinforcement pads shall be attached to vessel with full penetration welds.
- 4.7.4 Seams in supporting skirt shall be made with full penetration butt welds. Connections between skirt and vessel head shall be made with a smooth flat faced weld unless otherwise indicated in the engineering data sheet. Width of the weld at skirt end shall be equal to the skirt thickness and its height shall at least be twice its width.
- 4.7.5 All main weld seams shall be clear of nozzles, reinforcement pads, internals, tray support rings, cleats and stiffening rings by 50 mm minimum (weld edge to weld edge). In case the same is unavoidable following requirements shall apply:
- a) Nozzles without reinforcing pad
- i) Any weld seam having distance (weld edge to weld edge) to nozzles within 50 mm (but not fouling with weld seam) shall be fully radiographed and dye penetrant examined to a length equal to 100 mm on each side measured from nearest point to nozzle edge.
- ii) Any weld seam fouling with nozzle opening shall be fully radiographed and dye penetrant examined to a length equal to 3 times of outside diameter of nozzle i.e. 1.5 times of outside diameter of nozzle on each side after installation of nozzles. Nozzle to vessel fillet weld shall be provided with smooth concave radius.
- b) Nozzles with reinforcing pad
- i) Any weld seam having distance (weld edge to weld edge) to reinforcing pad within 50 mm (but not fouling with weld seam) shall be fully radiographed and dye penetrant examined to a length equal to 100 mm on each side measured from nearest point to reinforcing pad edge.

- ii) Any weld seam not fouling with nozzle opening but coming under reinforcement pad shall be ground flush, fully radiographed and dye penetrant examined to a length equal to portion of weld seam below reinforcement pad + 100 mm on each side.
- iii) Any weld seam fouling with nozzle opening shall be ground flush, fully radiographed and dye penetrant examined to a length equal to higher of 3 times of outside diameter of nozzle i.e. 1.5 times of outside diameter of nozzle on each side or length equal to portion of weld seam below reinforcement pad + 100 mm on each side.

In case other attachments like internals, tray support rings, cleats etc. is fouling with weld seam, the weld seam portion coming under the attachment plus 100 mm length on each side shall be ground flush, fully radiographed and dye penetrant examined before welding of any such attachment.

4.7.6 Vendor shall submit welding procedure specification and qualification record to purchaser's inspector or authorized representative for approval as per ASME Boiler and Pressure Vessels Code Section IX.

Previously qualified welding Procedure Qualification Record (PQR) under EIL, CEIL, Lloyds, DNV, TUV and Bureau Veritas shall also be acceptable.

4.7.7 Welding consumables shall be as per ASME Boiler and Pressure Vessel Code Sec. II Part C and shall be indicated in fabrication drawings.

4.7.8 Welding shall not commence unless the concerned procedures are approved.

4.7.9 Only welders who are qualified in the accepted procedure shall be employed for welding.

4.7.10 All internal/external attachments (nozzles, cleats etc.) with fillet welds to the vessel pressure components in case of Hydrogen service, cyclic service and vessels with design temperature (-)290°C and lower, vessels with design temperature 370°C and higher for carbon steel and 425°C and higher for low alloy steel shall be ground smooth and generous concave contour shall be provided.

4.7.11 Minimum shell course width shall be 1 meter. Maximum no. of longitudinal seams shall be as follows:

- | | | |
|-----|---|--|
| (a) | vessels up to 2 meter diameter | : 1 seam |
| (b) | vessels from 2 meter up to 4 meter diameter | : 2 seam |
| (c) | vessels from 4 meter up to 6 meter diameter | : 3 seam |
| (d) | vessels beyond 6 meter diameter | : seam nos. can be proportionately decided |

4.8 Post Weld Heat Treatment

4.8.1 Vessels shall be post weld heat treated when specified on the engineering drawings. In no case shall the post weld heat treatment performed be less than that specified in the code.

4.8.2 Vessels shall be post weld heat treated as a complete unit including skirt/support, wherever practicable.

4.8.3 All flange faces shall be suitably protected against oxidation during post weld heat treatment.

4.9 Tolerances

4.9.1 Tolerances shall be as per drawing/standard/code.

4.9.2 For dimensions not provided with tolerances, fabricator shall maintain dimensions as per good engineering practice.

5.0 INSPECTION & TESTING

- 5.1 All vessels shall be offered for inspection to purchaser or his authorized inspector.
- 5.2 Inspectors shall have free access to all workshops of contractors or sub-contractors.
- 5.3 Inspection shall be carried out both during fabrication and before delivery and also for sub-ordered materials, if any. In addition to final inspection and certification by Inspector, Inspector's written approval shall be obtained by the manufacturer at all stages of fabrication including, but not limited to the following:

- a) Raw material identification
- b) Edge preparation for welding, including visual check for laminations.
- c) Alignment of longitudinal seams.
- d) Rolling tolerance on individual sections
- e) Alignment of sections
- f) Root pass clearing before welding.
- g) Nozzle setting.
- h) Dimensional check.
- i) Radiographic / Ultrasonic Examination.
- j) Dye penetrant examination/Magnetic particle examination.
- k) Stress relieving.
- l) Calibration records of measuring instruments.
- m) Pressure Test (Hydrostatic/Pneumatic test).
- n) Any other special test such as for leak, corrosion, hardness etc.
- o) Surface preparation, primer and painting.

5.4 Radiography

- 5.4.1 The extent of radiography shall be as specified on the engineering drawings. In no case shall the radiographic examination be less than that specified in the code. However, spot radiography is the minimum requirement for all vessels.

- 5.4.2 When spot radiography is specified, the following requirements shall supplement the requirements specified in ASME Section VIII Division I:

Each category A or B pressure containing weld shall be spot radiographed in accordance with ASME Section-VIII Division-I, paragraph UW-52 as a minimum requirement. Each Spot radiograph shall be a minimum of six inches (150mm) in length and minimum one spot shall be selected in each circumferential & longitudinal seam. Additionally, at least one T-joint in each circumferential seam shall also be selected. Welds from each welding procedure, welded/welding operator shall be examined. DIA shall be consulted in marking the areas to be radiographed.

- 5.4.3 All nozzles fabricated from plate, irrespective of thickness of plate, shall be 100% radiographed. When Full radiography is specified due to Service requirement, 100% radiography shall be carried out of all butt welds including nozzle flange to nozzle neck, pipe to pipe and pipe to fitting.

- 5.4.4 Weld seams of formed ends shall be 100% radiographed after forming and heat treatment, if any.

- 5.4.5 The specified radiography of welds may be performed before or after post weld heat treatment (PWHT). If performed before PWHT, an additional radiography or alternatively, ultrasonic examination shall be performed after PWHT.
- 5.4.6 The technique employed and the weld quality achieved shall meet the requirement of the code.
- 5.4.7 If vendor intends to carry out radiography by Computed Radiography technique, then demo should be carried out under AI to prove vendor's capability to produce acceptable images meeting the Code requirements.
- 5.4.8 In case Supplier want to perform UT in lieu of RT based on Code para UW 51 (a) (4), the same is acceptable for Carbon Steel and Low Alloy Steel materials subject to the following:
- The thickness of weld is greater than 13 mm.
 - The joint is either Category A or Category B joint except shell to hemispherical dished end joint. (Category of joint as defined by Code).
 - Automated recordable UT machine incorporating TOFD and pulse echo probes or TOFD and Phased Array mounted on the same chassis that automatically traverses along the joints to be inspected and displaying both results simultaneously on a single screen may be considered in lieu of RT.
 - Calibration block of similar material & thickness shall be used. Calibration block shall have suitable notches to simulate longitudinal as well as transverse cracks on outside and inside surface. Setup should be capable of detecting defects on outside as well as inside while scanning from one surface only.
 - The system that is proposed to be deployed in lieu of radiography shall be submitted along with the track record prior to use for EIL review. The Supplier shall demonstrate successfully the capability of AUT machine and the defects evaluation in the same screen during the site visit of EIL representative. Based on which, the approval of the parties and their AUT system shall be given.
 - Qualified NDT persons shall be deployed to perform UT.
 - Acceptance criteria shall be as per Code para UW 51.
- 5.5 All nozzle to shell welds (Root and Final run) shall be examined by magnetic particle/ Dye- penetrant examination.
- 5.6 **Hydrostatic Test**
- 5.6.1 All necessary precautions shall be taken to guard against the risk of brittle fracture during hydrostatic test in the shop and at site. The temperature of testing medium shall be as per Code. Prior to hydrostatic test, all weld spatter, weld stubs, scale, dirt etc. shall be removed from vessel.
- 5.6.2 Hydrostatic test shall be conducted at pressures mentioned in engineering drawings after complete fabrication and post weld heat treatment, as applicable. After hydrostatic testing, Equipment shall be completely dried by passing hot air for sufficient time until no further increase in relative humidity of outgoing air is observed. Alternatively vacuum drying of the equipment is also acceptable.
- 5.6.3 Clean potable water shall be used for hydrotest. Sea water shall not be used.
- 5.6.4 During hydrotest, care shall be taken to avoid local stresses in shell from exceeding 90 % of the yield strength of the material at the temporary saddle supports.

5.6.5 Vessels shall not be painted or coated either internally or externally prior to the hydrostatic pressure tested.

5.7 For all weld overlays used in hydrogen or H₂S service with design temperature greater than 350°C, Hydrogen disbonding test shall be carried out. The test condition shall be representative of the actual design conditions and the procedure shall be submitted to Inspection Agency for approval. Rate of cooling shall be 100°C/hr (min.) unless specified otherwise in datasheets. Holding time shall be 48 hours unless specified otherwise in datasheets.

5.8 Vendor shall ensure that all alloy steel and stainless steel material are properly identified and finally check tested by a PMI analyzer before dispatch of equipment as per EIL Specification 6-81-0001.

6.0 SUPPLY

6.1 Surface Cleaning and Painting

6.1.1 Surface cleaning and painting shall be as per standard specification for shop and field painting (6-44-0004) or as per job specification as applicable. Paint system shall be selected as per the environments specified on engineering drawing.

6.1.2 All completed equipment shall be cleaned internally and externally to remove scale, dirt, sand, water and foreign matter.

6.1.3 All flanged faces and other machined surfaces shall be greased or protected with rust preventive coating.

6.1.4 Except for machined surfaces, all exterior surfaces of vessels and columns including skirts and integral supports shall be painted to prevent rust, corrosion or damage during transit and storage before erection and final painting.

6.2 Marking

In addition to General purchase conditions, the following requirements shall also be complied with:

6.2.1 All loose components such as studs, nuts, washers, gaskets etc. shall be packed in crates and shall be marked for the project, consignee, consigner, job number, item number, order number, gross and net weight, dimensions etc.

6.2.2 Additional indications such as North/East/South/West along with center of gravity shall be clearly marked with white paint.

6.2.3 Vessels which have been post weld heat treated or have an applied lining, e.g. lead, glass, rubber etc., shall have a suitable warning printed on the visible portion on the outside of vessel.

6.2.4 Specific marking with white paint for slinging shall be provided for all heavy lifts weighing 5 tons and above.

6.2.5 A copy of packing list shall accompany the material enclosed in a water tight envelope fastened inside a shell connection with an identifying arrow sign "Documents" applied with indelible paint.

6.2.6 If it is necessary to separate the unit into different parts for transportation all components and subassemblies shall be carefully identified and match marked to prevent any error in assembly.

6.3 Packing and Shipment

In addition to General Purchase Conditions, the following requirement shall also be complied with:

6.3.1 Packing

- a) Vessels, unless provided with their own steel saddles for entire protection, shall be provided with suitable wooden/steel saddles with steel ties and tension rods. The minimum height of the saddle shall correspond to the maximum projected length of the connected attachments, plus an additional clearance of 45mm. Saddles spacing shall depend on the length of the equipment.
- b) Equipment shall be provided with suitable type and adequate number of supports to prevent any deformation during transportation and handling. These supports shall not be removed until the equipment is placed in position at job site.
- c) All connections/protrusions shall be suitably protected. Flanges shall be provided with bolts on metal covers (minimum 5 mm thk) using at least four bolts. (Wiring on covers is not acceptable). For ocean shipment, flanged openings shall be additionally covered with heavy plastic bags taped to nozzle. All tell-tale holes shall be plugged with hard grease before dispatch. Tapped orifices shall have threaded plugs.
- d) Fragile or machined components shall be especially protected against nature during handling and transit.
- e) Pre-fabricated sections shall be protected by temporary stiffeners at each non-supported end. Edges of plates for section to be welded shall also be protected.

6.3.2 Shipment

All dispatches of equipment shall be done in accordance with the relevant terms of the Purchase Order.

7.0 GUARANTEE

Unless otherwise specified in General Purchase conditions regarding guarantee, the following shall govern:

- 7.1 Manufacturer shall guarantee that all materials used in the equipment are new and have been submitted to regular acceptance procedure and are free from any defect regarding quality, form and appearance.
- 7.2 Vessel(s) shall be guaranteed for design, raw materials and workmanship for a duration as defined in General Purchase Conditions. When design has been carried out by EIL, the word design shall be excluded from the guarantee clause. The manufacturer shall be completely responsible for any design work carried out by him. EIL's approval of his design will not relieve him of his responsibility to ensure satisfactory performance of such item.
- 7.3 Approval of work by EIL or release of vessels for shipment shall in no way release or relieve the manufacturer of any responsibility for carrying out all provisions of this specification.

8.0 SITE FABRICATION AND ERECTION

- 8.1 Where size or shape of vessel makes it impossible to ship it in one piece, the fabricator shall ship number of shop fabricated sections as defined in requisition. Assembly and testing shall be completed by vessel fabricator at site in horizontal position (for erection by others) in strict accordance with the provisions of applicable order/specification.

- 8.2 Where size or shape of vessel makes it impossible to erect in single piece, the fabricator shall ship number of shop fabricated sections as defined in requisition. Erection, assembly and testing shall be completed by vessel fabricator at site in vertical position in strict accordance with the provisions of the applicable purchase order/specifications.
- 8.3 In either of the above two cases, the following additional requirements shall apply:
- 8.3.1 All pieces shall be shop fit up into sections and each section fit to the adjacent one by the fabricator and all pieces match marked thereafter.
- 8.3.2 Suitable erection lugs /tailing lugs and locating pins shall be provided by the fabricator to ensure proper fit up & handling of the equipment.
- 8.3.3 All radiographic requirements for welds completed in the shop shall be made by the fabricator before the part of section leaves the shop.
- 8.3.4 For equipment requiring PWHT, complete or local PWHT may be carried out at site.
- 8.4 All lifting lugs/trunnions and tailing lugs shall be designed with an impact factor of minimum 1.5 unless otherwise specified.

9.0 DATA FOLDER

Manufacturer shall complete requisite copies of data folder as required in purchase order. This folder shall contain the following information duly certified by Inspector:

- a) Manufacturer's Code Certificate
- b) Fabrication drawing of vessel showing 'As Built' dimensions and 'As Built' erection weight.
- c) Material Test Certificates with their cast /heat and test numbers
- d) Welding procedure qualification reports
- e) Welder qualification reports
- f) Radiographic results
- g) Ultrasonic, Magnetic particle, Dye-penetrant test results (if applicable)
- h) Hardness, corrosion and leak test records (if applicable)
- i) Record charts showing complete heat treatment cycle (if applicable)
- j) Production test coupon results (if applicable)
- k) Charpy V notch test results (if applicable)
- l) Record chart of pressure test (Hydrostatic and/or pneumatic)
- m) Rubbing of name plate
- n) Any other documentation as required in the purchase requisition/purchase order.

कार्बन स्टील वैसल्स के
पूरक विनिर्देश

SUPPLEMENTARY SPECIFICATION
FOR
CARBON STEEL VESSELS

9	23.11.2023	REVISED AND REISSUED AS STD. SPEC.	PSV	TK	KA/NK	MN
8	26.06.2018	REAFFIRMED AND REISSUED AS STD. SPEC.	SK	TK	KJH	RKT
7	30.06.2010	REVISED AND REISSUED AS STD. SPEC.	KA	RKT	AKM/DM	N.DUARI
6	25.09.09	REVISED AND REISSUED AS STD. SPEC.	VB	RKG	AKM	N.DUARI
5	12.04.04	REVISED AND REISSUED AS STD. SPEC.	DNN	AKM	SSA	SKG
Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convener	Standards Bureau Chairman
Approved by						

Abbreviations:

ASME	:	American Society of Mechanical Engineers
BHN	:	Brinell Hardness Number
HAZ	:	Heat Affected Zone
LWN	:	Long Weld Neck
NB	:	Nominal Bore
PWHT	:	Post Weld Heat Treatment
UTS	:	Ultimate Tensile Strength

Static Equipment Standards Committee

Convenor: Mr. Nalin Kumar

Members: Mr. K. Anjaneyulu
Mr. Tarun Kumar (Emp. No. A328)
Mr. Tarun Khurana (Coordinator)
Mr. Anish Trehan
Mr. P V S Satyanarayana
Mr. Saikat Chakraborty
Mr. Piyush Suryavanshi
Mr. Mittal Kumar Patel
Mr. Srikanth Karanam
Mr. Ayush Mathur (Project)
Mr. Prabhakar Choudhary (SMMS)
Mr. Avdhesh Agarwal (SCM- Inspection)

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1.0 SCOPE

This supplementary specification indicating additional requirements for fusion welded carbon steel vessels shall form addenda to General Specification for Pressure Vessels (6-12-0001) in its latest revision.

2.0 DESIGN

Reinforcement for nozzle openings shall be self reinforced type for equipment where nominal thickness of shell/head exceeds 50 mm. Nozzles of size up to 50 NB LWN can be used in place of self reinforced nozzles.

3.0 ELECTRODES

3.1 Electrodes conforming to following specification shall be used. In case of any deviation, prior approval from EIL shall be obtained.

S. No.	Material to be welded	Electrode Specification
1.	General Structure Welding	ASME IIC SFA 5.1 E-6013
2.	Pressure Parts	
a.	Steels with UTS upto 70,000 psi	ASME IIC SFA 5.1 E7016/ E7018
b.	Steels with UTS upto 80,000 psi	ASME IIC SFA 5.5 E8016-X/ E8018-XX depending upon the alloy element.
c.	Low temperature service	
	Below 0°C and upto (-) 46°C Steels to SA-516 / 516M, SA-537 / 537M, SA-333 / 333M Gr. 6 and SA-350 / 350M LF2	ASME IIC SFA 5.1 E 7016-1/ E7018-1

3.2 All electrodes and fluxes shall be properly baked/dried as per manufacturer's recommendation before use.

3.2.1 All bare electrodes and fluxes shall be selected as per ASME IIC .All weld metal shall have equal or better mechanical properties than the parent metal.

3.2.2 Only dry flux shall be used.

4.0 FABRICATION

4.1 Plate Forming

4.1.1 Forming of shell plates and heads shall be carried out by machine, either hot or cold, in such a way so as to preserve the specified material properties and to produce a regular finish.

4.1.2 Magnetic particle/Dye penetrant examination shall be carried out on the outside and inside surfaces including edges of torispherical or elliptical heads in knuckle zone, after forming, for detection of cracks.

4.2 Edge Preparation

4.2.1 The preparation of edges to be welded shall be done by machining, chipping, grinding, cold shearing, Oxy- acetylene flame cutting or a combination of these.

4.2.2 Chipping shall be followed by grinding to a smooth and regular finish.

4.2.3 Oxy-acetylene flame cutting done in any circumstances, shall be followed by machining or grinding to eliminate any discolouration of material affected.

4.2.4 All welding edges shall be checked by Magnetic particle/Dye penetrant examination for detection of cracks, laminations or segregations.

4.2.5 No welding shall be carried out when ambient temperature is less than 10° Celsius unless preheating is carried out.

4.3 Heat Treatment

4.3.1 Heat treatment of formed parts shall be carried out as per following:

- a. Cold formed dished ends or knuckles shall be stress relieved, unless otherwise specified in requisition.
- b. Hot formed dished ends or similar parts, which have not been uniformly heated in the normalising range in the final stages of manufacture shall be normalised.
- c. When the completed vessel involves post weld heat treatment, heat treatment recommended in (a) above shall not be applicable.

4.3.2 Vessels in Hydrogen/Amine/ Sour (Wet H₂S)/Cyclic/Caustic/HIC service shall be PWHT.

4.4 Production Weld Tests

Production Weld Tests shall be applicable for vessels over 50 mm nominal thickness. The following requirements shall apply:

- a. Two production test plate coupons representative of one longitudinal and another circumferential seam shall be provided for each procedure, position and thickness in each vessel shell.




- b. One production test plate representative of the weld seams shall be provided for each procedure, position and thickness for welded dished ends/cones.
- c. The production test plate shall be from material of the same heat and thickness as of shell/head/cone as applicable. During and after welding, the test plates shall be subjected to same heat treatment as and together with the course they represent. Extra coupons shall be preserved to take care of eventuality of retests.
- d. The tests mentioned below shall be carried out as per methods of testing in governing codes:
- i. One transverse tension test
 - ii. Two side bend tests with weld located in the centre of bend.
 - iii. Hardness test on production test coupon weld & HAZ (Hardness limitations shall comply with requirement of EIL Spec. 6-15-0091)
 - iv. Micro & macro examination of welds
 - v. Charpy V notch tests on weld and HAZ.
 - a. For low temperature service (0°C & colder) impact test temperature shall be lowest of minimum ambient temperature, design temperature and minimum design metal temperature.
 - b. For vessel over 50 mm nominal thickness used for warmer service, the test temperature shall be lower of 0°C or lowest ambient temperature of the site.
 - c. The acceptance criteria for energy absorption shall be as per Table A 2.15 of SA-20 / 20M. In case the acceptance criteria is not available in SA-20, then applicable design code shall be referred unless otherwise specified in requisition.

4.5 Hardness Survey

Hardness Limitation for Vessels, where PWHT is required shall comply with requirement of EIL Spec. 6-15-0091.

बायलर क्वालिटी कार्बन स्टील प्लेटों का
मानक विनिर्देश

**STANDARD SPECIFICATION FOR
BOILER QUALITY CARBON
STEEL PLATES**

9	08.02.2022	REVISED AND REISSUED AS STD. SPEC.		KA		NK		SM
8	19.01.2017	REVISED & REISSUED AS STD. SPEC.	RNK	SK/KJH	RKT		RN	
7	30.06.2010	REVISED & REISSUED AS STD. SPEC.	KA	RKT	AKM/DM		N.DUARI	
6	10.09.09	REVISED & REISSUED AS STD. SPEC.	VB	RKG	AKM		N.DUARI	
5	16.04.04	REVISED & REISSUED AS STD. SPEC.	DNN	AKM	SSA		SKG	
Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman	Approved by	

Abbreviations:

ASME	American Society of Mechanical Engineers
EN	European Norm
HIC	Hydrogen Induced Cracking
IBR	Indian Boiler Regulations
SSC	Sulphide Stress Cracking

STANDARDS COMMITTEE

SMED-I (Static Equipment) (Group code 12,13,15,26)

Mr. Nalin Kumar (Convener)
Mr. K. Anjaneyulu
Mr. Tarun Kumar (Emp no. A328) {Coordinator}
Mr. Anish Trehan
Mr. PVS Satyanarayana
Mr. Tarun Khurana
Mr. Saikat Chakraborty
Mr. Srikanth Karanam
Mr. Ayush Mathur (Projects)
Mr. S Ghosal (SMMS)
Mr. Avdhesh Agrawal (SCM)

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1.0 SCOPE

- 1.1 This specification covers requirements for carbon steel plates intended primarily for pressure vessels/heat exchangers. The steel plates shall meet the requirements of ASME Boiler and Pressure Vessel Code Section II (latest). This is intended to supplement the minimum applicable requirements of the material specification indicated in the material requisition.
- 1.2 Following codes, standards etc shall be followed in their latest edition and addenda, errata, amendments unless specified otherwise:
- 1.2.1 ASME Sec VIII Div 1
- 1.2.2 ASME Sec II part A
- 1.2.3 EN 10163: Delivery Requirements for Surface Conditions.
- 1.2.4 EN 10204: metallic products – Types of Inspection Documents.

2.0 GENERAL

- 2.1 Plates supplied to this specification shall conform to specification SA-20 of ASME sec II part A with additional requirements mentioned herein.
- 2.2 The tolerance on thickness of steel plates shall be positive only.
- 2.3 Final Rolling shall be lengthwise.
- 2.4 The plates shall be free from injurious defects and shall have workmanlike finish. Reconditioning/repair of plates by welding shall not be permitted. Surface conditions shall meet requirements of EN 10163 Class A Subclass 3.

3.0 SUPPLEMENTARY TECHNICAL REQUIREMENTS

- 3.1 All plates shall be supplied in normalised condition except when the applicable material specifications require supply of plates in quenched and tempered condition.
- 3.2 a. One product analysis of each heat shall be carried out and reported. Chemical analysis shall be as per applicable specification.
- b. The carbon content for plates shall not exceed 0.23%.

Additionally, one of the following requirements for carbon equivalent based on heat analysis, shall be also satisfied:

$$C_{eq} = C + \frac{Mn}{6} \leq 0.42 \quad \dots \quad (\text{Eqn. - 1})$$

$$C_{eq} = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Cu+Ni}{15} \leq 0.43 \quad \dots \quad (\text{Eqn. - 2})$$

Equation-1 shall be used when applicable material specification specifies C and Mn only.

Equation-2 shall be used when applicable material specifies the above elements or restricted chemical requirements are specified or supplementary requirements S19 and S21 of SA-20 are specified in material requisition.

For HIC services, these requirements shall be as listed separately.

3.3 Ultrasonic Examination of Plates

- a. Plates having thickness 16 mm to 50 mm (both inclusive) shall be examined ultrasonically as per SA-435.
- b. For thicknesses above 50mm ultrasonic examination shall be carried out as per SA-578 and shall have acceptance standard of level-B.
- c. For quenched and tempered steel plates, ultrasonic examination shall be done after the heat treatment of plates.

3.4 Simulated Heat Treatment of Test Coupons

The following heat treatment shall be conducted on the test coupons representative of heat treated plates before the specified mechanical testing like tensile, bend, impact tests, etc. to meet minimum ASME Sec. II Part - A requirements and these details shall also be recorded on the test certificates.

- a. All plates supplied in Normalised condition and intended for hot rolling / hot forming:

Heat Treatment Cycle

One normalising* + One stress relieving as per UCS-56 of ASME Sec. VIII Div.1 complying with UCS-85 of ASME Section VIII Div. 1.

Note: Any other special requirement shall be specified in MR.

- b. All plates supplied in Quenched & Tempered condition and intended for hot rolling/ hot forming:

Heat Treatment Cycle

One normalising* + quenched & tempering + One stress relieving as per UCS-56 ASME Section VIII Div.1 complying with UCS-85 of ASME Section VIII Div.1.

Note : Tempering temperature shall be at least 20° C above highest stress relieving temperature.

* Normalising cycle shall be as per Material Test Certificate (MTC).

- c. All plates supplied in Quenched & Tempered condition and intended for cold forming:

Heat Treatment Cycle

One stress relieving as per UCS-56 ASME Section VIII Div.1 complying with UCS-85 of ASME Section VIII Div.1.

- 3.5 Impact test requirements shall be ascertained as per ASME Sec VIII Div.1 or Div.2 as applicable. When required, Impact testing shall be performed as per supplementary requirement of S5 of specification SA-20 and acceptance criteria for energy absorption shall be as per table A2.15 of SA-20.

- 3.6 If specified in the material requisition, plates shall meet the requirements of Indian Boiler Regulations (IBR).

3.7 Additional Requirements for High Thickness Plates

Plates above 50mm thickness shall meet following additional requirements:

- a. Vacuum Degassing treatment as per the supplementary requirement S1 of specification SA-20. If vacuum degassing is not reported in the test certificates, then through thickness tests as per SA 770 shall be conducted and minimum reduction in area of 35% shall be ensured.
- b. Charpy V-notch impact test as per the supplementary requirement S5 of specification SA-20.

Material meant to be used for design temperature warmer than 0°C, impact test shall be carried out at 0°C or MDMT whichever is lower and acceptance criteria for energy absorption shall be as per Table A2.15 of SA-20. In case the acceptance criteria is not available in SA-20, then applicable design code shall be referred unless otherwise specified in material requisition.

- c. Simulated heat treatment of test coupons for all plates as per Clause 3.4 mentioned above.

4.0 CERTIFIED DOCUMENTS

The supplier shall furnish certificates/documents (number of copies as specified in requisition) inclusive of all the following tests required as per specification duly certified by the Inspecting Authority before shipment of plates. The actual values obtained shall be recorded in the test certificates/documents. Material certificates shall conform to EN 10204 Type 3.1/3.2 as specified.

- a. Chemical Analysis
- b. Mechanical Tests
- c. Data of heat treatment i.e. initial temperature, heating rate, soaking temperature, cooling rate, etc.
- d. Simulated Heat Treatment of Mechanical Test coupons (S3 of SA-20) at indicated Heat Treatment Cycle (if specified in the requisition or whenever applicable)
- e. Ultrasonic Examination (S8 or S12 of SA-20)
- f. Charpy V-notch impact tests (S5 of SA-20 if specified in the requisition or whenever applicable)
- g. Certification as per IBR (if specified in the requisition)
- h. SSC and/or HIC tests (if specified in material requisition)
- i. Additional tests (if specified in requisition).

5.0 PAINTING AND COATING

No painting/coating of any kind is permitted on the steel plates, except stencil marking. However steel plates shall be carefully protected and packed against any damage during transit and shall be of sea worthy condition.

6.0 INSPECTION AUTHORITY

Material test certificates, duly certified by Mill's Quality Assurance Department are acceptable i.e. 3.1 certification as per EN 10204. However, if third party inspection is required specifically for plates in material requisition, all test certificates and documents shall be duly certified by the third party. i.e. 3.2 certification as per EN 10204.

स्टैटिक ईक्विपमेंट (प्रेशर वैसल्स हीट
एक्सचेन्जर्स) के
आवश्यक कठोरता के लिए
मानक विनिर्देश

STANDARD SPECIFICATION
FOR
HARDNESS REQUIREMENT
OF
STATIC EQUIPMENT

5	24.03.25	REVISED & REISSUED AS STD. SPEC.	BVK	TKh	KA/NK	MN
4	27.12.19	REAFFIRMED & REISSUED AS STD. SPEC.	PKP	NSK	KJH	RKT
3	05.11.14	REVISED & REISSUED AS STD. SPEC.	TK	KA	RKT	SC
2	29.06.09	REAFFIRMED & REISSUED AS STD. SPEC.	VB	RKG	AKM	N.DUARI
1	26.03.04	REAFFIRMED AND REISSUED AS STANDARD SPECIFICATION	NSK	PK	SSA	SKG
0	15.03.96	ISSUED AS STANDARD SPECIFICATION	RV	SSA	RKA	AS
Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
Approved by						

Abbreviations:

ASTM	:	American Society for Testing & Materials
BHN	:	Brinell Hardness Number
HAZ	:	Heat Affected Zone
PWHT	:	Post Weld Heat Treatment

Static Equipment Standards Committee

Convenor: Mr. Nalin Kumar
Co-Convenor: Mr. K. Anjaneyulu

Members:

Mr. Tarun Kumar (Emp. No. A328)
Mr. Tarun Khurana (Coordinator)
Mr. P V Satyanarayana
Mr. Anish Trehan
Mr. P Barik
Mr. Saikat Chakraborty
Mr. Piyush Suryavanshi
Mr. Mittal Kumar Patel
Mr. Srikanth Karnam
Mr. Aasheesh Handa (Projects)
Mr. Prabhakar Choudhary (SMMS)
Mr. Avdhesh Agrawal (SCM-Inspection)

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1.0 SCOPE

This specification covers general requirement of hardness of base metal, weld and heat-affected-zone (HAZ) and is applicable to all C-½ Mo, Cr-Mo steels and other materials whenever asked for in drawings/ specifications/standards. All testing shall be done after PWHT.

2.0 HARDNESS REQUIREMENTS

Hardness in base metals, weld and heat affected zone as per ASTM E10 shall not exceed the following:

For P1 materials	- 200 BHN
For P3 & P4 materials	- 225 BHN
For P5 & P6 materials	- 235 BHN

3.0 WELDING QUALIFICATION TEST

3.1. For each welding procedure qualification nine tests shall be made, three in base metal, three in weld metal and three in HAZ. Hardness requirements shall be as per cl. 2.0 above.

3.2. In addition to the requirement of 3.1 above, Vickers Micro hardness test shall be made on a full cross-section at 25 mm intervals beginning at 3 mm from the top surface with 5 kg load or with a load approved by the authorized inspector. Tests shall be made at each level for each of the following locations as per ASTM E 92:

Three tests shall be made in the weld metals, two tests in HAZ and one test in the base metal in accordance with Fig.1 and the hardness shall not exceed the following in base metal, weld metal and HAZ.

For P1 materials	- 210 VHN
For P3 & P4 materials	- 237 VHN
For P5 & P6 materials	- 247 VHN

4.0 PRODUCTION TEST

4.1 All pressure containing weld metals are to be checked for hardness of weld and HAZ after PWHT but before hydro-test. The hardness shall not exceed the value stipulated.

4.2 Each longitudinal seam shall be checked both internally and externally near the center and at one end.

4.3 Each circumferential weld shall be checked at four locations approximately 90° apart, both internally and externally.

4.4 Each nozzle weldments shall be checked at two locations, 180° apart, both internally and externally.

4.5 Above hardness readings shall be taken at minimum 3-4 locations inside as well as outside covering the entire seam, to the satisfaction of inspector.

5.0 APPROVAL

In case the hardness as obtained on production test is more than the limit specified in 2.0 above, the vendor shall submit the corrective procedure to lower the hardness in writing to EIL and/or authorized inspection agency for review/approval.

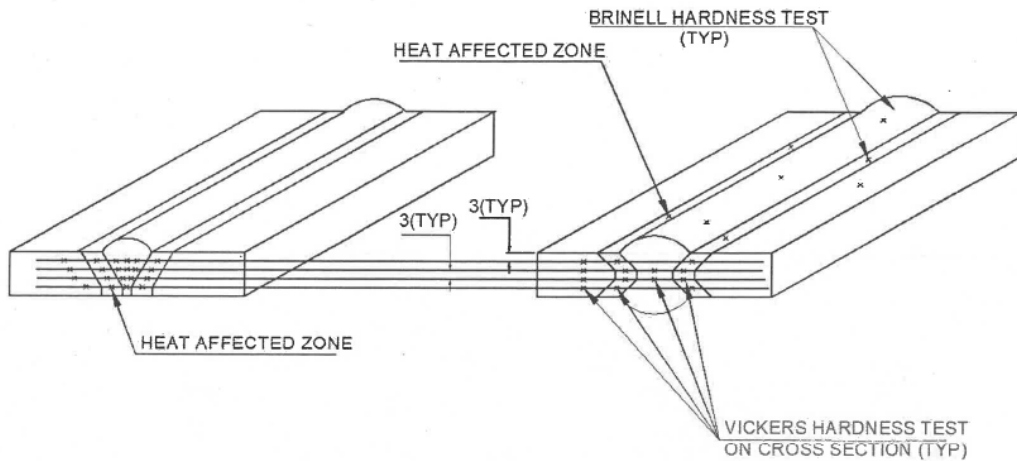
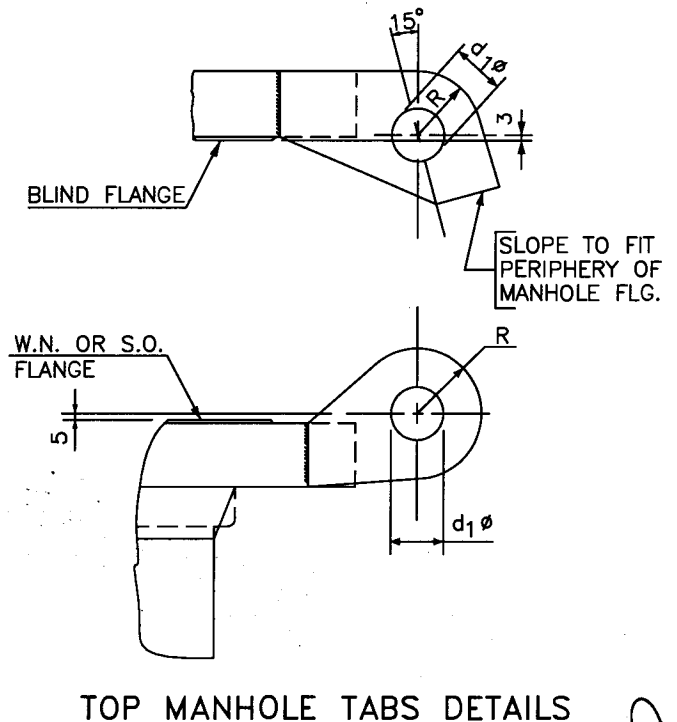
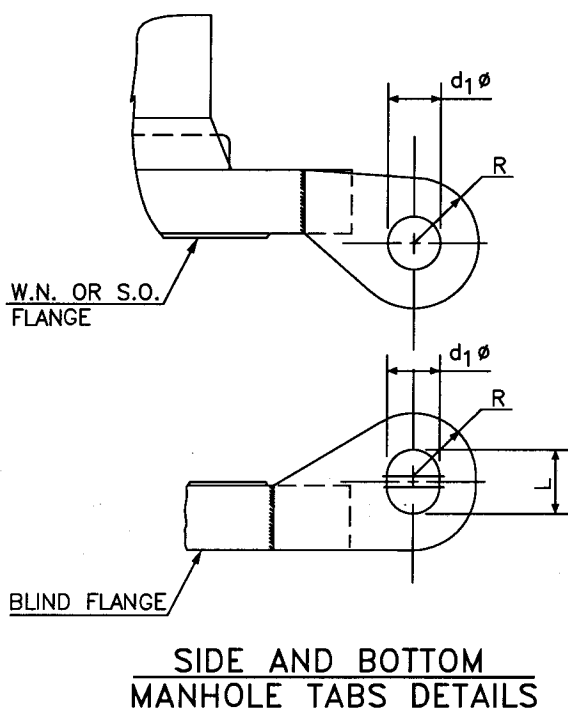
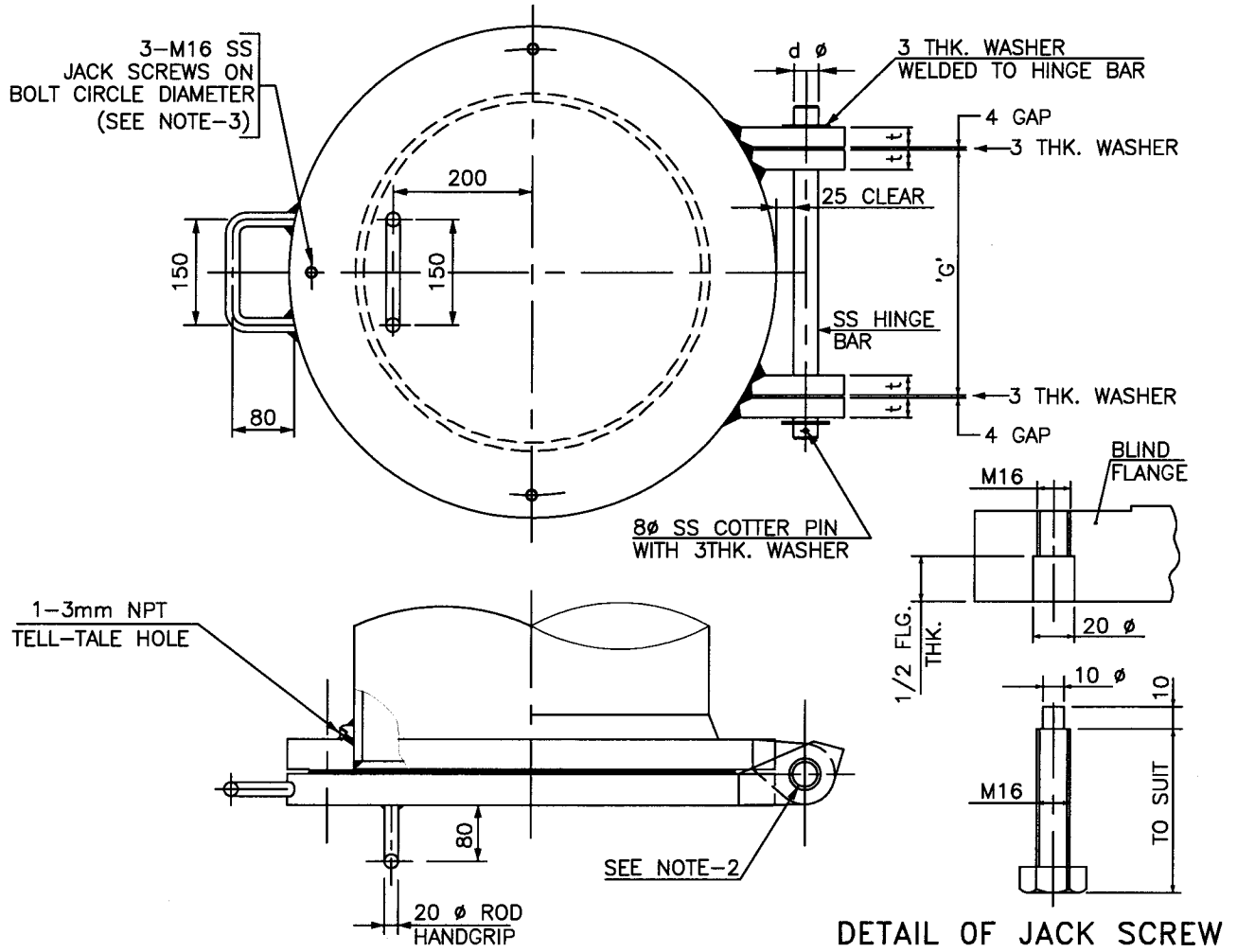


FIG.1- HARDNESS REQUIREMENT ON TEST COUPONS






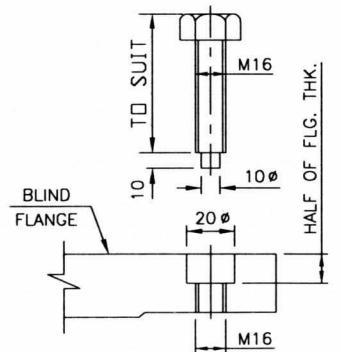
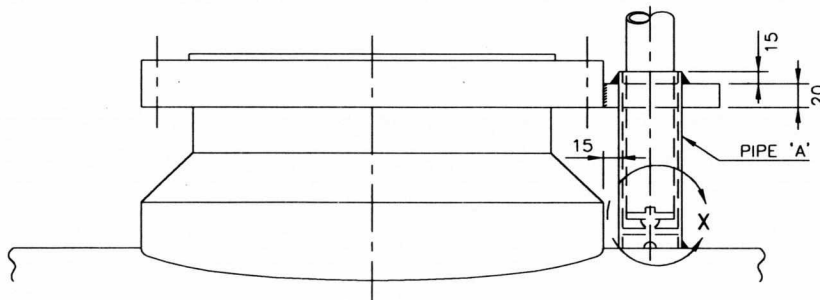
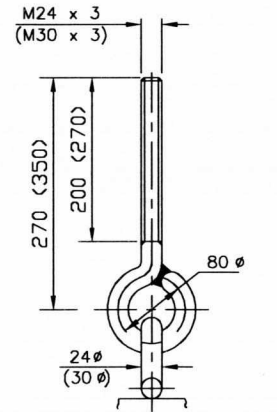
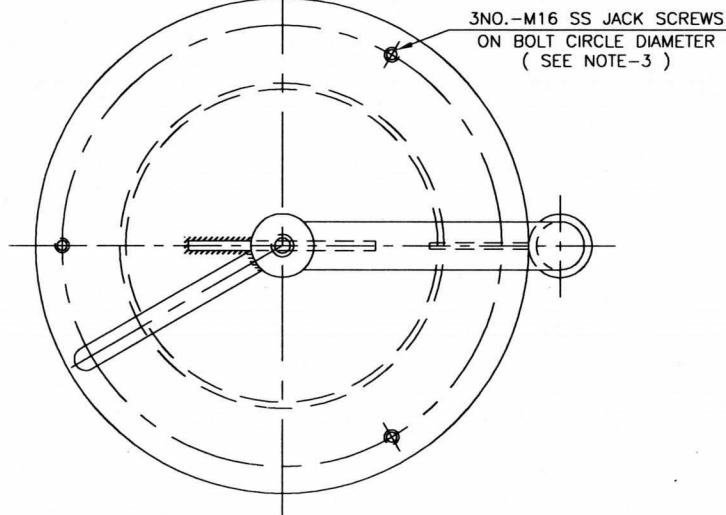
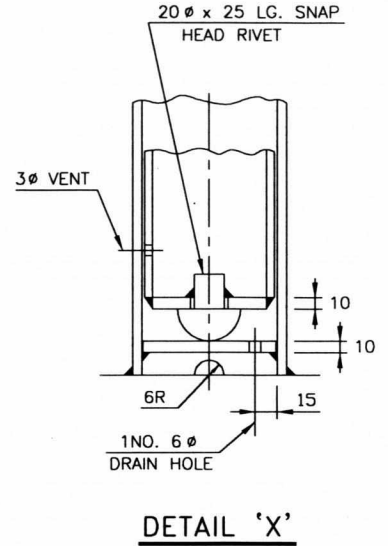
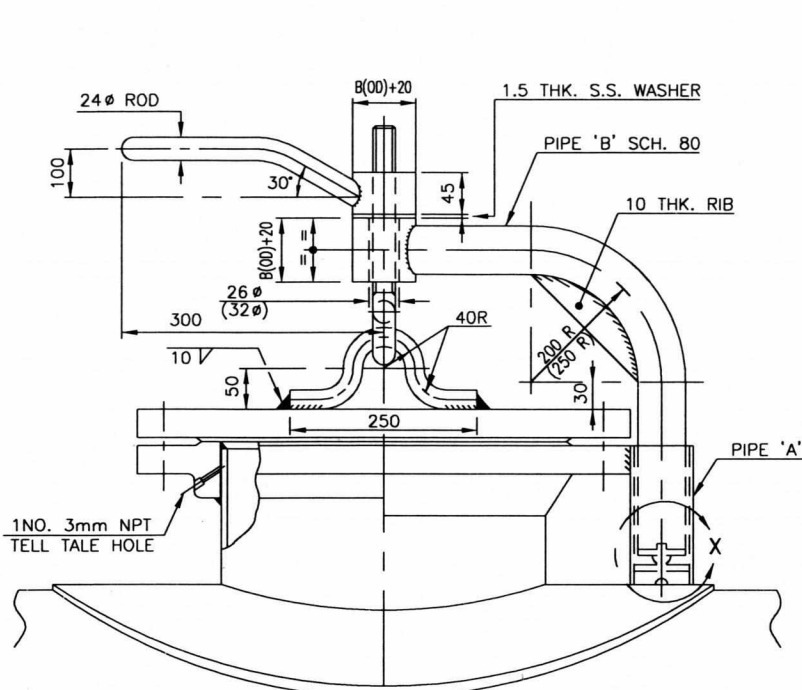
8	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	SK/KJH	RKT	SM
7	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN
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			Approved by			

FLANGE RATING	NOMINAL BORE	G	t	d	R	d ₁	L
CLASS 150	400	298	28	35	55	36	42
	450	318	28	35	55	36	42
	500	348	28	35	55	36	42
	600	406	28	35	55	36	42
CLASS 300	400	324	28	35	55	36	42
	450	355	28	35	55	36	42
	500	386	30	35	55	36	42
	600	458	30	35	55	36	42
CLASS 600	400	342	32	40	55	41	47
	450	372	32	40	60	41	47
	500	406	36	40	60	41	47
	600	470	36	40	75	41	47
CLASS 900	400	352	32	40	60	41	47
	450	394	32	40	65	41	47
	500	428	40	40	70	41	47
	600	520	40	40	90	41	47

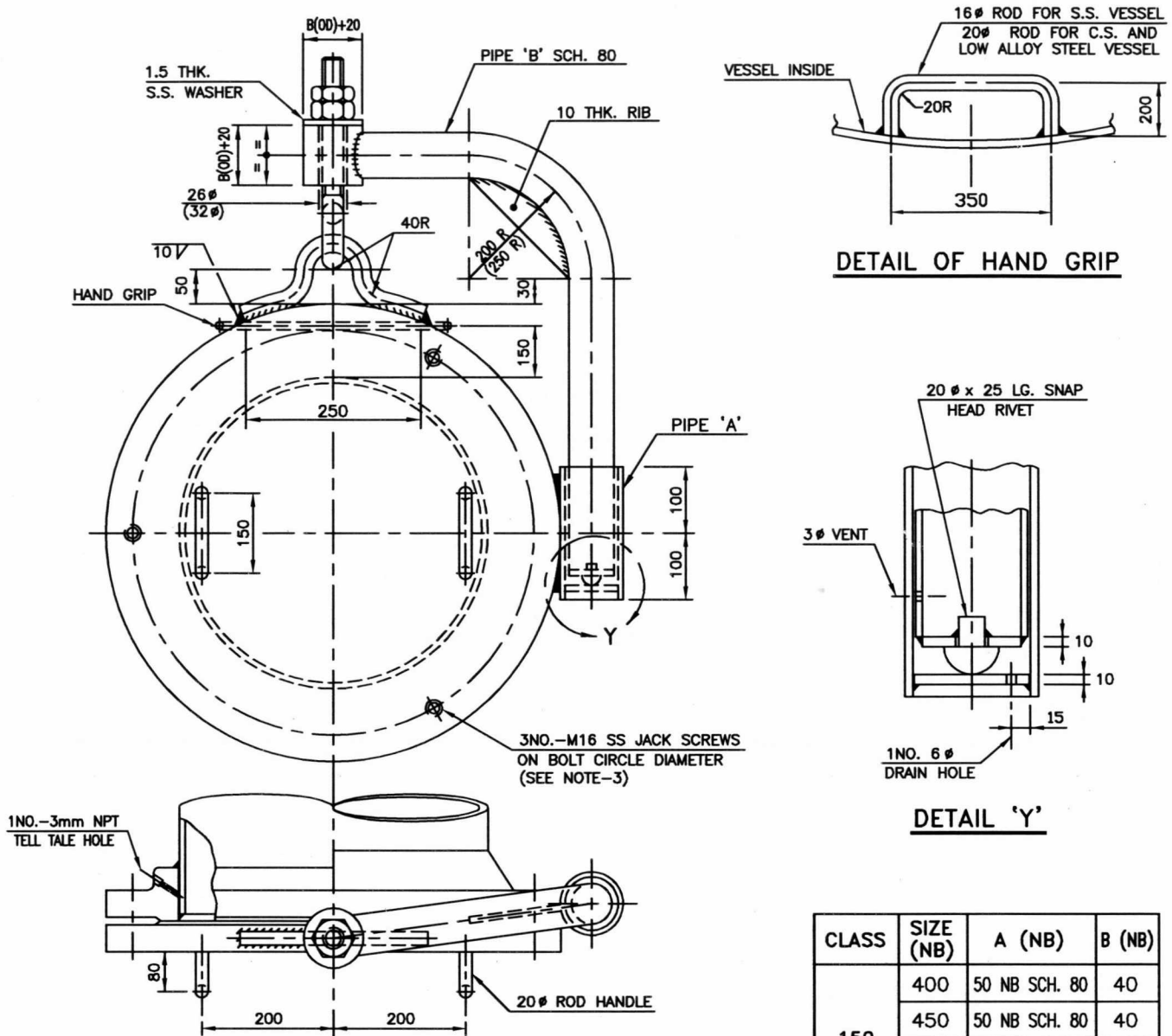
NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. WELD HINGE TABS AFTER TIGHTENING THE COVER WITH GASKET IN PLACE AND MAINTAIN A LOOSE FIT OF HINGE BAR IN HINGE TABS.
3. BCD OF JACK SCREWS IS TO BE SUITABLY CHANGED IF MANHOLE STUDS INTERFERE WITH JACK SCREWS.
4. IF SQUARE RODS ARE USED FOR HANDLES, THEIR EDGES SHALL BE ROUNDED OFF.
5. IN CASE OF CONFLICT, ENGINEERING DRAWING SHALL GOVERN.
6. ALL FILLET WELDS SHALL BE 6mm MINIMUM.
7. TELLTALE HOLE SHALL NOT BE PLUGED AND SHALL BE FILLED WITH HARD GREASE ONLY.
8. THE MATERIAL OF COMPONENTS SHALL GENERALLY BE IS : 2062 UNLESS OTHERWISE SPECIFIED ON ENGINEERING DRAWING. FOR LOW TEMPERATURE SERVICES AND SERVICES ABOVE 425°C THE HINGE TABS AND HANDLE SHALL BE OF SAME MATERIAL AS THAT OF SHELL.

8	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	 NIKHIL	 SK/KJH	NK/Nalin	 SM	
7	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN	
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8	07.07.2022	REVISED AND REISSUED AS STANDARD	JIT SINGH	PVSS/KA	NK	SM
7	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
Approved by						



NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. DIMENSIONS IN BRACKETS ARE FOR CLASS 900.
3. B.C.D. OF JACK SCREWS IS TO BE SUITABLY CHANGED IF MANHOLE STUDS INTERFERE WITH JACK SCREWS.
4. THE SLEEVE PIPE 'A' SHOULD BE IN TRUE VERTICAL POSITION WITHIN A TOLERANCE OF 2 1/2 DEGREE, AFTER WELDING TO THE FLANGE.
5. EDGES SHALL BE ROUNDED OFF IF SQUARE ROD IS USED FOR HANDGRIP.
6. THE COMPONENTS WHICH ARE DIRECTLY WELDED TO MANHOLE SHALL BE OF SAME METALLURGY AS THAT OF EQUIPMENT. MATERIAL FOR OTHER DAVIT COMPONENTS SHALL BE C.S. UNLESS OTHERWISE SPECIFIED IN ENGINEERING DRAWING.
7. ALL FILLET WELDS SHALL BE 6mm MINIMUM.
8. THIS STANDARD IS NOT APPLICABLE FOR LOW TEMPERATURE SERVICES.
9. MP/DP TEST SHALL BE CARRIED OUT FOR ALL THE WELD JOINTS.
10. VENDOR TO ENSURE PROPER FUNCTIONING OF DAVIT AND GUARANTEE THEIR HOLDING CAPACITY WITHOUT ANY FAILURE OF WELDED JOINTS/FILLET/ EYEBOLTS/LINKS ETC. BY TESTING AT VENDOR'S SHOP AS BELOW:-KEEP THESE HANDLING ITEMS IN HANGED POSITION ALONG WITH CONNECTED BLIND FLANGES/ASSEMBLY ETC. KEPT OPENED & HANGED FOR A CONTINUOUS DURATION OF 8 HOURS MINIMUM.
11. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.

CLASS	SIZE (NB)	A (NB)	B (NB)
150	400	50 NB SCH. 80	40
	450	50 NB SCH. 80	40
	500	65 NB SCH. 40	50
	600	65 NB SCH. 40	50
300	400	65 NB SCH. 40	50
	450	65 NB SCH. 40	50
	500	65 NB SCH. 40	50
	600	90 NB SCH. 40	80
600	400	80 NB SCH. 40	65
	450	90 NB SCH. 40	80
	500	125 NB SCH. 80	100
	600	125 NB SCH. 80	100
900	400	125 NB SCH. 80	100
	450	125 NB SCH. 80	100
	500	150 NB SCH. 80	125
	600	150 NB SCH. 80	125

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
8	07.07.2022	REVISED AND REISSUED AS STANDARD	JIT SINGH	PVSS/KA	NK Nalin	SM
7	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN

Approved by

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SUPPLEMENTARY SPECIFICATION
FOR
AUSTENITIC STAINLESS STEEL VESSELS

7	15.12.2023	REVISED AND REISSUED AS STD. SPEC.	MKP	TK	NK	MN
6	26.06.2018	REVISED AND REISSUED AS STD. SPEC.	SK	TK	KJH	RKT
5	30.06.2010	REVISED AND REISSUED AS STD. SPEC.	KA	RKT	AKM/DM	N.DUARI
4	25.09.09	REVISED AND REISSUED AS STD. SPEC	VB	RKG	AKM	N.DUARI
3	12.04.04	REVISED AND REISSUED AS STD. SPEC	DNN	AKM	SSA	SKG
Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
Approved by						



Abbreviations:

AISI	American Iron and Steel Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing & Materials
AWS	American Welding Society
BHN	Brinell Hardness Number
HAZ	Heat Affected Zone
IGC	Inter Granular Corrosion
IS	Indian Standards
MIG	Metal Inert Gas
NB	Nominal Bore
TIG	Tungsten Inert Gas
PPM	Parts Per Million

Static Equipment Standards Committee

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1.0 SCOPE

This supplementary specification indicating additional requirements for fusion welded austenitic stainless steel vessels shall form addenda to General Specification for Pressure Vessels (6-12-0001) in its latest revision.

2.0 DESIGN

Reinforcement for nozzle openings shall be self-reinforced type for equipment where nominal thickness of shell/head exceeds 50 mm. Nozzles of size up to 50 NB LWN can be used in place of self-reinforced nozzles.

3.0 MATERIALS

3.1 Austenitic stainless steel plates for shell, head and other pressure parts shall be as specified in, but not limited to, the following: SA 240 Type 304, 304L, 321, 347, 316, 316L, 316Ti and 317.

3.2 Nozzle neck shall be seamless pipe in accordance with SA 312 or SA 376. However, nozzle neck above 100 mm NB size may be fabricated out of plate.

3.3 Stiffening rings, external lugs for platforms, ladders, insulation supports, pipe supports and other non-pressure parts welded to the vessel directly shall be of same material as of shell.

3.4 Insulation support ring angles and rods not welded to the shell shall be of SA 36/ IS 2062 Gr. E250 Quality A or better.

3.5 All internal parts shall be of same material as of shell.

3.6 Gaskets

For ring type joints, metal oval rings of A 182F type SS grade having hardness minimum 15 BHN less than that of flange face shall be used.

3.7 Unless otherwise specified in Material Requisition/Engineering drawing all 300 series materials shall be intergranular corrosion (IGC) tested as per ASTM A 262 Practice E. The bend test specimen shall be examined at a magnification of 200 x.

4.0 FABRICATION

4.1 Plate Forming

4.1.1 Forming of shell plates, heads and knuckles shall be carried out by machine, either hot or cold, in such a way so as to preserve the specified material properties and to produce a regular finish. If hot forming is carried out, subsequent solution annealing is required. Subsequently, micro etching test and IGC test as per ASTM A 262 Practice E unless specified otherwise in engineering drawing shall be carried out to ascertain suitability and effectiveness of solution annealing. The bend test specimen shall be examined at a magnification of 200 x.

4.1.2 Cold formed ends and knuckles shall be solution annealed if any of the following condition exists:

- i) Specifically called for on Engineering Drawing.
- ii) Hardness value after forming exceeds 235 BHN
- iii) Nominal thickness of the plate is 16mm or above.

- 4.1.3 If austenitic stainless steel is to be hot worked, it shall be heated in a neutral or an oxidising atmosphere in an oil, gas or electric furnace and shall not be allowed to come in direct contact with the flame.
- 4.1.4 Fit-up clips should invariably be attached only on outside portion of the equipment using approved procedures for such welding. Where clips are attached internally, these shall match the shell material. Any external attachment welded directly to shell shall match the shell material.

4.2 Plate Cutting and Edge Preparation

- 4.2.1 The permitted thermal cutting processes shall be plasma arc or oxy-gas flux injection in which flux is injected through oxygen cutting jet. The flux may be iron powder, Sodium Carbonate or powdered marble. Oxy-acetylene arc cutting by metal electrode shall not be permitted.
- 4.2.2 When thermal cutting is used, a machining or grinding allowance of 1.5 to 3.0 mm shall be provided to allow for removal of heat affected material.
- 4.2.3 All plate edges shall be checked by Dye Penetrant examination for detection of cracks, laminations or segregations after cutting and before carrying out further work upon them. Sheared edges shall be carefully examined for cracks.

4.3 Welding

- 4.3.1 As far as practicable, the welds shall be left unground so as to maintain maximum corrosion resistant surface but shall be cleaned free of weld slag, heat tint, scale and other such contaminants.
- 4.3.2 All welding shall be done by a metal arc process such as Manual metallic arc, Argon-arc or submerged arc welding.
- 4.3.3 For single side weld, root-run shall be made by TIG or MIG process and shall have inert gas shielding at the back of the weld.
- 4.3.4 The table below shows the acceptable consumables to be used for various base metals. Covered welding electrodes shall be in accordance with the specification AWS A5.4/ASME IIC SFA-5.4. Welding rods and bare electrodes used as filler metal shall be in accordance with the specification AWS A5.9/ASME IIC SFA-5.9.

Stainless Steels	Electrodes
Type AISI 304	E - 308
Type AISI 304L	E - 308L
Type AISI 304H	E - 308H
Type AISI 321 and 347	E - 347
Type AISI 316	E - 316L or E - 318
Type AISI 316L	E - 316L
Type AISI 316Ti	E - 318
Carbon Steel to Austenitic Stainless Steel	E - 309/ 309 Mo

- 4.3.5 Unless otherwise specified in Material Requisition/Engineering drawing, all consumables shall be procured with intergranular corrosion (IGC) tested as per ASTM A 262 Practice E. This shall be explicitly indicated in consumable batch test certificate.

4.4 Pre and Post Weld Heat Treatment

- 4.4.1 For austenitic stainless steel, no preheat would be necessary but care shall be taken to maintain inter pass temperature of 100°C.
- 4.4.2 Whenever heat treatment on stainless steel is carried out, it shall be followed by Micro etching test and IGC test as per ASTM A 262 Practice E, unless specified otherwise, to ascertain suitability and effectiveness of solution annealing. The bend test specimen shall be examined at a magnification of 200 x.

4.5 Non-Destructive Test

- 4.5.1 All cold formed dished ends, cones, tori conical sections etc. shall be checked for surface cracks by dye penetrant method after heat treatment, if any, on the inside and outside.
- 4.5.2 Dye-penetrant examination shall be carried out for weld root, back chip and final run for detection of cracks.
- 4.5.3 Unless otherwise specified in Material Requisition/Engineering drawing, IGC test shall be carried out at HAZ and weld as per ASTM A 262 Practice E unless specified otherwise. The bend test specimen shall be examined at a magnification of 200 x.

4.6 Surface Cleaning

- 4.6.1 In order to obtain adequate corrosion resistance, the surface of stainless steel (both inside and outside) must be cleaned of oxides, scale and welding flux. This shall be done using stainless steel wire brushes.
- 4.6.2 All paint shall be removed from the vessel surface using suitable solvent and stainless steel brushes. The solvent shall not be harmful to the vessel and free from chlorides and fluorides.
- 4.6.3 All oil and grease shall be removed using hot clean water and suitable detergent. All traces of detergent shall be removed with several rinses of clean water.
- 4.6.4 After completion of fabrication and testing, all stainless steel surfaces (both inside and outside) shall be pickled and passivated in accordance with ASTM A 380. The pickling and passivation procedure shall be submitted to EIL for approval.



5.0 HYDROTEST

- 5.1 Clean fresh water shall be the primary hydrostatic test medium unless use of a different medium is approved by the purchaser. Hydrostatic testing of austenitic stainless steel vessels shall be done with potable quality water having chloride content less than 50 PPM.
- 5.2 If chloride content is greater than 50 PPM and up to a maximum of 150 PPM, a sufficient quantity of Sodium Nitrate shall be added to provide a test medium of 0.5% by weight Sodium Nitrate Solution. Water with a chloride content of greater than 150 PPM shall not be used for hydrotesting.

After hydrotesting, vessels shall be dried thoroughly using hot air, immediately after draining to prevent the possibility of evaporation and concentration of chlorides.

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STANDARD SPECIFICATION FOR STAINLESS STEEL PLATES

9	29.05.2023	REVISED AND REISSUED AS STD. SPEC.	 NSK	TK	NK	 SM
8	22.09.2017	REVISED AND REISSUED AS STD. SPEC.	RNK	SK/KJH	RKT	RN
7	30.06.2010	REVISED AND REISSUED AS STD. SPEC.	KA	RKT	AKM/DM	N.DUARI
6	25.09.09	REVISED AND REISSUED AS STD. SPEC.	VB	RKG	AKM	N.DUARI
5	16.04.04	REVISED AND REISSUED AS STD. SPEC.	DNN	AKM	SSA	SKG
Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convener	Standards Bureau Chairman
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Abbreviations:

ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing & Materials
EN	European Standard
BHN	Brinell Hardness Number
SS	Stainless Steel

Static Equipment Standards Committee

Convenor : Mr. Nalin Kumar

Members :

Mr. K. Anjaneyulu
Mr. Tarun Kumar
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Mr. Anish Trehan
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1.0 SCOPE

- 1.1 This specification covers requirements for chromium, chromium-nickel and chromium-manganese-nickel stainless and heat resisting steel plates intended primarily for pressure vessels/heat exchangers. The steel plates shall meet the requirements of ASME Boiler and Pressure Vessel Code Section II (latest). This is intended to supplement the minimum applicable requirements of the material specification indicated in the material requisition.
- 1.2 Following codes, standards etc. shall be followed in their latest edition and addenda, errata, amendments unless specified otherwise:
- 1.2.1 ASME Sec II Part A.
- 1.2.2 EN10163 (All parts): Delivery Requirements for Surface Conditions.
- 1.2.3 EN 10204: Metallic products- Types of Inspection Documents.

2.0 GENERAL

- 2.1 Plates supplied to this specification shall conform to specification SA-480 with additional requirements mentioned herein.
- 2.2 Adequate tolerance shall be considered on Plate length and width for shear and plasma cutting. The tolerance on thickness of plates shall be positive only.
- 2.3 Final Rolling shall be lengthwise.
- 2.4 Plates shall have no. 1 finish on both sides with reference to SA-480. Cold Rolled plates, if permitted by Requisition, shall have no. 2B finish. Repair/reconditioning of plates shall not be permitted.

3.0 SUPPLEMENTARY TECHNICAL REQUIREMENTS

- 3.1 All plates shall be supplied in hot-rolled, fully annealed and pickled condition. All stabilized grades of Stainless Steel (SS 321, SS 347etc.) shall be given stabilization heat treatment in addition to solution annealing. The soaking temperatures for stabilization heat treatment shall be $915^{\circ}\text{C} \pm 10^{\circ}\text{C}$ and soaking period shall be minimum of 4 hours (2 hours for thickness $\leq 3.5\text{mm}$).
- 3.2 Unless specified otherwise in material requisition, plate representative of each heat shall be subjected to intergranular corrosion tests as per ASTM A-262 Practice E for all the 300 series materials. The bend test specimen shall be examined at a magnification of 200 x; and bent specimen shall be free of any cracks or grain dropping.
- 3.3 For straight chrome (13% Cr) material, maximum carbon content shall not exceed 0.06%. Hardness of UNS no. S41000, S41008 and S40500 shall be less than 241 BHN unless otherwise specified in the ASME BPV Section II, material specification.
- 3.4 a. Plate having thickness 16 mm to 50 mm (both inclusive) shall be examined ultrasonically as per SA-435.
- b. For thickness above 50mm ultrasonic examination shall be carried out as per SA-578 and shall have acceptance standard of level-B.
- 3.5 All mandatory tests as per material specification shall be carried out. However tension test specimen shall be from finished material and shall be selected in transverse direction.

4.0 CERTIFIED DOCUMENTS

The supplier shall furnish certificates/documents (number of copies as specified in requisition) inclusive of all the following tests required as per specification duly certified by the Inspecting Authority before shipment of plates. The actual values obtained shall be recorded in the test certificates/documents. Material certificates shall conform to EN 10204 Type 3.1/3.2 as required.

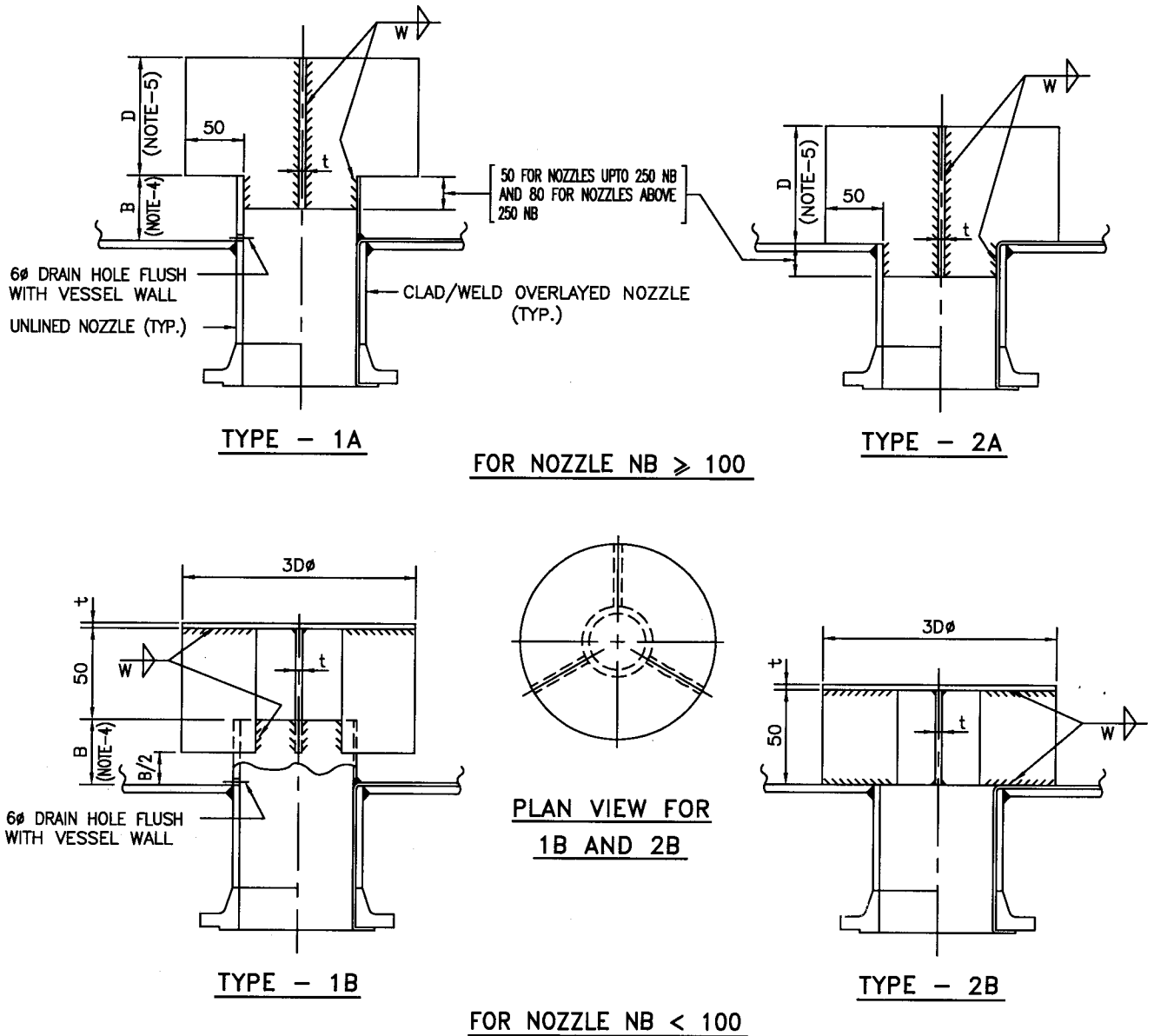
- a. Chemical Analysis
- b. Mechanical Tests
- c. Data of heat treatment i.e. initial temperature, heating rate, soaking temperature, cooling rate, etc.
- d. Ultrasonic Examination
- e. Intergranular corrosion test for 300 series
- f. Intergranular corrosion test for series other than 300 (whenever specified in the requisition)
- g. Type of finish for plate surfaces

5.0 PAINTING AND COATING

Plates are not to be painted/coated but shall be covered with plastic foils or paper or by other means for careful protection and shall be packed against any damage during transit and sea-weather conditions.

6.0 INSPECTION AUTHORITY

Material test certificates, duly certified by Mill's Quality Assurance Department are acceptable i.e. 3.1 certification as per EN 10204. However, as specified, if third party inspection is required specifically for plates, all test certificates and documents shall be duly certified by the third party. i.e. 3.2 certification as per EN 10204.

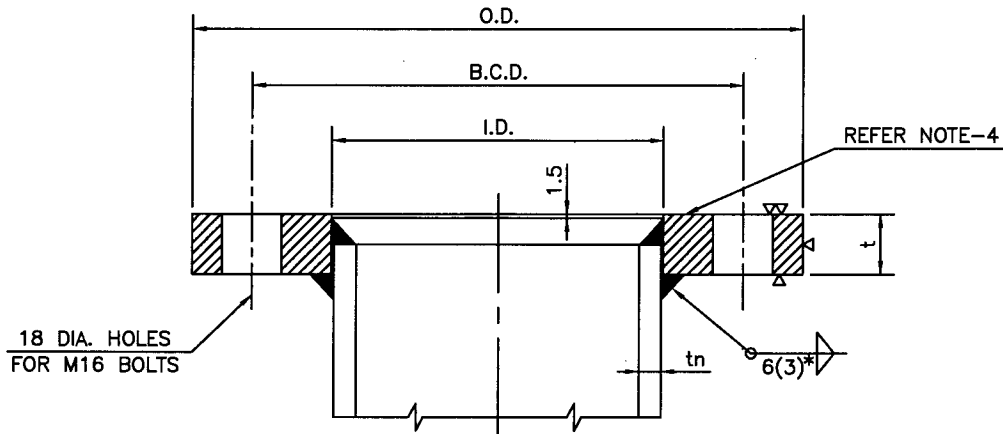


VESSEL MATERIAL	CARBON STEEL/LOW ALLOY STEEL				ALLOY / ALLOY CLAD/ ALLOY LINED (NOTE-3a)	CONCRETE LINED (NOTE-3b)
	1.5	3	4.5	6		
CORROSION ALLOWANCE	1.5	3	4.5	6	-	-
THICKNESS 't'	6	8	12	14	5	5
WELD SIZE 'W'	6	6	8	8	5	5

NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.
- 3.a) FOR ALLOY LINED VESSELS, THE BAFFLE MATERIAL SHALL BE SAME AS ALLOY LINING.
b) FOR CONCRETE LINED VESSELS, THE BAFFLE MATERIAL SHALL BE ALLOY AS SPECIFIED IN ENGINEERING DRAWING.
4. REFER ENGINEERING DRAWING FOR DIMENSION 'B'.
5. 'D' DENOTES NOMINAL BORE SIZE OF SUBJECT NOZZLE.

7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TK	NK Nataraj	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
						Approved by



NOMINAL PIPE SIZE (mm)	I.D.	B.C.D.	O.D.	NUMBER OF BOLTS	THICKNESS OF FLANGE t	
					CARBON STEEL	S. STEEL OR MONEL
40	51	110	160	4	16	10
50	63	120	170	4	16	10
80	92	150	200	4	16	10
100	117	180	230	4	16	10
150	171	240	290	4	16	10

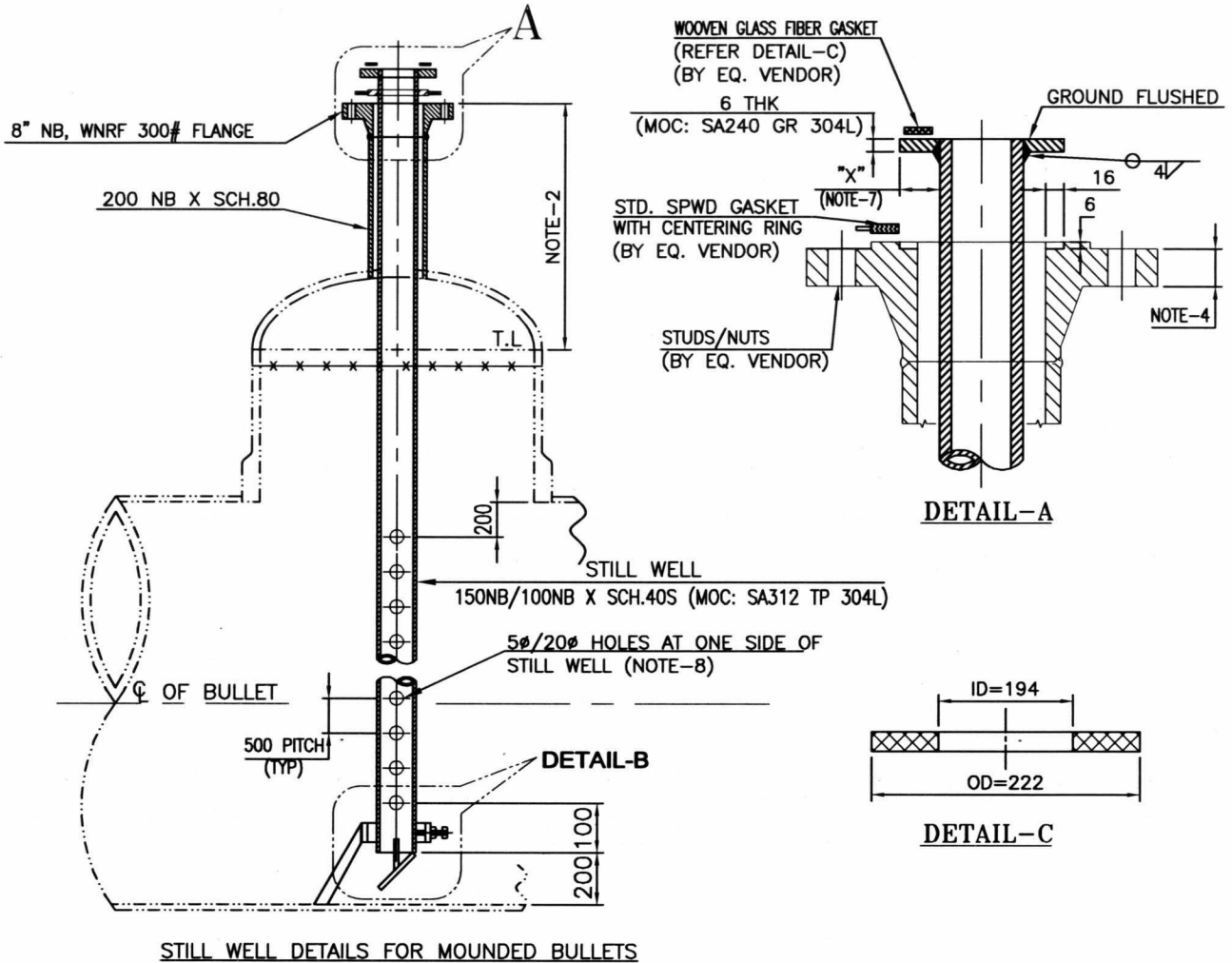
200	222	290	340	8	20	12
250	276	350	400	8	20	12
300	327	400	450	8	20	12

350	358	430	480	12	24	16
400	409	480	530	12	24	16
450	460	530	580	12	24	16
500	511	580	630	12	24	16
600	612	680	730	12	24	16

NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.
- * 3. FILLET SIZE IN BRACKET ARE FOR STAINLESS STEEL / MONEL.
4. FULL FACED GASKETS SHALL BE USED.
5. DIMENSIONS EXCEPT THICKNESS FOR INTERNAL FLANGES OF SIZE 25NB OR LESS SHALL BE AS PER ASME B16.5 CLASS 150. FLANGE THICKNESS AND FACING SHALL BE EQUIVALENT TO 40NB FLANGE COVERED IN THIS STANDARD.

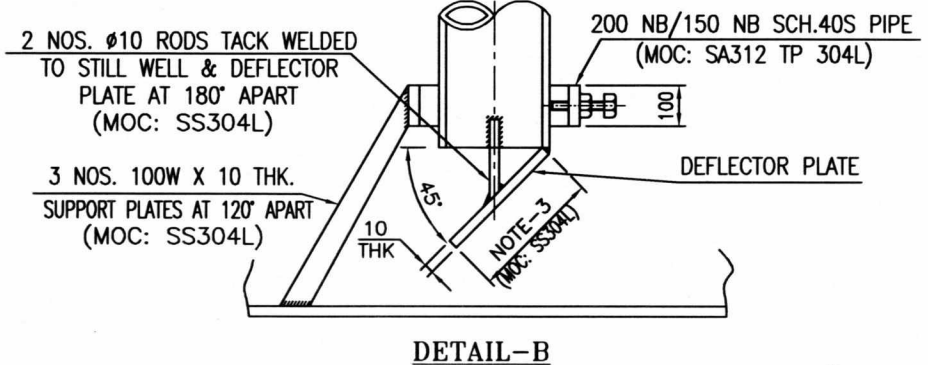
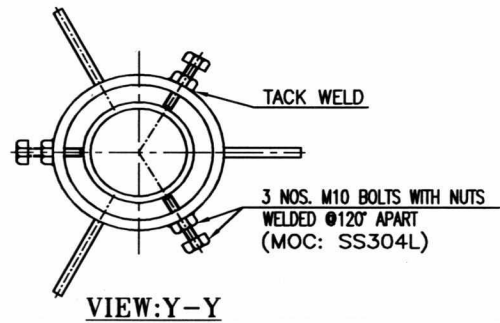
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TK	NK Nair	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convor	Stds. Bureau Chairman
						Approved by



STILL WELL DETAILS FOR MOUNDED BULLETS

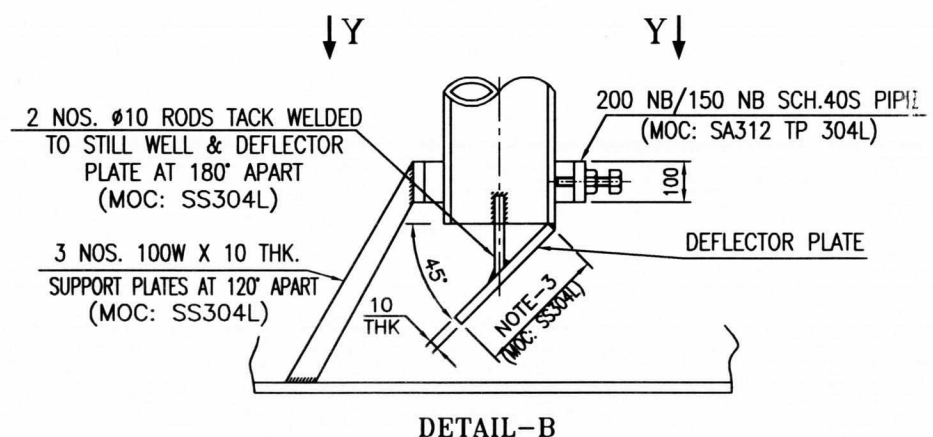
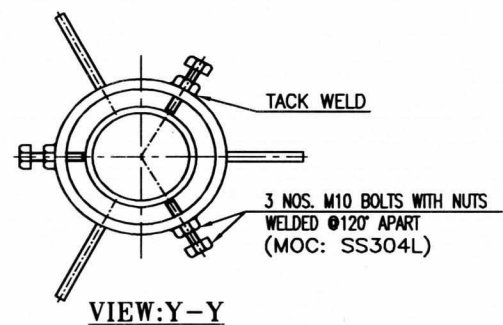
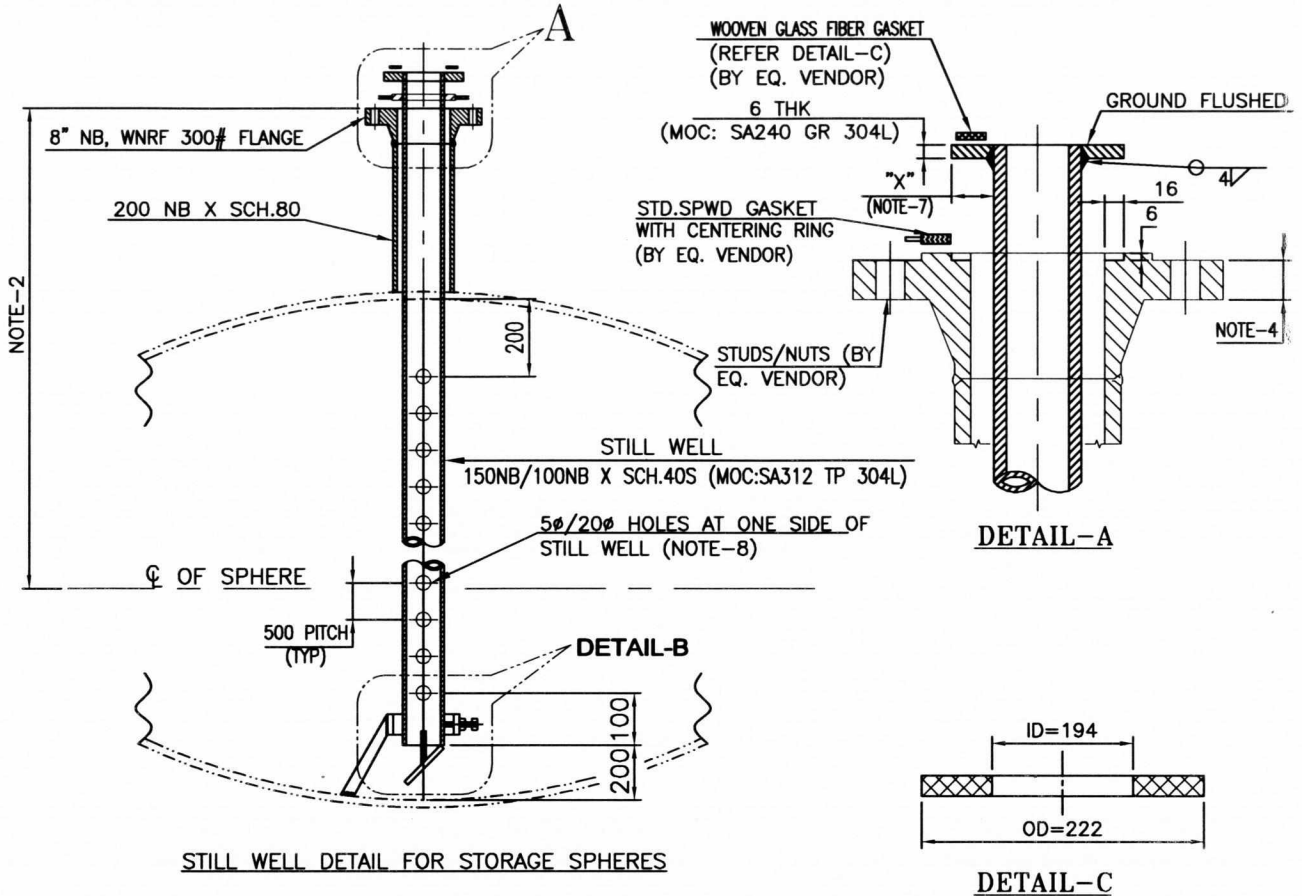
NOTES:-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. DIMENSION SHALL BE AS PER MDS.
3. SIZE OF THE DEFLECTOR PLATE TO BE DEVELOPED BY VENDOR CONSIDERING FULL COVERAGE OF THE STILL WELL PIPE OPENING.
4. FLANGE THICKNESS OF THE MOUNTING FLANGE SHALL BE INCREASED BY 6mm OVER AND ABOVE THE STANDARD FLANGE THICKNESS AS PER ASME B16.5.
5. MATERIALS, WHEREVER NOT STATED, SHALL BE AS PER MECHANICAL DATA SHEET.
6. IN CASE OF CONFLICT, ENGINEERING DRAWING SHALL GOVERN.
7. "X" = 27 mm FOR 6" NB STILL WELL AND 54 mm FOR 4" NB STILL WELL
8. HOLE DIAMETER SHALL FINALIZED BASED ON LEVEL INSTRUMENT VENDOR.

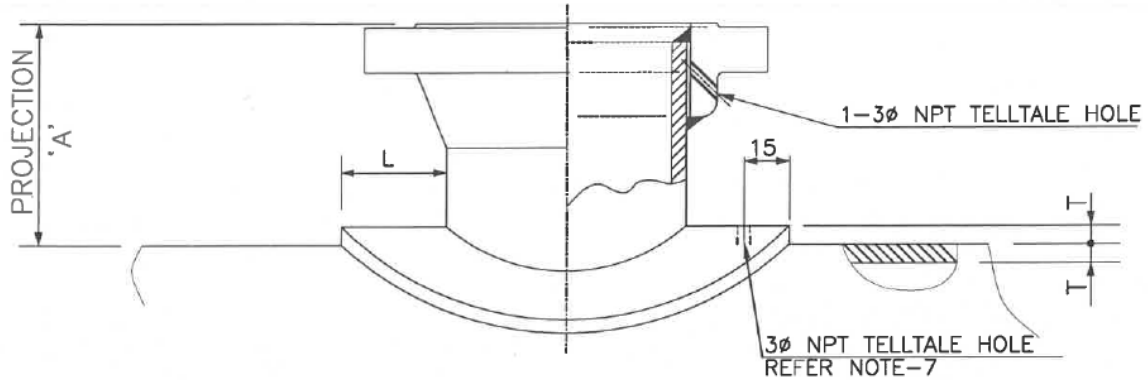


DETAIL-B

0	18.07.2023	ISSUED AS STANDARD	<i>SC</i>	<i>TK</i>	<i>NK</i>	<i>SM</i>
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
						Approved by



0	18.07.2023	ISSUED AS STANDARD	SC	TK	NK	SM
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
						Approved by



NOMINAL PIPE SIZE	OUTSIDE DIAMETER	L (WIDTH OF PAD) (⊙)		PROJECTION 'A' SEE NOTE-4,5,9&10			
		SHELL WELD EFF.=0.85	SHELL WELD EFF.=1.0	CLASS 150	CLASS 300	CLASS 600	CLASS 900
BELOW 3"	STANDARD	—	—	150	150	150	150
3"	88.9	40	45	200	200	200	200
4"	114.3	50	60	200	200	200	200
6"	168.3	70	85	200	200	200	250
8"	219.1	95	110	200	200	250	250
10"	273.0	115	135	200	200	250	300
12"	323.8	135	160	200	200	250	300
14"	355.6	150	175	250	250	250	300
16"	406.4	170	200	250	250	250	300
18"	457.2	195	225	250	300	300	350
20"	508.0	215	250	250	300	300	350
22"	558.8	235	275	250	300	300	—
24"	609.6	255	300	250	300	300	400
26"	660.4	285	330	250	300	350	450
28"	711.2	305	355	250	300	350	450
30"	762	325	380	250	300	400	450
32"	812.8	350	405	300	350	400	500
34"	863.6	370	430	300	350	400	500
36"	914.4	390	455	300	350	—	—
38"	965.2	410	480	300	350	—	—
40"	1016	435	505	300	350	—	—
42"	1066.8	455	530	300	400	—	—
44"	1117.6	475	555	300	400	—	—
46"	1168.4	500	585	300	400	—	—
48"	1219.2	520	610	300	400	—	—

8	21.02.2025	REVISED AND REISSUED AS STANDARD	AS	TKh	KA/NK	LN
7	23.01.2020	REAFFIRMED AND REISSUED AS STANDARD	DP	TK	KJH	RKT
6	07.06.2013	REVISED AND REISSUED AS STANDARD	NIKHIL	KA	RKT/SC	DM
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
						Approved by

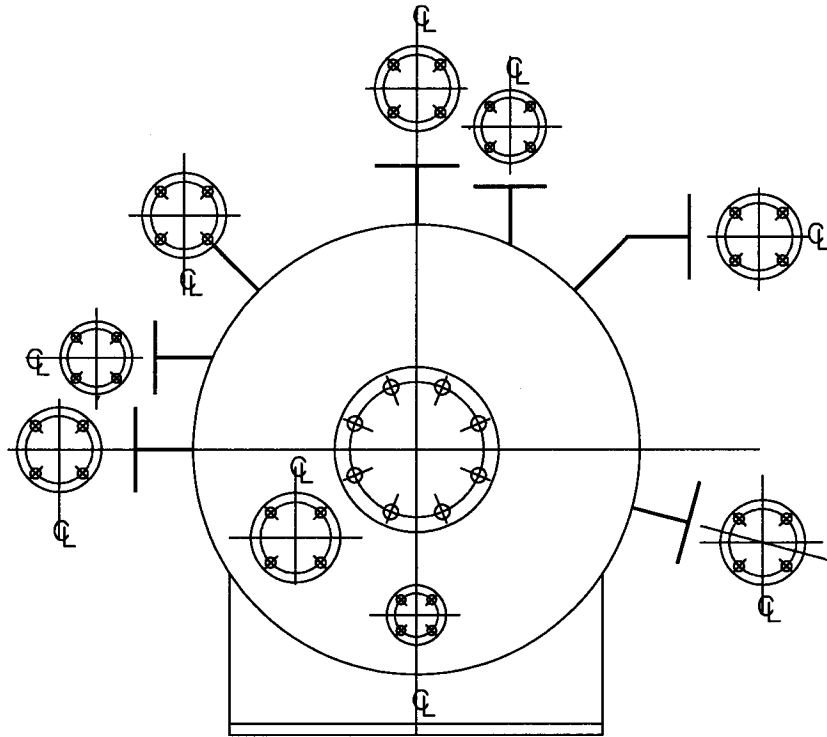
NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.
- ③ 3. WIDTH IS MINIMUM AND SHALL BE CHECKED AGAINST CODE REQUIREMENT. CHECK REINFORCEMENT REQUIREMENT FOR ALL EXTERNAL PIPING LOADING ALSO.
4. NOZZLE PROJECTIONS ARE BASED ON INSULATION THICKNESS EQUAL TO 75mm. FOR INSULATION THICKNESS GREATER THAN 75mm, THE NOZZLE PROJECTION IS 'A' + [INSULATION THICKNESS(mm)-75].
5. PROJECTION 'A' FOR SELF-REINFORCED NOZZLE SHALL BE BASED ON DESIGN OF REINFORCEMENT SUBJECT TO MINIMUM REQUIREMENTS AS PER THIS STD.
6. EXTEND PAD LOCALLY FOR MANHOLE DAVIT SUPPORT, IF REQUIRED.
7. EXTERNAL REINFORCING PADS SHALL HAVE A MINIMUM OF 1 NO. TELL-TALE HOLE EXCEPT THAT PADS FOR NOZZLES GREATER THAN 10"NB(250NB) SHALL HAVE MINIMUM TWO NOS. TELL-TALE HOLES AND NOZZLES IN EXCESS OF 36"NB (900NB) SHALL HAVE 4 NOS. TELL-TALE HOLES. PAD INSTALLED IN SECTIONS SHALL HAVE ATLEAST ONE TELL-TALE HOLE PER SECTION. TELL-TALE HOLES ON REINFORCEMENT PADS SHALL BE EQUALLY SPACED IN CIRCUMFERENTIAL DIRECTION OF PAD.
8. TELL-TALE HOLE SHALL NOT BE PLUGGED AND SHALL BE FILLED WITH HARD GREASE ONLY, AFTER HYDROTEST/PNEUMATIC TEST OF EQUIPMENT.
9. a) FOR COLUMNS & VERTICAL VESSELS, PROJECTION OF NOZZLE ON TOP HEAD SHALL BE 500mm MINIMUM FROM OUTSIDE.
b) FOR HORIZONTAL VESSELS, PROJECTION OF NOZZLES ON TOP SIDE OF SHELL SHALL BE 400mm MINIMUM FROM OUTSIDE.
10. PROJECTIONS ARE BASED ON ASME B16.5 FLANGES FOR UPTO AND INCLUDING 24"NB NOZZLES AND ASME B16.47 SERIES 'B' FLANGES FOR NOZZLE SIZES ABOVE 24"NB.

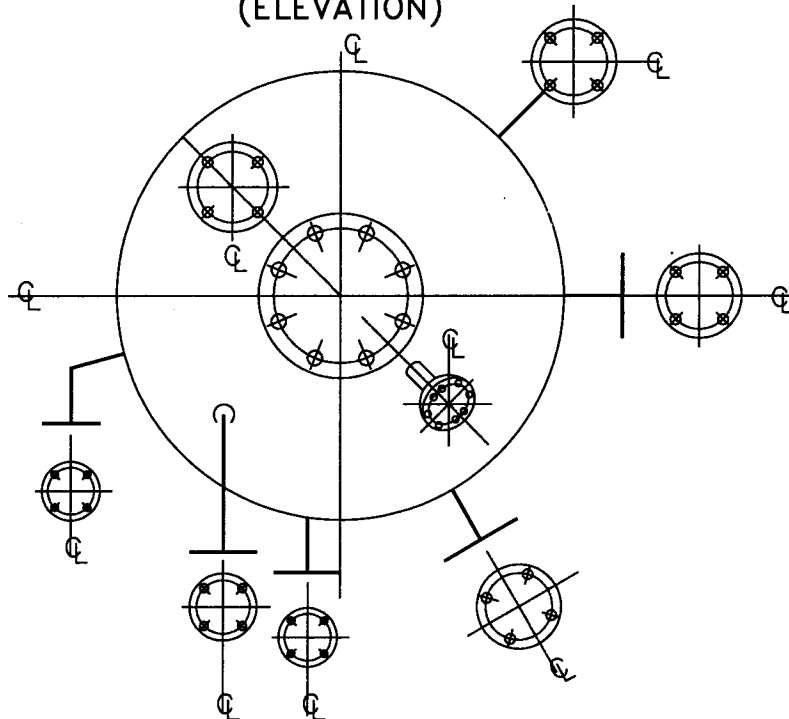
8	21.02.2025	REVISED AND REISSUED AS STANDARD	AS	TKh	KA/NK	MN
7	23.01.2020	REAFFIRMED AND REISSUED AS STANDARD	DP	TK	KJH	RKT
6	07.06.2013	REVISED AND REISSUED AS STANDARD	NIKHIL	KA	RKT/SC	DM
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	



STANDARD BOLT HOLE ORIENTATION

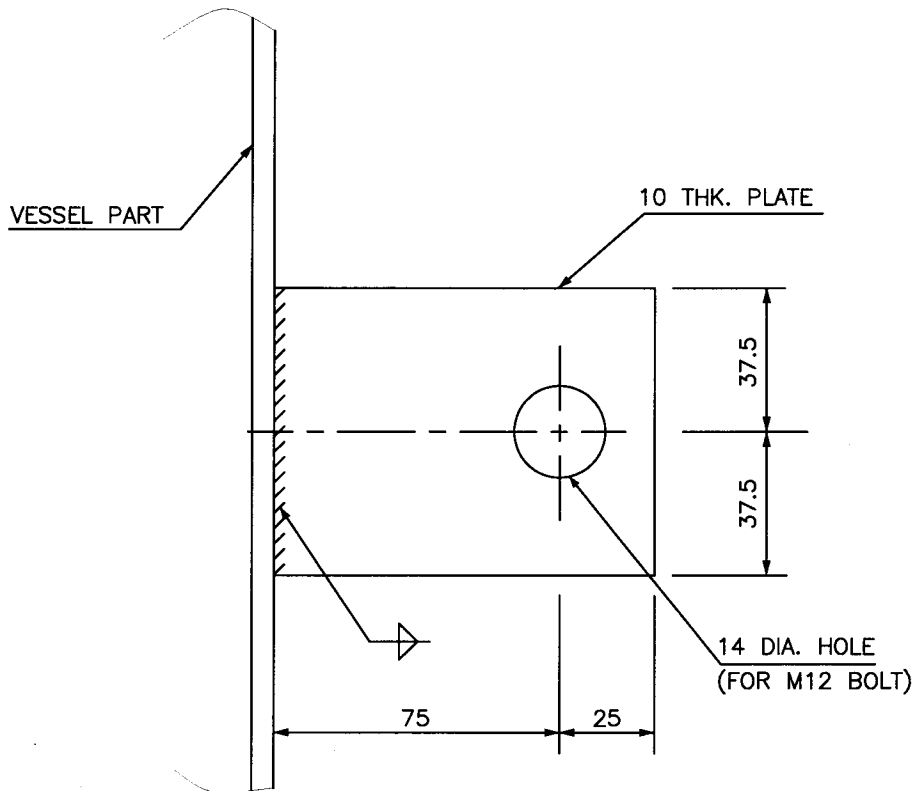


HORIZONTAL VESSEL
(ELEVATION)



VERTICAL VESSEL
(PLAN)

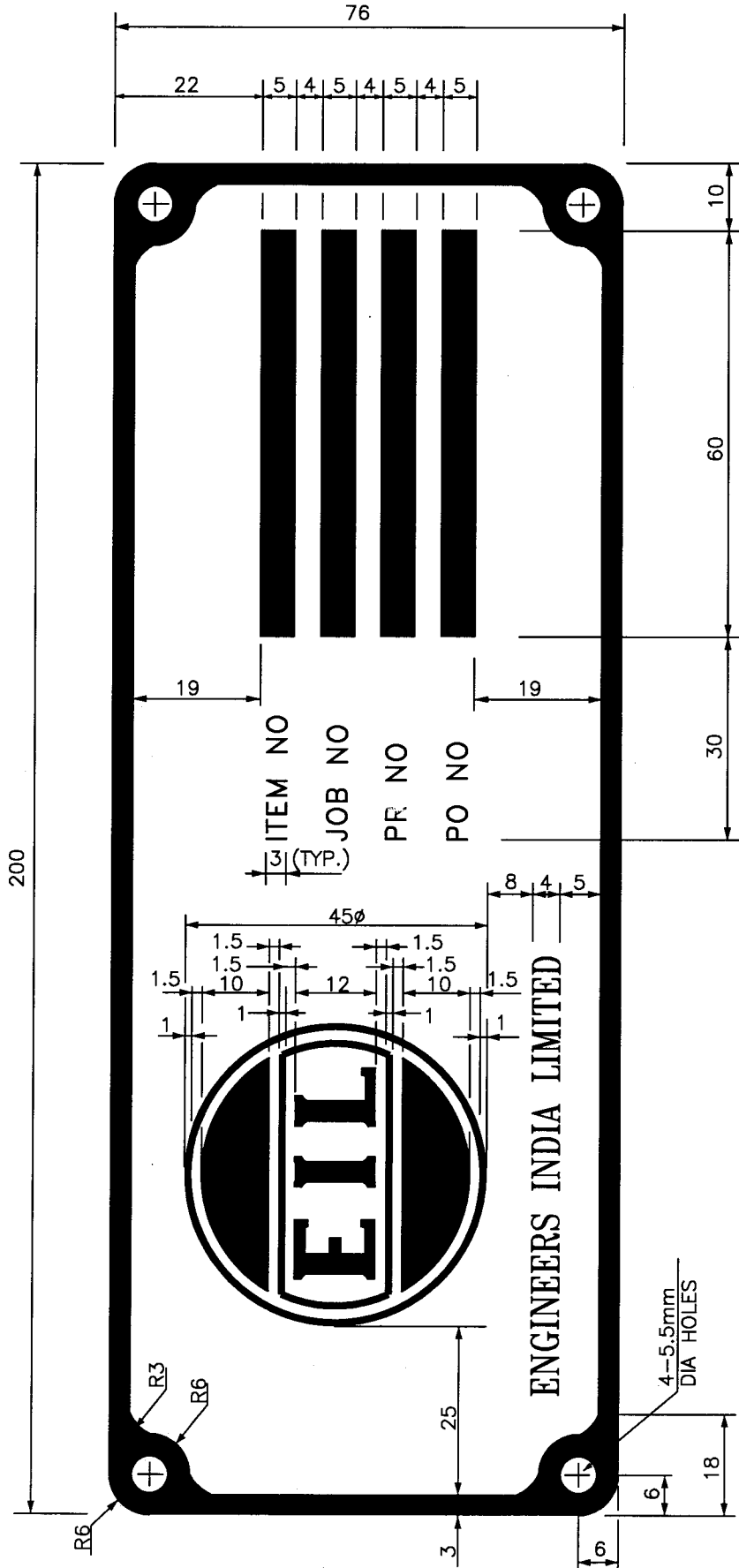
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TK	NK	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
						Approved by



NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. ALL EQUIPMENTS SHALL BE PROVIDED WITH TWO(2) EARTHING LUGS, UNLESS OTHERWISE STATED.
- 3.(a) EARTHING LUGS SHALL BE LOCATED DIAMETRICALLY OPPOSITE ON NORTH-SOUTH CENTER LINE ON SKIRT SUPPORTED EQUIPMENTS, ON ANY TWO(2) LEGS OF THREE(3) LEG SUPPORTED VERTICAL VESSEL, ON DIAMETRICALLY OPPOSITE LEGS OF FOUR(4) LEG SUPPORTED VERTICAL VESSEL AND ON EACH SADDLE OF HORIZONTAL VESSEL.
- (b) TWO(2) EARTHING LUGS ARE TO BE LOCATED ON EACH SADDLE OF HORIZONTAL VESSEL OF LENGTH GREATER THAN 20 METERS.
- (c) FOR SPHERE, TOTAL 4-NOS. OF EARTHING LUGS SHALL BE PROVIDED PREFERABLY ON DIAMETRICALLY OPPOSITE AND EQUALLY SPACED LEGS. (SPHERES ARE USUALLY PROVIDED WITH LEGS IN NUMBERS WHICH ARE MULTIPLE OF 4 FOR THE SYMMETRY)
4. DO NOT WELD EARTHING LUG ON PRESSURE PART.
5. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.
6. MATERIAL OF CONSTRUCTION SHALL BE CARBON STEEL.

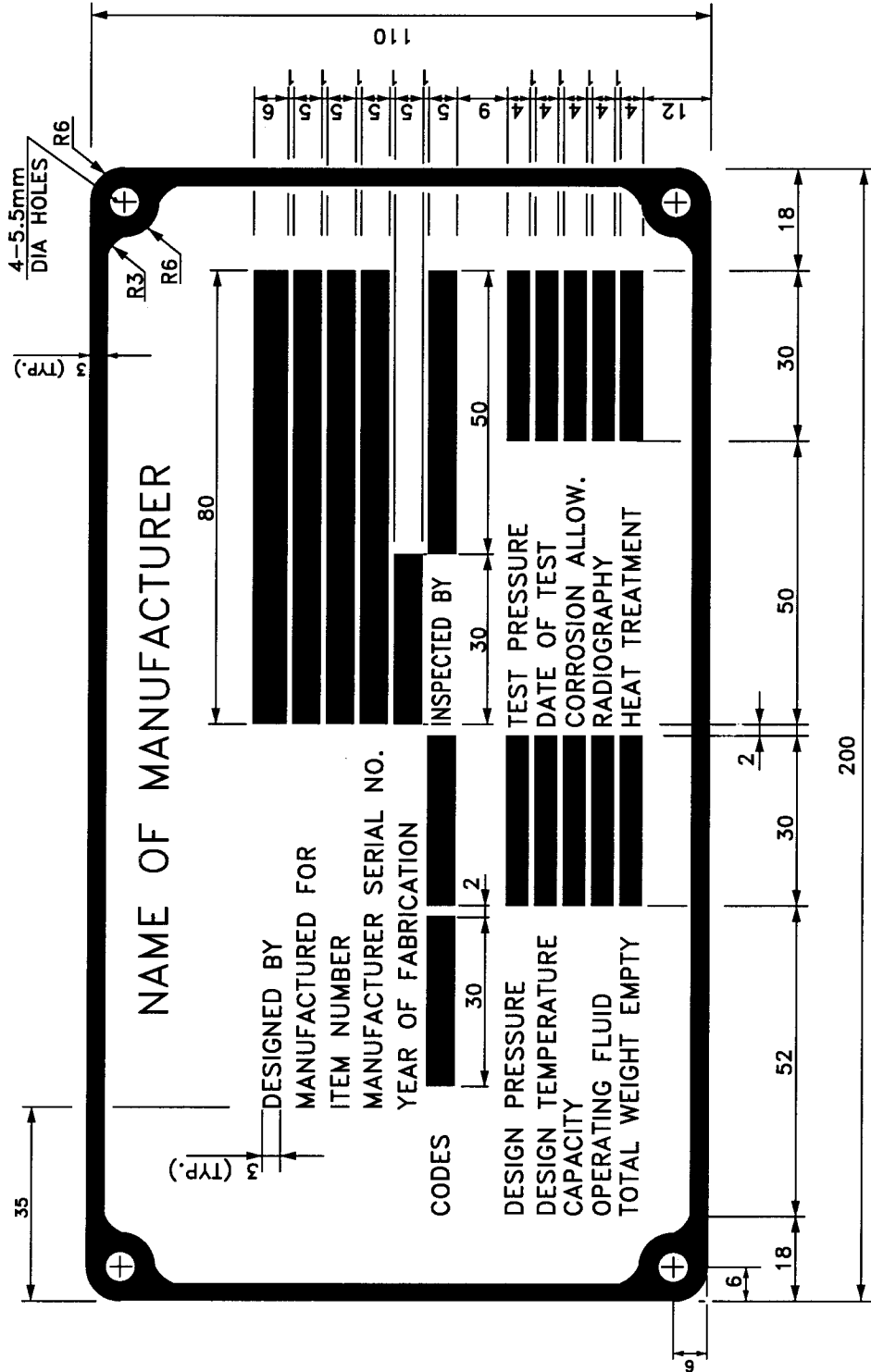
7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	SK	NK	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
						Approved by



NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. ALL LETTERS, BLOCKS AND BORDER SHALL BE OF RAISED POLISHED FACE.
3. BACK GROUND SHALL BE BLACK.
4. NAME PLATE SHALL BE TACK-WELDED TO THE BRACKET. WHERE NOT POSSIBLE IT MAY BE RIVETTED.
5. REFER STANDARD 7-12-029 FOR BRACKET DETAIL OF NAME PLATE.
6. NAME PLATE SHALL BE OF STAINLESS STEEL OF 2mm THICK.

7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TK	NK	Nikhil	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT		RN
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman	
						Approved by	



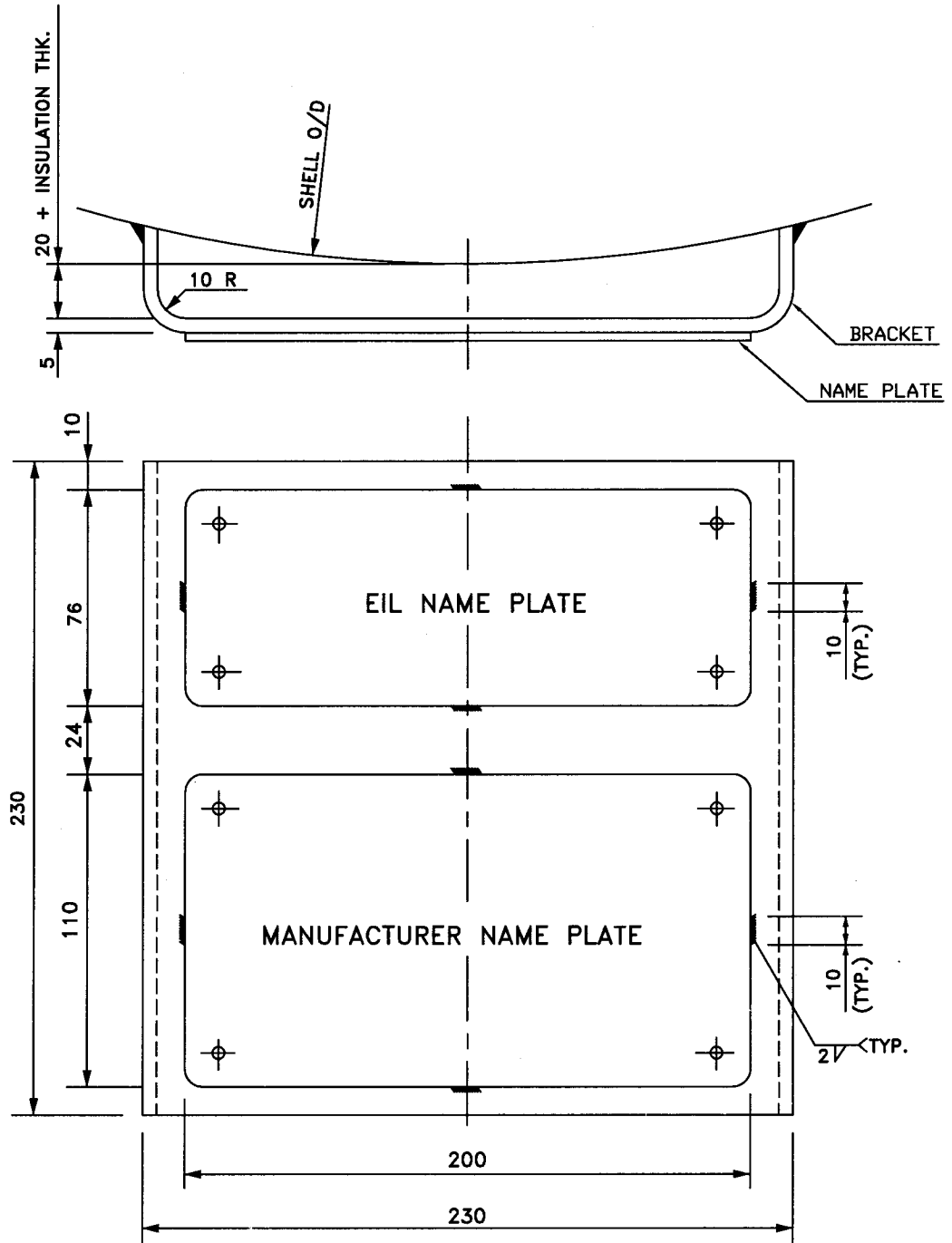
NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. ALL LETTERS, BLOCKS AND BORDER SHALL BE OF RAISED POLISHED FACE.
3. BACK GROUND SHALL BE BLACK.
4. NAME PLATE SHALL BE TACK-WELDED TO THE BRACKET. WHERE NOT POSSIBLE IT MAY BE RIVETTED.
5. REFER STANDARD 7-12-029 FOR BRACKET DETAIL OF NAME PLATE.
6. NAME PLATE SHALL BE OF STAINLESS STEEL OF 2mm THICK.

7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	SK	NK	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
						Approved by





Format No. 8-00-0001-F4 Rev.0

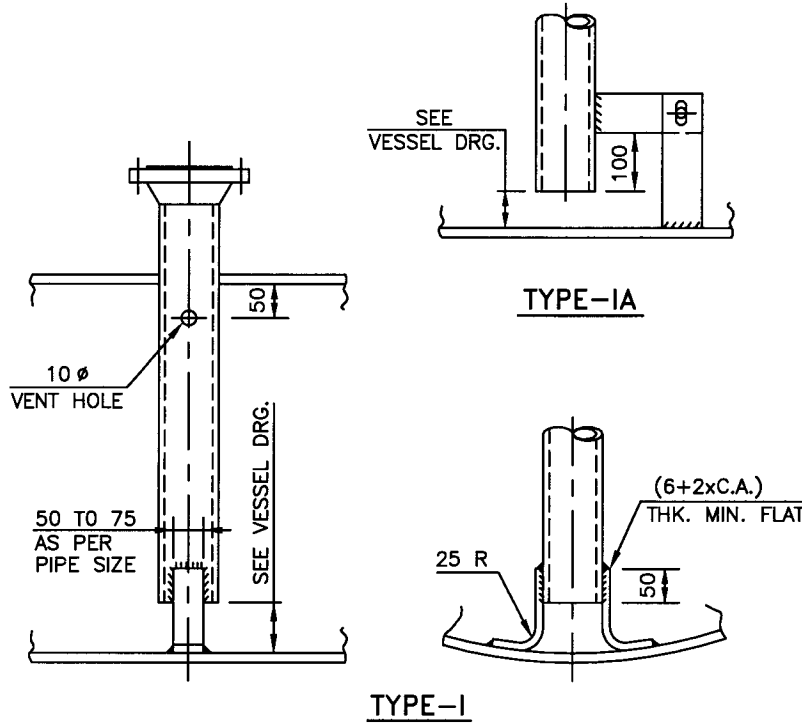
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NOTES

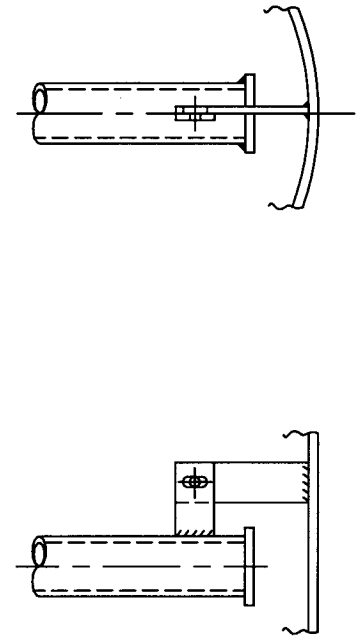
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. BRACKET MATERIAL SHALL BE SAME AS SHELL MATERIAL.

7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	 NIKHIL	 SK/KJH	NK 	 RN	
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN	
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman	
						Approved by	

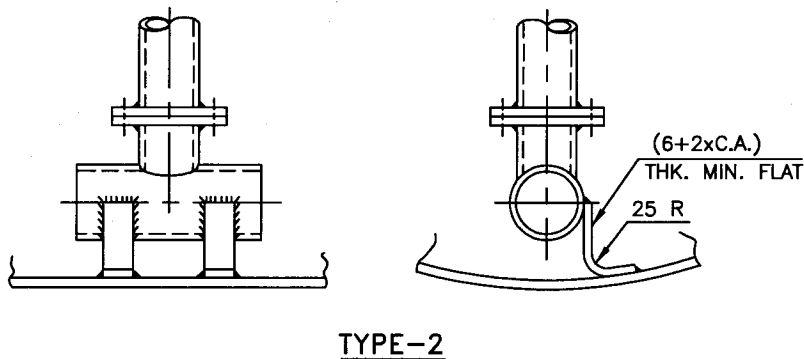


INTERNAL FEED PIPE FOR HORIZONTAL VESSEL

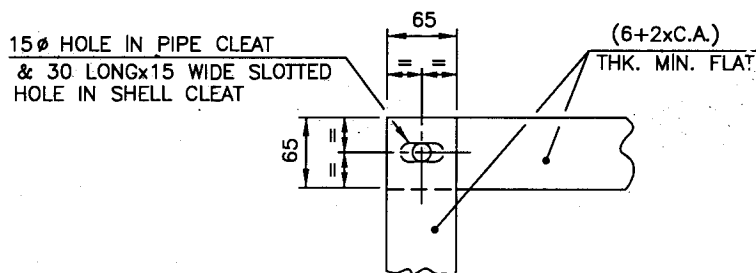
NOTE TYPE-IA IS APPLICABLE FOR LARGE THERMAL EXPANSION



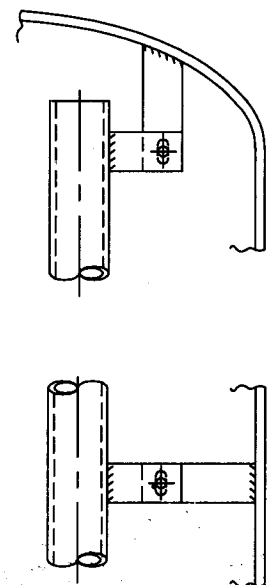
**SPARGER/FEED PIPE SUPPORT
(AIR / GAS SERVICE)**



INTERNAL SPLASH FEED PIPE FOR HORIZONTAL VESSEL

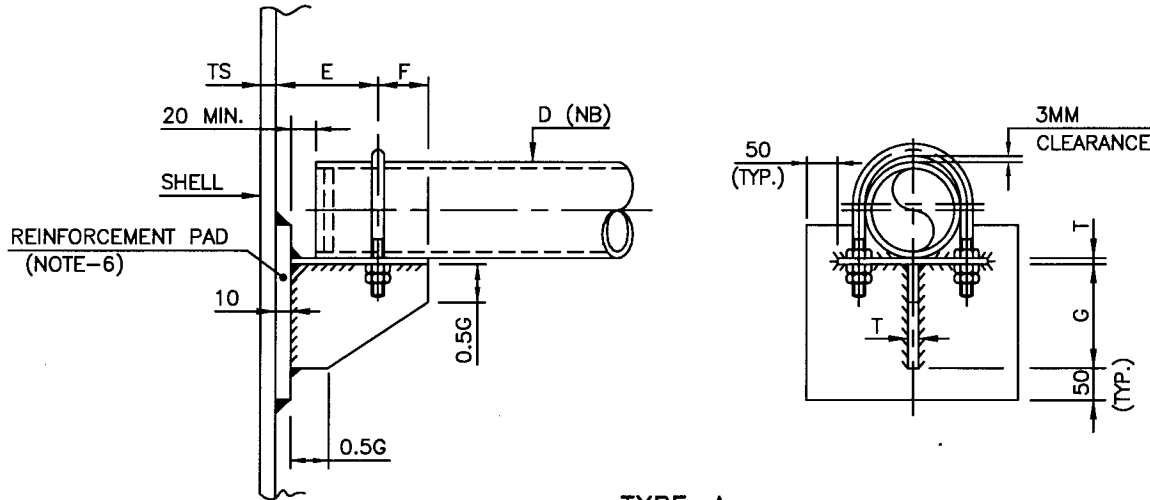


TYPICAL DETAIL OF BOLTING CLEATS

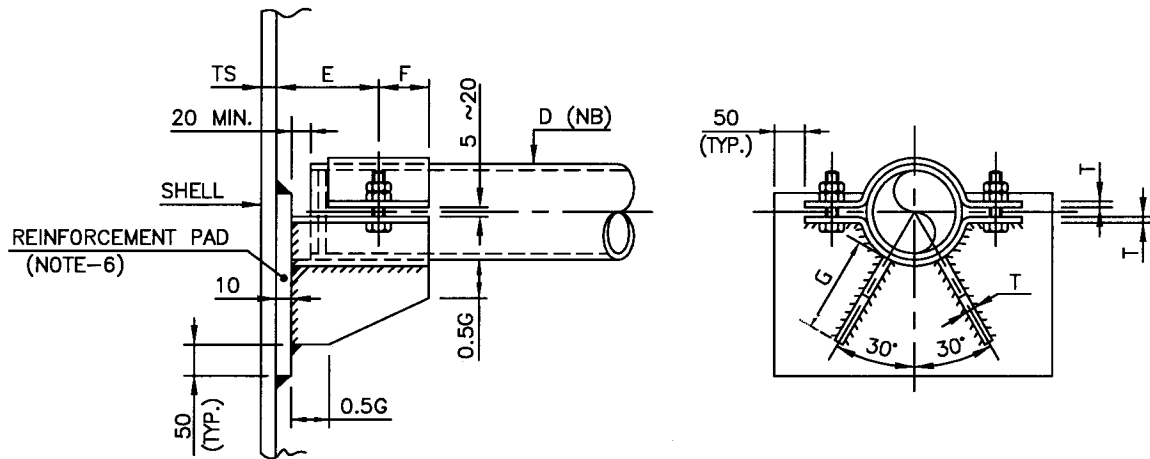


**SUPPORT CLEAT
FOR VERTICAL VESSEL**

6	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	SK	NK	GM
5	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
						Approved by



TYPE-A
 (FOR PIPES UPTO 250NB)



TYPE-B
 (FOR PIPES ABOVE 250NB)

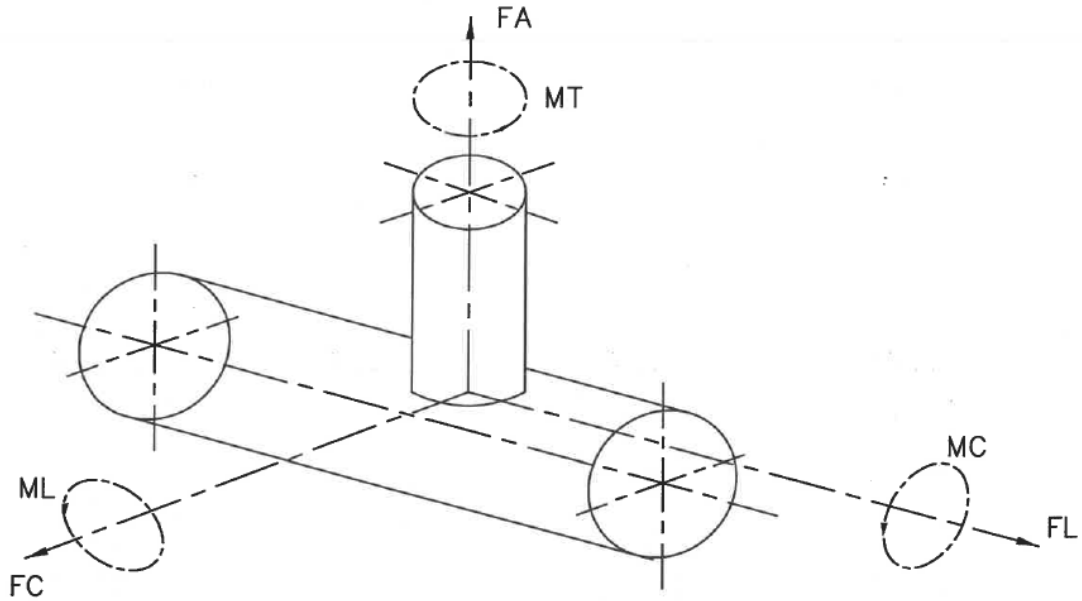
INTERNAL FEED PIPE FOR VERTICAL VESSEL/COLUMN

PIPE N.B. D	BOLT SIZE	T					E	F	G
		CA=0	CA=1.5	CA=3	CA=5	CA=7			
50 - 80	M 12	6	10	12	16	20	60	40	60
100 - 200	M 16	10	14	16	20	25	100	50	100
250 ~ OVER	M 16	14	18	20	25	28	150	100	150

NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. IN CASE OF CONFLICT VESSEL ENGG. DRAWING SHALL GOVERN.
3. MATERIAL OF CLEATS SHALL BE AS PER VESSEL ENGG. DRAWING.
4. ALL FILLET WELDS TO BE ALL AROUND & SIZE OF WELDS ARE (6+1x C.A.) MINIMUM UNLESS OTHERWISE STATED.
5. ALL INTERNAL BOLTS SHALL BE MIN. M 12 SIZE AND OF STAINLESS STEEL WITH DOUBLE NUTS.
6. REINFORCING PAD SHALL BE LARGER BY 50mm ALL AROUND THAN BRACKET CLEATS. NO PAD IS REQUIRED FOR VESSELS WITH WALL THICKNESS GREATER THAN 25mm.

6	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	NK Nalin	SM
5	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RN
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener
					Stds. Bureau Chairman
					Approved by



NOTES: -

1. THIS STANDARD COVERS ALLOWABLE NOZZLE LOADS FOR PRESSURE VESSELS & COLUMNS ONLY.
2. EACH PROCESS NOZZLE OF VESSELS SHALL BE ANALYZED FOR THE LOADS PROVIDED IN THIS STANDARD.
3. THESE LOADS SHALL BE CONSIDERED TO BE ACTING SIMULTANEOUSLY WITH INTERNAL/EXTERNAL DESIGN PRESSURE. ALLOWABLE STRESS SHALL BE AS PER APPLICABLE DESIGN CODE.
4. STRESS CALCULATIONS SHALL BE CARRIED OUT AS PER WRC BULLETIN NO. 537/ 297 (AS APPLICABLE). WRC 537 SHALL BE USED FOR NOZZLES ON DISHED ENDS AND WRC 297 SHALL BE USED FOR NOZZLES ON CYLINDRICAL SHELL.

2	02.12.2024	REVISED AND REISSUED AS STANDARD	JS/SM	TKh	KA/NK	MN
1	20.06.2019	REAFFIRMED AND REISSUED AS STANDARD	DP	TK	KJH	RKT
0	31.07.14	ISSUED AS STANDARD	GCP	KA	RKT	SC
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman

CARBON STEEL AND LOW ALLOY STEEL EQUIPMENTS
(CLASS 150 AND CLASS 300)

NOZZLE SIZES (DN)	FA (Kgf)	FL (Kgf)	FC (Kgf)	MT (Kgf-m)	ML (Kgf-m)	MC (Kgf-m)
50	135	200	200	50	40	30
80	202	300	300	112	90	67
100	270	400	400	200	160	120
150	405	600	600	450	360	270
200	540	800	800	800	640	480
250	675	1000	1000	1250	1000	750
300	810	1200	1200	1800	1440	1080
350	945	1400	1400	2450	1960	1470
400	1080	1600	1600	3200	2560	1920
450	1215	1800	1800	4050	3240	2430
500	1350	2000	2000	5000	4000	3000
600	1620	2400	2400	7200	5760	4320
650	1755	2600	2600	8450	6760	5070
700	1890	2800	2800	9800	7840	5880
750	2025	3000	3000	11250	9000	6750
800	2160	3200	3200	12800	10240	7680
850	2295	3400	3400	14450	11560	8670
900	2430	3600	3600	16200	12960	9720
950	2565	3800	3800	18050	14440	10830
1000	2700	4000	4000	20000	16000	12000
1050	2835	4200	4200	22050	17640	13230
1100	2970	4400	4400	24200	19360	14520
1150	3105	4600	4600	26450	21160	15870
1200	3240	4800	4800	28800	23040	17280
1250	3375	5000	5000	31250	25000	18750
1300	3510	5200	5200	33800	27040	20280
1350	3645	5400	5400	36450	29160	21870
1400	3780	5600	5600	39200	31360	23520
1450	3915	5800	5800	42050	33640	25230
1500	4050	6000	6000	45000	36000	27000

2	02.12.2024	REVISED AND REISSUED AS STANDARD	JS/SM	TKh	KA/NK Nalin	MN
1	20.06.2019	REAFFIRMED AND REISSUED AS STANDARD	DP	TK	KJH	RKT
0	31.07.2014	ISSUED AS STANDARD	GCP	KA	RKT	SC
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
						Approved by

CARBON STEEL AND LOW ALLOY STEEL EQUIPMENTS
(CLASS 600 AND ABOVE)

NOZZLE SIZES (DN)	FA (Kgf)	FL (Kgf)	FC (Kgf)	MT (Kgf-m)	ML (Kgf-m)	MC (Kgf-m)
50	168	250	250	62	50	37
80	253	375	375	140	112	84
100	337	500	500	250	200	150
150	506	750	750	562	450	337
200	675	1000	1000	1000	800	600
250	843	1250	1250	1562	1250	937
300	1012	1500	1500	2250	1800	1350
350	1181	1750	1750	3062	2450	1837
400	1350	2000	2000	4000	3200	2400
450	1518	2250	2250	5062	4050	3037
500	1687	2500	2500	6250	5000	3750
600	2025	3000	3000	9000	7200	5400
650	2193	3250	3250	10562	8450	6337
700	2362	3500	3500	12250	9800	7350
750	2531	3750	3750	14062	11250	8437
800	2700	4000	4000	16000	12800	9600
850	2868	4250	4250	18062	14450	10837
900	3037	4500	4500	20250	16200	12150
950	3206	4750	4750	22562	18050	13537
1000	3375	5000	5000	25000	20000	15000
1050	3543	5250	5250	27562	22050	16537
1100	3712	5500	5500	30250	24200	18150
1150	3881	5750	5750	33062	26450	19837
1200	4050	6000	6000	36000	28800	21600
1250	4218	6250	6250	39062	31250	23437
1300	4387	6500	6500	42250	33800	25350
1350	4556	6750	6750	45562	36450	27337
1400	4725	7000	7000	49000	39200	29400
1450	4893	7250	7250	52562	42050	31537
1500	5062	7500	7500	56250	45000	33750

2	02.12.2024	REVISED AND REISSUED AS STANDARD	JS/SM	TKh	KA/NK Nalin	MN
1	20.06.2019	REAFFIRMED AND REISSUED AS STANDARD	DP	TK	KJH	RKT
0	31.07.14	ISSUED AS STANDARD	GCP	KA	RKT	SC
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman

STAINLESS STEEL EQUIPMENTS
(ALL CLASSES)

NOZZLE SIZES (DN)	FA (Kgf)	FL (Kgf)	FC (Kgf)	MT (Kgf-m)	ML (Kgf-m)	MC (Kgf-m)
50	135	200	200	50	40	20
80	202	300	300	112	90	45
100	270	400	400	200	160	80
150	405	600	600	450	360	180
200	540	800	800	800	640	320
250	675	1000	1000	1250	1000	500
300	810	1200	1200	1800	1440	720
350	945	1400	1400	2450	1960	980
400	1080	1600	1600	3200	2560	1280
450	1215	1800	1800	4050	3240	1620
500	1350	2000	2000	5000	4000	2000
600	1620	2400	2400	7200	5760	2880
650	1755	2600	2600	8450	6760	3380
700	1890	2800	2800	9800	7840	3920
750	2025	3000	3000	11250	9000	4500
800	2160	3200	3200	12800	10240	5120
850	2295	3400	3400	14450	11560	5780
900	2430	3600	3600	16200	12960	6480
950	2565	3800	3800	18050	14440	7220
1000	2700	4000	4000	20000	16000	8000
1050	2835	4200	4200	22050	17640	8820
1100	2970	4400	4400	24200	19360	9680
1150	3105	4600	4600	26450	21160	10580
1200	3240	4800	4800	28800	23040	11520
1250	3375	5000	5000	31250	25000	12500
1300	3510	5200	5200	33800	27040	13520
1350	3645	5400	5400	36450	29160	14580
1400	3780	5600	5600	39200	31360	15680
1450	3915	5800	5800	42050	33640	16820
1500	4050	6000	6000	45000	36000	18000

2	02.12.2024	REVISED AND REISSUED AS STANDARD	JS/SM	TKh	KA/NK	MN
1	20.06.2019	REAFFIRMED AND REISSUED AS STANDARD	DP	TK	KJH	RKT
0	31.07.2014	ISSUED AS STANDARD	GCP	KA	RKT	SC
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman

भंडारण टैंक एवं वैसल के लिये वेल्डिंग
योग्य स्ट्रक्चरल क्वालिटी स्टील प्लेटों का
मानक विनिर्देश

STANDARD SPECIFICATION FOR
WELDABLE STRUCTURAL QUALITY
STEEL PLATES FOR STORAGE
TANKS AND VESSELS

7	27.03.2023	REVISED AND REISSUED AS STD. SPEC.	NSK	TK	NK	SM
6	22.09.2017	REVISED AND REISSUED AS STD. SPEC.	SK	KJH	RKT	RN
5	30.06.2010	REVISED AND REISSUED AS STD. SPEC.	KA	RKT	AKM/DM	N.DUARI
4	15.09.09	REVISED & REISSUED AS STD. SPEC.	VB	RKG	AKM,	N.DUARI
3	08.04.04	REVISED & REISSUED AS STD. SPEC.	DNN	AKM	SSA	SKG
Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	

Abbreviations:

EN : European Norm
IS : Indian Standard

Static Equipment Standards Committee

Convenor : Mr. Nalin Kumar

Members :

Mr. K. Anjaneyulu
Mr. Tarun Kumar (Emp. No. A328)
Mr. Tarun Khurana (Coordinator)
Mr. Anish Trehan
Mr. P V Satyanarayana
Mr. Saikat Chakraborty
Mr. Piyush Suryavanshi
Mr. Mittal Kumar Patel
Mr. Srikanth Karnam
Mr. Ayush Mathur (Project)
Mr. Prabhakar Choudhary (SMMS)
Mr. Avdhesh Agarwal (SCM-Inspection)

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1.0 SCOPE

- 1.1 This specification covers additional and supplementary requirements for weldable structural quality Steel Plates to IS: 2062 (latest), intended primarily for storage tanks and vessels.
- 1.2 Following Codes, standards etc. shall be followed in their latest edition and addenda, errata, amendments unless specified otherwise:
- 1.3 IS:2062, IS:1852, IS:10842 (All Parts)
- 1.4 EN 10163 (All Parts): Delivery for Surface Condition.
- 1.5 EN 10204: Metallic products – Types of Inspection Documents.

2.0 GENERAL

- 2.1 The maximum under tolerance permissible on the thickness of plate shall be 0.25 mm. Tolerances on other dimensions of plates shall be as per IS: 1852.
- 2.2 Direction of final rolling shall be lengthwise.
- 2.3 Reconditioning/Repair of plates by welding shall not be permitted. Surface finish shall be ground/flush smooth and shall be free from any surface imperfection.

3.0 SUPPLEMENTARY TECHNICAL REQUIREMENTS

- 3.1 Heat analysis and product analysis shall be carried out for each heat and chemical composition shall meet the limits as specified in IS: 2062.
- 3.2 Y-groove weld crackability test as per IS: 10842 shall be carried out for plates conforming to Gr. E250 C having thickness 12mm and above.
- 3.3 Charpy impact test shall be carried out on the plates having thickness greater than 12 mm conforming to Grade E250 BR, E250 B0 & E250 C. Test temperature and acceptance criteria for energy absorption shall be as mentioned in Table-2 of the specification IS: 2062.
For Thickness less than 12 mm (for materials E250 Gr.B0 & E250 Gr.C), if required, the minimum impact energy values of reduced sizes shall be as per Fig. 2 of the specification IS: 2062.

4.0 CERTIFIED DOCUMENTS

The supplier shall furnish certificates/documents (number of copies as specified in requisition) inclusive of all the following tests required as per specification, duly certified by the Inspecting Authority before shipment of plates. The actual values obtained during tests shall be recorded in the test certificates/documents. Material certificates shall conform to EN 10204 Type 3.1/3.2 as required.

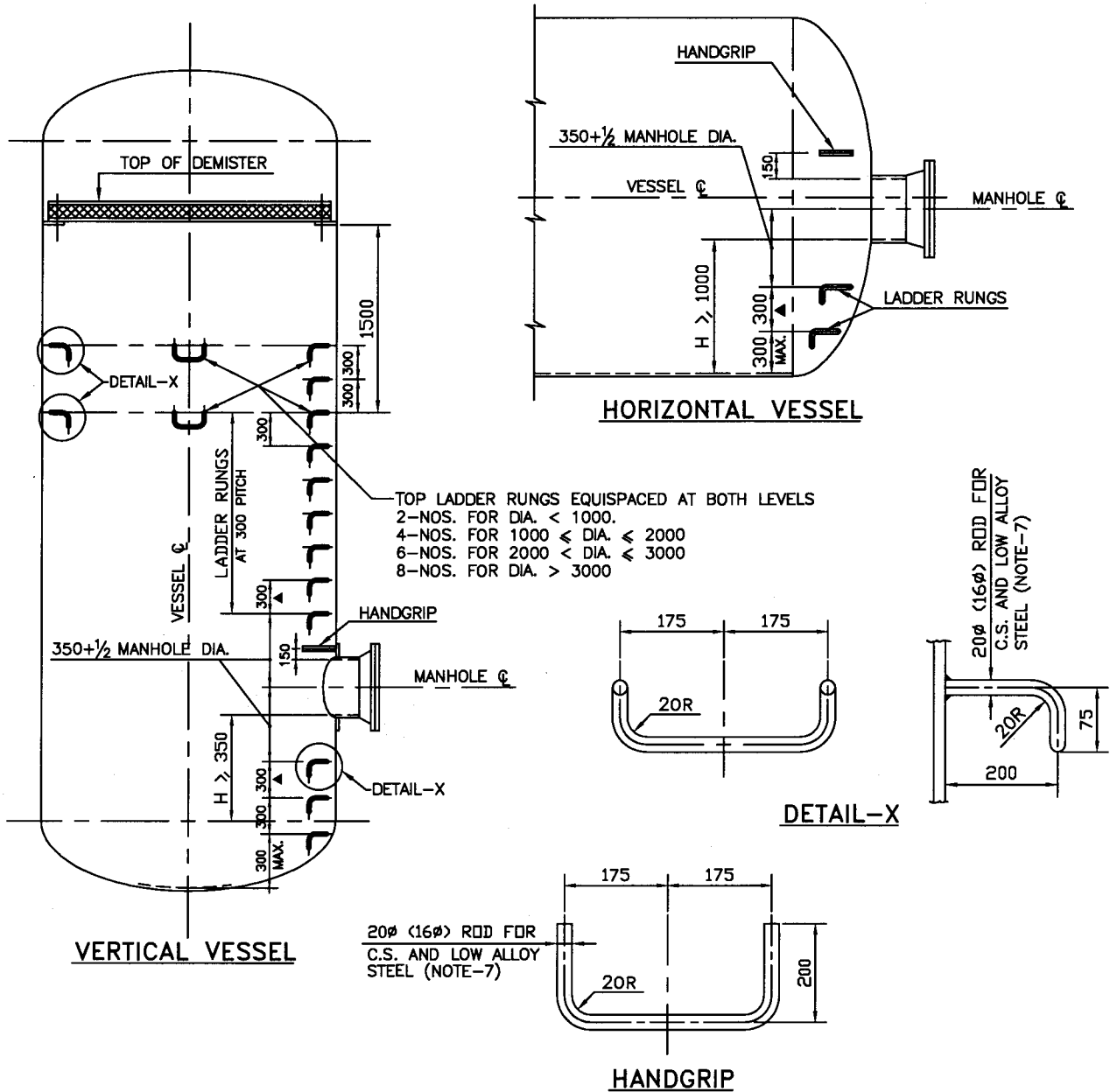
- a. Chemical Analysis
- b. Mechanical Tests
- c. Data of heat treatment
- d. Charpy V-notch impact tests
- e. Y- groove crackability test

5.0 PAINTING AND COATING

No painting/coating of any kind is permitted on the steel plates except stencil marking. However steel plates shall be carefully protected and packed against any damage during transit and shall be of sea worthy conditions.

6.0 INSPECTION AUTHORITY

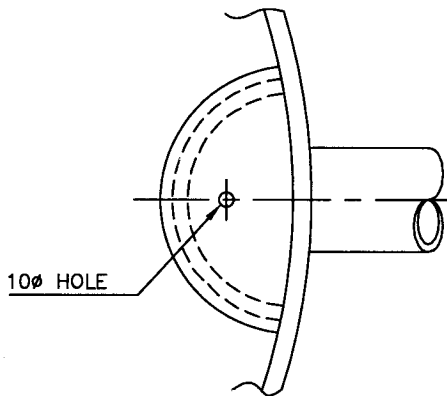
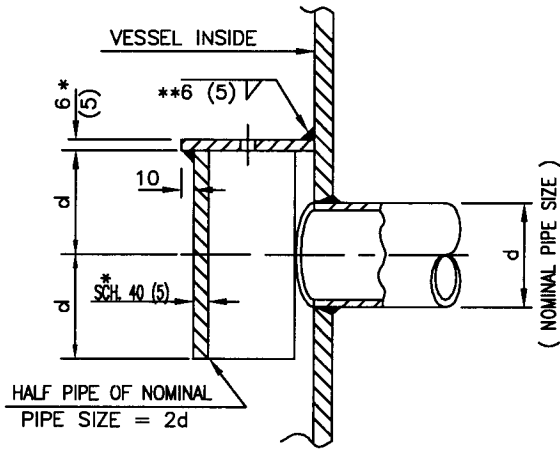
Material test certificates, duly certified by Mill's Quality Assurance Department are acceptable i.e. 3.1 certification as per EN 10204. However, if third party inspection is required specially for plates in requisition, all test certificates and documents shall be duly certified by the third party. i.e. 3.2 certification as per EN 10204.



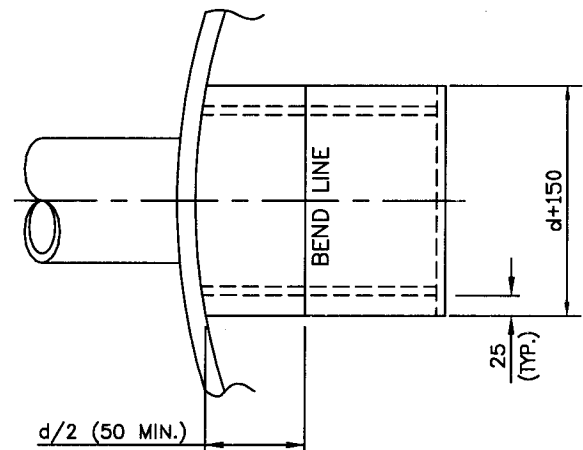
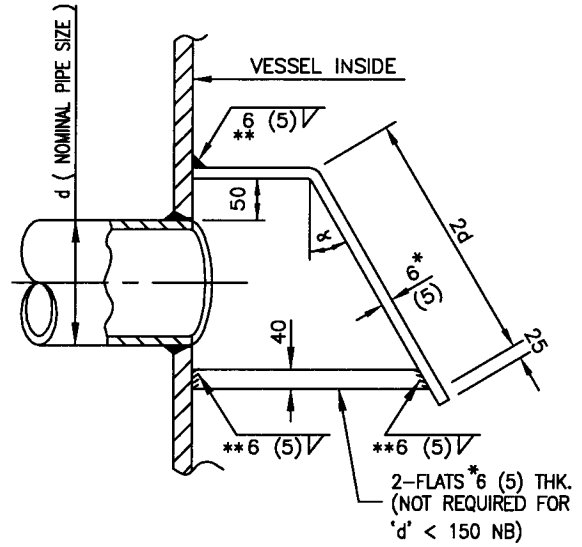
NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
- ▲ 2. VARIATION IN SPACING BETWEEN LADDER RUNGS IS PERMITTED IN CASE OF INTERFERENCE WITH SOME NOZZLE OR INTERNALS. HOWEVER THE SPACING OF RUNGS SHALL BE EQUAL.
3. SQUARE RODS MAY BE USED FOR HANDGRIP / LADDER RUNGS. IF FABRICATED FROM PLATE THE EDGES ARE TO BE ROUNDED OFF.
4. MATERIAL SHALL BE AS PER ENGINEERING DRAWING.
5. ALL FILLET WELDS SHALL BE 6 mm MINIMUM.
6. ORIENTATION OF LADDER RUNGS SHALL BE SAME AS OF MANHOLE.
7. DIMENSIONS SHOWN IN BRACKETS ARE FOR STAINLESS STEEL MATERIAL.

7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NS	TK	NK	BM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
						Approved by



TYPE-1

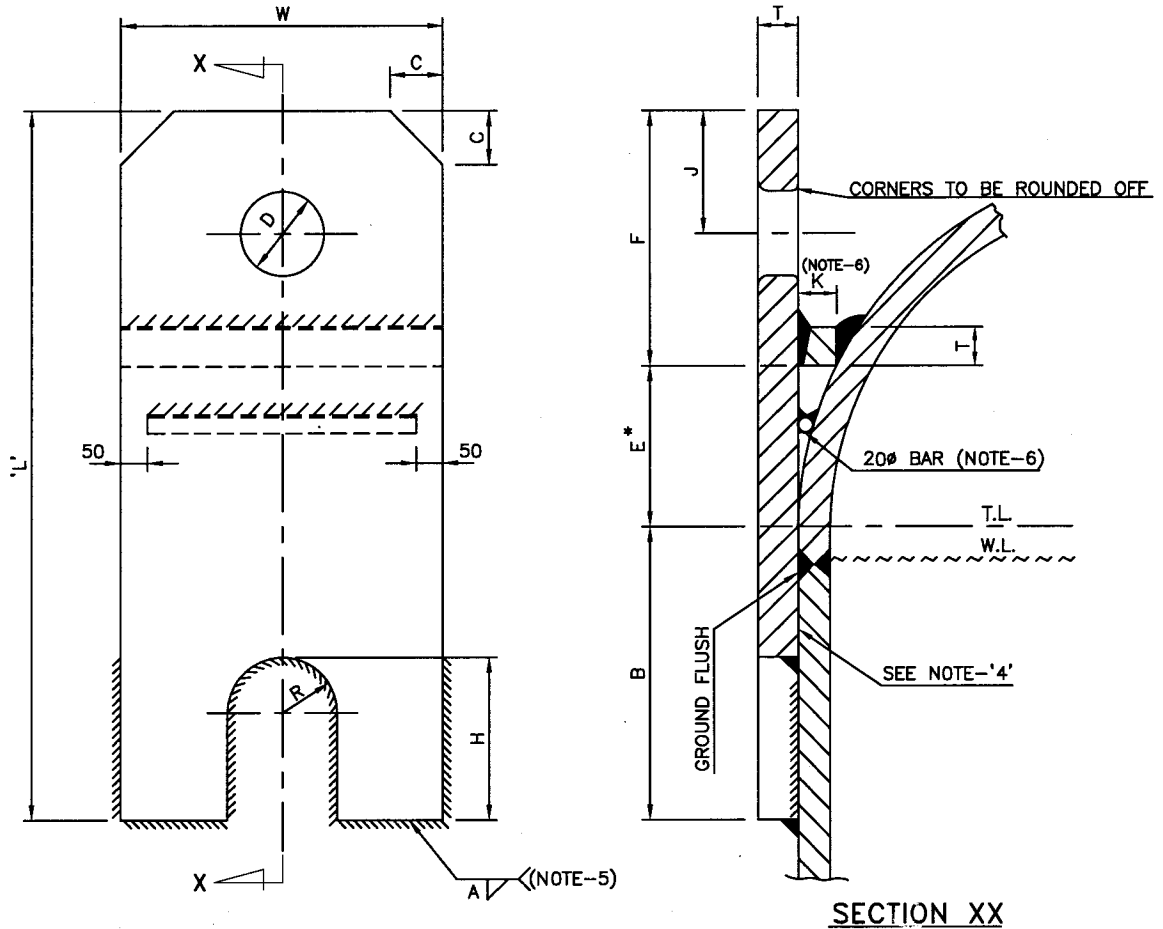


TYPE-2

NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. $\alpha = 30^\circ$ UNLESS OTHERWISE STATED (TO BE ADJUSTED TO PREVENT BLOWING INTO SEAL PAN).
3. MATERIALS SHALL BE AS PER ENGINEERING DRAWING.
4. IN CASE OF CONFLICT ENGINEERING DRAWING SHALL GOVERN.
5. DIMENSIONS IN BRACKETS ARE FOR STAINLESS STEEL.
- * 6. INDICATED THICKNESS OF INTERNAL BAFFLE PLATE IS MINIMUM TO WHICH TWICE THE CORROSION ALLOWANCE IS TO BE ADDED.
- **7. ALL FILLET WELD SIZE SHALL BE OF 6MM MINIMUM TO WHICH THE CORROSION ALLOWANCE IS TO BE ADDED.

7	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL		NK	SM
6	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman

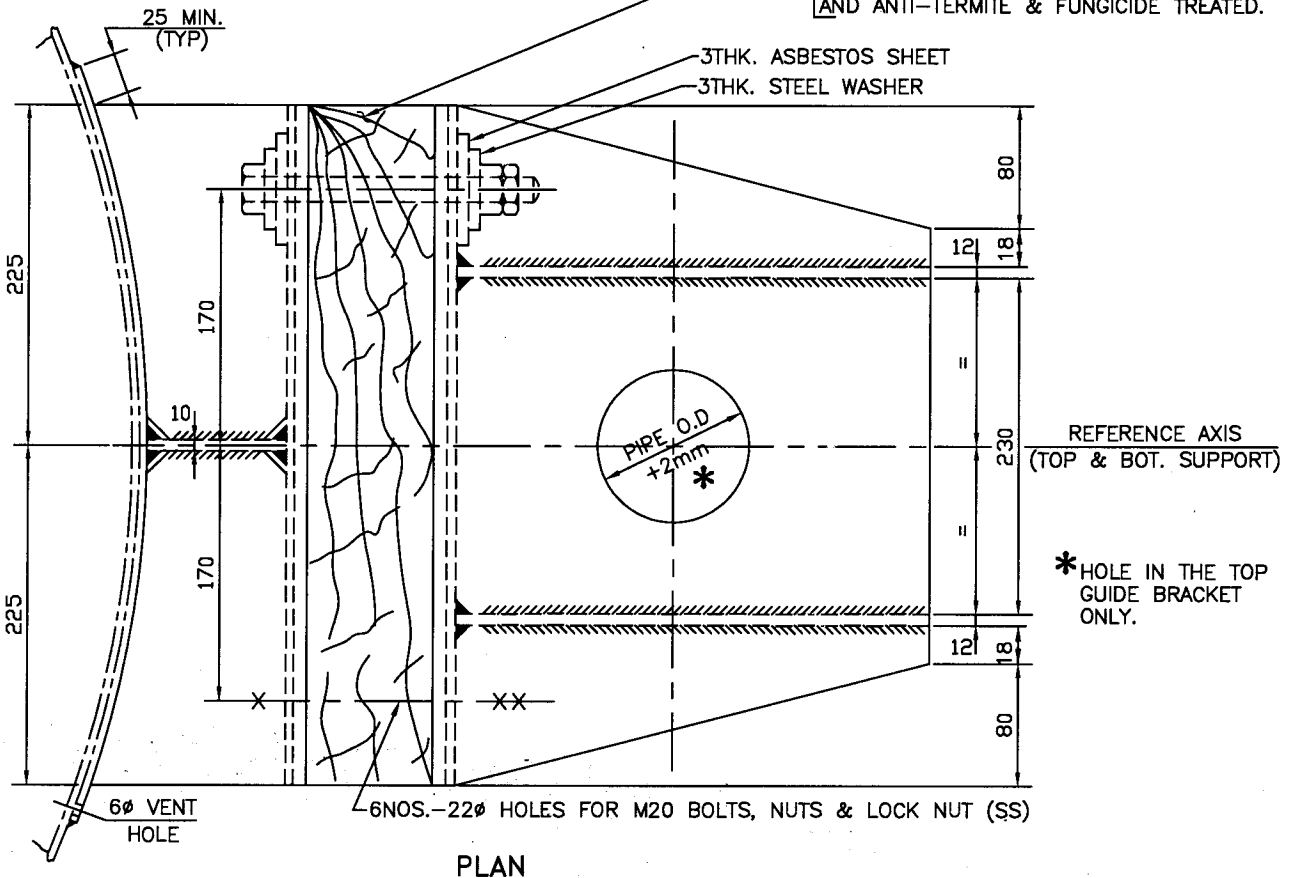
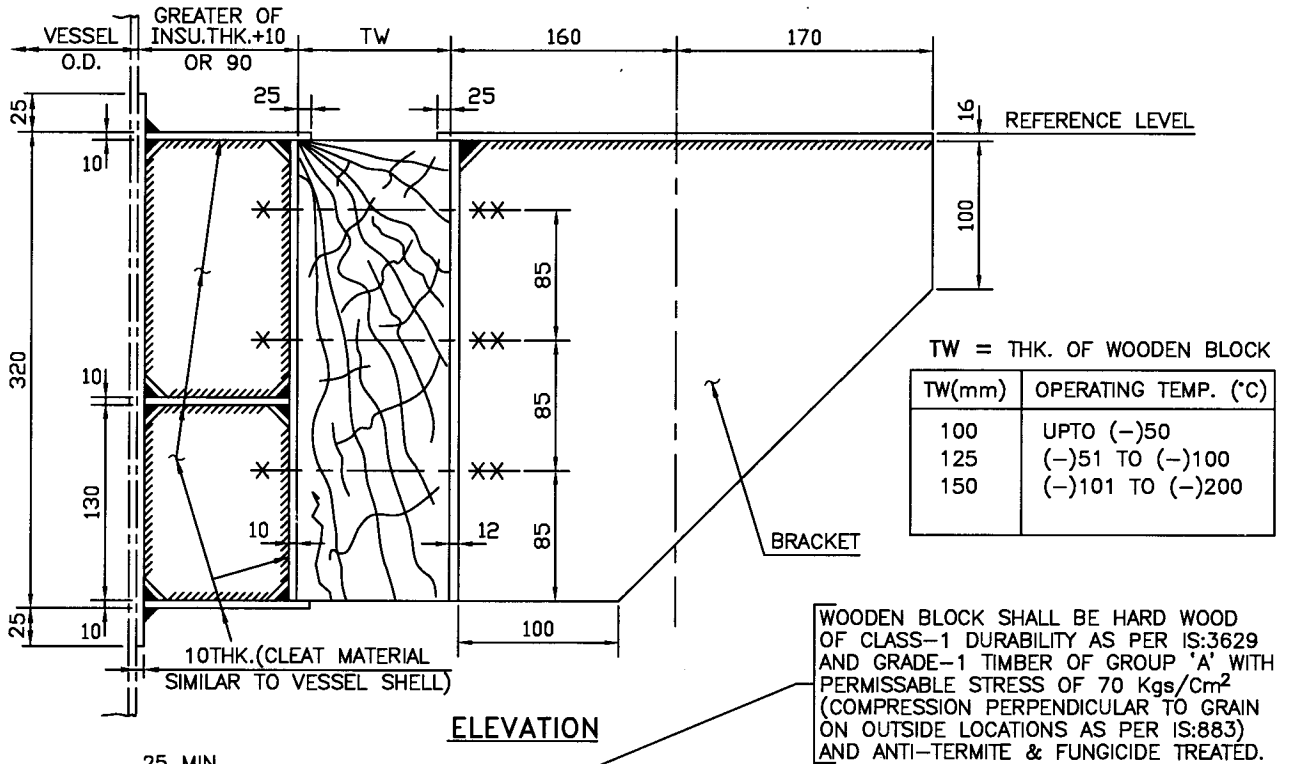


MAX. ERECTION WT. OF VESSEL (TONNES)		≤10	25	45	90	140	180
THICKNESS OF PLATE (MINIMUM)	T	12	28	40	50	70	80
WIDTH	W	200	230	300	400	500	610
LENGTH	L	400+E	460+E	580+E	750+E	900+E	1080+E
DIAMETER OF HOLE	D	60	75	75	100	130	150
HEIGHT OF NOTCH & SIDE WELD	H	130	130	150	200	250	300
RADIUS OF NOTCH	R	40	40	50	75	90	100
WELD SIZE (SEE NOTE 5)	A	10	14	20	30	38	46
BOTTOM OF BRACE TO TOP OF LUG	F	200	230	300	400	500	600
BOTTOM OF BRACE TO T.L. OF HEAD	E	SEE NOTE 2					
T.L. OF VESSEL TO BOTTOM OF LUG	B	200	230	280	350	400	480
	C	30	40	50	70	90	100
TOP OF LUG TO ϕ OF HOLE	J	90	90	115	150	180	230
	K	30	40	50	70	80	100
NO. OF LUGS		2	2	2	2	2	2

NOTES

- ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
- *2. DIMENSION 'E' IS TO BE DETERMINED BY THE SHAPE OF HEAD IN CONJUNCTION WITH DIMENSION 'K'.
- DETAIL, DIMENSIONS AND NOTES GIVEN IN ENGINEERING DRAWING TAKE PRECEDENCE OVER THOSE SHOWN HERE.
- FOR THIN WALLED EQUIPMENTS, DESIGNER SHALL ANALYSE THE STIFFNESS OF SHELL AT THE LIFTING LUG LOCATION.
- IF PADS ARE USED ON STAINLESS STEEL EQUIPMENTS THE SIZE OF FILLET WELD BETWEEN SHELL AND STAINLESS STEEL PAD SHALL BE ANALYSED.
- MATERIAL SHALL BE COMPATIBLE WITH HEAD MATERIAL.
- FOR INTERMEDIATE ERECTION WEIGHT, NEXT HIGHER SIZE OF LIFTING LUG SHALL BE USED.
- LIFTING LUG SHALL BE MACHINED TO COVER OFFSET BETWEEN OUTER DIAMETERS OF SHELL AND HEAD.

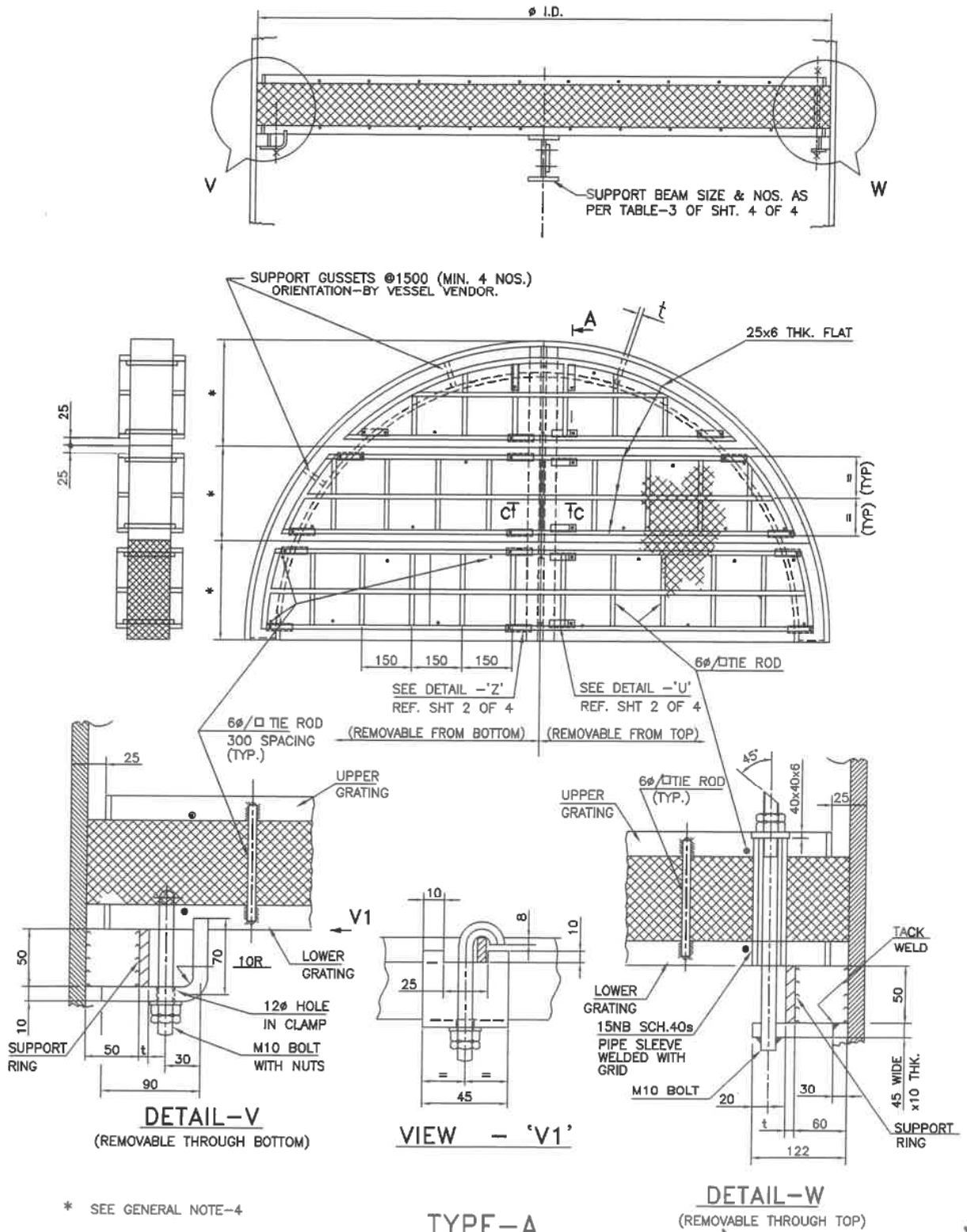
9	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKIL	SK	NK Nalwa	SM
8	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
						Approved by



NOTES

1. ALL DIMENSIONS ARE IN mm.
2. MATERIAL SPECIFICATION FOR BRACKET SHALL BE IS : 2062 UNLESS OTHERWISE STATED.
3. FOR DETAIL OF PIPE DAVIT REFER EIL STD. NO. 7-12-023.
4. TOP & BOTTOM SUPPORTS ARE IDENTICAL.
5. ALL FILLET WELDS ARE 10mm CONTINUOUS.

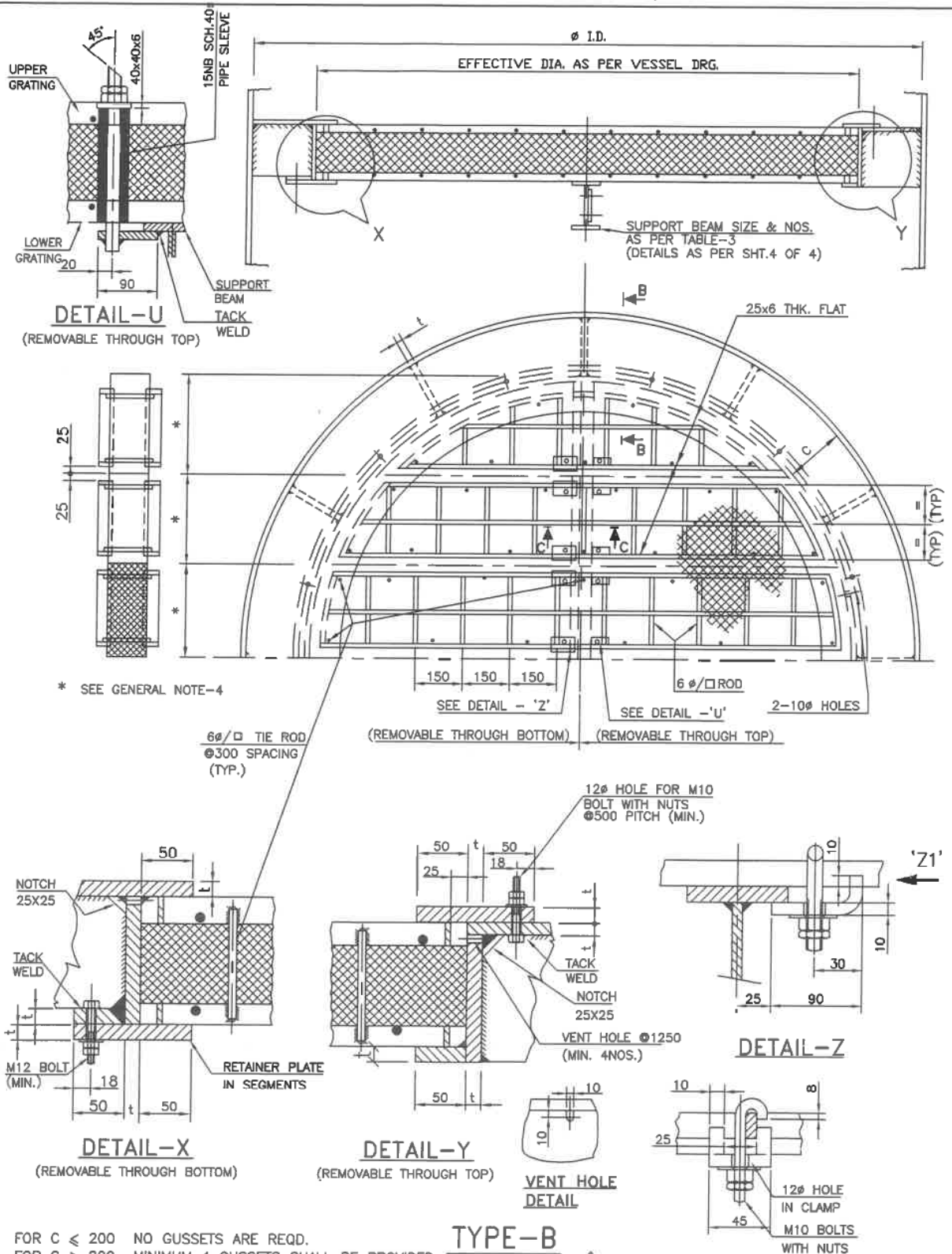
6	18.01.2022	REAFFIRMED AND REISSUED AS STANDARD	NIKHIL	TK	NK	SM
5	31.10.2016	REAFFIRMED AND REISSUED AS STANDARD	JIT SINGH	SK/KJH	RKT	RN
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
Approved by						



* SEE GENERAL NOTE-4

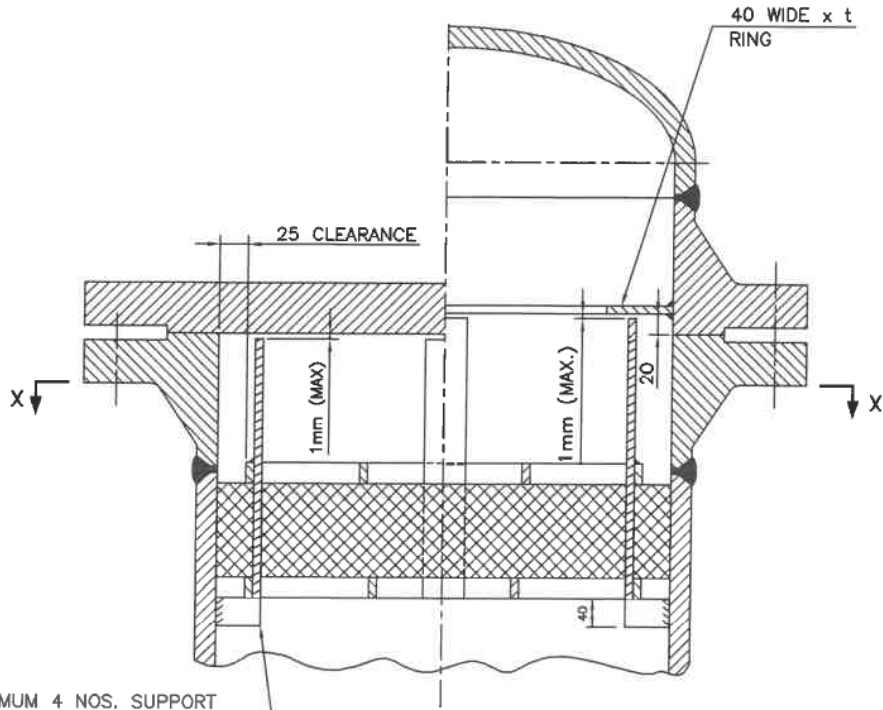
6	21.11.2024	REVISED AND REISSUED AS STANDARD	AS	TKh	KA/NK	MN
5	20.06.2019	REAFFIRMED AND REISSUED AS STANDARD	DP	TK	KJH	RKT
4	01.10.2013	REVISED AND REISSUED AS STANDARD	GCP	TK	RKT	SC

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
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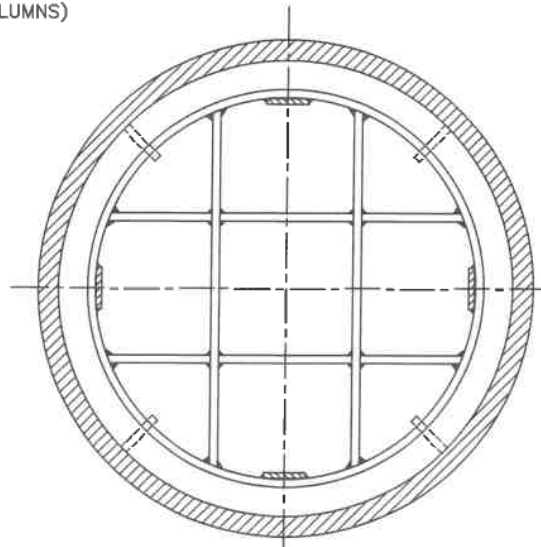


Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
6	21.11.2024	REVISED AND REISSUED AS STANDARD	AS	TKh	KANK Nalin	MN
5	20.06.2019	REAFFIRMED AND REISSUED AS STANDARD	DP	TK	KJH	RKT
4	01.10.2013	REVISED AND REISSUED AS STANDARD	GCP	TK	RKT	SC

Approved by



MINIMUM 4 NOS. SUPPORT
CLEATS (65x40xt)
EQUALLY SPACED
(t AS PER TABLE-1)
(NOT TO BE FOLLOWED FOR
TRAYED/PACKED COLUMNS)



SECTION X-X

TYPE-C

NOTES

1. THIS TYPE IS APPLICABLE FOR VESSELS WITH REMOVABLE COVERS.
2. GRATING FRAME AND HOLD DOWN BARS TO BE MADE FROM 25 X 6 THK. PLATE.

6	21.11.2024	REVISED AND REISSUED AS STANDARD	AS	TKh	KA/NK/Nalin	MN
5	20.06.2019	REAFFIRMED AND REISSUED AS STANDARD	DP	TK	KJH	RKT
4	01.10.2013	REVISED AND REISSUED AS STANDARD	GCP	TK	RKT	SC
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
					Approved by	

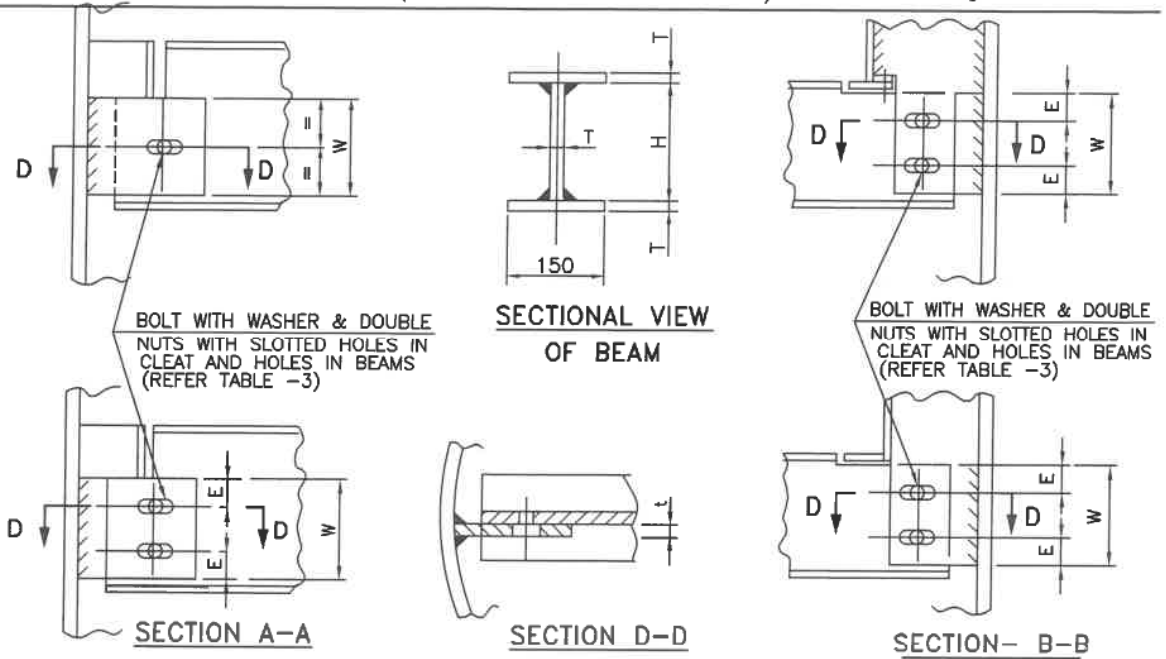
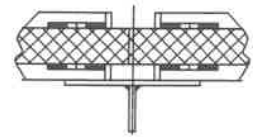


TABLE-1

CORROSION ALLOWANCE	SUPPORT CLEAT/RING THICKNESS (t)			
	CARBON & LOW ALLOY		STAINLESS STEEL [⊕]	
	UPTO 3000 ϕ	ABOVE 3001 ϕ	UPTO 3000 ϕ	ABOVE 3001 ϕ
0	6	10	6	10
1.5	10	14		
3.0	12	16		
6.0	18	22		

TABLE-2

CORROSION ALLOWANCE	MIN. FILLET WELD SIZE
0	6
1.5	8
3.0	10
6.0	12



SECTION- C-C
(REFER NOTE-4)

⊕ IF CORROSION ALLOWANCE IS SPECIFIED IN VESSEL DRG. THEN ADD 2xCA

TABLE-3

VESSEL I.D.(D)/ DEMISTER EFFECTIVE DIA.	NO. OF SUPPORT BEAM	H	T				S. STEEL (ADD 2xCA)	BOLT SIZE	SLOTTED HOLE	HOLE SIZE (ϕ)	NO OF BOLT		E	W
			CARBON STEEL AND LOW-ALLOY STEEL CORROSION ALLOWANCE								TYPE-A	TYPE-B		
			0.0	1.5	3.0	6.0								
UPTO 1800	—													
1801 < 3600	1	150					M16	18X30	20	1	2	30	90	
3601 < 5400	2	200	6	10	12	18	6	M16	18X30	20		35	125	
5401 < 7200	3	300						M20	22X36	24		50	175	
7201 < 9000	4	400						M24	26X40	28		50	325	

GENERAL NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. DEMISTER TYPE AND MATERIAL SHALL BE AS PER VESSEL DRAWING.
3. ALL INTERNAL BOLTS SHALL BE STAINLESS STEEL, OTHER MATERIALS SHALL BE AS PER VESSEL DRAWING.
4. WIDTH AND LENGTH OF EACH DEMISTER PIECE SHALL BE DECIDED BY VENDOR. HOWEVER THE WIDTH OF EACH PIECE SHALL BE SUCH THAT THE SAME CAN PASS THROUGH THE MANHOLE. THE LENGTH OF EACH PIECE SHALL NOT EXCEED 2.5 M.
5. ANY DETAIL SHOWN IN VESSEL DRAWING SHALL BE GIVEN PREFERENCE TO THAT OF STANDARD.
6. WIDTH OF SUPPORTING RING SHALL BE DECIDED BY VENDOR BASED ON LOADINGS.
7. DEMISTER PAD SHALL BE SUPPLIED SUITABLY OVER SIZED FOR SNUG FITTING.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convener	Stds. Bureau Chairman
6	21.11.2024	REVISED AND REISSUED AS STANDARD	AS	PKH	KA/INK	NALJA
5	20.06.2019	REAFFIRMED AND REISSUED AS STANDARD	DP	TK	KJH	RKT
4	01.10.2013	REVISED AND REISSUED AS STANDARD	GCP	TK	RKT	SC

पाइपिंग की रचना तथा उत्थापन
हेतु मानक विनिर्देश

STANDARD SPECIFICATION FOR
FABRICATION AND ERECTION OF
PIPING

6	28.03.25	REVISED AND ISSUED AS STANDARD SPECIFICATION	PK	SH	GB	MN
5	31.12.19	REVISED AND ISSUED AS STANDARD SPECIFICATION	PK	SH	MI	RKT
4	30.07.14	REVISED AND ISSUED AS STANDARD SPECIFICATION	SH	AK	RN	ATD SC
3	31.03.09	REVISED AND ISSUED AS STANDARD SPECIFICATION	RN	VKB	SC	ND
2	05.06.03	PMI REQ. INCLUDED AND ISSUED AS STANDARD SPECIFICATION	RN	DM	BN	SKG
Rev. No.	Date	Purpose	Prepared by	Checked by	Standards Committee Convener	Standards Bureau Chairman
Approved by						

Abbreviations:

A.S.	:	Alloy Steel
ASME	:	American Society of Mechanical Engineers
C.I.	:	Cast Iron
C.S.	:	Carbon Steel
IBR	:	Indian Boiler Regulations
LTCS	:	Low Temperature Carbon Steel
NACE	:	National Association of Corrosion Engineers
NB	:	Nominal Bore
NDT	:	Non Destructive Testing
P&ID	:	Piping and Instrumentation Diagram
PMI	:	Positive Material Identification
S.S.	:	Stainless Steel

Piping Standards Committee

Convenor: Mr. G. Balaji

Members : Mr. Udayan Chakravarty (Piping)
Ms. Sulakshana Hundekari (Piping)
Mr. Rameshwar Prasad (Piping)
Mr. K Anjaneyulu (S&ME)
Mr. Rajesh Chitara (SMMS)
Dr. Sudip Paul (Structural)
Mr. Harsh Vardhan (Projects)
Mr. Pankaj Kumar Rai (Construction)
Mr. T. Kamalakannan (SCM-Inspection)

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4.0	FABRICATION.....	8
5.0	ERECTION.....	11

1.0 SCOPE

This specification covers general requirements of fabrication and erection of above ground and trench piping systems at site. The specification covers the scope of work of Contractor, basis of work to be carried out by Contractor and standards, specifications and normal practice to be followed during fabrication and erection by the Contractor.

2.0 SCOPE OF WORK OF CONTRACTOR

Generally the scope of work of Contractor shall include the following:

2.1 Transportation of required piping materials (as described in Cl.2.1.1), pipe support (material as described in Cl. 2.3) and all other necessary piping materials from Owner's storage point or Contractor's storage point (in case of Contractor's scope of supply) to work site/shop including raising store requisitions for issue of materials in the prescribed format & maintaining an account of the materials received from Owner's stores.

2.1.1 Piping materials include the following but not limited to the same.

- a. Pipes (All sizes and schedule)
- b. Flanges (All sizes, types & Pressure ratings).
- c. Fittings (All sizes, types and schedule)
- d. Valves (All sizes, types and Ratings)
- e. Gaskets (All sizes, types & Ratings)
- f. Bolts, Nuts or M/C Bolts (All types)
- g. Expansion Joint/Bellows (All types)
- h. Specialty items like online filters, ejectors, sample coolers, steam traps, strainers, air traps, springs, silencers, snubbers, steam and condensate manifolds, injection nozzles, MOVs, sight glass, spray nozzles, integrated steam traps, hoses, hose couplings, etc.
- i. Online instruments like control valve, orifice flange, rotameter, safety valves, restriction orifice, rupture disc, de-super heaters, corrosion probes, annubar, magnetic flow meter, ultrasonic flow meter, Coriolis mass flow meters, venturi PG/PT/ Flow transmitter, ejectors, static mixers, flame arrestors, thermal flow switches, pre-fabricated hook-ups etc.
- j. Shut Down Valves with and without fire box.

2.2 Shop & field fabrication and erection of piping in accordance with documents listed under Cl.3.0 i.e. 'BASIS OF WORK' including erection of all piping materials enumerated above.

2.3 Fabrication and erection of pipe supports like shoe, saddle, guide, stops, anchors, clips, cradles, hangers, turn-buckles, supporting fixtures, bracket cantilevers, struts, tee-posts including erection of spring supports, sway braces, dummy pipes, corrosion pads/protection shields, low friction pads, clamps, special support, expansion bellows, steam and condensate manifolds supports etc. Corrosion Pads/Protection shields, stiffeners and stiffening rings, if not covered in the specifications/standards, shall be of the same material as of parent pipes.

2.4 Site fabrication of Piping items

Site fabrication of Piping items shall include but not be limited to the following

- 2.4.1 Fabrication of piping specials like special radius bends, reducers, mitres etc.
 - 2.4.2 Fabrication of plain and threaded nipples from pipes as required during erection.
 - 2.4.3 Fabrication of swage nipples as and when required.
 - 2.4.4 Fabrication of odd angle elbow like 60°, 30° or any other angle from 90°/45° elbows as and when required.
 - 2.4.5 Fabrication of flange, reducing flange, blind flange, spectacle blinds as and when required.
 - 2.4.6 Fabrication of stub-in connection with or without reinforcement.
 - 2.4.7 Grinding of edges of pipes, fittings, flanges etc. to match mating edges of uneven/different thickness wherever required.
 - 2.4.8 Fabrication of circular pipe for steam rings, fire water lines, utility lines.
 - 2.4.9 Threading of all small bore piping as per piping material specifications.
 - 2.4.10 Drilling on blind flange for inserting / joining small bore lines.
 - 2.4.11 Fabrication and welding of reinforcement pads at branch pipe locations wherever required.
 - 2.4.12 Equipment nozzle reinforcement with pads, jacket & stiffeners wherever required.
 - 2.4.13 Fabrication of injection nozzles as per details provided wherever required.
 - 2.4.14 Fabrication of chain operation arrangement for valves, wherever required. All material required for this modification shall be supplied by Contractor.
 - 2.4.15 Fabrication and erection in position of funnels required for OWS/ SS/ Condensate blow down system as per direction of Engineer-in-charge.
 - 2.4.16 Grinding/ finishing of uneven surfaces/ joints after welding. Internal grinding of welds of orifice flanges to render smooth surface.
 - 2.4.17 Tapping and drilling of holes in flanges, blind flanges etc. for making piping connections, providing jack screws in tapped and drilled holes, if required.
 - 2.4.18 Providing bird screens at the outlet of lines open to atmosphere.
- 2.5 Modifications like providing additional cleats, extension of stem of valve, locking arrangement of valves etc. as and when required. Seal welding of plugs in orifice flange excess tapplings, threaded drain plugs provided in valves as per direction of Engineer in charge.
- 2.6 Piping isometrics for main process/utility lines shall be provided to the Contractor for Units.

Preparation of miscellaneous small bore isometrics with bill of materials for process and utility lines (up to 1½" size) like instruments & pump flushing / cooling, sample connection, purging, pump casing vents & drains, pump base plate drains, control valve drains / vent to flare, instrument drains & vents, steam tracing (non-IBR) from steam supply stations up to

condensate recovery station, and lines specified as field routed within the Unit battery limit as and when required are in Contractor's scope of work. Approval for these isometrics prepared by the Contractor shall be taken from Engineer-in-charge before erection.

Small bore piping isometrics given by Owner shall be rechecked by Contractor before erection and installation.

- 2.7 Obtaining approval for drawings prepared by Contractor from statutory authority, if required. Contractor shall also arrange all necessary permits for hot work etc.
- 2.8 Spun concrete lining of the inside of pipes 3" NB & above including fittings and flanges as required in accordance with specification.
- 2.9 Rubber lining inside pipes, fittings, flanges as and when required, in accordance with specification.
- 2.10 Radiography, stress relieving, dye penetration, magnetic particle test etc. as required in specification.
- 2.11 Performing PMI using alloy analyzers as per 'Standard Specification for Positive Material Identification at Construction Sites, 6-82-0002'.
- 2.12 Casting of concrete pedestals and Fabrication and erection of small structures/ platforms for pipe supports and valve operation / attending some instruments, spectacle blinds etc., providing brackets, modification / extension of platforms, providing additional platforms / ladders for improving / providing accessibility.
- 2.13 Providing insert plates with anchor fasteners in concrete structures / paved floors. Cutting and repair of platform gratings around pipe openings and providing suitable members for support under the platform grating.
- 2.14 Making material reconciliation statement and return of Owner's supply left over materials to Owner's storage.
- 2.15 Flushing and testing of all piping systems as per standard specification for inspection, flushing and testing of piping systems (Specification No. 6-44-0013). The accessories required for blinding the line like flange, blind flange, gasket (all sizes, type and rating), stud-bolts, flexible hoses etc. are to be arranged by the Contractor. During flushing the discharged water / air shall be drained / routed as directed by the Engineer – In Charge.
- 2.16 Contractor shall prepare welding specifications for all weld joints where dissimilar welding will be performed, and obtain approval from EIL.
- 2.17 Contractor to ensure meeting all requirements for carrying out work in shutdown/running plant.
- 2.18 Pickling (as and when applicable) as per Job specification(s) for chemical cleaning of CS suction piping of compressors, SS Piping, Weldments etc, as applicable.
- 2.19 Chemical Cleaning/ Hydro jet cleaning as per marked-up P&IDs with supply of chemicals, consumables, DM water, equipments, boilers, coupons, tools & tackles and other testing equipments required for the same.
- 2.20 For Offsites, only Piping General Arrangement drawings shall be issued. Isometrics, if required, shall be prepared by the Contractor.

3.0 BASIS FOR WORK

- 3.1 The complete piping work shall be carried out in accordance with the following:
- 3.1.1 "Approved for Construction" drawings and sketches issued by EIL to the Contractor - Plans and/or Isometrics.
- 3.1.2 "Approved for Construction" drawings and sketches issued by Turn-key bidders to the Contractor - Plans and/or Isometrics.
- 3.1.3 Approved Process Licensor's standards and specifications.
- 3.1.4 Drawings, sketches and documents prepared by Contractor duly approved by Engineer-in-Charge (such as isometrics of small bore piping and offsite piping etc.).
- 3.1.6 EIL specifications/documents as below:
- a. Process and Instrument Diagram.
 - b. Job Piping Materials Specification (****-6-44-0005). **** denotes job number.
 - c. Piping support, engineering standards.
 - d. Line list
 - e. Piping support indices (only in offsite), if supports are not shown in plan.
 - f. Job specification of Non-destructive Requirement of Piping (****-6-44-0016)
 - g. Job Welding Specification Charts for Piping Classes (****-6-77-0005)
 - h. Job Welding specification for fabrication of piping (****-6-77-0001).
 - i. Any other EIL or OTHER specifications attached with Piping Material Specification or special condition of contract (such as standard for cement lining of pipe, standard of jacketed piping, standard for steam tracing, Dimensional Tolerances etc.)
 - j. Standard specification for positive material identification (PMI) at construction sites, 6-82-0002
 - k. Standard Spec for application of torque & hydraulic bolt tension for flange joints (6-76-0002) and its addendum, if any.
- 3.1.7 Following codes, standards and regulations
- a. ASME B 31.3 : Process Piping
 - b. ASME Sec. VIII : Code for unfired pressure vessel.
 - c. IBR Regulations
 - d. ASME Sec. IX : Qualification standard for welding and brazing procedures, welders, brazers and welding and brazing operators.

- e. NACE Std. : Code for Sour Services material requirements
MR-0175/MR0103/Job spec(NACE), as applicable

Note : All codes referred shall be latest edition, at the time of award of contract.

3.2 Deviations

Where a deviation from the "Basis of Work" and approved job procedure described above is required or where the basis of work does not cover a particular situation, the matter shall be brought to the notice of Engineer-in-Charge and the work carried out only after obtaining written approval from him in each case.

4.0 FABRICATION

4.1 Piping Material

Pipe, pipe fittings, flanges, valves, gaskets, studs bolts etc. used in a given piping system shall be strictly as per the "Piping Material Specification" for the "Pipe Class" specified for that system. To ensure the above requirement, all piping material supplied by the Owner / Contractor shall have proper identification marks as per relevant standards / EIL specifications / Licensors specification. Contractor shall provide identification marks on left over pipe lengths wherever marked up pipe lengths have been fabricated/erected. Material- traceability is to be maintained for A.S., S.S., NACE, LTCS, material for Hydrogen service and other exotic materials by way of transferring heat number, etc. (hard punching) as per approved procedure. This shall be in addition to colour coding for all piping materials to avoid mix-up.

For the purpose of common understanding the construction job procedure, to be submitted by the Contractor, shall include proposal for

- Maximizing prefabrication, inspection and testing at fabrication shop with minimum field joints.
- Positive material identification, handling, storage & preservation.

4.2 Dimensional Tolerances

Dimensional tolerances for piping fabrication shall be as per EIL Standard No. 7-44-0486. The Contractor shall be responsible for working to the dimensions shown on the drawings. However, the Contractor shall bear in mind that there may be variations between the dimensions shown in the drawing and those actually existing at site due to minor variations in the location of equipments, inserts, structures etc. Isometrics, if supplied may have the field welds marked on them. However, it is the responsibility of the Contractor to provide adequate number of field welds. Wherever errors / omissions/ mismatches occur in drawings and Bills of Materials it shall be the Contractor's responsibility to notify the Engineer-in-Charge prior to fabrication or erection.

4.3 IBR Piping

- 4.3.1 Contractor shall obtain approval for the piping systems falling under purview of IBR from the statutory Indian Boiler Regulations (IBR) authority of the state where the plant is situated. The Owner shall provide documentation for the IBR System. The Contractor shall carry out the fabrications, erection and testing of this piping as per requirements of Indian Boiler Regulations and to the entire satisfaction of the local Boiler Inspector. The Contractor shall also get the approval of IBR inspector for all fabrication and testing done by him at his own cost. All certificates of approval shall be in proper IBR forms.

- 4.3.2 IBR Package for residual, field routed and site modified steam lines shall be prepared by the Contractor. IBR approval for the same shall be in Contractor's scope, at his own cost.

4.4 Pipe Joints

The piping class of each line specifies the type of pipe joints to be adopted. In general, joining of lines 2" and above in process and utility piping shall be accomplished by butt-welds. Joining of lines 1-1/2" and below shall be by socket welding/butt welding/threaded joints as specified in "Piping Material Specifications". However, in piping 1-1/2" and below where socket welding/ threaded joints are specified butt - welds may be used with the approval of Engineer-in-Charge for pipe to pipe joining in long runs of piping. This is only applicable for non-galvanized piping without lining.

Flange joints shall be used at connections to Vessels, Equipment's, Valves and where required for ease of erection and maintenance as indicated in drawings.

4.5 Butt Welded and Socket Welded Piping

End preparation, alignment and fit-up of pipe pieces to be welded, welding, pre-heating, post-heating and heat treatment shall be as described in the Job welding specification (****-6-77-0005) and NDT specification (****-6-44-0016).

4.6 Screwed Piping

In general, Galvanized piping shall have threads as per IS:554 or ANSI B2.1 NPT as required to match threads on fittings, valves etc. All other piping shall have threads as per ANSI B2.1, tapered unless specified otherwise.

Threads shall be clean cut, without any burrs or stripping and the ends shall be reamed. Threading of pipes shall be done preferably after bending, forging or heat treating operations. If this is not possible, threads shall be gauge checked and chased after welding heat treatment etc.

During assembly of threaded joints, all threads of pipes and fittings shall be thoroughly cleaned of cuttings, dirt, oil or any other foreign matter. The male threads shall be coated with thread sealant and the joint tightened sufficiently for the threads to seize and give a leakproof joint. Threaded joints to be seal-welded shall be cleaned of all foreign matter, including sealant and made up to full thread engagement before seal welding.

It is the responsibility of the contractor to ensure leak proof joints and to maintain good workmanship handling or making threads during assembly.

4.7 Flange Connections

All flange facings shall be true and perpendicular to the axis of pipe to which they are attached. Flanged bolt holes shall straddle the normal centerlines unless different orientation is shown in the drawing.

Wherever jack screws are to be provided, drilling and tapping for the jack screws in the flange, shall be done as per EIL Standard before welding it to the pipe.

4.8 Branch Connections

Branch connections shall be as indicated in the piping material specifications. For end preparation, alignment, spacing, fit-up and welding of branch connections refer welding specifications. Templates shall be used wherever required to ensure accurate cutting and proper fit-up.

For all branch connections accomplished either by pipe to pipe connections or by using forged tees the rates quoted for piping shall be inclusive of this work.

Reinforcement pads shall be provided wherever indicated in drawings/ specifications etc. Reinforcement pads shall be pneumatically tested at 1.05 kg/cm²g with soap solution. This test shall be carried out before hydrostatic testing.

4.9 Bending

Bending shall be as per ASME B31.3 except that corrugated or creased bends shall not be used.

Cold bends for lines 1-1/2" and below, with a bend radius of 5 times the nominal diameter shall be used as required in place of elbows wherever allowed by piping specifications. Bending of pipes 2" and above may be required in some cases like that for headers around heaters, reactors etc.

The completed bend shall have a smooth surface, free from cracks, buckles, wrinkles, bulges, flat spots and other serious defects. They shall be true to dimensions. The flattening of a bend, as measured by the difference between the maximum and minimum diameters at any cross-section, shall not exceed 8% and 3% of the nominal outside diameter, for internal and external pressure respectively.

4.10 Forging and Forming

Forging and forming of small bore fittings, like reducing nipples for piping 1-1/2" and below, shall be as per ASME B 31.3.

4.11 Mitre Bends and Fabricated Reducers

The specific application of welded mitre bends and fabricated reducers shall be governed by the Piping Material Specifications. Reducers shall be fabricated as per directions of Engineer-in-Charge. The radiographic requirements shall be as per Material Specifications for process and utility systems and NDT Specification for steam piping under IBR, radiographic requirements of IBR shall be complied with.

4.12 Cutting and Trimming of Standard Fittings & Pipes

Components like pipes, elbows, couplings, half-couplings etc. shall be cut / trimmed / edge prepared wherever required to meet fabrication and erection requirements, as per drawings and instructions of Engineer-in-Charge. Nipples as required shall be prepared from straight length piping.

4.13 Galvanized Piping

Galvanized carbon steel piping shall be completely cold worked, so as not to damage galvanized surfaces. This piping involves only threaded joints and additional external threading on pipes may be required to be done as per requirement.

4.14 Jacketed Piping

The Jacketing shall be done in accordance with EIL Specification or Licensors specification as suggested in material specification or special condition of contract.

Pre-assembly of jacketed elements to the maximum extent possible shall be accomplished at shop by Contractor. Position of jump-over and nozzles on the jacket pipes, fittings etc. shall be marked according to pipe disposition and those shall be prefabricated to avoid damaging of inner pipe and obstruction of jacket space. However, valves, flow glasses, in line instruments or even fittings shall be supplied as jacketed.

4.15 Shop Fabrication / Prefabrication

The purpose of shop fabrication or pre-fabrication is to minimize work during erection to the extent possible. Piping spool, after fabrication, shall be stacked with proper identification marks, so as facilitate their withdrawal at any time during erection. During this period all flange (gasket contact faces) and threads shall be adequately fabricated by coating with removable rust preventive. Care shall also be taken to avoid any physical damage to flange faces and threads.

4.16 Miscellaneous

4.16.1 Contractor shall fabricate miscellaneous elements like flash pot, seal pot, sample cooler, supporting elements like turn-buckles, extension of spindles and interlocking arrangement of valves, operating platforms as required by Engineer-in-Charge.

4.16.2 Spun Concrete Lining

The work of inside spun concrete lining of pipes and specials of diameter 3" and above shall be done as per material specifications and special condition contract.

4.16.3 Fabrication of pipes from plate

Pipes shall be fabricated at site as and when required as per the specifications and the actual Piping Material Specification.

5.0 ERECTION

5.1 Cleaning of Piping before Erection

Before erection all pre-fabricated spool pieces, pipes, fittings etc. shall be cleaned inside and outside by suitable means. The cleaning process shall include removal of all foreign matter such as scale, sand, weld spatter chips etc. by wire brushes, cleaning tools etc. and blowing with compressed air/or flushing out with water. Special cleaning requirements for some services, if any, shall be as specified in the piping material specification or isometric or line list. S.S jacketed piping requiring pickling shall be pickled to remove oxidation and discolouring due to welding.

5.2 Piping Routing

No deviations from the piping route indicated in drawings shall be permitted without the consent of Engineer-in-Charge.

Pipe to pipe, pipe to structure / equipments distances / clearances as shown in the drawings shall be strictly followed as these clearances may be required for the free expansion of piping

/ equipment. No deviations from these clearances shall be permissible without the approval of Engineer-in-Charge.

In case of fouling of a line with other piping, structure, equipment etc. the matter shall be brought to the notice of Engineer-in-Charge and corrective action shall be taken as per his instructions.

5.3 Cold Pull

Wherever cold pull is specified, the Contractor shall maintain the necessary gap, as indicated in the drawing. Confirmation in writing shall be obtained by the Contractor from the Engineer-in-Charge, certifying that the gap between the pipes is as indicated in the drawing, before drawing the cold pull. Stress relieving shall be performed before removing the gadgets for cold pulling.

5.4 Slopes

Slopes specified for various lines in the drawings / P&ID shall be maintained by the Contractor. Corrective action shall be taken by the Contractor in consultation with Engineer-in-Charge wherever the Contractor is not able to maintain the specified slope.

5.5 Expansion Joints / Bellows

Installation of Expansion Joints/Bellows shall be as follows:

5.5.1 All Expansion joints / Bellows shall be installed in accordance with the specification and installation drawings, supplied to the Contractor.

5.5.2 a. Upon receipt, the Contractor shall remove the Expansion Joints/ Bellows from the case(s) and check for any damage occurred during transit.

b. The Contractor shall bring to the notice of the Engineer-in- Charge any damage done to the bellows / corrugations, hinges, tie-rods, flanges/ weld ends etc.

c. Each Expansion Joint / Bellow shall be blown free of dust / foreign matter with compressed air or cleaned with a piece of cloth.

5.5.3 a. For handling and installation of Expansion Joints, great care shall be taken while aligning. An Expansion Joints shall never be slinged from bellows corrugations/ external shrouds, tie / rods, angles.

b. An Expansion Joints / Bellow shall preferably be slinged from the end pipes / flanges or on the middle pipe.

5.5.4 a. All Expansion Joints shall be delivered to the Contractor at "Installation length", maintained by means of shipping rods, angles welded to the flanges or weld ends or by wooden or metallic stops.

b. Expansion Joints stop blocks shall be carefully removed after hydrostatic testing. Angles welded to the flanges or weld ends shall be trimmed by saw as per manufacturer's instructions and the flanges or weld ends shall be ground smooth.

5.5.5 a. The pipe ends in which the Expansion Joint is to be installed shall be perfectly aligned or shall have specified lateral deflection as noted on the relevant drawings.

b. The pipe ends / flanges shall be spaced at a distance specified in the drawings.

- 5.5.6 The Expansion Joint shall be placed between the mating pipe ends / flanges and shall be tack welded/bolted. The mating pipes shall again be checked for correct alignment.
- 5.5.7 Butt-welding shall be carried out at each end of the expansion joint. For flanged Expansion Joint, the mating flanges shall be bolted.
- 5.5.8 After the Expansion Joint is installed the Contractor shall ensure that the mating pipes and Expansion Joints are in correct alignment and that the pipes are well supported and guided.
- 5.5.9 The Expansion Joint shall not have any lateral deflection. The Contractor shall maintain parallelism of restraining rings or bellows convolutions.
- 5.5.10 Precautions
- For carrying out welding, earthing lead shall not be attached with the Expansion Joint.
 - The Expansion bellow shall be protected from arc weld spot and welding spatter.
 - Hydrostatic Testing of the system having Expansion Joint shall be performed with shipping lugs in position. These lugs shall be removed after testing and certification is over.

5.6 Flange Connections

While fitting up mating flanges, care shall be exercised to properly align the pipes and to check the flanges for trueness, so that faces of the flanges can be pulled together, without inducing any stresses in the pipes and the equipment nozzles. Extra care shall be taken for flange connections to pumps, turbines, compressors, cold boxes, air coolers etc. The flange connections to these equipments shall be checked for misalignment, excessive gap etc. after the final alignment of the equipment is over. The joint shall be made up after obtaining approval of Engineer-in-Charge.

Hydraulic bolt tensioning & torque tensioning shall be performed on flange joints as per the requirements specified in "Standard Specification for application of Torque & Hydraulic Bolt Tension for flange joints," 6-76-0002 and its addendum, if any.

Temporary protective covers shall be retained on all flange connections of pumps, turbines, compressors and other similar equipments, until the piping is finally connected, so as to avoid any foreign material from entering these equipments.

The assembly of a flange joint shall be done in such a way that the gasket between these flange faces is uniformly compressed. To achieve this, the bolts shall be tightened in a proper sequence. All bolts shall extend completely through their nuts but not more than 1/4".

Steel to C.I. flange joints, if any, shall be made up with extreme care, tightening the bolts uniformly after bringing flange flush with gaskets with accurate pattern and lateral alignment.

5.7 Vents and Drains

High point vents and low point drains shall be provided as per the instructions of Engineer-in-Charge, even if these are not shown in the drawings. The details of vents and drains shall be as per piping material specifications / job standards.

5.8 Valves

Valves shall be installed with spindle / actuator orientation / position as shown in the layout drawings. In case of any difficulty in doing this or if the spindle orientation / position is not shown in the drawings, the Engineer-in-Charge shall be consulted and work done as per his instructions. Care shall be exercised to ensure that globe valves, check valves, and other uni-directional valves are installed with the "Flow direction arrow" on the valve body pointing in the correct direction. If the direction of the arrow is not marked on such valves, this shall be done in the presence of Engineer-in-Charge before installation.

Fabrication of stem extensions, locking arrangements, interlocking arrangements of valves (if called for) and change in orientation of spindles (if required as per site conditions) shall be carried out as per drawings/ instructions of Engineer-in-Charge.

5.9 Instruments

Installation of in-line instruments such as control valve, orifice flange, rotameter, safety valves, restriction orifice, rupture disc, de-super heaters, corrosion probes, annubar, magnetic flow meter, ultrasonic flow meter, Coriolis mass flow meters, venturi PG/PT/ Flow transmitter, ejectors, etc. and Shut Down Valves with fireboxes shall form a part of piping erection work.

Fabrication and erection of piping upto first block valve / nozzle / flange for installation of offline Instruments for measurement of level, pressure, temperature, flow etc. shall also form part of piping construction work. The limits of piping and instrumentation work will be shown in drawings / standards / specifications. Orientations / locations of take-offs for temperature, pressure, flow, level connections etc. shown in drawings shall be maintained.

Flushing and testing of piping systems which include instruments mentioned above and the precautions to be taken are covered in flushing, testing and inspection of piping (EIL Spec. 6-44-0013). Care shall be exercised and adequate precautions taken to avoid damage and entry foreign matter into instruments during transportation, installation, testing etc.

5.10 Line Mounted Equipments / Items

Installation of line mounted items like filters, strainers, steam traps, air traps, desuperheaters, ejectors, samples coolers, mixers, flame arrestors, sight glasses etc including their supporting arrangements shall form part of piping erection work.

5.11 Bolts and Nuts

The Contractor shall apply molycoat grease mixed with graphite powder (unless otherwise specified in piping classes) all bolts and nuts during storage, after erection and wherever flange connections are broken and made-up for any purpose whatsoever. The grease and graphite powder shall be supplied by the Contractor within the rates for piping work.

5.12 Pipe Supports

Pipe supports are designed and located to effectively sustain the weight and thermal effects of the piping system and to prevent its vibrations. Location and design of pipe supports will be shown in drawings for lines 2" NB & above. For lines 1½"NB & below Contractor shall locate and design pipe supports in line with EIL Stds. In case of IBR Lines 1½"NB & below only indicative supporting shall be provided & detailing of such supports is in Contractor's scope. Contractor shall obtain approval of Engineer - in - Charge on drawings prepared by Contractor, before erection. However, any extra supports desired by Engineer-in-Charge shall also be installed. Upon issue of drawings contractor to prepare BOM for support members in

contractor's scope for procurement action. Pipe shall be erected along with the primary support to the maximum extent to minimize works at height.

No pipe shoe / cradle shall be offset unless specifically shown in the drawings.

Hanger rods shall be installed inclined in a direction opposite to the direction in which the pipe move during expansion.

Piping (including small bore) shall not be supported directly from gratings of platforms including equipment platforms.

Preset pins of all spring supports shall be removed only after hydrostatic testing and insulation is over. Springs shall be checked for the range of movement and adjusted if necessary to obtain the correct positioning in cold condition. These shall be subsequently adjusted to hot setting in operating condition. The following points shall be checked after installation, with the Engineer-in-Charge and necessary confirmation in writing obtained certifying that:

- All restraints have been installed correctly.
- Clearances have been maintained as per support drawings.
- Insulation does not restrict thermal expansion.
- All temporary tack welds provided during erection have been fully removed.
- All welded supports have been fully welded.

5.13 Dismantling and Modifications

Dismantling/ modification of erected piping shall be carried out, if required for routing of lines as per revised Isometrics. All necessary clearances have to be taken by contractor from Engineer-in-charge.

पइपिंग निकायों के निरीक्षण, प्रक्षालन तथा
परीक्षण हेतु मानक विनिर्देश

**STANDARD SPECIFICATION FOR
INSPECTION, FLUSHING AND
TESTING OF PIPING SYSTEMS**

6	28.09.23	REVISED & ISSUED AS STANDARD SPECIFICATION	ABA	SH	GB	SM	
5	31.07.18	REAFFIRMED&ISSUED AS STANDARD SPECIFICATION	PK	SH	MI	RKT	
4	01.07.13	REVISED & ISSUED AS STANDARD SPECIFICATION	UK	SH	RN	ATD	DM
3	27.08.07	REVISED & ISSUED AS STANDARD SPECIFICATION	RN	ATD	DM	VC	
2	05.06.03	PMI REQT. INCLUDED AND ISSUED AS STANDARD SPECIFICATION	RN	DM	BN	SKG	
Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convonor	Standards Bureau Chairman	Approved by

Abbreviations:

ASME :	The American Society of Mechanical Engineers
IBR :	Indian Boiler Regulations
PMI :	Positive Material Identification
ppm :	Parts per million
SS :	Stainless Steel

Piping Standards Committee

Convenor: Mr. G. Balaji

Members : Mr. Udayan Chakravarty
Mr. Rameshwar Prasad
Mr. K. Anjaneyulu (SMED)
Mr. Rajesh Chitara (SMMS)
Mr. S.C. Maity (Structural)
Mr. Harsh Vardhan (Projects)
Mr. P.K. Rai (Construction)

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1.0 SCOPE

This specification covers the general requirements for inspection, flushing and testing of piping systems. However, testing of steam lines falling under IBR shall also be governed by Indian Boiler Regulations.

Flushing and testing of all piping systems shall be witnessed by the Engineer-In-Charge.

2.0 REFERENCES

ASME B31.3	:	Process Piping
IBR	:	Indian Boiler Regulations
6-82-0002	:	Standard Specification for Positive Material Identification (PMI) at Construction Sites

3.0 INSPECTION

During various stages and after completion of fabrication and erection, the piping system shall be inspected by the Engineer-In-Charge to ensure that:

- Proper piping material has been used.
- PMI has been performed as per EIL specification '6-82-0002'.
- Piping has been erected as per drawings and instructions of Engineer-In-Charge.
- All supports have been installed correctly.
- Test preparations mentioned in this specification have been carried out.

4.0 FLUSHING

Flushing of all lines shall be done before pressure testing.

Flushing shall be done by 'fresh potable water' or by 'dry compressed air wherever water flushing is not desirable to clean the pipe of all dirt, debris or loose foreign material.

Required pressure for water flushing shall meet the fire hydrant pressure or utility water pressure. For air flushing, the line/system shall be pressurized by compressed air at the required pressure which shall be 3.5kg/cm²g maximum. The pressure shall then be released by quick opening of a valve, already in line or installed temporarily for this purpose. This procedure shall be repeated as many times as required till the inside of the pipe is fully cleaned.

In line instruments like control valves, orifice plates, rotameters, safety valves and other instruments like thermowells which may interfere with flushing shall not be included in flushing circuit.

The screens/meshes shall be removed from all permanent strainers before flushing. Screens/meshes shall be reinstalled after flushing but before testing.

During flushing temporary strainers shall be retained. These shall be removed, cleaned and reinstalled after flushing, but, before testing.

In case any equipment such as column, vessel, exchanger etc. form part of a piping circuit during flushing, this shall be done with the approval of Engineer-In-Charge. However, equipment thus included in the circuit shall be completely drained and dried with compressed air after flushing is completed.

During flushing discharged water/air shall be drained to the place directed by the Engineer-In-Charge. If necessary, proper temporary drainage shall be provided by the contractor.

Care shall be taken during flushing so as not to damage/spoil work of other agencies. Precautions shall also be taken to prevent entry of water/foreign matter into equipment, electric motors, instruments, electrical installations etc. in the vicinity of lines being flushed.

The contractor shall carry out all the activities required before, during and after the flushing operation, arising because of flushing requirements, such as but not limited to the following:

Dropping of valves, specials, distance pieces, inline instruments and any other piping part before flushing. The flanges to be disengaged for this purpose shall be envisaged by the contractor and approved by the Engineer-In-Charge. These flanges shall be provided with temporary gaskets at the time of flushing.

After flushing is completed and approved, the valve distance pieces, piping specials etc. shall be reinstalled by the contractor with permanent gaskets. However, flanges at equipment nozzles and other places where isolation is required during testing, only temporary gaskets shall be provided.

Records in triplicate shall be prepared and submitted by the contractor for each piping system for the flushing done in the proforma provided/approved by the Engineer-in-Charge.

5.0 PRESSURE TESTING

Pressure testing, in general shall be as per clause 345 of ASME B31.3, unless otherwise specified, herein. Lines carrying highly hazardous/poisonous fluids must have a sensitive leak test. For IBR lines, 'IBR Regulations' shall also be followed.

5.1 Extent of Testing

With the exclusion of instrumentation, piping systems fabricated or assembled in the field shall be tested irrespective of whether or not they have been pressure tested prior to site welding or fabrication.

To facilitate the testing of piping systems, vessels and other equipment may be included in the system with the prior approval of Engineer-In-Charge if the test pressure specified is equal to or less than that for the vessels and other equipment.

Pumps, compressors and other rotary equipment shall not be subjected to field test pressure.

Lines which are directly open to atmosphere such as vents, drains, safety valves discharge need not be tested, but all joints shall be visually inspected. Wherever necessary, such lines shall be tested by continuous flow of fluid to eliminate the possibility of blockage. However, such lines if provided with block valve shall be pressure tested up to the last block valve.

Seats of all valves shall not be subjected to a pressure in excess of the maximum cold working pressure of the valve. Test pressure applied to valves shall not be greater than the manufacturer's recommendation nor less than that required by the applicable code. Where allowable seat pressure is less than test pressure, test shall be made through an open valve.

Instruments in the system to be tested shall be excluded from the test by isolation or removals, unless approved otherwise by the Engineer-In-Charge.

Restrictions which interfere with filling, venting, draining such as orifice plates etc. shall not be installed unless testing is complete.

Control valves shall not be included in the test system. Where bypasses are provided test shall be performed through the bypass and/or necessary spool shall be used in place of the control valve.

Pressure gauges which are part of the finished system, but cannot withstand test pressure shall not be installed until the system has been tested. Where piping systems to be tested are directly connected at the battery limits to piping for which the responsibility rests with other agencies, the piping to be tested shall be isolated from such piping by physical disconnection such as valve or blinds.

5.2 General Requirements / Test Preparation for Testing

Testing shall be carried out with permanent gaskets installed unless specified otherwise or instructed by the Engineer-in-Charge.

No pressure test shall be carried out against closed valve unless approved by the Engineer-in-Charge

The Engineer-in-Charge shall be notified in advance by the Contractor, of the testing sequence and programme, to enable him to be present for witnessing the test. The Contractor shall be fully responsible for making arrangements with the local boiler inspector to witness the tests for steam lines falling under IBR. IBR certificates for these tests shall be obtained in the relevant IBR forms and furnished to the Engineer-in-Charge.

Before testing, all piping shall be cleaned by flushing to make it free from dirt, loose scale, debris and other loose foreign materials.

All piping systems to be hydrostatically tested shall be vented at the high points and the systems purged of air before the test pressure is applied.

Wherever in the line any void exists due to any reasons, like absence of control valves, safety valves, check valves etc. it shall be filled with temporary spools.

All joints welded, screwed or flanged shall be left uninsulated and exposed for examination during the test. Before pressurizing the lines, each weld joint shall be cleaned by wire brush to free it from rust and any other foreign matter. All joints may be primed and painted prior to leak testing unless they are subject to sensitive leak test or testing with soap solution (e.g., reinforcement pads and lines to be pneumatically tested, etc.).

Where a system is to be isolated at a pair of companion flanges, a blank shall be inserted between the companion flanges. Minimum thickness of the blank shall be designed in accordance with applicable design code.

Open ends of piping system where blanks cannot be used, such as pumps, compressors, turbines or wherever equipment or pipe spools have been recovered or disconnected prior to hydrostatic testing, shall be blinded off by using standard blind flanges of same rating as the piping system being tested.

Pressure gauges used in testing shall be installed as close as possible to the lowest point in the piping system to be tested, to avoid overstressing of any of the lower portions of the system.

For longer lines and vertical lines, two or more pressure gauges shall be installed at locations decided by the Engineer-in-Charge.

For lines containing check valves any of the following alternatives shall be adopted for pressure testing:

- Whenever possible pressurize up-stream side of valve.
- Replace the valve by a temporary spool and reinstall the valve after testing.
- Provide blind on valve flanges and test the upstream and downstream of the line separately and remove the blind after testing. At these flanges, temporary gaskets shall be provided during testing and shall be replaced by permanent gaskets subsequently.
- For check valves in lines 1½" and below flapper or seat shall be removed during testing (if possible). After completion of testing the flapper/seat shall be refitted.

Gas lines when hydrostatically tested shall be provided with additional temporary supports during testing as directed by the Engineer-in-Charge.

Piping which is spring or counter-weight supported shall be temporarily supported, where the weight of the fluid would overload the support. Retaining pins for spring supports shall be removed only after testing is completed and test fluid is completely drained.

When testing any piping system, air or steam of approximately 2 kg/ cm²g may be used as preliminary test to detect missing gaskets etc. as this avoids the necessity of draining the line to make repairs. However, steam shall not be used for this purpose, if the steam temperature is more than the design temperature of the line.

For jacketed pipes testing of core pipes shall be done on individual pieces where the pipe is continuously jacketed, before it is jacketed. The outer jacket shall be tested separately as a system. For piping with discontinuous jacketing the core pipe and the jacket shall be tested as separate continuous systems.

5.3 Testing Media, Test Pressure and Test Pressure Gauges

5.3.1 Testing Media

In general all pressure tests shall be hydrostatic using iron free water, which is clean and free of silt. Test fluid temperature shall be min. 5 °C. Maximum chloride content in water for hydrostatic testing for SS piping shall be 15- 20 ppm.

Air shall be used for testing only if water would cause corrosion of the system or overloading of supports etc. in special cases as directed by Engineer-in-Charge.

If operating fluid in the line is much lighter than testing fluid, the additional weight of testing fluid may render piping supports (as designed) inadequate. This will call for additional temporary supports. The typical examples are flare and vapor lines. It is preferable that hydrostatic testing is avoided in such systems and instead pneumatic testing may be specified.

Where air/water tests are undesirable, substitute fluids such as gas oil, kerosene, methanol etc. shall be used as the testing medium, with due consideration to the hazards involved. These test fluids shall be specified in the line list given to the contractor.

5.3.2 Test Pressure

The hydrostatic/ pneumatic test pressure shall be as indicated in the line list or as per the instruction of Engineer-in-Charge.

The selection of the piping system for one individual test shall be based on the following:

- Test pressure required as per line list.
- Maximum allowable pressure for the material of construction of piping.

Depending upon the above requirements and based on construction progress, maximum length of piping shall be included in each test.

5.3.3 Test Pressure Gauge

All gauges used for field testing shall have suitable range so that the test pressure of various systems falls in 35% to 65% of gauge scale range. Pressure gage dial shall be minimum of 150 mm. Size of Bourdon shall not be less than 75% of nominal diameter of dial range. Gauge shall be of a good quality and in first class working condition.

Prior to the start of any test or periodically during the field test programme, all test gauges shall be calibrated using a standard dead weight gauge tester or other suitable approved testing apparatus. Any gauge showing an incorrect zero reading or error of more than $\pm 2\%$ of full scale range shall be discarded. The Engineer-in-Charge shall check the accuracy of master pressure gauge used for calibration. Calibration certificate shall be furnished for the pressure gages.

5.4 Testing Procedure

5.4.1 Hydrostatic Test

All vents and other connections used as vents shall be left open while filling the line with test fluid for complete removal of air. In all lines for pressurizing and depressurizing the system, temporary isolation valves shall be provided if valved vents, drains do not exist in the system.

Pressure shall be applied only after the system / line is ready and approved by the Engineer-in-charge.

Pressure shall be applied by means of a suitable test pump or other pressure source which shall be isolated from the system as soon as test pressure is reached and stabilized in the system.

A pressure gauge shall be provided at the pump discharge for guidance in bringing the system to the required pressure.

The pump shall be attended constantly during the test by an authorized person. The pump shall be isolated from the system whenever the pump is to be left unattended.

Test pressure shall be maintained for a sufficient length of time not less than 10minutes. Test pressure shall be released only after physical checking of all the joints and attachments are completed, to permit thorough inspection of all joints and connections for leakage or signs of failure. Any joint found leaking during a pressure test shall be retested to the specified pressure after repair.

The pump and the piping system to be tested are to be provided with separate pressure indicating test gauges.

Care shall be taken to avoid increase in the pressure due to temperature variation during the test.

5.4.2 Pneumatic Test

When testing with air, pressure shall be supplied by means of a compressor. The compressor shall be portable type with a receiver, after cooler and oil separator.

Piping to be tested by air shall have joints covered with a soap and water solution so that the joints can be examined for leaks.

All other details shall be same as per hydrotesting procedure (specified above).

5.5 Completion of Testing

After the hydrostatic test has been completed, pressure shall be released by opening the vents, in a manner and at a rate so as not to endanger personnel or damage equipment.

All vents shall be opened before the system is to be drained and shall remain open till all draining is complete, so as to prevent formation of vacuum in the system. After draining, lines / systems shall be dried by air. In services like dry air, ethylene etc., small traces of water can cause problem. For such lines hot air drying is to be done after hydro-test.

After testing is completed the test blinds shall be removed and equipment / piping isolated during testing shall be connected using the specified gaskets, bolts and nuts. These connections shall be checked for tightness in subsequent pneumatic tests to be carried out by the contractor for complete loop / circuit including equipment (except rotary equipment).

Pressure test shall be considered complete only after approved by the Engineer-in-Charge. Defects, if any, noticed during testing shall be rectified immediately and retesting of the system/ line shall be done by the contractor at his cost.

5.6 Test Records

Records in triplicate shall be prepared and submitted by the contractor for each piping system, for the pressure test done in the proforma provided/approved by the Engineer-in-Charge. Records shall also be submitted for the PMI undertaken as per EIL Std. Specification No. 6-82-0002.

भूमिगत वेसल्स के लिए कैथोडिक संरक्षण प्रणाली विनिर्देशन

SPECIFICATION FOR CATHODIC PROTECTION SYSTEM FOR UNDERGROUND VESSELS

1	15.10.24	REAFFIRMED	PTR	NSB	RC	MN
0	15.10.18	ISSUED AS STANDARD SPECIFICATION	PTR	NSB	BRB	RKT
Rev.	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	

Abbreviations:

AC	Alternating Current
AJB	Anode Junction Box
BS	British Standards
BIS	Bureau of Indian Standards
CEA	Central Electricity Authority
CIMFR	Central Institute of Mines and Fuel Research
CJB	Cathode Junction Box
CP	Cathodic Protection
CPPSM	Cathodic Protection Power Supply Module
CPTR	Cathodic Protection Transformer Rectifier
CTE	Coal tar enamel
Cu/CuSO ₄	Copper/Copper Sulphate
DC	Direct Current
ERTL	Electronics Regional Testing Laboratory
FBE	Fusion Bonding Epoxy
HV	High Voltage
HMWPE	High Molecular Weight Poly Ethylene
IS	Indian Standards
$\mu\text{A}/\text{mm}^2$	Micro-ampere per square millimeter
mA/mm^2	Milli-ampere per square millimeter
MMO	Mixed Metal Oxide
NACE	National Association of Corrosion Engineers
PDB	Power Distribution Board
PE	Polyethylene
PVC	Polyvinyl Chloride
RMU	Remote Monitoring Unit
VDR	Vendor Data Requirement
VSP	Vessel to Sand Potential

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1.0 SCOPE

This specification covers the philosophy to be adopted for the design and engineering of the cathodic protection system for the underground Vessels (external surface) including corrosion survey of the electrolyte (sand).

2.0 APPLICABLE CODES AND STANDARDS

2.1 The system design, performance and materials to be supplied shall conform to the requirements of the latest revision of following standards as a minimum:

- i) NACE : SP-0285 Corrosion Control of Underground Storage Tank Systems by Cathodic Protection
- ii) BS : EN 13636:2004, Cathodic Protection of Buried Metallic Tanks and Related Piping
- iii) VDE : 0150, protection against corrosion due to stray currents from DC installations.
- iv) IS/ IEC: 60079 : Electrical Apparatus for Explosive Gas Atmosphere
- v) IS/ IEC: 60529 : Classification of Degree of Protection Provided by Enclosures
- vi) OISD-GDN-180 : Lightning Protection

2.2 The equipment shall also confirm the provisions of CEA regulations and other statutory regulations currently in force in the country.

2.3 In case of imported equipments, standards of the country of origin shall be applicable if these standards are equivalent or stringent than the applicable Indian standards.

2.4 In case of any contradiction between various referred standards/ specifications/ data sheet and statutory regulations, the most stringent requirement shall prevail and Owner's/EIL's decision in this regard shall be final and binding.

3.0 SYSTEM IMPLEMENTATION

All work to be performed and supplies to be effected as a part of CP system shall require specific review by Owner or his authorized representative. Major activities requiring review shall include but not be limited to those mentioned in vendor data requirement (VDR) form attached with MR/Tender.

4.0 CORROSION SURVEY

4.1 General

- 4.1.1 The corrosion survey includes the measurement of sand resistivity survey and chemical analysis for design of CP system which shall be carried out by Contractor. The corrosion survey shall also include collection of additional data as required for completeness of the job.
- 4.1.2 To carry out sand resistivity measurement, Wenner's 4-pin method or an equivalent soil/ sand box method approved by Owner/ Owner's representative shall be used. Survey instruments shall have maximum AC and DC ground current rejection feature.
- 4.1.3 Care shall be taken to ensure that the resistivity readings are not influenced by the presence of foreign structures/piping, and earth currents (if any) etc.

4.2 Report

On completion of all field work, a report incorporating all the results generated from surveys and details of additional data collected (e.g. nearby structures, details of hazardous area classification, location proposed for CPTR units, power source details etc.) shall be prepared. The report shall also contain detailed interpretation of survey results and resistivity data, to form a design basis for cathodic protection. This report shall also include various drawings prepared in connection with the above work. Soil resistivity values shall be plotted on semi-log graph sheets.

5.0 CATHODIC PROTECTION DESIGN PARAMETERS

A distinctly independent impressed current cathodic protection system shall be provided to protect the external surfaces the underground Vessel as specified.

Unless otherwise stated in the data sheets, the following parameters shall be used for design of permanent cathodic protection system:

- 5.1 Protection Current Density Range : 10-30 mA/m²
(at 25 °C operating temperature)
- 5.2 If operating temperatures of Vessel exceed 25 deg. C, protective current density shall be corrected @ 0.5mA/ m²/ deg. C.
- 5.3 Sand resistivity : 200 Ohm-m
- 5.4 Vessel natural potential : (-) 0.45 V (w.r.t. Cu/CuSO₄ ref. cell)
- 5.5 Anode : MMO wire anode
- 5.6 Current capacity of anode : 30 mA/m
- 5.7 Design life of CP system : 30 years, unless specified elsewhere

- 5.8 Anode ground bed loop resistance : 1 Ohm (max.)
including anode to ground resistance,
anode and cathode cable resistances
- 5.9 **Scheme for Cathodic Protection System of a Vessel**
- 5.9.1 Each Vessel's CP system shall be independent and exclusive. The scheme defined below shall be applicable.
- 5.9.2 Impressed Current Cathodic Protection (CP) System shall be provided for sand side corrosion prevention of Vessel external surface.
- 5.9.3 Anodes employed for CP System of vessels shall be mixed metal oxide coated on titanium wire anode, piggyback connected with anode lead cable, factory pre-packed with coke breeze.
- 5.9.4 The anode strings shall be located around the Vessel. Specific installation requirements of String Anode shall be as follows:
- Anode strings shall be distributed in loops and shall be installed in the sand cushion surrounding the Vessel at a separation distance of 1000mm from the Vessel surface.
 - Separation distance between consecutive String anode loops (vertical separation) shall be uniform and shall be limited to maximum 1000 mm.
 - Two consecutive anode loops shall be connected to different AJBs located opposite-along the Vessel centreline.
 - The above anode distribution is based on the assumption that temperature of the sand in pit at 1000mm distance from Vessel surface shall be below 75 deg.C
- 5.9.5 Highest of number/length of anodes calculated as per design parameters defined under clause 5.1 to 5.8 and that worked out as per clause 5.9.4 shall be provided.
- 5.9.6 Free ends of each string anode shall be terminated to AJB through loop connection.
- 5.9.7 Cathodic Protection Transformer-Rectifier unit (CPTR Unit) of suitable rating (25V/25A or 50V/50A or 75V/75A) shall be installed to energize the anode strings for Vessels.
- 5.9.8 CPTR Unit shall have two outgoing positive header cables, which shall be terminated to 2 nos. AJBs to be installed on opposite sides of the Vessel along its Centerline (TL-TL).
- 5.9.9 CPTR Unit shall have one out going negative header cable, which shall be connected to cathode junction box (CJB) located near Vessel for the drainage connection and potential measurement.
- 5.9.10 Two drainage cables and two measurement cables from each vessel shall be terminated to its CJB.

- 5.9.11 Minimum 5 no.s Cu/CuSO₄ Permanent Reference cells shall be provided for each vessel which shall be able to measure the complete potential profile of the Vessel.
- 5.9.12 Power supply for the CPTR Unit shall be drawn from the nearest Substation.
- 5.9.13 The reference cell cables and the measurement cables from each Vessel shall be routed through the respective Monitoring Junction Box (MJB).
- 5.9.14 If required, a MJB may be integrated with CJB and a single/composite Cathode junction box cum Reference cell junction box (CRJB) may be provided.
- 5.9.15 The CPTR unit shall preferably have the built-in RMU module. In case RMU is not integral part of CPTR unit, then a separate RMU panel may be provided and both the equipments (CPTR Unit and RMU) shall be connected with communication cables for status monitoring and control purpose.
- 5.9.16 For monitoring of Vessel to sand potentials, monitoring cables of reference cells shall be laid between MJB and CPTR unit & RMU. For CPTR unit at least three reference cells shall be connected and for RMU all the Reference cell cables shall be connected.
- 5.9.17 All Cable laying shall be done on existing cable route which shall be overhead cable trays/ cable trenches wherever possible. Underground Cable laying in paved/ unpaved areas shall be done through RCC trench/directly buried trenches respectively, wherever overhead cable trays/ cable trenches are not available.
- 5.9.18 Connection of drainage cables and measurement cables to the Vessel shall be done by Thernit welding.
- 5.9.19 Minimum 3 no's of perforated HDPE pipes surrounding the Vessel shall be installed for measuring potential using portable reference cells. The HDPE pipe shall be covered with geotextile cloth and shall be of 75mm diameter, slotted of 50 mm (2 inch) in length 0.15 mm width, 4 kg/cm² pressure rating, sealed at one end.

6.0 CATHODIC PROTECTION DESIGN CRITERIA

Cathodic protection system shall be designed to meet the following criteria:

- 6.1 The Vessel to sand potential (VSP) measurements shall be between (-) 0.85V (OFF) and (-) 1.20V (OFF) with respect to a Cu/CuSO₄ reference electrode.
- 6.2 A minimum polarization shift of (-) 100 millivolts can be accepted as an adequate level of cathodic protection for the Vessel with the approval of Owner in exceptional cases. Discretion to use any of the criteria shall solely rest with owner/owner's representative.
- 6.3 A positive potential swing of 50 millivolts or more shall be considered sufficient to indicate the presence of an interaction/ interference situation requiring investigation and incorporation of mitigation measures.

7.0 CATHODIC PROTECTION EQUIPMENTS

7.1 The system shall include the following major equipment/ sub-systems unless otherwise specified in project specifications:

- Power Distribution Board
- CPTR units.
- Remote monitoring unit
- MMO Anodes
- Anode junction box
- Cathode junction box
- Measurement Junction box
- Permanent reference cells
- Cables

7.2 All equipment shall be new and procured from EIL approved manufacturers. Equipment offered shall be field proven. Equipment requiring specialized maintenance or operation shall be avoided as far as possible. Prototype equipment shall not be accepted.

7.3 All equipment/ materials shall conform to the relevant specifications included in the tender document.

7.4 The CPTR unit and RMU etc. shall be located in safe non-hazardous areas. However all junction boxes shall be flame proof, Temperature class T3 (min.) & suitable for Gas Group specified in datasheet.

7.5 The electrical and electronic equipments installed in hazardous area shall be flame proof type and shall meet the requirements as per IS/ IEC: 60079 and shall be weather proof IP-65 as per IS/IEC:60529.

7.6 Hazardous area certificate from CIMFR or equivalent test house of country of origin, applicable PESO approval certificate, BIS license and original drawings referred in type test certificate shall be shown to the Inspection agency during inspection. The Certificate and BIS license must be valid at the time of dispatch.

7.7 Power Distribution Board

Power Distribution board (PDB) shall be provided incase multiple CPTR units are envisaged. PDB shall be fed through 1 no. 415V \pm 10%, 50Hz \pm 3% TPN feeder from Owner's substation and shall have required no. of outgoing feeder rated for 240V, SPN or 415V, TPN feeders.

7.8 CP Transformer Rectifier Unit

The Cathodic Protection Transformer Rectifier Unit (CPTR unit) shall conform to the requirements mentioned in datasheet and shall be installed in non-hazardous area as specified in data sheets.

7.9 Anode Beds/ Loops

Anodes shall be supplied complete with tail cables, which shall be long enough for termination on their associated anode lead junction boxes without intermediate joints. Exact lengths and termination details shall be indicated in construction drawings.

Potential gradient around the anodes shall be within safety requirements with regard to interference on foreign structures and its effective boundary shall be defined.

7.10 MMO Anodes

Anodes shall be mixed metal oxide coated titanium wire anodes. The MMO wire anodes shall be piggyback connected with anode lead cable, factory pre-packed with coke breeze. The detail specification shall be as mentioned in data sheet.

7.11 Anode Junction Box

All cable tails from individual anodes shall be terminated onto the respective anode junction boxes, which shall be further connected to the positive cable coming from CP power source. Each anode circuit in junction shall have provision for measurement and control of individual circuit/anode current through variable resistors, shunts and links of suitable ratings.

7.12 Cathode Junction Box

Cathode junction box shall be provided near the Vessel for connection of the negative drainage cables to the Vessel. The negative of the CP power source shall be connected to the incoming circuit of the cathode junction box.

The incoming circuit and each out going circuits shall have provision for measurement and control of current through variable resistors, shunts and links of suitable ratings.

7.13 Monitoring Junction Box

All the reference cells provided around the Vessel shall be connected to monitoring junction boxes. Measurement and control cables from monitoring junction box shall be connected to CPTR unit and RMU unit.

7.14 Permanent Reference Cells

Unless otherwise agreed, High purity copper/ copper sulphate reference cells with proven high reliability shall be provided for stable Vessel to sand potential measurement.

7.15 Cables

- 7.15.1. All the Power Cables i.e. Cables from Power feeder to PDB, PDB to CPTR Unit, PDB to RMU unit, and Positive/ Negative Header cables shall be with annealed high conductivity stranded copper conductor, PVC insulated, 650/1100 V grade, armoured, PVC sheathed conforming to IS 1554 part-I.

- 7.15.2. Anode lead cable shall be of 1CX16 mm² stranded copper conductor, 7 strands, insulated (Refer Sr. no. 1 or Sr. no. 2 of Table-1), unarmoured, with a double insulation system. The primary insulation shall be 0.04 inch thick irradiated cross-linked polyvinylidene fluoride (PVDF) or Ethylene Chlorotrifluoroethylene (ECTFE) 1100 Volt grade. The secondary insulation shall be 0.065 inch thick HMWPE (Refer Sr. no. 3 of Table-1) sheathing jacket over the primary insulation.

Table-1

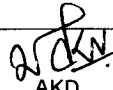
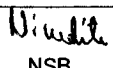


Sr no.	Insulation type	Insulation Specification*	
1.	polyvinylidene fluoride (PVDF) Irradiation cross linked	Tensile Break Strength	4500 PSI (min)
		Break Elongation	50%
		Flexural Strength	8600 PSI (min)
		Resistivity	2X10 ¹⁴ (min)
		Dielectric Constant	8 (min) at 100Hz
2.	Ethylene Chlorotrifluoroethylene (ECTFE)	Tensile Break Strength	6500 PSI (min)
		Break Elongation	100%
		Resistivity	1X10 ¹⁵ (min)
		Dielectric Constant	2.5 (min) at 1MHz
3.	High Density Molecular Weight Polyethylene (HMWPE)	Color	Black
		Density	0.941 gm/cm ³
		ASTM D1248, Type 3, Class C, Category 5 or IEC 60502-1	
		Temperature rating	90°C

* Standard Test Method ASTM D638 shall be used to determine the tensile strength, Flexural Strength and Break Elongation. For the resistivity and dielectric constant tests, standard test methods ASTM D257 and ASTM D150 shall be utilized.

- 7.15.3. The cables for reference cells, potential measurements shall be of copper conductor, HMWPE insulated, Aluminium backed by mylar/ polyester tape shielded, HMWPE sheathed, armoured, HMWPE over all sheathed type.

वेसल्स के लिए कैथोडिक प्रतिरक्षण प्रणाली हेतु
स्थापना, प्री-कमीशनिंग, परीक्षण और कमिशनिंग
के लिए विनिर्देश

SPECIFICATION
FOR
INSTALLATION, PRE-COMMISSIONING,
TESTING AND COMMISSIONING OF
CATHODIC PROTECTION SYSTEM
FOR VESSELS

Rev.	Date	Purpose	Prepared by	Checked by	Standards Committee Convener	Standards Bureau Chairman
0	26 02 20	ISSUED AS STANDARD SPECIFICATION	 AKD	 NSB	 SA	 RKT

Abbreviations:

AJB	:	Anode Junction Box
CJB	:	Cathode Junction Box
CP	:	Cathodic Protection
CPTR	:	Cathodic Protection Transformer Rectifier
DC	:	Direct Current
EIL	:	Engineers India Limited
ICCP	:	Impressed Current Cathodic Protection
IS	:	Indian Standards
MMO	:	Mixed Metal Oxide
NACE	:	National Association of Corrosion Engineers
OISD	:	Oil Industry Safety Directorate
PDB	:	Power Distribution Box
TRU	:	Transformer Rectifier Unit

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1.0 OBJECTIVE

This procedure defines the methodology, requirements, responsibilities and equipment required for the Impressed Current Cathodic Protection System Installation, Pre-commissioning and Commissioning of the vessel (external) to ensure CP contractor conform to the specifications and other applicable codes and standards

2.0 SCOPE

The scope of this document is to describe the procedures for typical requirement for wire anode installation, Pre-commissioning and Commissioning of an Impressed Current Cathodic Protection System works for vessel (external) and provide adequate Quality Assurance / Control of workmanship and inspection at site. Pre-commissioning inspection and testing will be carried out to conform satisfactory installation works as per the project specification design and drawings.

The contractor shall have all necessary construction equipment, tools and tackle and testing instruments to carry out the erection works and to commission the system as specified. These equipment shall be brought to site by contractor before start of work.

3.0 REFERENCES

- i) Project Specification for CP system for vessels
- ii) CP System Design & Detail Calculation Document for vessels (external).
- iii) Overall CP Equipment and Cable Route Layout.
- iv) NACE : SP-0285 : Corrosion control of underground storage tank systems by Cathodic Protection
- v) IS/IEC: 60529 : Classification of Degree of Protection Provided by Enclosures
- vi) OISD-GDN-180 : Lightning Protection

4.0 INSTALLATION

4.1 Prior to start of installation, contractor shall verify that equipment and complete materials have been received. Handling, shifting to required site location, installation, pre-commissioning, testing and commissioning shall be done by contractor with utmost care. Manufacturer's instructions and the requirements given in their technical manual shall be strictly adhered. The substation/control room wherein the equipment to be installed shall be clean, dry and free from all debris. Care shall be taken to observe the correct lifting arrangements and to make sure that the slings are attached to the manufacturer's designated lifting points, where applicable. No parts shall be subjected to undue strains or sudden stresses which could cause damage to the equipment.

The lifting position mark indicated on packing casing shall be adhered to strictly for keeping it in required vertical position.

Contractor shall check and report to the Engineer-in-charge about any damaged item and/ or missing component and shall replace the same as per specifications. During installation, all accessories and loose items shall also be inspected by the contractor before their assembly/mounting.

Manufacturer checklist, manual for erection, installation and any specific requirement for equipment handling, installation and commissioning shall be strictly adhered to.

4.2 Following activities shall be done by contractor during various stages of installation

4.2.1 STAGE-I

When the sand bed reaches at the bottom level of vessel shell, the activities involved are as given below:

- i) Making of slot in sand pad for Pre-packed MMO Wire Anode cable as per applicable drawing at surrounding of vessel sand layer.
- ii) Check continuity of anode and cable before installation in sand pad to ensure healthiness. This shall be followed at each stage of anode installation.
- iii) Provide anode identification marks on anode lead cable of each loops coming out from vessels. This shall be followed at each stage of anode installation.
- iv) Laying of Pre-packed MMO Wire Anode at bottom sand layer of vessel as per drawing.
- v) Making of pocket in sand pad for Ref. Cell as per applicable drawing at surrounding of vessel sand layer.
- vi) Checking healthiness of Permanent Reference Cell before installation at different stages with respect to calibrated Master Reference Cell.
- vii) Check continuity of reference cell cable before installation at different stages in sand pad to ensure healthiness.
- viii) Laying of Ref. Cell inside the pocket & sand fill with proper compaction by using wooden pallet.

4.2.2 STAGE-II

When the sand bed reaches up to middle Level of the vessel shell, the activities involved are as given below.

- i) Making of slot in sand pad for Pre-packed MMO Wire Anode cable as per applicable drawing at surrounding of vessel sand layer.
- ii) Laying of Pre-packed MMO Wire Anode at Middle sand layer of vessel as per drawing.

4.2.3 STAGE-III

When the sand bed reaches the Top level of the vessel shell, the activities involved are as given below.

- i) Making of slot in sand pad for Pre-packed MMO Wire Anode cable as per applicable drawing at surrounding of vessel sand layer.
- ii) Laying of Pre-packed MMO Wire Anode at bottom sand layer of vessel as per drawing.
- iii) Jointing of Pre-packed MMO Wire Anode strings end with anode lead cable by using In-line splice kits.
- iv) Laying of Cathode cleat cable and its termination at CJB.

- v) Laying of Measurement cleat cable and its termination at CJB.
- vi) Connecting Cathode cable with cleat by Thermit welding on the Vessel.
- vii) Connecting Measurement cable with cleat by Thermit welding on the Vessel.
- viii) Making of pocket in sand pad for Ref. Cell as per applicable drawing at surrounding of vessel.
- ix) Laying of Ref. Cell inside the pocket & sand fill with proper compaction by using wooden pallet.

4.2.4 STAGE-IV

The Activities which are to be performed outside the Mound area, the activities involved are as given below.

- i) Installation of junction boxes (AJB, CJB) with mounting frame.
- ii) Termination & connection of all the cables in the junction boxes (AJB, CJB etc.)
- iii) Installation of Transformer rectifier unit.
- iv) TR-unit connection of all incoming & outgoing cables & termination.

5.0 PRE-COMMISSIONING AND TESTING

- i) After the equipment is installed properly in accordance with specifications, design documents, drawings and contractor shall carry out all pre-commissioning checks and tests as per EIL format in the presence of Engineer-in-charge and test readings shall be recorded and furnished to EIL in triplicate.
- ii) It is anticipated that various installation checks have been previously accomplished and accepted during installation of CP equipment and facilities or otherwise to be carried out in conjunction with the commissioning activities.
- iii) The pre-commissioning inspection among other requirements shall include visual inspection, checking the workmanship of the installation, the rating of equipment, safety clearances, sizes of cables installed, wiring properly dressed and labeled, sealing of unused cable entries, checking of all safety interlocks, control/interface functions as per requirement etc.
- iv) The contractor shall bring to site all required tools, tackles and testing instruments for carrying out field testing. Contractor shall use only calibrated measuring and test instruments and shall maintain valid calibration record.
- v) The inspection/test data sheets associated with pre-commissioning and commissioning of cathodic protection system shall be provided by vendor.

5.1 General Inspection

Prior to commissioning of the CP system and before energizing the transformer rectifier unit, the following activities shall be performed.

- i) Review all test and inspection data sheets that have been previously accomplished during CP installation. All installation data results to be verified to ensure that inspection and testing have been carried out successfully.
- ii) Review all CP design drawings, deviations if any shall be noted and incorporated in the as-built drawings.
- iii) Visual inspections to be performed to ensure that all above ground (exposed) CP components and facilities are not physically damaged during or after CP installation works. Any discrepancies to be noted and necessary corrective actions shall be taken prior to commissioning.
- iv) All CP cables to be checked for proper termination and identification as per schematic drawings.

5.2 Pre-Commissioning Check List

5.2.1 Transformer Rectifier

5.2.1.1 The following information to be obtained and recorded as a minimum

- i) TR unit ID
- ii) TR unit Manufacturer
- iii) TR type/ model/ Sl. No.
- iv) Sun Shed
- v) TR Input and Output Rating
- vi) Date of Inspection
- vii) Name of Inspector

5.2.1.2 Inspection

The following inspections and checks shall be performed and recorded when the TR unit is in switched off condition.

- i) Visual inspection of each TR (transformer rectifier) unit to be performed to ensure correct installation and that the unit has not been physically damaged prior to operation. Any discrepancies will be noted and rectified.
- ii) All panel connections and terminals to be checked for tightness. Any loose connection shall be tightened.
- iii) The polarity of the DC output cable to be verified to ensure that the positive output cables are connected to the anode terminals and the negative terminals are connected to the vessel.
- iv) Verify that the power supply to the Transformer Rectifier (TR) corresponds to the required rating. Measure and record the AC supply voltage at the input terminals of the transformer rectifier circuit breaker.
- v) Verify and ensure that the Transformer Rectifier is properly grounded to the earthing system.
- vi) Ensure that all fuses are of proper current and voltage ratings. Check the continuity of all fuses and spares by an ohmmeter.

- vii) Measure the insulation resistance between Transformer & TR body and earthing resistance between TR and earth.
- viii) Check whether the output knobs are in minimum position.
- ix) Check the colour of silica gel.
- x) Ensure that TR (oil cooled) has at least minimum level of oil, if necessary, add more.

5.2.1.3 Total Circuit Resistance Test

- i) After proper polarity of the DC output cables have been confirmed and the cables have been labelled with permanent tags, disconnect the anode and the cathode cables from the DC output terminal of the Transformer Rectifier.
- ii) Using a four-pin resistance meter with P1/C1 and P2/C2 terminal shorted, connect the test leads of the instruments across the DC cables and measure the resistance.
- iii) This testing will be done to measure the overall circuit resistance of the CP system and to ensure that no short circuit exist between the anode (positive) and cathode (negative).
- iv) The result will be recorded in the AJB pre-commissioning data sheet.

5.2.2 Anode Inspection

- i) Verify that the anode have been properly checked and accepted for compliance with the drawings and design during the installation works.
- ii) Based on the above, check the power feed connections and verify that the cable is properly terminated and identified at the Anode Junction Box (AJB). Any discrepancies shall be rectified.
- iii) The tests shall be performed at the AJB between the anode feeders. Continuity test to be carried out between all anode feeders lead cable to ensure electrical continuity of all anodes.
- iv) The result will be recorded in the AJB pre-commissioning data sheet.

5.2.3 Junction Boxes & PDB

5.2.3.1 The following information shall be obtained and recorded as minimum:

- i) Junction Box & PDB ID
- ii) Number of Circuits
- iii) Resistor Rating if present
- iv) Shunt Rating, if present
- v) Date of Inspection and Name of the Inspector

5.2.3.2 The following inspections shall be performed at each junction box.

- i) A visual inspection of the junction box & PDB will be performed to ensure correct installation in accordance with the drawings and that the junction boxes & PDB have not been physically damaged prior to operation. Any discrepancies will be noted.

- ii) All cable connections and terminals shall be checked for tightness. Any loose connections shall be tightened.
- iii) All cables are to be checked for proper tagging and to ensure it is as per design /drawing.
- iv) The result will be recorded in the pre-commissioning format.

5.2.4 Natural Potential measurement

Before energizing the transformer rectifier, the natural potential of vessel (partially filled with product) should be measured and recorded using permanent reference electrodes as well as using portable reference electrode.

5.2.4.1 Potential Measurement using Permanent Reference Electrodes

- i) The vessel to soil potential measurement is obtained using high impedance multimeter (min. 10 Mega ohms).
- ii) Attach the test lead from the positive terminal of the meter to the vessel at the junction box.
- iii) Attach the test lead from the negative terminal of the meter to the permanent reference electrode point at the junction box.
- iv) The vessel potential in millivolts is read directly from the meter.
- v) Natural potential measurement using permanent reference electrode to be carried out at all reference electrode locations.
- vi) Record the millivolts reading with polarity on the corresponding data sheet.

6.0 COMMISSIONING

After successful pre-commissioning of the cathodic protection equipment, the CP system is ready for testing, start up and commissioning. The contractor shall carry out complete testing and commissioning of material and equipment as per Inspection and test plans (ITP).

6.1 Before switching "ON" the transformer rectifiers the following condition should be met.

- i) All CP cables inside junctions and TR are to be checked and corrected for any discrepancies.
- ii) Natural potential of all structures involved in cathodic protection system has been measured and recorded.
- iii) A close visual inspection of electrical equipment in hazardous area shall be made to ensure that equipment is suitable for the classified zone and gas group and correctly installed, with all covers, bolts, nuts and hardwares intact and there is no physical damage mark seen on the enclosure.

6.2 Commissioning Steps

The steps described below should be followed systematically during execution of final commissioning.

- i) The transformer rectifier has been previously checked and tested during the pre-commissioning stages and the results are recorded in the data sheet. Read and study the transformer rectifier data sheet & operation manual to familiarize the system and result of the pre-commissioning test.
- ii) Set the transformer rectifiers output control to 0% range and switch "on " the transformer rectifier.
- iii) Gradually adjust the transformer rectifier's output power in manual mode.
- iv) Measure and record the vessel to soil potential.

6.2.1 The following procedures should be followed when measuring the vessel to soil potential:-

- i) For vessels with permanent reference electrodes, at each reference cell box, connect the negative lead of the meter on the reference cell and positive on the vessel. Record each reference electrode reading with respect to negative.
- ii) Increase the transformer rectifier output in manual mode until the vessel bottom potential reaches the value as per specification [-850 to -1100 mV (typical)]. The "On" potential is not a true representation of the vessel protected potential. The instant "off" potential will be measured for final reading & conclusion. Before taking instant off potentials, the transformer rectifier should be kept energized until adequate polarisation is achieved (typically 24 to 48 hrs).
- iii) Instant "Off" potential measurement is required to determine the IR drop free potential of the vessel.
- iv) Final vessel to soil potential (instant off and on) will be measured by switching the rectifier output using current interrupter. Current interrupter shall be hooked-up to the transformer rectifier and programmed to switch in 1:4 ratio (1 second OFF and 4 second ON or any other cycle in the same ratio). Instant Off potential measurement is required to determine the IR drop free potential of the vessel.
- v) Instant Off potential can be measured by the following procedures:
 - a) Switch off the transformer rectifiers.
 - b) Disconnect the positive header cable connected in the positive terminal of the transformer rectifier.
 - c) Install the Current interrupter in series with the positive header cable and positive terminal of the transformer rectifier.
 - d) Set the current interrupter in 1:4 ratio i.e. 1 second off and 4 seconds on or any other cycle in the same ratio.
 - e) Record the instant "off" and instant "on" potential in the commissioning data sheet. After recording, disconnect the current interrupter and return the transformer rectifier to its original connection.
- vi) Check and record individual powers feed current in the junction box and record the results. Current shall be measured using digital clamp meter or digital multi meter.
- vii) Check and record the output voltage and current in the transformer rectifier.

- a) Check and record the output voltage and current in the transformer rectifier, when the instant 'OFF' potential value at all the reference electrode is in the range specified in the Specification (-0.850 to -1.1 V typical) after 48 hrs of polarization.
- b) AVCC MODE: After recording the TR output DC voltage and current in Manual Mode at which all the reference electrodes show -0.85V to -1.1V in instant 'OFF' (typical figure) condition as described above, changeover the operation to constant voltage in AVCC mode and set the DC output voltage at the predetermined voltage recorded during Manual Mode of operation at which all the reference electrodes having potential in the range specified in the specification (typically -0.850V to -1.1V voltage) if necessary to ensure optimal protection potential at all the reference electrodes. Record the corresponding DC output current for the set voltage. This will be the final setting at which the unit will be left for operation and handed over to client. Individual current output of all the anode loops to be measured and recorded in AVCC mode voltage setting.

The results will be recorded in the commissioning data sheet.

7.0 RECORDS

- i) Contractor shall keep up-to-date records of all activities carried out and test results. Field inspection/test/commissioning reports shall be submitted to EIL/Owner by contractor in bound volumes (triplicate copies)
- ii) All equipment layout drawings shall be marked by the contractor for "AS BUILT STATUS" and two sets of hard copies shall be submitted to EIL.

8.0 HEALTH, SAFETY & ENVIRONMENT

- i) Necessary PPE shall be utilized.
- ii) Only trained / experienced personnel shall be deployed for this activity.

9.0 PRECAUTION

- i) Care shall be taken for the proper connection of cables including Positive Header cable from Anode Junction Box to Positive (+ve) Terminal of TR Unit & Negative Header Cable from Structure to Negative (-ve) Terminal of the TR unit and interconnection cables
- ii) Before the systems facilities are put into operation, necessary tests shall be carried out to establish that equipment's, devices and wiring connection have been correctly set up and connected in good condition for projected operation.
- iii) Proper PPE shall be used.
- iv) Trained personnel to be deployed for Commissioning.
- v) Care should be taken while using MCB, AC/DC cable operation.

10.0 EQUIPMENT AND TOOLS

- i) Portable Reference Electrodes (Cu/CuSO₄)
- ii) Digital Multimeter
- iii) Clamp-on meter
- iv) Megger
- v) CP / Electrical Tool Box
- vi) Crimping tool

11.0 REPORTS

All the parameters recorded during the Testing & Commissioning at site will be recorded in inspection format as per approved QAP.

12.0 FORMATS (TYPICAL)

12.1 Pre-Commissioning Inspection and Test Plat Format

Project	
Client/Owner	
Consultant	
Main Contractor	
CP Contractor	
Ref. Document	
Report No.	

Check Sheet			
Sl. No.	Activity	Contractor	EIL/Owner
1	Approval of Pre-Commissioning Check Procedure	P	A
2	Pre Commissioning Checks For Cu/CuSO ₄ Reference Electrode and Anode using Anode Tail Cable	P	RM / W
3	ICCP System Cable Termination and Tagging	P	RM / W
4	ICCP unit Working Condition (No Load Condition)	P	W
5	Pre-Commissioning Checks of Earthing, Termination & Tagging for TR Unit and Junction Boxes	P	RM / W
Legends: A-Approval, RM-Random Check, W-Witness all, P- Perform			
Remarks:			

For CP Vendor		For Main/EPC Contractor		Client/EIL	
Name		Name		Name	
Sign		Sign		Sign	
Date		Date		Date	

12.2 Quality Assurance Plan (QAP)

Project	
Client/Owner	
Consultant	
Main Contractor	
CP Contractor	
Ref. Document	
Report No.	

Check Sheet					
Sl. No.	Activity	CP Vendor	EPC Contractor	EIL/Owner	Remarks
1	Approval of Procedure for Testing & Commissioning	S	R	A&R	
2	Checking of Parameters as Per Procedure	P	W	R&W	
3	Measuring of Natural Potential	P	W	R&W	
4	Measuring of TR Unit Input & Output	P	W	R&W	
5	Measuring IR (insulation resistance) value of TR unit	P	W	R&W	
6	Check Circuit Resistance	P	W	R&W	
7	Measuring of Structure To Electrolyte Polarized Potential With Portable/ Permanent Cu/CuSO ₄ Reference Cell.	P	W	R&W	
8	Measuring of Individual Anode Loop Current	P	W	R&W	
9	Measuring On - Instant Off Readings	P	W	R&W	
10	Running TR Unit in Auto mode (AVCC mode)	P	W	R&W	
11	Central Monitoring System (CMS)	P	W	R&W	
Legends: A-Approval, R- Review of Records, W-Witness All, P-Perform, S-Submitted By					

For CP Vendor		For Main/EPC Contractor		Client/EIL	
Name		Name		Name	
Sign		Sign		Sign	
Date		Date		Date	

12.3 Pre-Commissioning Check Format

Project	
Client/Owner	
Consultant	
Main Contractor	
CP Contractor	
Ref. Document	
Report No.	

Pre-commissioning- Check Sheet			
Item-1	Ref. Cell No.	Native Potential Reading (Volt)	Remarks
1.1	RE-1		
1.2	RE-2		
1.3	RE-3		
....		
1.n	RE-N		
Item-2	Anode String No.	Continuity test	
2.1	A-1	OK/ Not OK	
2.2	A-2	OK/Not OK	
2.3	A-3	OK/Not OK	
...	OK/ Not OK	
2.n	A-N	OK/ Not OK	
Item-3	TRU (no load test in manual mode)	Reading	
3.1	AC input voltage	Volt	
3.2	AC input current	Amp.	
3.3	DC output voltage	Volt	
3.4	DC output current	Amp.	
Remarks (overall):			

For CP Vendor		For Main/EPC Contractor		Client/EIL	
Name		Name		Name	
Sign		Sign		Sign	
Date		Date		Date	

12.4 Commissioning Check Format

Project	
Client/Owner	
Consultant	
Main Contractor	
CP Contractor	
Ref. Document	
Report No.	

Check Sheet (potential measurement using permanent Cu/CuSO₄ electrode)			
Item-1	TRU	Reading	Remarks
1.1	AC input voltage	Volt	
1.2	AC input current	Amp.	
1.3	DC output voltage	Volt	
1.4	DC output current	Amp.	
Item-2	Permanent Ref. Cell No.	Initial Reading (Volt)	Reading after 24 hrs (Volt) 48 hrs (Volt)
1.1	RE-1		
1.2	RE-2		
1.3	RE-3		
....		
1.n	RE-N		
Item-3	Activity	Reading	Remarks
3.1	Natural PSP		
3.2	Energised PSP		
3.3	ON PSP		
3.4	Instant Off PSP		
3.5	100 mV Shift		
Remarks (overall):			

For CP Vendor		For Main/EPC Contractor		Client/EIL	
Name		Name		Name	
Sign		Sign		Sign	
Date		Date		Date	

उच्च वोल्टेज स्विचबोर्डों
के लिए
मानक विनिर्देश
SPECIFICATION
FOR
MEDIUM VOLTAGE SWITCHBOARDS

8.	20.11.2024	REVISED & ISSUED AS STANDARD SPECIFICATION	<i>VB/MKM</i>	<i>RKS</i>	<i>HK</i>	<i>MN</i>
7.	10.01.2019	REVISED & ISSUED AS STANDARD SPECIFICATION	VB	HK	BRB	RKT
6.	15.10.2013	REVISED & ISSUED AS STANDARD SPECIFICATION	VB	HK	UAP/JMS	SC
5.	28.04.2010	REVISED & ISSUED AS STANDARD SPECIFICATION	HK	SA	NS/JMS	ND
4.	03.03.2005	REVISED & ISSUED AS STANDARD SPECIFICATION	RM	AKT	AAN	SKG
Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	

Abbreviations:

A	Ampere
AC	Alternating Current
BIS	Bureau of Indian Standards
BS	British Standard
CNT	Close-Neutral-Trip
CEA	Central Electricity Authority
CPRI	Central Power Research Institute
CRCA	Cold Rolled Cold Annealed
CT	Current Transformer
DC	Direct Current
EPDM	Ethylene Propylene Diene Monomer
FBT	Fast Bus Transfer
FRP	Fiber Reinforced Polyester
MV	Medium Voltage
Hz	Hertz
IAC	Internal Arc Classification
IEC	International Electro-Technical Commission
IEEE	Institute of Electrical & Electronics Engineer
IP	Ingress Protection
kV	Kilo Volt
kW	Kilo Watt
kWH	Kilo Watt Hour
LED	Light Emitting Diode
LOTO	Lock-Out Tag-Out
LSC	Loss of Service Continuity
MCB	Miniature Circuit Breaker
MCC	Motor Control Center
MCCB	Moulded Case Circuit Breaker
NEMA	National Electrical Manufacturers Association
NO	Normally Open Contact
NC	Normally Close Contact
OTMS	Online Temperature Monitoring System
PO	Purchase Order
PT	Potential Transformer
PU	Polyurethane
p.u.	Per unit
PVC	Poly Vinyl Chloride
RAL	Reichs-Ausschuss fur Lieferbedingungen
SF ₆	Sulphur Hexafluoride
SWG	Standard Wire Gauge
VCB	Vacuum Circuit Breaker
VDE	Verband Deutscher Elektrotechniker
VFD	Variable Frequency Drive
VT	Voltage Transformer
XLPE	Cross linked Poly Ethylene

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1.0 SCOPE

This specification covers the design, manufacture, testing, packing and supply of indoor, drawout type Medium Voltage Switchboards >1 kV up to and including 33 kV, incorporating Vacuum or SF₆ circuit breakers.

2.0 CODES AND STANDARDS

2.1 The equipment shall comply with the requirements of latest revision of the following standards issued by BIS, unless otherwise specified:

IS: 1248	Direct acting indicating analogue electrical measuring instruments and their accessories
IS: 2071	High Voltage Test Technique
IS: 2544	Porcelain post-insulators for systems with nominal voltage greater than 1000V
IS: 2705-1	Current transformers specification: Part 1 General Requirements
IS: 3618	Specification for phosphate treatment of iron and steel for protection against corrosion
IS: 5082	Wrought aluminium and aluminium alloy bars, rods, tubes, sections, plates and sheets for electrical applications
IS: 5578	Guide for marking of insulated conductors
IS: 6005	Code of practice for phosphating of iron and steel
IS: 16227	Instrument transformers
IS: 11353/ IEC 60445	Basic and safety principles for man-machine interface marking and identification - identification of equipment terminals conductor terminations and conductors
IS: 13703-4	Specification for low - voltage fuses for voltages not exceeding 1000V AC or 1500V DC : supplementary requirements for fuse links for the protection of semiconductor devices
IEC 60282-1	High voltage fuses – Current Limiting fuses
IS/IEC 60168	Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V
IS/ IEC 60529	Degree of Protection provided by Enclosure
IS/IEC 62271	High Voltage Switchgear and Controlgear (Part 1, 100, 102, 103, 105, 106, 200, 201, 301)
IEC 62271	High Voltage Switchgear and Controlgear

2.2 In case of imported equipment, standards of the country of origin shall be applicable, if these standards are equivalent or stringent than the applicable Indian standards.

2.3 The equipment shall also conform to the provisions of CEA Regulations with latest amendments and other statutory regulations currently in force in the country.

2.4 In case Indian standards are not available for any equipment, standards issued by IEC/BS/VDE/IEEE/NEMA or equivalent agency shall be applicable.

2.5 In case of any contradiction between various referred standards/specifications/data sheet and statutory regulations, most stringent requirement shall govern and decision of Owner/ EIL in this regard shall be final and binding.

3.0 GENERAL REQUIREMENTS

3.1 The offered equipment shall be brand new with state of art technology and proven track record of the manufacturer of similar product. No equipment without mandatory type test shall be offered.

3.2 Vendor shall ensure availability of spare parts and maintenance support services for the offered equipment for at least 10 years from the date of supply.

3.3 Vendor shall give a notice of at least one year to the end user of equipment and EIL before phasing out the product/spares to enable the end user for placement of order for spares and services.

4.0 SITE CONDITIONS

4.1 The switchboards shall be suitable for installation and satisfactory operation in an air conditioned/ pressurised sub-station or in a substation with restricted natural air ventilation or in a covered shed/ enclosed electrical room (e-room) in a tropical, humid and corrosive atmosphere.

4.2 The switchboards shall be designed to operate under site conditions as specified in the data sheets. If not specifically mentioned therein, a design ambient temperature of 40°C and an altitude not exceeding 1000 metres above mean sea level shall be considered.

4.3 All equipments described in this specification are intended for continuous duty operation, as per nameplate rating under the specified ambient conditions, unless indicated otherwise.

5.0 DESIGN AND FABRICATION REQUIREMENTS

5.1 Enclosure and Protection

5.1.1 The Medium Voltage Switchboard shall be metal-enclosed and shall comprise of standard pre-fabricated, cold-rolled, sheet steel units, assembled to form a rigid, freestanding, dead-front structure. As a minimum, 2mm (14 SWG) CRCA sheet steel shall be used for all front and rear doors and covers, and 1.6mm (16 SWG) CRCA sheet steel for inter-panel partitions. Wherever required, stiffeners shall be provided to increase stiffness of large size doors and covers.

As an alternative to CRCA, Aluzinc/pre-galvanised sheet steel can also be provided for internal inter-panel partitions only. However, all external surface shall be of CRCA with specified paint shade.

5.1.2 Vertical panels shall be assembled to form a continuous line-up of uniform height both for HV chamber as well as control chamber. Rear extension panels shall also be of full height. However, HV chamber height can be different from control chamber height.

5.1.3 The switchboards shall be totally enclosed and vermin-proof. If necessary, openings for natural ventilation shall be provided. These shall be louvered and provided with wire mesh having opening less than 1mm. Design of louvers/ opening shall be such that the arc does not come out in case of internal arc. The same shall be type tested for internal arc, as specified. The enclosure shall have complete protection against approach to live parts or contact with internal moving parts (IP-4X) as per IS/IEC: 60529.

5.1.4 All openings, covers and doors shall be provided with suitable Neoprene/ XLPE/ EPDM gaskets around the perimeter to make the switchboard dust and vermin proof.

5.1.5 Each unit of the switchgear shall have necessary internal sheet metal barriers to form separate compartments for circuit breaker, busbars, instruments and relays, cable connections etc. Compartments for cable connections shall allow cable termination and connection work with the switchgear energised. Suitable interlock shall be provided such that cable compartment can be opened only when earth switch is ON or Earthing truck is inserted.

5.1.6 The panel shall be internal arc tested as per IS/IEC 62271-200 requirements for full short circuit current and for a duration of 0.5 second (minimum) unless specified otherwise in job specification/ datasheet and shall be qualified to comply with all the 5 criteria as per IS/IEC 62271-200. Independent pressure relief devices shall be provided for all HV compartments, i.e. bus bar, cable and breaker compartments and each compartment shall have type test certificate for internal arc classification (IAC) as per IS/IEC 62271-200 for the short circuit current and duration as specified. IAC test shall be conducted on the offered panel variants such as smallest width panel, panel with louvers, panel with thermography window and any other variants (as applicable) as per job requirements. The panel shall also be AFLR tested as per IS/IEC 62271-200 requirements.

For panels having busduct entry in place of cable entry, busduct interface with panel shall be such that it does not interfere with the IAC type tested design of panel. Separate rear extension panel shall be provided for the Busduct entry. Wall through bushings shall be provided at interface point between busduct and panel.

In case vendor has considered pressure relief/ gas duct above switchboard for release of gases due to internal arc; vendor shall preferably provide suitable absorbers in the switchboard to prevent the release of harmful gases in the switchgear hall. Alternatively, duct including all accessories/supporting arrangement/sealing material/bends/installation material etc. shall be provided for evacuating harmful gases. The offered arrangement of pressure relief/ gas duct shall be as per type tested design.

- 5.1.7 All identical equipment and corresponding parts shall be fully interchangeable.
- 5.1.8 Safety barriers / shutters shall be provided to permit personnel to work safely within an empty compartment with the bus bars energised. Loss of Service Continuity (LSC) category of the switchgear shall be LSC2B as per IS/IEC-62271-200.
- 5.1.9 It shall be possible to extend the switchgear in either direction at a later date. Ends of bus bars shall be suitably drilled for this purpose. Panels at extreme ends shall have openings, which shall be covered with plates screwed to the panel. Details of drilled holes in bus bar and openings in the panels, provided for future extension shall be clearly shown in the vendor drawings.
- 5.1.10 The drawout carriage on the switchboard shall have three positions: "Service", "Test" and "Drawout" viz:
- "Full in" or "Service" position - In this position both power and control circuits shall be connected. This shall be the normal operating position of the circuit breaker.
 - "Test" position - The power contacts shall be disconnected in this position but the control connections shall not be disturbed, it shall be possible to close and trip the breakers in this position.
 - "Draw out" Position - both power and control circuits shall be disconnected in this position. Alternatively, "Test Position" with the secondary control circuit disconnected may be provided in lieu of "Draw out Position"

Circuit breaker operation shall be possible only in "Service" and "Test" positions. The circuit breaker shall be lockable in "Test" / "Draw-out" positions. Automatic safety shutters shall be provided to ensure the inaccessibility of all live parts after the carriage is drawn out.

There shall be a distinct overall door for the breaker compartment, which can be closed with the carriage in drawout position and it shall be lockable type.

- 5.1.11 All circuit breaker modules of the same rating shall be inter-changeable. Suitable interlocks shall be provided to prevent the following operations:
- "Plugging in" or "drawing out" of a closed breaker.
 - "Plugging in" a breaker with the earthing isolator closed.
 - "Closing" of the earthing isolator with the breaker "plugged in".
 - Pulling out the auxiliary circuit plug with the breaker in the service position. Pushing in the breaker to the service position, with the auxiliary circuit plug not in position.
- Additionally, the following shall also be provided:
- All operations such as breaker rack-in, breaker rack-out, breaker On/Off, spring charging, earth switch On/Off etc. shall be possible only with panel door closed.
 - Pad locking arrangement shall be provided for rack in operation of breaker as well as for the panel door meeting LOTO requirements.