B895-000-81-45-XXXXX

PREVALING WIND DIRECTION

N

W-1800.00 W-1600.00 W-1400.00 W-1200.00 W-1000.00 W-800.00 W-600.00 W-400.00 W-200.00 E-000.00

N-2400.00 N-2200.00 N-2000.00 N-1800.00 N-1600.00 N-1400.00 N-1200.00 N-1000.00 N-800.00 N-600.00 N-545.00 N-400.00 N-200.00 N.S-000.00 S-200.00 S-400.00 S-600.00 S-800.00 S-1000.00 S-1200.00

E-1000.00 E-1200.00 E-1400.00 E-1600.00 E-1800.00 E-2000.00 E-2200.00 E-2400.00

B1 A1 B2 B5

GREEN BELT AREA EXIST. AREA 1.53350 SQM REFER NOTE '10'

HELIPAD (HIGH MOUNT TYPE)

F R B L

FABRICATION YARD AREA

CONSTRUCTION PERMIT

TRUCK / LABOUR ENTRY

F A C T

GREEN BELT AREA

BUILDING DEMOLISHED

RETAINING WALL

SRR-6

S/STN-OUT (10kV,50)

VGO-HDT 130 x 235 16.00 16.35

DHDT 109x158 16.0 16.35

FCCU 140 x 285 16.35

SRR-5 (FCCU)

CDU/VDU/NSU GR LPG TREATER 140 x 285 16.0 16.35

EMERGENCY WEATHER SHELTER

CONVENTIONAL CONVEYOR WITH HOOD COVER

OIL DATHER (NEW)

NEW MT (TENTATIVE LOCATION)

PIPE CONVEYOR-001

SUMP & PUMP STATION FOR HPSG AND BOILER BLOW DOWN

EXISTING DYKE TO BE DISMANTLED

C.L OF DYKE WALL (TYP)

MOUNDED BULLET(02 NOs. LPG & 4 NOS. LPG/PROPYLENE) #8.0Wx50.0W (TYP) UNDER JOB NO. A255

PIPE CONVEYOR-002

ECO POND

ECO PASS

FLARE AREA

NOTE-13

DG SHED

MAIN ELECTRICAL SS

REFER NOTE-5

REPLACEMENT OF 1500NB 1-1-4-M0/A51 (44.2M, 1.142.0M EXISTING INSULTS TO BE USED FOR PPU

FLARE OF PRU TO BE DISMANTLED

GREEN BELT PLANT

4 M WIDE PIPE RACK NORTH OF EXISTING PIPE RACK

AAQMS-2 (EXISTING)

PUMP SHED (10nos) AIR TRANSFER PUMPS

CRUDE DRAIN TANK #18.50 (YT-26)

CRUDE TANK #18.50 (YT-25)

CRUDE TANK #18.50 (YT-27)

SUB-STATION

TELESTING UNIT

4.0 DISC PAVEMENT

4M. HIGH BARRICADING

WAREHOUSE FOR CONSTRUCTION PHASE (TEMPORARY) PROPOSED OPEN STORAGE AREA FOR EPCM

PORTA CABIN FOR EPCM STAFF

A GATE AAQMS-3 (EXISTING)

FACT

ECO POND

RAIL LOADING COKE SILO

CENTRE OF SILO LOCATION 693.00 FROM DEAD END OF RAIL ON SOUTH EAST SIDE

CIR. STACKER CUM RECLAIMER

TOWER LINE

RAIL LOADING COKE SILO-2

JETTY

TRUCK LOADING STATION, COKE TRUCK LOADING AREA, AUXILIARY FIRE STATION (60x10), RAIL SPUR FOR COKE, COKER NAPHTHA/COKER DIESEL

PROPOSED BOUNDARY WALL

MAIN GATE

HOC

ODC APPROACH TO PLANT

PROPOSED RELOCATION FOR EXISTING AAQMS-2

SUMP & PUMP STATION FOR CTBD

RAIN WATER HARVESTING RESERVOIR (TO BE USED FOR F.W. STORAGE)

F.W. SUMP & PH (50x12)

NEW SOUR FLARE (SUY-V-217)

OPEN/CLOSE STORAGE YARD (GREEN BELT AREA)

OPEN/CLOSE STORAGE YARD (NOT BLASTING YARD)

EXISTING TRUCK PARKING AREA

SEPARATION COMPOUND WALL

ASSEMBLY POINT FOR WORKFORCE & PARKING AREA

BPCL COCO OUTLET

RAW WATER QUARRY-5

RAW WATER QUARRY-6

RAW WATER QUARRY-7

RAW WATER QUARRY-8

REF. DWG. NO.	REFERENCE DRAWING TITLE
KR-A0-00-09-7200	OVERALL PLOT PLAN (KOCHI REFINERY)
B895-000-81-45-00001	OVERALL PLOT PLAN (POLYPROPYLENE PROJECT- KOCHI REFINERY)

NOTES :-

1. ALL DIMENSIONS AND COORDINATES ARE IN METERS UNLESS .
2. THIS DRAWING IS TO BE USED FOR THE COMPLEX LIMIT OF BPCL KOCHI REFINERY.WHEREAS MENTIONED IN TENDER DOCUMENT B895-999-81-45-CC-T-8002.

LEGEND

PROPOSED FACILITIES UNDER JOB NO. B895

KOCHI REFINERY COMPLEX LIMIT

REV.	DATE	REVISIONS	BY	CHKD	APPD	PM
C	30.01.25	REISSUED FOR TENDER	BSM	LP	AK	
B	15.10.24	REISSUED FOR TENDER	BSM	LP	AK	
A	19.07.24	ISSUED FOR TENDER	BSM	LP/NS	SKN	

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

भारत पेट्रोलियम कॉर्पोरेशन लिमिटेड BHARAT PETROLEUM CORPORATION LIMITED

कोच्चि रिफाइनरी KOCHI REFINERY

पोलीप्रोपीलीन प्रोजेक्ट कोच्चि रिफाइनरी	POLYPROPYLENE PROJECT KOCHI REFINERY
कोच्चि रिफाइनरी के कॉम्प्लेक्स की सीमा	COMPLEX LIMIT OF BPCL KOCHI REFINERY

SCALE	JOB NO.	UNIT	DIVN.	DEPT.	DWG. NO.	REV.
1:5000	B895	999	81	45	00002	C

3-1641-0500 REV.3 / 30.12.2019 A0-1189 x 841

B895-000-81-45-00001

ıZLrqr vk§k.k oa bisa fufgr fM+kbu bathfuLkZ baMk fyfeSM dh LkoZfiFr gSA ;s ek= m/kkjh fn, x gSa o ykbZlsal ,aM bathfuLkZ fyfeVsM ds vykok buds dkbZ vU; izfrHkkx ;k Hkkx fdlh Hkh :i esa m ekS Lkxehr Lks gksxk A
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B895-000-81-45-00001 - B895-ENGINEERS INDIA LIMITED - 3-1641-0500 REV.3 / 30.12.2019 - A0-1189 x 841 - Rev A

izLrqr vkSj[k .oa blesa fufgr fMt+kbu bathfu;LkZ baMk;k fyfeVsM dh Lkkeku; ;g L;V Lke>kSrk fd;k gS fd u rks mUgsa iqu% eqfnzr fd;kk tk,xk] u udh dh tk,xh]
u m/kkj fn;s tkus ds fy, tkjh fd;k tk,xk vkSj u gh bl Lkkeku; dk bLrseky fd;k tk,xk] tc rd fd bl izdkj dh izfr;ksa ds fy, fyfeVsM ls iwoZ vuqefr u yh tk,A
Lkkeku; ;k mlds fdlh Hkkx dh izfr;ksa ds fy, fyfeVsM ls iwoZ vuqefr u yh tk,A
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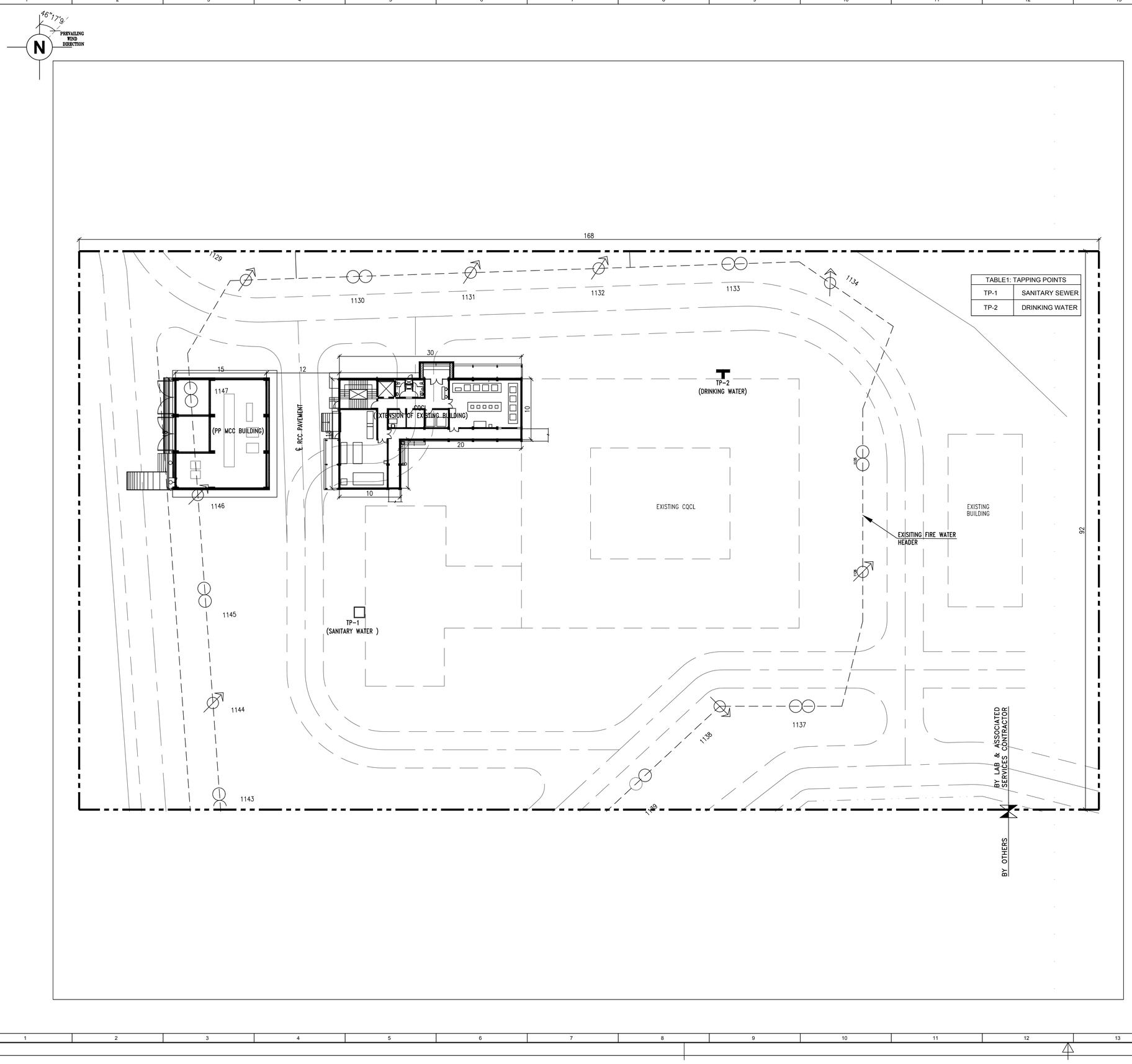


TABLE1: TAPPING POINTS	
TP-1	SANITARY SEWER
TP-2	DRINKING WATER

REF. DWG. NO.	REFERENCE DRAWING TITLE
B895-000-81-45-00001	OVERALL PLOT PLAN (KOCHI REFINERY)
B895-999-81-46-12761	QC LAB EXTENSION ARCHITECTURE DRAWING
B895-999-81-46-12421	SUBSTATION FOR LAB ARCHITECTURE DRAWING

NOTES :-

1. ALL DIMENSIONS, LEVELS AND COORDINATES ARE IN METERS.
2. THE ARRANGEMENT SHOWN IN THIS DRAWING IS SCHEMATIC AND IS INTENDED TO SHOW THE SCOPE LIMITS OF PACKAGE CONTRACTOR.
3. THE DIMENSIONS OF THE BUILDINGS GIVEN IN THIS DRAWING IS INDICATIVE, CONTRACTOR TO REFER ARCHITECTURE DRAWING FOR DIMENSION OF THE BUILDING.
4. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH SCOPE OF WORK, B895-000-81-45-SOW-09802.
5. COORDINATES PROVIDED ARE INDICATIVE AND ANTICIPATED MINIMUM AREA ONLY. EXACT COORDINATES SHALL BE FIRMED-UP DURING DETAIL ENGINEERING OF THE PACKAGE CONTRACTOR.
6. SITE GRADING OF ENTIRE AREA INCLUDING TREE CUTTING & BUSH CLEANING SHALL BE DONE BY PACKAGE CONTRACTOR, FINISHED GRADE LEVEL (FGL) SHALL BE CONSIDERED SAME AS EXISTING ADJACENT LAB BUILDING.
7. THE MICRO GRADING WITHIN SCOPE LIMIT SHALL BE CARRIED OUT BY PACKAGE CONTRACTOR.
8. ALL APPROACH ROADS FROM MAIN ROAD TO BATTERY LIMIT SHALL BE PROVIDED BY PACKAGE CONTRACTOR.
9. THE LOCATION OF APPROACH ROAD SHOWN HERE ARE INDICATIVE. TOTAL NOS. OF APPROACH ROADS, LOCATION AND WIDTH SHALL BE DECIDED DURING DETAILED ENGINEERING BASED ON EQUIPMENT LAYOUT, OPERATION & MAINTENANCE REQUIREMENT AND CONSTRUCTION / ERECTION SCHEME.
10. ALL TEMPORARY APPROACHES REQUIRED FOR FACILITATION OF CONSTRUCTION ACTIVITIES SHALL BE CONSTRUCTED BY THE PACKAGE CONTRACTOR.
11. STORM WATER DRAINS WITHIN SCOPE LIMIT SHALL BE CONSTRUCTED BY THE PACKAGE CONTRACTOR AND FURTHER CONNECTION WITH EXISTING DRAIN OUTSIDE THE SCOPE BATTERY LIMIT IS TO BE DONE BY PACKAGE CONTRACTOR.
12. PERIPHERAL DRAIN WITH HDG GRATING SHALL BE PROVIDED ALL AROUND THE LABORATORY & SUBSTATION BUILDINGS.
13. EXISTING OSBL DRAINS AND OTHER SERVICES IF DAMAGED DURING CONSTRUCTION SHALL BE RECONSTRUCTED BY THE PACKAGE CONTRACTOR.
14. DRINKING WATER REQUIRED FOR THE LABORATORY & SUBSTATION SHALL BE CATERED FROM MAIN HEADER BY THE PACKAGE CONTRACTOR.
15. TAPPING POINTS AS SHOWN ARE INDICATIVE ONLY. TAPPING POINTS NUMBERS AND LOCATION SHALL BE FINALIZED BY PACKAGE CONTRACTOR DURING DETAIL ENGINEERING.
16. OWS COLLECTION SYSTEM INCLUDING PUMPING SYSTEM AND SUMP FOR LABORATORY AND SUBSTATION SHALL BE DESIGNED BY PACKAGE CONTRACTOR AS PER THE REQUIREMENT.
17. ACID/ ALKALI HANDLING AREA SHALL BE PROVIDED WITH ACID/ ALKALI RESISTANT TILE LINING AND SUITABLE KERB WALL ALL AROUND. DYKE WALL SHALL BE PROVIDED AROUND H2SO4 STORAGE TANK. DYKE SHALL BE DESIGNED FOR FULL CONTAINMENT.
18. REROUTING OF EXISTING LIKE STORM DRAIN, DRINKING WATER LINE, TRENCHES, U/G PIPING SHALL BE DONE BY CONTRACTOR TO LOCATE THE BUILDINGS AT DESIRED LOCATIONS.

LEGEND:-

- HYDRANT
- MONITER
- VALVE
- SCOPE BATTERY LIMIT (LAB & ASSOCIATED SERVICES CONTRACTOR)
- EXISTING FACILITIES
- PROPOSED FACILITIES

REV.	DATE	DESCRIPTION	BY	CHKD	APPD	PEM
A	06.11.2025	ISSUED FOR TENDER	HR	BSM/LP	AK	

इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम) ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

भारत पेट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LIMITED
कोच्चि रिफाइनरी
KOCHI REFINERY

पोलीप्रौपेलीन प्रोजेक्ट
कोच्चि रिफाइनरी

POLYPROPYLENE PROJECT
KOCHI REFINERY

SCOPE DRAWING FOR GENERAL CIVIL FACILITES FOR LAB AND ASSOCIATED SERVICES

SCALE	JOB NO.	UNIT	DIVN.	DEPT.	DWG. NO.	REV.
1:300	B895	999	81	45	10577	A

Page 2082 of 4087 : B895-TENDER DOC-B895-999-85-41-EP-T-58802 : Rev. A

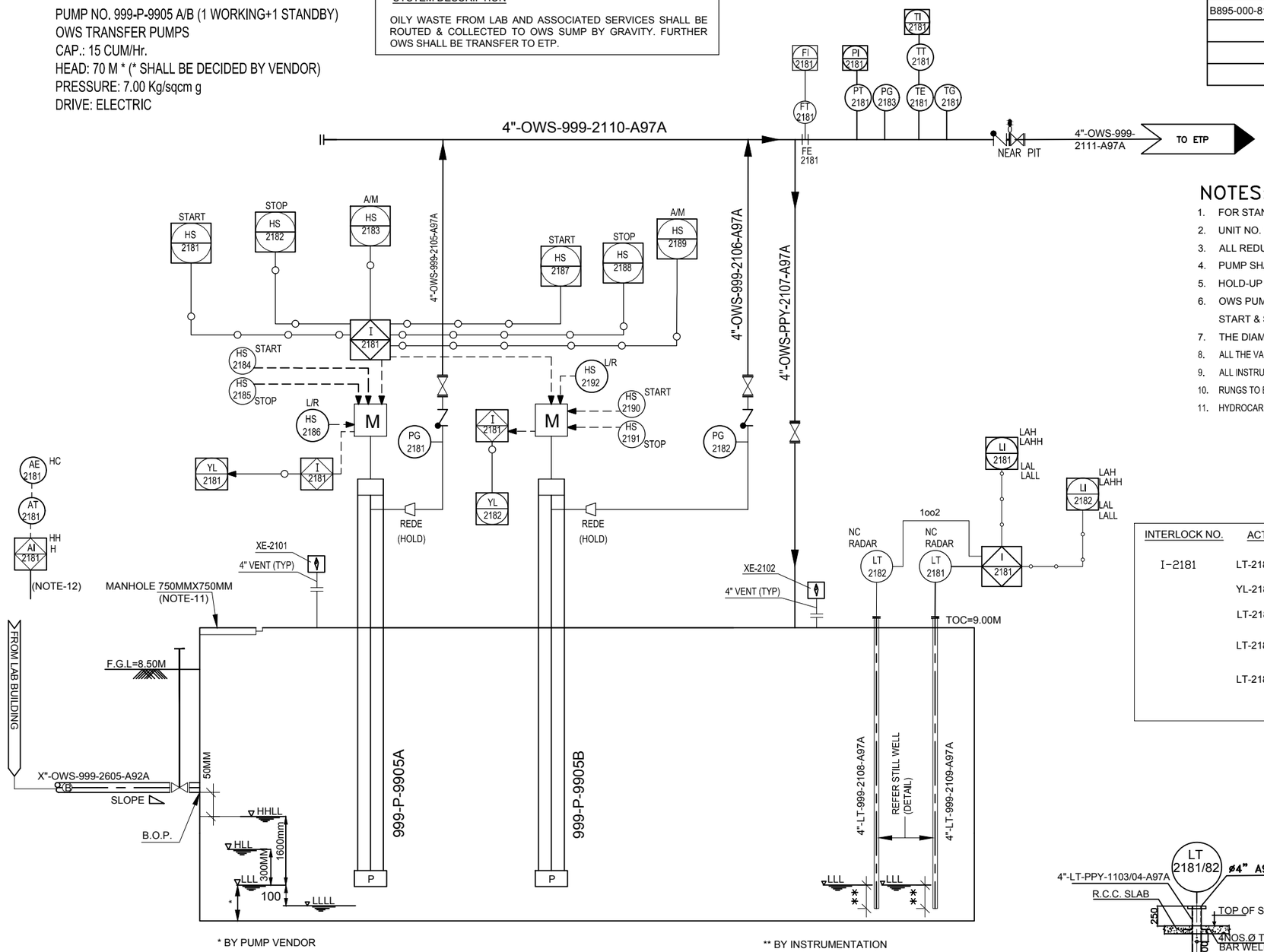
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PUMP NO. 999-P-9905 A/B (1 WORKING+1 STANDBY)
OWS TRANSFER PUMPS
CAP.: 15 CUM/Hr.
HEAD: 70 M * (* SHALL BE DECIDED BY VENDOR)
PRESSURE: 7.00 Kg/sqcm g
DRIVE: ELECTRIC

SYSTEM DESCRIPTION

OILY WASTE FROM LAB AND ASSOCIATED SERVICES SHALL BE ROUTED & COLLECTED TO OWS SUMP BY GRAVITY. FURTHER OWS SHALL BE TRANSFER TO ETP.

REF. DRG. NO.	REF. DRG. TITLE
B895-000-81-45-00001	OVERALL PLOT PLAN



* BY PUMP VENDOR

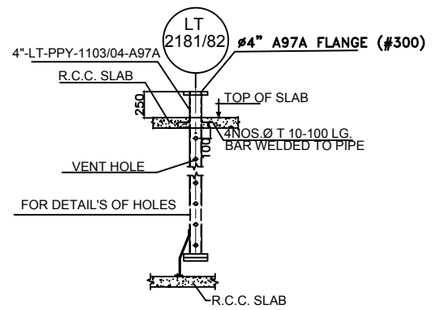
** BY INSTRUMENTATION

RCC OWS SUMP

NOTES:

1. FOR STANDARD SYMBOLS & NOMENCLATURE REFER DWG. NO. B895-02-42-00-1191/1192.
2. UNIT NO. 999 TO BE PREFIXED TO ALL INSTRUMENTS TAG NOS.
3. ALL REDUCERS ARE ECCENTRIC TYPE WITH FLAT TOP.
4. PUMP SHALL BE PROVIDED WITH A LOW LEVEL TRIP.
5. HOLD-UP CAPACITY OF SUMP SHALL BE BETWEEN HHLL AND LLL.
6. OWS PUMPS NO. 999-P-9905A/B TO BE PROVIDED WITH LOCAL FIELD MOUNTED SWITCH TO START & STOP OF PUMPS.
7. THE DIAMETER OF A97A IS IN INCH AND RCC PIPE IS IN MM.
8. ALL THE VALVES SHALL BE AS PER PMS A97A.
9. ALL INSTRUMENTATION SIGNALS SHALL BE ROUTED TO LAB AND ASSOCIATED SERVICES.
10. RUNGS TO BE PROVIDED INSIDE PIT FOR PUMP MAINTENANCE.
11. HYDROCARBON DETECTOR TO BE PROVIDED NEAR THE OWS PIT.

INTERLOCK NO.	ACTUATED BY	ACTION
I-2181	LT-2181/2182/LAH-2181/2182	START PUMP 999-P-9905 A OR PPY-P-9905 B
	YL-2181/2182	IF PUMP 999-P-9905A/B FAILS TO START, PUMP NO. 999-P-9905B/A SHALL START AUTOMATICALLY WITHIN 30 SEC.
	LT-2181/2182/LAHH-2181 /2182	START STAND BY PUMP 999-P-9905 B OR 999-P-9905 A
	LT-2181/LAL-2181	STOP RUNNING PUMP 999-P-9905 A OR 999-P-9905B
	LT-2181/2182/LALL-2181/2182	START PERMISSIVE PUMP 999-P-9905 A OR 999-P-9905 B (TO PREVENT DRY RUNNING DURING START-UP, PUMP SHOULD NOT START FROM FIELD & LAB BUILDING)



STILL WELL DETAIL

LEGEND & ABBREVIATIONS:-

	SINGLE WALLED SEALED MANHOLE
	DOUBLE WALLED SEALED MANHOLE
	GATE VALVE
P	PUMP
M	MOTOR
FA	FLAME ARRESTOR
PI	PRESSURE INDICATOR
LI	LEVEL INDICATOR
LT	LEVEL TRANSMITTER
	BOTTOM OF SUMP
XE-212XX	FLAME ARRESTOR

ENGINEERS INDIA LIMITED
NEW DELHI

भारत पेट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LIMITED
कोच्चि रिफाइनरी
KOCHI REFINERY

REV.	DATE	REVISION	BY	CHK	APPROVED	APPROVED
A	06.11.25	ISSUED FOR TENDER	BSM	LP	AK	

P&ID OF OWS PUMPING SYSTEM FOR LAB AND ASSOCIATED SERVICES

DRAWING NO.	REV.
B895-999-81-45-35222	A

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

B895-000-81-45-00001

SEPARATION DISTANCE BETWEEN FACILITIES AS PER OISD-118

SR. NO.	FROM / TO	1	2	3	4	5	6	7	8	9	10	11	12
1	PROCESS UNIT (PP UNIT)	36 (152)	16 (45)	30 (85.5)	30 (999)	30 (1249)	90 (738)	45 (1600)	60 (1252)	60 (60.8)	60 (235)	60 (243)	15 (110)
2	PROCESS CONTROL ROOM (SRR-11)	16 (45)	NA	30 (137)	30 (1149)	30 (1385)	90 (880)	45 (1750)	30 (1269)	30 (34)	15 (149)	30 (181)	0 (10)
3	STORAGE TANK CLASS-A #	30 (*)	30 (*)	67 (NA)	52 (*)	44 (*)	90 (*)	30 (*)	60 (*)	20 (*)	60 (*)	30 (*)	60 (*)
4	STORAGE TANK CLASS-B #	30 (*)	30 (*)	52 (NA)	41.5 (*)	44 (*)	90 (*)	30 (*)	60 (*)	20.75 (*)	30 (*)	30 (*)	30 (*)
5	STORAGE TANK CLASS-C #	30 (*)	30 (*)	44 (*)	44 (*)	* (NA)	90 (*)	30 (*)	60 (*)	30 (*)	30 (NA)	30 (*)	30 (*)
6	FLARE	90 (738)	90 (*)	90 (*)	90 (*)	90 (*)	* (*)	90 (*)	90 (*)	90 (*)	90 (831)	90 (770)	90 (912)
7	BULK LOADING LPG (ROAD) #	45 (*)	45 (*)	30 (*)	30 (*)	30 (*)	90 (*)	NA	90 (*)	30 (*)	60 (*)	30 (*)	30 (*)
8	FIRE STATION / FIRST AID CENTER#	60 (*)	30 (*)	60 (*)	60 (*)	60 (*)	90 (*)	60 (*)	NA	12 (*)	12 (*)	30 (*)	0 (*)
9	BOUNDARY WALL	60 (60.8)	0 (34)	20 (*)	20.75 (*)	20 (*)	90 (*)	30 (*)	12 (*)	NA	6 (15.2)	30 (32)	15 (32.9)
10	SERVICE BUILDINGS (CATALYST WH)	60 (156)	15 (67)	60 (1006)	30 (1091)	30 (1299)	90 (827)	60 (1585)	12 (1085)	6 (15.2)	NA	30 (32)	12 (67.8)
11	COOLING TOWER (PP CT)	30 (101)	30 (58)	30 (953)	30 (1038)	30 (1246)	90 (775)	30 (1533)	30 (1043)	30 (32)	30 (32)	NA	30 (22)
12	ELECTRICAL SUB STATION (JP-1)	15 (110)	0 (10)	60 (89)	30 (983)	15 (1201)	90 (719)	30 (1497)	30 (1048)	12 (32.9)	12 (67.8)	6 (22)	NA

* NOT APPLICABLE FOR PP PROJECT, THESE FACILITIES ARE EXISTING.
# EXISTING FACILITY - NOT TO BE USED FOR PP UNIT PROJECT OF KOCHI REFINERY

LIST OF UTILITIES (IREP)

SR.NO.	UTILITIES IN BLOCK	NOS. OF UNIT/ CHAIN/CELL	CAP.OF EACH UNIT/CHAIN/CELL	REMARKS
1.	COOLING TOWER:			
	CT-1	6+1	4000 CUM/HR	REFINERY COOLING TOWER
	CT-2	8+1	4000 CUM/HR	FCC COOLING TOWER
	CT-3	1+1	4000 CUM/HR	SULPHUR BLOCK COOLING TOWER
2.	CAPTIVE POWER PLANT:			
	UTILITY BOILERS	1+1	210 TPH	
	GTG	3	34.5 MW	
	HRSG	3	110 TPH	
3.	RAW WATER TREATMENT PLANT	2	1800 CUM/HR	
4.	ROOM PLANT & CPU:	6+1	168 CUM/HR	
	CPU	2+1	120 CUM/HR	
5.	EFFLUENT TREATMENT	1	700 CUM/HR	

LIST OF UNITS (IREP)

S.N.	UNITS IN BLOCK	UNIT NO.	CAPACITY IN MMTPA	LICENSER
1.	CDU/VDU/NSU, DE LPG TREATER, FG HEATER, FG SYSTEM	OIC/ICL/IVF/IUF	10.5 (TG TREATER-435 KTPA)	EIL
2	MCU (BOO)	--	2 X 0.0485	--
3	DHDT	OIG	4.3	HTAS
4	VGO HDT	OIV	3.0	SHELL
5	FCCU	OIF	2.2	STONE & WEBSTER
6	DCU & CR LPG	OIG/OIL	3.84	DCU-LUMMUS CR LPG-EIL
7	NHT/ISOM	OIH/OIR	0.30	UOP
8	SULPHER BLOCK			
(i)	SWS-1 & SWS-2	ISW	335/114 TPH	EIL
(ii)	ARU	ISA	680 TPH	EIL
(iii)	SRU	OIS	2x340 TPD	EIL
(iv)	TGT	--	MATCHING	CB & I LUMMUS

CRUDE STORAGE TANKS (IREP)

TANK NO.	EXISTING TANKS SERVICE	NEW SERVICE	NO. OF TANKS	TYPE OF ROOF	FLASH POINT IN °C	CLASS	DIA. IN METRE	HEIGHT IN METRE	CAP. IN CUM. /TANK (STORED) (EXISTING)	CAP. IN CUM. /TANK (STORED) (NEW)	EXISTING TANK FARM
T-19,20,21,22,23,24	CRUDE TANKS	CRUDE	6	FR	<23	A	79.0	14.2	59780	59780	CRUDE TANK FARM& IN DHDS AREA

INTERMEDIATE FEED TANKS (IREP)

T-308	MSRD TANK	NSRD/LSD/NSD/NAC DIESEL	1	FR	>23 & <65	B	30.48	12.17	7858	7858	MSD/IOT/SKO TANK FARM
T-309	SKO TANK	NSRD/LSD/NSD/NAC DIESEL	1	FR	>23 & <65	B	30.48	12.11	7675	7675	-DO-
T-330	HSD TANK	NSRD/LSD/NSD/NAC DIESEL	1	FR	>23 & <65	B	30.48	12.71	8187	8187	-DO-
T-150	NAPHTHA CAN TANK	DIRET FEED	1	FR	>23 & <65	B	42.67	12.13	15394	15394	-DO-
T-260, T1-250	ASPHALT/CLSHS	FCC-PC FEED	2	CR	>65	C	42.67	12.20	15394	15394	ASPHALT TANK FARM
T-260,261,262,263	FUEL OIL	FUEL OIL	4	CR	>65	C	36.60	12.54	12200	12200	FURNACE OIL TANK FARM
T1-14	FO	FUEL OIL	1	CR	>23 & <65	B	56.75	14.85	47290	47290	CRUDE TANK FARM
T1-20,22,23	FCC-PC FEED	FCC-PC FEED	3	CR	>65	C	34.0	17.0	12258	14500	FCC-PC TANK FARM
T-134	NAPTHA	MSD-FEED	1	CR	<23	A	34.50	13.0	9300	9300	
T1-34,35	VGO-FEED	FCC-PC FEED/VGO MOS FEED	2	CR	>65	C	36.00	13.5	12713	12713	VGO-TANK FARM
T1-50	PLANT FUEL	FO TANKS	1	CR	>65	C	36.48	12.45	8041	8041	
T1-340	VR	BBU FEED TANK	1	CR	>65	C	38.58	12.52	8942	8942	
T1-365	LCO	LCO	1	FR	>23 & <65	B	43.50	14.36	17844	17844	
T1-366	LCO	LCO	1	FR	>23 & <65	B	43.50	14.50	17844	17844	
T1-190	PLANT FUEL	PLANT FUEL	1	CR			13.72	10.88	1480	1480	

FINISHED PRODUCT TANKS (IREP)

T1-16	CDN BLEND TANK	NAPHTHA	1	FR	<23	A	66.75	14.38	45552	45552	NAPHTHA TANK FARM
T1-17	--DO--	NAPHTHA	1	FR	<23	A	79	15.11	61545	60000	-DO-
T1-18	CRUDE OIL TANK	NAPHTHA	1	FR	<23	A	79.00	14.38	61545	60000	-DO-
T1-10	CRUDE TANK	MSD-HV	1	FR	>23 & <65	B	60.96	15.10	36792	36792	CRUDE TANK FARM
T1-11	--DO--	MSD-HV	1	FR	>23 & <65	B	60.96	14.37	36792	36792	-DO-
T1-110	--DO--	MSD-HV	1	FR	>23 & <65	B	36.58	12.70	11572	11572	MSD/ATF/SKO TANK FARM
T1-120	--DO--	MSD-HV	1	FR	>23 & <65	B	36.58	12.99	12203	12203	-DO-
T1-130	--DO--	MSD-HV	1	FR	>23 & <65	B	36.58	14.17	13150	13150	-DO-
T1-350	--DO--	MSD-HV	1	FR	>23 & <65	B	36.58	14.12	12191	12191	INTERMEDIATE TANK FARM
T1-360	--DO--	MSD-HV	1	FR	>23 & <65	B	36.58	14.10	12081	12081	-DO-
T1-370	--DO--	MSD-HV	1	FR	>23 & <65	B	36.58	12.01	12191	12191	-DO-
T1-380	--DO--	MSD-HV	1	FR	>23 & <65	B	36.58	13.72	10240	10240	-DO-

CRUDE STORAGE TANKS (IREP)

TANK NO.	SERVICE	NO. OF TANKS	TYPE OF ROOF	FLASH POINT IN °C	CLASS	DIA. IN METRE	HEIGHT IN METRE	CAP. IN CU. M. /TANK (STORED)	TANK FARM NO.	REMARKS
T1-25,26	CRUDE	2	FR	<23	A	79.0	14.20	60000	TF-1	
T1-29	CRUDE WATER DRAIN TANK	1	CR	<23	A	18.30	15.0	3650	TF-2	
T1-28	SURGE RELIEF TANK	1	CR	<23	A	12.00	11.00	1100	TF-2	

INTERMEDIATE FEED TANKS (IREP)

T1-111,112,113,114	COKER NAPHTHA/COKER DIESEL	4	CR	<23	A	22.00	15.0	4395	TF-5	N2 BLANKETED
T1-107,108	NHT-FEED	2	DR	<23	A	15.80	12.0	1600	TF-4	N2 BLANKETING
T1-291	ISOM FEED	1	DR	<23	A	12.0	11.0	1100	TF-4	N2 BLANKETED
T1-115,116	ISOMERATE	2	DR	<23	A	15.50	12.0	2050	TF-4	N2 BLANKETED
T1-44,45	VGO-HDT FEED	2	CR	>65 & <93	C	33.10	15.0	12000	TF-6	N2 BLANKETED
T1-46,47	HCGO	2	CR	>65 & <93	C	20.00	15.0	4385	--	- NZ BLANKETED - EXISTING TANK NO. T1-270 IN EXISTING ASPHALT TANK FARM TO BE DISMANTLED

SCHEDULE OF NEW EXCLUDED PETROLEUM TANKS (IREP)

TANK NO.	SERVICE	NO. OF TANKS	TYPE OF ROOF	FLASH POINT IN °C	DIA IN METRE	HEIGHT IN METRE	CAP. IN CU. M./TANK (STORED)	TANK FARM NO.
T1-341,342,343,344	DCU FEED	4	CR	>93	32.10	15.0	11220	TF-3

FINISHED PRODUCT TANKS (IREP)

TANK NO.	EXISTING TANKS SERVICE	NEW SERVICE	NO. OF TANKS	TYPE OF ROOF	FLASH POINT IN °C	CLASS	DIA. IN METRE	HEIGHT IN METRE	CAP. IN CU.M. /TANK(STORED) (EXISTING)	CAP. IN CU.M. /TANK (STORED) (NEW)	EXISTING TANK FARM
T1-12	CRUDE TANK	MSD-IV	1	FR	>23 & <65	B	66.76	16.17	48550	48550	CRUDE TANK FARM
T1-115	NAPHTHA LAN TANK	MSD-IV	1	FR	>23 & <65	B	66.75	15.24	45552	45552	-DO-
T1-102	NAPHTHA LAN TANK	GASOLINE-IV	1	FR	<23	A	45.72	14.00	19311	19311	NAPHTHA TANK FARM
T1-103	CDN BLEND TANK	GASOLINE-IV	1	FR	<23	A	45.80	14.30	20587	20587	MSD/HCG TANK FARM
T1-60	MS E-10	GASOLINE-IV	1	FR	<23	A	30.48	14.15	8137	8137	GASOLINE TANK FARM
T1-70	-DO-	GASOLINE-IV	1	FR	<23	A	30.48	13.45	8019	8019	-DO-
T1-80	-DO-	GASOLINE-IV	1	FR	<23	A	21.34	13.98	4475	4475	-DO-
T1-90, T1-100	-DO-	GASOLINE-IV	1	FR	<23	A	30.48	14.00	8123	8123	-DO-
T1-101	CDN BLEND TANK	GASOLINE-IV	1	FR	<23	A	32.30	12.20	10250	10250	NAPHTHA TANK FARM
T1-91	GASOLINE FEED	GASOLINE-IV	1	FR	<23	A	15.00	13.22	7555	7555	GASOLINE TANK FARM
T1-140	-DO-	ATF	1	FCR	>23 & <65	B	21.30	14.18	4069	4069	MSD/ATF/SKO TANK FARM
T1-160	-DO-	ATF	1	FCR	>23 & <65	B	21.34	13.90	4141	4141	-DO-
T1-331	-DO-	ATF	1	FCR	>23 & <65	B	32.30	13.64	9500	9500	-DO-
T1-383, T1-384	-DO-	ATF	2	FCR	>23 & <65	B	36.00	15.50	11797	11797	VOLTEX TANK FARM
T1-400	DELETED										
T1-440 / 450	ATF	ATF	2	FCR	>23 & <65	B	33.00	17.00	5700	5700	
T1-381,382,385	SKO	SKO	3	FR	>23 & <65	B	36.00	14.80	11797	11797	
T1-420	MTO	MTO	1	FR	>23 & <65	B	18.00	10.50	2260	2260	
T1-430	MTO	MTO	1	FR	>23 & <65	B	12.00	8.0	791	791	
T1-410	HY. NAPHTHA	HY. NAPHTHA	1	FR	<23	A	18.00	DELETED 15.50	2286	2286	

SCHEDULE OF PRESSURIZED STORAGE (IREP)

VESSEL NO.	SERVICE	NO. OF VESSELS	DIA. IN METRE	HEIGHT IN METRE	CAP.IN CUM./TANK (STORED)	REMARKS
T1-626/627	LPG	2	8.0	80.0	3500	MOUNDED BULLET (UNDER JOB NO. A-255)
T1-632/633/634/635	LPG/PROPILENE	4	8.0	80.0	3500	MOUNDED BULLET (UNDER JOB NO. A-255)

SCHEDULE OF EXISTING PRESSURIZED STORAGE USED FOR PP PROJECT (B895)

VESSEL NO.	SERVICE	NO. OF VESSELS	DIA. IN METRE	HEIGHT IN METRE	CAP. IN CUM./TANK (STORED)	REMARKS
T1-630/631	PROPILENE	2	4.2	42.0	520 CUM	EXISTING MOUNDED BULLET
T1-632/633/ 634/635	PROPILENE	4	8.0	80.0	3600 CUM (1800MT) EACH	EXISTING MOUNDED BULLET

LIST OF UNITS & UTILITIES & BUILDINGS (JOB N.-B895)

SR.NO.	UNITS & UTILITIES & BUILDINGS	UNIT NO.	REMARKS
PROPOSED UNITS/REVAMP UNITS			
1	PP UNIT)	OPP	LICENSER : UNIPOL CAPACITY : 400KTPA
2	PFCCU UNIT	OIF	REVAMP
PROPOSED BUILDINGS & WAREHOUSE			
3	POLYMER WAREHOUSE (ASRS)	999	
4	CATALYST WAREHOUSE	999	
5	SRR-11 (PP UNIT)	999	BLAST RESISTANCE
6	SUB STATION (JP-1, PP UNIT)	999	
PROPOSED UTILITIES (JOB NO. B895)			
7	N2 PLANT/AIR	PPA	N2 -1150 NM3/HR, AIR-5000 NM3/HR
8	CT (PP UNIT)	PPC	2+1 CELLS 4000 M3/HR (EACH)
9	DG SET	999	
10	OWS PIT (OWS PUMPING) (4MX4M)	999	FOR B3 PLOT
11	SWS PIT-1 (SANITARY PUMPING) (4MX4M)	999	FOR B2 PLOT
12	SWS PIT-2 (SANITARY PUMPING) (4MX4M)	999	FOR B3 PLOT
13	CWS PIT (CWS PUMPING) (4MX4M)	999	(FOR RETAINTION PONDS)

EXISTING FACILITY TO BE USED IN (JOB NO. B895)

1	MAIN CONTROL RM	--
2	LPG SRR	--
3	SUB/STN BO10	--
4	TFMC CONTROL ROOM	--
5	BOB S/STN.	--
6	PROPOSED COMPRESSOR	--
7	CONT.RM. BLDG.(LPG T/L MCC ROOM)	--
8	CQCL	--
9	EXISTING 2 BAYS OF LPG TRUCK GANTRY CONVERTED TO UNLOADING PROPYLENE	--
10	OLD PIBU CONTROL ROOM	--
11	PRU SUB-STN.	--
12	S/STN-GC1 (FCCU)	--
13	SRR-5 (FCCU)	--
14	GIS 220KV SUB STN.	--
15	NEW MRS SUB. STN.(ER1-SS)	--
16	RO-DM SUB STN.	--
17	EXISTING BULLET (T-1-630/631/632/633/634/635)	--

REFERENCE DRAWING TITLE

REF. DWG. NO.	REFERENCE DRAWING TITLE
KR-A0-00-09-7200	OVERALL PLOT PLAN (KOCHI REFINERY)

NOTES :-

1. ALL DIMENSIONS AND COORDINATES ARE IN METERS UNLESS OTHERWISE MENTIONED.
2. DELETE.
3. DELETE.
4. DELETE.
5. REQUIREMENTS OF THE FOLLOWING FACILITIES SHALL BE USED FROM EXISTING REFINERY :
   a) FIRE STATION
   b) SITE OFFICE
6. BARRICADING SHALL BE PROVIDED IN ACCORDANCE TO MOM DATED 03.08.2022 HELD BETWEEN M/S BPCL, EIL GENERAL CIVIL & SAFETY.
7. SUITABLE SPACE SHALL BE ALLOCATED FOR ACCOMMODATING MCC/ LDB, UPS AND BATTERY ROOM ADJACENT TO EXISTING LAB SUBJECT TO AVAILABILITY OF SPACE DURING DETAILED ENGINEERING.
8. EXTENSION OF LAB BUILDING AT EXISTING CENTRAL QUALITY LAB.
9. EXACT LOCATION AND SIZE OF EXISTING PIBU CONTROL ROOM TO BE PROVIDED BY EIL.
10. TRUCK MOVEMENT AREA ON EAST OF WAREHOUSE AND RETENTION POND AREA TO BE UTILIZED AS TEMPORARY FABRICATION YARDS.
11. THE TOTAL GREEN BELT REQUIRED FOR SETTING UP PP PROJECT IS 21.29 ACRES (APPROX). HOWEVER 34 ACRES OF GREEN BELT IS BEING PROVIDED AS PER COMMUNICATION BY CLIENT VIDE MAIL DATED 08/12/23 AS ENVIRONMENTAL CLEARANCE(EC) FOR PP PROJECT WAS OBTAINED ON 29/07/23 AS AMENDMENT TO EC OF POLYOL PROJECT.
12. THE PADC BUILDING TO BE LOCATED IN THE OLD TOWNSHIP & SCHOOL AREA. THE LOCATION WILL BE FINALIZED AFTER RECEIPT OF INPUT FROM THE CLIENT.
13. DELETE.
14. DELETE.
15. CANTEEN & LABOUR AMENITIES BUILDING SHALL BE DISMANTLED AFTER COMPLETING THE CONSTRUCTION ACTIVITIES OF PP PROJECT.

HOLD:

(1) IDENTIFICATION OF EXISTING PIPE RACK FOR INTERCONNECTION ROUTE.

LEGEND

- PROPOSED FACILITIES UNDER JOB NO. B895
- GREEN BELT AREA
- RCC PAVED AREA
- EXISTING FACILITIES TO BE USED UNDER JOB NO. B895
- FABRICATION YARD AREA
- AREA USED IN EXISTING REFINERY FOR PROPOSED FACILITIES UNDER JOB NO B895
- SLEEPERS
- ODC ROUTE
- POLYMER TRUCK ENTRY AAQMS-X
- PROPOSED ROAD UNDER JOB NO. B895
- PROPOSED COMPOUND WALL
- PROPOSED PIPE-RACK
- PIPE SLEEPER
- RCC RETAINING WALL
- RR MASONARY RETAINING WALL
- EXISTING COMPOUND WALL
- LPG EXISTING LPG PIPELINE
- TO BE DEMOLISHED
- BARRICADING
- 9.75 FINISHED GRADE LEVEL (FGL)
- BR-XX BRIDGE
- 220 KV EXISTING ELECTRICAL TRENCH

AREA CHART :-

(JOB NO. B895 :- POLYPROPYLENE PROJECT)

S.NO.	LOCATION AND PLOT NUMBER	AREA HECTARE	AREA ACRE
1	PROPOSED AREA WITHIN B2 PLOT OF LAND	14.57	36.01
2	PROPOSED AREA WITHIN B3 PLOT OF LAND	1.19	2.94
3	IN EXISTING REFINERY FOR CT & N2	1.85	4.58
4	TOTAL PLANT AREA FOR PROPOSED FACILITIES EXCLUDING GREEN BELT	16.89	41.74
5	GREEN BELT AREA PROVIDED IN B1 PLOT	13.035	32.21
6	GREEN BELT AREA PROVIDED IN B2 PLOT	0.7254	1.79
7	TOTAL GREEN BELT AREA PROPOSED	13.76	34.00

NOTE FOR AREA CALCULATION: TRUCK PARKING FACILITIES MARKED IN B1 PLOT IS CONSIDERED AS TEMPORARY FACILITIES AND IT IS NOT MARKED IN AREA CHART.

REV.	DATE	REVISIONS	BY	CHKD	APPD	PM
H	28.02.25	ISSUED FOR PESO APPROVAL	LP	AK	SKN	
G	29.01.25	ISSUED FOR PPRRC APPROVAL	LP	AK	SKN	
F	22.11.24	REISSUED FOR ENGINEERING	LP	AK	SKN	
E	08.10.24	REISSUED FOR ENGINEERING	LP	AK	SKN	
D	11.07.24	ISSUED FOR ENGINEERING	SONU/LP	AK	SKN	
C	02.07.24	ISSUED FOR PPRC APPROVAL	LP	AK	SKN	
B	12.06.24	ISSUED FOR CLIENT'S COMMENTS	LP	AK	SKN	
A	22.05.24	ISSUED FOR COMMENTS	LP	AK	SKN	

इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम) ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

भारत पेट्रोलियम कॉर्पोरेशन लिमिटेड BHARAT PETROLEUM CORPORATION LIMITED कोच्चि रिफाइनरी KOCHI REFINERY

पोलीप्रोपैलीन प्रोजेक्ट कोच्चि रिफाइनरी	POLYPROPYLENE PROJECT KOCHI REFINERY
सम्पूर्ण क्षेत्र विन्यास	OVERALL PLOT PLAN

SCALE	JOB NO.	UNIT	DIVN.	DEPT.	DWG. NO.	REV.
1:5000	B895	000	81	45	00001	H

3-1641-0500 REV.3 / 30.12.2019 A0-1189 x 841

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PIPING MATERIAL SPECIFICATION

Spec Name	:	**B895-999-6-44-0005-9802**
Spec Desc.	:	**PMS FOR LAB BUILDING TENDER**
Client	:	**BPCL**
Project	:	**POLY PROPLENE UNIT**
Location	:	**KOCHI, KERALA**
Job No.	:	**B895**
Dept/Sec.	:	**16/43**

Rev.no	Date	Purpose	Prepared by	Checked by	Approved by
0	22-10-2025	ISSUED FOR TENDER	KCA	AM	RKG

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Abbreviations :

PMS : Piping Material Specifications

M : Matching (Schedule/ Thickness)

IBR : Indian Boiler Regulations

NACE : National Association of Corrosion Engineers

HDPE : High Density Poly Ethylene

NDT : Non Destructive Testing

PE : Plain End

BE : Bevel End

PBE : Plain Both Ends

ASTM : American Society for Testing & Materials

API : Ameriacn Petroleum Institute

ASME : American Society of Mechanical Engineers

SW : Socket Weld

BW : Butt Weld

BHN : Brinell Hardness Number

MP Test: Magnetic Particle Test

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Client	: BPCL	**Dept./Sect :**	16/43
Project	: POLY PROPLENE UNIT		
Location	KOCHI, KERALA		

PIPING MATERIAL SPECIFICATION INDEX

Sl. No.	Piping Class	Rating	C.A.	Spl. Reqt.	Basic Material	Service	Remarks
1	A3A	150	1.50		CARBON STEEL	NON CORROSIVE UTILITIES (ABOVE GROUND) CATEGORY "D" FLUID - COOLING WATER, INSTRUMENT AIR(2" & ABOVE-IN OFFISTES DISTRIBUTION), PLANT AIR, INERT GAS, CARBON DI OXIDE (DRY), NITROGEN, CONDENSATE & BOILER FEED SUCTION (NON IBR). THIS CLASS DOES NOT COVER UNDERGROUND PIPING AND THE FIRE WATER SERVICE. FOR SIZES ABOVE 30", TEMPERATURE AND PRESSURE RATINGS SHALL BE 70 DEG.C & 7.0 KG/CM2G RESPECTIVELY. (FOR PRESSURE ABOVE 7 KG/CM2G, A91A/A1A SHALL BE REFERRED).	

Notes :

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Client : BPCL	**Dept./Sect :** 16/43
Project : POLY PROPLENE UNIT	
Location : KOCHI, KERALA	**Piping Class : A3A**

PIPE CLASS : **A3A**
RATING : 150
BASE MATERIAL : CARBON STEEL
CORROSION ALLOWANCE : 1.50 MM
SPECIAL REQUIREMENT :

TEMPERATURE(Deg.C) AND PRESSURE(Kg/Sq.cm g) RATINGS

TEMP.	0	38	50	65	100	150	186
PRESS	10.55	10.55	10.55	10.55	10.55	10.55	10.55

SERVICE

NON CORROSIVE UTILITIES (ABOVE GROUND) CATEGORY "D" FLUID - COOLING WATER, INSTRUMENT AIR(2" & ABOVE-IN OFFISTES DISTRIBUTION), PLANT AIR, INERT GAS, CARBON DI OXIDE (DRY), NITROGEN, CONDENSATE & BOILER FEED SUCTION (NON IBR). THIS CLASS DOES NOT COVER UNDERGROUND PIPING AND THE FIRE WATER SERVICE. FOR SIZES ABOVE 30", TEMPERATURE AND PRESSURE RATINGS SHALL BE 70 DEG.C & 7.0 KG/CM2G RESPECTIVELY. (FOR PRESSURE ABOVE 7 KG/CM2G, A91A/A1A SHALL BE REFERRED).

NOTES

4 USAGE OF UNIONS TO BE RESTRICTED TO WATER SERVICES ONLY.

6 FOR FABRICATED REDUCERS,REFER EIL'STD 7-44-0485 & 7-44-0487. FOR MITRES, REFER EIL'STD 7-44-0033.

10 USE 5 PIECES 90 DEG MITRE FOR SIZE(S) 50, 54, 56, 60, 64 - 70; 6 PIECES 90 DEG MITRE FOR SIZE(S) 52, 62, 72 - 76; 7 PIECES 90 DEG MITRE FOR SIZE(S) 80; 45 DEG MITRE REQUIRES ONE PIECE LESS

31 USE BUTTERFLY VALVES INSTEAD OF GATE VALVES FROM 10" ONWARDS IN WATER SERVICE AND UPTO 70 DEG C. DESIGN PRESSURE FOR BUTTERFLY VALVES IS LIMITED UPTO 10 BAR.

32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.

65 FORGINGS ARE ACCEPTABLE IN LIEU OF PLATE MATERIAL FOR BLIND FLANGES AND SPACER & BLINDS.

76 FOR PERMANENT BW STRAINERS,REFER EIL'STD 7-44-0303 & 7-44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300.

77 FOR SIZES > 24", SPACER & BLIND SHALL BE AS PER EIL'STD 7-44-0164.

86 BUTTERFLY VALVES FOR THE SPEC ARE PN10 RATED WITH A MAXIMUM PRESSURE OF 10.2 KG/CM2G.

98 FOR SIZES ABOVE 30", TEMPERATURE AND PRESSURE RATINGS SHALL BE 70 DEG.C & 7.0 KG/CM2G RESPECTIVELY.

99 BLIND FLANGES AND SPACER & BLINDS SPECIFIED TO MANUFACTURER'S STANDARD SHALL BE DESIGNED FOR 70 DEG.C AND 7.0 KG/CM2G TO SUIT 150#, FF, 125AARH, AWWA C207 CL.D FLANGES.

100 USE 5 PIECES 90 DEG MITRE FOR SIZE(S) 50, 54, 56 - 60, 64, 66, 68 - 70; 6 PIECES 90 DEG MITRE FOR SIZE(S) 52, 62, 72 - 76, 77, 77.559, ; 7 PIECES 90 DEG MITRE FOR SIZE(S) 78 - 80; 45 DEG MITRE REQUIRES ONE PIECE LESS

101 NDT REQUIREMENTS AS PER JOB SPECIFICATION B895-6-44-0016

152 FIRST ISOLATION VALVE ON ALL FLOW, PRESSURE AND LEVEL TAPPINGS SHALL BE METAL TO METAL SEATED BALL VALVE.

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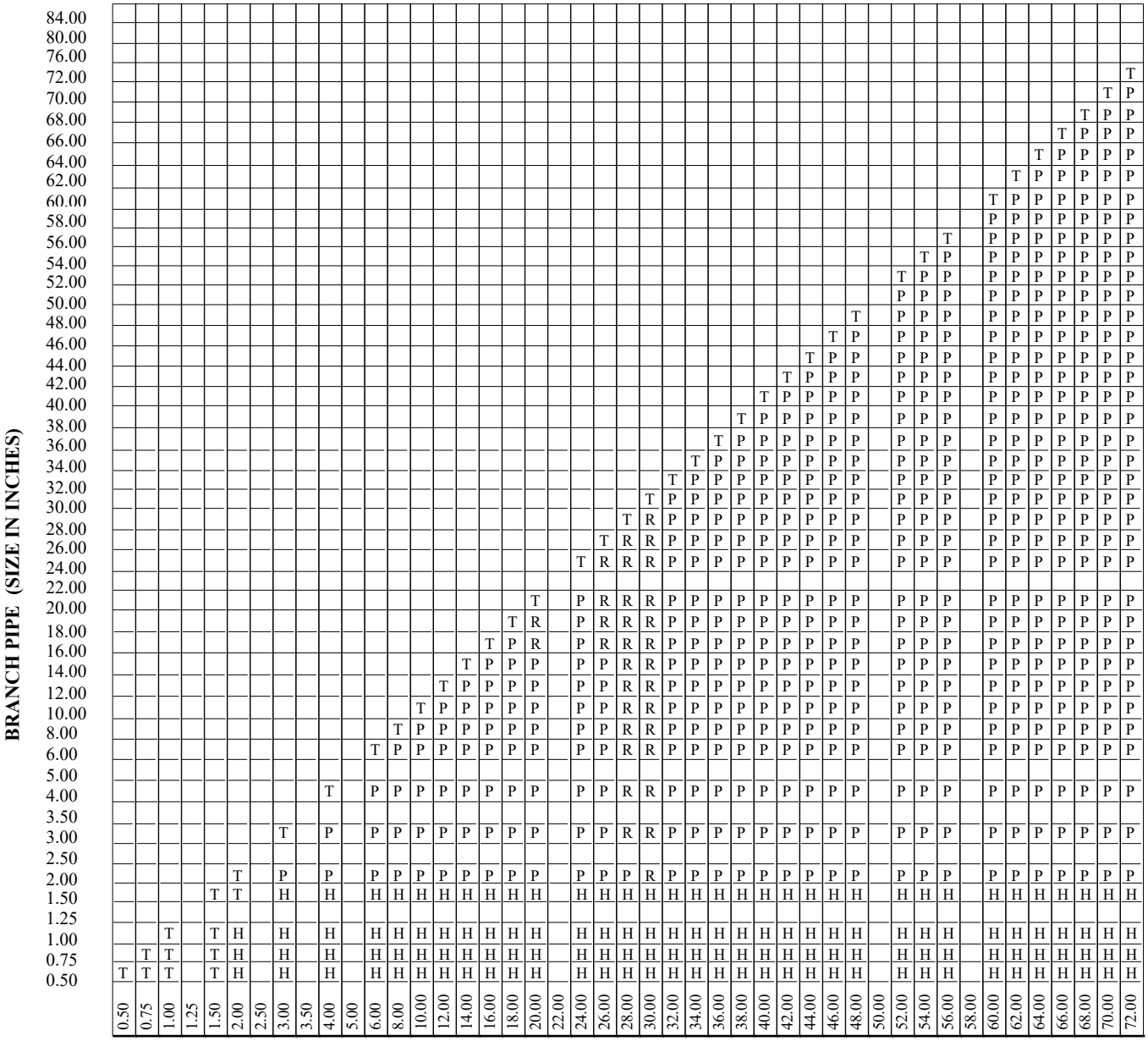
Client : BPCL	**Dept./Sect :** 16/43
Project : POLY PROPLENE UNIT	
Location : KOCHI, KERALA	**Piping Class :** **A3A**

SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING 3000 LBS.	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-350, DF3	
	ON LINES >= 2.0"	0.75" OR AS PER P&ID. REFER EIL STD. 7-44-351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-350, VC1	
	ON LINES >= 2.0"	0.75" OR AS PER P&ID. REFER EIL STD 7-44-351, V1	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-353	
PRESS.CONN	0.75"	SW, SH HVY NIPPLE WITH GATE VALVE TO SPEC AS PER EIL STD 7-44-354	

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Client : BPCL	**Dept./Sect :** 16/43
Project : POLY PROPLENE UNIT	
Location : KOCHI, KERALA	**Piping Class : A3A**



RUN PIPE (SIZE IN INCHES)

CODE	DESCRIPTION				
F	SADDLE FUSED JT	**T**	TEES	**J**	THREADOLET
H	H.COUPLING	**W**	WELDOLETS	**N**	NIPPOLET
P	PIPE TO PIPE	**I**	INSTRUMENT TEE	**U**	UNLISTED B31.3 COMP
R	REINFORCED	**X**	REFER NOTES		
S	SOCKOLETS	**L**	SWEEPOLET		

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Client : BPCL	**Dept./Sect :** 16/43
Project : POLY PROPLENE UNIT	
Location : KOCHI, KERALA	**Piping Class : A3A**

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn.STD	Material	Description	Commodity Code	Note No
Pipe Group									
PIP	PIPE	0.50	0.75	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	1.00	1.50	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2.00	2.00	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	3.00	14.00	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16.00	16.00	6.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
PIP	PIPE	18.00	20.00	8.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
PIP	PIPE	24.00	30.00	10.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	
PIP	PIPE	32.00	42.00	10.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	98
PIP	PIPE	44.00	52.00	12.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	98
PIP	PIPE	54.00	62.00	14.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	98
PIP	PIPE	64.00	80.00	16.0	IS-3589	IS-3589 GR.410	BE, SAW	PI7E316Z0	98
NIP	NIPPLE	0.50	0.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
NIP	NIPPLE	1.00	1.50	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
Flange Group									
FLG	FLNG.SW	0.50	1.50	M	B-16.5	ASTM A 105	150, RF/125AARH	FSC0127Z0	
FLG/300	FLNG.SW	0.50	1.50	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG/300	FLNG.WN	26.00	60.00	M	B-16.47-B	ASTM A 105	300, RF/125AARH	FWB0147Z0	
FLG/300	FLNG.WN	2.00	24.00	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLG	FLNG.SO	2.00	24.00		B-16.5	ASTM A 105	150, RF/125AARH	FNC0127Z0	
FLG	FLNG.SO	26.00	80.00		AWWA-C207 CL.D	ASTM A 516 GR.70	150, FF/125AARH	FN46321Z0	
FLB	FLNG.BLIND	0.50	24.00		B-16.5	ASTM A 105	150, RF/125AARH	FBC0127Z0	
FLB	FLNG.BLIND	26.00	48.00		AWWA-C207 CL.D	ASTM A 516 GR.70	150, FF/125AARH	FB46321Z0	
FEF	FLNG.FIG.8	0.50	8.00		ASME-B16.48	ASTM A 105	150, FF/125AARH	FGK0121Z0	
FEF	SPCR&BLND	10.00	24.00		ASME-B16.48	ASTM A 105	150, FF/125AARH	FCK0121Z0	

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Client : BPCL	**Dept./Sect :** 16/43
Project : POLY PROPLENE UNIT	
Location : KOCHI, KERALA	**Piping Class : A3A**

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn.STD	Material	Description	Commodity Code	Note No
Flange Group									
FEF	SPCR&BLND	26.00	80.00		AWWA C207D/EIL'STD	ASTM A 516 GR.70	150, FF/125AARH	FCT6321Z0	
Fitting Group									
ELB90	ELBOW.90	0.50	0.75		B-16.11	ASTM A 105	SW, 6000	WA602D3Z0	
ELB90	ELBOW.90	1.00	1.50		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	
ELB90	ELBOW.90	2.00	14.00	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16.00	48.00	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	0.50	0.75		B-16.11	ASTM A 105	SW, 6000	WB602D3Z0	
ELB45	ELBOW.45	1.00	1.50		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2.00	14.00	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16.00	48.00	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
MIT90	MITRE.90	50.00	80.00	M	EIL'STD	IS-3589 GR.410	BW, 1.5D	WDKF241Z0	100
MIT45	MITRE.45	50.00	80.00	M	EIL'STD	IS-3589 GR.410	BW, 1.5D	WGKF241Z0	100
TEQ	T.EQUAL	0.50	0.75		B-16.11	ASTM A 105	SW, 6000	WE602D3Z0	
TEQ	T.EQUAL	1.00	1.50		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2.00	14.00	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16.00	48.00	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	0.50	0.75		B-16.11	ASTM A 105	SW, 6000	WR602D3Z0	
TRED	T.RED	1.00	1.50		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2.00	14.00	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16.00	48.00	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2.00	14.00	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16.00	48.00	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDC	REDUC.CONC	50.00	80.00	M, M	EIL'STD	IS-3589 GR.410	BW	WUKF24ZZ0	

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Client : BPCL	**Dept./Sect :** 16/43
Project : POLY PROPLENE UNIT	
Location : KOCHI, KERALA	**Piping Class : A3A**

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn.STD	Material	Description	Commodity Code	Note No
Fitting Group									
REDE	REDUC.ECC	2.00	14.00	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16.00	48.00	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
REDE	REDUC.ECC	50.00	80.00	M, M	EIL'STD	IS-3589 GR.410	BW	WVKF24ZZ0	
SWGC	SWAGE.CONC	0.50	3.00	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	0.50	3.00	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	0.50	1.50		B-16.11	ASTM A 105	SCRF, 3000	WF60282Z0	
CAP	CAP	2.00	48.00	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CAP	CAP	50.00	80.00	CALC	ASME-VIII	ASTM A 516 GR.70	BW	WF3BY4ZZ0	
CPLF	CPLNG.FULL	0.50	0.75		B-16.11	ASTM A 105	SW, 6000	WJ602D3Z0	
CPLF	CPLNG.FULL	1.00	1.50		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	0.50	0.75		B-16.11	ASTM A 105	SW, 6000	WK602D3Z0	
CPLH	CPLNG.HALF	1.00	1.50		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	0.50	0.75		B-16.11	ASTM A 105	SW, 6000	WL602D3Z0	
CPLL	CPLNG.LH	1.00	1.50		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	0.50	0.75		B-16.11	ASTM A 105	SW, 6000	WM602D3Z0	
CPLR	CPLNG.RED	1.00	1.50		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
UNN	UNION	0.50	1.50		BS-3799	ASTM A 105	SW, 3000	WQH02D2Z0	4
Valves Group									
GAV	VLV.GATE	0.25	1.50		API 602/ ISO 15761	BODY-ASTM A 105, TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.-51001	51001ZZZ0	
GAV	VLV.GATE	2.00	24.00		API 600/ ISO 10434	BODY-ASTM A 216 GR.WCB, TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO. -51321	51321ZZZ0	
GLV	VLV.GLOBE	0.25	1.50		API 602/ ISO 15761	BODY-ASTM A 105, TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.-52001	52001ZZZ0	

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Client : BPCL	**Dept./Sect :** 16/43
Project : POLY PROPLENE UNIT	
Location : KOCHI, KERALA	**Piping Class : A3A**

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn.STD	Material	Description	Commodity Code	Note No
Valves Group									
GLV	VLV.GLOBE	2.00	16.00		BS-1873	BODY-ASTM A 216 GR.WCB, TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO. -52321	52321ZZZ0	
CHV	VLV.CHECK	0.25	1.50		API 602/ ISO 15761	BODY-ASTM A 105, TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.-53001	53001ZZZ0	
CHV	VLV.CHECK	2.00	24.00		BS 1868	BODY-ASTM A 216 GR.WCB, TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, B-16.5, RF/125AARH, SHT NO. -53321	53321ZZZ0	
CHV	VLV.CHECK	26.00	48.00		API-594	BODY-ASTM A 105 / A 216GR.WCB, TRIM-13%CR.STEEL, SEATS-STELLITED	FLGD, 150, AWWAC207, FF/125AARH, SHT NO. -53316	53316ZZZ0	
BLV	VLV.BALL	0.50	16.00		BS EN ISO 17292	BODY-ASTM A 105 / A 216GR.WCB, TRIM-BODY SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO. -54321	54321ZZZ0	
BLV/1	VLV.BALL	0.50	1.50		BS EN ISO 17292	BODY-ASTM A 105, TRIM-STELLITED,STEM-13% CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.-540AA	540AAZZZ0	152
BFV	VLV.BTRFLY	3.00	24.00		BS EN 593	BODY-ASTM A 216 GR.WCB, TRIM-13% CR.STEEL	WAFL, 150, B-16.5, WAF/125AARH, SHT NO.-56321	56321ZZZ0	
BFV	VLV.BTRFLY	26.00	48.00		BS EN 593	BODY-ASTM A 216 GR.WCB, TRIM-13% CR.STEEL	FLGD, 150, AWWAC207, FF/125AARH, SHT NO. -56316	56316ZZZ0	
Bolt Group									
BOS	BOLT.STUD	18.00	80.00		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
BOM	BOLT.M/C	0.50	16.00		B-18.2	BOLT:A307 GR.B, NUT:A563 GR.B		BM41418Z0	
Gasket Group									
GAS	GASKET	0.50	24.00		B-16.21-ANSI B16.5	NONASBESTOS BS7531 GR X	RING, 150, 2 MM	GKBAX52Z0	
GAS	GASKET	26.00	80.00		AWWA-C207 CL.D	NONASBESTOS BS7531 GR X	FULLFACE, 150, 2 MM	GK2AX22Z0	
GAS/300	GASKET	26.00	60.00		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK56274Z0	
GAS/300	GASKET	0.50	24.00		B-16.21-ANSI B16.5	NONASBESTOS BS7531 GR X	RING, 300, 2 MM	GKBAX54Z0	

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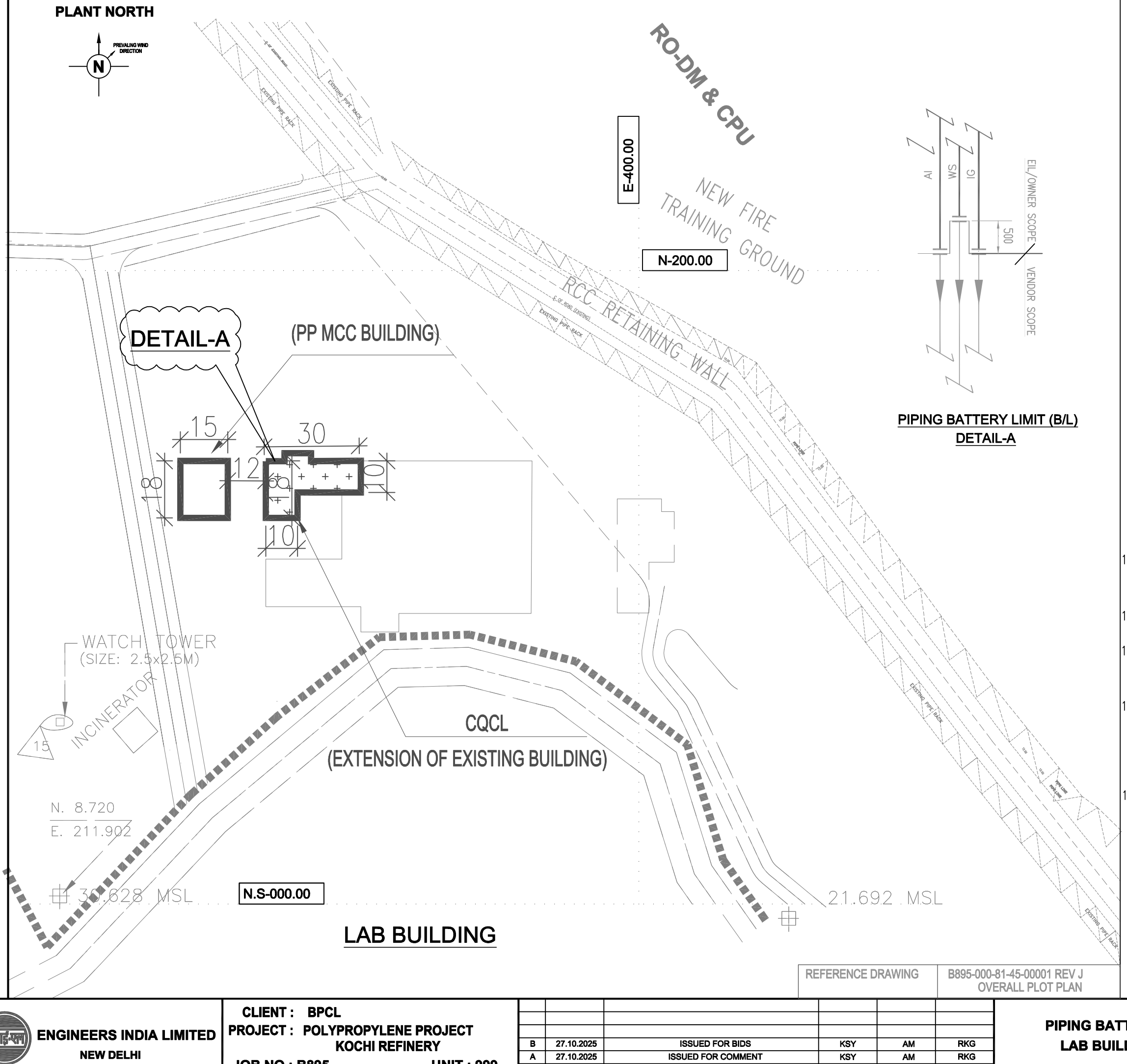
Client : BPCL	**Dept./Sect :** 16/43
Project : POLY PROPLENE UNIT	
Location : KOCHI, KERALA	**Piping Class : A3A**

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk (mm)	Dmn.STD	Material	Description	Commodity Code	Note No
Trap/Strainer Group									
TRP	TRAP.STEAM	0.50	1.50		MNF'STD	B:A105;T:13%CR;S:SS 304	FLGD, THRMDNMC , 150,RF/125AARH	TR3065530	
TSR	STRNR.TEMP	1.50	24.00		EIL'STD	B:A285GR.C;INT:SS30 4	CONETYPE , 150,FF/125AARH	ST14431Z0	
PSR	STRNR.PERM	0.50	1.50		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	
PSR	STRNR.PERM	2.00	6.00	M	EIL'STD	B:A234GR.WPB;INT:S S304	BW, T-TYPE	SP13344Z0	
PSR	STRNR.PERM	8.00	24.00	M	EIL'STD	B:A234GR.WPBW;IN T:SS304	BW, T-TYPE	SP13644Z0	

Pakage : IPMCS
Report No. : 50

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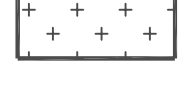


PIPING BATTERY LIMIT (B/L)
DETAIL-A

NOTES :-

1. ALL DIMENSIONS ARE IN M.M. AND COORDINATES ARE IN M(METERS) UNLESS OTHERWISE SPECIFIED.
2. ALL ELEVATIONS ARE IN M.M. & WITH REFERENCE TO HIGHEST PAVEMENT POINT EL.+100000 WHICH CORRESPONDS TO FGL MENTIONED IN OVERALL PLOT PLAN.
3. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH SCOPE FOR LAB BUILDING.
4. THIS DRAWING SHALL BE REFERRED FOR INDICATIVE LAYOUT FOR PIPING BATTERY LIMIT ONLY.
5. ALL LINES TO BATTERY LIMIT SHALL BE TERMINATED WITH A FLANGED CONNECTION. FLANGE SHALL BE STAGGERED AT BATTERY LIMIT, GASKETS/FASTENERS REQD, FOR FLANGED JOINT AT THE BATTERY LIMIT SHALL BE IN VENDOR SCOPE OF WORK. ALL LINES TO BATTERY LIMIT SHALL BE ANCHORED AT OR NEAR BATTERY LIMIT.
6. VENDOR BATTERY LIMIT DRAWING SHALL INCLUDE UNDERGROUND OWS, CRWS & SS POINTS ALSO (IF ANY).VENDOR SHALL ROUTE THESE LINES TO THE FUNNELS OR TO THE BATTERY LIMIT. THE LOCATION & REQUIREMENT OF THE FUNNEL POINT ETC. SHALL BE FURNISHED BY VENDOR.
7. ENTIRE WORK SHALL BE DONE AS PER P&ID,SPECIFICATION/SCOPE OF WORK, DATA SHEETS ETC. GIVEN IN THE BID DOCUMENTS. NO DEVIATION IS ACCEPTABLE.
8. NUMBERS OF LINES, LOCATION OF PIPING BATTERY LIMIT, ELEVATION & SEQUENCE OF PIPES ETC. SHOWN IN THE DRAWING ARE TENTATIVE. THE EXACT LOCATION AND ELEVATION SHALL BE FINALISED DURING DETAIL ENGINEERING WHICH MAY VARY FROM THE PRESENT LOCATION. PACKAGE CONTRACTOR TO FOLLOW THE FINAL BATTERY LIMIT CONDITIONS, WITHOUT ANY TIME AND COST IMPLICATION.
9. HIGH POINT VENT & LOW POINT DRAIN FOR PIPING IN CONTRACTOR SCOPE SHALL BE PROVIDED BY CONTRACTOR.
10. ALL VALVES, INSTRUMENT CONNECTION ETC. INSIDE PACKAGE LIMIT SHALL BE ACCESSIBLE AND IF REQUIRED PLATFORM TO BE PROVIDE FOR OPERATION BY VENDOR.
11. SUPPORT FOR PIPING WITHIN PACKAGE SCOPE SHALL BE PROVIDED BY PACKAGE VENDOR.
12. ALL THINGS NOT REFLECTED HERE BUT INCLUDED IN THE PROCESS PACKAGE / P&ID / BID DOCUMENT SHALL BE CONSIDERED AS INCLUDED IN PACKAGE VENDOR'S SCOPE.
13. SUPPLY, PROCUREMENT, INSPECTION, FABRICATION, ERECTION, TESTING, SUPPORTING , DISTRIBUTION AND COMMISSIONING OF UTILITY LINES FROM B/L TO WITHIN MCC BUILDING AND QUALITY LAB SHALL BE IN SCOPE OF PACKAGE VENDOR.
14. REFER ARCHITECTURE DRAWNG FOR LAB BUILDING FOR FURTHER DETAILS.

LEGEND :-



VENDOR PACKAGE

REFERENCE DRAWING	B895-000-81-45-00001 REV J OVERALL PLOT PLAN

ENGINEERS INDIA LIMITED
NEW DELHI

CLIENT : BPCL
PROJECT : POLYPROPYLENE PROJECT
KOCHI REFINERY
JOB NO : B895 UNIT : 999

REV.	DATE	REVISION	BY	CHK	APPROVED
B	27.10.2025	ISSUED FOR BIDS	KSY	AM	RKG
A	27.10.2025	ISSUED FOR COMMENT	KSY	AM	RKG

PIPING BATTERY LIMIT FOR LAB BUILDING TENDER

DRAWING NO.	REV.
B895-999-16-43-SK-9802	B
SHT. 1 OF 1	

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SCOPE OF WORK
(ARCHITECTURE)

FOR SETTING OF LABORATORY AND ASSOCIATED SERVICES

TENDER NO. B895-999-85-41-EP-T-9802

PROJECT: PROJECT MANAGEMENT CONSULTANCY (PMC) AND ENGINEERING, PROCUREMENT & CONSTRUCTION MANAGEMENT (EPCM) SERVICES FOR POLYPROPYLENE PROJECT OF BPCL, KOCHI REFINERY

OWNER: BHARAT PETROLEUM CORPORATION LTD.

CONSULTANT: M/s ENGINEERS INDIA LIMITED

JOB NO: B895

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	03.11.2025	ISSUED FOR TENDER	KT	SS	GJK

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5.0	CONSTRUCTION, INSTALLATION & COMMISIONING
6.0	PERFORMANCE GUARANTEE/ WARRANTY
7.0	PREAMBLE TO SCOPE OF WORK AND SUPPLY
8.0	LIST OF ATTACHMENTS

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1.0 GENERAL

1.1 This document describes the broad scope of work and supply of EPC CONTRACTOR for Architectural works of Laboratory Building and substation building for PP Project, BPCL, Kochi.

1.2 This document shall be read in conjunction with other documents (such as specifications, scope of works, design basis, drawings, applicable codes and standards etc) of the Bid document.

1.3 Requirements and provisions of design, drawings, specifications etc. contained in Bid document are conceptual in nature defining minimum requirements and are in no way exhaustive.

The above shall not relieve the EPC CONTRACTOR from ensuring correctness of his deliverables and other activities and any changes required for this purpose (after award of work) are deemed to be included in the EPC CONTRACTOR's scope of work, supply, execution and contract value/ price.

1.4 EPC CONTRACTOR shall develop and shall complete all activities in his scope of work and supply meeting all the provisions, requirements and criteria of Bid document.

1.5 During the tendering/ bidding stage, EPC CONTRACTOR shall review and verify the contents of Bid document and shall ensure his clear understanding of requirements, provisions and criteria of the same.

1.6 For this purpose, EPC CONTRACTOR shall point out any errors, omissions, contradictions, or discrepancies etc. with suggestive rectification for review & necessary action/ decision before award of the job.

1.7 After award of work, it shall mean that EPC CONTRACTOR has fully understood and accepted the provisions of Bid Document and has undertaken to fully comply with them.

1.8 There shall be no time and cost implication to the OWNER or COMPANY and PMC CONSULTANT for design, detail engineering, construction, execution, installation and other activities performed by the EPC CONTRACTOR required for completing the job due to any upward revisions and/ or additions of quantities, specifications, sizes etc.

2.0 DEFINITIONS

For definition of Architectural terminologies reference shall be made to National Building Code (NBC) and applicable referenced codes and standards.

3.0 BREIF SCOPE OF SUPPLY & WORK

3.1 Scope of supply & work of the EPC CONTRACTOR shall be pertaining to all the required buildings/ sheds/ structures such as:

- Laboratory Building

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- Substation for Laboratory Building

3.2 Buildings listed in clause 3.1 above are not exhaustive. Requirement of buildings shall also include:

3.2.1 Any other building/ buildings indicated in Plot plan/ area drawing/ equipment layout, scope of work & specification etc. of other disciplines.

3.2.2 Any other building/ buildings required to meet the Operational, Maintenance, HSE (Health, safety & Environmental), Licensor's and statutory Requirements.

The broad scope of work and supply of EPC CONTRACTOR shall include supply, detail design and engineering & construction of Laboratory building and Substation building with all internal and external walls/ partitions/ spaces/ rooms along with external and internal building finishes including flooring, painting, plastering, Internal door windows/ventilators, false ceiling, false flooring, special finishing items such as special floor coatings , acoustic treatments etc. , including supply and installation of office and lab furniture's as per functional, operational and safety requirement as specified elsewhere in the bid. Complete internal civil, plumbing, structural, architectural, electrical, HVAC related, IT – related work for the Laboratory Building and Substation Building is in the scope of EPC CONTRACTOR.

3.3 The broad scope of work and supply of the EPC CONTRACTOR shall be execution of Architectural works for Laboratory building including design & detail engineering of all internal building layouts including furniture, building services,false ceiling and flooring, partitioning, door/window and special finishing items such as special floor coatings, acoustic treatments etc, preparation and submission drawings, Co-ordination with Contractors and agencies, OWNER/ PMC, supply of all materials including office furniture's, Lab furniture, labour & tools etc, Construction, installation and Commissioning including necessary modifications, alterations, rectifications work required and any other incidental works not specifically mentioned but required for completion of the work of as mentioned in accordance with detail scope of work, approved drawings, standards, specifications, contract provisions and as directed by Engineer-In- Charge.

4.0 DETAIL SCOPE OF SUPPLY & WORK

Detail Scope of supply & work of the EPC CONTRACTOR shall broadly consist of:

4.1 Data collection.
4.2 Design & detail engineering.
4.3 Procurement and supply of all materials, labour, equipment, tools and tackles.
4.4 Fabrication, Transportation to site, Assembly, Erection, Installation. Construction, Execution and supervision.
4.5 Obtaining approvals from Statutory and Approving Authorities
4.6 Preparation of As built Drawing, Documents
4.7 Co-ordination
4.8 Any other incidental and other activities not explicitly mentioned but required to meet the requirements of the project.

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4.1 Data collection

4.1.1 EPC CONTRACTOR shall visit the site & facilities and collect data required for carrying out his scope of work.

4.1.2 EPC CONTRACTOR shall access the quantum of work based on site visit, and data provided with the bids.

4.2 Design & Detail Engineering

4.2.1 Design & Detail Engineering shall meet the requirements of Design Basis, Job Specification, Drawings, Standards, Specifications, Reference codes (Including amendment to the same if any) etc contained in the Bid Document.

4.2.2 Design & Detail Engineering by EPC CONTRACTOR shall include preparation and submission of internal and external layout, layout of external utility sheds with furniture layout/equipment layout including meeting all technical , functional, operational & safety requirements as specified in bid, , preparation & submission of deliverables, review by OWNER/PMC, re-submission after incorporation of changes, revisions & review comments, execution, resolution of conflicts and necessary co-ordination with all related parties.

4.2.3 Internal modification/ dismantling/ rectification work as applicable shall include

a. Matching the finished floor levels on all floors, thus maintaining the same height as per existing Laboratory building along with providing connections through corridors wherever required and feasible as per actual site conditions.
b. Design, detail engineering, supply and laying of floor drainage underneath the flooring including separating the lines such as OWS, grey water etc and disposing and interconnecting the suitable drain network.
c. Construction of all external sheds/building such as gas cylinder shed or any other shed as per functional and operational requirements etc.

4.2.4 Design, supply & installation of OFFICE FURNITURE including preparation & submission of drawings/deliverables, review and approval by OWNER/PMC, related integrated IT Services such as LAN, telephone, power points, switches as per approved furniture layout.

4.2.5 OFFICE FURNITURE shall include modular workstations L-shaped table, office ergonomically revolving chairs with wheels, cubical partitions, executive table & chair, visitor chairs, couch, side tables, center table, lockable storage shelf's, book shelf's, credenza, etc as approved by OWNER/PMC.

Number of OFFICE FURNITURE including GA shall be as approved by OWNER/PMC. Brand, Make& Model of OFFICE FURNITURE shall be procured and supplied from reputed national and international vendor as approved by OWNER/ PMC.

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4.2.6 For scope pertaining to Lab furniture or consoles reference shall be made other engineering discipline scope of work & supply attached with the bid.

4.2.7 Design & Detail Engineering by EPC CONTRACTOR including necessary work as specified above shall be in compliance to the codal/ statutory requirement as per NBC including:

a. Fire and life safety including fire escape/exit requirement.
b. Fire zoning of internal spaces and providing required rating for partitions.
c. Maintaining integrity of the existing and proposed fire ratings of material.
d. Sizing of main circulation corridors/spaces.

4.2.8 EPC CONTRACTOR shall summit the architectural material finishing schedule for the proposed design for review and submission. Unless otherwise specified or Selection of finishing material shall be based on the approved engineering design basis.

4.3 Procurement and supply of all materials

4.3.1 EPC CONTRACTOR shall Procure & Supply of all materials, Labor, Equipment, Tools & Tackles, safety gear & measures etc. for all applicable height and locations within the plant boundary as required for successful completion of job and as directed by site in charge.

4.3.2 Supply shall also include necessary accessories, nuts, bolts, washers, erection tools and tackles, adhesive tapes, insulation tapes, etc. necessary for successful installation of structures.

4.3.3 Supply of materials shall include anticipated wastages as per standard practice required for completion of the work as per the specification, Drawing.

4.3.4 All bought out items such as fitting and fixtures, doors, windows, rolling shutters hardware, etc shall be of approved quality. The supplier shall also have adequate after sales service records and infrastructure. Supplier shall allow for inspection and approval of such samples before procurement.

4.4 Fabrication, Transportation to site, Assembly, Erection, Installation. Construction, Execution and supervision

4.4.1 EPC CONTRACTOR shall submit deliverables for Review, approval, information etc. to OWNER/PMC in accordance with provisions of bid document and contract or agreed methodology.

a. Deliverables shall be revised and resubmitted incorporating comments from COMPANY or OWNER, PMC or any other design, engineering requirements until they are reviewed, approved or accepted for construction, execution and installation.
b. Review, approval, acceptance of deliverables by PMC, COMPANY or OWNER shall not relieve the EPC CONTRACTOR from ensuring correctness of his deliverables.

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c. EPC CONTRACTOR shall develop the conceptual design, detailed design to Approved For Construction (AFC) drawings, taking due account of the detailed requirements of the scope of work, design basis, specifications and standards for architectural works for the scope of work covered under this Package.

d. EPC CONTRACTOR shall not proceed with construction till those documents which are specifically listed at "Review" category are reviewed by OWNER/PMC.

e. Any incorrectness, non-compliance with Scope, Design Basis, Specification, Drawings, Standards, Specifications, Reference codes etc noticed at any stage shall be corrected by EPC CONTRACTOR irrespective of review, approval, acceptance of deliverables by PMC, COMPANY or OWNER without any time and cost implication to them.

f. EPC CONTRACTOR shall submit Architectural schemes for Laboratory Building and Substation Building supported by 3-D model (in Revit Software or as per software requirement mentioned elsewhere in the bid document) and rendered interior perspective indicating all lab and office furniture and accessories. The scheme once approved by Owner/ PMC (after incorporation of comments if any) shall be incorporated in the final design drawing to be issued for construction of the building.

g. Design & Detail engineering of building shall be performed by a qualified Architect or Architectural agency having Architects possessing experience of similar professional experience.

h. Any incorrectness, non-compliance with Design Basis, Job Specification, Drawings, Standards, Specifications, Reference codes etc noticed at any stage shall be corrected by EPC CONTRACTOR irrespective of review, approval, acceptance of deliverables by PMC, COMPANY or OWNER without any time and cost implication to them.

4.4.2 EPC CONTRACTOR shall prepare and submit all drawings, specifications and other deliverables required for execution of the job as indicated elsewhere in Bid document and Contract.

a. Deliverables shall be prepared using approved software in agreed format and shall be complete in all respect indicating document or drawing number, revision number, purpose of issue, signature of Performer, Checker and approver.

b. Drawings shall be prepared in 1:100 scale. For details the scale shall be 1:25. Key plans may be in larger but in legible scale.

c. Deliverables shall be submitted in requisite number of copies and approved media (Hard and soft copies) as indicated elsewhere in the Bid document.

d. EPC CONTRACTOR shall submit list of all Sub- vendors/ authorised applicators to be engaged for Execution of various specialised items (like office furniture, Aluminium Doors and Windows, Waterproofing and Insulation, False ceiling, False Flooring, Partitioning and Panelling etc.) for approval.

e. EPC CONTRACTOR shall depute his Architect/ design engineer to Owner/ PMC's review office as and when required for review of his documents. Schedule for communication with Architect or Architectural Agency shall be as follows:

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i) During Kick off meeting for approval of Architect/ Architectural agency.
ii) Approval of Conceptual drawings
iii) After incorporation of comments received on first submission of drawings with CRS and 3D model and rendered views of buildings as applicable.
iv) Further meeting (if required) for resolving pending issues/ closure within stipulated time frame.

f. During such reviews involving computer aided design/drafting, the EPC CONTRACTOR shall make his own arrangement of Personal Computer (PC) in the form of Lap-top in the premises of Owner's/ PMC office. This is required to expeditiously resolve all the comments including those involving the use of PC by EPC CONTRACTOR in his submission. The EPC CONTRACTOR shall ensure that these PC's are fully operational along with necessary software already loaded including the input/ output/drawing files being reviewed. The EPC CONTRACTOR shall revise and re-submit the design and drawings as required during review.

g. EPC CONTRACTOR shall prepare and submit filled checklist along with the first submission drawings complying to all applicable points in the drawings as specified in the checklist attached elsewhere in bid documents.

4.4.3 Following Parameters of Design & Drawings shall not be reviewed.

a. Adequacy of provisions (in terms of spaces, services & utilities) and space/ area/ Room sizes.

b. Correctness of Drawings in terms of dimensions, matching of Plan, Elevation, Section, etc. These parameters may be reviewed at random only.

c. Location, Co-ordinates, Orientation & Road/Ground/Pavement levels. The EPC CONTRACTOR shall ensure correctness of these vis-à-vis EIL reviewed/approved G.A. drawings.

4.5 Construction, Execution, Installation, Supervision

4.5.1 EPC CONTRACTOR shall construct, execute, and install the work in accordance with approved design and drawings, specifications, directions of Engineer-In-Charge etc. meeting the requirements of Bid Document.

4.5.2 Construction, execution, Installation shall include:

a. Procurement, Supply of all materials, Labor, Equipment, Tools & Tackles, safety gear & measures etc.
b. Dismantling of existing works if required.
c. Protection of existing works/ facilities as required.
d. Rectification of damaged works etc.
e. Disposal of debris, storage of retained items etc.
f. Handing over the buildings and other works in complete, neat, clean and operable condition.
g. Supervision
h. Any other incidental works or activities not explicitly mentioned but required for completeness of construction, execution and installation.

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4.6 Obtaining approvals from Statutory and Approving Authorities

4.5.1 EPC CONTRACTOR shall design and execute the works in accordance with requirements of Statutory Authorities and obtain approvals from them.

4.5.2 Approvals from following Authorities are envisaged.

a. Local Panchayat, Municipal, Development Authorities as applicable.
b. Factory Inspector, Department of Industrial safety & Health.
c. Department of Fire & Emergency Services.
d. Regional, City or Town Planning Authority if applicable.
e. Airport Authority if applicable.
f. Any other Authority having jurisdiction.

4.5.3 EPC CONTRACTOR shall prepare drawings & documents necessary for obtaining approvals from statutory authorities.

4.5.4 EPC CONTRACTOR shall make necessary changes, modifications etc. in design and execution if required for obtaining approvals from statutory authorities.

4.5.5 EPC CONTRACTOR shall perform all liaising & co-ordination activities with required parties, Authorities etc. as required for obtaining approvals from Statutory Authorities

4.7 Preparation of As-built drawings, documents

EPC CONTRACTOR shall prepare and submit As-built drawings in approved software and in requisite number of copies and approved media (Hard and soft copies) as indicated elsewhere in the Bid document, Contract.

4.8 Co-ordination

4.8.1 EPC CONTRACTOR shall do all co-ordination activities required for completion of the job with COMPANY or OWNER, PMC, SUB CONTRACTORs, MANUFATURERS, SUPPLIERS, VENDORS & other agencies.

4.8.2 Co-ordination by EPC CONTRACTOR shall also include presentation to COMPANY or OWNER, PMC as required for finalization of office/ lab furniture design and other issues.

5.0 CONSTRUCTION, INSTALLATION & COMMISIONING.

5.1 EPC Contractor shall construct, install & Commission the work in accordance with approved design, drawings, specifications, and directions of OWNER, PMC etc. meeting the requirements of bid document and hand over the buildings in complete, neat, clean and operable condition.

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5.2 All aspects of Construction, Execution, Installation such as material, workmanship, finishes etc. shall be in accordance with specifications contained in this specification & and directions of Engineer-In-Charge.

5.3 Deputation of requisite number of erection supervisors for erection supervision and guiding the assembly and installation works till successful installation of structures/ buildings/ sheds.

5.4 In case, required specification of any material, workmanship, finishes etc., is not covered in specification, relevant national or International codes, standards and recommendations of approved manufacturers shall be followed (with prior approval from the OWNER, PMC) without any time and cost implication to the OWNER, PMC.

6.0 PERFORMANCE GUARANTEE/ WARRANTY

6.1 All structural and civil works including supply and execution shall be warranted for a period mentioned in commercial agreement from the date of Installation & Commissioning. The Valid Warranty certificate must be submitted.

6.2 During this period, all defects arising out of defective material and faulty workmanship will be rectified by repairing or replacing part or whole material as necessary, free of charge.

6.3 Any consequential damage/defect or loss of items due to poor workmanship/ poor material quality/ negligence etc. attributed to the bidder to be rectified/ replaced by the bidder free of cost.

7.0 LIST OF ATTACHMENTS

7.1 Standard Specification

S. No.	Specification No.	Rev.	Title
1	6-75-0001	7	Specification for Architectural Works - General.
2	6-75-0002	7	Specification for floor finishing
3	6-75-0003	7	Specification for wood work (Doors and windows)
4	6-75-0004	8	Specification for Steel/ Aluminium doors, windows & ventilators
5	6-75-0005	7	Specification for Plastering & Pointing.
6	6-75-0006	7	Specification for roof treatment.
7	6-75-0007	7	Specification for whitewashing, Colour washing, distempering, Painting & polishing.
8	6-75-0008	7	Specification for roofing.
9	6-75-0009	7	Specification for sanitary fittings and fixtures.
10	6-75-0010	7	Specification for False Ceiling, False Flooring Under deck Insulation & Partitioning

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11	6-75-0011	2	Specification for fire check / fire resistant doors, windows & partitions
12	6-75-0015	0	Specification for storage racking system for store / warehouse
13	6-75-0016	0	Standard specification for aluminium composite panel (ACP) cladding system
14	6-75-0017	0	Standard specification for structural glazing system

7.2 Standards

S.No.	Standard No.	Rev.	Title
1	7-75-0002	6	Skirting detail (with brick wall).
2	7-75-0003	6	Skirting detail (with R.C.C. column).
3	7-75-0004	6	Dado detail (with brick wall & RCC col.)
4	7-75-0011	6	Wooden flush door (with pressed steel frame)
5	7-75-0014	6	Glazed Aluminium Door
6	7-75-0015	6	Glazed Aluminium Window
7	7-75-0036	7	Pipe hand rail with square up right type.
8	7-75-0041	6	False ceiling details with aluminium grid.
9	7-75-0042	6	Aluminium panel false ceiling (84C system).
10	7-75-0043	6	Aluminium panel false ceiling (tray type).
11	7-75-0049	3	False flooring
12	7-75-0051	6	Transformer gate details (upto 6000mm. width)
13	7-75-0052	5	Transformer gate details (beyond 6000mm. width)
14	7-75-0060	6	Orissa pan W.C. (fixing detail).
15	7-75-0062	6	European type WC (fixing detail).
16	7-75-0063	6	Urinal fixing detail.
17	7-75-0064	6	Wash basin fixing detail.
18	7-75-0065	6	Plinth protection (with building drain)
19	7-75-0066	6	Wooden panel door (toilet door)
20	7-75-0068	6	Roof Drainage and Waterproofing
21	7-75-0070	6	Steel Door (Pressed Steel) Single Shutter
22	7-75-0071	6	Steel Door (Pressed Steel) Double Shutter
23	7-75-0074	1	Steel Large door (pressed steel) double shutter
24	7-75-0091	2	Metal sheet (flashing detail)
25	7-75-0093	2	Stainless steel tubular handrail
26	7-75-0095	1	Toilet cubicles details
27	7-75-0097	1	Ramp detail (for wheel chair users)

7.3 Drawings

S. No	Drawing No.	Title
1	B895-999-81-46-12761	Laboratory Building - Ground floor plan & Section

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S. No	Drawing No.	Title
2	B895-999-81-46-12762	Laboratory Building - First floor plan
3	B895-999-81-46-12763	Laboratory Building - Second floor plan
4	B895-999-81-46-12764	Laboratory Building - Third floor plan
5	B895-999-81-46-12421	Substation for Laboratory Building – Plan and Section

7.4 Other Miscellaneous Documents

S.NO	DOCUMENT NO.	TITLE
1	B895-999-81-46-LL-9802	Approved Vendor List (Architecture)
2	B895-999-81-46-VDR-9802	Vendor Data Requirement (Architecture)
3	B895-999-81-46-EDB-1001	Engineering Design Basis
4	B895-999-81-46-TCL-9802	Technical Compliance List (Architecture)
5	B895-999-81-46-LL-0006	Checklist for LSTK Jobs (Architecture)
6	B895-999-81-46-SP-9802	Job Specifications (Architecture)
7	B895-999-81-46-SP-0001	Job Specifications (Roof Treatment)

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ENGINEERING DESIGN BASIS (ARCHITECTURE)

PROJECT: PROJECT MANAGEMENT CONSULTANCY (PMC) AND ENGINEERING, PROCUREMENT & CONSTRUCTION MANAGEMENT (EPCM) SERVICES FOR POLYPROPYLENE PROJECT OF BPCL, KOCHI REFINERY

OWNER: BHARAT PETROLEUM CORPORATION LTD.

CONSULTANT: M/s ENGINEERS INDIA LIMITED

JOB NO: B895

Bharat Petroleum
energising lives

(EIL) SIGNATURE

(BPCL) SIGNATURE

Rev. No.	Date	Purpose	Prepared by	Reviewed by	Approved by
0	02.07.2024	Issued for Engineering	Sandeep Sharma	Gursharan Jeet Kaur/ Anish Kundu	Anurag Sinha
B	20.06.2024	Clients comments incorporated and Issued For Client's Approval	Sandeep Sharma	Gursharan Jeet Kaur/ Anish Kundu	Anurag Sinha
A	10.05.2024	Issued For Client's Comment/ Approval	Bharti Rawat	Gursharan Jeet Kaur/ Anish Kundu	Anurag Sinha

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A.1.0 GENERAL

The purpose of this document is to establish the design philosophy/ criteria to be incorporated in Architectural design.

A.2.0 REFERENCED PUBLICATIONS

Architectural design shall be in conformity with following:

1. National Building Code of India (NBC) – Latest Revision.
2. Factory law/ state government factory acts.
3. Local Municipality or any other authority's bye-laws as applicable.
4. Oil industry safety directorate (OISD) standards (for oil industry projects).
5. Urban and Regional Development Plans Formulation and Implementation (URDPFI) guidelines of Town & Country Planning Organization (for Townships).
6. BIS (Bureau of Indian standards) codes.
7. Indian Electricity Rules.
8. Defense and Aviation bye-laws as applicable.
9. TAC (Tariff Advisory Committee) Rules.
10. BPE (Bureau of Public Enterprise) Norms.
11. CEA (Central Electricity Authority).
12. Guidelines of IGBC/ GRIHA/ LEED for Green Building concept.
13. Pollution Control Board norms.
14. Any other applicable law, rules, standard as referred in respective clause.

Note: All Latest Edition and amendments thereof of the referred publications mentioned in above clause A 2.0 shall be followed as applicable.

A.3.0 STANDARDS AND SPECIFICATIONS

Architectural design incorporates codes and standards as referred in the design philosophy of respective engineering disciplines as well as applicable engineering standards and specifications of Engineers India Limited (EIL).

A.4.0 DESIGN PHILOSOPHY/ CRITERIA

Architectural design of buildings shall be in accordance with this design basis, publications, standards and specifications stated above.

Unless otherwise specified, licensors/ process/ safety guidelines and recommendations shall be followed for building design. The most stringent guidelines shall override in case of conflict between above references publications mentioned in clause no. A.2.0 and A.3.0

Note:
Reference shall be made to NBC for meanings of terminologies and definitions.

A.4.1 Building lay-out

Required rooms, facilities and spaces shall be integrated to arrive at the lay-out meeting the functional, operational and HSE (health, safety and environment) requirements.

A.4.1.1 Spatial requirement

Spatial requirements i.e., requirement of various rooms and spaces to be accommodated in the building shall be identified based on functional requirement and related activities, occupancies, amenities, services and utilities and statutory requirements.

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Following spaces are classified as amenity spaces

i. Toilet (Gents & Ladies)
ii. Drinking Water Facility
iii. Locker & Change room.
iv. Rest room/Lunch room.
v. Washrooms & space for drying clothes.
vi. Canteen/Pantry room.
vii. First-aid room.

Out of the above-mentioned areas Toilet, Drinking Water and First aid room enclosure shall be mandatory requirement for buildings with human occupancy. Other requirements shall be provided as specified.

Utility spaces are the spaces required for the provision of services like Airconditioning, pressurization, firefighting, electrical, telephone etc. These spaces shall be provided as per specified building services. Following are the examples:

i. Air-conditioning plant room
ii. Air handling rooms
iii. Pressurization blower plant room
iv. Electrical distribution panel rooms
v. Service Ducts
vi. Fire Fighting Equipment room
vii. Telephone Exchange Equipment room
viii. UPS room
ix. Battery room

Requirement of services/utilities such as air-conditioning, LAN etc. shall be finalized as per Owner's specific requirement.

A.4.1.2 Sizing of rooms/spaces

In case of plant buildings, sizing shall be decided based on equipment/ panel/ machinery lay-out considering operation, maintenance, clearances, HSE requirement etc. obtained from originating discipline of the facility.

In case of non-plant buildings, sizing shall be done based on guidelines of NBC and Owner's specific requirements. In absence of guidelines in NBC, publications such as "Time saver standard", "Neufert – Architects data" shall be followed.

A.4.1.2.1 Minimum dimensions of rooms/ spaces:

Minimum area for room shall be 9 m^2 with minimum dimension of one side as 3m.

Minimum ceiling height shall be as follows:

Residential, business and mercantile buildings:

3.0 m measured from the floor to bottom of slab. Minimum clear head room under beam shall be 2.4 m. In case of air-conditioned rooms, height shall not be less than 2.4 m measured from floor to the lowest point of AC duct or the false ceiling or as applicable factory Act.

Educational buildings : 3.6 m

Industrial buildings : 3.6 m or as per applicable Factory Act

Minimum ceiling height for Fire station Building/ Control Room shall be 5.0 m measured from the floor to bottom of slab.

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A.4.1.3 Lay-out

Individual spaces of buildings shall be integrated and arranged with circulation system (consisting of Building Access, Entry, Lobby, Corridors, Passages, Staircases, Lifts etc.) to generate the lay-out considering following design parameters:

- Functional, operational requirement, equipment/panel/machinery lay-out, activities and inter-relationship of the rooms/ spaces.
- Fire & Life safety.
- Statutory requirements.
- Site conditions i.e., site dimensions, approaches, safety distances, contours etc.
- Circulation system & accessibility
- Energy efficiency.
- Amenities, services and utilities.

A.4.1.3.1 Circulation system:

Circulation system shall consist of building entry, exits, means of egress, lobby, corridor, passage, staircase, ramp, lift/ elevators (as required), entrance lobby/ foyer including reception & waiting, gangway/walkways, equipment loading/ unloading platforms, emergency exits, ramps for physically challenged and equipment entry/exit as applicable

A.4.1.3.2 Accessibility:

These requirements deal with barrier free access to, movement within and around buildings. In industrial complexes, which are normally not open to public, requirement of accessibility shall be applicable to following building occupancy types where occupancy of differently abled staff/ visitor is expected.

- Main gate house
- Administration and other office buildings
- Laboratory.
- Canteen
- First aid/ Occupational health center
- Control Rooms
- Auditoriums

Requirements of accessibility:

- At least one entrance, preferably main entrance per building shall be accessible to persons with disabilities.
- All common area open to public and staff and all facilities such as lobby, toilets, lifts, parking etc. shall be accessible to all persons with disabilities.
- Accessible toilet shall be provided.

Note: Reference shall be made to chapter-3, NBC for further details on accessibility.

A.4.1.3.3 Fire & Life safety:

Provisions for life safety in relation to fire prevention and fire protection of buildings shall be applicable to:

a) All high-rise buildings (15 meter or above in height, irrespective of its occupancy, height being vertical distance measured from average ground level around to the terrace of last livable floor of the building adjacent to external wall)

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b) Special buildings
   1) Hotel, educational, institutional, business, mercantile, industrial, storage, hazardous and mixed occupancies, where any of these buildings have floor area more than 500 m^2 on any one or more floors;
   2) Educational buildings having height 9 m and above;
   3) Institutional buildings having height 9 m and above;
   4) All assembly buildings;
   5) Buildings, having area more than 300 m^2 of incidental assembly occupancy on any floor; and
   6) Buildings with two basements or more, or with one basement of area more than 500 m^2.

Note:
Reference shall be made to chapter-4, NBC for further details on life safety

Requirements of exits for life safety:

a) Every building having human occupancy shall be provided with exits sufficient to permit safe egress of occupants in case of fire or other emergency.

b) Exit

Exit is that unobstructed component of means of egress *(A continuous way of travel from any point of in a building to a public way, consisting of three separate and distinct parts, i.e. exit access, exit and exit discharge)* which is between the exit access *(portion of means of egress that leads to an exit, i.e. doors, staircase, lobby, ramps, corridor leading to exit, a common path of travel leading to two independent directions to separate exits)* and the exit discharge *(The component of means of egress between the termination of an exit and a public way*) or public way *(street, alley open to outside)*.

An exit may be a fire exit doorway, an internal staircase, exit passageway, external doorway, external staircase having access to the street or to a veranda or to a refuge area *(An area within the building for a temporary use during egress, staging area which is protected from the effect of fire and smoke)* or to the terrace or roof of a building.

Exit doorway

Every exit doorway shall open into an enclosed stairway or a horizontal exit of a corridor/ passageway providing continuous and protected means of egress.

Corridors and passageways

Width of Corridors and passageways shall not be less than calculated width of exit doorways leading from them in the direction of travel to the exit.

In case of central corridor which is part of exit access of the building, doors of rooms (except for rooms having assembly occupancy) shall open inwards.

Doors provided in exit passageway (from exit-to-exit discharge) shall be fire rated doors of 120 minutes rating.

Lifts, escalators, moving walks, and revolving doors

Lifts, escalators, moving walks, and revolving doors shall not be considered as exits.

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c) For non-naturally ventilated areas, fire doors with 120 min fire resistance rating shall be provided and particularly at the entrance to lift lobby and stair well where a funnel of flue effect may be created, including and upward spread of fire, to prevent spread of fire and smoke.

d) Exits shall be so arranged that they may be reached without passing through another occupied unit/passage in other's control, if they pose challenge or restriction in means of egress

e) Doors in exits shall open it the direction of exit. In case of assembly buildings (Group D) and institutional buildings (Group C-1), exit door shall not open immediately upon a flight of stair and all such entries to the stair shall be through a landing, so that such doors do not impede movement of people descending from a higher floor when fully opened. While for other occupancies, such doors shall not reduce the pathway in the landing by more than half the width of such staircase. Overhead or sliding doors shall not be installed.

f) At least half of the required exit stairs from upper floors (rounded to the next higher number) shall discharge directly to the exterior or through exit passageways.

g) All the exits and exit passageways *(An exit component that is separated from other interior spaces of building by fire rated construction and opening protective, and provides for a protected path of egress travel in a horizontal direction to an exit or exit discharge)* to exit discharge shall have a clear ceiling height of at least 2.4m. however the height of exit door shall be at least 2.0m.

h) Number of exits

Minimum required number of exits shall be determined based on:

A. Occupant load

Occupant load factor:

Occupant load shall be based on actual number of occupants but not less than specified in the table below.

Occupancy	Occupant load factor (sqm/person)
Group A: Residential	12.50
Group B: Educational	4.00
Group C: Institutional	
Indoor patients' area	15.00
Outdoor patients' area	10.00
Group D: Assembly	
Concentrated use without fixed seating	0.65
Less concentrated use without fixed seating	1.40
Fixed seating	
Dining areas and restaurants with seating and table	1.80
Group F: Mercantile:	
Street floor and sales basement	3.0
Upper sales flour	6.00
Storage/warehouse, receiving and the like	20.00
Group E: Business	10.00
Group G: Industrial	10.00
Group H: Storage	30.00

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Group J: Hazardous	10.00

Width per person for exit:

Width per person for stairway, door, corridor, ramp shall be as per following table.

Occupancy	Width per person (mm)	
	stairway	Door, corridor, ramp
Residential (Group A)	10	6.5
Educational (Group B)	10	6.5
Institutional (Group C)	15	13
Assembly (Group D)	10	6.5
Business (Group E)	10	6.5
Mercantile (Group F)	10	6.5
Industrial (Group G)	10	6.5
Storage (Group H)	10	6.5
Hazardous (Group J)	18	10

Note:

Unit of exit width is 500mm, clear width of 250mm shall be additional half unit. Less than 250mm width shall not be considered.

Example:

An exit doorway measuring 1000mm in residential occupancy would provide exit capacity for 1000/6.5 = 153 persons. The capacity for 1000mm wide stairway shall be 1000/10 = 100 persons.

B. Maximum travel distance

Numbers and arrangement:

Exits shall be so located that the travel distance (*The distance to be travelled from any point in a building to a protected exit or external escape route or final exit measured along the line of travel*) on the floor shall not exceed the distance given below.

Exits shall be placed as remote from each other as possible and shall be in separate directions from any point in the area served.

Occupancy group	Maximum travel distance (Metre)	
	Type 1,2 construction	Type 3,4 construction
Residential (Group A)	30.00	22.50
Educational (Group B)	30.00	22.50
Institutional (Group C)	30.00	22.50
Assembly (Group D)	30.00	30.00
Business (Group E)	30.00	30.00
Mercantile (Group F)	30.00	30.00
Industrial (Group G)		
G-1, G-2	45.00	Construction type not permitted
G-3	22.50	Construction type not permitted
Storage (Group H)	30.00	Construction type not permitted
Hazardous (Group J)	22.50	Construction type not permitted

Note: 1. These types of construction are as per NBC classification

2. For fully sprinkled building, travel distance may be increased by 50 percent

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3. Travel distance shall be measured from the most remote point within a storey along the natural un obstructed path of horizontal or vertical egress travel to the door to the exit.

Dead end corridor:

Dead end corridor length in exit access shall not exceed:

- Educational, Institutional, assembly occupancy : 6 metre
- Others : 15 metre

i) Emergency Exits:

Emergency exits shall be provided for the building as per State Factory Rules & OISD Norms, NBC-Part IV and for individual functional spaces such as Console area, Cable Cellar, Switchgear Hall, Electrical room etc.

Emergency exits shall be located in such a manner that escape route is direct, unobstructed & without passing through any other functional areas to safe area.

Corridors/staircases shall be provided as escape route to the emergency exits.

A.4.1.3.4 Energy efficiency:

In order to achieve energy efficiency in the building design, following passive measures shall be incorporated to the extent feasible in developing the layout.

Orientation

The buildings should be oriented optimally based on sun-path. Exposure on the eastern and western side should be minimum.

Building form

Building volume should be reduced with optimum foot-print area.

Green building design approach will be adopted in building design wherever applicable.

A.4.2 Lighting and Natural Ventilation

A.4.2.1 Lighting

Recommended values of illuminance in accordance with Table-4, section-1, part-8 of NBC, shall be maintained in buildings.

Illuminance values shall be achieved by combination of natural day lighting and artificial lighting. Dependency on artificial lighting shall be minimized by optimum use of fenestration.

Note:

Reference shall be made to Engineering Design Basis (Electrical) for artificial and solar lighting.

A.4.2.2 Natural Ventilation

Recommended values of air changes in accordance with clause 5.2.2.1, section-1, part-8 of NBC,

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shall be maintained in buildings.

Recommended air changes shall be achieved by natural ventilation and shall be supplemented by mechanical ventilation (if required).

Natural Ventilation in Industrial Sheds:

a) Stores, Warehouses:

These shall be closed type sheds having full height external walls/ metal sheeting. Natural ventilation shall be by means of windows/ ventilators on side walls.

In case of sheds wider than 30 metre, ventilation shall be augmented by roof ventilation by means of Roof Monitor, wind driven Ridge Ventilator and Air Extractors etc. as necessary for required air change

b) Equipment/ machine sheds:

Generally, these sheds shall be open on all sides up to 3000 mm, thereafter side cladding shall be provided for the remaining height. Continuous sheet louvers shall be provided in the cladding on longer sides.

Roof Monitor, wind driven Ridge Ventilator and Air Extractors etc. as necessary for required air change shall also be provided.

A.4.3 Heating, Ventilation and Air-conditioning (HVAC)

Reference shall be made to Engineering Design Basis (Mechanical Equipment).

Necessary space, rooms, provisions such as AC plant, AHU, Blower room etc. required for HVAC system shall be provided in buildings.

A.4.4 Electrical Services

Reference shall be made to Engineering Design Basis (Electrical).

Necessary space, rooms, provisions such as Electrical Room, Building/ BMS Control Room, Battery Room, UPS Room etc. which are required for electrical system shall be provided in buildings.

Electrical Room may be provided to accommodate electrical/telephone main distribution box. However, depending on size, space requirement, the same may be mounted in wall recess.

All openings for Electrical / Inst cables shall be sealed after cabling.

A.4.5 Instrumentation Services

Reference shall be made to Engineering Design Basis (Instrumentation).

Necessary space, rooms, provisions such as Building/ BMS Control Room UPS Room etc. required for Instrumentation system shall be provided in buildings.

A.4.6 Plumbing Services

All human occupied buildings shall have toilet and drinking water facility. Accordingly plumbing

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system consisting of water supply, distribution, plumbing and sanitary fittings and fixtures, drains, sewer disposal etc. shall be provided in these buildings.

Suitable arrangements shall be made in buildings for drainage of condensed water from Air-conditioning units.

Note:

Reference shall be made to Engineering Design Basis (Civil-Structural) for supply, distribution and disposal system including piping and other required accessories, devices, drains, rain water harvesting etc. This design basis covers roof drainage, plumbing and sanitary fixtures only.

Roof drainage:

a) Flat roof

Rain water drainage of flat roof shall be through PVC rain water pipes. For small areas, drainage may be by means of spouts. Slope of finished roof shall not be flatter than 1:100.

Roof gutters shall be provided in cases of large drainage area of roof.

PVC Rain water pipes provided for roof drainage shall not be embedded or concealed. In case, concealing is required, the same shall be as per Owner's suggestion / approval.

b) Pitched roof

Rain water drainage of pitched roof shall be through valley/ eaves gutter and rain water pipes.

For small roof drainage area (up to 36m^2) and lesser roof height (up to 6m), free fall of roof water shall be considered.

A.4.7 Information technology (IT) Services

Reference shall be made to Engineering Design Basis (IT).

Necessary space, rooms, provisions such as Server Room, IT Hubs etc. which are required for IT system shall be provided in buildings.

A.4.8 Site Planning and Landscape

Site planning of building shall take into account aspects like interrelationship of the buildings with the whole system, movement pattern, traffic and road net-work, safety regulations, service network, fire safety, climatic and environmental aspects, site conditions like site dimension, contour, drainage, noise level, view, future expansion, visual aspects, Natural Light and Ventilation etc.

Main and service/ maintenance entrances of buildings shall be provided with vehicular access. All exit points shall also be provided with footpath/ vehicular access. Truck movement space in accordance with traffic pattern shall be provided for the building as per the location of hoisting bay/loading, unloading platform. Road network and open space around the buildings shall be designed considering movement and functioning of Fire tenders and cranes etc. Parking space in accordance with traffic load shall be provided to all buildings.

Climatic factors like wind direction, solar geometry shall be taken into account in orienting the buildings depending on type of climate. Orientation of building shall also consider noise and smell propagation, views, and visual effect from various directions.

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Sufficient open space shall be provided for planned expansion of buildings. Sufficient open space shall also be provided around the buildings for lighting and ventilation in accordance with Factory Acts & National Building Code. Open spaces in a plot and around buildings proportional to the height of the structure shall satisfy the requirements of the local byelaws.
Landscape shall be done if included in the scope.

Environmental sustainability shall be considered in Landscape planning by adopting land, vegetation and water sensitive design options. Cut and fill of the land shall be minimized. Storm water runoff in the landscaped area shall be planned in line with the drainage system of the whole complex.

Generally, Landscaping shall be done in following areas:
- Green belt around the complex
- Non plant areas (road sides, open spaces, Entrance area, court-yards and spaces around buildings, car-parking)
- Complex entry areas
- Reservoir areas
- Any other area within complex which can be utilized for landscaping.

Landscaping elements:

Generally following elements shall be part of landscaping.

- Tree plantation
- Hedges, shrubs, ground covers, creepers and climbers
- Flowering, ornamental plants
- Lawns
- Paving
- Earth-forms
- Water body (if feasible)
- Landscape lighting
- Landscaping furniture

A.4.9 Aesthetics

Buildings shall be aesthetically pleasant designed incorporating general principles of Aesthetics. Building facades shall reflect such principles like symmetry, balance, proportion, etc.

Building elements like building entry, canopies, overhangs & shading devices, gutters, roof projections, parapets, door& window composition, External wall/ facade shall be considered as contributory elements to aesthetics.

An Architectural control scheme shall be developed for the whole complex. The purpose of the control scheme shall be uniform Architectural style and identification of various building types.

A.4.10 Acoustics and Sound Insulation

Specified acceptable noise level shall be maintained inside a building/ shed as per provisions in NBC

Required noise level in any space shall be maintained by means of

- Segregating noise sources by buffer zones
- Dampening of noise levels by damping devices especially in AHU or other noise producing areas.
- Providing Acoustic treatment with acoustic material (on walls, ceilings, floors, as required).

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A.5.0 BUILDING ELEMENTS

A.5.1 Plinth Protection

The buildings shall be provided with minimum 1200 mm wide plinth protection around the building perimeter. Top of plinth protection to be 100 mm high from top of approach road level with drain (covered with grating) around the building. In case of approaches with different top levels, the highest top level of access road/ pavement shall be considered.

A.5.2 Finished Floor Level (FFL)

FFL of the Buildings shall be determined with respect to top level of building access (approach road/ pavement), surrounding ground level and requirements of under-floor cabling, cable trenches etc.

FFL shall generally not be less than 450mm from the surrounding ground level.

Following schedule shall be adhered to for FFL of the building:

Building	FFL
Control Room & other buildings having cavity/ false flooring	Top level of Building access + 250 mm + cavity depth (as per Instrumentation requirements) + floor finish
Sub Station	Transformer bays: Top level of Building access + 250 mm Other areas: Top level of Building access + Electrical requirement (minimum 300 mm)
Industrial sheds located in paved areas of units	Highest point of paving + 250mm
Stores, Warehouses having raised platform for loading/ unloading bays	Top of Building access + 450 mm (minimum) Truck dock height: Generally, Top of loading bays pavement level + 1100 mm
Other buildings	Top of Building access + 450 mm (minimum)

Notes:

1. In case of approaches with different top levels, the highest top level of access road/ pavement shall be considered.
2. FFL of external loading/unloading bays/ platforms, toilet, pantry, and kitchen shall be 10-15 mm lower than adjoining building level to check ingress/spillage of water along with provision of slope towards drain.

A.5.3 Access to the building

Vehicular access shall be provided for buildings.

Buildings shall be accessible through building entrance from the approach road/ paving by means of steps/ ramps.

A.5.4 Steps

Tread and riser of steps shall be 300mm & 150mm respectively. Edge of treads shall be provided with friction grip strips or similar anti-skid arrangement.

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A.5.5 Ramps

For equipment entry:

Minimum width : 1500 mm
Slope : 1: 6

For persons with disability:
(Refer clause A.4.1.3.2 for applicability and other details)

- Ramp shall not be curved.
- Single row of tactile warning block (TGSI) shall be placed at 300mm before the beginning and 300mm after the end of each ramp.
- Internal ramps should be avoided. Where required, internal ramps should not rise more than 2000mm. Maximum gradient shall be 1:15.
- End landing shall be provided both at bottom and top of the sloped path and also where the run changes direction. Length of end and intermediate landing shall not be less than 1500mm. Where the ramp run changes direction, minimum landing dimension shall be 1500mm x 1500mm.
- Width, slope and other requirements of ramps shall be as per following table:

Level difference	Maximum gradient	Ramp width	Handrail on both side	Other requirements
150 to 300mm	1:12	1200mm	Yes	-
301 to 750mm	1:12	1500mm	Yes	Landing after every 5metre ramp run
751 to 3000mm	1:15	1800mm	Yes	Landing after every 9metre ramp run
More than 3000mm	1:20	1800mm	Yes	Landing after every 9metre ramp run

A.5.6 Building Entrance

Building entrance shall consist of steps, ramps, building access platform, entrance door, canopies/ overhangs/ portico and entrance lobby.

A.5.7 Access Platform

Minimum 1200 mm wide platform shall be provided in between entrance door and steps/ramps.

Requirement for persons with disability:
(Refer clause A.4.1.3.2 for applicability and other details)

- A clear, firm and level landing of at least 1800mm x 1800mm shall be provided on either side of the entrance door.

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- Appropriate tactile ground surface indicator (TGSI) should be provided for leading to entrance.

A.5.8 Canopy /Overhang/ Portico

Canopy /Overhang/ Portico (projected outwards to access road/ pavement) shall be provided in building entrance.

Portico shall be provided in buildings having frequent vehicular movement for access such as Administration Building, Training Centre, Auditorium, Canteen, Laboratory etc.

Canopy/ Overhangs shall be provided in all buildings like Satellite Rack rooms, Substations etc and over all exits. Projection of the overhang shall be decided based on the aesthetics of the building/shed subjected to minimum of 1000 mm.

In place of projected Canopy/ Overhang/ Portico, covered space, recessed inside the building may also be provided depending on building design.

Canopy/ Overhang/ Portico shall be of pleasant aesthetic design contributing to the building aesthetics.

Water proofing and drainage provision shall be provided for canopies and overhangs.

Blast proof Control Rooms shall not have any projections with outer face of its walls except with false treatment for aesthetics of the building.

A.5.9 Entrance Lobby

Buildings having multiple rooms/ spaces connected by corridor/ passage shall be provided and

connected with Entrance lobby located immediately after entrance door.

Space provision for security check, waiting lounge, reception etc. shall be kept in Entrance lobby as required.

Size of the entrance lobby shall be decided on the basis of volume of the movement subjected to the minimum requirement of 9.5 sq.m.

Air-lock Lobby:

Air lock lobby shall be provided in centrally air-conditioned areas and large air-conditioned rooms.

A.5.10 Corridors and Passageways

Corridors and passageways shall be provided as a part of circulation system to connect individual rooms/ spaces of the buildings for smooth circulation within the building and as means of egress.

Width of corridors and passageways shall be finalized based on requirements of Fire and Life safety, accessibility and packing size of equipment (if equipment movement is envisaged) subjected to minimum width of 1800 mm. Corridor of 1500mm shall be provided in areas leading to toilet, pantry and other utility areas.

Requirements for fire and life safety:

(Refer clause A.4.1.3.3 for applicability and other details)

- Width of Corridors and passageways shall not be less than calculated width of exit doorways

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leading from them in the direction of travel to the exit.

- Dead end corridor length in exit access shall not exceed:

- Educational, Institutional, assembly occupancy : 6 metre
- Others :15 metre

Requirements for accessibility:
(Refer clause A.4.1.3.2 for applicability and other details)

- Minimum unobstructed width of corridor shall be 1500mm, preferably 1800mm.
- For wheel chair turning (90 degree), width shall be 1500mm, 1500mm long in the direction of travel.
- For wheel chair turning (180 degree), width shall be 1800mm, 2000mm long in the direction of travel.

A.5.11 Stairs

Staircases shall be provided for vertical circulation system, Exits and roof access.

Staircases shall be provided in required numbers with requisite components such as Treads, Risers, Landings, Handrails etc. as below:

Minimum width of tread (without nosing)	300mm	
Maximum height of riser	190mm (residential buildings, A-2 type) 150mm (other buildings)	
Maximum no. of risers per flight	12	
Minimum width of flight (Building occupancy wise)	Residential (A-2)	1000 mm
	Residential (A-1,3,4)	1250 mm
	Residential (A-5,6)	1500 mm
	Assembly	2000 mm
	Educational	1500 mm
	Institutional	2000 mm
	Others	1500 mm

Note: Category classification are as per NBC.

Requirements for Fire & Life safety:
(Refer clause A.4.1.3.3 for applicability and other details)

Requirements of stairs for fire and life safety are tabulated below:

Types of staircases:	
Internal staircase	Internal staircases are located inside the building and may be with an external wall.
External staircase	These are the staircases provided on the external wall/façade. These shall be open on at-least one side.
Curved staircase	Curved stairs shall not treated as part of means of egress. These may be used as part of exit access, provided depth of tread is not less than 280mm.
Spiral staircase	Shall be limited to low occupant load and to a building not exceeding 9 metre in height. Diameter shall not be less than 1500mm
Number of staircases	- Minimum 2 numbers - Actual numbers shall be based on occupant load and travel distance.

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Discharge through staircase	Discharge from stairs to exit discharge shall be a) directly, or b) through exit passageway, or c) through lobby. At least 50 % of the staircases shall discharge as per a) and/ or b)	
Minimum width of tread (without nosing)	250mm (residential buildings) 300mm (other buildings)	
Maximum height of riser	190mm (residential buildings, A-2 type) 150mm (other buildings)	
Maximum no. of risers per flight	12	
Internal staircases: Internal staircases shall meet following requirements:		
- Shall have minimum 120-minute fire rating - Shall not be arranged around lift shaft - Access to staircase shall be through minimum 120 minutes fire rated door. - Shall terminate at the level of exit discharge. Access to basement shall be by separate staircase		
Minimum width of flight (Building occupancy wise)	Residential (A-2)	1000 mm
	Residential (A-1,3,4)	1250 mm
	Residential (A-5,6)	1500 mm
	Assembly	2000 mm
	Educational	1500 mm
	Institutional	2000 mm
	Others	1500 mm
Handrail	- Handrail shall be provided on one side for width less than 1500mm and on both sides for width 1500mm and more - Projections of handrails in the staircase width shall not be more than 115mm	
External staircases: External staircases shall meet following requirements:		
Discharge	External stairs shall be directly connected to the ground.	
Door to external staircase	Any doorway leading to external staircase shall be minimum 120 minutes fire rated door	
Inclination of staircase	Inclination shall not be more than 45 degrees	
Width	Not less than 1500mm	
Handrails	1000mm high, on both sides with provisions of balusters with maximum gap of 150 mm.	

Stairs for roof access:

- In case of buildings of more than one story, where staircases are already provided for vertical circulation, minimum one stair case shall be continued for roof access.

- In case of single storied buildings having provision for future expansion, minimum one staircase shall be provided for roof access.

- In case of other single storied buildings, steel ladder or staircase shall be provided for roof access.

If there are equipment placed on roof of such buildings, staircase on shall be provided for operation / maintenance of the equipment.

Also, if the height of the building is more than 4.5 metre, staircase shall be provided.

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For very small single storied buildings of normal height like security cabin, scale room, small pump houses etc. ladder or staircase may be avoided as roof of such buildings can be accessed by normal maintenance ladders.

A.5.12 Lifts

Lifts shall be provided for vertical circulation in high rise (15 metre or above in height) buildings.

Capacity and number of lifts:

Capacity and numbers of lift shall be decided in accordance with the NBC

Requirements for accessibility:

- It is recommended that in multistoried buildings there be at least one lift accessible to transport persons with disabilities at all usable levels. This requirement shall be finalised in consultation with the owner.

- The minimum size of the lift shall be 1500mm x 1500mm

- Handrails shall be placed at height of 1000 mm from the floor level and shall be fixed on both sides and at the rear of the lift.

A.5.13 Toilets

Toilets shall be provided in all buildings having human occupancy.

- Separate toilets for Gents and Ladies shall be provided. However, in small buildings or for a smaller number of occupants, Unisex Toilet may be provided.

- Shaft for plumbing pipes etc. shall preferably be provided for maintenance and hiding the pipes etc. for aesthetic reason after seeking owner's approval for design.

- Janitor space shall be provided in the Toilet block of Satellite Rack Rooms, Substations and Warehouses only.

- Waterproofing shall be done for Toilets on first floor and above.

Number of fixtures:

Number of fixtures shall be in accordance with clause 4.2.5, Part-9 of NBC. Generally applicable requirements are tabulated below.

Building Type: Office

User	Number of fixtures		
	WC	Urinals	Wash Basin
Male	1 no per 25	1 no for 7 to 20 2 nos for 21 to 45 3 nos for 46 to 70 4 nos for 71 to 100	1 no per 25
Female	1 no per 15	-	1 no per 25

Building Type: Factories

User	Number of fixtures		
	WC	Urinals	Wash Basin
Male	1 no for up to 15	1 no for up to 20	1 no per 25 or

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	2 nos for 16 to 35 3 nos for 36 to 65 4nos for 66 to 100	2 nos for 21 to 45 3 nos for 46 to 70 4 nos for 71 to 100	part of thereof
Female	1 no for up to 12 2 nos for 13 to 25 3 nos for 26 to 40 4 nos for 41 to 57	-	1 no per 25 or part of thereof

Building Type: Restaurants, Dining Halls

User	Number of fixtures		
	WC	Urinals	Wash Basin
Male	1 no for 50 seats up to 200 Add 1 no per additional 100 or part thereof	1 no per 50 seats or part thereof	1 no per WC
Female	2 no for 50 seats up to 200 Add 1 no per additional 100 or part thereof	-	1 no per WC

Toilets for persons with disability:

- Minimum one number Unisex Toilet for persons with disability shall be provided in each floor fulfilling following requirements:
- Suitable arrangement of fixtures, grab rails (horizontal, vertical) and manoeuvring space for both wheel chair users and Ambulant Disabled People.
- Toilet door shall be outward opening door with clear opening width of 900mm. The door shall be provided with minimum 600 mm long horizontal pull bar at a height of 900 mm and horizontal pull handle at 700 mm height, both on the inside of the door.

A.5.14 Drinking Water

Drinking water facility shall be provided in all buildings having human occupancy. The facility shall either be provided inside the pantry or in some convenient area having provisions of water supply, RO facilities (including space required for RO equipment) and water disposal.

Requirement of drinking water fountain/ taps:

Number of fixtures shall be in accordance with clause 4.2.5, Part-9 of NBC. Generally, widely applicable requirements are tabulated below.

Building Type	Number of fixtures
Office	1 per every 100 or part thereof
Factory	1 per every 100 or part thereof

A.5.15 Pantry

Pantry (for tea/ coffee preparation, drinking water, snacks distribution etc.) shall be provided in all buildings having considerable human occupancy. In case of low occupancy, provisions for Tea/

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Coffee dispenser/ preparation facility etc. shall be kept in some convenient area having provisions of water supply, washing facilities, water disposal etc.

A.5.16 Walls

Walls shall be of Concrete block/ clay bricks/ fly ash bricks/ AAC masonry. For blast resistance, walls shall be of RCC.

Thickness of brick walls:

Wall Type	Thickness
External wall	230mm brick wall or 200 mm AAC/concrete block masonry
Internal partition wall	230mm or combination of 230 & 115-mm brick wall OR 200/100 mm or combination of 200 and 100-mm concrete/AAC block masonry
Walls abutting Transformers	200 thick RCC or 345 mm brick wall or 300 mm AAC/Concrete block masonry
Fire rated wall	Minimum 115 mm brick wall or 100 mm concrete/AAC block masonry for 2-hour fire rating
Blast resistant wall	RCC wall as/ structural design (minimum 230 mm brick wall or 200 mm AAC/concrete block masonry)

Notes:

1. The selection of type of bricks/ masonry to be carried out as per owner's approval.
2. 115 mm thk. Brick partition walls (with nominal steel requirement as per structure design) shall be provided with 230 mm thk. brick pillars for stability depending upon the length and height of wall.
3. For internal partition walls, wherever conduits or pipes are required to be concealed, thickness shall preferably be 220mm brick wall or 200 mm concrete blocks.

Fire rated walls:

Fire rated walls of required rating (minimum 2 hours) shall be provided in following areas of applicable buildings indicated in clause A.4.1.3.3

- Enclosure of internal staircase : 2 hours fire rating.
- Exit passageway/ corridor : 2 hours fire rating

- Walls separating various fire zones and separation walls between protected and non-protected areas of Process Control Rooms / Satellite Rack Rooms shall also be of 2 hours fire rating.

A.5.17 Partitions

Internal partitions shall be of engineered wood (block/ particle/MDF/ Gypsum board) and metal frame construction with specified finish. Fire rating requirement shall be similar to walls. Glazed panels shall be provided for visibility on the partitions as per requirements.

A.5.18 Doors

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Doors shall be provided for access, security and safety at entry and exits of rooms/ areas and the buildings.

Separate service entry shall be provided for service areas such as Kitchen, Airconditioning / Pressurization plant, Electrical Rooms, Battery & UPS Room etc. A common service entry may be provided depending on spatial arrangement.

Sizing of doors shall be based on Equipment size (including package) and Fire & Life Safety (Refer clause A.4.1.3.3).

Rolling shutters shall be provided in place of door when size exceeds 2500 mm x 2500 mm.

Requirements of Fire and Life Safety:
(Refer clause A.4.1.3.3 for applicability and other details)

- Doors provided in exit passageway (from exit-to-exit discharge) shall be fire rated doors of 120 minutes rating.
- All main entry and exit doors, doors leading towards exit corridor shall have panic push bar in all buildings.
- Fire doors with 120 min fire resistance rating shall be provided particularly at the entrance to lift lobby and stair well where a funnel of flue effect may be created, including upward spread of fire, to prevent spread of fire and smoke.
- Any doorway leading to external staircase shall be minimum 120 minutes fire rated door.
- Access door to internal staircase shall be minimum 120 minutes fire rated door.
- In case of central corridor which is part of exit access of the building, doors of rooms (except for rooms having assembly occupancy) shall open inwards.
- Width of Doors shall not be less than 1000 mm except assembly buildings, where door width shall not be less than 2000 mm and for WC cubicles, where door width shall not be less than 750mm.
- Blast resistant Control rooms shall be provided with Blast resistant Baffle wall as per OISD – STD – 163.

A.5.19 **Windows/ Ventilators** (Glazed & with Louvers)

Windows/ ventilators shall be provided in all areas for visibility, natural lighting & ventilation.

Minimum area of window/ ventilator:

Minimum window/ ventilator area shall be 10 percent of floor area in general.

Windows/ Ventilators in various areas:

Buildings/ Areas	Windows/ Ventilators (glazed & with Louvers)
Office and other work spaces	Normally full-length windows for visibility and natural day-light
Storage areas, Stores, Warehouses	Ventilators at high level with safety bars.
Equipment / Panel Rooms	Mostly ventilators at high level, windows
Process Control Rooms/ Satellite Rack Rooms	Refer OISD-STD-163
Security Cabins/ Watch Tower	Windows for maximum visibility
Battery room	Windows shall be provided with sun control film Provision of exhaust fans for ventilation

A.5.20 **Shading Devices** (for windows/ ventilators etc.)

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All Glazed windows/ ventilators shall be provided with shading devices for rain and sun protection having min 600mm width. The devices shall be in forms of horizontal/ vertical projections/ recesses and shall be part of façade aesthetics. Provision for water proofing and drainage shall be suitably made for projections.

A.5.21 Roof Monitor

Roof Monitors shall be located over openings at ridge of metal sheet roofing mainly for natural ventilation.

The Monitors shall consist of metal sheet roofing and louvers at the sides. Glass may also be used in combination with louvers for additional benefit of natural light. Bird wire mesh should be provided to prevent entry of birds.

The Monitors shall be suitably designed and detailed to ensure that the leakage of rain water is prevented.

Size of the Monitor:

Opening size at roofing sheet near ridge should be minimum 10% of the span. Height shall be suitably decided.

A.5.22 Ridge Ventilator

Ridge ventilators shall be wind driven/operated type and shall be factory made. The size shall be as required for required ventilation.

Suggested calculation of size / numbers:

Qv = (VxN)/ (Rx3600)

Qv = Quantity of Ridge Ventilators required.

V = Volume of the building

N = Number of air changes

R = Exhaust capacity of ridge vent @ stack height (considering available throat size, length of ridge ventilator etc.)

The Ridge ventilators shall be suitably designed and detailed to ensure that the leakage of rain water is prevented.

If required for necessary ventilation, wind driven/ operated Roof Air Extractors shall also be provided.

A.5.23 Roof Air Extractor

Roof Air Extractors shall be Wind Driven/operated type and shall be factory made. The size and numbers shall be as required for required ventilation.

Suggested calculation of size and numbers:

Number of Air extractors =
Volume of the Room X Required air-change per hour
Exhaust capacity of one extractor (considering throat size, height etc.)

They shall be suitably designed and detailed to ensure that the leakage of rain water is prevented.

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A.5.24 Roofing/ Cladding light sheets

Transparent roofing sheets shall be provided in combination with metal sheet roofing/ cladding for adequate uniform natural lighting. Minimum area of roof light sheets shall be 10% of roof area. The sheets to be provided with wire mesh protection below it, to arrest fall of maintenance personnel.

A.5.25 Roof Gutters

For buildings like Satellite Rack rooms, Substations etc, where additional metal roof sheeting is provided, RCC roof gutter shall not be provided for drainage from RCC roof. Slope on RCC roof slab shall be provided for rain water drainage from exposed PVC pipes

RCC Roof Gutters shall be provided only over the buildings where additional metal roof sheeting is not provided.

Metal sheet Eaves & Valley Gutters shall be provided for metal sheet roof.

Suggested calculation of Gutter sizing:

A = Roof area to be drained in Sq. M

B = Rainfall Intensity (mm/ hr) of the place

C = Runoff coefficient for roof surface (Concrete -0.8 to 0.95, Metal sheet -0.95)

D = Runoff in Cubic m / hr (D = A x B x C)

E = Total rain water coming from roof = D / No. of gutters

V = Velocity of water to be discharged by gutter drain (as per Manning's formula)

$$V = \left[\frac{1}{n}\right] x \left[R^{\frac{2}{3}} x\, S^{\frac{1}{2}}\right]$$

Where:

V= Velocity in meter per second

R= Hydraulic radius in M [For gutter R= (d x w)/ 2 x d +w), where d=effective depth of gutter & w = width of gutter]

n = Manning Coefficient of Roughness

S= Slope of Hydraulic gradient

Q = d x w x V (discharge)

If Q> D, gutter size is correct. If Q<D then d and w of the gutter need to be resized.

Roof water accumulated in gutters shall be drained through Rain Water Pipes.

A.5.26 Rain Water Pipes

Rain water pipes shall be provided in adequate numbers ensuring roof water drainage. The Rain Water Pipes if visible on facades of important buildings shall be suitably concealed after obtained owner's approval.

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If feasible, the pipes shall be located at the back-side of the buildings, which, in cases of un-important buildings (visually) may be kept exposed.

Suggested Rain Water Pipe sizing and numbers:

Diameter Rain water Pipe (mm)	Rainfall rate (mm/hour)					
	50	75	100	125	150	200
	Roof Area (Flat roof, sq. metre)					
50	29.70	19.80	14.85	11.88	9.90	7.42
75	81.84	54.56	40.92	32.74	27.28	20.46
100	168.00	112.00	84.00	67.20	56.00	42.00
125	293.48	195.66	146.74	117.39	97.83	73.37
150	462.95	308.64	231.48	185.18	154.32	115.74

The pipes shall be located at suitable spacing considering slope of finished roof etc.

A.5.27 Parapet wall

Parapet walls or Handrails shall be provided on the edges of roof terraces, Balconies, Verandahs etc.

Height of the Parapet walls shall not be less than 1100 mm except for small buildings with such as Security Cabins, Weigh- Bridges etc. where height of Parapet walls may be not less than 600 mm.

Railings (1000 mm high) shall be provided in stairs, and in all unprotected openings in slabs as a safety device. Steel railings in loading/ unloading bay of shall be of removable type. Parapets shall be given precedence over railings on roofs.

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A.6.0 SCHEDULE FOR ARCHITECTURAL FINISHES.

Colour Scheme for all Architectural items shall be as approved by the Owner. For the purposes of schedule of Architectural finishes, buildings are categorized into following types.

Type	Buildings
Type A	- Office Building - Training Centre - Gate House - Marketing Office Building - Canteen/Dining Hall - Guest House - Control Rooms - Satellite Rack Room
Type B	- Substation - Switchgear Building - MCC Room etc.
Type C	- Laboratory - Occupational Health Centre - Fire Station - Gate Houses (other than Main Gate House) - Other non-plant/ process building not listed in any other category
Type D	All process/ plant buildings not listed in other category.
Type E	- Stores - Ware house - Workshop - Cement Godown - Site Office - Weigh Bridge - Watch Towers - Other storage/ maintenance buildings
Type F	- Utility storage Sheds like DG Shed, Pump Houses, Compressor House, Analyzer Room etc. - Process sheds & other sheds

Note: In case of conflict between licensor/ process/ safety/ statutory requirement and this schedule of Architectural finishes, the former shall override.

A.6.1 INTERNAL FINISHES

A.6.1.1 Floor finishes:

A. Entrance Lobby, Reception, lounge, Waiting area, Viewing Gallery etc.:

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Combination of granite stone and vitrified tiles	• Kota Stone	• Combination of granite stone and vitrified tiles	• Vitrified tiles	• Vitrified tiles	• Not applicable

B. Office and associated office areas like records/ storage, meeting/ conference room etc.:

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Vitrified tiles	• Vitrified tiles	• Vitrified tiles	• Vitrified tiles	• Vitrified tiles	• Not applicable

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C. Circulation area (Corridor, passage, Lift corridor etc.):

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Combination of Granite stone and vitrified tiles	• Granite Stone	• Combination of Granite stone and vitrified tiles	• Vitrified Tiles	• Vitrified Tiles	• Vitrified Tiles

D. Kitchen, Pantry & Dining hall etc.:

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Vitrified Tile	• Vitrified Tile	• Vitrified Tile	• Vitrified Tile	• Vitrified Tile	• Not applicable

Note**:** Granite Stone counter top shall be provided for kitchen and pantry area.

E. Toilet, Drinking water area etc.:

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Combination of Granite and vitrified tile	• Ceramic tiles (anti-skid)	• Ceramic tiles (anti-skid)	• Ceramic tiles (anti-skid)	• Ceramic tiles (anti-skid)	• Not applicable

F. Staircase:

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Granite stone	• Granite Stone	• Granite stone	• Kota stone	• Kota stone	• Not applicable

Note: Above finishes shall be applicable for RCC staircase. For steel staircase, refer structure part in design basis.

G. Battery Room & Chemical Handling areas (All type of Buildings):

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Chemical (Acid / Alkali)/ abrasion resistant Epoxy coating over heavy duty cement concrete floor finish					

H. Electrical Room, Pressurization Room, AC Plant, Loading / Unloading bays, Equipment handling areas, Product storage areas, Switchgear, MCC, Ware House, Work Shop, Process/ Utility Sheds etc. (All type of buildings):

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Heavy Duty Cement concrete flooring. • Vacuum de-watering flooring in large Rooms/ areas of Storage/ Warehouse/ Workshop					

Note: Vacuum dewatering shall be done as per Structure Design Basis and specification

I. Console, Rack room, UPS Room, areas housing instrumentation equipment's requiring under-floor cabling (All type of buildings):

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Combination of granite stone, vitrified Tile and false flooring in case of trench arrangement • Raised access/ Cavity / False flooring					

Note: Criteria for false floor/ trench shall be established based on electrical/ instrumentation design basis.

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J. Executive Block Including all office areas, lounge, lobby, dining room, meeting/ conference room, etc. of admin building:

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Combination of Granite and Vitrified Tiles					

A.6.1.2 Internal Wall Finishes

A. Entrance Lobby, Reception, lounge, Waiting area etc.:

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Cement Plaster, POP punning & Texture Paint/ Plastic Emulsion Paint	• Cement Plaster, POP punning & Plastic emulsion paint	• Cement Plaster, POP punning & Texture Paint/ Plastic Emulsion Paint	• Cement Plaster, POP punning & Plastic emulsion paint	• Cement Plaster, POP punning & Plastic emulsion paint	• Not applicable

B. Office and associated office areas like records/ storage, meeting/ conference room etc.:

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Cement Plaster, POP punning & Plastic emulsion paint	• Cement Plaster, POP punning & Plastic emulsion paint	• Cement Plaster, POP punning & Plastic emulsion paint	• Cement Plaster, POP punning & Plastic emulsion paint	• Cement Plaster & Acrylic Distemper	• Not applicable

C. Circulation area (Corridor, passage, Lift corridor etc.):

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Cement Plaster, POP punning & Texture Paint/ Plastic Emulsion Paint	• Cement Plaster, POP punning & Plastic emulsion paint	• Cement Plaster, POP punning & Plastic emulsion paint	• Cement Plaster, POP punning & Plastic emulsion paint	• Cement Plaster & Acrylic Distemper	• Cement Plaster & Acrylic Distemper

Note: Putty shall only be provided in lift corridor in Type B

D. Kitchen, Pantry.:

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Vitrified tile dado up to 1500mm height, Cement Plaster, POP punning & Plastic emulsion paint up to 300mm above false ceiling	• Cement Plaster, POP punning & Plastic emulsion paint	• Cement Plaster, POP punning & Plastic emulsion paint	• Cement Plaster, POP punning & Plastic emulsion paint	• Cement Plaster, POP punning & Plastic emulsion paint	• Not applicable

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E. Dining hall :

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
Vitrified tile dado up to 1500mm height, Cement Plaster, POP punning & Plastic emulsion paint up to 300mm above false ceiling	• Ceramic tile dado upto 1500mm height, Cement Plaster, POP punning & Plastic emulsion paint up to 300mm above false ceiling	• Vitrified tile dado up to 1500mm height, Cement Plaster, POP punning & Plastic emulsion paint up to 300mm above false ceiling	• Ceramic tile dado upto 1500mm height, Cement Plaster, POP punning & Plastic emulsion paint up to 300mm above false ceiling	• Ceramic tile dado upto 1500mm height, Cement Plaster, POP punning & Plastic emulsion paint up to 300mm above false ceiling	• Not applicable

F. Toilet, Drinking water area etc.:

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Vitrified Tile Dado up to 2100mm, Cement Plaster, POP punning & Plastic emulsion paint up to 300mm above false ceiling	• Ceramic Tile Dado up to 2100mm, Cement Plaster, POP punning & Plastic emulsion paint up to 300mm above false ceiling	• Vitrified Tile Dado up to 2100mm, Cement Plaster, POP punning & Plastic emulsion paint up to 300mm above false ceiling	• Ceramic Tile Dado up to 2100mm, Cement Plaster, POP punning & Plastic emulsion paint up to 300mm above false ceiling	• Ceramic Tile Dado up to 2100mm, Cement Plaster, POP punning & Plastic emulsion paint up to 300mm above false ceiling	• Not applicable

G. Staircase:

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Cement Plaster, POP punning & Plastic emulsion paint	• Cement Plaster & Acrylic Distemper	• Cement Plaster, POP punning & Plastic emulsion paint	• Cement Plaster, POP punning & Plastic emulsion paint	• Cement Plaster & Acrylic Distemper	• Not applicable

Note: a. Above finishes shall be applicable for brick wall, Concrete staircase enclosure.

b. No putty shall be provided in external staircase of Type B

H. Battery Room & Chemical Handling areas (<u>All type of Buildings</u>):

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Chemical resistant epoxy coating over cement plaster up to 2100mm height and Cement Plaster, Acrylic Distemper above 2100mm height.					

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I. Electrical Room, AC Plant, Loading / Unloading bays, Equipment handling areas, Storage areas, Switchgear, MCC, Ware House, Work Shop, Process/ utility Sheds etc. (All type of buildings):

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Cement Plaster & Acrylic Distemper • Cement Plaster, POP punning & Plastic emulsion paint (Switchgear hall & MCC) • Cement Plaster & exterior acrylic paint (in weather exposed areas)					

Note: Putty shall be provided only in the air-conditioned areas only.

J. Rack room, Engineering room, UPS Room (All type of buildings):

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Cement Plaster, POP punning & Plastic emulsion paint					

K. Console Room:

• Texture Paint up to 2100mm height Cement plaster, POP punning & Plastic emulsion paint above
• Cement Plaster, POP punning with plastic emulsion paint (For consoles rooms other than in Main Control Room)

A 6.1.3 Internal ceiling finishes:

A. Entrance Lobby, Reception, lounge, Waiting area etc.:

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Gypsum False Ceiling • Combination of Gypsum & Mineral fibre tiles false ceiling • Cement Plaster, POP punning & Plastic emulsion paint	• Gypsum False Ceiling • Combination of Gypsum & Mineral fibre tiles false ceiling • Cement Plaster, POP punning & Plastic emulsion paint	• Gypsum False Ceiling • Combination of Gypsum & Mineral fibre tiles false ceiling • Cement Plaster, POP punning & Plastic emulsion paint	• Gypsum False Ceiling • Combination of Gypsum & Mineral fibre tiles false ceiling • Cement Plaster, POP punning & Plastic emulsion paint	• Gypsum False Ceiling • Cement Plaster, POP punning & Plastic emulsion paint	• Gypsum False Ceiling • Cement Plaster, POP punning & Plastic emulsion paint

Note: No putty shall be provided in entrance lobby of Type D, E and F

B. Office and associated areas like records/ storage, meeting/ conference room etc.:

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Combination of Gypsum & Mineral fibre tiles false ceiling • Cement Plaster, POP punning & Plastic emulsion paint in records/ storage rooms					

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C. Circulation area (Corridor, passage, Lift corridor etc.):

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Gypsum False Ceiling • Combination of Gypsum & Mineral fibre tiles false ceiling • Cement Plaster, POP punning & Plastic emulsion paint	• Gypsum False Ceiling • Combination of Gypsum & Mineral fibre tiles false ceiling • Cement Plaster, POP punning & Plastic emulsion paint	• Gypsum False Ceiling • Combination of Gypsum & Mineral fibre tiles false ceiling • Cement Plaster, POP punning & Plastic emulsion	• Gypsum False Ceiling • Combination of Gypsum & Mineral fibre tiles false ceiling • Cement Plaster, POP punning & Plastic emulsion paint	• Gypsum False Ceiling • Cement Plaster, POP punning & Plastic emulsion paint	• Gypsum False Ceiling • Cement Plaster, POP punning & Plastic emulsion paint

Note: No painting & putty shall be provided above the false ceiling height & slab ceiling in circulation area of Type C, D, E & F.

D. Other AC areas etc., where false ceiling required:

- Combination of Gypsum & Mineral fibre tiles false ceiling
- Aluminum panel false ceiling

Notes:

1. False ceilings shall be provided in the all-air-conditioned areas for the purpose of reducing room volume and to hide air-conditioned ducting etc. and also to maintain acoustic level inside any space.
2. In fire rated areas where walls and doors are required to be fire rated, false ceiling shall also have complementing fire rating.

E. Rack room, Engineering room, Switchgear hall, UPS Room (All type of buildings):

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Combination of Gypsum & Mineral fibre tiles false ceiling • Aluminum panel false ceiling					

F. Other area not indicated above etc.:

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Cement Plaster &plastic emulsion paint			• Cement Plaster & Acrylic Distemper		

Note: For non-air-conditioned utility areas such as electrical room, AC package, AHU etc Cement Plaster & Acrylic Distemper shall be provided.

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A.6.2 EXTERNAL FINISHES

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
Combination of: • Plain cement plaster and texture coating • Exterior Plastic Emulsion Paint • Granite stone/sand stone cladding • Plain cement plaster and Acrylic paint • Composite Aluminum Panel & structural glazing • GFRC Jaali/ Cladding	• Exterior Plastic Emulsion Paint • Plain cement plaster and Acrylic paint	Combination of: • Plain cement plaster and texture coating • Exterior Plastic Emulsion Paint • Granite stone/sand stone cladding • Plain cement plaster and Acrylic paint • Composite Aluminum Panel & structural glazing	• Exterior Plastic Emulsion Paint • Plain cement plaster and Acrylic paint	• Exterior Plastic Emulsion Paint • Plain cement plaster and Acrylic paint	• Exterior Plastic Emulsion Paint • Plain cement plaster and Acrylic paint

Note: Grooves in plaster shall be provided at junction of different materials and as per external facade treatment.

A.6.3 DOORS

A. Entrance/ exit Doors

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Powder coated Aluminum glazed doors with partly etched/ frosted film over glass					

B. Doors in circulation area of <u>all type of Buildings</u>:

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Powder coated Aluminum glazed doors with partly etched/ frosted film over glass					

C. Office area doors

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Powder coated Aluminium glazed doors with partly etched/ frosted film over glass					

D. All Electrical Room, A.C. Plant Room, Battery Room doors of all type of Buildings:

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Pressed steel frame with Pressed steel shutter, Powder coated • Powder coated Aluminium doors partly glazed/ partly with Aluminium sheet					

E. Toilet doors

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Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Cubicle system (with compact laminated board) • FRP Doors	• FRP Doors	• Cubicle system (with compact laminated board) • FRP Doors	• FRP Doors	• FRP Doors	• FRP Doors

F. Fire check/ resistant doors

Irrespective of above schedule, Fire check doors (minimum 2 hours rated) shall be provided wherever required as per OISD/ Statutory requirements.

1. Fire check doors In Control Room / Satellite Rack Room Building

A. Main entrance/ entry to Console:
- Glazed steel Fire check door

B. Other Rooms:
- Glazed steel Fire check door
- Solid type steel fire check door (with 300mm x 300mm vision panel)

2. Fire check doors In Administration Building

A. Main entrance/ entry/ circulation area:
- Glazed steel Fire check door
- Wooden, TW veneered fire check door (with 300mm x 300mm vision panel)

B. Other Rooms:
- Glazed steel Fire check door
- Solid type steel fire check door (with 300mm x 300mm vision panel)
- Wooden, TW veneered fire check door (with 300mm x 300mm vision panel)

3. Fire check doors In other Buildings

A. Main entrance/ entry/ circulation area:
- Glazed steel Fire check door
- Solid type steel fire check door (with 300mm x 300mm vision panel)

B. Other Rooms:
- Glazed steel Fire check door
- Solid type steel fire check door (with 300mm x 300mm vision panel)

Note:

1. Steel gate of suitable size in front of transformer bays in substation buildings to be provided as per electrical requirement.
2. Rolling shutters shall be provided in equipment areas like Switchgear/ MCC Room, Workshop, Ware House, AC Plant room etc. where opening size for door exceeds 2500 x 2500mm.
3. Mechanically operated Rolling Shutters shall be provided in the main equipment entry door and for opening Sizes exceeding 8.0 sq.m.
4. Doors/windows/ventilators shall be complete with all fittings & fixtures for easy smooth operation & locking facility.
5. All main entry and exit doors, doors leading towards exit corridor shall have panic push bar button in all buildings.
6. 6mm Toughened glass shall be used for glazing in Aluminum Doors and Windows.

A.6.4 WINDOWS & VENTILATORS

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F

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• Powder coated Aluminum glazed windows & ventilators

Note: For Green buildings. Double glazed units (DGU) shall be provided as per the requirement and orientation of openings.

A.6.5 ROOF TREATMENT

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Over-deck insulation cum waterproofing system (for central air conditioning buildings) • Atactic Polypropylene (APP) modified bituminous waterproofing membrane (where roof insulation is not required)- for non air-conditioned building					

Note: Underdeck insulation shall be provided in all Air-Conditioned spaces and HVAC room with roof exposed to sunlight with no over deck insulation.

A.6.6 ROOFING / CLADDING (sheds/workshop)

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Precoated, profiled color coated zincalume steel sheet roofing & cladding in compressor shed, pump house etc. with translucent roof light sheets where applicable • Insulated Pre-coated, profiled color coated zincalume steel sheet roofing & cladding in Warehouse, workshops, storage sheds and other sheds with translucent roof light sheets where applicable based on client's requirements. • Permanent additional roof of precoated galvalume sheet shall be provided over the top RCC slab of buildings like Substation, Satellite Rack Room and Control Room. Roof gutter shall be provided on the permanent sheet roof and shall be of plain galvalume/ zincalume sheet bent or fabricated to required shape and size and connected to rain water downtake pipes.					

A.6.7 SANITARY FITTINGS & FIXTURES

A. Water Closet (European type):

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Water efficient (dual flush) Wall hung type, coloured (premium luxury model)	• Water efficient (dual flush Pedestal type, coloured	• Water efficient (dual flush Pedestal type, coloured	• Water efficient (dual flush Pedestal type, coloured/ white	• Water efficient (dual flush Pedestal type, coloured/ white	• Water efficient (dual flush Pedestal type, coloured/ white

Note: Indian Water closet shall be provided as per functional requirement and applicability

B. Wash Basins:

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• Round/oval, coloured, with electronic sensor over granite counter • Round/oval, coloured, over granite counter	White, wall hung type	• White, wall hung type	• White, wall hung type	• White, wall hung type	• White, Wall hung type

Note: Battery Rooms to be provided with facility of sink and washing facility (with drinking water)

C. Urinals:

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Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• With electronic sensor (premium luxury model) • Standard Wall hung type	• Standard Wall hung type	• Standard Wall hung type	• Standard Wall hung type	• Standard Wall hung type	• Standard Wall hung type

Note: Laminated Board shall be considered for partitions between urinals

D. Plumbing fixtures (stop/ bib/ pillar cocks, flash valves etc.):

Type-A	Type-B	Type-C	Type-D	Type-E	Type-F
• CP brass (Premium luxury model)	• CP brass	• CP brass	• CP brass	• PVC	• PVC

Notes:

1. All plumbing fixtures shall be low flow type.
2. Stainless steel sink shall be provided in kitchen/ pantry.
3. Auto/ Self closing push cocks shall be used where electronic sensor fitted fixtures are not used.
4. All drain points shall be provided with floor trap.
5. All PVC pipes shall be used for drinking water network.
6. Overhead water tank of PVC type in each building shall be considered
7. All toilets shall be provided with exhaust fans for ventilation
8. All battery rooms shall be provided with Stainless sink with water connection and drawing below.

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JOB SPECIFICATIONS
(ARCHITECTURE)

FOR SETTING OF LABORATORY AND ASSOCIATED SERVICES

TENDER NO. B895-999-85-41-EP-T-9802

PROJECT:	**PROJECT MANAGEMENT CONSULTANCY (PMC) AND ENGINEERING, PROCUREMENT & CONSTRUCTION MANAGEMENT (EPCM) SERVICES FOR POLYPROPYLENE PROJECT OF BPCL, KOCHI REFINERY**
OWNER:	**BHARAT PETROLEUM CORPORATION LTD.**
CONSULTANT:	**M/s ENGINEERS INDIA LIMITED**
JOB NO:	**B895**

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	03.11.2025	ISSUED FOR TENDER	KT	SS	GJK

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1.0 GENERAL

1.1 This specification defines the technical and other requirements to be complied by the EPC CONTRACTOR for carrying out his scope of work and supply with respect to Architectural works.

1.2 This specification shall be read in conjunction with the remainder (such as specifications, scope of works, design basis, drawings, applicable codes and standards etc) of the Bid document.

1.3 Requirements specified in this specification are the minimum requirements and is in no way exhaustive. In case, any requirement for completion of Architectural works is not covered in the specification, referenced National or International codes and standards shall be followed with prior approval from the OWNER or COMPANY or PMC without any time and cost implication to the OWNER or COMPANY or PMC

1.4 In case of conflicts or contradictions amongst Architectural design basis, drawings and this Job specification, unless otherwise specifically mentioned, provisions of this Job specification shall be binding to the EPC CONTRACTOR.

1.5 In case of conflicts or contradictions with respect to specifications, design basis, other documents, and drawings of other disciplines, referenced publications etc. most stringent requirement or decision of OWNER or COMPANY or PMC shall be binding to the EPC CONTRACTOR.

2.0 REFERENCES

2.1 Requirements of Referenced Publications in design basis, related Codes, Standards and Rules/ guidelines/recommendations of Statutory Authorities such as Factory Inspectorate, Fire Services etc. shall be complied in Design, Detail engineering and Execution of Architectural works

3.0 SPECIFIC DESIGN REQUIREMENT

3.1 General

Design and detail engineering of Architectural works shall be done as elaborated in scope of supply and work (Architectural).

3.2 Spatial requirement

Spatial i.e. requirement of various rooms and spaces to be accommodated in the building shall be identified based on functional requirement and related activities, occupancies, amenities, services and utilities and statutory requirements.

3.3 Sizing of rooms/spaces

In case of plant buildings, sizing shall be decided based on equipment/panel/ machinery lay-out considering operation, maintenance, clearances, HSE requirement etc. obtained from originating discipline of the facility.

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In case of non-plant buildings, sizing shall be done based on guidelines of NBC and Owner's specific requirements. In absence of guidelines in NBC, publications such as "Time saver standard", "Neufert – Architects data" shall be followed.

4.0 SPECIFICATION OF ARCHITECTURAL FINISHES/PRODUCTS

4.1 General

4.1.1 Codes & Standards

i. Codes and standards indicated or referenced in the specifications form part of the specifications.

ii. Alternate codes and standards meeting the requirements of referenced codes and standards may be used with the approval of the OWNER OR COMPANY, PMC

iii. It shall be EPC CONTRACTOR's responsibility to be, or to become knowledgeable of the requirements of the codes and standards.

iv. Abbreviations

IS	-	Indian Standards
BS	-	British Standards
ISO	-	International Organization for Standardization
EN	-	European Standards
ASTM	-	American Society for Testing and Materials

4.1.2 Materials

i. All materials shall conform to the specifications and obtained from approved Manufacturer.

ii. EPC CONTRACTOR shall get the samples of materials approved by the OWNER OR COMPANY, PMC before ordering & procurement. Such approved samples shall be properly identified as approved sample and shall be kept as record for future reference.

iii. EPC CONTRACTOR shall furnish necessary test certificates etc. Further to that he shall get the materials tested from approved Test House (if and as asked by the OWNER OR COMPANY, PMC) at his own cost for which no extra payment is admissible to him.

iv. OWNER OR COMPANY, PMC shall have the right to reject all or any of the materials intended to be used and such materials shall immediately be removed from the site by the EPC CONTRACTOR at his own cost for which no extra payment is admissible to him.

v. All Material specifications of finishing items includes construction supervision; supply of all materials, labours, tools tackles, scaffoldings etc. and are applicable for all heights, locations etc.

4.1.3 Workmanship

i. Workmanship shall conform to the highest standards of construction, execution & installation practice to the complete satisfaction of the OWNER

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OR COMPANY, PMC.

ii. All works shall be undertaken by qualified skilled personnel having adequate tools, equipment etc. Specialized works such as Fire rated doors, windows & partitions, Suspended ceiling system, false flooring, and water proofing etc. shall be got executed, installed by approved applicators, agencies.

iii. All required precaution, protection and measures shall be taken by EPC CONTRACTOR during & after completion of work to prevent damages till final acceptance by the OWNER OR COMPANY, PMC. Damages if any, shall be rectified by EPC CONTRACTOR

4.1.4 Manufacturers

i. Manufacturers indicated in the specifications are the acceptable Manufacturers for that particular item.

ii. Wherever only single Manufacturer is indicated or specifications which are based on one particular manufacturer's product, purpose is to define the acceptable quality& performance as reference.

iii. Products by other Manufacturers which are of equal quality and performance may be considered for approval upon review of information as required and submitted to the OWNER OR COMPANY, PMC. No time and cost implication to the OWNER OR COMPANY, PMC is admissible for use of such approved products and Manufacturers.

iv. Product data sheet, specifications, performance data, installation instructions and other recommendations of approved Manufacturer shall form part of the specifications.

v. Materials, installation method and other requirements for execution of any item if required by Manufacturer's installation instructions, recommendations and requirements shall also from part of the specifications whether specified or not.

4.1.5 Packaging, Shipping, Delivery & Storage

i. All material, items shall be delivered in Manufacturer's original package bearing related information.

ii. All material, items shall be stored, preserved and protected to safeguard against all adverse environments.

iii. Specific requirement of packaging, shipping, storage, preservation & safety of materials, items if any as per Manufacturer's recommendation shall be ensured by the EPC CONTRACTOR.

iv. Materials, items damaged in handling, storage shall not be used. These shall be removed from site and replaced by EPC CONTRACTOR at his own for which no extra payment is admissible to him.

4.1.6 Submittals

i. If not specifically mentioned otherwise, EPC CONTRACTOR shall submit

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following.

- Samples for materials, components, accessories
- Test certificates
- Shop, fabrication drawings
- Product data sheets, installation & maintenance manuals.

Note:

1. In case of any conflict with specifications mentioned elsewhere, specifications as indicated in this clause shall prevail.

2. For specifications not covered herewith shall be prepared by contractor and submitted for Owner/ PMC approval. The work shall be executed in accordance with approved specifications.

3. For any aspect of item not covered in the document, the contractor shall follow instructions of the engineer-in-charge and execute the work as per relevant IS codes/ recommendations of approved manufacturer/ good engineering practice without any cost or time implication to Owner/PMC. Contractor shall refer only to the relevant part of the specifications given below as per the Building Finishes described before.

4.1.7 Architectural Finishes

Architectural finishes shall be in accordance with engineering Design Basis (Architectural).

For this purpose, Buildings are categorized into groups in line with Engineering Design basis.

4.2 FLOOR FINISHING

4.2.1 Heavy Duty Cement Concrete Flooring

For detail refer clause no. 3.0 of EIL STANDARD SPECIFICATION 6-75-0002.

4.2.2 Heavy Duty Cement Concrete Flooring

For detail refer clause no. 3.0 of EIL STANDARD SPECIFICATION 6-75-0002.

4.2.3 Cement Plaster Skirting

For detail refer clause no. 4.0 of EIL STANDARD SPECIFICATION 6-75-0002.

4.2.4 Tile Work (Ceramic/Vitrified Porcelain)

For detail refer clause no. 5.0 of EIL STANDARD SPECIFICATION 6-75-0002.

4.2.5 Kota Stone Flooring/ Skirting/ Dado

For detail refer clause no. 8.0 of EIL STANDARD SPECIFICATION 6-75-0002.

4.2.5 Granite Stone Flooring/Cladding

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The Granite Stone slabs in flooring and cladding shall be pre-polished (mirror-polish), hard, sound, dense, homogenous in texture, free from cracks, decay, weathering and flakes minimum 18-19mm thickness of selected premium quality (grade- I) and texture/ shade of owner's choice.

For steps in Granite stone finish, provision for antislip groove lines to be provided (min 03 no, on each step).

For Ramps with Granite stone finish Unpolished/rough granite stone floor finish shall be provided instead of polished granite stone finish.

External and Internal Granite stone cladding (18 mm thickness pre-polished granite stone) shall be provided as mentioned in drawings and design basis etc.

For detail refer clause no. 9.0 of EIL STANDARD SPECIFICATION 6-75-0002.

4.2.8 **Abrasion Resistant Epoxy Floor Coating System**

For detail refer clause no. 11.0 of EIL STANDARD SPECIFICATION 6-75-0002.

4.2.11 **Chemical Resistant Novolac Epoxy Floor Coating System**

For detail refer clause no. 13.0 of EIL STANDARD SPECIFICATION 6-75-0002.

4.2.12 **Chemical Resistant Novolac Epoxy Wall Coating System**

For detail refer clause no. 14.0 of EIL STANDARD SPECIFICATION 6-75-0002.

4.3 DOORS AND WINDOWS

4.3.1 **Aluminium Glazed Doors, Windows and Ventilators**

Refer clause no. 6.0 of EIL STANDARD SPECIFICATION NO. 6-75-0004.

4.3.2 **Steel Doors**

Refer clause no. 4.0 of EIL STANDARD SPECIFICATION NO. 6-75-0004.

4.3.3 **Wooden Flush Doors**

Wooden flush door with frame shall be provided in main toilet entrance door of control room building along with all door hardware accessories.

Refer EIL STANDARD SPECIFICATION NO. 6-75-0003.

4.3.4 **Steel Rolling Shutter**

Electrically Motor operated rolling shutter shall be provided in all buildings as per approved design. Provision of mechanical gear for opening the rolling shutter shall be provided for emergency use in power failure.

For detail refer clause no. 7.0 of EIL STANDARD SPECIFICATION NO. 6-75-0004.

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4.3.4 **PVC Door**

PVC doors shall be provided in toilet blocks of substations building. PVC doors shall be made of UV stabilized compounds of PVC ('Sintex' or approved equivalent), consisting of 53x 60mm L-shaped door frame (BLR53 of 'sintex' or equivalent), 33x47mm shutter frame (DWUF 306 of 'sintex' or equivalent), 30mm thick infill panel slats, complete as per manufacturer's specifications and recommendations, including all fittings, fasteners, fixtures, sealing periphery with polymeric sealant etc.

4.3.5 **Toughened Glass**

Toughened glass panes of 6.0 mm thickness in aluminium door, window, ventilator shutters and and 12 mm thick for fully glazed partitions etc. with EPDM rubber/ neoprene gasket etc. complete as per the approved architectural drawings and the directions of engineer-in-charge.

4.3.6 **Fire Check Doors, Windows & Partition**

Fire check/ resistant/ rated door, window & partition assemblies shall be of fire resistance/ rating and type (solid metallic/ glazed etc.) mentioned in the drawings, specification, design basis etc and shall be complete assembly with frame, shutter/ leaves, glazing, partition panel, hardware etc.

For detail refer EIL STANDARD SPECIFICATION NO. 6-75-0011.

4.4 PLASTERING & WALL CLADDING

4.4.1 **Plain Cement Plaster**

Plain Cement plaster shall be provided in following thickness:

a. 12mm thick in 1:4 cement mortar for all plumb of the internal masonry walls & RCC Columns coming in line (flush) with this side of wall.

b. 15mm thick in 1:4 cement mortar for rough side of internal masonry walls RCC Columns coming in line (flush) with this side of wall.

a. The external plastering shall be with waterproof compound (cement mortar mixed with approved acrylic waterproof compound @ 1 Kg. per 50 Kg. of cement) 18mm thick cement plaster in 1:4 cement mortar for all external surfaces as indicated.

d. 6mm thick in 1:3 cement mortar for all RCC ceiling, beam etc. However, if the undulation in ceiling is beyond 6mm thick plaster, extra thickness of plaster shall be applied without any extra cost to give a smooth and fair surface to the satisfaction of Engineer-In-Charge.

For detail refer EIL STANDARD SPECIFICATION NO. 6-75-0005.

4.5 ROOF WATERPROOFING CUM INSULATION SYSTEM

Roof waterproofing cum Insulation system shall be a complete system including base preparation and top finishing ensuring leak proof, water tight roof/ terrace surface and efficient rain water drainage.

The roof waterproofing system shall be leak-proof, water tight, properly finished and

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levelled with necessary slope for efficient roof water drainage.

All waterproofing materials of the system including insulation, primer, top coat shall be from a single approved Manufacturer. Mix of waterproofing materials procured from different Manufacturers shall not be permitted.

The roof waterproofing system shall be laid by agencies approved by Engineer-In-Charge.

For detail refer EIL Job Specification no. B895-999-81-46-SP-0001.

4.6 WHITE/ COLOUR WASHING, PAINTING, POLISHING ETC.

4.6.1 Acrylic Distemper (Interior)

Refer Clause no. 8 of EIL STANDARD SPECIFICATION NO. 6-75-0007.

4.6.1 Acrylic/Plastic Emulsion Paint (Interior)

Refer Clause no 10 of EIL STANDARD SPECIFICATION NO. 6-75-0007.

4.6.2 Plaster Of Paris Punning

Plaster of Paris punning shall be applied over roughened plastered surfaces. Superior quality Plaster of Paris of approved make shall be mixed with water to obtain paste like consistency and shall be applied on walls, ceiling etc. in sufficient thickness to give an absolutely smooth, plumb and straight surfaces.

4.6.3 Polishing of Wood Surfaces.

Refer Clause no.13 of EIL STANDARD SPECIFICATION NO. 7-75-0007.

4.6.4 Painting of Steel and Other Metal Surface

Synthetic enamel paint shall be provided for all Refer Clause no.13 of EIL STANDARD SPECIFICATION NO. 7-75-0007.

4.6.5 Waterproofing Cement Paint

Refer Clause no.9 of EIL STANDARD SPECIFICATION NO. 7-75-0007.

4.6.6 Textured Coating Paint

Refer Clause no.12 of EIL STANDARD SPECIFICATION NO. 7-75-0007.

4.6.7 Acrylic based Exterior Emulsion Paint-LOW VOC

Refer Clause no.11 of EIL STANDARD SPECIFICATION NO. 7-75-0007.

4.7 ROOFING

Roofing/cladding sheet

Precoated Galvanized Steel Sheet shall be provided over metal structural roof for roofing / cladding application including Trims, gutters, flashings and other accessories such as flashings for gable, corner, openings, parapet flashing, transition trims, expansion joint

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trims, ridge caps, eaves gutter, rain water pipes, shall be provided on roofing and cladding for weather tightness, day-lighting, ventilation, roof water drainage etc.

For detail refer clause no. 5 of STANDARD SPECIFICATION NO. 6-75-0008.

Roof/wall trims, gutters, flashings and other accessories:

These shall be fabricated out same material/ quality etc. as that of sheeting; bent and profiled to match with the roofing and cladding, including all cutting, fabrication, rivetting, fastners etc. all complete.

Material, thickness etc. of these if not mentioned otherwise shall be as per approved Manufacturers standard specification.

Colour, finishing of these shall be similar to the roofing/wall panels.

Rain water pipes:

Rain water pipes shall be unplasticised rigid PVC rain water pipes conforming to IS : 13592 Type A with fittings/ accessories.

Ridge Ventilator:

Ridge ventilator shall be gravity type and weather tight with required throat width as required for maintaining required air change as per NBC. Ridge Ventilator shall be made of steel sheet (sheet thickness, specification and coating similar to external steel sheet of roof sheeting) including necessary framing, flashing, bird screen, trims, sealants, EPDM/ beadings etc. all complete in accordance with approved manufacturer's standard practice with required overlapping, providing supporting frame work, anti-corrosive polyester coated nuts, bolts, screws, sealing of all joints so that there shall not be any accumulation or leakage of water, making them waterproof etc.

Air extractor:

Air extractor shall be gravity type and weather tight with required throat width as required for maintaining required air change as per NBC. Air extractor shall be industrial grade wind driven turbine ventilator/ air extractor having rotating turbine vents made of anodized aluminium (grade H24), with teflon bearings, teflon bush, Teflon cap, translucent FRP base, stainless steel shaft having zero friction rotation etc. all complete as per manufacturer’s specifications, including fixing on pitched metallic roof sheeting with required overlapping, providing supporting frame work, anticorrosive polyester coated nuts, bolts, screws, sealing of all joints so that there shall not be any accumulation or leakage of water, making them waterproof etc.

Workmanship/Installation

The sheet shall be fixed to Purlins/ Girts with self-drilling polymer coated Class III & Class IV Fasteners (ZincandTin Coated compatible fasteners) with EPDM washer all as per manufacturer's specifications, including, flashing, ridge, copings for all edges, caps, corners, overlapping and sealing the joints with approved silicone sealant to make the joints to be dust proof and leak proof. The fixing shall be done taking all safety precautions using best safety equipments like scissor lift, boom-lift, safety belt, safety helmet and safety etc.

Poly carbonate Sheet

Poly carbonate sheet (for roofing and cladding) shall be machine made 2mm thick corrugated polycarbonate sheets (conforming to IS :14434, 14443) of approved

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manufacturer (in approved shade) extruded from polycarbonate resin, having profiles asapproved/matchingexactlywiththesurroundingpre-coatedroofing/claddingsheetsandhavingfollowingproperties:

(a) Specificgravity1.2g/cm3
(b) Hardness119MScale
(c) TensileStrength64Mpa
(d) Compressivestrength66Mpa
(e) ImpactStrength900J/m

Poly carbonate sheet shall be fixed to steel structure members (truss/ purlins)/ brick masonry walls by means of polymer coated 'J' or 'L' hooks, bolts, nuts 8mm dia G.I. bitumen washers etc. all complete as per approved manufacturer's recommendations and specifications.

4.8 SANITARY FITTINGS AND FIXTURES

4.8.1 Wash Down Type European Water Closets (EWC)

Superior quality EWC shall be provided in Control room building.

Premium quality EWC shall be provided in all substation building.

For detail refer clause no .3.0 of EIL STANDARD SPECIFICATION NO. 6-75-0009.

4.8.2 Urinal system

Sensor based urinal shall be provided in control room building.

For detail refer clause no .4.0 of EIL STANDARD SPECIFICATION NO. 6-75-0009.

4.8.3 Wash Basins (WB)

Superior quality WB shall be provided in Control room building.

Premium quality WB shall be provided in all Substation building.

For detail refer clause no. 5.0 of EIL STANDARD SPECIFICATION NO. 6-75-0009.

4.8.4 Stainless Steel Sink

For detail refer clause no. 5.0 of EIL STANDARD SPECIFICATION NO. 6-75-0009.

4.8.5 Fittings & Fixtures

For detail refer clause no. 6.0 of EIL STANDARD SPECIFICATION NO. 6-75-0009.

4.9 FALSE CEILING, FALSE FLOORING, PARTITIONING, UNDERDECK INSULATION ETC.

4.9.1 False ceiling system

False or suspended ceiling systems shall be complete with supporting frame work /

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suspension system and ceiling boards/ panels/ tiles. Following types of false ceiling systems (either with only one type or in combination of various types) shall be provided as specified in design basis, job specifications & drawings etc.

1. Aluminum False Ceiling system (square grid type)
2. Mineral Fibre Board False Ceiling
3. Gypsum Board False Ceiling

For each type of false ceiling , refer detail specification refer clause no. 3.0 of EIL STANDARD SPECIFICATION NO. 6-75-0010.

4.9.2 False (Raised access) Flooring system

Control rooms shall be provided with the false flooring system . For rooms to be provided with false flooring , refer attach bid drawings .The pattern of false ceiling tile shall be as per approved drawing.

For detail refer clause no .5.0 of EIL STANDARD SPECIFICATION NO. 6-75-0010.

4.9.3 Underdeck Insulation system

Underdeck insulation shall be provided in rooms having exposed RCC roofs which are non insulated and air-conditioned. Provision of Underdeck insulation shall be provided in other areas as such as AHU and AC plant rooms etc and as specified in engineering design basis.

Insulating material of Underdeck insulation system shall be of Polyisocyanurate (PIR) foam boards/slabs.

For detail refer clause no .4.0 of EIL STANDARD SPECIFICATION NO. 6-75-0010.

4.10 MISCALLENEOUS ITEMS

4.10.1 Transformer Gates/ Fencing

Transformer gates/ fencing shall be made of 50mm x 50mm x 6mm M.S. Angle frame, 50mm x 50mm x 6mm M.S. Tee stiffeners, 50mm x 50mm x 8mm welded mesh fixed to the frame by 20mm x 3mm M.S. flat beading. The gate/ fencing shall be fixed to the masonry/ R.C.C. by M.S. hinge arrangement (consisting of 65mm x 65mm x 6mm M.S. angle, bolt, washers etc.) with M..S. holdfast grouted with M-20 concrete block. The gate shall have M.S. pivot arrangement (ensuring smooth operation of the gate), one heavy duty 450mm long M.S. aldrop, heavy duty M.S. tower bolts etc. complete. The entire gate/ fencing with fittings/ fixtures/ accessories shall be finished with two or more coats of synthetic enamel paint of approved make and shade over a coat of approved red oxide zinc chromate primer. All embedded metallic parts shall be provided with primer.

(Refer EIL STD No. 7-75-0051 for transformer gate upto 6 m width & 7-75-0052 for transformer gate beyond 6m width)

4.10.2 Plinth Protection

The plinth protection shall consist of a layer (150mm thick) of compacted sand and over that 100mm thick M-20 grade concrete top layer laid to slope. The top concrete layer shall be trowel finished, cured etc. complete. The work also includes carrying out the necessary excavation, disposal of surplus earthwork etc.

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The plinth protection along with building drain all around the periphery of the building shall be provided as per EIL STD No. 7-75-0065. Building drain below the access roads , pavements shall be covered type in RCC type suitable for vehicular load.

4.10.3 Cinder Filling

All the sunk R.C.C slabs shall be provided with cinder filling comprising of:-

(a) Plastering the R.C.C. slab top, sides etc. with 18mm thick cement plaster 1:6 (1 cement: 6 sand by volume) mixed with approved waterproof compound @3% of cement by weight and finishing with a floating coat of neat cement slurry @ 2.75 kg. per sq. Mtr, finishing, curing etc. The work includes preparation of base surface as described in plastering item.

(b) Filling with Cinder concrete 1:10 (1 cement: 10 cinder of 12mm and down grade) including consolidating, finishing, curing etc. complete.

4.10.4 Sealing of Expansion Joints

All expansion joints (25mm wide) of the building shall be sealed with premium grade Silicon sealant (SILPRUF of GE Silicons or equivalent) consisting of the following:-

(a) The surfaces over which it is to be applied shall be totally dried and cleaned of all dirt, oils, mortar droppings, all loose material etc. by vigorous wire brushing and wherever necessary by grinding and blast cleaning (sand or water).

(b) A backup material or joint filler tapes (as per approved manufacturer's specifications) shall be fixed in the expansion joint.

(c) A coat of primer as per approved manufacturers specifications (specially developed for use with Silicon sealant material) shall then be applied over the surface.

(d) Silicon sealant shall be applied by means of cartridge- type caul gun, either hand or air pressure activated. The sealant shall be applied in a continuous operation, horizontally in one direction and vertically from bottom to top of joint opening. The sealant shall be applied in excess so that a positive pressure adequate to properly fill and seal the joint is created. The sealant shall be struck with light pressure to spread the material against the back up material and the joint surfaces properly. The sealant shall be tooled to slightly conclave surface. As the work progresses, the excessive sealant shall be removed. The masking tape shall be removed immediately after tooling. The sealant shall be cured as per approved manufacturer's recommendations.

Entire work shall be carried out as per as per approved manufacturers specifications and recommendations.

4.10.5 Anti Termite Coating

All woodwork (frames, panels etc. including hidden/ embedded portions of wooden members shall be provided with anti- termite coatings of approved quality aldrine-chlorinated phenol compound conforming to IS: 401. Three or more coats as required @ 3 Sq. Mtr. per coat per Kg. covering capacity shall be applied before applying the finishing (painting, polishing, lamination etc. as specified) coats.

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4.10.6 Stainless steel railing

Stainless steel railing shall be (SS 304 grade) 1000 mm high satin finish tubular railing of approved design in all buildings as per staircases, ramps, loading/unloading platforms, around floor cut outs etc as per EIL STD NO. 7-75-0093.

Note:

1. For physically disabled ramps in all accessible building such as control room etc. Stainless steel railing shall be (SS 304 grade) 1000 mm high satin finish tubular railing as per EIL STD NO. 7-75-0097 shall be provided.

4.10.7 Toilet Cubicles

Toilet cubical system shall be provided in toilet partitions of control room as per below specification and as per EIL STD NO. 7-75-0095:

Toilet cubicle system shall have an overall height of 2000mm made out of 18 and 12 mm thick compact laminated board , in select colours as per manufacturer shade card, with 18mm thick front panels and doors with SS U-section top rail on top side for better rigidity to be supported by adjustable SS leg 100 to 150 mm height, 12mm thick continuous divider/ intermediate panels of maximum depth 1500 mm without any joints fixed to wall and front by using U profile, door size 600 x 1800 (for handicap toilet 900 x 1800) with front panel cut and fixed as per the requirement, maximum width of the front panel including door to be 1100 mm (for handicap toilet 1600mm provided with a 10 x 10mm rebate on both the sides of door and front panel with 2mm thick silicon rubber lining pasted in the rebate for noise reduction of the door. Each cubicle shall be equipped with the following necessary hardware:

a. SS316 - primary thumb turn/ indicator lock - 1no.
b. SS316 - Door knob. Handle set - 1 no.
c. SS316 - Coat hook - 1 no.
d. SS316 - Auto reverse hinge with cap - 3 nos.
e. SS316 - 150 mm height adjustable leg - 2 nos.
f. SS316 - l-bracket, corner fixing wherever required.

4.10.8 G.I. Spout

50mm dia GI pipe spouts shall be fixed to slope for drainage of canopy, sunshade etc., including puncturing the masonry/ RCC and grouting with M-20 grade concrete, finishing etc. all complete.

4.10.9 Rain water pipes:

All buildings shall be provided with rainwater down take pipes from the RCC gutters for effective roof drainage as per design requirement specified in Engineering design basis. Rain water pipes shall be unplasticized rigid PVC rain water pipes conforming to IS: 13592 Type A with fittings/ accessories.

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4.11 FURNITURE ITEMS

4.11.1 General

a. All buildings shall be provided with Following furniture's items in each building:

Laboratory Building	Furniture	Number
Sample retention room & sample receiving room	Steel office table	02
	Workstation chair	02
	Steel Almirah	02
Documentation room	Steel office table	01
	Workstation chair	01
	Steel Almirah	08
Office area	Workstation Modular Table top Modular Partitions Keyboard tray Mouse tray CPU tray	04
	Mobile pedestals	04
	Office cabin desking system Main table Mobile pedestal Side table	01+03
	Executive chair (for cabin)	01
	Visitor chair (for cabin)	02
	Workstation chair	04

b. All furniture shall be Factory made, standard product of Manufacturer which shall be customized as required.

c. Product data sheet, specifications, performance data, installation instructions, and other recommendations of Manufacturer's also form part of this specification subject to compliance with other requirements specified herein. Materials / Items not covered in this specification shall be as per approved Manufacturer's standard specification.

d. Colour/ texture/finishing of furniture shall be as approved by Owner/ PMC.

e. Drawings attached in the specification/ Tender are intended to clarify the design and other requirements. Contractor shall submit fabrication drawings and 3-D rendered perspective or isometric views of all furniture. Contractor shall design, fabricate, supply and install the furniture in accordance with specifications, approved fabrication drawings and views prepared by him and directions of Engineer-In-Charge.

f. The term "approved equivalent" used anywhere in this tender shall mean the material/item meeting the specifications as mentioned in the tender for that material/ item, resembling the reference image given in the tender for that item/ material, having price (latest/ prevalent pricelist of the manufacture) same or more than the approved makes specified in the tender and sample is submitted by the contractor and approved by Engineer in charge

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4.11.2 Material & Accessories

i. Materials, accessories, fittings, finishing etc used for furniture shall be of first quality and shall conform to Indian or international standards.

ii. If not mentioned otherwise, all metallic items of furniture shall be CRCA steel and shall have powder coating finish (50 micron).

iii. If not mentioned otherwise, CRCA steel shall have following treatment.

A. Pre-treatment

Degreasing, De-rusting, Phosphate, Passivation for better adhesion of the protective coating to the surface and greater corrosion resistance.

B. Primer

Primer surface gray shall be used as anti-corrosion resistance. All physical & chemical properties shall conform to IS 101-1964.

C. End test

Salt spray test, scratch hardness test, and impact test.

D. Phosphating

Phosphating shall be done to provide:

Clean, oil & grease free surface.
Fine crystalline corrosion inhibiting base for paint.
Non conducting bond between the base metal and paint.
Chemically inert surface to prevent the reaction between the metal surface and paint ingredient.

E. Passivation

Passivation shall be done with Hexavalent Chromium.

F. Water Rinse

Soft water shall be used which gives corrosion protection for a long time.

iv. Boards, laminates shall conform to following standards:

Material	**BIS**
Block Board	IS:2202
Plywood	IS:303
Laminate	IS:2046
MDF Board	IS:12406
Particle Board	IS:3087
Veneered Particle Board	IS:3097
Pre-Laminated Particle Board	IS:12823

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v. Particle/ MDF board

If not mentioned otherwise, thickness of Particle/ MDF board work surfaces such as table top and gable ends shall be minimum 25mm thick. For other application of Particle/ MDF board, thickness shall be minimum 18mm.

vi. Lamination

If not mentioned otherwise, Particle/ MDF board of all furniture shall be prelaminated on both sides.

vii. Veneer

The veneer board shall be 4 mm thick of approved shade, colour and pattern conforming to IS: 15457 and it shall be factory pressed on the board. The surface shall be finished with melamine or PU or polyester polish as mentioned.

viii. PVC edge strip

If not mentioned otherwise, all exposed Particle/ MDF board, wooden edges shall be finished with 2mm thick PVC edge strip matching with the lamination fixed with suitable adhesive.

ix. Hardware

Hardware shall be of approved make & finish.

The locking arrangement shall be with 4 lever brass body locks and Stainless-Steel handles of approved design.

Hinges shall be of stainless steel. Hinges for wooden shutters shall be able to open the shutters at 165 degree.

Glass shutters shall have stainless steel patch fittings.

Handles shall be of stainless steel (matt finish).

x. Leveling Screws

ABS Leveling screws shall be provided in furniture to take care of unevenness in floor.

xi. Gromets

Gromets (cut outs) shall be provided on all table tops for cabling. Gromets shall be provided with ABS cover.

xii. CPU Trolley

CPU Trolley shall be made out of minimum 1.2mm thick CRCA Steel (powder coated) with four numbers poly-propylene Castors, out of which front two castors shall be lockable.

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xiii. Fabric magnetic panels

Fabric magnetic panels shall be of approved fabric (Colorrays, Response, Vimal or approved equivalent) upholstered over metal tiles of minimum 0.6mm Galvanized sheet.

xiv. Fabric tackable panels

Fabric tackable panels shall be made of minimum 8mm plain particle board wrapped with fire retardant fabric panel as per approved design. The fabric shall be backed with Polyurethane foam for tackablity and upholstered with adhesives.

xv. White board panels

White board panels shall be made of 8 mm thick particle board laminated with 0.6mm thick white glossy high pressure laminate on outer side & 0.6mm backing laminate on inner surface with minimum 0.5 mm thick PVC edging.

xvi. Glass Panels

Glass panels shall be 5mm thick toughened glass, chemically frosted or with itching as per approved design edged with suitable material

xvii. Fabric

The fabric used in panel/tile, chairs shall meet the following specifications. The quality, shade and texture of fabric shall be approved by Engineer in charge. The contractor shall submit manufacturer's test certificate towards the compliance to the following specifications.

Sr.no	**Description**	**Specification for Fabric panels/tiles**	**Specification for chair fabric**
1	Composition	100% polyester	100% polyester
2	Weight (gram per liner meter)	415 (Width of fabric shall be 1.40 meter ± 2%)	257
3	Abrasion	In excess of 90,000 cycles Martindale abrasion tester at 12 KPA Pressure.	36, 000 cycles
4	Flammability	BS EN 1021-1:1994 (Cigarette) BS 7176: 1955 (Low Hazard)	BS EN 1021-1:1994 (Cigarette) BS7176:1955 (Low Hazard)
5	Fastness to light	5+(BS 1006 : 1990)	4 or more
6	Fastness to rubbing	Wet: 5, Dry : 4.5	4-5

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xviii. Leatherite

Leatherite used in furniture shall conform to following specification

Sl.No.	Description	Specifications
1	Composition	PVC + PU coated fabric
2	Weight	650 GSM+5%
3	Abrasion	Above 80000 cycles as per ASTM D 4966:98 (Martindale test, load: 600g)
4	Fastness to light	4-5
5	Fastness to rubbing	Wet: 5, Dry : 3

4.11.3 OFFICE / CABIN DESKING SYSTEMS

Cabin Desking System shall consist of one Main Table, one Side Table (return unit) and one mobile pedestal as per approved design. The tables shall be complete knock down system. Main Table, Side Table with pedestal shall be from the same suite of desking system.

Specification of components of desking system shall be as below:

Main Table	Table top: 30 mm thick MDF (Medium density Fiber Board) with teakwood half round moulding at edges, finished with 4mm thick teak veneering and high gloss polyester polishing, supported on side panels/supports. Table top shall have grommet with ABS wire manager cap. Stationary tray: 600 mm x450 mm, Integrated with table top, made of 18 mm MDF board with metallic sliding channel, Facia finished with 4mm thick veneer and high gloss polyester polishing. Modesty panel: 18 mm thick MDF board, finished with 4mm thick teak veneering and polyester polishing on outer side, 1 mm thick balancing laminate on inner side. Side panels/supports: Hollow box formed with 18 mm thick MDF board finished with 4mm thick teak veneering and polyester polishing.
Mobile pedestal	Size: 450mm wide x 525 mm depth. Height – suitable for placing below table top. Drawers: Mobile pedestal shall have two drawers and one filing drawer all mounted on metallic double extension ball slides. Carcass: Mobile pedestal carcass shall be made of 12mm MDF board finished with polyester finish. Top face and Front facia shall be made of 18 mm thick MDF board finished with 4mm thick teak veneering and polyester polishing. Inside face of carcass and drawers shall have 1mm thick balancing laminate. Each drawer shall have Stainless Steel (202 grade) handles. Drawers shall have central locking (chrome plated) system.

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Table	Table top: 30 mm thick MDF (Medium density Fiber Board) with teakwood half round moulding at edges, finished with 4mm thick teak veneering and high gloss polyester polishing, supported on side panels/supports. One no. Key-board tray made of 18 mm thick MDF board finished with 4mm thick teak veneering and polyester polishing shall be fitted with the table top. Top panel shall have grommet with ABS wire manager cap and one mounted key-board tray. Side/ support / panels: 18 mm thick MDF board, finished with 4mm thick teak veneering and polyester polishing on outer side, 1 mm thick balancing laminate on inner side. Fixed pedestal: Fixed type pedestal to accommodate CPU and drawer shall be integrated with the side table. Carcass shall be made of 12mm MDF board finished with polyester finish. Top face and front facia of drawers shall be made of 18 mm thick MDF board finished with 4mm thick teak veneering and polyester polishing. Inside face of carcass and drawers shall have 1mm thick balancing laminate. Each drawer shall have Stainless Steel (202 grade) handles. Drawers shall have central locking (chrome plated) system.

Tables	Main Table	Side Table
Cabin Desking System	2100(L) x 900(W) x 750(H)	1200(L) x 450(W) x 750(H)

Note: The Above-mentioned size / dimension are minimum requirement.

4.11.4 **WORK STATION**

Work-stations shall be easily demountable and re-usable modular, customized, & designed on the basis of approved furniture lay-out drawings.

Work stations shall consist of Table top Table top, self-supporting Partition and Gable Ends as per specification. They shall be clustered as per work station lay-out drawing.

Each individual Work station shall be provided with Key board tray, Mouse tray, CPU trolley, Mobile Pedestal all @ one number each, and Grommet for cabling. Key board and mouse tray shall be built up in the Table top.

If not mentioned otherwise in SOR, drawings etc. the individual table tops shall be minimum 600mm wide, “L” shaped, of overall dimension 1800mm x 1650mm. At the junction of two sides, the Table top shall be chamfered.

Specification of components of Work-station shall be as below:

Table Top	Table Top shall be made of Minimum 25 mm thick pre-laminated

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	particle board fixed to Work Station partition brackets and supported on 25mm thick pre-laminated particle board Gable ends. Exposed edges of the table top, gable ends shall be finished with 2 mm thick PVC edge strip.
Work Station Partition	Work station partition shall be minimum 60mm thick, 1200mm high, straight, in plumb and stable. Framework for partition shall be made of vertical and horizontal members and fittings (combination of 16-18 SWG CRCA box section and 14-18 SWG extruded Aluminium section). The exposed ends of the frames shall be provided with 1.2 mm thick aluminum extrusion alloy covers and posts finished with epoxy powder coating. The framework shall have snap fitted skirting of minimum of 100mm height made up of 0.8 mm thick CRCA steel. Heavy-duty glide screws/ level adjusters shall be provided at the base of the frame, gable ends at suitable intervals for adjusting the level of the workstation up to +/-10mm to take care of variations in the floor level Portion of partition below table- top shall be clad on both sides with minimum 9mm thick pre-laminated particle board. Partition above table-top shall be provided with combination of Fabric Magnetic Panels, Fabric Tackable Panels and White Board Panels as per approved design. The partition shall have arrangement for accommodating concealed electrical/ computer/ data cables.

Note: The Above-mentioned size / dimension are minimum requirement.

4.11.5 CONFERENCE TABLE

Conference Tables shall be as per approved shapes/ designs and of specified capacity as indicated in the drawings

Table top shall be minimum 38mm thick (total thickness of boards and laminate) made of 2 layers of 18mm thick MDF boards jointed together, finished with 1mm thick laminate and PVC membrane foil of 0.4mm thickness on top surface and 0.6mm thick laminate on bottom side. PVC membrane foil shall be dust wrap around type. The foil shall be pre-coated with a layer of polyurethane for scratch resistance.

Table top shall be supported by sufficient number of Leg supports made of 2 layers of 18mm thick MDF boards jointed together, finished with laminate of 0.6mm thick and PVC membrane foil of 0.4mm thickness. Height of Table top shall be 750mm.

Modesty panel made of 18mm thk pre-laminated Particle board shall be provided. Glide screws shall be put at the bottom of the legs for level adjustment. Brackets

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will be fitted to table top to give sturdiness to the top.

Concealed wire management facility with flaps, covers etc. shall be provided in conference Table Tops which does not have voids at centre.

SIZE :

Conference Table	size
12 Per Capacity	Rectangular Type

Note: The Above-mentioned size / dimension are minimum requirement.

4.11.6 VERTICAL STORAGE CABINETS

The top, body, shutter and shelves shall be made of 18mm thick Particle board with prelaminated finish. The back shall be provided of 18 mm thick Pre-laminated particle board. All exposed edges shall be concealed with 2mm PVC edge strip.

Each unit shall have lockable double door fitted with hinges allowing opening the door at 180 degree. Hinges shall be soft closing. Hinges and handles shall be as per clause 3.2.
Each unit shall have two numbers of adjustable shelves.

Skirting of 18mm thick Particle board with pre-laminated finish shall be provided.

Furniture	size
Vertical Storage Cabinet	750 (W) x 450 (D)x 1200 (H) mm

Note: The Above-mentioned size / dimension are minimum requirement.

4.11.7 STEEL ALMIRAH

Providing of Steel Amirah with following specifications:

Body: The overall design shall have outer body, lower base of steel 125mm high , steel doors 2 nos, steel shelves, 1 locker & locking system. The CR Sheet used to make almirah shall be of prime quality, Confirming to IS-513 and thickness 1.0 mm, finished with Electrostatic powder coating.

Self: Each shelf be formed such the edges are bend two times at right angle, first bend 30mm and second bend 8mm.

Door stiffener: Door stiffener frame inside to its full height in top hat section size 100mm width.

Leaver Rod: Lever rod shall be of Ms 12mm round/square bar, or 10mm bright bar.

It shall be provided with:

Hinges of size 75mm length x 1.6mm thk. & Brackets shall be made of 1.6 mm of CR sheet, riveted or bolted on each side of hinges.

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Machine made lever plate (patla) with brass bush of good quality or machine made six lever type patla. Patla shall be covered by box covered by box over fitted with round head screws.

For locking brass body Godrej type cabinet lock or cabinet lock 6leaver die cast zinc alloy body of size(h) 65 x (W) 50mm fitted on four screws or “GRACE” LOCK. Keys in duplicate with key rings shall provide.

Metallic key cover electroplated Nickel/chrome on front side of the door shall provide.

For door, die cast chrome plated handle fitted with washer and double nut.

Leg height shall be 125 mm x 100 mm.

SIZE:

Steel Almirah	size
	915mm (W)x 480mm (D)x 1980mm(H)

4.11.8 **EXECUTIVE CHAIR**

The Executive chairs shall be ergonomic, comfortable, aesthetically designed as per BIFMA Guideline/ Standards and HIGH BACK type having following specification.

Structure	• The Seat shall be made up of minimum 12mm thick (seven layers) hot pressed plywood and moulded PU foam upholstered with leatherite tapestry. Back shall also be upholstered with leatherite tapestry
Foam	• Type: Moulded Polyurethane Foam • Density: minimum 50mm Kg/Cu. M. • Hardness Minimum 15 Kg. F. • Compression 50% • Tensile Strength 1.03 Kg/Sq.m. • Tear strength(Min): 2.0 N/cm • Resilience: 50% - 60% • Comfort / Indentation Hardness : 15.4 • The back foam shall be designed with Contoured lumber support for extra comfort.
Mechanism	• 360 degree revolving synchro knee tilt with multi angle lock (free floating) • Pneumatic height adjustment shall be maintenance free, having adjustment stroke of 100 mm
Pedestal	• Assembly shall be made of HR Steel 1.2mm thick chrome plated fitted with 5 nos. twin wheel castors • Castor shall be injection moulded in 30 % Glass filled black nylon
Arm Rest	• Armrest are made of chrome assembly shall comprise of chrome plated contoured frame connected and bolted to seat and back. • Cushion with foam upholstered leatherite
Tentative Size	• Seat Size: 525mm (W) X 500mm (D)

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	• Back Height: 525mm (W) X 760 (D) • Height (Overall): 1125mm

Reference Image	

4.11.9 VISITOR CHAIR (FOR CABIN)

The Visitor chairs for Cabin shall be ergonomic, comfortable, aesthetically designed as per BIFMA Guideline/ Standards and MID BACK type having following specification.

Structure	• The Seat shall be made up of minimum 12mm thick (seven layers) hot pressed plywood and moulded PU foam upholstered with leatherite tapestry. Back shall also be upholstered with leatherite tapestry.
Foam	• Type: Moulded Polyurethane Foam • Density: minimum 50mm Kg/Cu. M. • Hardness Minimum 15 Kg. F. • Compression 50% • Tensile Strength 1.03 Kg/Sq.Cm. • Tear strength (Min): 2.0 N/cm • Resilience: 50% - 60% • Comfort / Indentation Hardness: 15.4 • The back foam shall be designed with Contoured lumber support for extra comfort.
Mechanism	• Cantilever Fixed Base Made up-of 25mm MS Pipe Frame with Power Coating
Arm Rest	• The arm rest shall be made up of injection moulded polypropylene • Cushion with foam upholstered leatherite
Tentative Size	• Seat Size: 475mm (W) X 515mm (D) Back Height (from Seat): 580mm Height (Overall): 1028mm

Reference Image	

4.11.10 WORKSTATION CHAIR

The chairs for Work Stations shall be ergonomic, comfortable, aesthetically designed as per BIFMA Guideline/ Standards and MID BACK type having following specification.

Structure	• The Seat shall be made up of minimum 12mm thick (seven layers) hot pressed plywood and moulded PU foam upholstered with fabric. Back shall also be upholstered with fabric
Foam	• Type: Moulded Polyurethane Foam • Density: minimum 50mm Kg/Cu. M. • Hardness Minimum 15 Kg. F. • Compression 50% • Tensile Strength 1.03 Kg/Sq.Cm. • The back foam shall be designed with Contoured lumber support for extra comfort.
Mechanism	• 360 degree revolving synchro knee tilt with single point locking • Pneumatic height adjustment shall be maintenance free, having adjustment stroke of 100 mm
Pedestal	• Assembly shall be made shall be injection moulded in 30% Glass filled black nylon and fitted with 5 nos. twin wheel castors
Arm Rest	• Armrest shall be made of Polypropylene fitted to seat.
Tentative Size	• Seat Size: 475mm (W) X 515mm (D) Back Height (from Seat): 610mm (H) X 455mm (D)
Reference Image	

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4.11.11 STEEL OFFICE TABLE

OVEERALL SIZE: (L) 1220 X (W) 760 (H) 750 mm.

Steel table provided shall have following specifications:

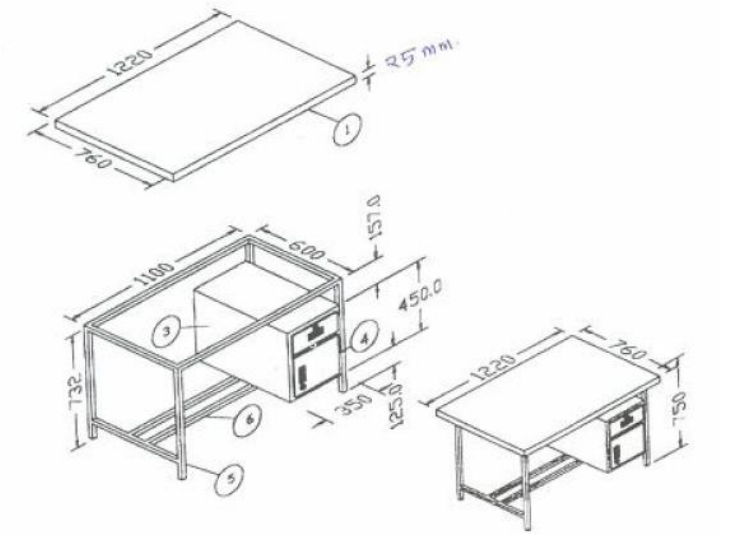


TABLE TOP: - 25mm THK. ISI Marked Pre-Laminated MDF Board IS-14587-1998. with upto date amendment

LIPPING: - Teak wood half round 50mm wide, supported from inside by Jungle wood 25mm x 25mm. (Not shown in fig.)

DRAWER BOX: - CR sheet 0.80mm thick Confirming to IS-513

CUBOARD size 600(D)x350(W)x450mm(H).

DRAWER SIZE: - 500(L)X100mm(D) Minimum.

FRAME:- ERW Square pipe25x25x1.25mm in

STRUCTRUE: size1100(L)x600(W)x732(H)mm.

UPBOARD:- BOX TYPE made of 0.80mm CR sheet Confirming to IS-513.

SHUTTER: ISI Marked Pre-Laminated MDF Board IS-14587-1998.

FOOT REST :- ERW square pipe 25x25x1.25mm in full length and gap between two pipes approx. 85.mm.

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JOB SPECIFICATION
FOR
ROOF TREATMENT

TENDER NO. B895-999-85-41-EP-T-9802

PROJECT: PROJECT MANAGEMENT CONSULTANCY (PMC) AND ENGINEERING, PROCUREMENT & CONSTRUCTION MANAGEMENT (EPCM) SERVICES FOR POLYPROPYLENE PROJECT OF BPCL, KOCHI REFINERY

OWNER: BHARAT PETROLEUM CORPORATION LTD.

CONSULTANT: M/s ENGINEERS INDIA LIMITED

JOB NO: B895

Rev No	Date	Purpose	Prepared by	Checked by	Approved by
0	03.11.2025	ISSUED AS JOB SPECIFICATION	SS	GJK	AK

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Abbreviations:

ASTM	:	American Standards of Testing of Materials
BS	:	British Standards
EN	:	European Standards
ISO	:	International Organization for Standardization
NBC	:	National building Code
NFPA	:	National Fire Protection Association
NABL	:	National Accreditation Board for Testing and Calibration Laboratories
PUF	:	Polyurethane
CuM	:	Cubic Meter
GSM	:	Grams per square meter
PCC	:	Plain cement concrete
Sq.M	:	Square meter
MPa	:	Mega Pascal

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1.0 GENERAL

This standard specification lays down requirements of water proofing treatment for RCC roofs and terraces of buildings.

2.0 REFERENCES

2.1 The codes and standards listed below contain provisions which through reference in this specification constitute provisions of this standard specification if not specifically mentioned otherwise.

2.2 In case of similar codes of different organizations such as ISO, BS, EN, BS-EN, ASTM, NFPA, NBC etc. conformity with any of the similar codes is acceptable.

2.3 Reference codes and standards:

Standards	Document title
ASTM C165	Standard Test Method for Measuring Compressive Properties of Thermal Insulations
ASTM C177	Standard Test For Measuring the Thermal Conductivity of a Material by Means of a Guarded-hot-plate Apparatus.
ASTM C423	Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
ASTM C518	Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
ASTM C836	Standard Specification for High Solids Content, Cold Liquid- Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
ASTM C1363	Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.
ASTM D5	Standard Test Method for Penetration of Bituminous Materials
ASTM D36	Standard Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)
ASTM D41	Standard Specification for Asphalt Primer Used in Roofing, Damp-proofing, and Waterproofing
ASTM D146	Standard Test Methods for Sampling and Testing Bitumen- Saturated Felts and Woven Fabrics for Roofing and Waterproofing
ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
ASTM D570	Standard Test Method for Water Absorption of Plastics
ASTM D1621	Standard Test Method for Compressive Properties of Rigid Cellular Plastics
ASTM D1622	Standard Test Method for Apparent Density of Rigid Cellular Plastics
ASTM D1623	Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
ASTM D1970	Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
ASTM D2842	Standard Test Method for Water Absorption of Rigid Cellular Plastics
ASTM D6226	Standard Test Method for Open Cell Content of Rigid Cellular Plastics
ASTM D7425	Standard Specification for Spray Polyurethane Foam Used for Roofing Applications

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3.0 ROOF WATER PROOFING SYSTEMS

3.1 General

Roof waterproofing system shall be a complete system including base preparation and top finishing ensuring leak proof, water tight roof/ terrace surface and efficient rain water drainage. Waterproofing cum insulation system shall be provided as specified in design basis, job specifications, item descriptions, drawings etc.

3.2 The roof waterproofing system shall be leak-proof, water tight, properly finished and levelled with necessary slope for efficient roof water drainage.

3.3 All waterproofing materials of the system shall be from a single approved Manufacturer. Mix of waterproofing materials procured from different Manufacturers shall not be permitted.

3.4 The roof waterproofing system shall be laid by agencies approved by Engineer-In-Charge.

4.0 WATERPROOFING CUM INSULATION SYSTEM

Waterproofing cum Insulation system shall consist of cement concrete screed on prepared base, primer coat, Polyurethane foam insulation, PU waterproof coating, Geo-textile membrane and a top protective finishing layer as below:

Layer	Material
1st layer	Polyurethane primer coat
2nd layer	Minimum 1.5 mm DFT (Dry Film Thickness) single component Polyurethane (PU) water proofing coating – base coat
3rd layer	40 mm thick machine sprayed Polyurethane Foam insulation
4th layer	Minimum 0.8 mm DFT (Dry Film Thickness) single component Polyurethane (PU) water proofing coating – top coat
5th layer	Geo-textile membrane
6th layer	PCC top protective finishing layer

4.1 Materials

4.1.1 Primer

Primer shall be polyurethane primer compatible to sprayed Polyurethane Foam insulation or single component Polyurethane water proofing coating as applicable (which shall be applied over the primer) and shall be as per approved Manufacturer/ system provider's standard specification and as approved by Engineer-In-Charge.

4.1.2 Polyurethane (PU) water proofing coating

Polyurethane water proofing coating/ membrane shall be single component (moisture cured, elastomeric, free from bitumen and tar) viscous liquid containing urethane polymers having following properties:

Property	Value	Testing Method
Solid content	Minimum 85%	ASTM C 836

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Elongation	Minimum 400%	ASTM D 412
Tensile Strength	2-3 MPa	ASTM D 412

4.1.3 Sprayed Polyurethane Foam insulation

Polyurethane Foam insulation shall be CFC (Chlorofluorocarbons) and HCFC (hydro chlorofluorocarbon) free with closed cell structure having following properties. (Reference: Properties for type-1 foam as mentioned in Table-1 of ASTM D 7425.)

Property	Value	Testing Method
Thermal resistance of 25mm thickness	Minimum 0.98 K-sqM/W at mean temperature 24 degree C	ASTM C177, C1363 or C 518
Compressive strength	Minimum 276 KPa at yield or 10% deformation	ASTM C165 or ASTM D 1621
Density	Minimum 40 Kg/CuM	ASTM D 1622
Water absorption	Maximum volume % 5	ASTM D 2842
Tensile Strength	Minimum 276 KPa	ASTM D 1623
Closed cell content	Minimum 90%	ASTM D 6226

4.1.4 Geo-textile membrane

Geo textile membrane shall be of 150 GSM (grams per square meter) as per approved Manufacture/ system provider's specification and as approved by Engineer-In-Charge.

4.1.5 Top protective finishing layer

Top protective layer shall be of PCC (plain cement concrete – 1 cement: 2 coarse sand: 4 aggregate) with 24 SWG chicken wire mesh. Thickness of the layer shall be minimum 50 mm thick

4.2 Workmanship

4.2.1 Base Surface Preparation

a. The entire base surface of the roof/ terrace shall be thoroughly cleaned with ire brush or mechanically and all foreign matter including loose concrete etc. shall be removed.

b. Well defined cracks on the surface shall be cut to "V" section, cleaned and filled up with polymerised mastic or a paste of liquid single component elastomeric waterproofing and fine sand mix or with Polysulphide Sealant.

c. Potholes or depressions shall be filled up after removing weak cement concrete or cement plaster etc. with PCC (1 cement :1.2 coarse sand :3.5 stone aggregate of 6mm & down size by volume,) laid over a coat of neat cement slurry @2.75 Kg of cement per Sq.M of area, to achieve a smooth prepared surface.

d. The finished surface shall be perfectly dry and any dampness should be allowed to evaporate

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4.2.2 Primer coat

Polyurethane primer shall be brush applied @ 6-8 square meter area/ Litre over the entire prepared roof surface.

4.2.3 Polyurethane (PU) water proofing base coating (1.5 mm DFT)

a. Polyurethane water proofing coating of specified thickness shall be spray or brush applied as directed by Engineer-In-Charge in minimum two layers over primer. If thickness is not mentioned specifically, thickness shall be minimum 1.5 mm DFT (dry film thickness) with coverage @ 2.5 kg/sq.mtr.

b. Scrim cloth reinforcement shall be provided in between the layers. Scrim cloth reinforcement shall also be provided in places where there is a change in surface profile. eg. junction of horizontal and vertical surface of wall, pedestal etc and also near openings for rainwater pipe etc. Scrim cloth to be placed for a distance of 150 mm on either side of junction. Scrim cloth shall be continued upto minimum 100mm inside the rain water pipes.

c. The coating shall be properly cured.

d. After the waterproofing coating is cured, water ponding test for leakage shall be done on waterproof coated surface in locations as directed by Engineer-In-Charge by making sand/mud bundhs in panels of 2 metre x 2 metre and water ponding for minimum 72 hours. Any leakage or defect found in the test shall be rectified as directed by Engineer-In-Charge.

4.2.4 Polyurethane Foam insulation

Polyurethane Foam insulation shall be spray applied conforming to relevant international standard over the primer coat in layers with compatible spraying machine to form a seamless, crack free and monolithic insulation layer. Public movement shall be restricted over the insulation layer.

4.2.5 Polyurethane (PU) water proofing top coating (0.8 mm DFT)

a. Polyurethane water proofing coating of specified thickness shall be spray or brush applied as directed by Engineer-In-Charge in minimum two layers over primer. If thickness is not mentioned specifically, thickness shall be minimum 0.8 mm DFT (dry film thickness) with coverage @ 1.5 kg/sq.mtr.

b. Scrim cloth reinforcement shall be provided in between the layers. Scrim cloth reinforcement shall also be provided in places where there is a change in surface profile. eg. junction of horizontal and vertical surface of wall, pedestal etc and also near openings for rainwater pipe etc. Scrim cloth to be placed for a distance of 150 mm on either side of junction. Scrim cloth shall be continued upto minimum 100mm inside the rain water pipes.

c. The coating shall be properly cured.

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4.2.6 Geo-textile membrane

Geo-textile membrane shall be provided over the cured Polyurethane water proofing coating as a separation layer for subsequent PCC layer after emptying the water used for ponding test for leakage.

4.2.7 Top protective finishing layer

a. Geo textile member shall be provided over the cured PU coating as a separation layer for subsequent PCC layer after emptying the water used for ponding test for leakage.

b. The top protective finishing layer of PCC (minimum 50 mm thick) with chicken wire mesh shall be laid over Geo textile member. The finished surface shall be in desired slope.

c. Continuous angular fillet/coving of minimum 75mm x 75mm size with PCC or cement sand mortar (in 1: 3 proportion) as approved shall be provided at all junction of horizontal and vertical surfaces.

d. PCC shall be laid in panels of maximum 1200 x 1200 mm size.

e. The PCC layer and the angular fillet/ coving shall be cured in accordance with regular concrete curing practices.

f. The joints between panels shall be raked out neatly (after stipulated curing period) to a minimum 10mm X 10mm V groove and shall be filled up approved quality polyurethane sealant.

g. Khura (minimum size 450 mm x 450 mm) shall be provided at every rain water outlets.

4.2.8 Waterproofing treatment over parapets/ vertical surfaces

Waterproofing treatment over Parapets/ Vertical surfaces shall comprise of Polyurethane water proofing coating (refer clause 4.1.2) over primer coat (refer clause 4.1.1) finished with cement plaster. Sand shall be sprinkled over the Polyurethane water proofing coating when still in tacky state, to form key for holding cement plaster finishing on polyurethane waterproofing coating.

a. Entire surface shall be prepared in accordance with clause 4.2.1

b. Continuous angular fillet/coving of minimum 75mm x 75mm size with PCC or cement sand mortar (in 1: 3 proportion) as approved shall be provided at all junction of horizontal and vertical surfaces. The angular fillet/ coving shall be cured by means of regular wetting.

c. Polyurethane Primer coat shall be applied over the prepared surface in accordance with clause 4.2.2.

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d. The Polyurethane water proofing coating (minimum 1.5mm DFT -Dry Film Thickness) applied on roof shall be continued over parapet/ vertical surface over the primer coat.

e. The Polyurethane water proofing coating shall be continued over vertical surface as per drawing or as directed by Engineer-In-Charge subjected to upto minimum 300 mm height from the finished roof surface.

f. Scrim cloth reinforcement shall be provided in between the layers of the coating and in places where there is a change in surface profile. eg. junction of horizontal to vertical surfaces and also near openings for rainwater pipes/ outlets etc. Scrim cloth shall be placed for a distance of 150 mm on either side of junction.

g. Scrim cloth shall be continued upto minimum 100mm inside the rain water pipes.

h. The coating shall be properly cured.

4.2.9 Finishing of parapet/ vertical surfaces

a. Sand shall be sprinkled over the Polyurethane water proofing coating when still in tacky state, to form key for holding cement plaster finishing on polyurethane waterproofing coating.

b. Minimum 12mm thick cement plaster (1 cement: 4 sand, with polypropylene fibers @ 125 gms per bag of cement or as per recommended dosage by manufacturer to avoid cracking and disintegration) finishing shall be provided over the Polyurethane water proofing coating.

4.2.10 Roofing treatment in concrete gutter

a. Roofing treatment over Parapets/ Vertical surfaces of gutter shall comprise of Polyurethane water proofing coating over primer coat finished with minimum 12mm thick cement plaster similar to clause 4.2.7 & 4.2.8. The treatment shall be done on entire vertical surfaces/Parapet including gutter facia top.

b. Roofing treatment on horizontal surface of gutter shall comprise of screed of PCC or approved light weight material such as cinder concrete, Polyurethane water proofing coating over primer coat, Geotextile membrane and top finishing layer of plaster or PCC as approved.

c. Entire surface shall be prepared similar to the base surface preparation of roof surface.

d. Necessary slope shall be provided by means of PCC or approved light weight material such as cinder concrete.

e. Continuous angular fillet/coving of minimum 75mm x 75mm size with PCC or cement sand mortar (in 1: 3 proportion) as approved shall be provided at all junction of horizontal and vertical surfaces. The angular fillet/ coving shall be cured by means of regular wetting.

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f. Polyurethane Primer coat as per clause 4.1.1 shall be applied over the prepared surface in accordance with clause 4.2.2.

g. The Polyurethane water proofing coating (Minimum 1.5mm DFT -Dry Film Thickness) applied over roof shall be continued over horizontal and parapet/ vertical surface of gutter in accordance with clause 4.2.3 over the primer coat.

h. Scrim cloth reinforcement shall be provided in between the layers and in places where there is a change in surface profile. eg. junction of horizontal to vertical surfaces and also near openings for rainwater pipes/ outlets etc. Scrim cloth shall be placed for a distance of 150 mm on either side of junction.

i. Scrim cloth shall be continued upto minimum 100mm inside the rain water pipes.

j. The coating shall be properly cured.

k. After the waterproofing coating is cured, water ponding test for leakage in the gutter shall be done as directed by Engineer-In-Charge by making sand/mud bundhs and water ponding for minimum 72 hours. Any leakage or defect found in the test shall be rectified as directed by Engineer-In-Charge.

l. PU waterproof coating shall be finished with minimum 12 mm thick plaster or PCC as approved. PCC shall be laid in accordance with clause 4.2.7

m. Ponding test for leakage of the finished roof surface shall be done after the top layer has cured in locations as directed by Engineer-In-Charge by making sand / mud bundhs water ponding for 72 hours. Any leakage or defect found in the test shall be rectified as directed by Engineer-In-Charge.

4.3 TESTING

Test for leakage shall be done in two stages.

Stage 1:

After the polyurethane waterproofing coating is cured, water ponding test for leakage shall be done on waterproof coated surface in locations as directed by Engineer-In-Charge by making sand/mud bundhs in panels of 2 meter x 2 meter and water ponding for minimum 72 hours.

Stage 2:

After the top layer is cured, water ponding test for leakage shall be done for finished surface in locations as directed by Engineer-In-Charge by making sand/mud bundhs in panels and water ponding for minimum 72 hours. Smooth roof water drainage through roof water outlets shall also be checked during this stage of testing.

Any leakage or defect found in the test shall be rectified as directed by Engineer-In-Charge.

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5.0 DELIVERABLES BY THE CONTRACTOR

The Contractor shall furnish product data sheets and test certificates (by Government or NABL approved Laboratories) in support of properties/ performance of specified materials/ systems. Method of tests shall be as mentioned in related standards.

6.0 WARRANTY

Warranty of minimum 10 years shall be provided by the contractor for leak proof roof or any other damage/ defect of the complete roofing system. Any leakage, damage, defect (excepting any leakage, damage caused by 3rd party and causes not attributable to waterproofing contractor) within the warranty period shall be rectified by the contractor at his own cost to the satisfaction of Engineer In charge.

7.0 MEASUREMENT

Measurement of waterproofing treatment shall be the measurement of actual surface area on which waterproofing has been done.

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VENDOR DATA REQUIREMENTS FOR SETTING OF LABORATORY AND ASSOCIATED SERVICES

Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by
A	03-NOV-2025	ISSUED FOR BIDS	KT	SS	GJK

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VENDOR DATA REQUIREMENTS

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

S. NO.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	Vendor drawing/ documents submission schedule		✔		✔	
2.	Construction drawings of Laboratory Building. Construction Drawings shall contain the followings. These drawings shall be prepared incorporating comments etc. on the preliminary Drawings. 1. Plan of all levels, Terrace Plan, Key Plan. 2. Sections as required for complete understanding of the Design & Construction 3. Elevations of all sides. 4. Schedule of Finishes 5. Any other Drawing as required for complete understanding of the Design & Construction. 6. Door/ Windows Details 7. False Ceiling and False Flooring layouts and other Details.		✔		✔	
3.	Construction drawings of Substation for Laboratory Building. Construction Drawings shall contain the followings. These drawings shall be prepared incorporating comments etc. on the preliminary Drawings. 1. Plan of all levels, Terrace Plan, Key Plan. 2. Sections as required for complete understanding of the Design & Construction 3. Elevations of all sides. 4. Schedule of Finishes 5. Any other Drawing as required for complete understanding of the Design & Construction. 6. Door/ Windows Details 7. False Ceiling and False Flooring layouts and other Details.		✔		✔	

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S. NO.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
4.	Construction drawings of Any other building/ shed/ structure. Construction Drawings shall contain the followings. These drawings shall be prepared incorporating comments etc. on the preliminary Drawings. 1. Plan of all levels, Terrace Plan, Key Plan. 2. Sections as required for complete understanding of the Design & Construction 3. Elevations of all sides. 4. Schedule of Finishes 5. Any other Drawing as required for complete understanding of the Design & Construction. 6. Fixing Details, flashing details, rain water pipes & gutter details etc.		✔		✔	
5.	Architectural schemes for finalized buildings (Laboratory and substation building) supported by 3-D model (in Revit Software) and rendered perspective (exterior and interior) indicating all lab and office furniture and accessories.		✔		✔	
6.	General Arrangement of Lab Furniture in Laboratory Building indicating sizing of all Furniture and internal spaces		✔		✔	
7.	Preliminary drawings of Laboratory interiors walls/Partitions/ spaces/ rooms indicating scheme for proposed layout for approval.		✔		✔	
8.	Construction drawings of Laboratory interiors including walls/Partitions/ spaces/ rooms and exterior storage sheds as per scope of work including plan, elevation & sections and other miscellaneous details.		✔		✔	
9.	Specification of special finishing material proposed by the contractor such as acoustic door, window, floor coating ,glazing, fire doors, ceilings etc.		✔		✔	
10.	Detail specifications of all office and lab Furniture in Laboratory building as per scope of work indicating material finish, profile size , GA and colors for approval.		✔		✔	
11.	As built drawings for all buildings/ Sheds			✔	✔	
12.	Documents/ Drawings for Statutory approval in accordance with the statutory requirement for all buildings.			✔	✔	
13.	Miscellaneous documents/ drawings other than the above.		✔		✔	
14.	Detail drawings and related documents for fire check doors and windows.			✔		
15.	List of all Sub- vendors/ authorized applicators to be engaged for execution of specialized items		✔		✔	
16.	Dossier for approval of Factory Inspector.			✔	✔	
17.	COA Registration of Architect.		✔			

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S. NO.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
18.	Documents/ certificates in support of Architect possessing experience of similar works.		✔			

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. Packaged Equipment
16. Static Equipment
17. General Civil
18. Piping
19. Structures
20. Architecture

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JOB NO : **B862**

TENDER NO : **B895-999-85-41-EP-T-9802**

PROJECT NAME :

CONTRACTOR :

ACTIVITY/ DELIVERABLE : **ARCHITECTURE DRAWING**

DOCUMENT TITLE :

DOCUMENT NO./ REV. :

SR. NO.	CHECK/ CONTROL POINTS	CONTRACTOR RESPONSE
1	Drawings to be prepared by approved architect/architectural agency.	
2	Drawings shall include details of architect/architecture agency such as title , name, sign and stamp etc.	
3	Drawing is prepared based on requirements of approved GA/Feed drawings ? In case drawings are prepared based on approved GA drawings , Contractor to include the drawing number in the drawing legend.	
4	Attach the Approved GA drawings along with the first submission drawings	
5	Drawing is prepared in compliance with Engineering Design Basis.	
6	List all licensor requirement included in drawings if applicable for the project.	
7	Compliance to OISD-163 in case of Control room /SRR buildings if applicable to the project.	
8	Comment from OWNER to be obtained for important occupancy Plant and Non-Plant buildings such as control room ,SRR, admin building , lab building , gate house , canteen workshop etc etc. Please enclose the comment sheet obtained from client along with resolution.	
9	Drawing shall indicate the space utilization based on the equipment layout, furniture layouts, circulations, exits etc.	
10	Drawing is co-ordinated with related disciplines and comment/observations/input from them are incorporated.	
11	Drawing note shall include the building classification as per NBC.	
12	Drawing note shall include the type of Construction as per per NBC.	
13	Drawing note shall include the height of building calculated as per NBC and its classification as high rise and low rise buildings.	
14	Drawings shall include the critical calculations based on number of occupancy such as; a. Number of exits b. Clear width of exits & aisle c. Travel distance d. number of fire exit staircase e. width of fire exit staircase	

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SR. NO.	CHECK/ CONTROL POINTS	CONTRACTOR RESPONSE
	f. exit doorways g. fire rating of door assembly and walls.	
15	Drawing shall include critical information of fire exit requirement as applicable a. Fire zoning b. Compartmentation c. Emergency escape route d. Emergency exits e. Refuge area	
16	Drawing Note shall include type of active fire suppression system considered for the building.	
17	All rooms in the drawing to be tagged for AC, FC, FF, UD& OD as per tender requirements.	
18	Drawing number is as per approved DCI.	
19	Drawing contains Plans, Elevations, Sections, Schedules of Door-Window, Finishes, Standard Notes, Key Plan etc. as required.	
20	North Line, Orientation is provided and is as per input data/ Plot Plan.	
21	All relevant Level i.e. Finished Floor level (FFL), Finished Road Level (FRL) or Finished Ground Level (FGL) are marked in the plan.	
22	Schedules of Door-Window, Finishes, comply with Job Specifications, approved Design Basis and Tender Specifications.	
23	Field notes for specific instructions/ scope of work defined.	
24	Layout of grids and spacing/ dimensions/ etc. as per input data and compatible with the structural drawings.	
25	All internal and external dimensions marked in the drawing.	
26	All relevant Level i.e. Finished Floor level (FFL), Finished Road Level (FRL) or Finished Ground Level (FGL) are marked in the plan.	
27	All revision and changes to be cloud marked for tracking the changes over previous submission.	
28	All wall openings schedule to be specified in the drawing pertaining to utility and services.	
29	False ceiling drawings of building shall be prepared based on approved electrical layout and HVAC duct layout.	
30	Correct Revision no is marked in drawing title block.	
31	“Holds” are clearly marked in the drawing.	
32	Parts of drawing which is revised is clearly marked by clouding and writing revision nos.	
33	Floor drains to be indicated in the drawings.	
34	Drawing is in standard Format in requisite scale.	

Any other observation/comment (attach additional sheet, if required):

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Date: Name & Signature

Notes:

1. Contractor shall attach this filled in checklist along with document for OWNER/PMC review and approval.

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TECHNICAL CONFIRMATION LIST (ARCHITECTURAL)

FOR SETTING OF LABORATORY AND ASSOCIATED SERVICES

TENDER NO. B895-999-85-41-EP-T-9802

PROJECT: PROJECT MANAGEMENT CONSULTANCY (PMC) AND ENGINEERING, PROCUREMENT & CONSTRUCTION MANAGEMENT (EPCM) SERVICES FOR POLYPROPYLENE PROJECT OF BPCL, KOCHI REFINERY

OWNER: BHARAT PETROLEUM CORPORATION LTD.

CONSULTANT: M/s ENGINEERS INDIA LIMITED

JOB NO: B895

Bidder's signature and stamp	

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	28.10.25	ISSUED FOR TENDER	KT	SS	GJK

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Sl. No	COMPLIANCE STATEMENT / QUERY	BIDDER'S CONFIRMATION / ANSWER
1.	Confirm that the entire work shall be executed as per contract document. No deviation is acceptable. The scope of work for architectural works shall be complied in all respects as specified in the BID document and all the equipments, materials and work not explicitly mentioned but nevertheless required to fulfill the functional requirements shall be deemed to be included in the scope of BIDDER with no additional cost and time implication to the owner.	
2.	A detailed list of drawings / documents shall be submitted to OWNER/ OWNER'S representative for review. The drawing list and quantity statement shall be updated every month and submitted to OWNER/ OWNER'S representative.	
3.	Confirm that all deliverables (document index /documents, drawings/ specifications/ drawings for statutory approval, as-built drawings, list of sub vendors/authorized applicators for specialized items/ Monthly/Weekly report showing status of submitted documents/ schedule of submission, category of submitted documents, etc.) as elaborated in scope of work & supply shall be submitted by the contractor.	
4.	Confirm that the design and drawings for each independent facility/ building/ structure/ system shall be submitted by the BIDDER in one lot so as to facilitate an overall systematic review.	
5.	Note and confirm that all statutory approvals are in BIDDER'S scope of work. Any modifications, alterations/ additions required to meet statutory regulations are in BIDDER'S scope of work and no extra amount shall be paid on this account.	

Notes: -

1. The BIDDER shall indicate his reply in the space provided in the Technical confirmation. 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 confirmation statements/ Queries are required to be categorically confirmed/answered by the BIDDER and the completely filled in Technical confirmation shall be submitted together with the Bid.

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VENDOR LIST
(ARCHITECTURAL)

FOR SETTING OF LABORATORY AND ASSOCIATED SERVICES

TENDER NO. B895-999-85-41-EP-T-9802

PROJECT: PROJECT MANAGEMENT CONSULTANCY (PMC) AND ENGINEERING, PROCUREMENT & CONSTRUCTION MANAGEMENT (EPCM) SERVICES FOR POLYPROPYLENE PROJECT OF BPCL, KOCHI REFINERY

OWNER: BHARAT PETROLEUM CORPORATION LTD.

CONSULTANT: M/s ENGINEERS INDIA LIMITED

JOB NO: B895

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	28.10.25	ISSUED FOR TENDER	KT	SS	GJK

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Sr No	Supplier Name	City	Phone	E-Mail	Remarks
Department : ARCHITECTURE					
Area of Experience: Other					
Item : 1.1 FLOOR FINISHING - CERAMIC TILES					
1	APARNA ENTERPRISES LIMITED	Hyderabad	, , NA	NA	BRAND NAME-VITERO
2	ASIAN GRANITO INDIA LIMITED	MATHURA	, ,		BRAND NAME-ASIAN
3	CERA SANITARYWARE LTD.	NEW DELHI	, ,	NA	BRAND NAME- CERA
4	H&R JOHNSON LIMITED	MUMBAI	, ,		BRAND NAME-JOHNSON
5	KAJARIA CERAMICS LIMITED	DELHI	, ,		BRAND NAME-KAJARIA
6	MURUDESHWAR CERAMICS LIMITED	HUBLI	, ,	"	BRAND NAME-NAVEEN
7	NITCO LIMITED	Mumbai	", ,	"	BRAND NAME-NITCO
8	ORIENT BELL CERAMICS & INDUSTRIES LTD.	DELHI	, ,		BRAND NAME-ORIENT
9	REGENCY CERAMICS LIMITED	HYDERABAD	, ,		BRAND NAME-REGENCY
10	SPL LIMITED	DELHI	, ,		BRAND NAME-SOMANY
11	VARMORA GRANITO PVT. LTD.	MUMBAI	, ,		BRAND NAME-VARMORA
Item : 1.2 FLOOR FINISHING - VITRIFIED TILES					
1	APARNA ENTERPRISES LIMITED	Hyderabad	, , NA	NA	BRAND NAME-VITERO
2	ASIAN GRANITO INDIA LIMITED	MATHURA	, ,		BRAND NAME-ASIAN
3	CERA SANITARYWARE LTD.	NEW DELHI	, ,	NA	BRAND NAME- CERA
4	EURO CERAMICS LIMITED	MUMBAI	, ,		BRAND NAME-EURO
5	H&R JOHNSON(I) LIMITED	MUMBAI	, ,		BRAND NAME-JOHNSON
6	KAJARIA CERAMICS LIMITED	DELHI	, ,		BRAND NAME-KERROGRES
7	MURUDESHWAR CERAMICS LTD.	HUBLI	, ,		BRAND NAME-NAVEEN
8	NITCO LIMITED	Mumbai	", ,	"	BRAND NAME--NITCO
9	ORIENT BELL CERAMICS & INDUSTRIES LTD.	DELHI	, ,		BRAND NAME-ORIENT
10	PAVIT CERAMICS PVT LTD	AHMEDABAD	, ,	NA	BRAND NAME- PAVIT
11	RAK CERAMICS INDIA PVT. LTD.	MUMBAI	, ,		
12	REGENCY CERAMICS LIMITED	HYDERABAD	, ,		BRAND NAME-REGENCY
13	REGENT GRANITO INDIA LTD.	GUJARAT	, ,		BRAND NAME-REGENT
14	SPL LIMITED	DELHI	, ,		BRAND NAME-SOMANY
15	VARMORA GRANITO PVT. LTD.	MUMBAI	, ,		BRAND NAME-VARMORA
Item : 1.3 FLOOR FINISHING - ACID RESISTANT TILES					
1	H & R JOHNSON(I) LTD.	MUMBAI	, ,		BRAND NAME-ENDURA
2	REGENCY CERAMICS LIMITED	HYDERABAD	, ,		BRAND NAME-REGENCY
Item : 1.4 FLOOR FINISHING - PVC TILES/ROLLS					

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Sr No	Supplier Name	City	Phone	E-Mail	Remarks
1	ALL MANUFACTURE'S LISTED BY BIS UNDER IS 3462		, ,		
Item : 1.5 FLOOR FINISHING - PVC TILES/ROLLS(ANTI STATIC)					
1	ARMSTRONG WORLD INDUSTRIES INDIA (P) LTD	MUMBAI	, ,		BRAND NAME-SOLIDLG1
2	PREMIER POLYFILM LTD.	DELHI	, ,		BRAND NAME-ANSTAT
Item : 1.6 FLOOR FINISHING - EPOXY COATING					
1	APURVA INDIA LIMITED	MUMBAI	, ,		
2	BASF CONSTRUCTION CHEMICALS (I) PVT.LIMITED	DELHI	, ,		BRAND NAME-MASTERTOP-1200 SERIES
3	BUILDTECH PRODUCTS(I) PVT LIMITED	DELHI	, ,		BRAND NAME-BUILDPOXY-SL
4	CICO TECHNOLOGIES	DELHI	, ,		BRAND NAME-CICO POXY TC 200
5	CIPY POLYURETHANES PVT.LIMITED	PUNE	, ,		BRAND NAME-CIPOXY SL 1000
6	FOSROC CHEMICALS (INDIA) PVT LTD	BANGALORE	+91 8042521900, ,	enquiry.india@fosroc.com	BRAND NAME-NITOFLOOR SL 2000/1000
7	LEADING EDGE INDUSTRIAL CORPORATION	NAGPUR	, , 066048048051	NA	BRAND NAME: 1. COROGUARD-KRAYON MAKE 2. KRAYON
8	PIDILITE INDUSTRIES LIMITED	New Delhi	, ,	NA	BRAND NAME-DR. FIXIT PIDIPOXY ESL
9	SIKA	KOLKATA	, ,		BRAND NAME-SIKA FLOOR
10	STP LIMITED	NEW DELHI	, ,		
11	SUNANDA SPECIALITY COATING PVT LTD	MUMBAI	, ,		BRAND NAME- SUNEPOXY-SL (Epoxy Coating)
12	SYNORGANIC PAINTS PVT LTD	Bhilai	, ,	'	BRAND NAME-INDUSCOAT EP COVER 100
Item : 1.7 FLOOR FINISHING - FLOOR HARDENER					
1	CHOKSEY CHEMICALS	MUMBAI	, ,		BRAND NAME-TECHFLOOR HT-200
2	CICO TECHNOLOGIES LTD.	DELHI	, ,		BRAND NAME-CICO SURFACE HARDENER
3	SAMROCK CHEMICALS (I) LTD.	AHMEDABAD	, ,		BRAND NAME-SAMHARD STD
4	STP LIMITED	NEW DELHI	, ,		
Item : 2.1 WOODWORK - BLOCK BOARD/FLUSH DOOR					
1	ALL MANUFACTURER'S LISTED BY BIS UNDER IS:2202		, ,		
Item : 2.2 WOODWORK - PLYWOOD					

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Sr No	Supplier Name	City	Phone	E-Mail	Remarks
1	ALL MANUFACTURER'S LISTED BY BIS UNDER IS:303	--	, ,		
Item : 2.3 WOODWORK - LAMINATES					
1	ALL MANUFACTURER'S LISTED BY BIS UNDER IS:2046		, ,		
Item : 2.4 WOODWORK - MDF BOARDS					
1	ALL MANUFACTURER'S LISTED BY BIS UNDER IS:12406	--	, ,		
Item : 2.5 WOODWORK - PARTICLE BOARD (Plain / Veneered / Pre-Laminated)					
1	ALL MANUFACTURER'S LISTED BY BIS UNDER IS:3087,IS:3097 & IS:12823(GRADE 1& 2)	--	, ,		
Item : 3.1 DOORS/ WINDOWS/ VENTILATORS - PRESSED STEEL					
1	DHIMAN STEEL	DELHI	, ,		
2	PAULSON INDUSTRIES	ERNAKULAM	, ,	NA	BRAND NAME- PAULSON INDUSTRIES
3	SHAKTI HORMANN PVT. LTD.	MEDCHAL MALKAGIRI	, ,	NA	BRAND NAME- SHAKTI HORMANN
4	SKS STEEL IND.	DELHI	, ,		
5	SUPER STEEL WINDOWS CO.	DELHI	, ,		
6	SUPREME METWOOD PVT LTD	Faridabad	, ,	NA	BRAND NAME-SUPREME METWOOD
Item : 3.2 ALUMINIUM EXTRUSION PROFILES FOR DOORS, WINDOWS AND VENTILATORS					
1	HINDALCO	MUMBAI	, ,		
2	JINDAL ALUMINIUM LTD.	BANGALORE	, ,		
3	OMALCO EXTRUSION (P) LTD	NEW DELHI	, ,	NA	BRAND NAME- OMALCO
Item : 3.3 DOORS/ WINDOWS/ VENTILATORS - FIRE RATED					
1	BHAWANI FIRE PROTECTION PRIVATE LIMITED	GHAZIABAD	, ,	NA	BRAND NAME- BHAWANI FIRE
2	GALAXY FIRE PROTECTION COMPANY	DELHI	, ,	"	BRAND NAME-FIRE CHECK
3	MPP TECHNOLOGIES PVT. LTD.	BANGALORE	, ,		
4	NAVAIR INTERNATIONAL LTD.	DELHI	, ,		
5	PACIFIC FIRE CONTROLS PRIVATE LIMITED	New Delhi	, ,	NA	BRAND NAME-PACIFIC
6	PAULSON INDUSTRIES	ERNAKULAM	, ,	NA	BRAND NAME- PAULSON INDUSTRIES
7	SHAKTI HORMANN PVT. LTD.	MEDCHAL MALKAGIRI	, ,	NA	BRAND NAME- SHAKTI HORMANN

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Sr No	Supplier Name	City	Phone	E-Mail	Remarks
8	SUPER STEEL WINDOWS CO.	DELHI	, ,		
9	SUPREME METWOOD PVT LTD	Faridabad	, ,	NA	BRAND NAME-SUPREME METWOOD
Item : 4.1 DOORS / WINDOWS FITTINGS - MORTICE LOCKS WITH HANDLES					
1	EVERITE AGENCIES (P) LTD.	DELHI	, ,		BRAND NAME-EVERITE
2	GODREJ & BOYCE	INDIA	, ,		BRAND NAME-GODREJ
3	GOLDEN INDUSTRIES	DELHI	, ,		BRAND NAME-GOLDEN
Item : 4.2 DOORS / WINDOWS FITTINGS - HYDRAULIC DOOR CLOSER (Overhead / Floor Mounted)					
1	ALL MANUFACTURER'S LISTED BY BIS UNDER IS:3564 FOR OVERHEAD TYPE & IS:6315 FOR FLOOR MOUNTED TYPE	--	, ,		
Item : 4.3 DOORS/ WINDOWS FITTINGS - MISC. DOOR FITTINGS e.g. Hinges, Tower Bolts, Latches, Stoppers etc					
1	ALL MANUFACTURER'S LISTED BY BIS UNDER IS:204 FOR TOWER BOLTS, IS 2681 FOR ALDROP,IS:1823 FOR STOPPE		, ,		
Item : 5.1 ROOF TREATMENT & WATERPROOFING - P.U. BASED (ONE COMPONENT)					
1	ASIAN PAINTS LIMITED	MUMBAI	, ,	NA	BRAND NAME-ASIAN PAINTS SMARTCARE PU MAGNUM
2	BASF CONSTRUCTION CHEMICAL (I) PVT. LTD.	DELHI	, ,		BRAND NAME-SONOSHIELD/ MASTERSEAL HLM 5000R
3	BERGER PAINTS INDIA LIMITED	New Delhi	, ,	NA	BRAND NAME-HOMESHIELD ELASTOSEAL NON UV 1K
4	CHRYSO INDIA PRIVATE LIMITED	NAVI MUMBAI	022 2768 5991, ,	info.india@chryso.com	BRAND NAME-CHRYSO ELASTOTHANE
5	CICO TECHNOLOGIES LTD.	DELHI	, ,		BRAND NAME-CORCHEM 2061
6	FOSROC CHEMICALS (INDIA) PVT LTD	BANGALORE	+91 8042521900, ,	enquiry.india@fosroc.com	BRAND NAME-NITOPROOF 600 PF
7	LLOYD INSULATIONS (I) LTD.	DELHI	, ,		BRAND NAME-ISOTHANE EMA
8	MAPEI CONSTRUCTION PRODUCTS INDIA PVT LTD	BANGALORE	, ,	"	BRAND NAME- PURTOP ONE IN
9	MYK ARMENT PVT LTD	HYDERABAD	, ,	"	BRAND NAME-AQUAARM SPU-SPL
10	PIDILITE INDUSTRIES LIMITED	New Delhi	, ,	NA	BRAND NAME- DR. FIXIT FLEXI PU 270 (l)
11	STP LIMITED	NEW DELHI	, ,		

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Sr No	Supplier Name	City	Phone	E-Mail	Remarks
12	SUNANDA SPECIALITY COATING PVT LTD	MUMBAI	, ,		BRAND NAME- FLEXIROOF PU/ SUNROOF PU - One component PU based waterproofing
13	SUPREME BITUCHEM INDIA PVT.LTD	NAGAPUR	, ,		
14	TECHNONICOL INDIA PVT LTD	MUMBAI	, ,	"	BRAND NAME-TECHNONICOL ULTRATHANE
Item : 5.2 ROOF TREATMENT & WATERPROOFING - P.U. BASED (TWO COMPONENT)					
1	BUILDTECH PRODUCTS INDIA PVT. LTD.	DELHI	, ,		BRAND NAME-BUILDTHENE IC
2	FOSROC CHEMICALS (INDIA) PVT LTD	BANGALORE	+91 8042521900, ,	enquiry.india@fosroc.com	BRAND NAME-BRUSHBOND
3	INDUSTRIAL PRODUCT MFG. CO.	PUNE	, ,		BRAND NAME-EZECOAT
4	SHIVALIK AGRO POLY PRODUCTS LTD.	DELHI	, ,		BRAND NAME-SHIVABOND 903
5	SIKA	KOLKATA	, ,		BRAND NAME-SIKALASTIC 450H
6	STP LIMITED	NEW DELHI	, ,		
Item : 5.3 ROOF TREATMENT & WATERPROOFING - APP MEMBRANE					
1	A.R. Industries	Vadodara	, ,	-	BRAND NAME- BITUSEAL (APP Waterproofing Membrane)
2	ALEX EXTRUSIONS LTD	KOLKATTA	, ,		
3	ASIAN PAINTS LIMITED	MUMBAI	, ,	NA	BRAND NAME-SMARTCARE
4	BERGER PAINTS INDIA LIMITED	New Delhi	, ,	NA	BRAND NAME-PROSHIELD P
5	BUILDTECH PRODUCTS PVT. (I) LTD.	DELHI	, ,		BRAND NAME-BUILDWRAP P
6	CHOKSEY CHEMICALS	MUMBAI	, ,		BRAND NAME-POLYMOD
7	CHRYSO INDIA PRIVATE LIMITED	NAVI MUMBAI	022 2768 5991, ,	info.india@chryso.com	BRAND NAME-CHRYSO ARMOURSHIELD
8	CICO TECHNOLOGIES LTD.	DELHI	, ,		BRAND NAME-CICO SHIELD
9	DELHI BUILDER'S STORES	DELHI	, ,		BRAND NAME-DERMABIT APP
10	FAIRMATE CHEMICALS PVT. LTD.	GUJARAT	, ,		BRAND NAME-WATERGAURD MEMBRANE APP G
11	FOSROC CHEMICALS (INDIA) PVT LTD	BANGALORE	+91 8042521900, ,	enquiry.india@fosroc.com	BRAND NAME-PROOFEX TORCHSEAL
12	IWL INDIA LTD.	CHENNAI	, ,		BRAND NAME-HYPERPLAS
13	LLOYD INSULATIONS (I) LTD.	DELHI	, ,		BRAND NAME-LLOYD PLASTOLAY
14	PIDILITE INDUSTRIES LTD.	MUMBAI	, ,		BRAND NAME-DR. FIXIT TORCHSHEILD P 4160
15	PURE LEATHERS PVT. LTD.	DELHI	, ,		BRAND NAME-ROOFSEAL

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Sr No	Supplier Name	City	Phone	E-Mail	Remarks
16	SHIVAM TAR PRODUCTS	KARNAL	, ,	NA	BRAND NAME- SUPERIOR MULTIPOLYPLAS-SHIVAM
17	SIKA	KOLKATA	, ,		BRAND NAME-SIKA WP SHIELD
18	STP LTD.	DELHI	, ,	NA	SUPER THERMOLAY
19	SUPREME BITUCHEM INDIA PVT. LTD.	NAGPUR	, ,		
20	TECHNONICOL INDIA PVT LTD	MUMBAI	, ,	"	BRAND NAME- ULTRAPLAST
21	TEXSA INDIA LTD.	GURUGRAM	, , "	"	BRAND NAME-MOPLY
22	TIKI TAR DANOSA (INDIA) PVT LTD	Vadodara	, ,	NA	BRAND NAME-HYDROSTOP
Item : 6.1 PAINTING WORKS - PLASTIC/ ACRYLIC EMULSION (INTERNAL AND EXTERNAL), DISTEMPER ETC					
1	ACROPAINTS LTD.	DELHI	, ,		
2	ASIAN PAINTS LIMITED	MUMBAI	, ,	NA	
3	BERGER PAINTS	KOLKATA	, ,		
4	GODAVARI PAINTS PVT. LTD.	MUMBAI	, ,		
5	ICI PAINTS/ICI INDIA LTD.	KOLKATA	, ,		
6	KAMDHENU ISPAT LTD.	GURUGRAM	, ,	"	
7	N.E. PAINT UDYOG	SIVASAGAR(ASSAM)	, ,		
8	NEROLAC PAINTS	MUMBAI	, ,		
9	SHALIMAR PAINTS	MUMBAI	, ,		
Item : 6.2 PAINTING WORKS - SYNTHETIC ENAMEL (FOR BUILDING WORKS)					
1	ASIAN PAINTS LIMITED	MUMBAI	, ,	NA	
2	BERGER PAINTS	KOLKATA	, ,		
3	BERGER PAINTS INDIA LIMITED, BRITISH PAINT DIVISION	NEW DELHI	, ,	NA	BRAND NAME- GLO HI-GLOSS ENAMEL
4	GODAVARI PAINTS PVT.LIMITED	MUMBAI	, ,		
5	ICI PAINTS/ICI INDIA LIMITED	KOLKATA	, ,		
6	KAMDHENU ISPAT LIMITED	GURUGRAM	, ,	"	
7	N.E PAINT UDYOG	SIVANAGAR(ASSAM)	, ,		
8	NEROLAC PAINTS	MUMBAI	, ,		
9	SHALIMAR PAINTS	MUMBAI	, ,		
Item : 6.3 PAINTING WORKS - WATERPROOF CEMENT					
1	ACRO PAINTS LTD.	DELHI	, ,		BRAND NAME-ACROCEM
2	GODAVARI PAINTS PVT. LTD.	MUMBAI	, ,		BRAND NAME-SUPEREMCEM
3	KAMDHENU ISPAT LTD.	GURUGRAM	, ,	"	BRAND NAME-DREAMZ COLOR
4	KILLICK NIXON LTD.	MUMBAI	, ,		BRAND NAME-SNOWCEM

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Sr No	Supplier Name	City	Phone	E-Mail	Remarks
5	RAJDOOT PAINTS	DELHI	, ,		BRAND NAME-XTRACEM 76 SUPERIOR CEMENT PAINT
6	SNOW WHITE INDUSTRIAL CORP.	CHENNAI	, ,		BRAND NAME-SUPERCEM
Item : 6.4 PAINTING WORKS - DECORATIVE TEXTURED COATING					
1	ACRO PAINTS LTD.	DELHI	, ,		BRAND NAME-ACROTEXTURES
2	BAKELITE HYLAM LTD	SECUNDRABAD	, ,		BRAND NAME-HARITAGE
3	KAMDHENU ISPAT LTD.	GURUGRAM	, ,	"	BRAND NAME-DREAMZ COLOR
4	LUXTURE SURFACE COATINGS PVT. LTD.	AJMER	, ,		BRAND NAME-LUXTURE
5	NCL ALLTEK AND SECCOLOR LTD	HYDERABAD	, ,		BRAND NAME-ALLTEK
6	SPECTRUM PAINTS	DELHI	, ,		BRAND NAME-SPECTRUM
7	UNITILE	DELHI	, ,		BRAND NAME-UNITILE
Item : 6.5 PAINTING WORKS - POLISHING (for Woodwork)					
1	ASIAN PAINTS LIMITED	MUMBAI	, ,	NA	
2	SHALIMAR PAINTS	MUMBAI	, ,		
Item : 6.6 PAINTING WORKS - WALL PUTTY					
1	BIRLA WHITE	DELHI	, ,		BRAND NAME-WALL CARE
2	JK CEMENT LTD	DELHI	, ,		BRAND NAME-JK WALL PUTYY
3	MANCHANDA ENTERPRISES	FARIDABAD	, ,		BRAND NAME-SARA
4	MYK LATRICRETE	LATA FINISH	, ,		BRAND NAME-LATA FINISH
5	NCL ALTEK & SECCOLOR LTD.	HYDERABAD	, ,		BRAND NAME-NCL SKIM COAT 1127
Item : 10 FALSE FLOORING					
1	AET FLEXIBLESPACE (I) PVT LTD	Mumbai	", ,	"	BRAND NAME-FLEXI
2	EVEREST INDUSTRIES LTD	NOIDA	", ,	"	BRAND NAME-EVEREST ACCESS FLOOR
3	LLOYD INSULATION (I) LTD	DELHI	, ,		
4	MULTI FLOORS	DELHI	, ,		
5	THE ELEMENTS	NEW DELHI	, ,	"	BRAND NAME-HI FLOOR
6	UNITED ACCESS FLOORS PVT LTD	MUMBAI	, ,		BRAND NAME- UNITILE
7	UNIVERSAL BUILDING PRODUCTS	DELHI	, ,		BRAND NAME-UNIFLOOR FS1500
Item : 11.1 INSULATION - UNDERDECK INSULATION					
1	BAKELITE HYLAM LTD	SECUNDRABAD	, ,		BRAND NAME-PHENOTHERM
2	LLOYD INSULATIONS (I) LTD	DELHI	, ,		BRAND NAME-ISOLLOYD NILFLAME
3	ROCKWOOL INDIA PVT LTD	HYDERABAD	, ,	"	BRAND NAME-ROCKINSUL
4	UP TWIGA FIBRE GLASS LTD	DELHI	, ,		BRAND NAME-TWIGA
Item : 11.2 INSULATION - OVERDECK INSULATION					

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Sr No	Supplier Name	City	Phone	E-Mail	Remarks
1	BASF CONSTRUCTION CHEMICALS (I) PVT LTD	DELHI	, ,		BRAND NAME-ELASTOSPRAY
2	BEST PLASTRONICS LTD	DELHI	, ,		BRAND NAME-BESTPLASTRONICS
3	LLOYD INSULATION (I) LTD	DELHI	, ,		BRAND NAME-LLOYD SPRAY FOAM
Item : 7.1 ROOFING SHEETS & ACCESSORIES - PRECOATED PROFILED G.I./ GALVALUME/ ZINCALUME SHEETS					
1	BDS PROJECTS	Rohtak	, ,	NA	BRAND NAME-BDS
2	COLOUR ROOF INDIA LTD.	MUMBAI	, ,		BRAND NAME-HISPAN
3	ERA BUILDING SYSTEMS LTD	DELHI	, ,		BRAND NAME-ERA
4	INTERARCH BUILDING PRODUCTS (P) LTD	NOIDA	, ,	NA	BRAND NAME-TRACDEK
5	JAPAN METAL BUILDING SYTEMS PVT LTD	BANGALORE	, ,		BRAND NAME-JMBS
6	LLOYD INSULATION (I) LTD	DELHI	, ,		BRAND NAME-LLOYDECK
7	METCO ROOF PVT LTD	CHENNAI	", ,	"	BRAND NAME-TOP GUARD
8	METECNO (INDIA) PVT LTD	CHENNAI	, ,		BRAND NAME-G6
9	MULTI COLOR STEEL (I0 PVT LTD	CHENNAI	, ,		BRAND NAME-MULTI CLAD
10	PHENIX CONSTRUCTION TECHNOLOGIES	AHMEDABAD	, ,	"	BRAND NAME-PHENIX
11	ROOFCLAD INFRA PVT LTD	PALWAL	, ,	NA	BRAND NAME- ROOFCLAD
12	SHIV SHAKTI FIBRE UDYOG	DELHI	, ,		
13	SHREE PRE FAB STEELS (P) LTD	AHEMDABAD	, ,	NA	BRAND NAME- PRIMEDEK 1015
14	SHREE PRECOATED STEELS LTD	MUMBAI	, ,		BRAND NAME-METACOLOUR
15	SUPERTECH (INDIA) PVT LTD	NOIDA	, ,	NA	BRAND NAME- SUPERTECH HI-RIB
16	TATA BLUESCOPE STEEL LTD	PUNE	, ,		BRAND NAME-TRIMDECK
Item : 12.1 MISCELLANEOUS ITEMS - INTEGRAL WATER PROOFING COMPOUND (IN PLASTER)					
1	CHOKSEY CHEMICALS	MUMBAI	, ,		BRAND NAME-MASTERPROOF IWP-1/ IWP-2
2	CICO TECHNOLOGIES LIMITED	DELHI	, ,		BRAND NAME-CICO NO 1
3	FAIRMATE CHEMICALS PRIVATE LIMITED	VADODARA	, , 9879613004	nandan@fairmate.net	BRAND NAME-FAIRPLAST IP
4	PIDILITE INDUSTRIES	MUMBAI	, ,		BRAND NAME-PIDIPROOF LW
5	SAMROCK MUREXIN CHEMICAL (I) LIMITED	GUJARAT	, ,		BRAND NAME-SAMPLAST LW 150/PW
6	STP LIMITED	NEW DELHI	, ,		
Item : 13.1 CONSTRUCTION SEALANTS - POLYSULPHIDE SEALANT					
1	CHOWKSEY CHEMICALS PVT LTD	MUMBAI	, ,		BRAND NAME-TECHSEAL 940/941

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Sr No	Supplier Name	City	Phone	E-Mail	Remarks
2	CICO TECHNOLOGIES LTD	DELHI	, ,		BRAND NAME-CICOSEALANT T680
3	FOSROC CHEMICALS (INDIA) PVT LTD	BANGALURU	+91 8042521900, ,	enquiry.india@fosroc.com	BRAND NAME-THIOFLEX 600
4	PIDILITE INDUSTRIES LTD (DR. FIXIT)	MUMBAI	, ,	NA	BRAND NAME-PIDISEAL PS41G/ PIDISEAL PS42P
5	STP LIMITED	NEW DELHI	, ,		
Item : 13.2 CONSTRUCTION SEALANTS - SILICON SEALANTS					
1	PIDILITE INDUSTRIES LTD (DR. FIXIT)	MUMBAI	, ,	NA	BRAND NAME-DR. FIXIT SILICON SEALANT WX
Item : 14.1 PRE ENGINEERED BUILDINGS (PEB)					
1	BALARKA FABRICON PRIVATE LIMITED	JHAJJAR	", ,	"	
2	BDS PROJECTS	Rohtak	, ,	NA	BRAND NAME-BDS
3	ECO TURNKEY SOLUTIONS PVT LTD	FARIDABAD	, ,	NA	BRAND NAME- ecopeb
4	EVEREST INDUSTRIES LTD	NOIDA	", ,	"	
5	INTERARCH BUILDING PRODUCTS (P) LTD	NOIDA	, ,	NA	
6	JINDAL MECTEC PVT LTD	GURUGRAM	", ,	"	
7	KAIZEN STEEL BUILDING SOLUTIONS PVT LTD	Delhi	, ,	NA	BRAND NAME-KAIZEN
8	KIRBY BUILDING SYSTEMS	NEW DELHI	", ,	"	
9	LLOYD INSULATION (I) LTD	DELHI	, ,		
10	METCO ROOF PVT LTD	CHENNAI	", ,	"	
11	MGI INFRA PRIVATE LIMITED	NEW DELHI	, ,	"	
12	MOONWALK INFRAPROJECTS PVT. LTD.	NOIDA	, ,	NA	BRAND NAME- MOONWALK
13	MPIL STEEL STRUCTURES LIMITED	MUMBAI	, ,	"	
14	PENNAR ENGINEERED BUILDING SYSTEM LTD	HYDERABAD	", ,	"	
15	PHENIX CONSTRUCTION TECHNOLOGIES	AHMEDABAD	, ,	"	
16	PKM METAL BUILDINGS COMPANY PRIVATE LIMITED	CHENNAI	", , "	"	
17	RISHIKESH STRUCTURAL SOLUTIONS LLP	VADODARA	, ,	NOT AVAILABLE	
18	SAXENA MARINE TECH (P) LTD	NOIDA	, ,	"	
19	SHIV SHAKTI FIBER UDYOG	FARIDABAD	, ,		BRAND NAME- SHIV SHAKTI FIBER UDYOG

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Sr No	Supplier Name	City	Phone	E-Mail	Remarks
20	SHREE PRE FAB STEELS (P) LTD	AHEMDABAD	, ,	NA	
21	SUPER DISCO ISPAT PVT LTD	New Delhi	, ,	NA	
22	SUPERTECH (INDIA) PVT LTD	NOIDA	, ,	NA	
23	UNISTAR METALS PVT. LTD.	KOLKATA	, ,	NA	BRAND NAME- UNISTAR
24	ZAMIL STEEL BUILDINGS INDIA PVT LTD	PUNE	, ,	NA	
Item : 15.1 ALUMINIUM COMPOSITE PANEL					
1	3A COMPOSITES INDIA PVT LTD	Mumbai	, ,	-	BRAND NAME- ALUCOBOND
2	ALSTONE INTERNATIONAL	New Delhi	, ,	NA	BRAND NAME-ALSTONE
3	ALUBOND DACS INDIA PVT LTD	Mumbai	, ,	NA	BRAND NAME- ALUBOND
4	ALUDECOR LAMINATION PVT LTD	New Delhi	, ,	NOT AVAILABLE	BRAND NAME- ALUDECOR
5	ALUTECH INDUSTRIES	New Delhi	, ,	NA	BRAND NAME-ALUTECH
6	EURO PANEL PRODUCTS PVT LTD	Mumbai	, ,	-	BRAND NAME- EUROBOND
7	PIONEER PANELS	MUMBAI	, ,	NA	BRAND NAME-PIONEER
8	REYNOBOND INDIA	NEW DELHI	, ,	'	BRAND NAME-REYNOARCH FR (PLUS)
9	SONIA PLASTICS PVT LTD	NEW DELHI	", ,	"	BRAND NAME-HYNADECOR
10	VIRGO LAMINATES LIMITED	New Delhi	, ,	NA	BRAND NAME-VIRGO
11	VIVA COMPOSITES PANEL PVT LTD	MUMBAI	, ,	-	BRAND NAME- VIVA
Item : 7.2 ROOFING SHEETS & ACCESSORIES - C.G.I. SHEET					
1	ISPAT INDUSTRIES LTD	DELHI	, ,		BRAND NAME-EVEREST
2	STEEL AUTHORITY OF INDIA LTD	--	, ,		BRAND NAME-SAIL
3	TATA STEEL	--	, ,		BRAND NAME-TISCO
Item : 16.1 TOILET CUBICLE/ TOILET PARTITION					
1	GREENLAM INDUSTRIES LTD	TINSUKIA	, ,	"	BRAND NAME- GREENLAM
2	INNER SPACE	MUMBAI	, ,	"	BRAND NAME- T-LINE
3	MERINO PANEL PRODUCTS LTD	NEW DELHI	, ,	"	BRAND NAME- MERINO
Item : 7.3 ROOFING SHEETS & ACCESSORIES - ALUMINIUM SHEET					
1	HINDALCO	MUMBAI	, ,		
2	JINDAL ALUMINIUM LTD	BANGALORE	, ,		
Item : 7.4 ROOFING SHEETS & ACCESSORIES - FIBER GLASS SHEET & PANELS					
1	ROOFCLAD INFRA PVT LTD	PALWAL	, ,	NA	BRAND NAME- ROOFCLAD
2	SHIV SHAKTI FIBER UDYOG	FARIDABAD	, ,		BRAND NAME-FRP SHEET
3	SIMBA FRP (P) LTD	DELHI	, ,		BRAND NAME-SIMCRYL
Item : 7.5 ROOFING SHEETS & ACCESSORIES - POLYCARBONATE ROOFING SHEET					
1	ROOFCLAD INFRA PVT LTD	PALWAL	, ,	NA	BRAND NAME- ROOFCLAD
2	SARASWATI PLASTOTECH INDIA PVT. LTD.	JAMMU	, ,	NA	BRAND NAME- ULTRALITE

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Sr No	Supplier Name	City	Phone	E-Mail	Remarks
3	SHIV SHAKTI FIBRE UDYOG	DELHI	, ,		BRAND NAME-SHIV SHAKTI
4	UNITED STEEL & STRUCTURES PVT LTD	CHENNAI	, ,		TUFLIFE
Item : 8.1 SANITARY, PLUMBING FITTINGS & FIXTURES - SANITARY FITTINGS					
1	ALL MANUFACTURER'S LISTED BY BIS UNDER IS:2556	--	, ,		
Item : 8.2 SANITARY, PLUMBING FITTINGS & FIXTURES - PLUMBING FITTINGS AND FIXTURES					
1	CERA SANITARYWARE LTD.	NEW DELHI	, ,	NA	BRAND NAME- CERA
2	GEM INTERNATIONAL	FARIDABAD	, ,		BRAND NAME-GEM
3	H&R JOHNSON INDIA	DELHI	, ,		BRAND NAME-JOHNSON
4	JAQUAR & COMPANY LTD	DELHI	, ,		BRAND NAME-JAQUAR
5	JUPITER AQUA LINES LTD	MOHALI	, ,		BRAND NAME-JUPITOR
6	ORIENT CERAMICS	DELHI	, ,		BRAND NAME-ORIENT
7	OTHELLO FAUCETS PVT LTD	DELHI	, ,		BRAND NAME-MAYUR
8	PARKASH BRASSWARE INDUSTRIES	DELHI	, ,		BRAND NAME-PARKO
9	PLASTOCRAFT SANITARY INDIA PVT LTD	DELHI	, ,		BRAND NAME-KINGSTON
10	PRAYAG POLYMERS (P) LTD	DELHI	, ,		BRAND NAME-H2O
Item : 8.3 SANITARY, PLUMBING FITTINGS & FIXTURES - MIRROR / GLASS					
1	ATUL GLASS	DELHI	, ,		BRAND NAME-ATUL
2	CERA SANITARYWARE LTD.	NEW DELHI	, ,	NA	BRAND NAME- CERA
3	CONTINENTAL FLOAT GLASS	DELHI	, ,		BRAND NAME-CONTINENTAL
4	GUJARAT GUARDIAN LTD	DELHI	, ,		BRAND NAME-MODIGUARD
5	HINDUSTAN SAFETY GLASS	KOLKATA	, ,		BRAND NAME-HINDUSTAN
6	TRIVENI GLASS	KOLKATA	, ,		BRAND NAME-TRIVENI
Item : 9.1 FALSE CEILING - ALUMINIUM STRIP/ TRAY TYPE					
1	AURA SYNERGY INDIA PVT LTD	NEW DELHI	, ,	NA	BRAND NAME- GRID SQUARE
2	COMPLETE INFRA STRCTURE PVT LTD	NEW DELHI	, ,	NA	BRAND NAME- BOLLARD
3	HUNTER DOUGLAS	DELHI	, ,		BRAND NAME-LUXALON
4	INTERARCH BUILDING PRODUCTS (P) LTD	NOIDA	, ,		BRAND NAME-TRAC
5	LLOYD INSULATION (I) LTD	DELHI	, ,		BRAND NAME-LLOYD LINEAL CEILINGS
6	MANRAJ CEILING PRODUCTS PVT LTD	Ghaziabad	, ,	NA	BRAND NAME- ROYAL KRAFT
7	MASCOT OVERSEAS	DELHI	, ,		BRAND NAME-METALIC/ TRULON

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Sr No	Supplier Name	City	Phone	E-Mail	Remarks
8	P. R. PRODUCTS	DELHI	, ,	"	BRAND NAME-Hi-Steel
9	P.R. CEILING PRODUCTS	AGRA	, ,	"	BRAND NAME- MCRA
Item : 9.2 FALSE CEILING - GYPSUM BOARD					
1	SAINT GOBAIN GYPROC INDIA LTD	MUMBAI	, ,		BRAND NAME-GYPBOARD
2	USG BORAL BUILDING (INDIA) PRIVATE LIMITED	GURUGRAM	, ,	"	BRAND NAME-LaGyp
Item : 9.3 FALSE CEILING SYSTEM- MINERAL FIBER					
1	ARMSTRONG WORLD INDUSTRIES INDIA (P) LTD	MUMBAI	, ,		
2	COMPLETE INFRA STRCTURE PVT LTD	NEW DELHI	, ,	NA	BRAND NAME- BOLLARD
3	USG BORAL BUILDING (INDIA) PRIVATE LIMITED	GURUGRAM	, ,	"	
Item : 17.1 SPRAYED PU FOAM INSULATION (FOR OVERDECK ROOF INSULATION CUM WATER PROOFING SYSTEM)					
1	ASIAN PAINTS LIMITED	MUMBAI	, ,	NA	BRAND NAME-ASIAN PAINTS (AP) SMART CARE (SC) PU INSULATOR
2	BERGER PAINTS INDIA LIMITED	New Delhi	, ,	NA	BRAND NAME-PU SPRAY PUF
3	CHRYSO INDIA PRIVATE LIMITED	NAVI MUMBAI	022 2768 5991, ,	info.india@chryso.com	BRAND NAME-CHRYSO ELASTOTHANE SF
4	MAPEI CONSTRUCTION PRODUCTS INDIA PVT LTD	BANGALORE	, ,	"	BRAND NAME-PURTOP FOAM 45 HFC
5	MYK ARMENT PVT LTD	HYDERABAD	, ,	"	BRAND NAME-AQUAARM INSUSPRAY PUF B2
6	PIDILITE INDUSTRIES LIMITED	New Delhi	, ,	NA	BRAND NAME-DR. FIXIT FOAM SHIELD
7	STP LIMITED	NEW DELHI	, ,		BRAND NAME-SHALI PUF SA
8	TECHNONICOL INDIA PVT LTD	MUMBAI	, ,	"	BRAND NAME-TECHNONICOL LOGICFOAM SPF
Item : 18.1 ABRASION RESISTANT EPOXY FLOOR COATING SYSTEM					
1	BERGER PAINTS INDIA LIMITED	New Delhi	, ,	NA	BRAND NAME- PRO SHIELD HS (PRIMER) + PRO EPISHIELD (FLOOR SCREED) + PRO EPISHIELD SL (COATING)
2	PIDILITE INDUSTRIES LIMITED	New Delhi	, ,	NA	BRAND NAME- DR. CIPY CIPOXY 17 (PRIMER, SCREED/ SCRATCH COAT) & DR. CIPY FLOORTOP 2000 (TOP COAT)

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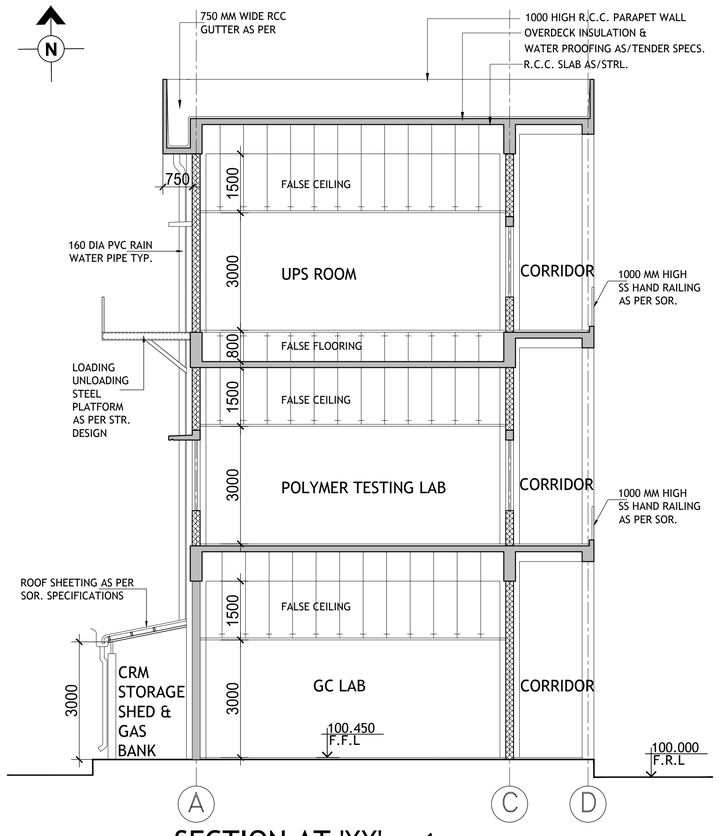
Sr No	Supplier Name	City	Phone	E-Mail	Remarks
3	SYNORGANIC PAINTS PVT LTD	Bhilai	, ,	'	INDUSCOAT EP BOND 250 (PRIMER) & INDUSCOAT EP COVER 100 (SCREED/ SCRATCH COAT) & INDUSCOAT EP COVER 100 (SCREED) & INDUSCOAT EP COVER 100 (TOP COAT)
Item : 19.1 ABRASION & IMPACT RESISTANT POLYURETHANE FLOORING SYSTEM					
1	BERGER PAINTS INDIA LIMITED	New Delhi	, ,	NA	BRAND NAME-PRO EPISHIELD WB (PRIMER) + PRO POLYSHIELD CONCRETE (SCREED/SCRATCH COAT) + PRO POLYSHIELD CONCRETE (COATING)
2	PIDILITE INDUSTRIES LIMITED	New Delhi	, ,	NA	BRAND NAME- DR. CIPY AQUOXY 50 (PRIMER) & DR. CIPY DURACRETE MD (SCREED/ SCRATCH COAT & TOP COAT)
3	SYNORGANIC PAINTS PVT LTD	Bhilai	, ,	'	INDUSCOAT EP WB (PRIMER) & INDUSCOAT PU SHIELD 100 (SCREED/ SCRATCH COAT) & INDUSCOAT EP TOPCRETE 300 (TOP COAT)
Area of Experience:					
Item : 13.1 CONSTRUCTION SEALANTS - POLYSULPHIDE SEALANT					
1	SIKA INDIA PVT LTD	KOLKATA	, ,		

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प्रस्तुत आरेख एवं उसमें निहित डिज़ाइन इंजीनियर्स इंडिया लिमिटेड की संपत्ति है। ये मात्र उधार दिए गए हैं और इन्हें पुनः मुद्रित किया जाएगा, न प्रकाश की जाएगी, न उधार दिए जाएंगे, न प्रदर्शित किए जाएंगे और न ही बीमित और किसी प्रकार के अलावा इसका कोई अन्य प्रयोग इंजीनियर्स इंडिया लिमिटेड की लिखित अनुमति के बिना नहीं किया जाएगा।
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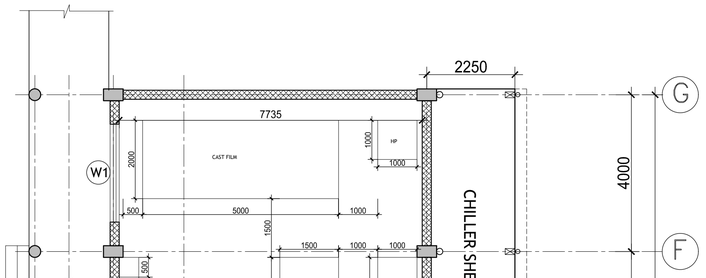
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SECTION AT 'XX'

ARCHITECTURAL FINISHES SCHEDULE				
ROOM	FLOOR FINISH	SKIRTING/ WALL BASE	WALL FINISH	CEILING FINISH
GC LAB ,PROCESSING LAB, WDXRF & FTIR ,POLYMER TESTING LAB,XYLENE SOLUBILITY LAB.,SAMPLE RETENTION ROOM,MECHANICAL TESTING LAB,GLASS & MISCELLANEOUS STORE,OFFICE,DOCUMENT ROOM,LOBBY, BOTTLE WASH & SAMPLE RECEIVING.	VITRIFIED TILE FLOORING	SAME AS FLOOR FINISH	CEMENT PLASTER, POP PUNNING & PLASTIC EMULSION PAINT	COMBINATION OF GYPSUM BOARD & MINERAL FIBRE TILE FALSE CEILING
ELECTRICAL ROOM , RAMP & AHU ROOM	HEAVY DUTY FLOORING	CEMENT PLASTER SKIRTING	CEMENT PLASTER & ACRYLIC DISTEMPER	CEMENT PLASTER &ACRYLIC DISTEMPER
UPS & SERVER ROOM	FALSE FLOORING	SAME AS FLOOR FINISH	CEMENT PLASTER, POP PUNNING & PLASTIC EMULSION PAINT	COMBINATION OF GYPSUM BOARD & MINERAL FIBRE TILE FALSE CEILING
CHEMICAL STORE & BATTERY ROOM	EPOXY PAINT ON FLOOR WITH 2500MM HIGH EPOXY PAINT ON DADO/WALL	SAME AS FLOOR FINISH	CHEMICAL RESISTANT EPOXY COATING OVER CEMENT PLASTER UP TO 2500MM HEIGHT AND CEMENT PLASTER, OIL BOUND DISTEMPER ABOVE 2500MM HEIGHT	CEMENT PLASTER & ACRYLIC DISTEMPER
RECEPTION, CORRIDOR, COUNTERS, STEP & STAIRCASE	GRANITE FLOORING	GRANITE SKIRTING	CEMENT PLASTER, POP & PLASTIC EMULSION PAINT	COMBINATION OF GYPSUM BOARD & MINERAL FIBRE TILE FALSE CEILING
LADIES & GENTS TOILET,	VITRIFIED TILES (ANTI-SKID) FLOORING	-	GLAZED VITRIFIED TILES DADO (300X600) UP TO FALSE CEILING	GYPSUM BOARD FALSE CEILING
EXTERNAL	ROOFING: • OVERDECK INSULATION SHALL BE PROVIDED OVER THE ROOF. COMBINATION OF : • PLAIN CEMENT PLASTER AND TEXTURE COATING • ~~GRANITE STONE/SAND STONE CLADDING~~ • PLAIN CEMENT PLASTER AND ACRYLIC PAINT • ~~COMPOSITE ALUMINIUM PANEL & STRUCTURAL GLAZING~~ • ~~GFRC :AAH~~			

OCCUPANCY DETAIL GROUND FLOOR & FIRST FLOOR		
SR. NO.	ROOM NAME	OCCUPENCY
1	GC LAB	3-4
2	PROCESSING LAB	3-4
3	SAMPLE RECEIVING	1-2
4	BOTTLE WASH	1-2
5	MECHANICAL TESTING LAB	3-4
6	POLYMER TESTING LAB	3-4
7	XYLENE SOLUBILITY LAB	3-4
8	OFFICE	8-10
9	RECEPTION	1-2
	TOTAL	26

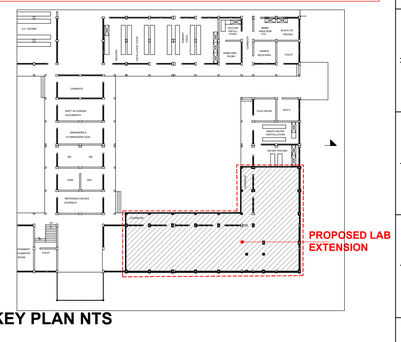


GROUND FLOOR PLAN

REF. DWG. NO.	REFERENCE DRAWING TITLE
B895-999-81-46-12762	FIRST FLOOR PLAN
B895-999-81-46-12763	SECOND FLOOR PLAN
B895-999-81-46-12764	TERRACE PLAN

NOTES:

1. DIMENSIONS, CO-ORDINATES, LEVELS
   A. ALL DIMENSIONS ARE IN MILLIMETRES.
   B. DRAWING IS NOT TO BE SCALED FOR ANY MISSING DIMENSION.
   C. ALL LEVELS & CO-ORDINATES ARE IN METRES.
   D. LEVEL 100.000 CORRESPONDS TO TOP OF APPROACH / ACCESS ROAD NEAR THE BUILDING ENTRY, CROSS REFERENCE TO STRUCTURAL DRAWING SHALL BE MADE.
   E. PLINTH LEVEL OF THE BUILDING SHALL BE SAME THROUGHOUT UNLESS SPECIFICALLY INDICATED.
   F. LOCATION/ORIENTATION/CO-ORDINATES OF THE BUILDING SHALL BE CROSS-CHECKED WITH STRUCTURAL AND PLOT PLAN DRAWINGS. IN CASE OF ANY MIS-MATCH THE SAME SHALL BE GOT RESOLVED BEFORE CONSTRUCTION.
2. FLOOR
   A. FINISHED FLOOR LEVEL OF WC/BATH CUBICLES & DRINKING WATER SHALL BE 12MM LESS THAN ADJOINING AREAS AND SHALL HAVE PROPER SLOPE FOR FLOOR DRAINAGE.
   B. FLOOR OF CABLE CELLAR, AC PLANT/AHU, BATTERY ROOM SHALL HAVE PROPER SLOPE FOR FLOOR DRAINAGE.
   C. REFERENCE SHALL BE MADE TO RELEVANT DRAWINGS BEFORE STARTING FLOORING WORKS. TRENCHES/CUT OUTS IN FLOOR SHALL BE PROVIDED IN ACCORDANCE WITH RELEVANT ELECTRICAL/INSTRUMENTATION/PED/ STRUCTURAL/EQUIPMENT DRAWINGS.
   D. SKIRTING DETAIL SHALL BE AS /EIL STANDARD NO. 7-75-0002 & 7-75-0003.
3. WALL
   A. THICKNESS OF ALL BRICK WALLS (EXCEPT WC) SHALL BE 200MM THK SOLID CONCRETE BLOCK IF NOT SPECIFICALLY INDICATED.
   B. INTERNAL PARTITION WALLS OF WC/BATH CUBICLES SHALL BE 2500MM HIGH FROM FLOOR LEVEL.
   C. ALL OTHER WALLS SHALL BE UPTO ROOF/ROOF BEAM IF NOT SPECIFICALLY INDICATED.
   D. CUT-OUTS/OPENINGS FOR CABLES/DUCTS ETC. SHALL BE PROVIDED IN MASONRY WALLS AS PER RELEVANT ELECTRICAL/INSTRUMENTATION/ PED/STRUCTURAL/EQUIPMENT, CABLE, DUCTING DRAWINGS.
4. CABLING/CONDUITS
   A. ALL CONDUITS SHALL BE CONCEALED TYPE EXCEPT IN AREAS CONCEALED BY FALSE CEILING AND SHALL BE LAID AS PER RELEVANT DRAWINGS.
   B. IN CASE OF CONDUITS CONCEALED IN ROOF/BEAM/FLOOR, THEY SHALL BE LAID BEFORE CASTING.
5. FINISHING
   A. IN CASE OF ANY CONFLICT WITH TENDER/PACKAGE, THE SAME SHALL BE GOT RESOLVED BEFORE PROCUREMENT AND EXECUTION.
   B. ALL OUTSIDE SURFACES SHALL BE FINISHED WITH 18MM THK. PLASTER ON SOLID CONCRETE BLOCK SURFACES.
   C. ALL INTERNAL WALLS SHALL BE FINISHED WITH 12MM/15MM THK. PLAIN PLASTER ON PERIPHERAL WALLS & 12MM/15MM THK. PLAIN CEMENT PLASTER ON EITHER SIDE OF INTERNAL WALLS. 6MM THK. PLAIN PLASTER SHALL BE PROVIDED ON R.C.C. SURFACES.
6. PLINTH PROTECTION
   A. 1200 WIDE PLINTH PROTECTION SHALL BE PROVIDED ALROUND THE BUILDING PERIMETER.
7. MISCELLANEOUS
   A. OVERDECK INSULATION SHALL BE PROVIDED TO THE ROOF OF ALL AC AREAS AT TOP FLOOR.
   B. ALL SUNSHADE & ROOF PROJECTIONS SHALL HAVE DRIP MOULD GROOVES UNDERNEATH ALL ALONG THE PERIPHERIES.
   C. ALL DOORS, GATES ETC. SHALL BE PROVIDED WITH FACILITY OF LOCKING THE DOORS.
   D. SIZE OF AHU ROOM SHOWN IN THE DRAWING IS TENTATIVE. FINAL AHU ROOM SIZE SHALL BE DECIDED BY CONTRACTOR AND LEFT OUT AREA, IF ANY SHALL BE UTILIZED AS DEFINED IN ARCHITECTURE SPECIFICATION.
   E. SINCE AHU ROOM IS AT THE TOP FLOOR, SUPPLY AIR DUCT SHALL BE ROUTED FROM OUTSIDE THE TOWARDS OUTSIDE.



KEY PLAN NTS

LEGEND :-

F.R.L. - FINISHED ROAD LEVEL
F.F.L. - FINISHED FLOOR LEVEL

AC FC
FF OD
AC = AIR CONDITIONED
FC = FALSE CEILING
OD = OVERDECK INSULATION
FF = FALSE FLOORING

= 300 THK RCC WALL
= 200 THK SOLID CONCRETE BLOCK
= 100 THK SOLID CONCRETE BLOCK

REV.	DATE	DESCRIPTION	BY	CHKD	APPD	PM
D	03.11.25	ISSUED FOR TENDER	NK	BR	GJK	
C	28.08.25	RE-ISSUED FOR COMMENTS	NK	BR	GJK	
B	22.08.25	RE-ISSUED FOR COMMENTS & CLIENT APPROVAL	NK	BR	GJK	
A	18.07.25	ISSUED FOR COMMENTS	NK	BR	GJK	

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भारत पेट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LIMITED
कोच्चि रिफ़ाइनरी
KOCHI REFINERY

पोलीप्रोपेलीन प्रोजेक्ट कोच्चि रिफ़ाइनरी

POLYPROPYLENE PROJECT KOCHI REFINERY

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भूतल का प्लान व काट

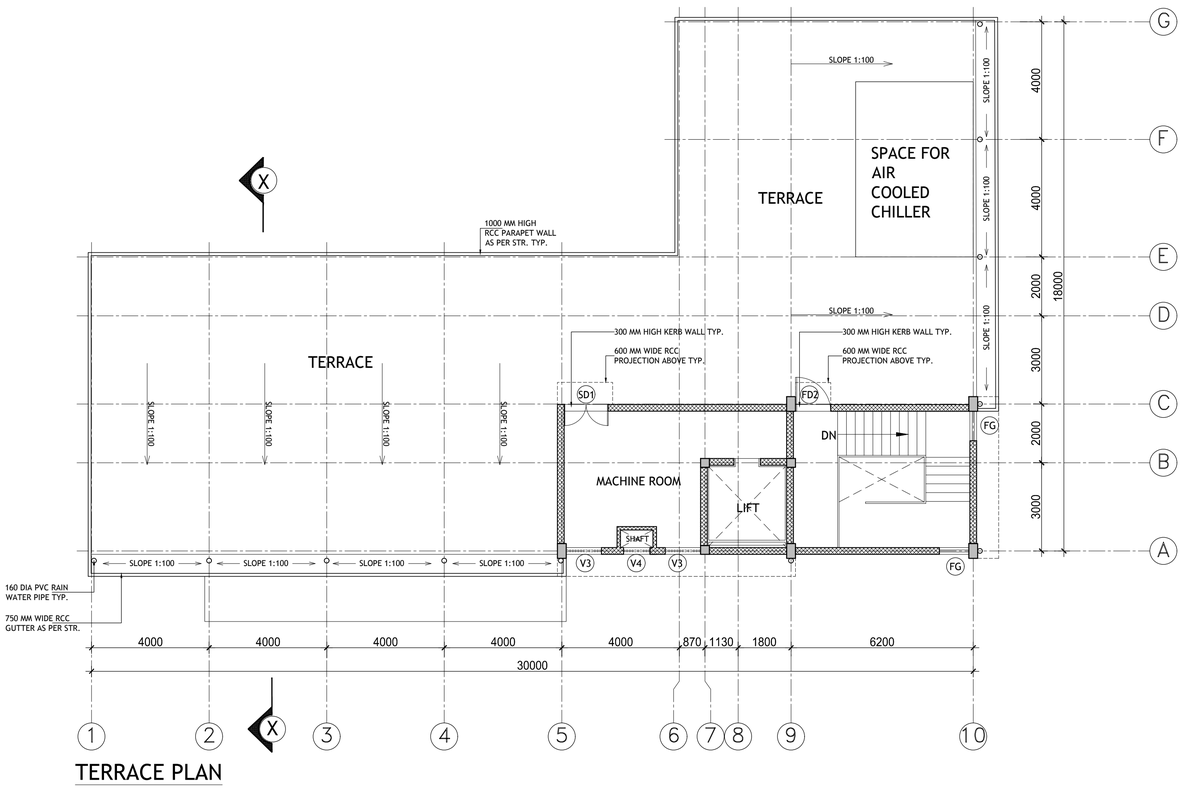
QUALITY CONTROL LABORATORY EXTENSION
GROUND FLOOR PLAN & SECTION

SCALE	JOB NO.	UNIT	DIVN.	DEPT.	DWG. NO.	REV.
1:100	B895	999	81	46	12761	D

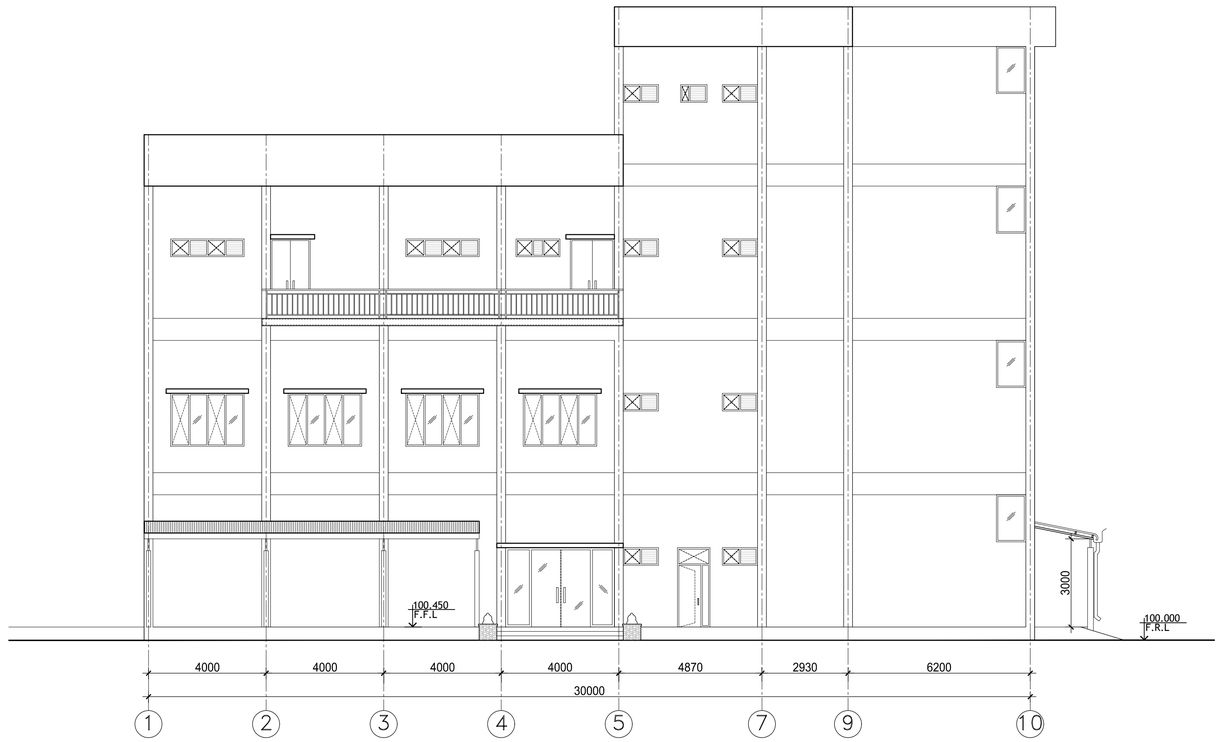
3-1641-0501 REV.4 / 06.03.2024 A1-841x594

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B895-999-81-46-12763



TERRACE PLAN



FRONT ELEVATION

REF. DWG. NO.	REFERENCE DRAWING TITLE
B895-999-81-46-12761	GROUND FLOOR PLAN & SECTION
B895-999-81-46-12762	FIRST FLOOR PLAN
B895-999-81-46-12763	SECOND FLOOR PLAN

NOTES:
1. DIMENSIONS, CO-ORDINATES, LEVELS
A. ALL DIMENSIONS ARE IN MILLIMETRES.
B. DRAWING IS NOT TO BE SCALED FOR ANY MISSING DIMENSION.
C. ALL LEVELS & CO-ORDINATES ARE IN METRES.

LEGEND :-

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REV.	DATE	DESCRIPTION	BY	CHKD	APPD	PM
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A	28.08.25	ISSUED FOR COMMENTS	NK	BR	GJK	

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BHARAT PETROLEUM CORPORATION LIMITED
कोच्चि रिफ़ाइनरी
KOCHI REFINERY

पोलीप्रोपेलीन प्रोजेक्ट
कोच्चि रिफ़ाइनरी

POLYPROPYLENE PROJECT KOCHI REFINERY

गुणवत्ता नियंत्रण प्रयोगशाला
छत का का प्लान व दृश्य

QUALITY CONTROL LABORATORY EXTENSION
TERRACE PLAN & ELEVATION

SCALE	JOB NO.	UNIT	DIVN.	DEPT.	DWG. NO.	REV.
1:75	B895	999	81	46	12764	B

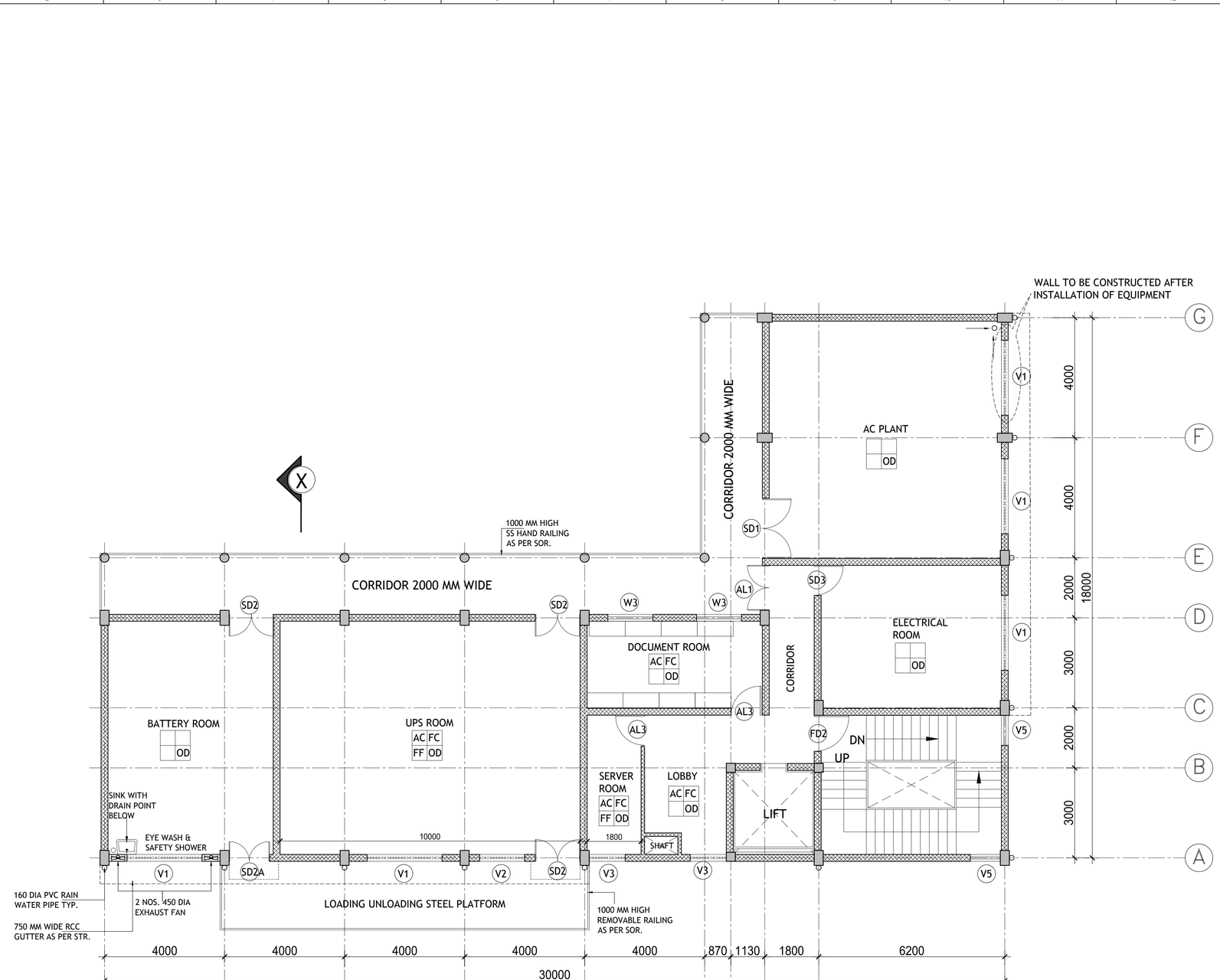
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B895-999-81-46-12763



SECOND FLOOR PLAN

REF. DWG. NO.	REFERENCE DRAWING TITLE
B895-999-81-46-12761	GROUND FLOOR PLAN & SECTION
B895-999-81-46-12762	FIRST FLOOR PLAN
B895-999-81-46-12764	TERRACE PLAN

NOTES:
1. DIMENSIONS, CO-ORDINATES, LEVELS
   A. ALL DIMENSIONS ARE IN MILLIMETRES.
   B. DRAWING IS NOT TO BE SCALED FOR ANY MISSING DIMENSION.
   C. ALL LEVELS & CO-ORDINATES ARE IN METRES.

LEGEND :-

F.R.L. - FINISHED ROAD LEVEL
F.F.L. - FINISHED FLOOR LEVEL

AC FC / FF OD
AC = AIR CONDITIONED
FC = FALSE CEILING
OD = OVERDECK INSULATION
FF = FALSE FLOORING

= 300 THK RCC WALL
= 200 THK SOLID CONCRETE BLOCK
= 100 THK SOLID CONCRETE BLOCK

REV.	DATE	DESCRIPTION	BY	CHKD	APPD	PM
D	03.11.25	ISSUED FOR TENDER	NK	BR	GJK	
C	28.08.25	RE-ISSUED FOR COMMENTS	NK	BR	GJK	
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BHARAT PETROLEUM CORPORATION LIMITED
कोच्चि रिफ़ाइनरी
KOCHI REFINERY

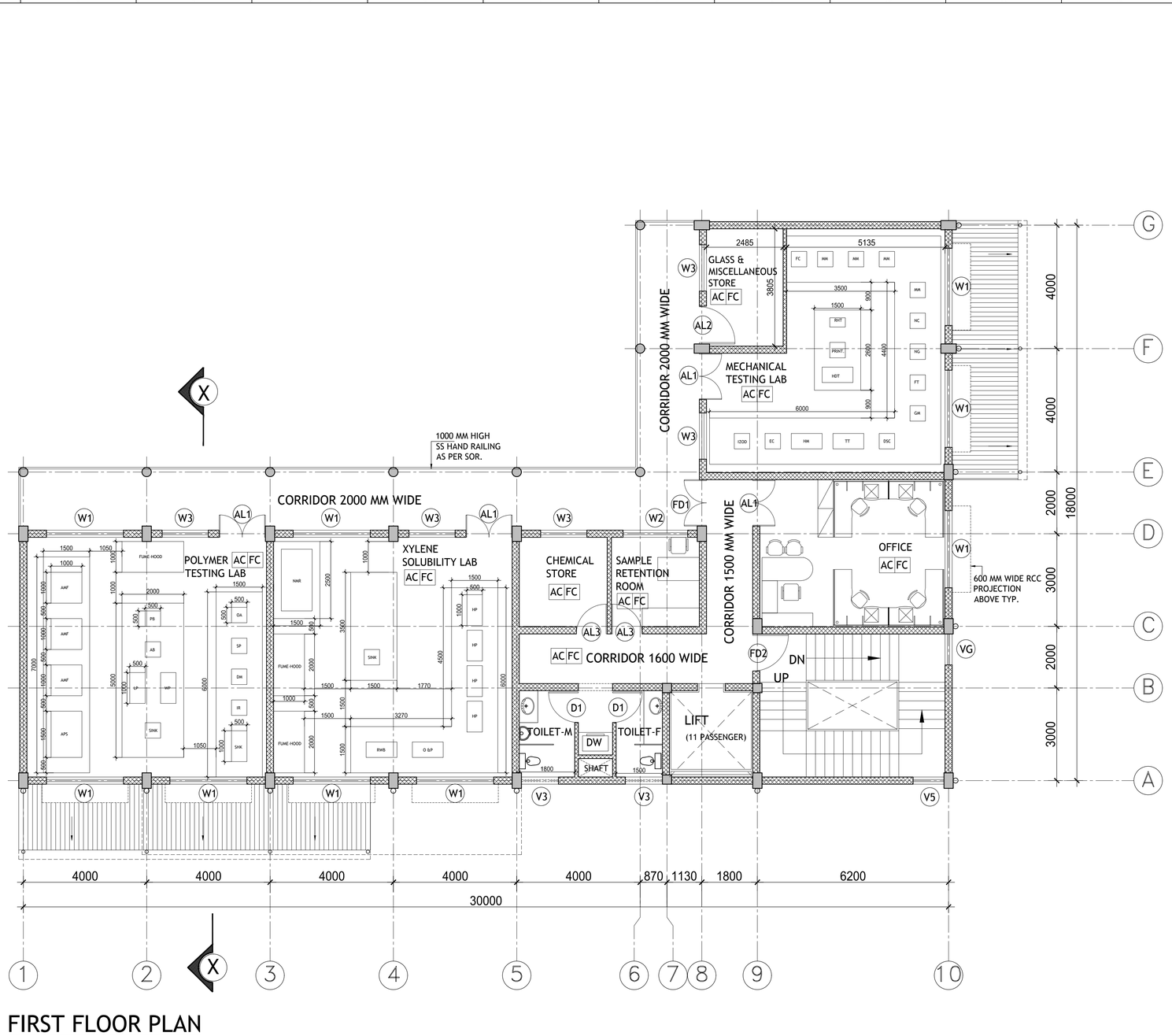
पोलीप्रोपेलीन प्रोजेक्ट कोच्चि रिफ़ाइनरी	POLYPROPYLENE PROJECT KOCHI REFINERY
गुणवत्ता नियंत्रण प्रयोगशाला द्वितीय तल का प्लान	QUALITY CONTROL LABORATORY EXTENSION SECOND FLOOR PLAN

SCALE	JOB NO.	UNIT	DIVN.	DEPT.	DWG. NO.	REV.
1:75	B895	999	81	46	12763	D

प्रस्तुत आरेख एवं इसमें निहित डिज़ाइन इंजीनियर्स इंडिया लिमिटेड की संपत्ति है। ये मात्र उधार दिए गए हैं और उधारकर्ता ने यह स्पष्ट समझौता किया है कि न तो उन्हें पुनः मुद्रित किया जाएगा, न नकल की जाएगी, न उधार दिए जाएंगे, न प्रदर्शित किए जाएंगे और न ही सीमित और लिखित रूप में दी गई सहमति से इतर किसी अन्य प्रयोग में लाए जाएंगे।

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B895-999-81-46-12762



FIRST FLOOR PLAN

REF. DWG. NO.	REFERENCE DRAWING TITLE
B895-999-81-46-12761	GROUND FLOOR PLAN & SECTION
B895-999-81-46-12763	SECOND FLOOR PLAN
B895-999-81-46-12764	TERRACE PLAN

NOTES:
1. DIMENSIONS, CO-ORDINATES, LEVELS
   A. ALL DIMENSIONS ARE IN MILLIMETRES.
   B. DRAWING IS NOT TO BE SCALED FOR ANY MISSING DIMENSION.
   C. ALL LEVELS & CO-ORDINATES ARE IN METRES.

SCHEDULE OF DOORS & WINDOWS (HOLD)

TYPE	OPENING SIZE	FRAME SIZE	LINTEL LEVEL	DESCRIPTION	NOS.
RS1	3000X3500	-	3500	STD. STEEL ROLLING SHUTTER(ELECTRICALLY OPERATED)	1
FD1	1500X2700	1180X2690	2700	2- HR FIRE RATED, GLAZED DOOR AS PER MANUFACTURER'S SPECIFICATION.	3
FD2	1200X2700	1180X2690	2700	2- HR FIRE RATED, GLAZED DOOR AS PER MANUFACTURER'S SPECIFICATION.	6
AL1	1500X2700	1480X2690	2700	POWDER COATED ALUMINIUM GLAZED DOOR DOUBLE SHUTTER WITH FAN LIGHT WITH 6.0 MM THK. TOUGHENED GLASS AS/EIL STD.	8
AL2	1200X2700	1480X2690	2700	POWDER COATED ALUMINIUM GLAZED DOOR SINGLE SHUTTER WITH FAN LIGHT WITH 6.0 MM THK. TOUGHENED GLASS AS/EIL STD.	2
AL3	1000X2700	0980X2690	2700	POWDER COATED ALUMINIUM GLAZED DOOR SINGLE SHUTTER WITH FAN LIGHT WITH 6.0 MM THK. TOUGHENED GLASS AS/EIL STD.	6
SD1	2000X2700	1980X2690	2700	PRESSED STEEL FRAME WITH PRESSED STEEL SHUTTER, POWDER COATED DOUBLE SHUTTER AS/EIL STD	2
SD2	1500X2700	1480X2690	2700	PRESSED STEEL FRAME WITH PRESSED STEEL SHUTTER, POWDER COATED DOUBLE SHUTTER AS/EIL STD	3
SD2A	1500X2700	1480X2690	2700	PRESSED STEEL FRAME WITH PRESSED STEEL SHUTTER, POWDER COATED DOUBLE SHUTTER AS/EIL STD WITH BOTTOM LOUVERS.	1
SD3	1200X2700	1180X2690	2700	PRESSED STEEL FRAME WITH PRESSED STEEL SHUTTER, POWDER COATED SINGLE SHUTTER AS/EIL STD	1
D1	1000X2100	0980X2090	2700	35 MM THICK FLUSH DOOR SHUTTER AS PER SPECIFICATION & AS/EIL STD	5
D2	750X2100	0980X2090	2700	PVC DOOR WITH PVC FRAME AS PER SPECIFICATIONS	1
W1	2500X1800	2480X1780	2700	POWDER COATED ALUMINIUM GLAZED PARTLY FIXED/ PARTLY OPENABLE WINDOW WITH 6.0 MM THK.TOUGHENED GLASS AS/EIL STD.	14
W2	2100X1800	2080X1780	2700	POWDER COATED ALUMINIUM GLAZED PARTLY FIXED/ PARTLY OPENABLE WINDOW WITH 6.0 MM THK.TOUGHENED GLASS AS/EIL STD.	2
W3	1500X1800	2080X1780	2700	POWDER COATED ALUMINIUM GLAZED PARTLY FIXED/ PARTLY OPENABLE WINDOW WITH 6.0 MM THK.TOUGHENED GLASS AS/EIL STD.	9
V1	2500X750	2480X730	2700	POWDER COATED ALUMINIUM GLAZED VENTILATOR PARTLY FIXED TYPE WITH 6.0 MM THK.TOUGHENED GLASS AS/EIL STD.	5
V2	1500X750	1480X730	2700	POWDER COATED ALUMINIUM GLAZED VENTILATOR PARTLY FIXED TYPE WITH 6.0 MM THK.TOUGHENED GLASS AS/EIL STD.	1
V3	1200X750	1180X730	2700	POWDER COATED ALUMINIUM GLAZED VENTILATOR PARTLY FIXED TYPE WITH 6.0 MM THK.TOUGHENED GLASS AS/EIL STD.	8
V4	1000X750	0980X730	2700	POWDER COATED ALUMINIUM GLAZED VENTILATOR PARTLY FIXED TYPE WITH 6.0 MM THK.TOUGHENED GLASS AS/EIL STD. WITH 300MM DIA EXHAUST FAN	1
V5	1000X750	0980X730	AS/ELEVATION	POWDER COATED ALUMINIUM GLAZED VENTILATOR PARTLY FIXED TYPE WITH 6.0 MM THK.TOUGHENED GLASS AS/EIL STD. WITH 300MM DIA EXHAUST FAN	8
GL1	3700X2700	3680X2690	2700	POWDER COATED ALUMINIUM GLAZED FIXED TYPE WITH 6.0 MM THK.TOUGHENED GLASS AS/EIL STD.	1

LEGEND :-

F.R.L. - FINISHED ROAD LEVEL
F.F.L. - FINISHED FLOOR LEVEL

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FC = FALSE CEILING
OD = OVERDECK INSULATION
FF = FALSE FLOORING

= 300 THK RCC WALL
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= 100 THK SOLID CONCRETE BLOCK

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कोच्चि रिफ़ाइनरी
KOCHI REFINERY

पोलीप्रोपेलीन प्रोजेक्ट
कोच्चि रिफ़ाइनरी

POLYPROPYLENE PROJECT KOCHI REFINERY

गुणवत्ता नियंत्रण प्रयोगशाला
प्रथम तल का प्लान

QUALITY CONTROL LABORATORY EXTENSION
FIRST FLOOR PLAN

SCALE	JOB NO.	UNIT	DIVN.	DEPT.	DWG. NO.	REV.
1:75	B895	999	81	46	12762	D

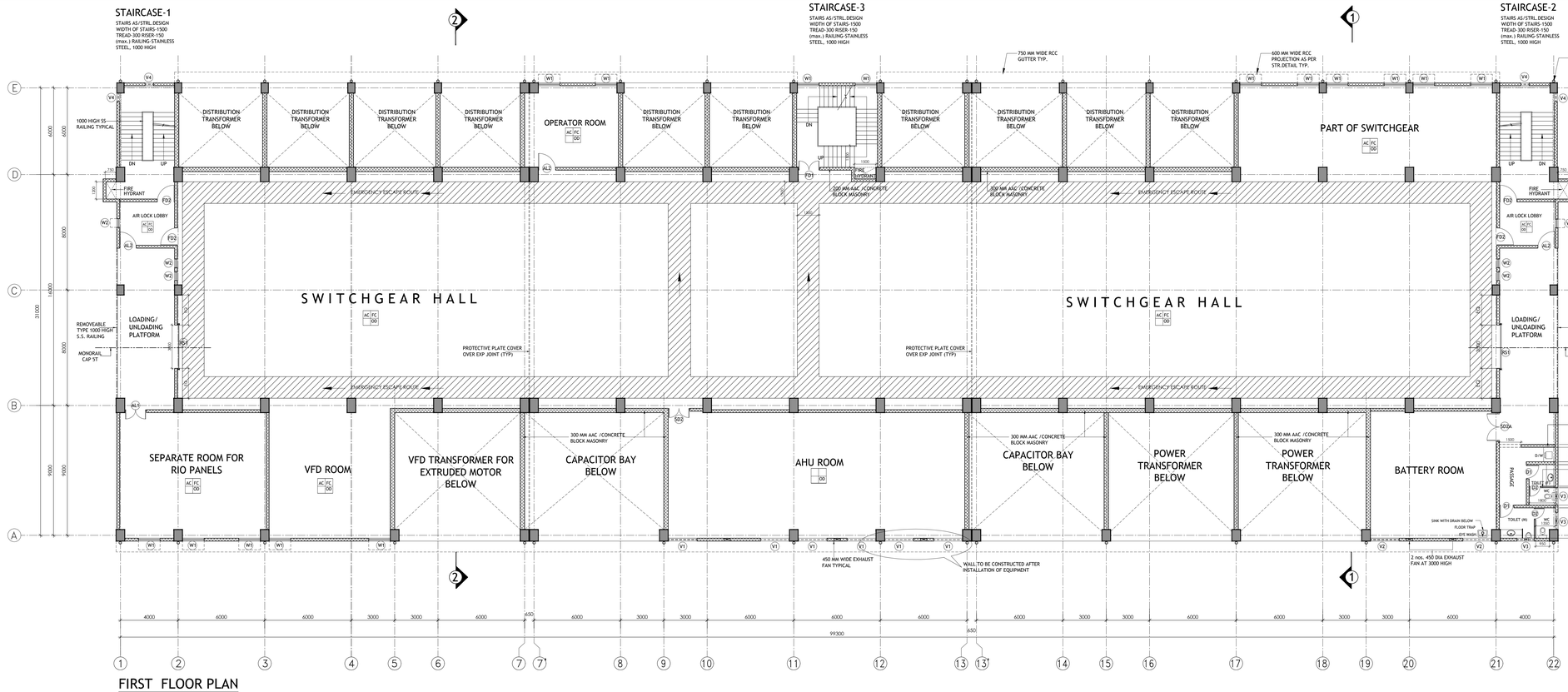
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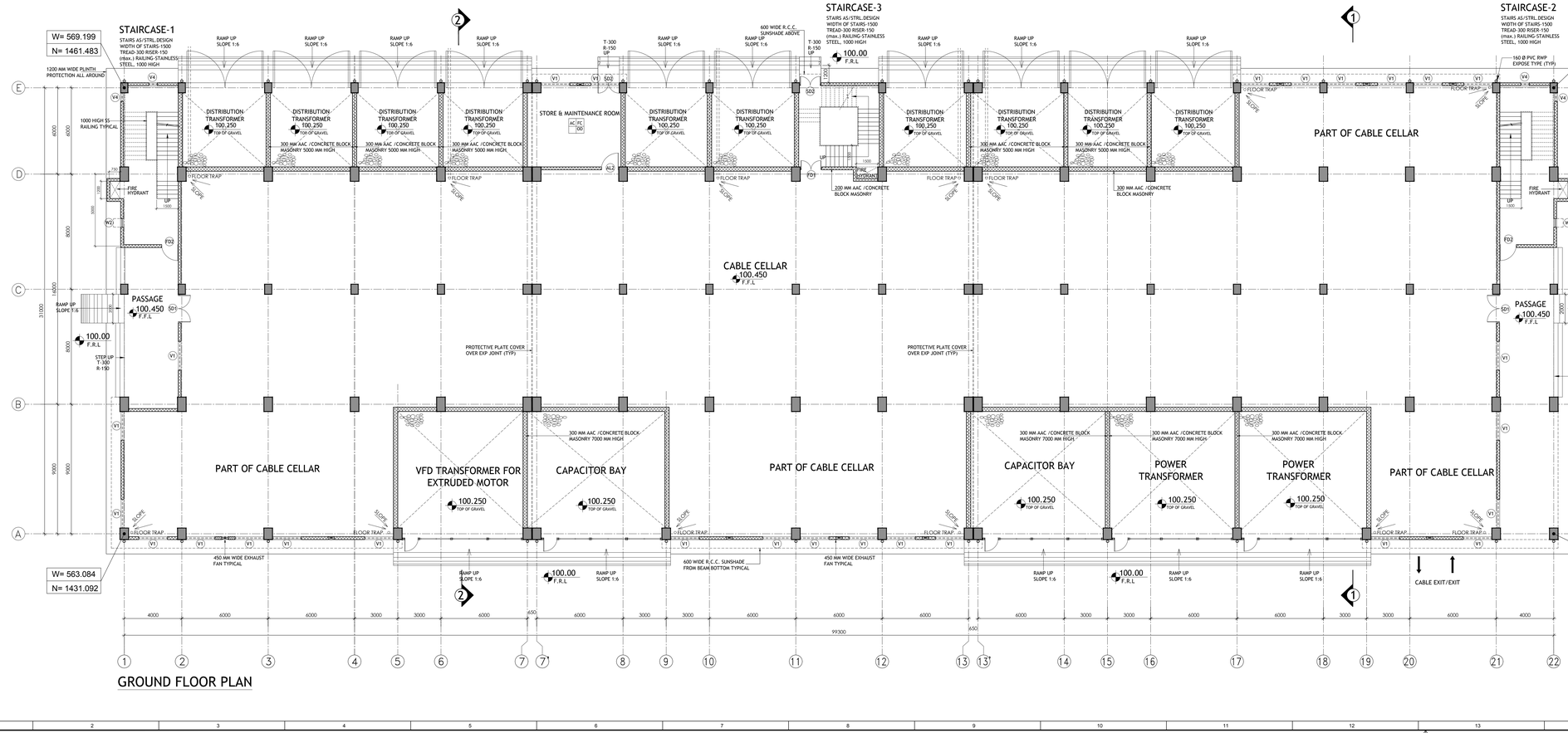
Page 2206 of 1497 : B895-TENDER DOC-B895-999-85-41-EP-T-9802 : Rev. A

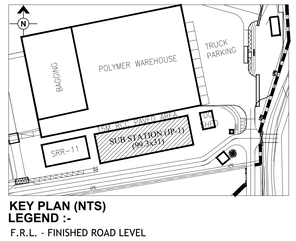
प्रस्तुत आरेख एवं इसमें निहित डिज़ाइन इंजीनियर्स इंडिया लिमिटेड की संपत्ति है। यह उधार दिए गए है और उधारकर्ता ने यह उधार दिए जाएंगे, न प्रदर्शित किए जाएंगे और न ही कॉपीज़ की जाएंगी। इसे किसी अन्य प्रयोग हेतु अथवा किसी अन्य व्यक्ति को बिना इसी प्रकार की लिखित अनुमति के अलावा इसका कोई अन्य प्रयोग नहीं किया जाएगा।

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B895-999-81-46-02401







KEY PLAN (NTS)

LEGEND :-

F.R.L. - FINISHED ROAD LEVEL
T.O.G- TOP OF GRAVEL
F.F.L. - FINISHED FLOOR LEVEL

AC = AIR CONDITIONED
FC = FALSE CEILING
OD = OVERDECK INSULATION

= 300 MM AAC/ CONCRETE BLOCK MASONRY
= 200 MM AAC/ CONCRETE BLOCK MASONRY
= 100 MM AAC/ CONCRETE BLOCK MASONRY (ONLY FOR TOILET PARTITION 2500 MM HIGH)

REF. DWG. NO.	REFERENCE DRAWING TITLE
B895-999-81-46-02402	SECTIONS & ELEVATIONS
B895-999-81-46-02403	LOWER TERRACE & UPPER TERRACE
B895-999-81-46-02404	ELEVATIONS

NOTES:
1. DIMENSIONS, CO-ORDINATES, LEVELS
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B. DRAWING IS NOT TO BE SCALED FOR ANY MISSING DIMENSION.
C. ALL LEVELS & CO-ORDINATES ARE IN METRES.
D. LEVEL 100.000 CORRESPONDS TO TOP OF APPROACH / ACCESS ROAD NEAR THE BUILDING ENTRY. CROSS REFERENCE TO STRUCTURAL DRAWING SHALL BE MADE.
E. PLINTH LEVEL OF THE BUILDING SHALL BE SAME THROUGHOUT UNLESS SPECIFICALLY INDICATED.
F. LOCATION/ORIENTATION/CO-ORDINATES OF THE BUILDING SHALL BE CROSS-CHECKED WITH STRUCTURAL AND PLOT PLAN DRAWINGS. IN CASE OF ANY MIS-MATCH THE SAME SHALL BE GOT RESOLVED BEFORE CONSTRUCTION.

2. FLOOR
A. FINISHED FLOOR LEVEL OF WC/BATH CUBICLES & DRINKING WATER SHALL BE 12MM LESS THAN ADJOINING AREAS AND SHALL HAVE PROPER SLOPE FOR FLOOR DRAINAGE.
B. FLOOR OF CABLE CELLAR, AC PLANT/AHU, BATTERY ROOM SHALL HAVE PROPER SLOPE FOR FLOOR DRAINAGE.
C. REFERENCE SHALL BE MADE TO RELEVANT DRAWINGS BEFORE STARTING FLOORING WORKS. TRENCHES/CUT OUTS IN FLOOR SHALL BE PROVIDED IN ACCORDANCE WITH RELEVANT ELECTRICAL/INSTRUMENTATION/ PED/ STRUCTURAL/EQUIPMENT DRAWINGS.
D. SKIRTING DETAIL SHALL BE AS /EIL STANDARD NO. 7-75-0002 & 7-75-0003.

3. WALL
A. THICKNESS OF ALL BLOCK MASONRY (EXCEPT WC) SHALL BE 200MM THK BLOCK MASONRY IF NOT SPECIFICALLY INDICATED.
B. INTERNAL PARTITION WALLS OF WC/BATH CUBICLES SHALL BE 2500 MM HIGH FROM FLOOR LEVEL.
C. ALL OTHER WALLS SHALL BE UPTO ROOF/ROOF BEAM IF NOT SPECIFICALLY INDICATED.
D. CUT-OUTS/OPENINGS FOR CABLES/DUCTS ETC. SHALL BE PROVIDED IN MASONRY WALLS AS PER RELEVANT ELECTRICAL/INSTRUMENTATION/ PED/STRUCTURAL/EQUIPMENT, CABLE, DUCTING DRAWINGS.

4. CABLING/CONDUITS
A. ALL CONDUITS SHALL BE CONCEALED TYPE EXCEPT IN AREAS CONCEALED BY FALSE CEILING AND SHALL BE LAID AS PER RELEVANT DRAWINGS.
B. IN CASE OF CONDUITS CONCEALED IN ROOF/BEAM/FLOOR, THEY SHALL BE LAID BEFORE CASTING.

5. FINISHING
A. IN CASE OF ANY CONFLICT WITH TENDER/PACKAGE, THE SAME SHALL BE GOT RESOLVED BEFORE PROCUREMENT AND EXECUTION.
B. ALL OUTSIDE SURFACES SHALL BE FINISHED WITH 18mm THK. PLASTER ON BLOCK MASONRY WALL SURFACES.
C. ALL INTERNAL WALLS SHALL BE FINISHED WITH 12mm/15mm THK. PLAIN PLASTER ON PERIPHERAL WALLS & 12mm/15mm THK. PLAIN CEMENT PLASTER ON EITHER SIDE OF INTERNAL WALLS. 6mm THK. PLAIN PLASTER SHALL BE PROVIDED ON R.C.C. SURFACES.

6. PLINTH PROTECTION
A. 1200 WIDE PLINTH PROTECTION SHALL BE PROVIDED ALROUND THE BUILDING PERIMETER.

7. MISCELLANEOUS
A. OVERDECK INSULATION SHALL BE PROVIDED TO THE ROOF OF ALL AC AREAS AT TOP FLOOR.
B. ALL SUNSHADE & ROOF PROJECTIONS SHALL HAVE DRIP MOULD GROOVES UNDERNEATH ALL ALONG THE PERIPHERIES.
C. ALL DOORS, GATES ETC. SHALL BE PROVIDED WITH FACILITY OF LOCKING THE DOORS.
D. OUTDOOR UNITS OF VRF SYSTEM SHALL BE KEPT ON RCC ROOF.

SCHEDULE OF DOORS AND WINDOWS

TYPE	OPENING SIZE	FRAME SIZE	LINTEL LEVEL	DESCRIPTION	NOS.
RS1	3000 x 3500	-	3500	STD. STEEL ROLLING SHUTTER (ELECTRICALLY OPERATED)	02
FD1	1500 x 2700	1480 x 2690	2700	2-HR FIRE RATED, DOUBLE SHUTTER STEEL DOOR AS/ SPECIFICATIONS.	02
FD2	1200 x 2100	1180 x 2090	2100	2-HR FIRE RATED, SINGLE SHUTTER STEEL DOOR AS/ SPECIFICATIONS.	06
AL1	1500 x 2700	1480 x 2690	2700	POWDER COATED ALMN. GLAZED DOOR WITH 6mm THK TOUGHENED GLASS, DOUBLE LEAF	01
AL2	1200 x 2700	1180 x 2690	2700	POWDER COATED ALMN. GLAZED DOOR WITH 6mm THK TOUGHENED GLASS, SINGLE LEAF	04
SD1	2000 x 2700	1980 x 2690	2700	PRESSED STEEL DOOR WITH PRESSED STEEL FRAME, DOUBLE SHUTTER	02
SD2	1500 x 2700	1480 x 2690	2700	PRESSED STEEL DOOR WITH PRESSED STEEL FRAME, DOUBLE SHUTTER	03
SD2A	1500 x 2700	1480 x 2690	2700	PRESSED STEEL DOOR WITH PRESSED STEEL FRAME, DOUBLE SHUTTER WITH BOTTOM LOUVERS	01
SD3	1000 x 2100	0980 x 2090	2100	PRESSED STEEL DOOR WITH PRESSED STEEL FRAME, SINGLE SHUTTER	03
D1	1000 x 2100	0980 x 2090	2100	FRP DOOR AS/SPECIFICATION	02
D2	0800 x 2100	0780 x 2090	2100	FRP DOOR AS/SPECIFICATION	02
W1	1500 x 1800	1480 x 1780	2700	POWDER COATED ALMN. GLAZED WINDOW WITH 6 mm THK TOUGHENED GLASS PARTLY FIXED PARTLY OPENABLE TYPE.	17
W2	0600 x 1800	0580 x 1780	2700	POWDER COATED ALMN. GLAZED WINDOW WITH 6 mm THK TOUGHENED GLASS PARTLY FIXED TYPE.	08
V1	2000 x 750	1980 x 0730	BEAM BOTTOM	POWDER COATED ALMN. GLAZED VENTILATOR WITH 6 mm THK TOUGHENED GLASS, PARTLY FIXED/ OPENABLE TYPE.	33
V2	2000 x 750	1980 x 0730	2700	POWDER COATED ALMN. GLAZED VENTILATOR WITH 6 mm THK TOUGHENED GLASS, PARTLY FIXED/ OPENABLE TYPE	02
V3	1200 x 0600	1180 x 00580	2700	POWDER COATED ALMN. GLAZED VENTILATOR WITH 6 mm THK TOUGHENED GLASS, PARTLY FIXED/ OPENABLE TYPE WITH 300 Ø EXHAUST FAN.	03
V4	0600 x 0900	0580 x 0880	AS/ELE	POWDER COATED ALMN. GLAZED VENTILATOR WITH 6 mm THK TOUGHENED GLASS FIXED.	14

REV.	DATE	DESCRIPTION	BY	CHKD	APPD	PM
0	13.10.25	ISSUED FOR CONSTRUCTION	NK	SS	GJK	
D	06.08.25	RE-ISSUED FOR ENGINEERING	NK	SS	GJK	
C	20.03.25	ISSUED FOR ENGINEERING	NK	SS	GJK	
B	27.02.25	ISSUED FOR TENDER	NK	SS	GJK	
A	06.11.24	ISSUED FOR COMMENTS/CLIENTS APPROVAL	BR	SS	GJK	

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भारत पेट्रोलियम कॉर्पोरेशन लिमिटेड BHARAT PETROLEUM CORPORATION LIMITED

कोच्चि रिफाइनरी KOCHI REFINERY

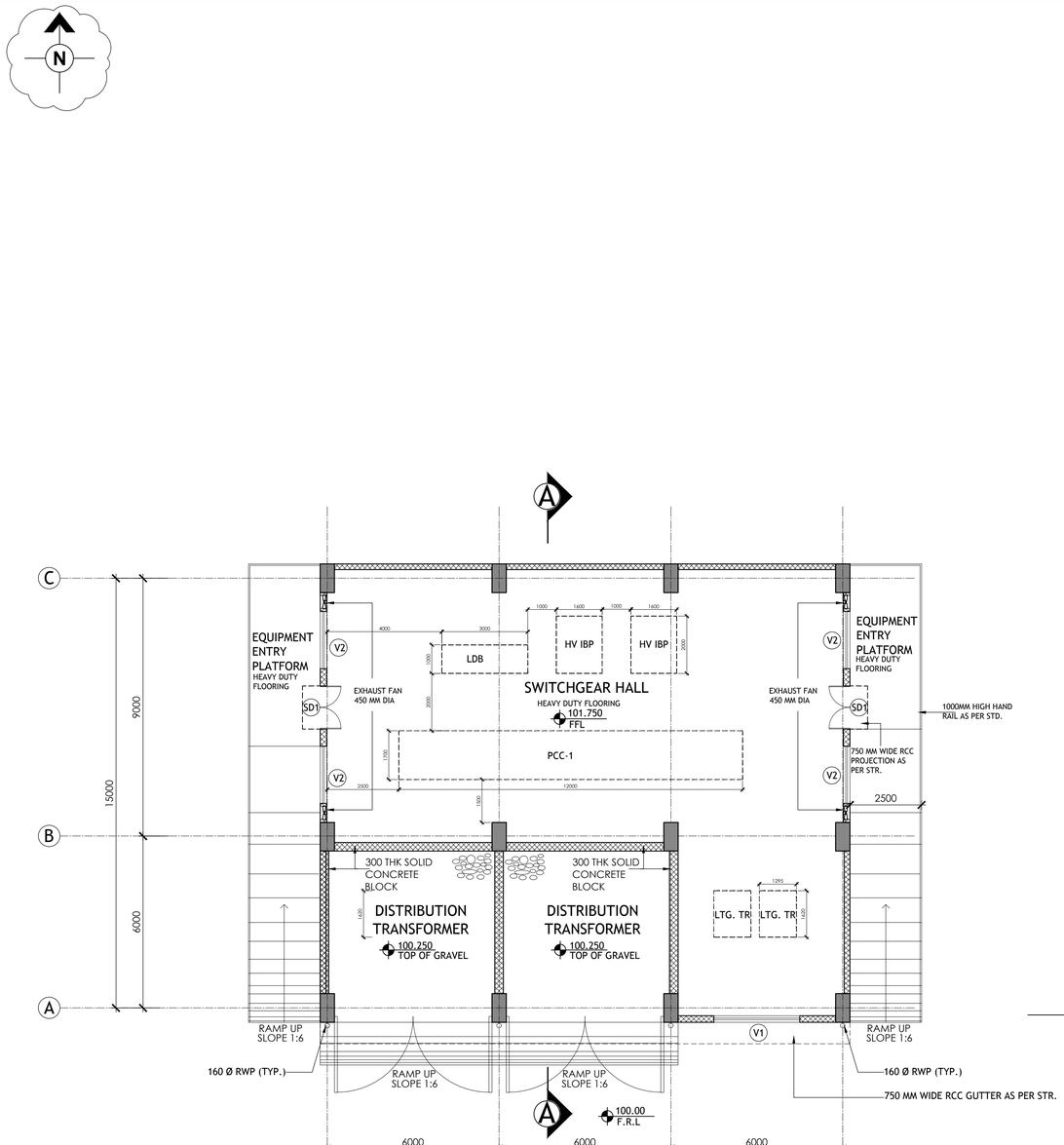
पोलीप्रोपेलीन प्रोजेक्ट कोच्चि रिफाइनरी	**POLYPROPYLENE PROJECT KOCHI REFINERY**
सब स्टेशन जे पी.1 भू तल प्लान एवं प्रथम तल का प्लान	**SUB STATION JP-1 GROUND FLOOR PLAN & FIRST FLOOR PLAN**

SCALE	JOB NO.	UNIT	DIVN.	DEPT.	DWG. NO.	REV.
1:125	B895	999	81	46	02401	0

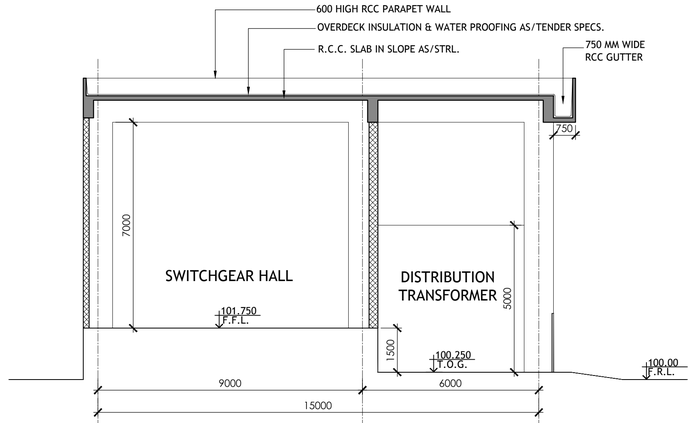
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B895-999-81-46-12421



GROUND FLOOR PLAN



SECTION AT A-A

REF. DWG. NO.	REFERENCE DRAWING TITLE

NOTES:

1. DIMENSIONS, CO-ORDINATES, LEVELS
A. ALL DIMENSIONS ARE IN MILLIMETRES.
B. DRAWING IS NOT TO BE SCALED FOR ANY MISSING DIMENSION.
C. ALL LEVELS & CO-ORDINATES ARE IN METRES.
D. LEVEL 100.000 CORRESPONDS TO TOP OF APPROACH / ACCESS ROAD NEAR THE BUILDING ENTRY, CROSS REFERENCE TO STRUCTURAL DRAWING SHALL BE MADE.
E. PLINTH LEVEL OF THE BUILDING SHALL BE SAME THROUGHOUT UNLESS SPECIFICALLY INDICATED.
F. LOCATION/ORIENTATION/CO-ORDINATES OF THE BUILDING SHALL BE CROSS-CHECKED WITH STRUCTURAL AND PLOT PLAN DRAWINGS. IN CASE OF ANY MIS-MATCH THE SAME SHALL BE GOT RESOLVED BEFORE CONSTRUCTION.

2. FLOOR
~~A. FINISHED FLOOR LEVEL OF WC/BATH CUBICLES & DRINKING WATER SHALL BE 12MM LESS THAN ADJOINING AREAS AND SHALL HAVE PROPER SLOPE FOR FLOOR DRAINAGE.~~
~~B. FLOOR OF CABLE CELLAR, AC PLANT/AHU, BATTERY ROOM SHALL HAVE PROPER SLOPE FOR FLOOR DRAINAGE.~~
C. REFERENCE SHALL BE MADE TO RELEVANT DRAWINGS BEFORE STARTING FLOORING WORKS. TRENCHES/CUT OUTS IN FLOOR SHALL BE PROVIDED IN ACCORDANCE WITH RELEVANT ELECTRICAL/INSTRUMENTATION/PED/ STRUCTURAL/EQUIPMENT DRAWINGS.
D. SKIRTING DETAIL SHALL BE AS /EIL STANDARD NO. 7-75-0002 & 7-75-0003.

3. WALL
A. THICKNESS OF ALL BLOCK WALLS (EXCEPT WC) SHALL BE 200MM THK SOLID CONCRETE BLOCK MASONRY IF NOT SPECIFICALLY INDICATED.
~~B. INTERNAL PARTITION WALLS OF WC/BATH CUBICLES SHALL BE 2500MM HIGH FROM FLOOR LEVEL.~~
C. ALL OTHER WALLS SHALL BE UPTO ROOF/ROOF BEAM IF NOT SPECIFICALLY INDICATED.
D. CUT-OUTS/OPENINGS FOR CABLES/DUCTS ETC. SHALL BE PROVIDED IN MASONRY WALLS AS PER RELEVANT ELECTRICAL/INSTRUMENTATION/ PED/STRUCTURAL/EQUIPMENT, CABLE, DUCTING DRAWINGS.

4. CABLING/CONDUITS
A. ALL CONDUITS SHALL BE CONCEALED TYPE EXCEPT IN AREAS CONCEALED BY FALSE CEILING AND SHALL BE LAID AS PER RELEVANT DRAWINGS.
B. IN CASE OF CONDUITS CONCEALED IN ROOF/BEAM/FLOOR, THEY SHALL BE LAID BEFORE CASTING.

5. FINISHING
A. IN CASE OF ANY CONFLICT WITH TENDER/PACKAGE, THE SAME SHALL BE GOT RESOLVED BEFORE PROCUREMENT AND EXECUTION.
B. ALL OUTSIDE SURFACES SHALL BE FINISHED WITH 18mm THK. PLASTER ON SOLID CONCRETE BLOCK MASONRY SURFACES.
C. ALL INTERNAL WALLS SHALL BE FINISHED WITH 12mm/15mm THK. PLAIN PLASTER ON PERIPHERAL WALLS & 12mm/15mm THK. PLAIN CEMENT PLASTER ON EITHER SIDE OF INTERNAL WALLS. 6mm THK. PLAIN PLASTER SHALL BE PROVIDED ON R.C.C. SURFACES.

6. PLINTH PROTECTION
A. 1200 WIDE PLINTH PROTECTION SHALL BE PROVIDED ALROUND THE BUILDING PERIMETER.

7. MISCELLANEOUS
A. OVERDECK INSULATION SHALL BE PROVIDED TO THE ROOF OF ALL AC AREAS AT TOP FLOOR.
B. ALL SUNSHADE & ROOF PROJECTIONS SHALL HAVE DRIP MOULD GROOVES UNDERNEATH ALL ALONG THE PERIPHERIES.
C. ALL DOORS, GATES ETC. SHALL BE PROVIDED WITH FACILITY OF LOCKING THE DOORS.

SCHEDULE OF DOORS & WINDOWS

TYPE	OPENING SIZE	FRAME SIZE	LINTEL LEVEL	DESCRIPTION	NOS.
SD1	2000x2500	1980x2490	2500	PRESSED STEEL DOOR WITH PRESSED STEEL FRAME, DOUBLE SHUTTER AS/ EIL STD. 7-75-0071	2
V1	3000x0600	2980x0580	BEAM /BOTTOM	POWDER COATED ALUMINIUM GLAZED VENTILATOR WITH 6 mm THK TOUGHENED GLASS, PARTY FIXED & PARTLY OPENABLE TYPE.	1
V2	2000x0600	1980x0580	BEAM /BOTTOM	POWDER COATED ALUMINIUM GLAZED VENTILATOR WITH 6 mm THK TOUGHENED GLASS, PARTY FIXED & PARTLY OPENABLE TYPE.	4

LEGEND :-

F.R.L. - FINISHED ROAD LEVEL
F.F.L. - FINISHED FLOOR LEVEL

AC	FC	AC = AIR CONDITIONED FC = FALSE CEILING
FF	OD	FF = FALSE FLOORING OD = OVERDECK INSULATION

= 300 THK SOLID CONCRETE BLOCK
= 200 THK SOLID CONCRETE BLOCK

REV.	DATE	DESCRIPTION	BY	CHKD	APPD	PM
C	06.11.25	RE-ISSUED FOR TENDER	NK	SS	GJK	
B	03.11.25	ISSUED FOR TENDER	NK	SS	GJK	
A	03.09.25	ISSUED FOR COMMENTS	NK	SS	GJK	

इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम) ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

भारत पेट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LIMITED
कोच्चि रिफ़ाइनरी
KOCHI REFINERY

पोलीप्रोपैलीन प्रोजेक्ट कोच्चि रिफ़ाइनरी	POLYPROPYLENE PROJECT KOCHI REFINERY
सब स्टेशन फोर लैब भूतल प्लान एवं काट	SUB-STATION FOR LAB GROUND FLOOR PLAN & SECTION

SCALE	JOB NO.	UNIT	DIVN.	DEPT.	DWG. NO.	REV.
1:100	B895	999	81	46	12421	C

3-1641-0501 REV.4 / 06.03.2024 A1-841x594

प्रस्तुत आरेख एवं इसमें निहित डिज़ाइन इंजीनियर्स इंडिया लिमिटेड की संपत्ति है। ये मात्र उधार दिए जाएंगे, न प्रदर्शित किए जाएंगे और न ही सीमित और किसी प्रयोग के अलावा इसका कोई अन्य प्रयोग होगा और यह प्रयोग उधार देने वाले द्वारा उधारकर्ता को लिखित रूप में दी गई सहमति से होगा।
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1.0 INTRODUCTION

The Plant LAN System is to be deployed for LAB Building at **BPCL, Kochi.** The Plant LAN System Infrastructure in the campus across various buildings shall be capable of supporting current and future technologies. Connectivity of all user devices, Servers, PCs, Printers, Peripherals etc. shall be through 1000 Mbps or higher switched Ethernet ports. The CONTRACTOR shall procure, supply, install, test and commission the complete Plant LAN System as per scope and specifications mentioned in this document.

The LAN Structured cabling infrastructure in the buildings shall be constructed using UTP CAT-6A (LSZH-FR) cabling and components. The Fiber Connectivity between various buildings shall be through Single mode Fiber Optic cables and its associated components which include Fiber Optic Patch panels, Fiber Optic Patch cords, Connectors etc. and shall be supplied, installed and commissioned by the Contractor. It shall be the responsibility of the CONTRACTOR(s)/SUPPLIER(s) under the present tender to ensure completeness of the total System for proper functioning.

2.0 DEFINITIONS

OSAT	On-site Acceptance Tests
SYSTEM(s)	Comprising of Structured cabling components like CAT 6A UTP cables, Patch cords, Jack Panels, OFC cable (intra and Inter-building), Fiber Patch Cords, Network Racks, Connectors etc. and any other items included in this Tender.
Contractor	Supplier / Cable System Integrator
GbE	Gigabit Ethernet
FE	Fast Ethernet
LAN	Local Area Networks
Gbps	Gigabits per second
Mbps	Megabits per second
UTP	Unshielded Twisted Pair Cable

3.0 CODES AND STANDARDS

The IT Cabling Infrastructure for the campus shall be designed and installed with reference to the following Standards

- ISO/IEC 11801:2002/A1:2008 and A2:2010 Information technology - Generic cabling for customer premises (including subsequent addendums and revisions)
- ANSI/TIA/EIA Building Telecommunications Wiring Standard TIA-568-C.0,
- ANSI/EIA/TIA-568-C.1, Commercial Building Telecommunication Cabling
- ANSI/EIA/TIA-568-C.2, Balanced Twisted Pair Cabling Components
- ANSI/EIA/TIA-568-C.3, Optical Fiber Cabling
- ANSI/EIA/TIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces
- ANSI/EIA/TIA-607 Generic Telecommunications Bonding and Grounding (Earthing) For Customer Premises
- ANSI/EIA/TIA-942 Telecommunications Infrastructure Standard for Data Centre's

4.0 GENERAL TERMS AND CONDITIONS

a) All network passive components for the LAN shall be from a **single OEM** to ensure single consolidated component warranty, cabling system performance warranty and certification by the OEM of the passive components. **LAN Solution consisting of multiple passive component OEMs shall not be acceptable**. LAN components must be intelligent, manageable and cyber security compliant.

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b) Contractor to follow LAN connectivity and standard industry practices of Information security guidelines and must ensure that entire LAN is secure reliable and compliant.

c) All products / technologies used in the LAN solution shall be Gigabit Ethernet compliant as per the relevant ANSI/ISO/IEEE/EIA/TIA/IEC standards, and the LAN shall provide end-to-end Gigabit (1 & 10 GE both) Ethernet performance.

d) It is the responsibility of the contractor to coordinate with other Contractors / Agencies / Vendors involved in the complex for proper and timely execution of work.

e) All IT equipment shall be connected through UPS power (Proper size UPS to be provided by vendor if UPS is in vendor's scope)

f) Contractor to connect the Plant LAN system to nearest distribution switch of existing network of BPCL through 6 core single mode fiber optic cable in a redundant way including all material and labor and as per approved drawings specifications of this tender and directions of engineer in Charge.

5.0 DELIVERY AND INSTALLATION

On completion of delivery, contractor shall get the Bill of Material checked and signed by OWNER's co-ordinator, carry out the installation and show the SYSTEM(S) in working order and ensure that the SYSTEM(S) meets all the functional requirement to OWNER's co-ordinator at SITE.
On successful completion of the Installation and proper tuning of the SYSTEM(S), these shall be handed over to the users. Contractor shall submit the installation report along with SYSTEM(S) configuration report to OWNER's co-ordinator at Site.

6.0 FUNCTIONAL REQUIREMENT

Contractor is required to Supply, Install, Commission and Testing Plant LAN System Including Cat-6A UTP and Single Mode Fiber Optic Structured Cabling System and Components, active Components like Switches etc. as indicated in the document to implement an active Data System Network in the Plant.

7.0 OVERVIEW OF SCOPE OF WORK

7.1 The scope shall include design, engineering, supply, installation, termination, testing and commissioning, drawing, documents of the following at all the building as per "Table-1: List of Buildings for OFC Backbone, Ethernet Switches and Building LAN Connectivity" of this document, under the scope of this tender:

a) Complete Optical Fiber Cable (OFC) backbone, interconnecting all buildings and connecting the same to existing network of BPCL through Fiber Optic Cable.

b) Edge Ethernet Switches at all the buildings, and

c) Ethernet Switch Racks, UTP cabling & Components for Local Area Network (LAN) connectivity within various buildings.

7.2 Scope of work shall include supply, installation, termination, integration, testing and commissioning of all equipment and items at the site(s) as per the Schedule of Rates (SOR) enclosed with the tender, drawing and documentation as indicated in this document to meet the requirements defined in specifications attached with the tender and which are required for successful completion of the work. The items and quantities have been indicated in the Schedule of Rates enclosed with the tender.

7.3 The contractor shall also integrate the Plant LAN with the OWNER's existing network.

7.4 The detailed scope of supply, installation, termination, testing and commissioning for the contractor shall be as per the following sections/clauses.

7.5 The bidder may visit the site at their own cost before bidding with prior permission of BPCL / EIL to understand the scope of the tender.

8.0 GENERAL REQUIREMENTS

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8.1 The contractor shall establish a fully integrated and functional LAN at the site as per Table-1 including the supply, installation, testing and commissioning of the following:

i). OFC backbone covering in all the BUILDINGS and connecting the buildings to existing network.
ii). Ethernet Switches in all the BUILDINGS. (in air conditioned area)
iii). CAT-6A LAN cabling and Ethernet Switch Racks in the BUILDINGS of this tender

8.2 The contractor' scope of work shall include the design and engineering of the entire LAN solution.

8.3 The LAN shall be based on an EDGE architecture consisting of Edge Ethernet Switches, Inter-building OFC backbone and Intra-building CAT-6A UTP cabling.

8.4 The OFC backbone shall include complete OFC connectivity between existing network to new Distribution Ethernet Switches and all new Edge Ethernet Switches.

8.5 The Contractor shall supply all the items as listed in the Schedule of Rates (SOR) enclosed with the tender.

8.6 The contractor shall supply, install, test and commission any other material/components, although not explicitly mentioned in this document or in the SOR, but are required for completion of the work as per specifications, drawings and instruction of Engineer-in-charge to establish a fully integrated and functional LAN at the site without any additional cost and time implication to EIL/OWNER.

8.7 The Contractor shall supply only latest, and recently manufactured, unused, non-refurbished equipment / devices / components.

8.8 The Contractor shall supply all items/ accessories/ consumables (e.g. screws, straps, valcro tapes, nuts, bolts, clamps, ties, supports, grounding strips, wires, connectors, fiber connectorisation kits, cross reference cable marker/cable tags/SS name tags, PVC pipe bends/fittings, PVC flexi pipes, GI & HDPE pipe bends/fittings etc.) as necessary for the proper installation of the OFC backbone and the Ethernet Switch Racks & CAT-6A cabling & Components as per industry best practices.

8.9 All the items in the scope shall conform to (i.e. meet or exceed) the minimum technical specifications as indicated in the "Table-2: Minimum Technical Specifications" section of this document.

8.10 The contractor shall bring their own installation equipment, tools, splicing machines (kits), testers, software, computers, laptops, manpower, consumables etc. required for the installation of all the items.

8.11 The contractor shall follow OEM's guidelines and best engineering practices for the design and installation of all the devices, cabling and components etc.

8.12 The Contractor shall be responsible for protection and rectification of damage of the installed equipment, cables and systems from man, heavy equipment, rodents, insects etc. till commissioning.

8.13 Minor civil work (for successful completion of the Job) shall be included in bidder's scope without any extra cost.

8.14 The Contractor shall be responsible for cleanliness of the equipment areas till the time of final acceptance of system by EIL/OWNER.

9.0 INSTALLATION, TERMINATION, TESTING AND COMMISSIONING OF OFC BACKONE IN THE BUILDINGS

9.1 All fiber cabling system products and components shall meet or exceed the technical specifications indicated in this document.

9.2 The overall IT network with existing and new addition with all passive components, signal flow and interconnection levels and complete IP details to be prepared and submitted to BPCL for review and approval.

9.3 The scope of supply, installation, termination, testing and commissioning of the OFC backbone covering all the BUILDINGS for the contractor shall be as per "Table-1: List of Buildings for OFC Backbone, Ethernet Switches and Building LAN Connectivity" and shall include the following as a minimum:

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i). Laying of HDPE Conduit in the RCC trenches/pipe rack/existing duct/cable-trays/ raceways etc. and Laying of PVC conduits, GI Pipes within the buildings as per the SOR and various documents refereed therein, as specified in this tender

ii). Laying of OFC cable in the HDPE conduit, PVC conduits & GI Pipes as per the SOR and various documents referred therein, as specified in this tender

iii). Interconnection of various buildings in the refinery using fiber optic cable as per "Table-1: List of Buildings for OFC Backbone, Ethernet Switches and Building LAN Connectivity" attached with the tender.

iv). Installation of fiber optic patch panel, fiber optic patch cords, connectors etc. on the Ethernet switch rack in all the buildings as specified at "Table-1: List of Buildings for OFC Backbone, Ethernet Switches and Building LAN Connectivity".

v). Termination of all the cores of OFC cables on fiber optic patch panels (FOPP) in all the buildings.

vi). Installation of fiber patch cords.

vii). Cable shall be dressed and terminated as per the relevant EIA/TIA standards, OEM's installation standards / practices and best industry practices.

viii). Numbering / tagging / ferruling on each rack, fiber optic patch panels, ports on the fiber optic patch panels, fiber optic patch cords etc. shall be done as per OEM's standard cable tagging and identification practices. Tags shall be of SS make only with computerized printing of letters.

ix). Each building shall be connected to nearest distribution switch of existing network.

x). Engraved SS304 cable tag / route marker of 25mm wide and 2 mm thick at an interval of 30 meters and bending entry shall be provided on HDPE duct for identification shall be on Contractor scope and contractor shall update the route in final as built.

xi). One number of 48 core single mode fiber optic cable rings shall be covered all the buildings in redundant way. The fiber optic connectivity shall be implemented in a Ring / Star topology.

9.4 The scope for supplying and installing OFC cable for all inter-building OFC cabling, shall be from FOPP-to-FOPP including, but not limited to, laying of fiber optic cables in the PVC/HDPE conduits/GI Pipe, Laying of PVC conduits, Laying of HDPE conduits in the RCC trenches / cable-trays/ raceways / conduits, , Laying of GI Pipes in vertical shafts, installation of fiber optic patch panels, splicing of pig tails, termination and patching of fiber optic cables on the FOPPs, labeling / tagging / ferruling of cables, etc.

9.5 The scope shall include testing of all the cores of entire OFC cabling for all the buildings using optical time-domain reflectometer (OTDR). The OTDR measurement should follow procedure outlined in TIA/EIA 455-59, 455-60 and 455-61. All the above tests / checks shall be carried out by the Contractor internally and EIL/OWNER reserves the rights to witness the tests on random sampling basis. All Internal Test Reports and Certificates shall be furnished to EIL/OWNER for review and acceptance.

10.0 INSTALLATION, TERMINATION, TESTING AND COMMISSIONING OF ETHERNET SWITCHES IN THE EXISTING BUILDINGS AND NEW BUILDINGS

10.1 The edge switches shall be installed at all the BUILDINGS as per Table-1 and shall have provision for OFC connectivity to any other building/network of the OWNER.

10.2 All Ethernet switches are to be managed switches.

10.3 The scope of supply, installation, testing and commissioning of the Ethernet Switch include the following:

i). Installation of Ethernet Switch in Racks in an air-conditioned area
ii). Stacking of Edge Ethernet Switches (if required)
iii). Integration with the CAT-6A LAN cabling
iv). Integration with the Fibre Optic Backbone Network and connecting to existing network
v). Switching & Routing and VLAN Configuration as per OWNER's requirements
vi). Network Device Configuration of the Ethernet Switches as per OWNER's requirements

End-to-end network connectivity testing to meet the switching and routing requirements of the OWNER

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11.0 INSTALLATION, TERMINATION, TESTING AND COMMISSIONING OF ETHERNET SWITCH RACKS AND CAT-6A LAN CABLING IN THE BUILDINGS

11.1 The OFC backbone being commissioned by this contractor shall be connected to the LAN cabling in all the BUILDINGS as per the list provided in Table-1.

11.2 The scope of work related to the CAT-6A LAN cabling in the BUILDINGS and integration of the same with the OFC backbone shall include the following:

i). Installation of the Ethernet Switch Racks in an air-conditioned room/area.
ii). Installation of PVC conduits & PVC channels for laying and installation of UTP cables in PVC conduits and PVC channels. The PVC conduits shall be concealed. PVC channels shall be used only for surface cabling at workstation end
iii). Installation of UTP cabling and LAN Nodes in the BUILDINGS / floors in PVC conduits and PVC channels
iv). The scope for installing UTP cable shall be from rack-to-I/O including, but not limited to,
- laying of UTP cable in the PVC conduits/channels,
- installation of racks / cable managers, CAT-6A I/Os, Faceplates, Gang boxes, patch cords, jack panels,
- UTP cable termination on the jack panels and I/Os,
- fixing IOs, Faceplates & gang boxes,
- labelling / tagging of Faceplates and on Jack Panels,
- Ferruling of cables at both ends.

11.3 Parallel run of UTP cables with electrical cables to be avoided and a minimum 12inch gap to be maintained from electrical cabling. UTP & electrical cable crossing is permissible only at right angles.

11.4 UTP cabling route selection shall avoid proximity to any electrical appliance/lighting equipment etc. and minimum 12inch gap to be maintained.

11.5 The UTP cable length between the jack panel and the workstation I/O shall not exceed 90 meters.

11.6 UTP Cable route shall be indicated by the contractor in the electrical cabling drawings

11.7 Cable shall be dressed and terminated as per the relevant EIA/TIA standards, OEM's installation standards / practices and best industry practices.

11.8 Numbering / tagging / ferruling on each rack, jack panel, port on the jack panel, shall be done as per OEM's standard cable tagging and identification practices.

11.9 The CAT-6A network passive cabling architecture shall be based on the latest structured cabling standard ANSI/EIA/TIA-568B, 569.

11.10 The scope shall include the following testing prior to acceptance of the work:

i). Penta-Scanner testing of all the UTP cabling for all the BUILDINGS as per relevant EIA/TIA standards for conformance to CAT-6A requirements. All the above tests / checks shall be carried out by the Contractor internally and EIL/OWNER reserves the rights to witness the tests on random sampling basis. All Internal Test Reports and Certificates shall be furnished to EIL/OWNER for review and acceptance.
ii). Functional testing for average Round Trip Latency (using) and average Packet Loss at random nodes within and across buildings. The average round trip latency (ping response time) shall not exceed 1 millisecond and the average packet loss shall not exceed 0.5% when measured between random nodes within and across buildings.
iii). Functional testing for Switching & Routing and VLAN Configuration as per OWNER's requirements

11. WARRANTY

i). All products and services provided by the Implementation Contractor for the project shall be covered by a comprehensive warranty as mentioned in the general condition of contract document. It is the responsibility of the Contractor to ensure that all materials used for the project are sourced through authorized channels of the respective products with proper and required warranty coverage.

ii). The installed system shall be inspected by the manufacturer representative during installation and after completion of works and approved for quality and compliance to their

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best installation practices for certification at the site. Any defects identified shall be corrected at no additional cost to the Owner / EIL.

Warranty of the item/system shall be as per commercial terms and conditions. However, Application Assurance Warranty from the manufacturer of the cabling system for a period of minimum of 20 years from the date of acceptance and handover.

1.0 OTHER REQUIREMENTS

1.1 The contractor shall provide Certification of Data Communication System and submission of performance warranty of 20 years from the OEM of the passive components as per the specifications of this tender and directions of Engineer-in-Charge.

1.2 During the warranty period if the performance of the OFC backbone and/or any items in the scope of this tender degrades or if there are any manufacturing defects with the same then the defective components shall be replaced and installed by the contractor without any time and cost to the owner.

1.3 The Contractor shall submit the following documents during engineering for all SOR (SOR quantities are considered based on the engineering documents should meet the actual requirements while execution) items for review / approval by EIL/OWNER:

i). OEM datasheets for all SOR items,
ii). Test Certificates as mentioned in specifications of various items in Table-2 below,
iii). OFC and LAN component and connectivity diagram

1.4 The Contractor shall submit the following documents to EIL/OWNER during commissioning:

i). Installation Report
ii). Penta-Scanner Test Reports
iii). OTDR Test Reports
iv). Latency and packet loss test reports
v). Device configuration report (if any)
vi). As built OFC and LAN component and connectivity diagram
vii). Cable termination diagram,
viii). OEM datasheets,
ix). Test Certificates of various items in Table-2 below,
x). Detailed documentation of network including cabling layout, equipment location and bill of material etc.

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Table-1: List of Buildings for OFC Backbone, Ethernet Switches and Building LAN Connectivity

Sl. No.	Site Name	Building Name / Floor		LAN Nodes
1.	BPCL, KOCHI	BUILDINGS	LAB BUILDING GROUND FLOOR	10*
			LAB BUILDING FIRST FLOOR	15*
			LAB BUILDING SECOND FLOOR	10*

* Number of nodes may vary due to actual requirement of number of PC & peripherals etc.

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Table-2: Minimum Technical Specifications

S No.	MINIMUM SPECIFICATIONS REQUIRED
1.0	**Structured Cabling System with proper termination in Jack Panels and Racks for LAN Works** All passive network components quoted by the bidder should be from a **single OEM** only. All OEM of passive network components should be ISO 9001:2015 & ISO 14001:2015 Certified. Material should have been manufactured in OEM's own manufacturing facilities. All passive components should be RoHS complied. Declaration of – ROHS compliant should clearly be mentioned on data sheets of each Passive Components, or a separate RoHS declaration must be submitted. There should be minimum 20 years application assurance warranty as a part of certification of entire installed cable in plant. All Ethernet switches quoted by the bidder should be from a **single OEM** only
1.1 *	**Fiber Cable 6 Core single mode, armoured** **Make & Model offered**: Shall be 6-core Single Mode OS2, FRLSZH Single Jacket, Single Armor, Gel-free, Fiber Cable. Applicable Qualification Standards shall be EN 187105/ EN 50173 and Telcordia GR-20 & GR-409 (as per requirement) As per ITU-T G.652.D/ ITU-T G.657.A1 (Bend Insensitive), ANSI/TIA-568 C.3 (OS2). RoHS 2002/95/EC compliant Total number of fibers shall be 6, with 1 Central Loose Tube (Unitube) Design (Gel Free). The Fiber shall have FRLSZH outer jacket, with Corrugated Steel Tape Armoring with FRLSZH Sheath as per IEC 60332. The Fiber shall be Black in color to ensure UV stabilized. The Fiber should have protection the fiber cores from water. Central strength member shall be FRP Rod. The Fiber shall be suitable for Aerial (lashed), Indoor and Outdoor Ducts or Direct Burial applications. Shall be supplied with all accessories /consumables like clamps, ties etc. as per the industry standards to tie cables on trays etc.
1.2 *	**Fiber Patch Panel 12 Core Single mode** **Make & Model offered**: Shall have 12 nos. of ISO/IEC-11801-OS2/ ANSI /TIA-568C.3 Bend Insensitive Pigtails as per ITU-T G.652.D / G.657.A1 with LC Type connectors. Fiber Pigtails shall be Low-Smoke & Zero-Halogen IEC-60754 Shall have all accessories including, but not limited to, the front panel, coupler plates, blanking plates, duplex LC couplers (OS2) for terminating fibres on the FOPP Shall be Front Patching Type, 1U high and rack mountable on standard 19" rack with mounting arrangements Related certification / documents to be submitted. Shall be supplied with all consumables for fusion splicing for termination of fibre Shall be made of powder coated steel. Shall have all necessary accessories for fibre management inside such as Fibre guides, radius controls & secure tie-downs within the FOPP Shall include all accessories for terminating, single mode pigtails with LC type Connectors, Splicing sleeves and splice tray
1.3 *	**LC-LC single mode Duplex Patch cord** **Make & Model offered**:

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	Length shall be 3 meters
	Shall be Duplex Single Mode OS2, Bend Insensitive as per ITU-T G.652.D / G.657.A1 Fiber Optic Patch Cords.
	The fiber cable jacket shall be LSZH, and Riser rated. The flame test method shall be compliant to IEC 60332
	Patch Cods shall be LC/UPC to LC/UPC
	All patch cords shall be factory terminated and packed
	Shall be RoHS compliant
	The cable of the patch cord shall not be twin zip, the fiber cores shall be enclosed in a single jacket.
	The polarity of the connector shall be changeable on the field without any tools
1.4 *	**Supply and Installation of OFC Joint Pits/ Splicing Enclosures** **Make & Model offered:**
	Shall be a butt type enclosure with a dome and base (IP 68 Rated)
	The Cable entries should be through the cable ports located in the base.
	The dome and base should be sealed using a clamp with O-ring system. The cable entry ports should be sealed mechanically instead of heat shrink.
	IP68 Rated
	No. of Splice trays: 4 nos.
	Splice Tray Capacity: 24 Fibers
	No. of cable entry ports: 4 round ports and 1 oval port.
	The closure should have the capability to accommodate loop cables (uncut loose tube cables)
	The cables should be secured to the closure using hose clamps and a cable attachment device.
	The closure should have a basket for storing loose tubes.

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1.5 *	**OFC Building Distribution Enclosure IP 54** **Make & Model offered:**

Compact Building Fiber Distribution box, wall mountable fiber enclosures for indoor and outdoor use. They are specifically designed for fast deployment and easy customer connection.
It should be easy to install
It shall be compact and flexible design
It shall have Fire retardant, LSZH materials
It shall be UV stable material for outdoor above ground use
Bottom cable seal blocks with seals for different cable types
Allows integration of passive optical components
It shall have UMS (Universal Mounting System) available to mount splice modules
Shall meet the IP55 Rated.
It shall be water and dust proof and insect proof.
No. of Splice trays: 4 no.
Splice Tray Capacity: 12 Fibers
No. of Drop cable entry ports: round ports.
Shall have 1 Mid Span Port
Shall have removable enclosure lid
Storage temperatures of -20°C to +70°C.
It should also be termite proof and provide positive sealing against dust and water.
The product and its components shall be free from any defects. Metal parts shall be corrosion resistant.
The Building Fiber Distribution Box should have the capability to accommodate loop cables/Mid Span.
The Building Fiber distribution box should be Wall mountable.

1.6 *	**Ethernet switch Rack-15U** **Make & Model offered:**

Shall be wall Mounting type
Shall have the following dimension: 550(W) X 600 (D) X 15 U (H)
Shall conform to DIN 41494 / EIA- 310
Shall be Powder coated steel cabinet and cabinet colour shall be black RAL 9005
Shall have Locking arrangement as per OEM standard
Shall have 19 inch rail equipment mounting frame with notches at regular intervals for mounting equipment's as per industry standard
Shall have Front door with glass cover
Shall be provided with 2 Nos. Horizontal cable manager
Shall have 2 nos. Brushless fans with fan tray mounted on the top cover for equipment cooling
Shall have 2 nos. Power distribution Units (PDUs) strips each with 4 nos. 3-pin socket 16/6 A, 230 V AC power outlets and cabinet Earthing / grounding facility shall be provided
Shall have ventilation louvers or uniform perforation on side panel and rear door
Shall have Steel top cover and bottom panels with cable entry facilities
Shall have accessories (such as nuts, bolts, washers, clip-on nuts for equipment mounting etc.) and assembly hardware
LED light shall be provided in cabinet

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1.7 *	**Pre lubricated HDPE PLB Duct - ISI Approved** **Make & Model offered:** HDPE (High Density polyethylene) telecom ducts for use as Optical Fibre Cable ducts. Smooth inside & outside surface free from blisters, shrink, hole, scratches & roughness Outer diameter: 40 +/- 0.4 mm Color – Yellow with Black stripe Length - 500 Meter Roll Accessories: Coupler, End Plug, Endcap shall be included Suitable for direct burial applications Manufacturer Company should be ISI certified
1.8 *	**PVC conduit pipe with accessories** **Make & Model offered:** Construction - Both the surface should be smooth and free from burrs Maximum OD - 32.00 MM ISI Marked
1.9 *	**PVC channel with accessories** **Make & Model offered:** Maximum OD - 25.00 MM ISI Marked
1.10 *	**CAT 6A LSZH UTP cable 305m box** **Make & Model offered** The UTP Cat 6A Gigabit copper cable as per ANSI/TIA-568C.2 4-pair, Cat 6A U/UTP Cable, Category-6A with ETL 4 connector channel test/equivalent report as per ISO/IEC 11801, 23 AWG bare solid copper. ETL 4 Connector channel Test report, Performance ETL/equivalent Verified Certificate. RoHS Compliant. Sheath should be LSZH as per flame rating standard IEC 60332. PAIRS with Standard Color Code & length: 305 Mtrs. (1000 ft.)
1.11 *	**CAT 6A Jack Panel - 24 port** **Make & Model offered**: Shall be loaded with 24 nos. Category-6A I/O complying with TIA-568 C. Cat 6A U/UTP Jack Panel should be UL Listed, RoHS Compliance Shall be 19” rack mountable and of 1U/2U height & complete with all mounting accessories. Shall have rear cable management features, shall be loaded and shall have termination manager for proper termination of cables at rear. Shall have Comprehensive individual port numbering on front. Shall be supplied with Rear cable management as a standard accessory and this shall only occupy the same space as the panel. The patch panel type shall be a 1U panel capable of supporting 24 unshielded modular 8-pin connectors compliant with IEC 60603 while meeting the Channel Performance. Panel shall be made of High-impact, flame retardant, thermoplastic and Powder coated steel.

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1.12	*	**CAT 6A LSZH Modular Patch Cord-3FT** **Make & Model offered:** All patch cords shall conform to Category-6A as per the ANSI /TIA-568C.2 Shall support network line speeds up to 10 Gbps Shall have factory crimped RJ-45 jacks at both the ends and length should be available in feet/meter The Patch cords shall be solid core construction to provide superior performance. Shall be compliant with ISO/IEC 60332 ETL/UL/equivalent Electrical performance testing of telecommunications patch cords to the requirements ISO/IEC 11801 for Category 6A patch cords shall be submitted.
1.13	*	**CAT 6A LSZH Modular Patch Cord-7FT** **Make & Model offered:** All patch cords shall conform to Category-6A as per the ANSI /TIA-568C.2 Shall support network line speeds up to 10 Gbps Shall have factory crimped RJ-45 jacks at both the ends and length should be available in feet/meter The Patch cords shall be solid core construction to provide superior performance. Shall be compliant with ISO/IEC 60332 ETL/UL/equivalent Electrical performance testing of telecommunications patch cords to the requirements ISO/IEC 11801 for Category 6A patch cords shall be submitted.
1.14	*	**CAT 6A I/O** **Make & Model offered**: Cat 6A UTP Jack PCB/PWB based Information Outlet (I/O) RJ45, TIA-568 C.2 Category-6A. UL Listed, ETL Channel test report as per ISO/IEC 11801, ANSI/TIA 568 C.2. High-impact, flame-retardant, UL- RATED 94v 0 thermoplastic – ABS, Plug Insertion Life Min. 750 times as per IEC 60603. The information outlet must support 90-degree cable termination, RoHS compliant. Cat 6A UTP Jacks should be available in different colors for easy identification.
1.15	*	**CAT 6A Face plate including Gangbox** **Make & Model offered**: Shall be (RJ45) square plate, dimension as per commercially available modular office furniture. Shall have spring shuttered front access for preventing ingress of dust. Shall Supply Gang Box of the same size. Safety Standard UL/ETL/equivalent Listed, RoHS Compliant. Shall have Write on labels in transparent plastic window along with the plate. Shall have Screw hole covers along with the plate. Shall be able to support variety of jacks – CAT 5e / CAT 6 / CAT 6A UTP
2.0		**Active Components**
2.3	*	**Access Switch-24 Port** **Make & Model offered:** **Specifications** Minimum 24 x 10/100/1000 Base-T PoE+ and 4 x 1/10G ports DAC/Stack cable to be provided to achieve MLAG/Stacking/virtual-chassis

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128Gbps or higher Backplane capacity and minimum 95 Mpps of forwarding rate
Should support Non-blocking hardware architecture, all proposed ports must provide wire speed line rate performance. Switch should have trusted modules/mechanism for secure OS boot/authentication process or secure boot process
All interfaces should provide wire speed forwarding for both Fiber and copper ports
The Switch should have minimum 360 W PoE Budget
The switch should support IEEE802.3af and IEEE802.3at on all ports.
Support for VLANs, IPv4 routes, MAC address
It should support IGMP snooping v2 & v3
It should have static IP routing, RIP and OSPF from Day-1 Switch should support VXLAN with L2VNIs
Switch should support 8 hardware queues per port Switch should support ACL entries IPv4 and IPv6
Switch should support Strict priority queuing / WRED/DWRR or equivalent
Switch should support streaming/Flow Based telemetry capability
Should support IPv4 and IPv6 security features
Should support Secure Shell (SSH) Protocol and Simple Network Management Protocol Version 3 (SNMPv3).
Switch needs to have dedicated OOB 1G port, console cable and 19" rack mounting kit to be provided along with.
SFTP/SCP for upgrading the operating System
IEEE 802.1x support, IEEE 802.1D Spanning-Tree Protocol, IEEE 802.1p class-of-service (CoS) prioritization, IEEE 802.1Q VLAN
SNMP v1,v2,v3, sflow/netflow, NTP/Precision time protocol
Switch should be manageable through both IPv4 & IPv6.
Certification
The Switch Series/Switch OS Series should be EAL 3 or above/NDPP/ NDcPP certified under Common Criteria. Offered Switch/Switch series shall be certified for Mandatory Conformance (MTCTE - Mandatory Testing and Certification of Telecommunication Equipment) issued by TEC (Telecommunication Engineering Centre), DoT.
Warranty and Support
The below Warranty and support shall be offered directly from the switch OEM.
The OEM should have TAC centre in India and also 24x7 TAC support with Indian Toll free number – reflected in official website/documents. NBD support to be provided.

All necessary items like licenses, management modules, hardware such as 3-pin power cords suited to Indian environments, console cables, hardware, cables, connectors, mounting rails, clamps and any other required accessories for mounting in rack, supports, fittings etc. required for installation of the switch shall be included in the supply

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2.5 *	**10G SFP+ LR Upto 10 Km** **Make & Model offered**:

Transceiver Type SFP+
Product Type Optical
Transceiver Connector Duplex LC
Signaling rate, each lane 10 Gbps
Transmitter fiber SMF
Transmitter wavelengths (range)1260 nm to 1355 nm
Transmitter output power, each lane (minimum)–8.2 dBm
Transmitter output power, each lane (maximum)0.5 dBm
Receiver input power, each lane (minimum)-14.4 dBm
Receiver input power, each lane (maximum)0.5 dBm
Core size/cladding, 9/125 µm
Distance up to 10 km
Operating Temperature (range) 0° C to 70° C
Storage temperature –40° C to 85° C
The Transceiver should be of the same OEM as that of the switches

* -> Item quantities are tentative in nature which may vary and shall be procured and installed as per actual requirements at site on unit rate basis. All Active components (switches) shall be from **same OEM** and all passive components (copper and fiber) shall be from **same OEM**.

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PROCEDURE FOR SMART INTEGRATED ENGINEERING & DIGITAL HANDOVER FOR DRAWINGS / DOCUMENTS / TRACKING

PROJECT	**:**	**PMC AND EPCM SERVICES FOR POLYPROPLENE PROJECT OF BPCL KOCHI REFINERY**
OWNER	**:**	**BHARAT PETROLEUM CORPORATION LIMITED (BPCL)**
PMC/EPCM	**:**	**ENGINEERS INDIA LIMITED (EIL)**
JOB NO.	**:**	**B895**

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
0	05.12.2024	ISSUED FOR TENDER	VSY	MK	SV

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1. GENERAL

This chapter details the requirements pertaining to various drawings and documents to be generated at various stages during the course of execution of the project by the BIDDER for activities associated with Smart Integrated Engineering. These stipulations are supplementary to following specifications (enclosed elsewhere in the Tender):

S. No.	Spec. No.	Specification detail
1.	6-78-0001	Specification for quality management system requirements from bidders
2.	6-78-0002	Specification for documentation requirements from contractors
3.	6-78-0003	Specification for documentation requirements from suppliers

The BIDDER shall recognize that efficient handling of drawings and documents to be prepared by him under the contract is the key to the timely completion of the plant.

The BIDDER shall undertake to ensure that all drawings and documents to be submitted by him to the OWNER/CONSULTANT shall be of professional quality and conforming to the contractual requirements.

The BIDDER shall submit the drawings through the consultant's VENDOR document management system for review by OWNER /CONSULTANT, and shall maintain a record of drawings submitted till date at all times.

BIDDER shall provide COMOS Software platform and submit all the drawings and documents in COMOS System for the project. Bidder scope also includes conversion of documents of LLI vendors in COMOS.

Compliance of this chapter on drawings and documents is mandatory and is non-negotiable.

Computer aided design and drafting shall only be used. Standard, approved and well-established PC based computer programs/software packages, available in market shall only be used by the BIDDER / Vendors / sub-Vendors etc.

All documents, before forwarding to OWNER / CONSULTANT shall be vetted in detail by BIDDER. Documents received without vetting will be returned without review. Also, any inaccuracies / mistakes found will not only be rectified by the BIDDER but the CONTRACTOR shall remain liable for bearing charges towards efforts spent by OWNER/CONSULTANT for discussing the same. Delay owing to these shall be to the account of BIDDER.

Review of the drawings/documents by OWNER/CONSULTANT would be only limited to the review of compatibility with basic designs and concepts. The review by the OWNER/CONSULTANT shall not be construed by the BIDDER as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and drawings.

All drawings, datasheets, specification & model etc. shall be generated by use of authoring tools specified elsewhere in the contract document. The digital handover shall be in soft native files along with associated database.

BIDDER shall furnish 3D model (with complete details with respect to equipment, Piping, Civil, Structure, Electrical & Instrumentation (AS APPLICABLE) in line with scope of work

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for 3D modeling) for the process unit with dynamic walk-through facility to check any interference, requirement of safety, operation and maintenance for getting approval from OWNER/CONSULTANT with input data. Associated data base files along with library shall also be furnished at 30%, 60% and 90% model reviews.

Each drawing submitted by the BIDDER shall be clearly marked with the name of the Owner, the unit designation, the specifications, title, the specification number and the name of the Project with revision No. and date. If standard catalogue pages are submitted the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawings shall be in English. The template shall be approved by the consultant/client. All documents shall be prepared on the approved template.

All the Engineering design and specifications shall be normally prepared in MKS system except for Civil / Structural, wherein the SI system is in vogue based on applicable design codes. Upon receiving comments on Drawings/Documents, the BIDDER shall provide compliance report, separately on each of the comments, document-wise, along with the subsequent submission. Comments given by OWNER/CONSULTANT shall be discussed, if required, and finalized within the agreed schedule.

The schedule of submission of Drawings/Documents shall be in accordance with project plans only. The detailed list under different category, document-wise, shall be prepared by BIDDER for review/records of OWNER/CONSULTANT.

The BIDDER shall maintain up-to-date record of drawings & document status and make regular issue of drawing/documents index **discipline wise, on monthly basis, with copies to OWNER / CONSULTANT Site &, H.O.** indicating schedule date of submission, submission date of various revisions and date of review with code of review/ approval.

2. Category of Documents and Cycle Time

The handling-over of documents to OWNER / CONSULTANT by BIDDER shall be as follows:

2.1 OWNER /CONSULTANT's Review/Records

A detailed document list clearly identifying review / records category against each document shall be developed. Following may please be noted for all the documents engineered by the BIDDER:

a) Review

BIDDER can proceed if OWNER / CONSULTANT's comments are not received within 15 working days of its receipt by OWNER / CONSULTANT. However, if major deviation to contract specification for any design deficiency is detected in the course of review after stipulated period, it shall be the responsibility of the contractor / BIDDER to see that such deviations and deficiencies are corrected to ensure compliance to contract without any cost and time implication to Owner.

b) Records

BIDDER shall submit documents for OWNER/CONSULTANT's information and proceed with the work. OWNER/CONSULTANT comments, If any, which relates any cost and/or time implication to the owner due to inadequacies/inaccuracies may be bought to the attention of BIDDER at any stage for incorporation without any cost or time impact to owner.

The documents falling under review category shall in general, except for drawings requiring multi-

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disciplinary review, be returned with comments within 10 working days.

Documents submitted without meeting pre-requisite requirements will be returned without review.

However, documents like equipment layout etc. where multi-disciplinary activity is involved, the BIDDER, after submission for OWNER/CONSULTANT's review, shall visit OWNER/CONSULTANT for discussion for expeditious review of documents.

In absence of visit of BIDDER'S engineering team at OWNER/CONSULTANT office, review time shall be 15 working days. The information category document will be retained for records only. It is BIDDER'S responsibility to correct the deviation, if any, to the stipulation in the bid document, without any cost or time implication to Owner.

2.2 BIDDER Review

BIDDER shall furnish compliance statement to OWNER /CONSULTANT's comments while submitting the next revision within 10 days from the date of release of drawings and documents by OWNER/CONSULTANT.

2.3 Control and Monitoring of documents review and submission

Drawing schedule shall indicate the following:

- Schedule/Actual submission date to owner
- Category of submission
- Receipt of comments from Owner
- Category of return status from Owner
- Issue date for Construction

This updated schedule shall be issued on fortnightly/monthly basis, as agreed, and compared with Owner's log.

Detailed listing of documents (discipline wise) which are scheduled to be submitted or re-submitted incorporating OWNER/CONSULTANT's comments shall be provided by CONTRACTOR / BIDDER in the weekly meetings. Contractor / BIDDER shall ensure that drawings / documents are submitted as per the agreed schedule only. Bunching of documents/out of sequence submissions and consequential delay of documents and its review thereof shall be exclusively attributable to BIDDER.

2.4 Pre-Requisites from Contractor

2.4.1 At the kick-off meeting, the BIDDER must submit discipline wise list of documents and drawings index.

2.4.2 The Drawing Index (discipline wise) shall include description of drawings/ documents, category of drawings, scheduled date of submission, actual date of submission, review code received with dates. This shall be updated fortnightly/monthly, as agreed by BIDDER and copies issued to OWNER / CONSULTANT site and H.O. as well as Owner. Drawings submitted before finalization of drawing index shall be rejected.

2.4.3 BIDDER shall separately submit list of drawings/documents involving multi-disciplinary reviews, considering the OWNER / CONSULTANT departmental activities (furnished in the contract) during the kick off meeting itself. They are also highlighted in the discipline- wise document list.

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2.4.4 Critical and typical drawings / documents having impact on schedule and quality should only be identified for such timely reviews in Document Control Index. This shall be adopted after receipt of drawings / documents indexes from the BIDDER at the kick-off meeting with mutual understanding of the CONTRACTOR / concerned specialist / Owner.

2.4.5 Any deviation on Record category drawings / documents and on review category drawings observed later or in execution at site during site visit/technical review by OWNER/CONSULTANT shall be taken seriously. Contractor shall rectify the same at his own cost and time.

2.4.6 BIDDER shall plan submission progressively so that no bunching takes place in any discipline.

2.4.7 Review period shall be reckoned from the "Date of Receipt" of documents/drawings at OWNER / CONSULTANT to the "Date of Receiving" the reviewed documents by the BIDDER from OWNER /CONSULTANT office. BIDDER shall monitor submission and receipt.

2.4.8 Documents/drawings received prior to holiday / week end shall be accounted as received on the following working day and the review period committed shall include only working days.

2.4.9 Quality of drawings/documents is the essence for a timely review. If major comments/deviations to the contract document are noticed, the drawing shall be returned in Code-3.

2.4.10 Sequence of submission of drawings is essential for proper review of documents and timely completion of the project and the same is to be adhered to. In case sequence is not maintained, the documents submitted shall not be reviewed by OWNER/CONSULTANT and the responsibility of timely execution of the plant shall remain with BIDDER.

2.4.11 Piping/Instrument & other engineering drawings/documents shall be issued only after the corresponding P&IDs & Process documents coming under review category are first reviewed by the concerned department in code-2 as a minimum.

2.4.12 In principle, BIDDER is not expected to revise drawings/documents already reviewed in Code-1.

a) If it is of utmost necessity to revise or add some minor details in Code-1 drawings, BIDDER shall highlight such revisions by marking "CLOUD" to such additions/alterations. BIDDER is also needed to provide a "BLOCK" in the drawing indicating reasons of such changes and to insert another "Review Block". OWNER / CONSULTANT shall put relevant code for such revisions only. Code marking given by OWNER / CONSULTANT on such revisions shall not change the category of drawing.

b) Any major change in Code-1 drawing shall call for preparation of new drawing.

2.4.13 Based on the confidence gained on BIDDER'S quality of drawings/documents already submitted, "Review Category" drawings could be retained as Information/Records and vice versa at the discretion of OWNER/CONSULTANT. This however, does not change the category of drawings.

2.4.14 Once a document is already reviewed in Code-2, subsequent submission due to non-incorporation of comments shall not be accounted for any contractual commitment of review period from OWNER / CONSULTANT. BIDDER is expected to comply with OWNER / CONSULTANT's comments in the next revision after Code-2 and is required to submit a compliance report accordingly.

2.4.15 Deviation permit, submitted for seeking deviation in BIDDER document management system,

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shall be separately identified and shall not be considered as a document for timely approval/review.

2.4.16 When OWNER/CONSULTANT deploys engineers at the BIDDER'S work center following shall be satisfied:

- Review is limited to identified long delivery/schedule critical items only.
- Readiness of documents/drawings shall be ensured by the BIDDER.
- Presence of lead engineers of all disciplines of the BIDDER.

2.4.17 If OWNER / CONSULTANT highlights any necessary rectifications required in the construction at the time of Technical Review/Audit, construction executed based on record category drawings not complying with Bid requirement, BIDDER shall rectify without any impact of time and cost to Owner.

2.4.18 BIDDER shall submit designs drawings for review only after the corresponding GA / Equipment datasheets etc. have been coordinated in his office and reviewed by OWNER / CONSULTANT engineers at least in Code-2. Such OWNER / CONSULTANT reviewed drawings shall be furnished along with drawings/designs for timely review.

2.4.19 BIDDER shall open an engineering office in India (applicable for foreign bidder) for speedy document submission and to help faster review of the drawings & documents.

2.5 Approved for Manufacturing / Construction Drawings:

Drawings reviewed under Code-1 & Code-2 required for execution at site shall be decided by BIDDER and copies need to be sent to OWNER / CONSULTANT.

- "**Approved for Manufacturing / Construction**" stamped/sticker drawings shall be issued by BIDDER for manufacturing and execution

- "**Approved for Construction"** stamped/sticker shall be done separately on the reviewed print and not on the Title block.

- Copies of only reviewed or final documents like design calculations, design basis etc. shall be sent to OWNER /CONSULTANT site for records.

- Copy of such transmittal shall be sent to OWNER / CONSULTANT (HO) for records.

2.6 Critical Drawing / documents shall be reviewed by Licensor during the course of Project execution, list of Licensor mandatory review document is enclosed elsewhere in the contract.

2.7 Mandatory compliance to the smart engineering activities at Contractor's / BIDDER's end

2.7.1 All P&IDs need to be smartly developed in Smart P&ID. All the constituents of P&ID need to be mapped with database/database driven. There shall not be any graphics/symbols/texts in the P&ID. There shall not be any dummy graphics/symbols/texts in main body of the P&ID.

2.7.2 3D Modeling for Piping, Equipment, Instruments & Electrical need to be database driven. Dummy graphics need to be avoided. Quality check & data connectivity shall be ensured at Contractor's / BIDDER's end before submitting the data files/documents/3D Model to the Consultant.

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2.7.3 All the applicable deliverables shall be extracted from 3D model without any manual rework done thereafter. This is to maintain the consistency between 3D model and extracted deliverables.

2.7.4 Deliverables from 3D model shall be extracted only on conforming the alignment of interfaces with client model and clash free design.

2.8 Digital handover of Engineering Information

2.8.1 Smart Integrated engineering shall be utilized to carry out engineering activities. Intelligent Systems shall be used for the management of P&ID, Equipment layout, 3D Model, Piping, Electrical and Instrumentation design & deliverables including P&IDs, Reports, MTO, procurement etc.

The data in each such intelligent system, including the 3D Model, Intelligent P&ID's, Electrical and Instrumentation documents to be submitted by the Contractor in a predefined Software version/format, as tabulated below. The same shall be submitted by the respective BIDDER / Equipment suppliers strictly without any deviation.

All documents shall be submitted online (in Owner / Consultant Documentation Portal) for review and approval by Owner / Consultant.
All project documentation shall be as per BPCL specification for handover of Engineering Information- document No. 03/DE/TR/EIS/HDVR (attached as Annexure-I).

All the documents developed and submitted by BIDDER / Suppliers shall be in software as defined in Table-1 below.

Software versions / Format Requirements

The definition is in general terms containing (native (N), image (I), portable document format (D)) the formats in which Contractor shall provide electronic versions of Documents. Acceptable applications for each format type are listed in the table below.

TABLE-1

Data/Document Types	Authoring Software*	Version
2D CAD	E3D, AutoCAD	2019/2018
Intelligent P&IDs	Smart PID	V11
Instrument Index, Datasheet etc.	Smart Instrumentation (SI)	2018
Electrical Load List / Interconnection details / Cable Schedule	Smart Electrical (SE)	V10
3D Model	E3D	2019

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Text Documents/Reports	MS Word as agreed with Company	
Datasheets/Lists	MS Excel or Adobe Acrobat as agreed with Company	
Email	Rich Text Format	
Schedules	Primavera	
Organization Charts/diagrams	Visio, Microsoft power point or as agreed with Company	
Portable Document Format Files	PDF files shall always be directly generated to PDF from the authoring application. Scanned documents/Images which are converted to Adobe Acrobat format do not qualify as Portable Document Format files and shall be treated as image files for the purpose of format compliance.	

*In case documentation submitted is of authoring software mentioned below, the data has to be submitted comprehensively including databases, catalogs etc., as detailed here.

E3D	Project DBs along with Reference project for Catalogues, Standards, customization develop for the job etc.
INTERGRAPH SMART P&ID	SPID Project Backup along with deliverables extracted from SPID (P&ID, PDS, Line list)
AUTOCAD	DWG/DXF files
SMART Instrumentation	SPI Project Backup (DWG + Datasheets + Tags & Attributes in excel format)
SMART Electrical	SE Project Backup (DWG + Tags & Attributes in excel format)

2.8.2 Documentation in COMOS

All documents shall be handed over to OWNER / CONSULTANTS in COMOS Documentation Software platform

Process

Preliminary following to be ensured by Bidder while converting the smart P&ID in COMOS P&IDs.
1) All data of P&ID should be transferred to COMOS.
2) There should not be any loss/ Change in data/symbols while converting.
3) All attribute of smart P&ID should be transferred to COMOS with all details.
4) Reports should be extractable in editable form with all details filled as in smart P&ID.
5) Integration of COMOS software P&ID along with Vendor P&ID, EPC/EPCM P&IDs etc.

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Electrical

Inputs of various electrical equipment shall be provided in Autocad/Excel/PDF/Word format. Scope shall also include documentation in COMOS software.

Instrumentation

Inputs of various Instrumentation documents shall be provided in Autocad/Excel/PDF/Word format/ SPI. Scope shall also include documentation in COMOS software.

2.8.3 DELIVERABLES

Process

a) The P&IDs, PFDs and Interactive Operating manual, shall be created in COMOS format.
b) P&ID and PFD in AutoCad and COMOS with Database & attributes also.
c) Line List, Equipment List, and Instrument List etc extractable from COMOS based on database.

Electrical

Following Electrical documents shall be created in COMOS format under “Issued for Engineering”

a) Intelligent single line and circuit diagrams
b) Load Analysis
c) Motor list
d) LCS List
e) Switchboard feeder list
f) Transformer sizing

Following Electrical documents shall be created in COMOS format under “Issued for Construction”

g) Interconnection & Cable Schedule

Instrumentation

Following Instrumentation Documents shall be provided in COMOS
a. Index
b. Instrument Data Sheets
c. Point Data base
d. Instrument Loop diagram
e. Instrument Hookup diagrams
f. Cable Schedules

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Bidder shall consider the documentation license for COMOS software considering all the deliverables for all engineering disciplines.

3.0 Real Time Tracking of Major Shipments for BPCL-KR PP Project and Data Sharing for Use on Project Control Tower (PCT)

3.1 General Requirements

The Bidder / Vendor (directly and/or through their transport agency) shall provide real-time tracking information for all consignments as per the following:

Tracking information of all shipments through all modes of transport vs. Air, Land and Sea
GPS tracking for all shipments. EIL/BPCL reserves the right to exempt shipments of small value from GPS Tracking.
Electronic sharing of GPS tracking data (as applicable) and consignment tracking data (through Transport Agency's Transport Management System) via REST API and on web portal of Bidder / Vendor or transport agency, including depiction of location of consignments on map where GPS tracking is applicable
Tracking details for both international and domestic shipments.
For International Shipments mandatory vessel tracking through AIS (Automatic Identification System)

3.2 Mandatory Tracking Information

The Bidder / Vendor must provide the following information for each consignment:

Unique consignment identifier
Real-time GPS coordinates for in-transit shipments
Scheduled, Estimated and actual departure times from point of origin
Scheduled, Estimated and actual arrival times at destination
Current location and status updates on a daily basis (GPS Status updates shall be live)
Total Distance, Cumulative Actual Distance Travelled, Daily Distance Travelled to be updated on Daily basis.

Any deviation from planned route or schedule
Detailed consignment route details with GPS coordinates for key touchpoints like ports, terminals and warehouses.

3.3 Data Sharing Protocol

The Bidder / Vendor shall:
Provide access credentials for their tracking platform as applicable
Share tracking data in real-time for GPS tracking and daily basis
Provide notification of any tracking system failures/ downtime or data gaps

3.4 Security and Confidentiality

All tracking data shall be treated as confidential information
Data transmission must use secure protocols
Bidder / Vendor shall comply with relevant data protection regulations

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TECHNICAL SPECIFICATION FOR HANDOVER OF ENGINEERING INFORMATION

1. INTRODUCTION

1.1 SCOPE

This Specifications covers the requirements against which Designers, Manufacturers, and Suppliers shall deliver information to enable project handover and reduce the need to reclassify, reformat and rework the documents and data at handover points during the project life-cycle. This specification addresses the requirements for document and data handover from the Contractor / PMC to the owner who will commission, operate and maintain the plant. All documents and data required by the Project's scope of work shall be handed over in accordance with this specification.

1.2 DEFINITIONS

The **Contractor** is the party which carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or facility. This term shall also include consultants and Process licensors.

The **Manufacturer/Supplier** is the party which manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Owner** is the party which initiates the project and ultimately pays for its design and construction. The Owner will generally specify the technical requirements. The Owner may also include an agent or consultant, authorised to act for, and on behalf of, the Owner. NOTE: In some places the Owner is also referred to as the "Company" or as "BPCL-KR"

The word "**Structured data**" means that the data can be accessed and manipulated directly by computer programs without human intervention. In this form, information adheres to a well-defined model. Structured information may be quantitative (such as structural analysis data), descriptive (such as finishes or coatings) or graphical (such as schematic diagrams, scaled drawings or 3D CAD models). This information form allows for automated—and therefore cost effective—editing, search, retrieval and update, while maintaining the intelligent information content.

The information may be database information (such as equipment data or line information) or graphical information such as intelligent schematic diagrams or 3D CAD models.

All structured data shall be delivered in a structured data format such as spreadsheet, database or XML format. In this specification, S/D is an abbreviation for Structured Data.

Native File is the form in which the electronic file is created by specific software application that was used to edit or author the document, such as AutoCAD .DWG file, CAESAR .C2 file or Microsoft Word .DOC file. If the information has any structure then it will only be interpretable by the original application that created it (or other software that can translate it). The details about the characteristics of information to be handed over in this form is specified elsewhere in this document.

The word **shall** indicates a requirement. The word **should** indicates a recommendation.

2. GENERAL

2.1 PURPOSE OF AN ENGINEERING INFORMATION SPECIFICATION

Accurate and appropriate asset information is crucial for the efficient and safe operation of a facility. During the project development phase of a facility a vast amount of asset information is generated, normally with the express purpose of enabling the facility to be built. Traditionally, little attention is paid to developing the information in line with the requirements for the operational and maintenance stage of the plant life-cycle.

The purpose of this specification is to define, the information required to manage the effective execution of the project and also to Operate and maintain the facility after handover to the owner.

There are broadly two groups of information: Documents and Asset Information. Asset information is data which goes into operational applications (e.g. maintenance management systems and engineering systems). Document information is documents and their Meta data, which typically go into an electronic data management system (EDMS).

2.1.1 Delivery Schedule

All Pre-Project documents like Feasibility reports, scouting documents, study reports, Statutory approvals, licenses etc. shall be handed over within 2 weeks of receipt by the Project executing agency.

All drawings, documents and data related to equipments supplied by Vendors/manufacturers shall be handed over, within 2 weeks from delivery at site or erection on foundation, whichever is earlier.

All documents required for pre-commissioning activities shall be delivered within a week of Mechanical completion.

All “As built” documents and data shall be handed over by the contractor after Mechanical completion and before startup of the Facility, but not later than 2 months from the date of Mechanical completion.

2.1.2 Media

Unless otherwise specified, information shall be provided as hard copy and soft copy on DVD-ROM, CD-ROM or flash disk and shall be labeled with a Transmittal Record. The number of hard copies shall be Three unless specified otherwise.

2.1.3 Deliverable packages

Different sets of information shall be delivered in separate packages. Documents and drawings related to different Tag numbers shall not be clubbed together into a single package.

2.1.4 Delivery format

Unless otherwise specified, data shall be delivered in the format defined in this specification. The order in which information appears in the tables is also the order in which the information shall be delivered. For example, if data is delivered in a spreadsheet, CSV file, or database, the column arrangement should be in the same

order as specified in the definition tables. Formats shall not be changed unless agreed by Owner.

3. DOCUMENTS

Documents are to be stored in an electronic document management system of the Owner, for which purpose pre-defined meta-data is also required, enabling effective storage, searching, and retrieval.

All document metadata and relations shall be delivered in a structured data format such as spreadsheet, database, text file or XML format as defined by the Owner and as specified in this specification.

3.1 META DATA AND STRUCTURE

Meta data is required for each document or drawing submitted, and shall be as per table A

3.1.1 Document number

The following rules shall apply to Document numbers:

1. The document number shall be unique.
2. If the number itself implies additional information it shall be based on Tag numbers, document attributes or relations.
3. If the number itself implies additional information it shall be based on information that will not change during the entire life-cycle, and shall be meaningful beyond the project phase.

3.2 DOCUMENT AND FILE REQUIREMENTS

3.2.1 Sheets

A drawing is a Document and all Document rules shall apply to it. Multiple drawings in a series shall not be clubbed as a single file.

3.2.2 Document Types

The Document Type classification is applied to ensure the nature of the document content is understood before the document is opened, and unexpected content is not contained within the document (e.g. a Document classified as an Operating Manual shall not contain drawings such as GA or cross sectional drawings. If necessary, they may be referenced instead).

3.2.3 File requirements

Each Document shall reference an electronic file containing an image, and/or the source information. The following shall apply:

- Each rendition of a Document shall be delivered in a single electronic file.
- Only drawings shall have multiple Sheets, and each Sheet shall be a separate document. Therefore, each sheet shall be created as a single electronic file. Multiple renditions of the same Sheet may be delivered as multiple files.
- As far as possible, page sizes shall be consistent across similar types of

documents.

- Any design or maintenance document that refers to a single item of Equipment, Tag or Model shall be delivered as a single file (e.g. 2 data sheets for 2 pumps shall not be delivered in a single file).

- Each electronic file shall be self-contained. It shall not require, or call in, any other electronic files for viewing or updating (e.g. X-Ref, shape files, fonts, MS Word template).

- The maximum file size for a document is 2 Mega-bytes unless otherwise agreed by the Owner.

- Electronic files shall accurately represent the information on the equivalent paper deliverable. The completeness of electronic files shall be the same as that of paper deliverables. Electronic native files need not contain the sign-off signatures for the current issue.

The following rules shall apply to file names:

- The file name shall be unique to the project.
- The file name shall end with the application file extension.
- The file name should include the Document Number and Revision.
- The file name shall only contain alphabetic, numeric, and underscore characters (no special characters are allowed).
- The file name of documents of tagged equipments shall begin with the tag number.
- The file name shall not contain or imply any relevance. It shall be possible to rename the file without affecting the viewing or editing of that file or any other file.
- File naming philosophy shall be agreed between the contractor and owner at the start of the project.

3.2.4 Electronic Files to be delivered

Unless otherwise specified final documentation shall be delivered as native electronic files. Additionally, a PDF rendition of all documents shall be delivered if specified by the Owner. In this case, PDF files shall be rendered directly from the authoring application to preserve image quality and embedded text.

Unless otherwise specified non-final documentation shall be delivered in PDF files.

Paper or Hardcopy is required for some legally binding agreements and for certificates carrying original signatures or marks that authenticate a document. These hard copy formats shall be deemed to be the original native format.

3.2.5 Information to be provided along with all documents as document Index.

The following information (metadata) shown in **Table-A** shall be provided for all Documents (including drawings), in Microsoft Excel format whenever they are submitted to the owner. The format of the columns shall not be changed.

Table - A		
COLUMNS	**DESCRIPTION**	**EXAMPLE**
SL NO	Serial Number (running number of rows)	98
UNIT	Process Unit in the Plant breakdown hierarchy	CDU
SUB UNIT	Process Sub Unit	IC
EQPT TAG NO	Tag Number of equipment	IC-P-106
EQUIPMENT NAME	Description of Equipment	NAPHTA PUMP
EQUIPMENT TYPE	Type of Equipment from BPCL type list mentioned in separate table	PUMP
DOCUMENT TYPE	Document Type Folder, mentioned in separate table	GA
DRAWING NO	Drawing Number as per BPCL/EPCM nomenclature	IC-P-106-BH-P-6417
SHEETS	Sheet Number that the drawing / document represents	1 OF 8
REVISION	Revision number of the document	5
TITLE	Document Title	GENERAL ASSEMBLY & DETAILS FOR NAPHTHA PUMP: IC-P-106
VENDOR NAME	Name of Vendor supplying the equipment	BHEL
P.O NO	Purchase Order Number for the Equipment	4504018162
FILE NAME	Filename and path of the location where the document is stored	D:\Pumps\IC-P-106_GA_01_R05.pdf
CONSULTANT	EPC / Engineered by	EIL
DOC STATUS CODE	Document status code (mentioned in separate table)	AS-BUILT
PAGE SIZE	Page size (A0, A1, A2, A3 or A4 / other)	A1
PLANT CODE	Plant code	CDU
AREA CODE	Area code	IC
MANUFACT NAME	Manufacturer's name	FLOWSERVE
MODEL NO. / TYPE	Manufacturer’s generic identifier of an item	FSP-196-AHX
REQ NO	Purchase requisition number	A307-IC-PR-4550
AUTHOR	Document Author	BHEL -HYDERABAD

3.2.6 Image quality for scanned documents

No documents shall be accepted as electronic images except statutory / legal documents containing a wet signature and/or official stamp(s). These documents will be accepted as scanned / image files. Scanned documents shall comply with the following rules:

- Documents shall be scanned at their original size directly from the original hard copy.
- Images shall be scanned in an orientation that allows viewing without rotation.
- The minimum scan resolution shall be 300 dpi for A4 and A3 size documents. For scans of handwritten documents the minimum scan resolution shall be 600 dpi for A4 and A3 size documents.

3.2.7 Hyperlinks

Hyperlinks may be made between information within the same document. Hyperlinks shall not be made between different documents.

3.2.8 Special characters

Special characters shall not be used in file names, attributes, text or data. .

3.2.9 Date format

The date format for all information shall be DD-MM-YYYY (e.g. 18-08-2003).

4.0 Structured Data Requirements

Structured Engineering Data of the entire facility may be in the form a single database or multiple databases. The structured data / information will typically appear on data sheets created by the Licensor/EPC/Vendor/Contractor during design stage (with input on actual values from equipment suppliers). The information to be handed over at the completion of the contract should typically include *all* of the information found on Contractor's or supplier's *standard* data sheets. If Contractor's standard data sheet does not include a particular piece of information specified in this specification, then that piece of information should be supplied as part of the Structured Engineering Data.

This database will form the backbone of a shared repository of accurate project engineering information, which is utilized and populated during the various stages of the project design, construction and commissioning. This database shall be handed over to BPCL upon completion of the project.

The Structured Engineering Data must include not only the necessary information but also the necessary associations to ensure that lists can be generated from the Structured Engineering Data.

The information stored in the Structured Engineering Data will contain the necessary information and associations to enable suitable query tools to extract the following lists. The lists shall be generated in Microsoft Excel format unless otherwise specified.

4.1 Master Equipment List

The following is data required for all plants and equipment. This data will form the Master Equipment List which is required for the control and issue of tag numbers for

future projects.

Information	Description
Tag Number	Location and functional identifier of item / equipment.
Service	Duty of item currently associated with equipment.
Description	General description of equipment.
Parent Tag	Associated main or major item currently associated with the equipment.
Location	Area location.
Systems	Identifier of the process utility or other system of which the equipment forms part.
Serial Number	Manufacturer's unique identification Number
Vendor	Person/source upon whom order is placed.
Order Number	Number of purchase order placed on vendor.
Type/Model	Manufacturer's generic identifier of an item currently associated with equipment.
Original Equipment Manufacturer (OEM)	Name of Manufacturer who manufactured the equipment.

4.2 Cable Schedule Information

The Cable Schedule is a list of all cables used in the construction of an operating plant. Each cable in the plant, whether for power, communications, or other purposes, must be included in the schedule. This listing is used during both start-up and commissioning and as a troubleshooting and maintenance tool. Refer to the Electrical and Telecommunications discipline sections for descriptions of specific data items.

Information
Cable Number
Number of Cores
Cross Sectional Area
Estimated Length
Location
From Tag
From Location
From Gland
From Termination Drawing
To Tag
To Location
To Gland
To Termination Drawing
Intrinsically Safe (Y/N)
Type of signal carried
System that cable is part of

4.3 Line Schedule Information

The Line Schedule is a list of each "line" in an operating plant. All process and utility lines shall be included in the list. This list is used to plan construction, start-up, commissioning, and maintenance work and includes at a minimum the following:

Line Schedule Information
Line Number
Size
Service
Spec
From
To
Design Pressure
Design Temperature
Operating Pressure
Operating Temperature
Test Pressure
Test Medium
Insulation Thickness
Insulation Specification
Trace Heating (Min Temp)
P&ID Drawing Number
Critical line (Y/N)
Stress Analysis Required (Y/N)
Designed for steam out (Y/N)

4.4 Control System I/O List

The Control System I/O list referenced in this document is a list of input and output signals for the plant process control system and relevant control system configuration information stored in the database (the Control System I/O list with full system data will be available from the Control System itself). Each tagged instrument item which interfaces with the control system, whether a physical item or a software function used in control system configuration, must be included in the Control System I/O list.

4.5 Instruments

Each “tagged” instrument item, whether a physical item or a software function used in control system configuration, must be included in the Instrument database table. The instrument data is used in conjunction with other documentation during start-up and commissioning, and is also necessary for plant maintenance and operation.

Information	Description
Tag Number	Functional identifier of the instrument.
Equipment/ Line Number	The tag number of the equipment or pipe line number that the instrument tag is associated with or installed upon.
Mechanical Connections	The type of connection associated with the instrument.
Gasket Type	The type of gasket required for sealing the mechanical connections of the instrument.
Calibrated Span	The calibrated operating range (including minimum and maximum settings) for the instrument.
Output Range	The output range for the instrument.
Trip Category	The trip category as defined in design basis

Set Point High	The trip or alarm high setting.
Set Point Low	The trip or alarm low setting.
Proportional Band/Gain	The details of a controller setting.
Integral Action/Reset	The details of a controller setting.
Derivative Action	The details of a controller setting.
ANSI Leak Class	The leakage class for control valves for sealing/shut off requirements.
Maximum Leakage Rate (Valves)	The maximum valve leakage to determine seating/shut off requirements.
Maximum Test Pressure (Valves)	The maximum test pressure to determine seating shut off requirements.
Bench Setting	The valve stroke and related information for setting up a control valve.
Operating Time To Open	The time a control or ESD valve takes to open.
Operating Time To Close	The time a control or ESD valve takes to close.
Valve Travel	The total length of the valve stem travel. Valve Action on Failure
Valve Action On Failure	The final position of the control or ESD valve on loss of input signal.
Hazardous Area Classification	The certification, gas grouping and temperature rating for hazardous area equipment.
Certifying Authority	The Certifying Authority for hazardous area equipment.
Certifying Number	The number of certificate as issued by certifying authority.
Reference Document Number	The document number for reference information.

4.6 Electrical

Information	**Description**
Overload Rating and Type	The type and setting of overload device for motors.
Contactor Rating and Type	The type and setting for contactor.
Lubrication Details	The lubrication requirement for rotating equipment and actuators.
Bearing Details (Drive and Non Drive End)	The bearing type, size details for rotating equipment.
Fuse Type/Rating	The fuse type and current rating for equipment.
Actuator Detail	The type and size of valve actuator.
Torque Setting	The torque setting for actuators.
Voltage Rating	The maximum and minimum voltage rating for equipment.
kW Rating	The kW power rating for the equipment.
KVA Rating	The voltage ampere rating for the equipment.
Phase	The voltage/current relationship for the equipment.
Frequency	The operating frequency of the equipment.
Speed	The normal operating rotational speed of the equipment.

AH Rating	Capacity rating of a battery.
Voltage/Cell and Total	The voltage per cell and total voltage for a battery.
Full Load Current	The full load current for the equipment.
Anti-Condensation Heater Detail	The type and make of heater.
Weight Dry/Empty	The weight of an item when dry and empty.
Transformer Ratios	The input/output ratio for a transformer.
Frame Size	The class and frame size for motors.
Switchgear Protection Rating	The load protection level on the system equipment.
Ingress Protection Rating	Rating for protection against ingress of foreign bodies for safety and hazardous equipment.
Hazardous Area Classification	The certification, gas grouping and temperature rating for hazardous area equipment.
Certifying Authority	The Certifying Authority for hazardous area equipment.
Certificate Number	The number of certificate as issued by certifying authority.
Reference Document Number	The document number for reference information.

4.7 Mechanical Equipment

Information	**Description**
Design Code	The industry standard to which the equipment complies.
Design Pressure	The pressure to which the equipment has been designed.
Design Temperature	The temperature to which the equipment has been designed.
Hydrostatic Test Pressure	The pressure to which the equipment is to be hydraulically tested.
Shell Test Pressure	The pressure to which a heat exchanger shall be tested.
Tube Test Pressure	The pressure to which a heat exchanger tube bundle is to be tested.
SWL	The safe working load.
Test Load	The load to be used in proof load testing an item.
Test Requirements	Defines the description of test parameters for an item i.e. SWL X 1.5.
Certification Requirements	The test or certifying authority for an item.
Weight Dry/Empty	The weight of an item when dry and empty
Tube Bundle Weight	The weight of a heat exchanger tube bundle.
Material	The physical composition of material for an item.
Operating Pressure	The normal operating pressure for the equipment.
Operating Temperature	The normal operating temperature for the equipment.
Connection Size and Rating	The dimensions, type and pressure rating of mechanical connections.

Gasket Type	The gasket details for mechanical connections.
Bursting Pressure	The design pressure at which a bursting disc will rupture.
Cold Set Pressure	The pressure to which a pressure relief valve is set up on a test bed.
Design setting	Design set point for Pressure relief devices
Back Pressure	The normal process pressure condition into which a relief valve vents.
Speed	The normal operating rotational speed for equipment.
Rotation	The direction of rotation as viewed from the NDE or DE (specify which).
Peak Load	The maximum working load/output power of the equipment.
Capacity	The volume of fluid/medium held or capable of being moved in a given time.
Number of Stages	The number of pressure stages in the equipment.
Seal Details	The manufacturer, type and size of seal.
Driver Details	The prime mover description.
Coupling Detail	The manufacturer, type and size of the coupling.
Certification Date	The certification test date (load test, pressure test etc.) for lifting equipment, vessels and PSV's.
Filter Element Detail	The manufacturer, type and size for filter elements.

4.8 Piping

Information	**Description**
Tag No.	Identifier of the valve / Relief valve
Type	The valve type
Valve Datasheet Number	Datasheet /specification number as detailed in valve specification.
Line Number	The identifier of line in which the valve is located.
Size - Inlet	Valve Inlet connection and bore size.
Size - Outlet	Valve Outlet connection and bore size.

5.0 As Built 3D Model

5.1 PDMS software version 12.1 SP4 (fix 28 or later versions), or AVEVA E3D, shall only be used for 3D modeling.

The objective of this 3D modeling is to deliver to OWNER i.e. M/s BPCL a complete 3D model which shall be utilized for all future detailed engineering related to maintenance, operation, revamping and any debottlenecking of the plant.

5.2 DELIVERABLES & DRAWING EXTRACTION

All reports and deliverables for various disciplines like Piping, Static and rotary equipment, General Civil, Structures, Electrical and Instrumentation shall be extracted from the system so that correct and coherent information and data flows across the project.

Complete 3D model along with as built GAD's, Isometrics, MTO reports extracted and 3D models for all disciplines, with any other document generated from 3D model and naming conventions with as-built updates along with complete reference databases, component catalogues for all the size range shall be handed over to owner. Apart from the 3D Model, all drawings like GADs, Isometrics etc. extracted from the model shall also be submitted by the Contractor in Electronic form. 3D model along with complete Project databases shall be submitted at each model review stage and as final as-built. The contractor shall also submit all the configuration files, customization files, templates and all referenced databases

3D Models shall be installed on one workstation at OWNER'S office/location by the Contractor to ensure availability of the updated 3D model at site throughout the execution period of the project and shall be continuously updated either through dedicated ISDN Link or broad band connection, or through CD's etc. (updates once a fortnight for the first 3 months and once a week thereafter). Updating of Model by any other means shall only be permitted if the specified means are not available.

Smooth handover of the deliverables with detailed index of all the models GADs, ISOs any other document/drawing to BPCL personnel shall be performed by the Contractor along with some minor modification works which might be required as per BPCL's requirements at the time of final handing over/commissioning the "As-Built" 3D model at BPCL.

a) GAD Extraction

Piping General Arrangement Drawings (GAD's) are to be extracted from the 3D Model on A0 Size with a scale of 1:33 1/3. Separate plans shall be made for each level. Dimensions shall be in millimetres while levels and coordinates in meters. Vital installations and Battery limits shall be marked with coordinates. All locating dimensions like spacing for Equipments, Structural columns, pipe to pipe, etc. shall be marked on the GAD's. Equipment Tag numbers, Line numbers, Instrument and Specialty Item Tag numbers shall be marked on the GAD's.

Electrical/Instrument ducts shall be marked and labelled. Access ways, Maintenance corridors, Drop out areas, bundle removal areas shall be marked on the GAD's. The Contractor shall show section / elevation view where the details are not clear from Plan View.

b) Isometric Extraction

Isometrics shall be extracted from 3D model using PDMS software along with Bill of Material and logical pipe supports.

5.3 If the Contractor uses any earlier versions of PDMS, the models shall be upgraded to PDMS 12.1 SP4 Fix 28 or later versions suitable for use with AVEVA E3D already installed at BPCL.

The PDMS/E3D database Administrator username and password for each project shall be provided along with the editable 3D model. The contractor shall provide XSL file containing PDMS project structure such as team, Database, MDB, etc. Any other database locks/encryption should be unlocked/decrypted and made read-write accessible before handover to BPCL.

There shall be no expiry date for any of the databases used in the project. The reference databases from all package contractors shall also be handed over to BPCL.

The configurations, templates, customizations, reports etc., carried out for the project shall have read/write access and BPCL should be able to extract the reports or modify them without any additional configuration efforts. Any pre-activity to be performed for generation of drawings / reports / model export / design / drawing etc. should be informed to BPCL during final handover of the "As-built" 3D model. An Administrator reference document clearly documenting the above requirements for the entire project shall be part of the final documentation.

6.0 Handover Information, Information Quality and Handover Plan

6.1 The content, structure and format of structured data and documents shall be defined during the project kick off stage. It is the responsibility of the contractor to get the same approved by the Owner during the project initiation stage. Trial handover of structured data and documents shall be done at start of the project, before significant amount of information is created, so as to avoid reworking of large quantities of data at a later stage. Trail handover shall be done not later than one month of placement of purchase order.

6.2 The contractor shall submit the data quality assurance plan for BPCL review and approval to ensure integrity, completeness, consistency and quality of information to be handed over. All data and documents will be validated against set standards. Data and documents that do not meet the specified requirements will be rejected and returned for further rework.

6.3 Handover Plan: The procedure and time frame for continuous handover of documents and data at various stages of the project including rules and trigger points for handover of data to BPCL shall be defined at the start of the project.

6.4 The following tables lists the minimum information that are to be handed over to the owner (BPCL-KR). The list is not exhaustive and is to be used as a guide to identify the most common information types to be handed over to the owner.

In the following tables, reference is also made to information to be handed over in structured data form and as Native files.

Contract Management documents

	Information	Description	Hard copies	Soft Format
	Contract Document / Agreement	Schedule of information to be supplied	1	Scanned Copy
	Certificates of Insurance	Certificates of insurance for policies required by the law of the land and by the contract	1	Scanned Copy
	Insurance Policies and Guarantees	Insurance policies and guarantees required by the law of the land and by the contract	1	Scanned Copy

Material Management

	Information	Description	Hard copies	Format
	Project Procurement Procedures	Plan and procedure for the purchase of bulk materials, equipment and services	1	Native
	Vendor / Supplier List	List of proposed suppliers for bulk materials, equipment and services	1	Native
	Purchase Requisition	Copies of Purchase requisition for materials and equipment	1	Native

	Purchase Order	Copies of orders for materials and equipment	1	Native
	Procurement Inspection – Surveillance Plan	Plan for the inspection of delivered materials and equipment	1	Native

Construction Management

	Information	Description	Hard copies	Format
	Construction Permits/License/Legal docs.	Permits and licenses issued to allow construction to take place	1	Scanned Copy
	Transportation Program / Erection plans	Program showing transport of major equipment to site (including Video and Pictures - Road Conditions, Before and After), ODC movement etc., and erection plans of all heavy equipments.	1	Native

QA /QC certification

	Information	Description	Hard copies	Format
	Quality Plan	Plan for the management of quality through the project	3	Native
	Construction Inspection & Test Plan	Inspection and test plan for all construction work	3	Native

Health / Safety / Environment

	Information	Description	Hard copies	Format
	Safety/Health Program	Program to ensure health and safety	3	Native
	Quantitative Risk assessment report	Quantitative risk assessment report of the project	3	Native
	Waste Material Management Plan	Plan for management and safe disposal of all waste	3	Native
	Environmental Management Plan	Plan for management of environmental issue	3	Native
	Site Evacuation Plan	Evacuation Plan for the Site in case of Fire / emergency.	3	Native
	HAZOP Review and Report	Review and report for all project HAZOP studies	2	Native

Process

	Information	Description	Hard copies	Format
	Facility Block Diagram	Schematic representation of main systems	2	S/D
	Process Flow Diagrams	Details major items of equipment, primary lines and valves, operating temperatures, pressures and mass flows.	2	S/D
	Utility Flow Diagrams	Details major items of equipment, primary lines and valves, operating temperatures, pressures and mass flows.	2	S/D
	Process and Instrument Diagrams	Showing in schematic form the equipment, piping, valves, tagged instruments, piping specification (& breaks) and line numbering for the process, utilities and loss control systems.	2	S/D
	Equipment List	List of major process equipment items	2	S/D
	Power and Utility Summary	List of power and utility loads and requirement	2	S/D
	All Project Philosophies	Self-explanatory	3	Native
	All Project Studies (Generated in the EPC phase and later)	Self-explanatory	3	Native
	Cause and Effect Charts	Process cause and effort charts	2	S/D
	Process Calculations	Design calculations for all process conditions and process equipment selection	2	Native
	System Design Basis Reports	Document outlining the basis for the design of the facility and comprising all process design philosophies i.e. environmental philosophy, drainage philosophy, ventilation philosophy, spading/isolation philosophy, plant availability/down time assessment and relief/blowdown philosophy etc. The philosophies detail the reasoning and assumptions made in plant design and are required as reference documents for the optimisation/modification of plant.	2	Native
	Supervisory Level Operating Procedures for all Process/Utility System(s). (Shall include Steady State, Start-Up, Shutdown & transient Operations)	Comprises operating information and procedures needed for the safe and efficient operation of the process plant and utilities	2	Native

	Mass Balance	Chart summarising mass flow rates at key points within the process and utility systems	2	Native
	Fluid and substance data	Details the composition/makeup of process and produced fluids.	2	Native
	Relief & blowdown data	Sizing data for the relief and blowdown systems	2	Native
	Surge and dynamic analysis data	Details and results of any analysis carried out to verify design of process plant.	2	Native
	Process simulation model	Computer based process flow model used in the design	2	Native
	Criticality Resume	Assumptions and reasoning behind the allocation of criticality ratings to plant and equipment. Needed for reference to support modifications	2	Native
	Process Safeguarding drawings	Diagrams showing pressure and temperature trips, blow down, pressure relief, isolation, emergency shutdown valves and HP/LP interfaces	2	Native
	Process Data Sheets	Describe the operating parameters (temperatures, pressure, service conditions and operating fluid characteristics) of the equipment in the form of sketches and tables and are the basis of the performance specification for the equipment.	2	S/D

Instrumentation

	Information	**Description**	**Hard copies**	**Format**
	Instrument Data	All relevant data on a specific piece of equipment	2	S/D
	Instrument and Design Specifications	Design specifications of Control valves, Shut Off Valves, & MOV's etc.	2	Native
	Installation and Mounting Standards	Standard drawings and specification for mounting instruments	3	Native
	Loop Drawings	Details the interconnection and relationships between all elements of a control loop, from sensing element through to controlling element, and cabling and wiring details for the associated instruments. Includes junction box, marshalling cabinet and control panel terminations and power supply details. The drawing enables maintenance persons to function test, maintain and find instrument loops without needing to refer to numerous related wiring diagrams.	2	S/D
	Room Layout	Layout of all field equipment rooms and control rooms showing position of equipment in relation to building details	2	Native
	Interface Drawings	Diagrams showing Interface terminations and hook ups between Contractors	2	S/D
	Termination Drawings	For equipment, panels, junction boxes, etc. identifies all connections and cable terminations at input/output rails. Required for removal/hook up purposes and modifications. To include vendor interfaces.	2	S/D
	Hook-up drawings	Shows the instrument impulse, pneumatic and electronic connections and pipework including valves, fittings, flanges and support details with associated material take-off list. Used for removal/hook up purposes and modifications.	2	S/D
	Instrument sizing calculations	Control Valves, Shut Off Valves, ESD, flowmeter sizing etc.	2	Native
	Fiscal Metering Design Calculations	These are calculations to demonstrate the conformity of the fiscal metering station to the relevant standards.	2	Native
	Cause and Effect Diagrams	The logic of alarm and trip systems shown in matrix form detailing the relationships between input variations on the output. Required for an understanding of the alarm and protection systems and for fault finding and modifications.	2	S/D
	Interlock logic and trip settings	Interlock logic and trip setting values	2	S/D
	Shutdown Logic Drawings	Provides an overview in graphic form of the "and", "or" and other logic functions of the shutdown systems and the sequence in which initiation events occur. Required for trip testing, system fault finding, maintenance testing and modifications	2	Native
	Instrument/Control System Power Distribution, Grounding Interconnects Drawing	Schematic diagram of instrument power supplies and earthing arrangements	2	Native
	Alarm/Trip Schedule	Schedule of all alarms and trip settings including those in vendor packages	2	S/D
	JB/ Cable Schedule	All relevant data on a specific piece of equipment	2	S/D
	Cable /OFC/duct Routing Drawings	Details the routing of cables, OFC and ducts throughout the facility between the plant and equipment, modules etc. including transit locations.	2	Native

	Testing and Commissioning Procedures	Includes procedures for each type of equipment to be tested and commissioned	3	Native
	Overall Control System Block Diagrams, I/O Loading & Cabinet Layouts	Self-explanatory	2	S/D
	Detailed Procedures for Control and Shutdown System FAT	Self-explanatory	3	Native
	Failure Modes Effects Analysis for Shutdown Systems	Self-explanatory	2	Native
	Standard Instrument Details	Dimensioned drawings of instruments and supplier technical and installation details	3	Native
	Instrument location drawing	Shows the physical location of all equipment	2	Native
	General arrangement drawings	Shows general arrangement and locations of instrumentation and associated items on skids and within panels and cabinets. Annunciator panel GA's shall include front fascia details along with full alarm text and tag numbering	2	Native
	Control schematic	Gives a pictorial representation of the main elements and functions of a control circuit/system with input/output sources (switches, relays etc.) and their relationships. Details logic functions of the circuit/system	2	Native
	SCADA/PLC/DCS Details	This documents the SCADA/PLC/DCS implementation philosophy including configuration details of inputs, outputs, logic and screen graphics, and software revision status. This will include hard copy software documentation where the software system is not self documenting.	2	Native
	Control room panel and field panel wiring diagrams	Self-explanatory	2	Native
	Interlock Check reports, SAT,FAT reports	Self-explanatory	3	Native
	OEM Maintenance Manual	Self-explanatory	2	Native
	Master details for SAP upload	Equipment master details in Excel format for upload into SAP system of Owner.	2	Native
	Spares list and AMC offer	Self-explanatory	3	Native

Fire and Gas

	Information	**Description**	**Hard copies**	**Format**
	F&G equipment Data	All relevant data on a specific piece of equipment	2	S/D
	Installation and Mounting Standards		3	Native
	Loop Drawings	Details the interconnection and relationships between all elements of a control loop, from sensing element through to controlling element, and cabling and wiring details for the associated instruments. Includes junction box, marshalling cabinet and control panel terminations and power supply details. The drawing enables maintenance persons to maintain and fault find instrument loops without needing to refer to numerous related wiring diagrams.	2	S/D
	Interface Drawings	Diagrams showing Interface terminations and hook ups between Contractors	2	S/D
	Termination Drawings	For equipment, panels, junction boxes, etc. identifies all connections and cable terminations at input/output rails. Required for removal/hook up purposes and modifications.	2	S/D
	Hook-up drawings	Shows the instrument impulse, pneumatic and electronic connections and pipework including valves, fittings, flanges and support details with associated material take-off list. Used for removal/hook up purposes and modifications.	2	S/D
	Cause and Effect Diagrams	The logic of alarm and trip systems shown in matrix form detailing the relationships between input variations on the output. Required for an understanding of the alarm and protection systems and for fault finding and modifications .	2	S/D
	F&G Logic Drawings	Provides an overview in graphic form of the " and" , " or" and other logic functions of the shutdown systems and the sequence in which initiation events occur. Required for system fault finding, maintenance testing and modifications	2	S/D

	F&G System Power Distribution, Grounding Interconnects Drawing	Schematic diagram of instrument power supplies and earthing arrangements	2	S/D
	Cable Schedule	All relevant data on a specific piece of equipment	2	S/D
	Cable Routing Drawings	Details the routing of cables throughout the facility between the plant and equipment, modules etc. including transit locations.	2	Native
	Testing and Commissioning Procedures	Includes procedures for each type of equipment to be tested and commissioned	3	Native
	Overall F&G System Block Diagrams, I/O Loading & Cabinet Layouts	Self-explanatory	2	S/D
	Detailed Procedures for F&G System FAT	Self-explanatory	3	Native
	Failure Modes Effects Analysis for F&G Systems	Self-explanatory	2	Native
	Standard Fire/Gas Details	Dimensioned drawings of instruments and supplier technical and installation details	3	Native
	F&G location drawing	Shows the physical location of all equipment. Shows the exact position of detectors/alarms and for detectors, shows their orientation and fire area covered.	2	Native
	General arrangement drawings (instruments, field mounting arrangements, panels)	Shows general arrangement and locations of instrumentation and associated items on skids and within panels and cabinets. Annunciator panel GA's shall include from fascia details along with full alarm text and tag numbering.	2	Native
	F&G schematic	Gives a pictorial representation of the main elements and functions of a control circuit/system with input/output sources (switches, relays etc.) and their relationships	2	S/D

Telecommunication

	Information	Description	Hard copies	Format
	Telecommunications equipment data	All relevant data on a specific piece of equipment	2	S/D
	Loudspeaker Loop Drawings	Details the loudspeaker connection and information on the designated loop. Required for automated PA interrogation system fault finding.	2	S/D
	Cable Schedule	All relevant data on a specific piece of equipment	2	S/D
	Cable Routing Drawings	Details the routing of cables throughout the facility between the plant and equipment, modules etc. including transit locations.	2	Native
	Testing and Commissioning Procedures		3	Native
	Overall System Block Diagrams, I/O Loading & Cabinet Layouts		2	S/D
	System drawings	Details the telecommunications system and how it interconnects into the overall communications network	2	S/D
	Single Line diagram	Details how equipment is connected into a system to include comprehensive data thread and telephone trunk records.	2	S/D
	Block and Level Drawing	Details transmission levels within systems and through networks	2	S/D
	Termination drawing	For equipment, panels, junction boxes, etc. identifies all connections and cable terminations at input/output rails. Required for removal/hook up purposes and modifications	2	S/D
	Wiring Diagrams	Details all points of interconnecting wiring showing cable numbers, core colours and termination points.	2	S/D
	Telemetry ID listing	Database model listing input and output points of plant instrumentation interconnections to telemetry systems.	2	S/D
	IDF Records	Details intermediate distribution frame connections in tabular form to show the origin and destination of individual system channels i.e. cable head and jumpering terminations.	2	S/D
	Radio license	Statutory requirement for radio operation for display on facility.	1	Scanned Copy

Architectural

	Information	Description	Hard copies	Format
	General Arrangement for Buildings and Structures	To include layouts of all rooms including equipment and accommodation details, external layouts and elevations	3	Native

	Completion Stage Architectural Drawings	General drawings for construction details of buildings (final)	3	Native
	Completion Stage Architectural Specification	Contains Contractor detail design based on initial specifications	3	Native
	Technical Interfaces	Drawings and documents describing interfaces between architectural and other Contractor scopes	3	Native
	Statutory Approvals	Statutory approvals from Govt. / Local authorities for Buildings / facilities	1	Scanned copy

Electrical

	Information	Description	Hard copies	Format
	Electrical equipment data	All relevant data on a specific piece of equipment	2	S/D
	Electrical System Studies	Includes load flows, transient and dynamic stability	2	Native
	Power System and load transfer philosophy	Power system operation and the philosophy of load transfer	2	
	Short Circuit Studies	Self-explanatory	2	Native
	Protective Device Co-ordination	To include protective device settings with calculations for entire distribution system	2	Native
	Cable Size Calculations	Self-explanatory	3	Native
	Single Line Diagrams	Detail the main equipment items (switchboards, transformers etc.) and their relationships within the platform electrical distribution system including details of fault levels and current and voltage ratings.	2	S/D
	Block diagrams	Similar to the SLD above but detailing the relationships in single line form between items of equipment, control panels, distribution boards.	2	S/D
	Schematic Diagrams	Gives a pictorial representation of the main elements and functions of a control circuit for electrical equipment with input/output sources (switches, relays etc.) and their relationships. Details logic functions of the circuit	2	S/D
	Wiring Diagrams	Details electrical wiring on all plant, equipment, boards, boxes and panels including interconnection/termination details for interface and hook up	2	S/D
	Electrical Interconnection Diagrams	Details of cable numbers and terminations between vendor packages, equipment and particularly at Contractor interfaces	2	S/D
	Electrical Equipment Arrangement Layouts	GA's of main electrical equipment, including switchboards, transformers, large loads, etc.	2	Native
	Lighting and Grounding Layouts	Layout of lighting and grounding on facility	2	Native
	Cable Tray Layouts	Layout of main cable tray routes on facility	2	Native
	Power Layouts	Layout of main power distribution on facility	2	Native
	Electrical Layouts	Layout of main electrical loads on facility	2	Native
	Building Electrical Layouts	Layout of electrical equipment and lighting within buildings	2	Native
	Schedules and Lists	All relevant data on a specific piece of equipment	2	S/D
	Lighting Fixture Schedule	Self-explanatory	2	S/D
	Panel Schedule	Self-explanatory	2	S/D
	Conduit Schedule	Self-explanatory	2	S/D
	Cable Schedule	All relevant data on a specific piece of equipment	2	S/D
	Load List	Tabulation of electrical loads which the electrical system must accommodate including detail of individual distribution board loads.	2	S/D
	Legends and Symbol Lists	As used in all drawings	3	S/D
	Standard Power Details	Typical installation details	3	Native
	Standard Lighting Details	Typical installation details	3	Native
	Standard Ground Details	Typical installation details	3	Native
	Standard Cable Tray Details	Typical installation details	3	Native
	Cable Routing	Details the routing of cables throughout the facility between plant and equipment, modules etc. including transit locations.	2	Native
	Grounding Drawings	Detail grounding connections for plant and equipment and between modules and dissimilar structural elements	2	Native
	Statutory Approvals / Licenses	Statutory approvals from Govt. / Local authorities / CEA etc.	1	Scanned copy

Mechanical

	Information	Description	Hard copies	Format
	Plot Plans	Plan view of a area showing exact location of main items of equipment.	2	Native
	Equipment Location Plan	Showing next level of detail from plot plan	2	Native
	General Arrangement	Dimensional drawing indicating overall extremities of plant or equipment in plan, elevation or sectional view.	2	Native

	Equipment Detail Drawing	Sectional or exploded view drawing detailing main fabrication/assembly information - design parameters (pressures, temperatures, manufacturing code etc.), materials, wall thicknesses, lining, internal fittings, test details of major process and utility vessels.	2	Native
	Equipment Design Calculations	Prepared in order to prove that the item of equipment or system selected meets the design criteria.	2	Native
	Critical Weld Procedures	Required for critical plant and equipment where non standard (exotic) materials and methods are used i.e. vessel lining, sour service. The procedures may not be industry standard or readily available thus resulting in significant costs (for procedure development/qualification and production loss) if repairs etc. required at short notice.	2	Native
	Standard weld procedure	Weld procedures not covered by the above	3	Native
	Performance Curves	These are charts detailing the design performance envelope and limits for major rotating machinery - turbines, crane/auxiliary diesels, compressors, transfer, fire and WI pump sets.	2	Native
	Alignment Specifications	Manufacturers recommended alignment readings and tolerances needed for re-coupling of major rotating machinery following overhaul.	2	Native
	Start-up Logs for M/c's	Running logs taken on first start up/commissioning of major rotating machinery. Of particular importance are running hours for scheduling over speed tests and initial oil changes.	3	Native
	Condition Monitoring Baselines	Set of vibration and SPL readings and oil/grease analysis results for first operation/run up of rotating machinery.	2	Native
	Lubrication Schedule	Details the lubrication requirements (oil, grease etc.) for all plant and machinery including detail of the lubricants (manufacturer's and BPCL equivalent), quantities used and recommended change frequency. The schedule will be a rationalisation of lubricant grades/types so as to minimise offshore stockholdings.	2	Native
	Access Manuals	Document detailing the methods and procedures for all mechanical handling activities that will take place during Operations. Details procedures for removing plant and equipment for maintenance purposes, lifting/handling equipment to used, load paths and laydown areas.	2	Native
	Pressure Vessel Certificate / IBR certificate	Certificate issued by Certifying Authority is specific to pressure vessels and lists the salient data - manufacturer, type of construction, test pressure rating etc.	3	Scanned Copy
	PSV Test Certificate	Records details of inspection of PSV and required to demonstrate they are fit for purpose	3	Scanned Copy
	Lifting Equipment Certificate	Issued by competent third party inspector covering all portable and fixed lifting gear.	3	Scanned Copy
	Statutory Approvals	Statutory Approvals from Govt. / Local / PESO/ F&B etc.	1	Scanned copy

Rotory Equipments

	Information	**Description**	**Hard copies**	**Format**
	P&ID relevant to the equipment	Showing in schematic form the equipment and all connected piping, valves, tagged instruments etc.	2	Native
	Datasheet	Filled in Datasheet of the equipment	2	Native
	GA (General Arrangement) Drawings	Self explanatory	2	Native
	Layout Drawings	Self explanatory	2	Native
	Foundation drawing	Self explanatory	2	Native
	Cross Section Drawings with Bill of Materials	Self explanatory	2	Native
	Seal and Cooling piping	Self explanatory	2	Native
	Mechanical Seal Drawing with Bill of Materials	Self explanatory	2	Native
	Coupling Drawings with Bill of Materials	Self explanatory	2	Native
	Exploded view of parts	Self explanatory	3	Native

	O&M Parts List with part number	Self explanatory	2	Native
	Operation and Maintenance Manuals	Self explanatory	2	Native
	Performance Curves	Self explanatory	2	Native
	Performance Test Reports	Self explanatory	3	Native
	Torque values if applicable	Self explanatory	2	Native
	Start up & Shutdown procedures	Self explanatory	2	Native
	Lube Oil Skid details if available.	Self explanatory	3	Native
	Special tools list if supplied along with the equipment	Self explanatory	3	Native
	Assembly disassembly procedure	Self explanatory	2	Native
	SAP Equipment Master data & Characteristic data as per BPCL KR formats	Self explanatory	2	S/D
	Details and spare parts list of auxiliary equipments like lube oil ,filter skid	Self explanatory	2	Native
	Gearbox and clutch details if applicable	Self explanatory	2	Native
	Wet gas seal / dry gas seal and cooling piping isometrics for Compressors	Applicable for compressors	2	Native
	Air / Seal gas/ lube oil filter details	Self explanatory	2	Native
	Protocol readings	Self explanatory	2	Native
	Torque values for casing bolts	Torque values for casing bolts for steam turbines	2	Native

Cross country pipelines

	Information	Description	Hard copies	Format
	Water Analysis - Cert. Test Report	For pressure testing	3	Native
	Pressure Test Records	Showing test equipment calibration reports, test reports and results	3	Native
	General Arrangement	Of pipeline equipment e.g. valves, pig launchers	2	Native
	Alignment sheets	Showing pipeline routes, road crossings, elevations	2	Native
	As built data	Based on actual field installation and survey	2	Native
	Cathodic Protection drawing	Showing locations of cathodic protection and schematic diagrams	2	S/D
	Design, Fabrication & Installation Specifications	Self-explanatory	2	Native
	Design Calculations	Self-explanatory	2	Native
	Fabrication Records	For pre-fabricated sections, including test reports	3	Native
	Installation Procedures	Including safety compliance	3	Native
	Compliance Documents	Test records, reports, etc.	3	Native
	Emergency P/L Valve Certificate	Self-explanatory	3	Scanned Copy
	Surge analysis reports	Report and calculations of surge analysis of cross country pipelines.	3	Native

Plant Piping

	Information	Description	Hard copies	Format
	Pipe and piping equipment data	All relevant data on a specific piece of equipment	2	S/D
	Line schedule data	All relevant data on a specific piece of equipment	2	S/D
	Piping Support Standards	Self-explanatory	2	Native
	Pipe Support Details	Self-explanatory	2	Native
	Pipe Support Schedule and Spring Schedule	Tables defining special/critical support type (static, pre-loaded, spring hangers etc.) and tag number.	2	S/D

	Piping GA Drawings	Drawings which provide plan and/or sectional views, highlighting the routing of dimensioned pipework. To include general arrangements of special pipe supports.	2	Native
	Fabrication Isometric Drawing	Isometric view of pipe run detailing configuration, orientation and necessary details (dimensions, material requirements) for manufacture and assembly.	2	Native
	Piping Specification	Provides piping materials definition, design pressures and temperatures, pipe nominal bores and wall thicknesses, fitting types and applications and material test criteria.	3	S/D
	Piping Special Items Specifications	Definition as per the piping specification but for non standard items not included in piping specification.	2	Native
	Design Calculations	Prepared in order to prove that the item of equipment or system selected meets the design criteria. For special pipe support will include details of load settings.	2	Native
	Pipe Stress Analysis results and Caesar2 input files	Reports containing pipe stress evaluation results and recommendations (including input files .c2, configuration files and unit files, calculations, stress isometrics, support type and acceptable load criteria) for specific critical piping configurations.	2	Native
	Valve Specification	Provides valve type, material definitions design pressures and temperatures, operating service conditions actuation type, end connection and dimensional details.	3	S/D
	Insulation Specification	Provides equipment application information (pipe, vessel etc.) material type, thickness requirements, services conditions, personnel protection and fireproofing.	3	Native
	Critical Line List	List of critical lines	3	S/D

Corrosion control / Painting

	Information	**Description**	**Hard copies**	**Format**
	Cathodic Protection Field Testing Reports	Including test methodology and results	3	Native
	Coatings Test Reports	Including test methodology and results	3	Native
	Material Selection Drawings	Schematics showing material selection on process	2	Native
	Material Selection Philosophy	Details reasons and assumptions made in the choice of materials for construction of structure, plant and equipment. Essential reference document should modifications be necessary due to change in process conditions (increased H20 etc.).	3	Native
	Corrosion Control Philosophy	Forecast of plant condition based on hazards, operability and corrosion effects. Must be in place before start up and is basis for corrosion monitoring programme.	3	Native
	Painting Specifications	Details protective coatings/paint systems, application methods (including preparation) and where applied. Required to support fabric maintenance programme	3	Native
	Baseline Corrosion Readings	Required for critical process pipework and vessels and are base readings for corrosion monitoring records	3	Native

HVAC

	Information	**Description**	**Hard copies**	**Format**
	Equipment data	All relevant data on a specific piece of equipment	2	S/D
	Cooling, Heating, Ventilation Load Calculations	Report on studies done to verify and demonstrate the adequacy of ventilation. Required for modifications to HVAC systems.	2	Native
	HVAC Duct and Instrument Diagrams	Single line drawings providing an overview of the HVAC system including all main components and instruments and duct sizes, flowrates, velocities	2	S/D
	Drawings (GA, Equipment, Ductwork, Piping & Accessories)	Drawings including plans and sections, giving details required for installation of HVAC ducts, dampers and screens etc.	2	Native
	Equipment Schedule with Capacities	Self-explanatory	2	S/D
	Control Logic Diagrams	Self-explanatory	2	S/D
	Control Schematic Diagrams	Self-explanatory	2	S/D
	Control Termination Diagrams	Self-explanatory	2	S/D
	All HVAC Related Construction Specifications	Self-explanatory	3	Native

	All Certified Equipment and Accessories Drawings	Self-explanatory	2	Native
	Ductwork – Material Specification	Self-explanatory	3	Native
	Grilles, Registers and Diffuser Performance Data	Self-explanatory	3	Native
	Insulation Details	Self-explanatory	3	Native
	Filters and Retainer Frames Data	Self-explanatory	2	S/D
	Piping System Valves, Fittings & Accessories Drawing Details	Self-explanatory	2	Native
	Performance Data and Operational Curves	Self-explanatory	2	Native
	Test Procedures	Self-explanatory	3	Native

Loss control and Safety

	Information	Description	Hard copies	Format
	Equipment data	All relevant data on a specific piece of equipment	2	S/D
	Hazardous Area Classification	Self explanatory	2	Native
	Register of Safety Devices	Listing and detailed description of integrity protection devices including relevant basis and design information and service conditions. All items on this register must be flagged in the Master Equipment List and on P & IDs.	2	S/D
	HAZOP Report and Project Response	Report on the findings of Hazard and Operability Studies for all hydrocarbon and main utilities system including Hazop team worksheets. Required as reference documents when modifying/optimising plant performance to support operations Safety Case submissions.	3	Native
	Fire Fighting Systems P&ID's	Details in schematic form the active fire fighting systems, equipment (fire pumps, deluge, monitor and halon skids) piping, valves, tagged instruments and their relationships.	2	S/D
	Fire Fighting Equip Layout Drawings	Drawing detailing the location of all portable/semi portable firefighting equipment (fire extinguishers, crash kits, hydrants & equipment, hosereels, breathing apparatus).	2	Native
	Lifesaving Equip & Escape Route Drawing	Drawing detailing access routes and means of escape in emergency and the location of all lifesaving equipment (escape sets, first aid boxes, showers etc.).	2	Native
	Hazardous Source Data	Details all individual point sources for emissions, discharge inventories and corresponding zone classifications.	2	Native
	Fire Protection Philosophy	Philosophy summarising the means of fire protection both passive (firewalls) and active (manual, foam, monitor, deluge/sprinkler systems etc.)	2	Native
	Active Fire Protection System Data	Design data and information that forms the basis of the performance specification for the active fire fighting systems (manual, foam, monitor, deluge/sprinkler systems etc.).	2	Native
	Equipment Failure Information	Details of the design life, failure modes and causes for critical items of equipment within the hydrocarbon, main utilities and safety systems. Used in predicting plant availability and identifying critical equipment for maintenance monitoring purposes.	2	S/D
	Hazardous Substance Data Sheets	As defined by Statutory and International Regulations.	2	Native
	Emergency Procedures Manual	As defined for Facilities Operations and for Pipeline Operations.	2	Native
	HIPS dossier	Reliability, availability and design dossier for all identified High Integrity Protection Systems	2	S/D
	Test Procedures	Test Procedures for safety equipments	3	Native

Civil Structural

	Information	Description	Hard copies	Format
	Site Survey (Data & Information Report)	Self-explanatory	3	Native
	Underground Piping Layouts	Self-explanatory	2	Native
	Road and Drainage Layouts	Self-explanatory	2	Native
	Concrete and Structural Specifications	Self-explanatory	3	Native
	Building Plans	to include external and internal layouts and elevations	3	Native
	Concrete Mix Design	Self-explanatory	3	Native

	Geotechnical & Geophysical Investigation reports	Self-explanatory	3	Native
	Structural Steel Calculations	Self-explanatory	3	Native
	Topographic Drawing of Site	Self-explanatory	3	Native
	Fabrication Drawings	Fabrication drawings covering all welds and association fabrication details for the structures.	3	Native
	Fireproofing specification	Details all passive fire protection systems, application methods and where applied.	3	Native
	Design integrity documents	The final set of documentation - drawings, sketches, calculations - that demonstrates the design and structural integrity. Required for reference for carrying out structural repairs/modifications. Documentation relating to temporary fabrication and installation conditions are not required.	3	Native
	Foundation details	Self-explanatory	3	Native
	Structural steel drawings	Self-explanatory	2	Native

Fabrication Control requirements

	Information	Description	Hard copies	Format
	Welding Procedure Specifications (WPS)	Self-explanatory	3	Native
	Welding Procedure Qualification Records (PQR's)	Self-explanatory	3	Native
	Welder Qualification Program & Records	Self-explanatory	3	Native
	Pressure Testing Procedures	Self-explanatory	3	Native
	Material Traceability Report/Records	Self-explanatory	3	Native
	NDE Procedures	Self-explanatory	3	Native
	Radiographic Qualification Procedures	Self-explanatory	3	Native
	Weld Maps (Location/Type/NDE Req.)	Self-explanatory	3	Native
	NDE Test Reports	Self-explanatory	3	Native
	Weld Repair Procedures	Self-explanatory	3	Native

General Engineering

	Information	Description	Hard copies	Format
	Drafting Standards	Standards to be adopted for all drawings, including symbol library	3	Native
	Supplier Data Dossiers	Vendor information for all purchased equipment, including specifications, diagrams, drawings, maintenance procedures, etc.	2	Native or S/D
	Engineering Reports & Calculation Packages	Independent consultant reports and calculations for critical plant and equipment	2	Native
	Design Change Control Procedures	Self-explanatory	3	Native
	Maintenance and Preservation Procedures	During project phase to include programme	3	Native
	Change control records	Audit trail summarising status and outstanding actions associated with all change to originally agreed design/statement of requirements. Will be referenced for completion of outstanding works post handover.	3	Native
	Design deviation reports	Audit report on variances from design found at the as built/post construction stage of the Project along with their justification and reasons for acceptance. Document to be referenced when modifications carried out.	3	Native
	Maintenance Information	Comprises equipment manufacturer's information necessary to specify and support maintenance (planned and breakdown) and inspection activities. To include manufacturer's recommendations for maintenance and inspection, fault finding guidance, drawings, procedures, parts lists, lubrication details, adjustments, settings and tolerances. Certain of this information may already be specified separately	2	Native
	Operating Information	Information in the form of instructions, procedures, drawings, tables, etc. for the operation stop, start, and the emergency shutdown of the equipment including details of operational limits, function testing, possible interruptions, corrective actions and potential hazards and corrective measures to be taken.	2	Native

	Spares Listings	Recommended holding of operating and insurance spares. The operating spares recommendation is a listing of spare parts required to support the day to day operation and maintenance of the equipment for a period of two years. Insurance spares are parts/complete units not normally required on a day to day basis but needing to be held as an insurance against breakdown/outage of critical utility and process plant. To be provided with relevant supporting documentation (equipment details, drawings, parts list etc.) to permit full evaluation of the recommendation.	2	Native

SITE SPECIFIC SEISMIC SPECTRA

PROJECT : PPU & REVAMP OF PFCCU

OWNER : BPCL KOCHI

CONSULTANT : ENGINEERS INDIA LIMITED

JOB NO. : B895

Rev. No	Date	Purpose	Prepared by	Reviewed by	Approved by
0	29/08/2024	ISSUED FOR ENGINEERING	MBA	GGSA	SVRS

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SITE SPECIFIC SEISMIC SPECTRA

Site specific seismic spectrum is generated in accordance with Section 7 of IS 1893 (Part 4): 2024 for 10% probability of exceedance in 50 years for different damping values. The design horizontal seismic coefficient shall be estimated in accordance with Clause no. 7.3.1 of IS 1893 (Part 4) using spectral acceleration coefficient presented below.

Spectral Acceleration Coefficients (S_a/g) for 10% probability of exceedance in 50 years:

Spectral Acceleration Coefficients (Sa/g) for 5% damping for 10% probability of exceedance in 50 years in the horizontal direction shall be based on the following equation. The spectral acceleration values for different damping ratio are presented in Figure 1 and Table 1.

S_a/g (damping: 5%)	= 0.12	for 0.00<T<0.01 sec
	= 0.1+2.0T	for 0.01<T<0.10 sec
	= 0.3	for 0.10<T<0.6 sec
	$=\frac{0.18}{T}$	for 0.6<T<6.00 sec
	$=\frac{1.08}{T^2}$	for 6.0<T<10.00 sec

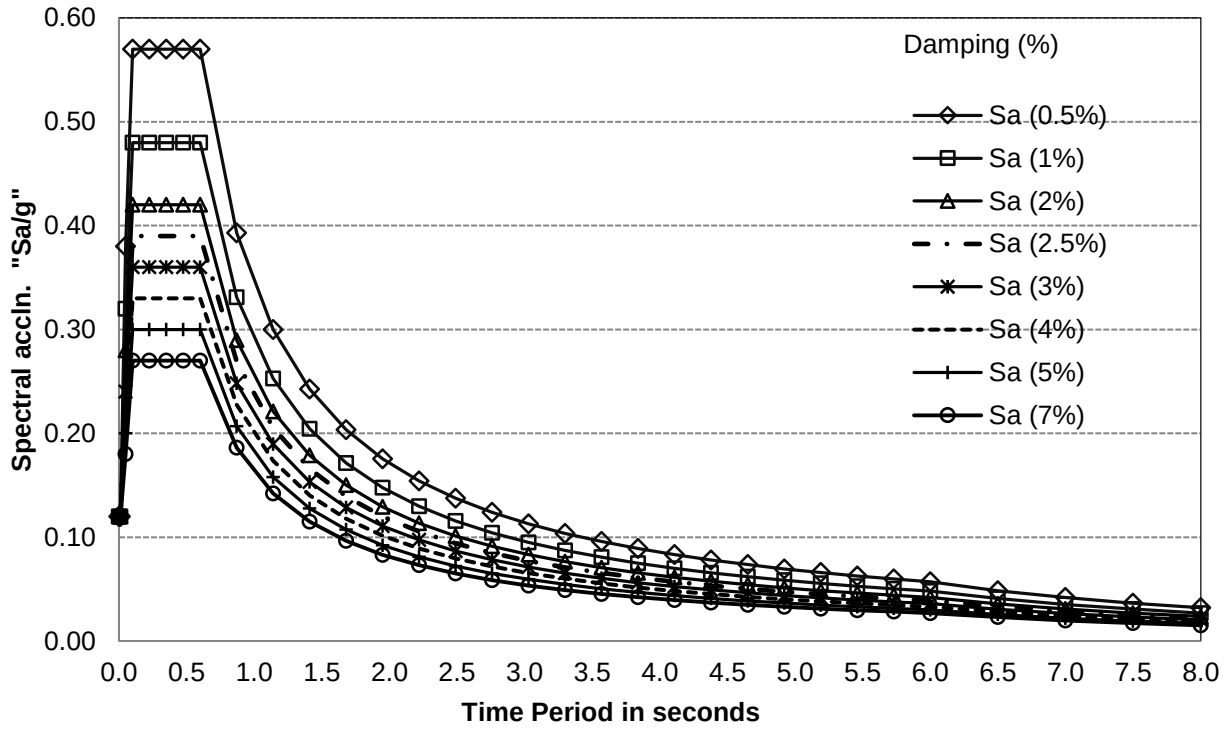


Figure 1: Site specific seismic spectra for 10% probability of exceedance in 50 years

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Table 1: Spectral Acceleration Coefficients (S_a/g) for Design Basis Earthquake (DBE)

Time Period (sec)	Percentage of critical damping							
	0.5	1.0	2.0	2.5	3.0	4.0	5.0	7.0
0.000	0.120	0.120	0.120	0.120	0.120	0.120	0.120	0.120
0.010	0.120	0.120	0.120	0.120	0.120	0.120	0.120	0.120
0.050	0.380	0.320	0.280	0.260	0.240	0.220	0.200	0.180
0.100	0.570	0.480	0.420	0.390	0.360	0.330	0.300	0.270
0.225	0.570	0.480	0.420	0.390	0.360	0.330	0.300	0.270
0.350	0.570	0.480	0.420	0.390	0.360	0.330	0.300	0.270
0.475	0.570	0.480	0.420	0.390	0.360	0.330	0.300	0.270
0.600	0.570	0.480	0.420	0.390	0.360	0.330	0.300	0.270
0.870	0.393	0.331	0.290	0.269	0.248	0.228	0.207	0.186
1.140	0.300	0.253	0.221	0.205	0.189	0.174	0.158	0.142
1.410	0.243	0.204	0.179	0.166	0.153	0.140	0.128	0.115
1.680	0.204	0.171	0.150	0.139	0.129	0.118	0.107	0.096
1.950	0.175	0.148	0.129	0.120	0.111	0.102	0.092	0.083
2.220	0.154	0.130	0.114	0.105	0.097	0.089	0.081	0.073
2.490	0.137	0.116	0.101	0.094	0.087	0.080	0.072	0.065
2.760	0.124	0.104	0.091	0.085	0.078	0.072	0.065	0.059
3.030	0.113	0.095	0.083	0.077	0.071	0.065	0.059	0.053
3.300	0.104	0.087	0.076	0.071	0.065	0.060	0.055	0.049
3.570	0.096	0.081	0.071	0.066	0.061	0.055	0.050	0.045
3.840	0.089	0.075	0.066	0.061	0.056	0.052	0.047	0.042
4.110	0.083	0.070	0.061	0.057	0.053	0.048	0.044	0.039
4.380	0.078	0.066	0.058	0.053	0.049	0.045	0.041	0.037
4.650	0.074	0.062	0.054	0.050	0.046	0.043	0.039	0.035
4.920	0.070	0.059	0.051	0.048	0.044	0.040	0.037	0.033
5.190	0.066	0.055	0.049	0.045	0.042	0.038	0.035	0.031
5.460	0.063	0.053	0.046	0.043	0.040	0.036	0.033	0.030
5.730	0.060	0.050	0.044	0.041	0.038	0.035	0.031	0.028
6.000	0.057	0.048	0.042	0.039	0.036	0.033	0.030	0.027
6.500	0.049	0.041	0.036	0.033	0.031	0.028	0.026	0.023
7.000	0.042	0.035	0.031	0.029	0.026	0.024	0.022	0.020
7.500	0.036	0.031	0.027	0.025	0.023	0.021	0.019	0.017
8.000	0.032	0.027	0.024	0.022	0.020	0.019	0.017	0.015
8.500	0.028	0.024	0.021	0.019	0.018	0.016	0.015	0.013
9.000	0.025	0.021	0.019	0.017	0.016	0.015	0.013	0.012
9.500	0.023	0.019	0.017	0.016	0.014	0.013	0.012	0.011
10.000	0.021	0.017	0.015	0.014	0.013	0.012	0.011	0.010

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NOTES:

1. For methodology of calculation of seismic forces and other seismic design criteria, refer latest revisions of the following codes:

   IS 1893 (Part 1): 2016 General provisions and buildings

   IS 1893 (Part 4): 2024 Industrial structures including stack-like structures

2. All parameters shall be in accordance with the above-mentioned codes.
3. When cylindrical storage tanks are designed as per API 650/620 using site-specific design methods, the percentage of critical damping and response reduction shall be taken in accordance with the respective design codes.

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DESIGN BASIS FOR WIND LOAD ON PIPING

PROJECT	:	**PMC AND EPCM SERVICES FOR POLYPROPLENE PROJECT OF BPCL KOCHI REFINERY**
OWNER	:	**BHARAT PETROLEUM CORPORATION LIMITED (BPCL)**
PMC / EPCM	:	**ENGINEERS INDIA LIMITED (EIL)**
JOB NO.	:	**B895**

Rev. No	Date	Purpose	Prepared by	Reviewed by	Approved by
0	06.09.2024	ISSUED AS GUIDE	RNB	PG	SVRS

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1. SCOPE

The scope of this document is to specify the wind pressure to be considered for calculation of wind load on piping systems. The effect of wind on a piping system is to produce a set of vibratory/dynamic loads acting along different directions depending on the configuration of the piping. However, the design wind load for a piping system is often calculated on the basis of a statically applied maximum pressure(s) that can be expected over the design life of the plant/unit.

2. GENERAL NOTES

The wind load analysis shall be done for the following piping systems.

(i) Two Phase Flow Lines.
(ii) Flare Header.
(iii) Any other line of size 20" (O.D.) & above (including insulation, if any) running above 10 meter height from HPP level.

However, all lines should have a sufficient number of horizontal restraints/guides to resist the design wind load to be calculated as per the formula indicated in section 3 of this document. Additional horizontal supports may be required to reduce excessive horizontal deflection of pipe due to wind load.

3. DESIGN WIND LOAD

The design wind load on a pipe shall be calculated from the following relation:

$$F_{wz} = C_f \; p_d D_o$$

Where
F_{wz} = Wind load at height z **per unit length of pipe**
C_f = Shape factor (to be considered as 0.7)
D_o = External diameter of pipe including the insulation
p_d = $K_d * K_a * K_c * p_z$, Design wind pressure on pipe at height z
p_z = Wind pressure on pipe at height z..

Height (in 'm') of pipe above ground	≤10	15	20	30	50	100
Design wind pressure (in 'N/m^2')	851	967	1048	1155	1289	1480

Note:

(i) Above wind pressures are based on k_1 value corresponding to Basic Wind Speed of 39 m/s and Design Life of 100 years, k_2 value corresponding to Category 3, k_3 (topography factor) value to be 1.0 and k_4 (importance factor for the cyclonic region) value to be 1.0 respectively as defined in IS 875.

(ii) K_d (Wind directionality factor) value to be 1.0, K_a (Area averaging factor) value to be 1.0 and K_c (Combination factor) value to be 1.0 respectively as defined in IS 875.

(iii) Wind pressure for any intermediate height may be linearly interpolated.

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4. LOAD COMBINATIONS

All supports should be adequate for the following load combinations due to wind load alone in addition to other load conditions considered for the design of piping:

(i) Sustained load + Wind Load

(ii) Sustained load + Thermal load (operating) + Wind Load

However, the stress in the piping should be checked only for the first load case (i.e., Sustained load + Wind Load) and the maximum stress in the pipe should be limited to 1.33 times the allowable stress at the maximum operating temperature.

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SEISMIC DESIGN REQUIREMENTS FOR PIPING

PROJECT	:	**PMC AND EPCM SERVICES FOR POLYPROPLENE PROJECT OF BPCL KOCHI REFINERY**
OWNER	:	**BHARAT PETROLEUM CORPORATION LIMITED (BPCL)**
PMC / EPCM	:	**ENGINEERS INDIA LIMITED (EIL)**
JOB NO.	:	**B895**

Rev. No	Date	Purpose	Prepared by	Reviewed by	Approved by
0	06.09.2024	ISSUED AS GUIDE	RNB	PG	SVRS

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1. SCOPE

This document provides certain guidelines/methods to be used for seismic analysis of the piping. However, detailed mathematical formulations for seismic analysis are outside its scope.

2. DESIGN ACCELERATION DUE TO EARTHQUAKE

The spectral acceleration coefficients (S_a/g) shall be obtained from the site-specific seismic spectra document no. B895-000-16-54-DB-0001. The horizontal seismic acceleration coefficients (A_h) shall be calculated as per section 7.3.1 of IS 1893, Part 4: 2024. I/R ratio (Importance factor to response reduction factor) shall be considered as 0.75 for process piping while for utility piping it shall be 0.6. Vertical acceleration values may be taken as 2/3rd of the corresponding horizontal values.

3. METHOD OF SEISMIC DESIGN

3.1 METHOD OF ANALYSIS

Response Spectrum Method shall be used for seismic analysis of piping. The piping that requires seismic analysis has to be designed for multi-component earthquakes (i.e., two horizontal directions and the vertical direction) as per the procedure given in section 8.3.2.1 of code IS 1893 (Part-4): 2024.

3.2 SUGGESTED DAMPING (IN PERCENTAGE OF CRITICAL) VALUES

Component	Damping Value (%)
All piping except for the following systems	2.0
Integrated systems (i.e., piping modeled alongwith vessel/equipment and structure)	5.0

4. CRITERIA FOR REQUIREMENT OF SEISMIC ANALYSIS

Seismic analysis has to be performed when the piping satisfies any one of the following criteria:

(i) All emergency service lines such as fire water line of diameter 10" and above
(ii) All two-phase flow lines having slug flow of diameter 12" and above
(iii) All lines with 900 # and higher-pressure class of diameter 16" and above
(iv) For those lines which do not come under any of the above types, following criteria shall be considered:

For elevations* < 25.0 m	**For elevations* ≥ 25.0 m**
Line diameter 26" and above	Line diameter 16" and above

***** Elevation of highest portion of piping

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IMPORTANT NOTES:

1. Gapped restraints/supports which are effective in operating load condition shall be treated as full restraints/supports while carrying out seismic analysis.
2. Only mechanical restraints including snubbers and sway braces should be considered in seismic analysis. Frictional resistance should not be considered as a restraint.
3. Only operating temperature and pressure need to be considered for load combinations involving the seismic effect.

5. LOAD COMBINATIONS

All supports should be adequate for the following load combinations due to seismic load alone in addition to other load conditions considered for the design of piping:

(i) Sustained load + Seismic load
(ii) Sustained load + Thermal load (operating) + Seismic load

However, the stress in the piping should be checked only for the first load case (i.e., sustained load + Seismic load) and the maximum stress in the pipe should be limited to 1.33 times the allowable stress at the maximum operating temperature.

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Scope of Work and Job Specifications for BPCL-KR PP Project Package Contracts (Digital Technology Solutions)

PROJECT : **PMC AND EPCM SERVICES FOR POLYPROPLENE PROJECT OF BPCL KOCHI REFINERY**

OWNER : **BHARAT PETROLEUM CORPORATION LIMITED (BPCL)**

PMC / EPCM : **ENGINEERS INDIA LIMITED (EIL)**

JOB NO. : **B895**

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1.0 GENERAL

1.1 The Specification given below provides Scope of Work and Job Specifications for Digital Technology Solutions. The same shall be read in conjunction with the Licensor's process package, Scope of Work and Job Specifications for other functions and depts. provided elsewhere in the tender document. Bidder shall provision, implement, support, utilize the digital solutions (as applicable) as per requirements of process package, engineering design basis, standards, specifications and drawings enclosed with this bid package.

1.2 **Location of field equipment & accessories:** The field equipment and accessories for digital solutions covered in this document shall be deployed during construction phase. The same shall be uninstalled and removed before feed cut-in i.e. from the hazardous area. In existing refinery areas, where work is to be conducted in hazardous area, IS Mobile Phones for Digital Safety Management (App Based) shall be suitable for respective hazardous area.

Bidder shall ensure that Bidders and their subcontractor's personnel having ordinary (Safe Area use) mobile devices and/or Active RFID/BLE Cards do not enter the units of existing BPCL Plants, as those are electrically hazardous areas.

2.0 SCOPE OF WORK/SUPPLY

S. No.	DESCRIPTION	Scope of Supply/Work	
		Bidder	Purchaser
2.1	**Scope of Supply/Work:** For Digital Solutions in Bidders Scope- Design, Engineering including residual engineering, detail engineering, procurement, supply, implementation and operations including all hardware and software of all systems preparation of engineering drawings and documents, review of vendor drawings, manpower support, coordination with Clients other Contractors/Vendors etc. Scope of Work also includes providing support and utilizing (Note-1) Digital Solutions deployed by Client or their contractors/vendors. All the digital solutions shall be operational only for the project duration and shall be decommissioned and removed at the end of the construction/during commissioning period, or as instructed by Engineer-In charge.		
2.1.1	Project Control Tower/ Common Data Environment (PCT/CDE) – Provisioning and Implementation.		Yes
2.1.2	Project Control Tower/ Common Data Environment (PCT/CDE) – Support.	Yes	
2.1.3	4D Monitoring Solution – Provisioning and Implementation.		Yes

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2.1.4	4D Monitoring Solution – Support (Note 2)	Yes	
2.1.5	App Based Digital Safety Management System (DSMS-APP) – Provisioning and Implementation.		Yes
2.1.6	App Based Digital Safety Management System (DSMS-APP) – Support.	Yes	
2.1.7	Automated Manpower Productivity System (MANPS) – Provisioning and Implementation		Yes
2.1.8	Automated Manpower Productivity System (MANPS) – Support.	Yes	
2.1.9	Automated Machine Productivity System (MACPS) – Provisioning and Implementation		Yes
2.1.10	Automated Machine Productivity System (MACPS) – Support.	Yes	
2.1.11	Warehouse management system (WMS) – Provisioning and Implementation. (Note-3)	Yes	
2.1.12	Warehouse management system (WMS) - Integration with Purchaser's CT/CDE.		Yes
2.1.13	Transport Management System (TMS) – Provisioning and Implementation.	Yes	
2.1.14	Transport Management System (TMS) - Integration with Purchaser's CT/CDE.		Yes
2.1.15	Spool Management System – Provisioning and Implementation *(Where Spool Fabrication at site is in Bidder's Scope)*	Yes	
2.1.16	Providing Mobile Devices (Smart Phones) to Bidders concerned personnel, for use of DSMS-APP, PCT/CDE .	Yes	
2.2	Coordination		
2.2.1	Coordination with • Purchaser • PMC/EPCM • Purchaser's CT/CDE Vendor • Purchaser's Managed Service Provider (MSP) for DSMS-App, MANPS and MACPS Digital Solutions • Sub-vendors of Digital Solutions Implemented by Bidder.	Yes	
2.3	Training		

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2.3.1	Training for Spool Management System for purchaser's personnel, bidder's own personnel and sub-contractor's personnel.	Yes	
2.4	Operations, Support and Maintenance		
2.4.1	Operations Support and Maintenance Services for Spool Management System and Warehouse Management System.	Yes	
2.5	Cyber Security Requirements		
2.5.1	Cybersecurity Compliance as per BPCL's Cybersecurity guidelines for Spool Management System and Warehouse Management System.	Yes	
2.6	Watch and Ward/Safekeeping of Digital Technology Solutions Devices	Yes	
2.6.1	Responsibility for safekeeping of Digital Technology Solutions devices deployed by Purchaser viz. MANPS-RFID/BLE Cards, Readers, Network/ Edge devices inside Bidders B/L or Work Area.	Yes	

Notes:

1. **Support-** Support consists of aid in implementation of the digital solution on ground:
    a. Providing information for the checklists/ KPI's
    b. Providing Data for self/ sub-contractors in a timely manner
    c. Distributing/ setting up of active RFID/BLE Tags/ sensors from the purchaser's implementation partner.
    d. Providing Power Supply/ Installation Supports, as applicable, for respective digital solutions.
    e. Use the functionality of the digital solution/ tools for the intended purpose.
    f. Coordination with purchaser's digital implementation partners
2. Where 3D Modelling is in bidder's scope.
3. Where Warehouse is in bidder's scope.
4. In case of non-functionality of any of the digital solution planned by Purchaser, bidder shall report for each use case in other forms as instructed by Engineer-in-Charge
5. Bidder shall ensure that smartphones deployed are not misused for taking unauthorized photos and videos. Person found doing so may be handed over to the security team for further action.
6. One or more solution may not be applicable for a tender based on nature of job / tender conditions / scope of work.
7. PMC is having responsibility of overall project progress monitoring and will be actively engaged with the bidder for successful utilisation of the digital solutions.

3.0 JOB SPECIFICATIONS

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3.1 PROJECT CONTROL TOWER (PCT) & COMMON DATA ENVIRONMENT (CDE)

3.1.1 System Overview

3.1.1.1 Purchaser intends to deploy a Control Tower/CDE for Project Planning, Scheduling and Monitoring, Project Cost Control, Workflows between Client, MPMC, PMCs, EPCs and EPCMs Contractors; Report Generation and 4D Project Monitoring, etc. The entire reporting including Planning Package, Project Schedules, DPR, WPR, MPR etc is expected to be executed online through the above systems.

3.1.1.2 The systems deployed by Purchaser shall be broadly in alignment with the relevant specs for Project Planning, Scheduling, Monitoring And Control System for this Contract (Encl. elsewhere in the tender) and bidder's obligations shall be read in context and in alignment with the same.

3.1.2 Bidders Obligations

3.1.2.1 Bidder shall support implementation of PCT-CDE (deployed by the Purchaser) by providing data/ update for the KPIs for self and sub-contractors through APIs/ Excel templates/ Manual Data Entry etc. in the PCT/CDE. Data is provided by bidder through excel or manual entry or templates or online forms etc which will be provided by purchaser. For seamless integration between bidder's Primavera P6 EPPM or MS Project and PCT/CDE, bidder shall provide necessary plug-ins in their side.

3.1.3 Bidder shall provide all support, assistance and guidance to Purchasers CT/CDE Vendor to integrate the Bidders Systems (as required) with CT/CDE and ensure uninterrupted and seamless data exchange throughout the contract period. This includes making changes to Bidders Systems (if required).

3.1.3.1 Bidder shall be provided 1-2 No. User Id's to access the PCT System for providing input.

3.1.3.2 As a minimum bidder shall provide data for KPIs in CT-CDE as per Annexure-1-KPI List.

3.1.3.3 Bidder shall be responsible for complying with the workflows as defined in the PCT-CDE.

3.1.3.4 Bidder shall nominate representatives to attend mandatory PCT-CDE training sessions and achieve proficiency in use of the same.

3.1.3.5 Bidder shall provide URL's for Viewing Physical Location on Critical Equipment, Long Lead Items (LLI's) interfaced from Transport Management Solutions of Vendors/Contractors.

3.1.3.6 As a minimum bidder shall provide data for following KPIs in CT-CDE:

i. Project Schedule including Project Critical Path, Near Critical Path/Activities- Tabular and Gantt Chart Format (Native P6 EPPM Files)
ii. Project Progress Status- Sch/Act- S-Curves at Unit , Functional, Major Subcontract Level
iii. Drawings Status- Sch/Act
iv. Procurement Status- Sch/ Act
v. Tendering Status- Sch/ Act
vi. Construction Status- Sch/ Act
vii. Critical Issues (along with Action Plan/ Target Dates/ Issue Status/ Issue Ranking etc.)
viii. HSE Statistics
ix. Actual/planned/projected cash flows

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x. Resource (Manpower/ Construction Machinery) Deployment at Site
xi. Project Risk Score and Matrix
xii. URL's for Viewing Physical Location on Critical Equipment, Long Lead Items (LLI's) interfaced from Transport Management Solutions of EPC's Vendors.

3.1.3.7 Bidder shall comply with the CT-CDE data security protocols and ensure that only authorized personnel access the system using approved devices.

3.2 4D MONITORING

3.2.1 4D Monitoring Platform will be provisioned and implemented by purchaser. The solution will integrate the schedule and actual progress data and 3D Models for rendering the 4D model. It will implement visualization of work at different stages of Procurement and Construction w.r.t. the schedule. The 4D rendering will highlight items, color code items and work done during any specified period.

3.2.2 Wherever 3D Modelling is in Bidder's scope, bidder shall support and utilize 4D Monitoring Platform deployed by Purchaser by using Navisworks (.nwd) files from 3D models and Schedule and Actual progress data from PCT-CDE/ P6 EPPM or MS Projects for the unit.

3.2.3 Bidder has to prepare schedule in such a manner that activities/ tasks can be mapped to 3D model elements.

3.2.4 4D Monitoring will be progressively detailed from L1 to approx. L4 Level (Work Package) as 3D Model Matures and the project moves from Engineering to Commissioning Phase. Update Frequency will be Monthly. Bidder shall provide inputs accordingly.

3.3 APP BASED DIGITAL SAFETY MANAGEMENT SYSTEM (DSMS-APP)

3.3.1 Solution Overview

3.3.1.1 A web application and Mobile App based Digital Safety Management System (DSMS-APP) hosted in Meity empanelled cloud data centre, will be provisioned and implemented by purchaser. The application will have feature to report different types of safety violations, incidents e.g. PPE non-compliance, unsafe working at height, absence of fence/ barricade in required areas, intrusion in restricted zones, proximity to heavy/ dangerous machinery, fire/smoke etc. in real-time from Smart phones (Android™). Safety violation reporting will include capture of violations/ non-compliance observed by BPCL, EIL, Bidder with photo(s), short (upto ten second) video from the field.

3.3.1.2 The application will have feature to report the safety violation observed to the bidder/ bidder's vendor/ sub-contractor HSE personnel with observation (text and photo/ video) along with corresponding contract name, type and category of violation, date, time etc. It shall also have feature for concerned contractor's/ sub-contractor's HSE personnel to submit resolution against the violation with Text plus Photo(s), short (upto ten second) video. The application will have feature to accept/ reject & return Contractor's/ sub-contractor's Resolution against the violation.

3.3.2 Bidders Obligations

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3.3.2.1 Bidder shall support implementing DSMS-APP by providing consent by their employees and vendors'/ sub-contractors' employees and utilizing the application. Bidder shall ensure that each and every safety violation/ incident observed and reported through the DSMS-APP in their work unit are looked into, corrective actions are taken and resolution is submitted.

3.3.2.2 Bidder shall ensure all their own and vendors/ sub-contractors designated HSE personnel at field are equipped with smartphones (Android™ 11 or later) to use the DSMS-APP.

3.3.2.3 Bidder shall nominate representatives to attend mandatory DSMS-APP training sessions and achieve system proficiency within one month of deployment.

3.3.2.4 Bidder shall facilitate full compliance with the use of DSMS-APP for safety violation reporting, good observations reporting, resolution tracking, and emergency notifications.

3.3.2.5 Bidder shall follow the manual paper/ email based HSE compliance system as defined in the HSE Specs and directions of Engineer-in-Charge in case the DSMS-APP is dysfunctional or is withdrawn during the course of execution of the contract.

3.3.2.6 Bidder shall ensure that all safety violations, incidents, and near-miss events observed on-site are reported through the DSMS-APP timely. Each report shall include accurate details, relevant photos, short videos (10 seconds max), and annotations to highlight the specific safety issue.

3.3.2.7 Bidder shall address and resolve reported violations within 48 hours by submitting detailed proof of resolution through the DSMS-APP. This includes textual descriptions of corrective actions, updated photographs, or short videos demonstrating rectification measures, and additional comments if required. Rejected resolutions shall be readdressed promptly as per feedback provided within the system.

3.3.2.8 Bidder shall actively monitor dashboards and reports generated by DSMS-APP to track unresolved issues and compliance trends, ensuring timely compliance.

3.3.2.9 Bidder shall utilize DSMS-APP to raise real-time alerts in emergencies requiring immediate action, providing accurate location data for response teams.

3.3.2.10 Bidder shall comply with the DSMS-APP data security protocols and ensure that only authorized personnel access the system using approved devices.

3.3.2.11 Bidder shall ensure their personnel including sub-contractors and vendors are equipped with laptops/ tablets/ smartphones (AndroidTM 11 or later) for use of the DSMS-APP. User/ Role based access to the system shall be provided. For Refinery revamps contracts, intrinsically safe smartphones are to be deployed.

3.4 AUTOMATED MANPOWER PRODUCTIVITY SYSTEM (MANPS)

3.4.1 Solution Overview

3.4.1.1 Automated web-based Manpower Productivity System (Active RFID/ BLE based), hosted in MeitY empanelled cloud data centre, will be provisioned and implemented by purchaser. The digital solution will be used for tracking of deployment/ mobilization of manpower including attendance/ variance in total mobilization, labour composition vs plan (skilled, semi-skilled, unskilled), average daily working hours, location tracking etc.

Active RFID/ BLE cards may be an addition to contractor's entry gate pass.

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3.4.2 **Bidders Obligations**

3.4.2.1 Bidder shall support implementing MANPS by their employees and vendors'/ sub-contractors' employees and by utilizing the application.

3.4.2.2 Bidder shall furnish accurate details of all workers, name, gender, Photo ID Card No., skill levels (skilled, semi-skilled, unskilled), and vendor/ sub-contractor specific details, to the MANPS system at least four working days prior to mobilization.

3.4.2.3 Bidder shall provide monthly projections of worker mobilization and demobilization for the next two months to ensure smooth operations.

3.4.2.4 Bidder shall ensure that all bidder's, and bidder's vendors', sub-contractors' personnel/ workers wear the Active RFID/ BLE cards while inside the BPREP Project Area.

3.4.2.5 Bidder shall nominate representatives responsible for managing worker data, verifying card issuance, collecting cards and returning, changing of card battery, and addressing any system-related queries.

3.4.2.6 Bidder shall nominate representatives to attend mandatory MANPS training sessions and achieve proficiency in use of the same.

3.4.2.7 Bidder shall provide distribution of workers based on work allocation in the MANPS package.

3.4.2.8 Bidder shall use MANPS to track worker attendance, deployment and location, ensuring compliance with authorized areas and reporting and taking corrective actions for any unauthorized access detected by the system.

3.4.2.9 Bidder shall promptly update the MANPS system with details of demobilized workers and return their RFID/BLE cards daily to the MANPS solution provider as per process requirements. In case card is not returned, bidder will have to bear the actual cost of card incurred by BPCL plus admin charges in line with GCC.

3.4.2.10 Bidder shall report any lost or damaged RFID/BLE cards through the MANPS system and bear the cost of replacements (actual cost of card incurred by BPCL plus admin charges in line with GCC.), as applicable. Also, the case of non-submission of the RFID/ BLE cards / lost RFID/ BLE cards shall require the contractor to lodge complaint at the local Police Thana and submit a copy of the same to BPCL Security.

3.4.2.11 Bidder shall utilize the dashboards and reports generated by MANPS for monitoring worker attendance, deployment w.r.t. skill level, location tracking, ensuring alignment with project requirements.

3.4.2.12 Bidder shall ensure all workers comply with the MANPS usage protocols.

3.4.2.13 Bidder shall obtain and maintain explicit consent from all their/ their vendors/ sub-contractor personnel/ workers for the collection, use, and processing of their data within the MANPS system, with compliance with relevant data protection regulations and project guidelines.

3.4.2.14 Bidder shall coordinate with the MANPS solution provider to ensure smooth integration of worker data into the MANPS system, flag any system-related issues promptly, and provide general cooperation for effective system operation.

3.4.2.15 Bidder shall coordinate their site works with purchaser's MANPS Solution Provider.

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3.4.2.16 Bidder shall be responsible for watch and ward/safekeeping of devices deployed by MANPS Solution Provider within or near the B/L or contractors work area.

3.5 AUTOMATED MACHINE PRODUCTIVITY SYSTEM (MACPS)

3.5.1 Solution Overview

3.5.1.1 Automated web-based Machine Productivity System, hosted in MeitY empanelled cloud data centre, will be provisioned and implemented by purchaser. The digital solution will be used for tracking of construction machine productivity including GPS location tracking and utilization (running and idling condition) by deploying/installing a IOT Sensor on the Bidders Construction Equipment like Excavators, Bulldozers, Pavers, Dump Truck, Compactors, Backhoe Loader, Graders etc. System will also be capable to record other information like Equipment Details, Capacity etc.

3.5.2 Bidders Obligations

3.5.2.1 Bidder shall furnish a comprehensive list of all construction equipment, and enter all the relevant details like machine type, Equipment Details, Capacity, Operator Name and details, Contractor Name and Details, Sub-contractor Name and Details, Valid Certification, due date of renewal, permissible load as per the load chart for cranes etc. to enable registration in the MACPS system.

3.5.2.2 Bidder shall nominate personnel responsible for coordinating with the MACPS solution provider for installation, system configuration, and addressing queries related to equipment tracking and productivity monitoring.

3.5.2.3 Bidder shall provide access to construction equipment for the installation, inspection, and maintenance of IoT devices by the MACPS solution provider and ensure the availability of equipment at designated locations as agreed with the purchaser/ MACPS solution provider.

3.5.2.4 Bidder shall provide Power Supply suitable for IoT Devices/ Sensors for MACPS in the respective construction equipment. This includes undertaking suitable modifications/ additional wiring etc in the construction equipment as required.

3.5.2.5 Bidder shall obtain explicit consent from construction equipment owners/ operators for data collection, usage and processing within the MACPS system, ensuring compliance with relevant data protection regulations.

3.5.2.6 Bidder shall cooperate fully with the MACPS solution provider during IoT device installations and ensure that no unauthorized tampering or interference occurs with the devices or associated systems.

3.5.2.7 Bidder shall be responsible for the safekeeping of IoT devices installed on their equipment and report any loss, damage, or theft to the purchaser/ MACPS solution provider promptly. Bidder shall bear the cost of replacements (actual cost of IOT Devices incurred by BPCL), as applicable.

3.5.2.8 Bidder shall ensure that their operators and supervisors are aware of and comply with operational guidelines for construction equipment monitored through the MACPS system.

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3.5.2.9 Bidder shall utilize the MACPS dashboards and reports provided by the MACPS solution provider to track construction equipment location, utilization and compliance with project requirements, implementing corrective actions as needed.

3.5.2.10 Bidder shall nominate representatives to participate in compulsory training sessions conducted by the MACPS solution provider to understand the use of MACPS features, including dashboards, KPI monitoring, and productivity reporting.

3.5.2.11 Bidder shall facilitate coordination between construction equipment operators and the MACPS solution provider to address any operational constraints or challenges during system implementation.

3.6 WAREHOUSE MANAGEMENT SYSTEM (WMS)

3.6.1 Bidder shall deploy Warehouse Management System and provide APIs/ Manual Data Entry (as necessary) for sharing information with purchaser's CT-CDE to facilitate a live view of the material availability in bidder's warehouse.

3.6.2 Bidder shall provide all assistance and guidance to Purchasers CT/CDE Vendor to integrate the WMS with CT/CDE and ensure uninterrupted and seamless data exchange throughout the contract period.

3.6.2.1 Bidder shall provide login credentials to Purchaser, PMC/ EPCM to provide access to their WMS in case the bidder WMS is not able to integrate with Purchaser CT/ CDE or CT/ CDE is dysfunctional during the course of execution of the contract. Bidder may also have to provide manual entry in CT-CDE related to WMS in case of integration failure.

3.7 TRANSPORT MANAGEMENT SYSTEM (TMS)

3.7.1 Bidder shall deploy URL's for provide real-time tracking information of Long Lead Items (LLI's), ODC equipment, Critical Materials etc. interfaced from Transport Management Solutions of Bidder's Vendor's (TMS shall be by bidder's OEMs/ Transporters) as per the following points.

i. Tracking information of all shipments through all modes of transport vs. Air, Land and Sea

ii. GPS tracking for all Long Lead Items (LLI's), ODC equipment, Critical Materials. EIL/BPCL reserves the right to exempt shipments of small value from GPS Tracking.

iii. Electronic sharing of GPS tracking data (as applicable) and consignment tracking data (through Transport Agency's Transport Management System) via REST API and on web portal of vendor or transport agency, including depiction of location of consignments on map where GPS tracking is applicable.

iv. Tracking details for both international and domestic shipments

v. For International Shipments mandatory vessel tracking through AIS (Automatic Identification System).

3.7.2 Bidder shall provide all assistance and guidance to Purchasers CT/CDE Vendor to integrate the TMS with CT/CDE and ensure uninterrupted and seamless data exchange throughout the contract period.

3.8 SPOOL MANAGEMENT SYSTEM

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3.8.1 Bidder shall deploy and use Piping Spool Management System to reduce construction errors and delay during identifying, tracing and installing piping spools. The objective of the system shall be as under.

(i) Productivity and trackability improvement

(ii) Job tracking and availability of real time data capture

(iii) Better inventory control

(iv) Reducing the errors and associated cost in sending incorrect spools to site for installation

3.8.2 Methodology and controls: The general guidelines for piping spool management are stated below

(i) The Spool Tracing System shall work in alignment with DQIS where records for Piping Spool Fabrication, Erection , Alignment and Piping Quality Control (NDT Records, LHS etc) are maintained.

(ii) A unique numbering system for pipe-spools shall be developed. The system shall incorporate unit designation/ number, line number and spool sequence number as a minimum. The spool number shall be hard-punched on the pipe spool at conspicuous location.

(iii) All fabricated I completed spools shall be marked and identified using conventional multi-line bar code stickers which shall have information pertaining to spool number as well as traceable correlation to other parameters recorded in a database. Printed bar code stickers shall be properly fixed on to the pipe spools.

(iv) The barcode stickers fixed on spools shall be readable with the help of bar code readers and shall show a unique bar code serial number upon reading. The bar code shall be co-relatable to the spool number of the pipe.

(v) Apart from the above, spools shall be affixed with suitable RFID (Radio Frequency Identification) tags which can be read through a RFID scanner. The RFID system shall have search and Id capability and shall be co-relatable to spool number in the database

(vi) All Hardware, software, consumables, labour and supervision required for implementing the spool management system shall be provided by contractor at no extra cost. Contractor shall develop a detailed procedure incorporating the above suggested elements and submit the same to Engineer In-charge for approval before implementation.

3.8.3 Bidder shall provide direct access to 3 Nos. Users of PMC and 2 Nos. Users of Purchaser to the Spool Management System during the contract duration. Bidder shall also arrange training session to PMC and Purchaser personnel on using the system.

3.9 COMMON SYSTEM FEATURES & FUNCTIONALITIES

3.9.1 BPCL cyber security guidelines as Circular IS24-25.1 and IS24-25.2 (attached) are to be followed for the integrated Digital Solutions under bidder's scope (Spool Management System). Bidder shall also comply to the BPCL Cybersecurity Checklist (attached), BPCL

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Security Checklist for Cloud/ Third-party solutions (attached) and BPCL Security conditions in tender for purchasing Commercial software (attached).

3.9.2 Software applications, including 3rd Party applications, with valid licenses & support should only be deployed. Any liability arising out of any software non-compliance would strictly lie with the bidder.

3.9.3 Bidder is responsible for complete system architecture, setup and maintenance of all system software components including Operating System, Database Server, Security devices etc, as needed for robust performance and as per system performance standards in the SLA.

3.9.4 For all solutions providing file upload scenarios, following functionalities to be ensured:

(i) File upload should verify the file types. Only required file-types to be accepted by the application.

(ii) While uploading, files need to be scanned against malware. Solution should allow only clean files to be uploaded.

3.9.5 For APIs, following minimum security controls should be included: -

(i) Strong Authentication

(ii) Encryption

(iii) Rate limiting

3.9.6 All web-based applications/ dashboards etc. shall have feature of session auto-log out in case of idling of user by 10 min.

3.9.7 **PROVEN TRACK RECORD**

3.9.7.1 The digital solutions under bidder's scope (Spool Management System) shall have been supplied or provided as managed solution (either cloud hosted or on premise) by bidder/ bidder's respective digital solution provider either by themselves or with support from any OEM(s), and each of the solutions shall have completed a period of minimum six (6) months after go-live.

3.9.7.2 In case bidder proposes to provide the digital solutions Spool Management System through OEM(s)/ solution provider(s), following shall apply:

(i) Bidder shall furnish Manufacturer Authorization Certificate and Logistic Support letter from OEM(s)/ digital solution provider(s) of Spool Management System confirming the following. The letter must be signed by OEM(s)/ digital solution provider(s) corporate level signatory on company letter head.

"The OEM(s)/ digital solution provider(s) assumes complete responsibility for their involvement with the bidder in all phases of work during the contract period like system engineering, cloud hosting, User Acceptance Test, Go-live, operation, maintenance, decommissioning and exit management."

3.9.8 **MANPOWER DEPLOYMENT**

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3.9.8.1 Bidder shall deploy necessary manpower at the BPCL KR site dedicated for operation and maintenance and to provide support and assistance to users of Spool Management System . The persons shall have minimum 2 years of experience in IT support. Bidder shall also be responsible for deploying additional personnel as per project exigencies.

4.0 ADHERENCE TO STANDARDS

4.1 QUALITY, SAFETY, DOCUMENTATION AND CYBERSECURITY

4.1.1 The bidder shall comply with the mentioned standards for the execution of the work as mentioned in the following clauses.:

(i) Quality Management System: Bidder shall comply to EIL Standard Specification for Quality Management System, 6-78-0001.

(ii) Documentation Requirements: Bidder shall comply to EIL Standard Specification for Documentation Requirements for Contractors 6-78-0002 and from Suppliers, 6-78-0003.

(iii) HSE Management and Safety Measures for Electrical Installations: Bidder shall comply to EIL Standard Specification for Health, Safety and Environment, 6-82-0001 and Safety Measures for Electrical Installations during Construction, 7-51-0332.

(iv) Cybersecurity Requirements: Bidder shall comply to BPCL's Cybersecurity requirements as per Circular. IS24-25.1, IS24-25.2 (attached), BPCL Security Checklist for Cloud/ Third-party solutions (attached) and BPCL Security conditions in tender for purchasing Commercial software (attached).

5.0 INTEGRATED ACCEPTANCE TEST (SAT)

5.1 GENERAL

5.1.1 Bidder/ bidder's respective digital solution provider for Spool Management System shall demonstrate the functional requirements of the respective digital solution to BPCL and EIL for acceptance.

5.1.2 Bidder shall furnish the SAT Procedure for Spool Management System for BPCL/ EIL review prior to offering the respective digital solution for SAT.

6.0 LIST OF ATTACHMENTS

i. EIL Standard Specification for Quality Management System, 6-78-0001

ii. EIL Standard Specification for Documentation Requirements from Contractors, 6-78-0002.

iii. EIL Standard Specification for Documentation Requirements from Suppliers, 6-78-0003.

iv. EIL Standard Specification for Health, Safety and Environment, 6-82-0001

v. EIL Standard Specification for Safety Measures for Electrical Installations during Construction, 7-51-0332

vi. BPCL IT and Cybersecurity Guidelines

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a. BPCL Cybersecurity requirements as per Circular. IS24-25.1
b. BPCL Cybersecurity requirements as per Circular. IS24-25.2
c. BPCL IT Security Compliance Check List
d. BPCL Security Checklist for Cloud/ Third-party solutions
e. BPCL Security conditions in tender for purchasing Commercial software

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CIRCULAR

Circular.IS.24-25/1 **30th May, 2024**

Subject: Guideline for ensuring cyber security compliance of new IT initiatives

BPCL is leveraging Information Technology extensively for its various business needs by deploying a wide range of systems and applications. Over a period, many SBUs and Entities have also started implementing various IT solutions hosted in cloud/ third-party data centers.

With such an expansive growth in digitization, our exposure to cyber-risk is also increasing. While adopting a new IT solution, any gap in cyber security controls may lead to severe cyber incidents resulting in financial loss, operational disruptions, statutory/ regulatory penalties, reputational damage etc. Under the Digital Personal Data Protection Act, 2023, penalties for data breaches will vary in the range of INR 50 Crore to INR 250 Crore based on the severity and nature of the breach.

Therefore, it is essential to incorporate all necessary cyber security controls right from the planning & design phase itself, so that cyber security requirements become part of the overall specifications (or RFP). At the same time, it is equally important to ensure that all such requirements are complied with before deploying the solution into production.

To ensure that the planned IT solution (and its underlying infrastructure) is secure by design, it is recommended to conduct **Vulnerability Assessment & Penetration Testing (VAPT)/ Web Application Penetration Testing (WAPT),** as applicable, through an independent auditor empaneled with Indian Computer Emergency Response Team (CERT-In) before the initial roll-out. Subsequently, VAPT/ WAPT to be repeated before a major change/ upgrade or once in a year, whichever is earlier.

What is VAPT?

VAPT is a comprehensive assessment through which security weaknesses or loopholes are identified, which can be exploited by malicious actors. This assessment also simulates real-world attacks to determine viability and impact if the vulnerabilities are exploited. Generally, VAPT is performed on the backend IT infrastructure of the application such as application server, database server, network/ security devices, etc.

What is WAPT?

WAPT is a type of VAPT designed to discover vulnerabilities in web applications/mobile applications/ Application Programming Interface (APIs)/ Software-as-a-Service (SaaS) solutions.

Why VAPT/ WAPT is to be conducted?

Conducting VAPT/ WAPT helps to identify and address security issues early, reduce risks, and ensure compliance. It is a proactive approach that contributes to a more secure and reliable system.

What is the assessment process?

The build which is ready to be rolled out after User Acceptance Test (UAT), should be given for VAPT/ WAPT. The auditor carries out Level1 assessment and identifies the vulnerabilities. The solution provider must patch these vulnerabilities. The auditor carries out retest in Level2 assessment and if all vulnerabilities are closed, then issues a Level2 Report and/ or 'Safe to Host' certificate. In short, there are a minimum of 2 assessments in one cycle. **Overall, it may take an additional 3-4 weeks to complete this process, which needs to be factored in the project schedule.**

Regarding VAPT, following points to be noted: -

I. The auditing agency should be empaneled with the **CERT-In.** Refer the list of CERT-In empaneled auditors at https://www.cert-in.org.in/PDF/Empanel_org_2022.pdf.

II. The solution provider should submit Level2 report to BPCL. If a solution provider is unable to disclose the Level2 report as per their policy, then 'Safe to Host' certificate from CERT-In empaneled auditor is acceptable.

III. For global solutions or the solutions which are not hosted in India, the solution provider is required to submit the VAPT Level2 report/any other equivalent security audit report/ 'Safe to Host' Certificate issued by a reputed third-party independent auditing firm, in case audit by CERT-In empaneled agency is not feasible.

IV. New Solution/ major upgrades should be deployed into production only after obtaining the Level2 report/ 'Safe to Host' certificate.

In addition to the VAPT requirements, a comprehensive security checklist also to be included in the tender (refer **Annexure I**) and its compliance to be submitted for security clearance.

You are requested to follow these guidelines for all IT initiatives.

Shital Jiwane
GM IS Cyber Security & GRC

Annexure -I: Security Checklist for Cloud/ Third-party solutions

1. **Non-Disclosure Agreement (NDA)** should be signed between BPCL and the Contracting Agency (on Rs.100/- non-judicial stamp paper) as well as between contracting agency and their service providers before the start of contract. NDA should be signed by the contracting agency as well as BPCL signatory. No data should be shared before signing of the NDA.

2. Data centre on which the application to be hosted should preferably be within India, unless there is a strong justification for hosting it outside and acceptable to BPCL.

3. Access to the applications should be preferably restricted to **India Region**.

4. Cloud Service Provider should maintain accreditation by MeitY or Local accreditation agency (for data hosted outside India).

5. Cloud Service Provider should maintain relevant security standards. e.g.
   - ISO/IEC 27001 (Information Security Management)
   - ISO/ IEC 27017 (Code of practice for securing cloud services)
   - ISO/IEC 27018 (Code of Practice for Protecting Personal Data)
   - SOC 2

6. Backups of all components are taken periodically (to be decided by the business) to ensure the availability of data & the relevant applications in case of a major failure or a security incident.

7. Network/ perimeter should be protected through a **Firewall** and **intrusion protection system (IPS / IDS).**

8. All components including Operating System, DB, Web server, application server, Network & Security devices etc. should be **hardened** before deployment of any new solution.

9. **Patching and reboot** of systems (if applicable) should be done on periodic basis.

10. The servers should be protected through a leading **Anti-virus/ Anti-malware solution.**

11. Exchange of data should be carried on encrypted channel using **TLS1.2** or above.

12. The **data at rest** should be **encrypted** with **AES-256** encryption algorithm or more.

13. Default passwords should be changed at all layers of components including Operating System, Applications, Web Servers, Database, Network & Security devices & all other related systems. Passwords should be **complex** and **not easily guessable or common phrases**. Passwords should be changed periodically.

14. Access to the solution should be configured with **multi-factor authentication**.

15. Local Administrator accounts should be renamed.

16. Unused accounts should be disabled or deleted.

17. Vulnerability Assessment Penetration Testing (Level1 and Level2) should be done through CERT-In empanelled auditor:

    - before initial roll-out,
    - subsequently before a major change/ upgrade or once in a year, whichever is earlier.

    and submit Level2 report to BPCL.

18. All identified vulnerabilities need to be closed before deploying the solution into production.

19. Apart from VAPT assessment, vulnerabilities identified through other mediums (disclosure by OEM, advisories by statutory agencies, tool-based scanning etc.) should be patched as per below timelines:

    - Critical – 3 days
    - High – 5 days
    - Medium – 15 days
    - Low – 21 days

20. Any unused published web services/ APIs for information exchange should be taken down.

21. All whitelisted IP addresses should have access only to a specific service/ ports.

22. All outgoing access to public Internet from servers must be restricted to limited IP addresses or URLs only as per the business requirement.

23. All types of clear-text protocols such as TELNET, FTP etc. must be disabled.

24. Software with valid licenses & support should only be deployed.

25. All Internet-facing web applications should have Web Application Firewall (WAF), Anti-DDoS, Anti-BOT, API security protection enabled.

26. Logging should be enabled at all layers of the infrastructure and logs to be provided for auditing/ forensic investigations as and when requested by BPCL. All security, access & transaction logs should be retained for minimum 180 days.

27. The solution should be governed through continuous monitoring & response (identify-protect-detect-respond-recover) from any security incident/ data breach.

28. The solution provider should follow secure software development lifecycle practices to develop & maintain the software being offered.

29. The solution provider must notify BPCL immediately as soon as they know or believe that a Cyber Security Incident/ Breach of Data/ Loss of Information has or may have taken place and must provide full details of the incident and any mitigation measures already taken and intended to be taken by them and (where applicable) any mitigation measures recommended by them to be taken by BPCL.

30. Following a Cyber Security Incident involving BPCL's services/ data, the solution provider shall:

(a) use their best endeavours to mitigate the impact of the Cyber Security Incident, e.g. if any system is reported under breach/ incident, the solution provider shall disconnect it from the network immediately to contain its lateral movement;

(b) shall extend all necessary support and assistance to BPCL for carrying out incident analysis/ forensic investigation till its conclusion.

(c) shall ensure to preserve the digital evidence and logs till the conclusion of the investigation and confirmation from BPCL about the deletion of the evidence.

(d) take any action deemed necessary by BPCL in the circumstances, including complying with any additional security measures deemed appropriate by BPCL.

31. In case the solution provider has purchased the entire solution/ service (to be offered to BPCL) or parts of it from another supplier/ provider, then they must be aware of the complete chain of suppliers/ providers.

32. The solution provider shall ensure to obtain the necessary security compliance documents (such as VAPT report/ Any other Security Audit report/ 'Safe to Host' Certificate etc.) from the suppliers/ providers for all the components purchased. The solution provider must conduct all necessary checks to ensure that the purchased product does not have any embedded security threat such as malware, rootkit, remote access trojans or backdoor etc.

33. In case the solution provider has used an open-source or third-party software codes/ libraries in building the offered software, then they shall carry out necessary security tests against those software components (such as Static Application Security testing, source code review, Secure Composition Analysis etc.) to ensure such components are secured by design.

---------- End of Document ----------

Non-Disclosure Agreement (NDA)

This Agreement is made as of the ---------- (date) between **BHARAT PETROLEUM CORPORATION LTD. (BPCL)** a Government of India Enterprise, having its registered office and Corporate office at Bharat Bhavan, 4&6, Currimbhoy Road, Ballard Estate, Mumbai - 400001 **hereinafter referred as "First Part"** which expression shall unless repugnant to the subject or the context mean and included its successors, nominees or assigns and M/s ---------- ---------- a company incorporated under the Indian Companies Act, 1956, and having its registered office at ---------- ---------- ---------- herein after called "**Second Part**" which expression shall unless repugnant to the subject or the context mean and include its successors, nominees or assigns.

Whereas in order to pursue the business purpose of this particular project as specified in **Annexure A** (the "Business Purpose"), **M/s**---------- recognize that there is a need to disclose certain information, as defined in para 1 below, to be used only for the Business Purpose and to protect such confidential information from unauthorized use and disclosure.

In consideration of First Part's disclosure of such information, Second Part agrees as follows:

1. This Agreement will apply to all confidential and proprietary information disclosed by First part to Second part, including information which the disclosing party identifies in writing or otherwise as Confidential before or **within thirty days** after disclosure to the receiving party ("Confidential Information").

   Confidential Information consists of certain specifications, designs, plans, drawings, software, prototypes and/or technical information, and all copies and derivatives containing such Information, that may be disclosed to other part by first part for and during the Purpose, which disclosing party considers proprietary or confidential ("Information"). Confidential Information may be in any form or medium, tangible or intangible, and may be communicated/disclosed in writing, orally, or through visual observation or by any other means by other part (hereinafter referred to as the receiving party) by the First Part (hereinafter referred to as one disclosing party). Information shall be subject to this Agreement, if it is in tangible form, only if clearly marked as proprietary or confidential as the case may be, when disclosed to the receiving party or, if not in tangible form, its proprietary nature must first be announced, and it must be reduced to writing and furnished to the receiving party within thirty (30) days of the initial disclosure.

2. M/s ---------- i.e. Second Part ----------hereby agreed that during the Confidentiality Period:

   a) The receiving party shall use Information only for the Purpose, shall hold Information in confidence using the same degree of care as it normally exercises to protect its own proprietary information, but not less than reasonable care, taking into account the nature of the Information, and shall grant access to Information only to its employees who have a need to know, but only to the extent necessary to carry out the business purpose of this project **as defined in exhibit A,** shall cause its employees to comply with the provisions of this Agreement applicable to the receiving party, shall reproduce Information only to the extent essential to fulfilling the Purpose, and shall prevent disclosure of Information to third parties. The receiving party may, however, disclose the Information to its consultants and contractors with a need to know; provided that by doing so, the receiving party agrees to bind those consultants and contractors to terms at least as restrictive as those stated herein, advise them of their obligations, and indemnify the disclosing party for any breach of those obligations.

b) Upon the disclosing party's request, the receiving party shall either return to the disclosing party all Information or shall certify to the disclosing party that all media containing Information have been destroyed.

3. The foregoing restrictions on each party's use or disclosure of Information shall not apply to Information that the receiving party can demonstrate:

a) Was independently developed by or for the receiving party without reference to the Information, or was received without restrictions; or

b) Has become generally available to the public without breach of confidentiality obligations of the receiving party. The information shall not be deemed to be available to the general public merely because it is embraced by more general information in the prior possession of Recipient or of others, or merely because it is expressed in public literature in general terms not specifically in accordance with the Confidential Information; or

c) Was in the receiving party's possession without restriction or was known by the receiving party without restriction at the time of disclosure and receiving party declare of possession of such confidential information within a day upon such disclosure by disclosing party ; or

d) Pursuant to a court order or is otherwise required by law to be disclosed', provided that Recipient has notified the disclosing party immediately upon learning of the possibility of any such court order or legal requirement and has given the disclosing party a reasonable opportunity and co-operate with disclosing party to contest or limit the scope of such required disclosure including application for a protective order.

e) Is disclosed with the prior consent of the disclosing party; or

f) The receiving party obtains or has available from a source other than the disclosing party without breach by the receiving party or such source of any obligation of confidentiality or non-use towards the disclosing party.

4. Receiving party agrees not to remove any of the other party’s Confidential Information from the premises of the disclosing party without the disclosing party’s prior written approval and exercise extreme care in protecting the confidentiality of any Confidential Information which is removed, only with the disclosing party’s prior written approval, from the disclosing party’s premises. Receiving party agrees to comply with any and all terms and conditions the disclosing party may impose upon any such approved removal, such as conditions that the removed Confidential Information and all copies must be returned by a certain date, and that no copies are to be make off of the premises.

5. Upon the disclosing party's request, the receiving party will promptly return to the disclosing party all tangible items containing or consisting of the disclosing party's Confidential Information all copies thereof.

6. Receiving party recognizes and agrees that all of the disclosing party's Confidential Information is owned solely by the disclosing party (or its licensors) and that the unauthorized disclosure or use of such Confidential Information would cause irreparable harm and significant injury, the degree of which may be difficult to ascertain. Accordingly, receiving party agrees that the disclosing party will have the right to obtain an immediate injunction enjoining any breach of this Agreement, as well as the right to pursue any and all other rights and remedies available at law or in equity for such a breach.

7. As between the parties, all Information shall remain the property of the disclosing party. By disclosing Information or executing this Agreement, the disclosing party does not grant any license, explicitly or implicitly, under any trademark, patent, copyright, mask work protection right, trade secret or any other intellectual property right. The disclosing party disclaims all warranties regarding the information, including all warranties with respect to infringement of intellectual property rights and all warranties as to the accuracy or utility of such information. Execution of this Agreement and the disclosure of Information pursuant to this Agreement does not constitute or imply any commitment, promise, or inducement by disclosing party to make any purchase or sale, or to enter into any additional agreement of any kind.

8. Disclosing party's failure to enforce any provision, right or remedy under this agreement shall not constitute a waiver of such provision, right or remedy.

9. This Agreement will be construed in, interpreted and applied in accordance with the laws of India.

10. This Agreement and Exhibit A attached hereto constitutes the entire agreement of the parties with respect to the parties' respective obligations in connection with Information disclosed hereunder and supersedes all prior oral and written agreements and discussions with respect thereto. The parties can amend or modify this Agreement only by a writing duly executed by their respective authorized representatives. Neither party shall assign this Agreement without first securing the other party's written consent.

11. This Agreement will remain in effect for three years from the date of the last disclosure of Confidential Information, at which time it will terminate, unless extended by the disclosing party in writing.

12. With regard to the confidential information of M/s…….. disclosed to BPCL, BPCL agrees to comply with all the obligations of receiving party mentioned in this Agreement.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement by their duly authorized officers or representatives.

M/S. _____	**BHARAT PETROLEUM CORPORATION LIMITED**
Signature: _____	Signature: _____
Printed Name: _____	Printed Name: _____
Designation: _____	Designation: _____

Exhibit A

1. **Business Purpose:** _____

   _____

2. **Confidential Information of M/s.** _____

   a. All communication/ information submitted to the BPCL relating to the proposal of M/s. _____ for the purpose of procurement and subsequent integration with existing infrastructure of BPCL, marked as confidential.

3. **Confidential Information of BPCL:**

   a. All details relating to architecture and other Network infrastructure details of BPCL etc.

   b. All information shared in oral or in written form by BPCL with M/s._____.

   c. Any information desired by M/s. _____ shall be justified for.

   d. Information downloaded or taken in physical form shall be returned/ destroyed after use and not copied.

   e. Draft Technical specifications for the various projects and Tender documents for the same.

BPCL: _____ **M/s.** _____

Signed **Signed**

IT Security Compliance Checklist

(For Cloud or Third party hosted applications)

Application Details	
Application Name	
Application URL/ IP Address	
Business Case	
Application owner (SBU/ Entity of BPCL)	
Name of the Vendor	
Technical Contact Person(s) of vendor	Name: _____ Email: _____ Mobile: _____

Security Checklist		
Security Control	**Response**	**Remarks**
Is **Non-Disclosure Agreement (NDA)** signed between BPCL and Contracting Agency? Is **NDA** signed between the vendor and their Service Provider? (if applicable) **Note**: *NDA shall be signed and stamped by the vendor and BPCL on a non-judicial stamp paper (of Rs. 100/-)*	☐ Yes ☐ No ☐ Yes ☐ No	
Type of the offered solution (IaaS/ PaaS/ SaaS or others) • **IaaS (Infrastructure as a Service)**: Vendor will manage dedicated infrastructure alongwith software for BPCL requirement, in which Infrastructure contains underlying servers, storage, network, security devices etc.	_____	

• **PaaS (Platform as a Service)**: Hardware & Software platform will be managed by the Cloud Service Provider whereas vendor will manage BPCL application. • **SaaS (Software as a Service)**: Vendor has offered a standard or enterprise-level application/ software to BPCL which will be customized as per BPCL's requirement. • Any other type: Please specify.		
Details of data hosted by the application: • Employee data, Consumer/ Customer data, Third-party or vendor data, or others. Specify details. • Does it contain any sensitive/ personal data (such as mobile no, address, PAN no, Ration card no., bank details, etc.). If yes, specify details. • Does it contain Aadhaar related data? • Does it contain any sensitive or confidential information of BPCL or any other third-party? If yes, provide details.	_____ _____ ☐ Yes ☐ No ☐ Yes ☐ No _____	
Is Data Centre located within India? (specify location) If 'No', provide SBU/ Entity Head approval as per **Part-I**	☐ Yes ☐ No Primary: _____ DR: _____	
Is Data Centre accredited by MeitY (for DC within India)/ local authority (for DC outside India)?	☐ Yes ☐ No	
Is Data Centre compliant with following Security standards? • ISO/ IEC 27001 • ISO/ IEC 27017 • ISO/ IEC 27018 • SOC 2	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No	
Details of Asset Inventory (*Use the excel file for providing asset inventory)*		

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BPCL_IT_Asset_Inventory_Template.xlsx		
Attach Network architecture diagram **Note**: *In the network architecture diagram, specify all the components, draw their connections and data flows. Also specify IP addresses (private and public IPs as applicable).*		
Application platform	_____	
Database platform	_____	
Is access to the application restricted within India region? (Or, is Geo-fencing enabled?)	☐ Yes ☐ No If 'No', provide SBU/ Entity Head approval as per **Part-II**	
Is access to the application configured with multi-factor authentication?	☐ Yes ☐ No	
Is Captcha enabled on the login page and for critical transaction screens?	☐ Yes ☐ No	
Is account lockout policy configured at the application and system level? If Yes, specify the threshold value (maximum no. of invalid login attempts allowed)	☐ Yes ☐ No Threshold _____	
Password Policy: • Is Password policy configured? • Is default password changed at all layers (e.g. OS, Application, DB & all other associated systems/ devices)? • Are passwords hardcoded in any program/ scripts? • Is password changed periodically? (Frequency of Password change)	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No _____	
Account Security: • Is Local Administrator account renamed?	☐ Yes ☐ No	

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• Are all unused accounts disabled/ deleted? ○ Administrators ○ Developers ○ Users (transferred/ resigned/ terminated/ suspended/ role-changed)	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No	
Are timestamps across all systems synchronized with NTP (Network Time Protocol) servers? **Note: As per CERT-In's directive, NTP server should be in sync with NTP of National Informatics Centre (NIC) or National Physical Laboratory (NLP)**	☐ Yes ☐ No	
Is backup of all components taken periodically? (Specify periodicity)	☐ Yes ☐ No _____	
Is network/ perimeter protected through Firewall and Intrusion detection system (IPS/ IDS)? Specify make & model of the solution:	☐ Yes ☐ No _____	
Is hardening of all components completed before deployment of the solution?	☐ Yes ☐ No	
Is patching (and reboot of systems, wherever applicable) done on periodic basis**?**	☐ Yes ☐ No	
Are servers protected through anti-virus/ anti-malware/ EDR/ XDR solution? If yes, specify the product name:	☐ Yes ☐ No _____	
Is data in transit encrypted by TLS? (Specify TLS version)	☐ Yes ☐ No _____	
Is critical & sensitive data at rest, if any, encrypted with AES-256 algorithm or more?	☐ Yes ☐ No	
Provide VAPT (Vulnerability Assessment and Penetration Testing) and WAPT (Web Application Penetration Testing) compliance report issued by CERT-In empaneled Security Auditor (for application hosted within India)/ Authorized Third Party Security Auditor (application hosted outside India). **Note: (i) VAPT/ WAPT to be done before roll-out and, (ii) repeated once a year or before roll-out of a major upgrade, whichever is earlier. All**		

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observations need to be closed and final closure report to be submitted. • **VAPT to be carried out for all infrastructure components (servers/ network/ security devices/ load-balancers and all other associated devices).** • **WAPT to be carried out for all web applications, APIs, mobile apps etc.**		
Does vendor follow secure coding practices where vulnerabilities are detected and mitigated during the development phase via Static Application Security Testing (SAST) process?	☐ Yes ☐ No	
Is any open-source component (such as open-source codes/ libraries etc.) used during the development of the solution? If yes, provide Software Bill of Material (SBOM):	☐ Yes ☐ No _____	
Are all unused published web services/ APIs for information exchange deactivated?	☐ Yes ☐ No	
Do all whitelisted IP addresses have access only on a specific service/ ports?	☐ Yes ☐ No	
Is incoming Internet access disabled or restricted from limited IP addresses or URLs as per business requirement? Is outgoing Internet access from servers disabled or restricted to limited IP addresses or URLs only as per business requirement?	☐ Yes ☐ No ☐ Yes ☐ No	
Are all types of clear-text protocols such as TELNET, FTP etc. disabled across all layers of systems?	☐ Yes ☐ No	
Does software have valid licenses & support?	☐ Yes ☐ No	
Is any system/ application accessible from the Internet (without using VPN)? If yes, provide the list (including URL, public IP address)	☐ Yes ☐ No _____	
Are Development and UAT environment accessible from the Internet (without using VPN)? If yes, provide the details.	☐ Yes ☐ No _____	
Is any Database directly accessible from the Internet (without using VPN)?	☐ Yes ☐ No	

If yes, provide the details.	_____	
Are all Internet-facing websites protected using WAF, Anti-DDoS, Anti-BOT, API protection solution? If yes, specify details (name of the solution):	☐ Yes ☐ No _____	
Is logging & auditing enabled across all layers (OS, Web server, Application, DB etc.) and includes origin client IP address, transaction date & time, etc. wherever applicable? (Specify Log retention period) **Note: As per CERT-In's directive, security logs are required to be preserved for 180 days.**	☐ Yes ☐ No _____	
Specify how developers access the application remotely if they are not in office	_____	
Specify how system administrators access the systems if they are not in office	_____	
Specify how BPCL users access the Dev/ UAT environment	_____	
Are all administrative (privilege access) activities recorded and reviewed periodically?	☐ Yes ☐ No	
Is any change control process followed for making the changes in the application and infrastructure?	☐ Yes ☐ No	
Compliance Report Submitted by **(BPCL Officer In-Charge)**	Name: Signature:	
Recommendation by CISO		

Bharat Petroleum	☐ **Part I: Hosting of Application on Cloud/ Data Centre located outside India** ☐ **Part II: Application access to be provided from outside India**

Application Name	
Part I: Hosting of Application on Cloud/ Data Centre located outside India	
Business Justification for hosting/ transferring the data outside India	
Locations where data shall reside	
Details and Type of data stored outside India (e.g. Employee Name, Staff No., email, etc.)	
Name of the Data Centre provider (who shall host the data)	
Is GDPR (General Data Protection Regulation) or any other local Data Protection Law applicable to the location? If "Yes", whether the Data Centre Provider is compliant to it?	
Any plan to shift the data back to India in course of time? If yes, expected time duration	

Part II: Application access to be provided from outside India	
Business Justification for providing access from outside India	
Countries from where access to be provided	
Who will access? [BPCL Employees, Customers, Vendors, Others (specify details)]	
Validity of access permission (Temporary/ Permanent)	
Approvals:	
Requested By	Name : Designation : Signature :
Recommended By (DGM or above)	Name : Designation : Signature :
Approved By (Business/ Entity Head)	Name : Signature : Remark (If any) :

Note: *Why Data Localization?*

1. *The main intent behind data localization is to protect the personal/ sensitive information of the country's citizens and residents from foreign surveillance and give local governments and regulators the jurisdiction to call for the data when required.*
2. *Storing of data locally is expected to help law-enforcement agencies to access information that is needed for the detection of a crime or to gather evidence.*
3. *Local laws of land are applicable for the data hosted outside India.*

Security conditions in tender for purchasing Commercial software

1. **Non-Disclosure Agreement (NDA)**: Non-Disclosure Agreement (NDA) should be signed between BPCL and the vendor (on Rs.100/- non-judicial stamp paper) before the start of contract. NDA should be signed by the representatives of both the organizations. No data should be shared before signing of the NDA.
2. Software should be secured by design. It should support following security functionalities: -
    a. Authentication
    b. Authorization
    c. Generating Logs and Audit trails
    d. Role based access
3. Software should support configuring multiple roles with the least privilege principles. Software should also support configuring strong password policy (complexity, age, history etc.).
4. Vulnerability Assessment Penetration Testing (Level1 and Level2) of the proposed software should be done through CERT-In empanelled auditor:
    - before initial roll-out,
    - subsequently before a major change/ upgrade or once in a year, whichever is earlier.

    and submit Level2 report to BPCL.
5. All identified vulnerabilities need to be closed before deploying the solution into production.
6. The software provider should inform whenever any new security issue or vulnerability is identified related to the software. The provider should release security patches or updates for the same in timely manner. The software provider should also patch the vulnerability in timely manner in case any vulnerability is reported by BPCL.
7. The vendor should ensure deploying security patches/updates and software upgrades in timely manner during the period of the contract including warranty/extended warranty/ comprehensive contracts post warranty. The software provider should maintain the compatibility of the software in line with newly released operating system/ database/ webserver/ browser etc.
8. The software should have provision to integrate with other standard security technologies like:
    a. Multi-factor authentication
    b. Single Sign-ON
    c. Identity and Access management
9. The software should support encryption for data at rest using the latest encryption algorithms such as AES 256 or higher. It should support encryption of data in-transit using minimum TLS 1.2 or above.
10. Software should support generating logs and audit trails. It should support retention of logs for at least 180 days.
11. Vendor should submit the SBOM (Software Bill of Materials) of the proposed software. SBOM should include, at a minimum: name of the component, version of the component, name of the publisher etc.
12. In case any cyber incident/data breach is reported in relation to the deployed software in BPCL, the vendor should provide all necessary support during cyber incident response and forensic investigation without charging any additional cost to BPCL.
13. BPCL may conduct security audit or assessment (through third-party auditors) of the software after deployment. The vendor should extend all necessary support and assistance during the

audit process as well as mitigate the reported observations without charging any additional cost to BPCL.

CIRCULAR

Circular.IS.24-25/ 2 **29th July 2024**

Subject: Guidelines for BUs/ Entities on Cyber Security matters

BPCL is leveraging Information Technology (IT) and Operations Technology (OT) extensively for its various business needs. Though most solutions are managed by IS, Refinery IS and Digital; businesses and entities have also deployed IT/ OT/ IoT solutions for their specific business needs.

With such a widespread rise in technology adoption, it becomes more imperative to ensure the cyber security of all solutions and their underlying infrastructure. If not protected properly, a cyber-attack may cause severe impact such as operational disruptions, financial and/ or reputational damage to the organization.

In view of it, it is essential to discuss the requirement of a new system/ application/ solution with the Chief Information Security Officer (CISO):

- **At the beginning of the project** so that adequate security controls commensurate with the requirement can be suggested and can be incorporated into the solution design & tender.
- Also, the **Security Checklist along with NDA** (to be signed before the start of contract), **VAPT** (for third-party data center/ cloud infrastructure)/ **WAPT** (for applications) **Level2 reports** to be submitted before go-live.

This point was also covered in the circular (**Circular.IS.24-25/ 1 dated 30.05.2024**) issued by the CISO on '**Guideline for ensuring cyber security compliance of new IT initiatives'**. It was discussed, inter alia, during the recent Information Security Council meeting held on 26.06.2024. CFD has also perceived the need for better cyber governance and have passed below resolution:

1. All SBUs and Entities of BPCL shall seek CISO's (Chief Information Security Officer) approval on cyber security controls implemented in the solution before launching any new system/application/solution.
2. Any non-compliance shall be treated as a security violation and shall be dealt in accordance with CDA rules.
3. All cases of non-compliance shall be reported to the CFD during the quarterly cyber security status update by CISO and respective SBU/ Entity Head.

You are kindly requested to make a note of the same and follow these guidelines in your respective SBU/ Entity. It may please be noted that regular reporting must be made by the undersigned to the CFD.

SHITAL VIBHAS JIWANE

Digitally signed by SHITAL VIBHAS JIWANE
Date: 2024.07.29 18:50:57 +05'30'

Shital Jiwane
GM IS Cyber Security & GRC

Security Checklist for Cloud/ Third-party solutions

1. **Non-Disclosure Agreement (NDA)** should be signed between BPCL and the Contracting Agency (on Rs.100/- non-judicial stamp paper) as well as between contracting agency and their service providers before the start of contract. NDA should be signed by the contracting agency as well as BPCL signatory. No data should be shared before signing of the NDA.

2. Data centre on which the application to be hosted should preferably be within India, unless there is a strong justification for hosting it outside and acceptable to BPCL.

3. Access to the applications should be preferably restricted to **India Region**.

4. Cloud Service Provider or the Data Centre Provider should maintain accreditation by MeitY or Local accreditation agency (for data hosted outside India).

5. Cloud Service Provider or the Data Centre Provider should maintain relevant security standards. e.g.
   a. ISO/IEC 27001 (Information Security Management)
   b. ISO/ IEC 27017 (Code of practice for securing cloud services)
   c. ISO/IEC 27018 (Code of Practice for Protecting Personal Data)
   d. SOC 2

6. Solution provider should submit the detailed asset inventory, application & database platform and network architecture details as per template shared by BPCL.

7. Backups of all components are taken periodically (periodicity to be decided by the business) to ensure the availability of data & the relevant applications in case of a major failure or a security incident.

8. Network/ perimeter should be protected through a **Firewall** and **intrusion protection system (IPS / IDS).**

9. All components including Operating System, DB, Web server, application server, Network & Security systems etc. should be **hardened** before deployment of any new solution with minimum of following (but not limited to) controls: -
   a. Local Administrator accounts should be renamed.
   b. Unused accounts should be disabled or deleted.
   c. Guest accounts should be disabled.
   d. Default passwords should be changed.
   e. All unused ports and services should be disabled or removed.
   f. Account lock-out policy should be configured.
   g. All applicable security updates/patches should be installed.

10. Timestamp of all system components should be in sync with the Network Time Protocol (NTP) servers of National Informatics Centre (NIC) or National Physical Laboratory (NPL).

11. **Patching and reboot** of systems (if applicable) should be done on periodic basis.

12. The servers should be protected through a leading **Anti-malware/ EDR / XDR solution.**

13. Data in transit should be encrypted using **TLS1.2** or above.

14. The **data at rest** should be **encrypted** with **AES-256** encryption algorithm or above.

15. Passwords should be **complex** and **not easily guessable or common phrases**. Passwords should not be hardcoded in any program/ script. Passwords should be changed periodically (between 42 to 90 days).

16. Access to the solution should be configured with **multi-factor authentication**.

17. Administrator/ Privilege access extended to the personnel of solution provider should be logged and reviewed periodically.

18. All whitelisted IP addresses should have access only to a specific service/ ports.

19. All outgoing access from servers to Internet must be restricted through limited IP addresses or URLs as per the business requirement.

20. Except production applications, all other application and systems (including development, UAT, DB and other infrastructure components) should not be made accessible directly over Internet. In case remote access to such systems is required by vendor personnel (Administrators/ developers/ other employees) or BPCL, the access should be provisioned via secure mechanism (such as VPN, IP restriction etc.).

21. Captcha to be enabled on the login screen, and also for critical transactions.

22. Vulnerability Assessment Penetration Testing (Level1 and Level2) should be done through CERT-In empanelled auditor:
    - before initial roll-out,
    - subsequently before a major change/ upgrade or once in a year, whichever is earlier.

    and submit Level2 report to BPCL.

23. All identified vulnerabilities need to be closed before deploying the solution into production.

24. Vulnerabilities identified either through VAPT/ WAPT or through other mediums (disclosure by OEM, advisories by statutory agencies, tool-based scanning etc.) should be patched as per below timelines:
    - Critical – 3 days
    - High – 5 days
    - Medium – 15 days
    - Low – 21 days

25. Any unused published web services/ APIs should be taken down.

26. All types of clear-text protocols such as TELNET, FTP etc. must be disabled.

27. Software with valid licenses & support should only be deployed.

28. In case the solution provider has used an open-source or third-party software codes/ libraries in building the offered software, then they should carry out necessary security

tests against those software components (such as Static Application Security testing, source code review, Secure Composition Analysis etc.) to ensure such components are secured by design. In addition, solution provider should share **the Software Bill of Materials (SBOM)** for all open-source components with BPCL.

29. All Internet-facing web applications should have Web Application Firewall (WAF), Anti-DDoS, Anti-BOT, API security protection enabled.

30. Logging should be enabled at all layers of the infrastructure and logs to be provided for auditing/ forensic investigations as and when requested by BPCL. All security, access & transaction logs should be retained for minimum 180 days.

31. Change Management process should be followed for making changes in the solution as well as in the infrastructure.

32. The solution should be governed through continuous monitoring & response (identify-protect-detect-respond-recover) from any security incident/ data breach.

33. The solution provider should follow secure software development lifecycle practices (including Static Application Security Testing, source code review, etc.) to develop & maintain the software being offered.

34. The solution provider must notify BPCL immediately as soon as they know or believe that a Cyber Security Incident/ Breach of Data/ Loss of Information has or may have taken place and must provide full details of the incident and any mitigation measures already taken and intended to be taken by them and (where applicable) any mitigation measures recommended by them to be taken by BPCL.

35. Following a Cyber Security Incident involving BPCL's services/ data, the solution provider should:
    a. use their best endeavours to mitigate the impact of the Cyber Security Incident, e.g. if any system is reported under breach/ incident, the solution provider should disconnect it from the network immediately to contain its lateral movement.
    b. extend all necessary support and assistance to BPCL for carrying out incident analysis/ forensic investigation till its conclusion.
    c. ensure to preserve the digital evidence and logs till the conclusion of the investigation and confirmation from BPCL about the deletion of the evidence.
    d. take any action deemed necessary by BPCL in the circumstances, including complying with any additional security measures deemed appropriate by BPCL.

36. In case the solution provider has purchased the entire solution/ service (to be offered to BPCL) or parts of it from another supplier/ provider, then they must be aware of the complete chain of suppliers/ providers.

37. The solution provider should ensure to obtain the necessary security compliance documents (such as VAPT report/ other Security Audit report/ 'Safe to Host' Certificate etc.) from the suppliers/ providers for all the components purchased. The solution provider must conduct all necessary checks to ensure that the purchased product does not have any embedded security threat such as malware, rootkit, remote access trojans or backdoor etc.

---------- End of Document ----------

PROJECT EXECUTION AND ASSURANCE PLAN

CONSTRUCTION SUPERVISION AND MANAGEMENT BY PACKAGE CONTRACTOR

SETTING UP LABORATORY & ASSOCIATED SERVICES OF PP PLANT- BPCL KOCHI

PROJECT : SETTING UP LABORATORY & ASSOCIATED SERVICES FOR PP PLANT-BPCL KOCHI

OWNER : BPCL-KOCHI

PMC : ENGINEERS INDIA LTD

JOB No. : B895

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CONSTRUCTION SUPERVISION AND MANAGEMENT

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1.0 GENERAL

1.1 The CONTRACTOR shall construct Plant/Facilities in accordance with the requirements of the Technical Standards/ Specifications, with proven/good engineering practices and procedures. Such Facilities shall be safe, reliable and suitable for their intended purpose.

1.2 The CONTRACTOR shall provide all supervision, labour, construction equipments, tools & tackles, materials and consumables, temporary facilities, Construction utilities, Drinking Water, Restroom, washroom Facilities etc. and render all support services necessary for the construction. Provision of construction power and water shall be as per Special Conditions of Contract (SCC)/ General Conditions of Contract (GCC).

1.3 The CONTRACTOR shall plan, execute, manage and control all the construction activities for the facilities forming a part of this contract.

1.4 The CONTRACTOR shall arrange insurance coverage for all the personnel engaged by him for the work as per statutory rules, regulations and local laws.

1.5 The CONTRACTOR shall insure all the materials and equipments against fire, flood, earthquake, theft, etc. as per SCC/ GCC brought for the job till the Plant/Facilities are commissioned and handed over to the OWNER.

1.6 The CONTRACTOR to ensure mechanizing the construction activities to a great extent.

1.7 The CONTRACTOR is deemed to have full knowledge of the applicable laws and regulations, conditions of labour, local conditions, the site conditions, environmental aspects and shall comply with the requirements thereof.

1.8 The CONTRACTOR is required to organize and mobilize Construction Management Services in a systematic and sequential manner to ensure that the Plant installation is carried out in accordance with the approved engineering drawings, specifications, standards, QA/QC procedures etc. and its mechanical completion is achieved within targeted time schedule. Construction Management and Supervision is to be carried out by the CONTRACTOR himself by deploying persons on his rolls and this activity is not to be sub-contracted in any case.

For this purpose, the Contractor shall deploy a Construction Management Team headed by a qualified & experienced person at site. The Construction Management team shall include engineers/ specialists in QA/QC, Project Control (Planning, scheduling, monitoring), contracts, construction supervision, progress measurement/billing, safety, warehousing, purchasing etc. Key personnel including the Head should have sufficient qualification/experience and should not be changed without concurrence from Owner/PMC.

Curriculum vitae of all key Construction Personnel shall be submitted to Owner/PMC at least 3 months before deployment. Owner/PMC reserves the right to interview these personnel before their mobilization.

1.9 The CONTRACTOR shall ensure delegation of adequate and sufficient powers (including financial) to the Head of his Construction Team for effective and smooth functioning of the construction management. HO support shall be provided to the Head of Construction Team at site during construction on all matters of project execution including the following:

- Field engineering.
- Vendor specialists required during construction.
- Rectification/replacement of defective supplies, if any, noticed during construction.
- Expediting replacement of imported items found short/damaged.
- Required documentation for the material management & material inspection at site

- Compilation and submission of Field Inspection documents in requisite copies as per contract
- Documentation to meet Statutory requirements.

1.10 The construction supervision, co-ordination and management activities shall be carried out by the CONTRACTOR in accordance with the construction procedures developed and submitted by the CONTRACTOR and approved by Owner/PMC. CONTRACTOR shall prepare construction schedules within the framework of overall contract schedule and submit to Owner/PMC for approval. CONTRACTOR shall plan, execute, monitor and control construction activities as per the approved construction schedule. The schedule so prepared shall be reviewed periodically and backlog if any related to availability of work front/ materials shall be brought to the notice of Engineer-in- Charge and corrective actions to be taken to meet the monthly/ overall Construction targets.

CONTRACTOR shall depute a project team at site during construction phase under a project coordinator for providing above-mentioned support to the Head of Construction Team.

1.11 The CONTRACTOR shall procure material like cement, reinforcement bars and structural steel from approved vendors only. The CONTRACTOR shall establish and maintain a material testing laboratory for carrying on field tests during execution of contracts under different disciplines by sub-contractor's, at no extra cost to Owner. The entire test equipments deployed shall have valid test/calibration certificates traceable to relevant national/ international standards. Such material tests, for which testing facility at site is not established, shall be carried out by CONTRACTOR at testing laboratories approved by Owner/PMC at no extra cost. CONTRACTOR shall maintain the test records and the same shall be made available for review/ inspection of Owner/PMC. Further, Owner/PMC reserve the right to witness/ inspect testing at the laboratory at no extra cost to Owner/PMC.

1.12 Construction supervision and management functions to be performed by the CONTRACTOR shall include the following as key functions for effective execution, monitoring and control:

- Planning, scheduling, monitoring & reporting.
- Construction supervision, discipline wise.
- Quality assurance and quality control, discipline wise.
- Shipping, custom clearances, inland transportation
- Warehouse management and material control.
- Field engineering/Purchase.
- Health, Safety and Environment (HSE) Management
- Enforcement of statutory rules/ regulations and Labour Laws
- Personnel/administration/Industrial Relations
- Billing and invoicing
- Finance and Accounts
- Security

2.0 EXECUTION OF WORKS

The CONTRACTOR'S work during construction shall include but not be limited to the following:

i. Prepare and submit all the Plans, Procedures and documents to Owner/PMC as specified in the contract.

ii. Establish requisite site organization staffed by competent and experienced specialists, supervisors and inspectors.

iii. Supervise, Coordinate and manage the activities performed at site by him and by his sub-contractors for execution of work and render all technical/specialist services.

iv. Plan and schedule the construction work, monitor and take timely corrective action when required to adhere to approved execution schedule.

v. Plan, allocate and mobilize required resources, manpower, and construction equipment/materials, commensurate with construction plan/schedule.

vi. Provide all temporary facilities required for Construction including drinking water, lighting, office space, electronic transmission of drawings & documents, printing facilities, rest rooms, crèches, first-aid, fire protection system, toilets, canteen facilities, labour hutments, transport facilities for the workers and staff.

vii. Prepare & implement Quality Control and Quality Assurance plan.

viii. Prepare & implement Health, Safety & Environment (HSE) plan.

ix. Report beforehand and take approval from Owner/PMC regarding use of any equipment and/or material not conforming to the contract, drawings and specifications.

x. Execute and supervise all additional works and modification works as required or suggested by Owner/PMC as a part of approved change orders.

xi. Erect and install the equipments and materials according to the approved specifications and procedures.

xii. Establish required Field Inspection and Testing Laboratories at site to carryout tests as specified in the standards/specifications of the contract.

xiii. To organize and obtain all applicable clearances/approvals from statutory bodies/authorities, as required by the laws of land for the work executed at site shall be the responsibility of the Contractor under the contract.

xiv. Obtain approval of Owner/ PMC for Welding Procedure Specifications (WPS)/ Procedure Qualification Records (PQR) as required. Carry out inspection, non-destructive tests and analyze and certify acceptability of all welds and materials in accordance with specified Technical Standards. Carry out inspection and testing of incoming materials as per agreed procedures.

xv. Organize and conduct Weekly Project Review meeting related to site construction activities.

xvi. Provide daily work progress reports and detailed weekly and monthly progress reports summarizing percentage completion of the work including status of drawings, materials and effects on approved schedule, areas of concern and corrective actions required thereof. Contractor shall also identify any foreseeable delays in any aspect of the WORK and take corrective actions to eliminate/minimize the effect on Overall Completion Schedule. All progress shall be quantified.

xvii. Take photographs and video recording of Project Construction Progress on regular basis and submit the same to Owner/PMC on monthly basis along with the Monthly Progress Report.

xviii. Prepare and submit safety and labour relation procedures in line with all applicable codes, regulations and OWNER'S requirements.

xix. Supervise and monitor all safety and labour relation functions as per agreed procedures and applicable laws of the land and report to Owner immediately for any violations and injuries.

xx. If any part of the facilities is completed and is under operation, while other parts of the facilities are under construction, or work is to be carried in running Plant, it is essential that rigid safety rules be prepared and maintained for all works in accordance with the requirements of Owner/PMC.

xxi. Maintaining all the records generated during project execution up-to-date and made available to Owner/PMC whenever requested. These records shall be handed over to Owner on completion of the work at no extra cost to Owner.

xxii. Carryout warehouse management and material control in accordance with approved procedure.

xxiii. Take all necessary precautions and required actions to protect construction work and materials from damage by local weather conditions and ongoing construction activities in the vicinity, theft and pilferage etc. till handing over of the plant to Owner.

xxiv. Damages, if any, occurred to the existing facilities at the site during execution of the job shall be intimated to Owner / PMC immediately and the damages shall be rectified promptly without any extra cost to Owner.

xxv. Take insurance policies for materials in transit and storage-cum-erection risk and other insurance covers required for men and materials at site as per SCC/ GCC in consultation with Owner.

xxvi. Undertake housekeeping including sweeping, clean up to maintain cleanliness, sanitation, removing excess materials, temporary facilities, scaffolding, etc. on Daily basis till handed over to Owner.

xxvii. Prepare and submit to Owner/PMC the following daily reports for construction activities covering the following:

a. Weather

b. Manpower deployment category wise

c. Construction Equipments

d. Work Progress

xxviii. Ensure the control of all works with regard to its impact on the surrounding environment.

xxix. Ensure all hot works are performed outside hazardous areas and in compliance with OWNER'S Safety Permit System requirements wherever applicable.

xxx. Arrange and coordinate the visits of suppliers representatives/specialists at site as per instruction of Engineer In-Charge.

xxxi. All material handling equipment, tools, tackles, hoisting and lifting equipments/ machineries should be subjected to required load test initially and then periodically, to ensure safe/stable operation.

xxxii. Organize field engineering work, wherever required and ensure timely resolution of interface problems / site constraints in consultation with Owner/PMC.

xxxiii. Prepare and certify material reconciliation statement on completion of work to enable Owner to take over the surplus materials, as applicable.

xxxiv. Organize the codification and handing over of surplus materials (as applicable) and spares/ tools and tackles to the Owner on completion of work.

xxxv. Provide weekly/daily activity plan for site inspection.

xxxvi. Develop a phased mechanical completion program to facilitate sequential Pre-commissioning/Commissioning activities in a logical manner to meet the Overall Project Schedule.

xxxvii. Remove / demolish all temporary structures/ establishments/ facilities created by the Contractor / his sub-contractors during the execution of the work and restore the site to its original condition.

xxxviii. Contractor shall ensure that stud bolts are ordered extra long to facilitate tensioning.

xxxix. Organize safety induction programme for their manpower before deployment on work and at regular intervals thereafter.

3.0 EXECUTION PLANS

CONTRACTOR shall submit Construction Execution Plan to Owner/PMC for review/approval during kick-off meeting. The Plan shall detail the execution methodology of the CONTRACTOR during construction phase of the PROJECT covering following aspects as minimum –

3.1 Construction Management Plan

CONTRACTOR shall submit Construction Management Plan to Owner/PMC for approval during kick-off meeting. The Plan shall detail the management methodology to be applied during the construction phase of the PROJECT, along with a list of procedures to be utilized in undertaking the work.

All reference procedures and detail work plans referred to in this document must be submitted for review and approval by Owner/PMC at least (4) four weeks in advance of actual commencement of the activity concerned.

3.2 Construction Execution Plan:

It shall include the following as minimum:

3.2.1 Contractor's manpower and man-hour histogram by major section and discipline and their manpower deployment schedule on monthly basis.

3.2.2 Major equipment mobilization plan on monthly basis with short description. CONTRACTOR to develop this plan with due consideration to maximize the mechanization of construction activities.

Other plans of Contractor and procedures to be submitted at least four (4) weeks/as stipulated in tender prior to start of respective activity at site, include the following as a minimum:

a. Develop/ prepare construction/erection plan/procedures and submit to Owner/ PMC for approval.
b. Temporary facilities, etc.
c. Piling plan
d. Barricading Plan
e. Scaffolding plan
f. Excavation and underground work plan
g. Heavy transport and heavy lifting plan (Rigging Plan),
h. Pre-fabrication / Modularization plan
i. Other activity plans e.g. piping, equipment and steel structure erection plan etc.
j. Monsoon counter measures and preparation
k. Emergency Evacuation Procedure
l. Storm Management Plan
m. Schemes to carry out works in inclement weather

Contractor shall ensure that lay down area (as applicable) given to him shall be utilized optimally.

3.3 Sub-Contracting Plan

A minimum of the following activities shall be performed by the CONTRACTOR directly and shall not be subcontracted:

a) Project Management

b) Planning

c) Procurement

d) Construction Management

e) Commissioning

If CONTRACTOR proposes to engage sub-contractor(s) for the execution of some of the activities at site, a preliminary sub-contracting plan along with the identified scope of work for each sub-contract shall be furnished by the CONTRACTOR to the Owner/PMC at the time of bid submission. However, the credentials of proposed Sub-contractor(s)'s shall be submitted by the CONTRACTOR on award of work, which shall be evaluated by Owner/PMC at SITE for acceptance. CONTRACTOR shall not be permitted to change the sub-contractor under any circumstances without prior approval of Owner/PMC. Non-compliance of the above shall be strictly dealt within relevant provision(s) of the contract.

The sub-contracting plan shall cover

i) Sub-contracting philosophy and plan

ii) List and scope of work of each subcontract

iii) Subcontract administration plan

iv) Organization chart of each sub-contractor.

The list and major scope of each subcontract shall not be changed from those of the CONTRACTOR'S plan unless specially approved by OWNER.

4.0 TEMPORARY FACILITIES

The CONTRACTOR shall arrange the following temporary facilities as the minimum (including for his sub-contractors also):

i) Exact location of temporary work area, access and general layout inside the area.

ii) Planning and description of the temporary facilities such as:

a. Identification of borrow earth area (if required)/excess earth dumping yards
b. Site office and Fabrication yards, Open storage area and Warehouse
c. Miscellaneous workshops including maintenance area for construction equipments.
d. Temporary roads including access road to Plant, fencing and gates
e. Security, watch & ward, security gates, etc.
f. Utility supply systems viz. Construction power with DG Sets, construction water, drinking water etc.
g. Area lighting
h. Fire fighting equipments
i. Drainage and Sanitation
j. Camp Accommodation/ Rest Rooms/ Dining rooms.
k. Mobile toilets and necessary arrangement for cleaning and disposal from refinery to outside refinery.
l. Field Testing Laboratory

m. Radiography Source Pit as per BARC Guidelines
n. Film processing and viewing labs
o. Communication facilities viz. Telephone, Fax, E-mail, electronic transmission of drawings./ documents, etc.
p. Hutments, transport, Pantry and Canteen for staff and workers. Hutments/ labour colony shall not be allowed inside the refinery complex.
q. Vehicle parking area including construction equipments.
r. First aid arrangement/ medical and health care facilities
s. Gate pass for workmen/officials/ vehicles as per OWNER security system.
t. Work Permits as per Owner's prevailing system.

CONTRACTOR shall develop the temporary facilities layout for approval of Owner/PMC.

5.0 CONSTRUCTION PLANNING, SCHEDULING, MONITORING & REPORTING

The CONTRACTOR shall be responsible for construction Planning, Scheduling, Monitoring and Reporting activities at site in line with the overall master schedule and details stipulated elsewhere in the document.

The CONTRACTOR shall submit constructability report to Engineer In charge/ Owner within 60 days from the date of award of contract after detailed study for execution to meet the time schedule.

6.0 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

The CONTRACTOR shall be responsible for ensuring quality of construction (including materials) carried out by him/his approved sub-contractors in accordance with the requirements given in Appendix-A for Quality Assurance / Quality Control (QA/QC) during construction including all documents referred therein.

7.0 WAREHOUSE MANAGEMENT & MATERIAL CONTROL

The CONTRACTOR shall construct/ build warehousing facilities (both covered and open) appropriate for storing materials required for the job. The facilities shall include proper lighting, fire protection system, office/rest rooms/toilets for warehouse personnel.

The CONTRACTOR shall obtain all statutory approvals from concerned authorities for all warehouse equipment, instruments etc. The CONTRACTOR shall comply with statutory regulations for storage of any material covered under Explosives rules.

The CONTRACTOR shall be responsible for carrying out the Warehouse Management and Material Control in accordance with the approved warehousing procedure and material control procedure, which is to be submitted by the CONTRACTOR during kick-off meeting. The activities shall include but not limited to:

- Transport Liaison, both for imported materials as well as materials procured indigenously, from the time of dispatch up to receipt at site.
- Transportation Plan (i) from source to site (ii) site to erection location.
- Receipt, Handling, Identification, Inspection (including confirmation by an Alloy Analyzer for Alloy Steel, Stainless Steel and other Exotic Materials) and Acceptance, Storage and Preservation of Materials, Codification of all materials including free issue materials to be supplied by OWNER.
- Filing of insurance Claims and follow up.
- Documentation for control and accounting of materials.
- Generation and upkeep of Traceability Records for materials.
- Materials Control & Issue.
- Inventory Checks.
- Field Requisition and Purchase.

- Spare & Non Sparking Tools including handing over of mandatory Spares/Tools to the OWNER as per the terms of the contract.
- Material Appropriation and Handing Over of all items to OWNER with Owner's codification system as per terms of contract.
- Security.
- Taking up with suppliers on short supplied items and placing replacement orders for lost/damaged items.
- Intimating to there HO regarding short/lost/damaged items received at site and further replacement action, as applicable.

CONTRACTOR shall generate and issue following reports:

- Fortnightly statement of consignments in transit.
- Daily report of material received.
- Material receipt status and inventory status w.r.t. material delivery schedule
- Material Inspection Report with respect to materials received at site
- Report on Over/Short/Reject/Damage (OSRD) receipts against each consignment on receipt at warehouse.
- Weekly status of consignments, Material Receipt Report (MRRs)
- Monthly status of field purchase.
- Monthly status of over, short, reject & damage (OSRD) settlement.
- Monthly status of piping material MTO V/s Actual receipt.
- Log Register of Rotating Equipments maintenance
- Daily Stock Position of Cement
- Any other report as desired by Owner/PMC.

8.0 FIELD ENGINEERING

CONTRACTOR shall be responsible for controlling and issue of technical drawings and documents, preparation of field sketches, field modifications, checking/preparation of as- built drawings, etc. CONTRACTOR should have adequate facilities for incorporating field changes, preparation of As-built drawings, Printing machines and Drawing & Document Control System.

9.0 FIELD TENDERING

CONTRACTOR shall be responsible for carrying out field tendering activities, as required from the site itself.

10.0 FIELD PURCHASE

CONTRACTOR shall be responsible for carrying out field purchase activities, as required.

Field Purchase items are restricted to those required for running and maintenance of the field offices, items required to expedite construction work and items found short, missing or damaged against the main order when received at the site. Any material purchased from field for usage in the plant should have proper inspection certificate and should be purchased from Owner/PMC approved suppliers. If required by OWNER/ PMC, check testing of the material samples selected by Owner/PMC shall be carried out by CONTRACTOR without any extra commercial implication.

11.0 HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT

The CONTRACTOR shall be responsible for Health, Safety and Environment (HSE) Management at construction site for the construction activities to be carried out by the him/his approved sub-contractors in accordance with the requirements mentioned in Appendix-B for Health, Safety and Environment Management during construction.

CONTRACTOR shall be working in an operating refinery. All measures required for safe construction are to be ensured for Process safety Management and safe work practices. Besides

all personnel employed in the job to follow safety requirements of Owner/PMC, the movement of CONTRACTOR's personnel will be restricted to their workplace only.

12.0 HOUSE KEEPING

It is the responsibility of the CONTRACTOR to maintain general cleanliness and proper housekeeping at work site. CONTRACTOR shall organize disposal of excavated earth /garbage/ rubbish/scrap, etc. on day to day basis to identified disposal areas/safe areas and forward daily report for the same indicating the details of men and machinery deployed for the purpose; if asked by Owner/PMC.

Wastage and serviceable/ unserviceable scrap generated during dismantling and regular works shall be segregated and dumped in designated locations in consultation with Owner/PMC. Earth and landfill materials shall be dumped at locations identified by Owner/PMC, otherwise outside the Project Site and the required fees charged by the local authorities shall be borne by the CONTRACTOR without any extra cost to OWNER.

13.0 INDUSTRIAL LABOUR RELATIONS

CONTRACTOR shall be responsible for industrial relation functions and implementation of labour laws at site. CONTRACTOR'S staff shall be suitably trained and experienced in Labour Relation functions so as to ensure a good relationship with labour and to prevent the occurrence of industrial disputes resulting in subsequent delays or work stoppages. In particular, CONTRACTOR shall maintain close liaison with Owner/PMC.

CONTRACTOR shall maintain proper liaison with Statutory Authorities and local bodies and shall be responsible to implement and observe all statutory laws at site. CONTRACTOR must have in his staff; a well experienced Labour Relation Officer, preferably from local area.

CONTRACTOR shall maintain the records of wages paid in a wage register, PF, etc. as per statutory regulations.

CONTRACTOR shall report immediately to Owner/PMC any problems including labour disputes, fight, and work stoppages. A written report shall be submitted to Owner/PMC within 24 hours of the incident.

CONTRACTOR must submit a Labour Relation Plan including their sub-contractor(s) prior to the start of the work/within one month of award of the contract, whichever is earlier, mentioning as a minimum:

- A detailed estimate of the number of labour, both indirect and direct, sorted by craft.
- Outline recruiting plans for all manpower requirements.
- Identify personnel involved with labour relations and outline procedures to mitigate labour disputes & problems.
- Labour welfare plan

CONTRACTOR shall hold labour relations meeting twice a month with their work force as well as a separate meeting with the Owner.

14.0 CONSTRUCTION EQUIPMENTS

The Contractor is required to organize and mobilize the construction equipments and other tools/tackles in a sequential manner and ensure that plant installation is carried out in a mechanized manner to the extent possible and its mechanical completion is achieved within targeted time schedule.

Contractor shall ensure deployment of the following construction equipment as a minimum as per requirement to the maximum extent –

i. Cranes of different capacities required for erection/ handling of materials.
ii. Trailers

iii. Tower crane, as required
iv. Hydraulic Crane (model no: TRX SERIES- K10,F15 TRX 1651, TRXS 2319 , MAC 1214, FX 120, FX150, 15XWE, 15XWF RHINO110 FC) with audio-visual signaling devices and limit switches
v. Batching plants
vi. Concrete Boom Placer
vii. Hydraulic Excavators
viii. Bar Bending/Cutting Machine
ix. All weather fabrication sheds
x. Welding machines
xi. DG sets
xii. Electrical and Instrumentation equipments/measuring devices etc.
xiii. Bevel Cutting Machines
xiv. Test Pumps
xv. Compressors
xvi. Gas and Mechanical cutting devices
xvii. Various inspection / measuring devices

The Contractor shall, without prejudice to his responsibility to execute and complete the work strictly as per the specifications and other laid down procedures, execute all the work by mechanizing the construction activities to the maximum extent by deploying all necessary construction equipments/machinery of adequate capacities and numbers.

For the purpose of Equipment/ Structural steel Erection, the Contractor shall deploy a Rigging team headed by a Rigging Foreman/Engineer reporting to concerned Area Engineer. Area Engineer should be well conversant with various erection techniques and shall be responsible for preparing erection schemes in accordance with the approved procedures and based on crane manuals and suiting to plant layout. Area Engineer shall have to foresee various other construction activities in the surroundings areas while planning erection schemes including safety aspects of man and machinery also.

Contractor shall prepare erection schedule in line with the overall project schedule of the Plant in phased manner with erection schemes of various equipments, vessels and submit to Owner/PMC for approval, Monitoring and control of erection schedule and erection activities shall be carried out by the contractor as per the approved construction procedures.

For efficient working and maintenance of construction aids, Contractor shall establish and maintain crane yard / workshop equipped with regular maintenance facilities for various construction aids for carrying out routine field maintenance during performance of the contract. Temporary approach road and hard stands, wherever required for the movement of the Cranes and other vehicles for equipment erection and transportation of material shall be properly planned and made by the Contractor. Weekly/fortnightly maintenance shall be planned in such a way that the same does not hamper the erection schedule.

During performances of the work, Contractor must ensure that structures, materials and equipments are adequately braced with Guys, Struts or any other means as deemed fit & approved by Owner/PMC. Such means shall be supplied and installed by the Contractor as required till the erection works is satisfactorily completed. Such guys, shoring, bracing, strutting, planking supports etc. shall not interfere with the work of other agencies and shall not damage or cause distortion to works executed by other agencies. All lifting tools, tackles and cranes shall be tested periodically by statutory/ competent authorities for their load carrying capacity. Such relevant valid/test certificates shall be submitted to Owner/PMC for review before actual use of the tools, tackles and cranes.

Contractor shall submit the construction equipment deployment schedule at the time of kick off meeting. Daily construction equipment deployment report will also be submitted by the Contractor to Owner/PMC in the performa approved by Engineer In charge.

Contractor shall ensure the timely augmentation of the men, equipments and machinery depending upon the exigencies of the work to meet the overall project schedule and as per instructions of Owner/PMC.

15.0 CONSTRUCTION MANPOWER

The Contractor is required to organize and mobilize construction staff/ manpower in a sequential manner to ensure that the work is carried out in accordance with the construction schedule. Mobilization of construction staff should be such that the progress achieved in phased manner should match with the overall Project Schedule. Key Personnel i.e. Resident Construction Manager, Site In-charge, Lead QA/QC Engineer, Lead Planning Engineer, Safety officer, Discipline Engineer for execution of job shall be deployed meeting the qualification and experience requirement of Document No. 7-82-0003.

For this purpose, the Contractor shall clearly indicate in his construction methodology whether work shall be done departmentally or by engaging sub-contractor or the combination of both. Contractor shall prepare detailed methodology for the work to be carried out departmentally as well as through sub-contractors clearly, defining the scope and responsibility of Contractor and his sub-contractors.
The works of all sub-contractors shall be managed by the construction staff of the main Contractor who shall perform the duties of construction management and shall administer, coordinate, and inspect the works of the sub-contractor(s) and be responsible for the Quality and timely completion of respective works. The Contractor shall establish the pre-requisites for successful completion of sub-contractor (s) work. However, by deploying the sub-contractor (s), as approved by Owner/PMC for any discipline, does not absolve the Contractor of his total responsibility under the subject contract.

The Contractor must note that in case of any sub-contractors' failure to execute the works as per standards/specifications/drawings and/or negligence & disobedience in carrying out any order or instruction of Owner/PMC, the same shall be viewed very seriously and any action as deemed fit in accordance with provision(s) of the contract shall be taken by Owner/PMC.

Contractor shall submit the construction manpower deployment schedule at the time of kick off meeting. Daily construction manpower deployment report shall also be submitted by the Contractor to Owner/PMC on approved format. Any additional manpower of any category required to be deployed during the actual execution of the work to meet the Project time schedule and as instructed by Owner/PMC, shall be mobilized by the Contractor within a reasonable time. Mobilization of such additional manpower by the Contractor shall not entitle him for any additional compensation at all.

All construction supervision, coordination and management activities shall be carried out by the Contractor in accordance with the construction procedures approved by Owner/PMC. Contractor shall prepare construction schedules based on the Overall Project Schedule and submit the same to Owner/PMC for approval. Monitoring and control of the construction activities shall be carried out as per the approved construction schedule & procedures.

During the execution of works at site, if the Contractor engages sub-contractor (s) for execution of works at site as per approval obtained from Owner/PMC in line with contract provision(s) and in the event sub-contractor complains in writing to the Owner with regard to the non-payment of

their dues from the Contractor for the works executed by them (excluding final payments and payments due after termination of sub-contractors' services by the main Contractor), Owner/PMC reserves the right to make such payment to the sub-contractors directly based on approved measurements with due notice to the Contractor. Owner/PMC shall release such payments to sub-contractor at the cost and risk of the Contractor in order to ensure smooth execution of work at site. All such payments made by Owner/PMC to the sub-contractor(s) shall be deducted from the running account bills or any other payments due to the Contractor.

The above provisions shall also be applicable in case of construction materials procured at site by the Contractor from the suppliers.

16.0 INTERFACE WITH OTHER CONTRACTORS

CONTRACTOR shall ensure that his interface with other CONTRACTORS is smooth and cordial. In case of any dispute, Owner/PMC decision shall be binding.

Owner/PMC may arrange weekly/fortnightly/monthly interface meetings. The CONTRACTOR shall depute concerned personnel to attend these meetings.

Generally, the following interfaces may be present:

- CONTRACTOR shall allow movement of persons/ material/ equipment/ vehicles belonging to other CONTRACTORS or Owner/PMC through the roads constructed by him.
- CONTRACTOR shall coordinate with 'neighboring' contractors for maintaining elevations/levels of various interconnecting services.
- CONTRACTOR shall not dump his earth, scrap or any material in other Contractors' area. He shall cooperate with Owner/PMC in maintaining good housekeeping throughout the complex.
- CONTRACTOR shall ensure proper drainage and no water logging in his area/other areas.
- If requested by the Owner/PMC, CONTRACTOR shall allow testing of materials of other Contractors in his laboratory, in case of emergency.
- CONTRACTOR shall clearly define in the interface meeting with other contractors their erection / construction interface at their Battery limits.

APPENDIX - A

QUALITY ASSURANCE

AND

QUALITY CONTROL

DURING CONSTRUCTION PHASE

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1.0 SCOPE

This document shall be applicable to all construction works to be executed by CONTRACTOR.

2.0 RESPONSIBILITY

It is Contractor's prime responsibility to arrange/produce the product conforming to contract specifications and inspect all equipment, materials and works at various stages of execution as per the approved QA Plans. In addition, they have to coordinate all efforts in this regard directly with the Owner/PMC and other involved agencies to give adequate confidence that the activities are performed as per agreed ITPs and necessary documentation is available. Contractor shall deploy an exclusive team of Quality control Engineers and Supervisors for ensuring the quality of works executed at site on day to day basis. Verification by Owner/PMC or his representative at any stage shall not relieve CONTRACTOR of his responsibility towards quality of the product.

The CONTRACTOR shall comply with all statutory rules & regulations in force during execution of work and interface with such authorities as required.

3.0 METHODOLOGY

The management of construction quality control is divided into the following categories:-

(1) Procurement of materials required for the construction work.

(2) Execution of work

(3) QA/QC Audits

3.1 PROCUREMENT OF MATERIALS REQUIRED FOR THE CONSTRUCTION WORK

The CONTRACTOR shall develop list(s) defining the items to be procured along with proposed Vendors for approval of the Owner/PMC. The list shall comprise of all items except vessels, equipments, pumps, electrical/ instrumentation panels etc. which may be available directly ready for installation or requiring small fabrication as per requirement. The vendor list shall be in line with the contract document. In case, no vendor list exists in the contract for a particular item, the CONTRACTOR shall propose a list of Vendors to Owner/PMC. CONTRACTOR has to satisfy himself with the capability of the vendor to deliver the product in time with quality before proposing him as a prospective vendor. CONTRACTOR shall submit the QA/QC plans for all major items and carry out their procurement in line with the approved plans. The categorization plan shall be submitted by contractor in line with the contract requirement/ bid package. The CONTRACTOR can either provide his own adequate qualified staff for inspection or employ a separate third- party inspection agency with prior approval to carry out these functions. Involvement of Owner/PMC in the quality control plan, if required, shall be defined during approval of the same.

3.2 EXECUTION OF WORK

(i) The QA plans for execution shall be developed by the CONTRACTOR. OWNER/ PMC's approval for the same shall be taken well before start of the work. The final Inspection & Test Plans (ITPs) and formats, based on the indicative ITPs (enclosed elsewhere in package), shall be developed by the CONTRACTOR as per contract specifications for approval by Owner/PMC. For the activities which are identified as Witness or Hold Point, specific inspection call shall be raised by the CONTRACTOR with Owner/PMC in the requisite format well in advance.

The indicative ITPs enclosed in the bid package are for guidance to the CONTRACTOR and may not cover some of the activities to be performed during execution of works under the scope of this contract. The CONTRACTOR shall develop Inspection & Test Plans and Formats for all such activities also and submit the same to Owner/PMC for approval, before actually undertaking such activities

CONTRACTOR shall be completely responsible for management of approved quality plans and Owner/PMC involvement will be only of Surveillance in nature to randomly check the works at selective/critical junctures. Their role shall be to monitor that the CONTRACTOR is executing the quality plans as per the approved drawings, employing adequately qualified staff and other resources for various items of works. Any deviation to the specifications shall be brought to the notice of Owner/PMC in prescribed formats by CONTRACTOR for approval.

(ii) It is likely that the CONTRACTOR may engage sub-contractor(s)/vendors for performance of the work. CONTRACTOR shall be responsible for ensuring the implementation of approved QA plan, contract specifications and contract conditions through their sub-contractors to achieve the quality during all stages of construction. It shall be the responsibility of the CONTRACTOR to ensure proper coordination between his sub- contractor(s) and other agencies working at site.

The sub-contractor(s)/vendors selection shall be done after evaluation by the CONTRACTOR in line with contract requirements and shall be got approved by Owner/PMC before engaging them for the works.

(iii) Storage

All the materials procured shall be stored/stacked as per the standard norms and as recommended in various clauses of relevant codes and contract document. The storage of material shall be such as to avoid damage to life/properties (physical and chemical) of the materials. The storage shall not cause deterioration, rusting, mix-up etc. and hamper the other related works in any way. CONTRACTOR shall submit his detailed warehouse plan for Owner/PMC approval to manage the above in open/covered areas.

The materials susceptible to fire shall be kept away in a separate protected place.

In general, the materials shall be kept systematically in order of their class, batch number and identification number, so that they are accessible for the inspection by Owner/PMC whenever required and to avoid the mix up in those materials.

(iv) Use

The materials shall be stacked in such a way that the lot, which is procured first, will be consumed first. For materials which are having specific expiry date/ shelf life shall not be used beyond that date and shall be removed from site. Wherever there is any doubt about the change in properties of the materials, such materials shall be sent to reputed approved laboratory for testing and acceptance.

(v) Inspection

The CONTRACTOR shall be responsible for carrying out inspection of the materials brought at site and conducting tests/ checks (at site or in approved laboratories) at predefined frequencies as per contract. It is the responsibility of the CONTRACTOR to ensure that the materials used at site shall conform to relevant codes/ standards and Manufacturer Test Certificates are available for correlation as and when required. The CONTRACTOR shall maintain the records of all materials brought at site and tests conducted on them.

(vi) In process and final Inspection

CONTRACTOR shall be responsible to arrange verification of products during in- process and final inspection. Relevant checks and tests shall be arranged for the works performed and records maintained. Tolerances achieved with respect to contract specification and execution drawings for various activities/processes shall be ascertained and submitted to Owner/PMC for approval. Efforts shall be made to keep checks and controls in such a way that a non-conforming product is avoided. However, if in an isolated case, the tolerances are beyond the acceptable values given in the contract/execution drawings/codes, non-

conformance resolution/Deviation permit need to be raised by the CONTRACTOR and got approved/resolved from Owner/PMC.

The CONTRACTOR shall arrange verification of ingredients used and validation of the software used at the batching plant(s). Owner/PMC reserve the right to inspect the working of batching plant including validation of the software used and calibration of measuring & monitoring devices any time. The CONTRACTOR shall ensure the quality of the concrete delivered by the transit mixers, as applicable and maintain verifiable records.

CONTRACTOR will carryout Inspection, Non-destructive Tests and analyze and certify acceptability of all welds, materials and works in accordance with specified technical standards/International standards and carryout inspection and testing of incoming materials as per agreed procedures.

v) Any Observation on quality aspects , Owner/PMC shall raise observation in attached OQA format which has to be acknowledged & compliance to be done by the contractor within the agreed time period.

vi) The CONTRACTOR shall follow the requirements given for control of monitoring and measuring devices (Refer Document no. 7-82-0002).

3.3 QA/QC AUDITS

During the execution of the works, CONTRACTOR shall carry out periodical Quality Audits at least quarterly in all areas of work. These audits will be conducted by a team of specialists in the respective areas. The auditors shall not be directly involved in the jobs being audited.

The CONTRACTOR shall prepare an Audit Plan and Procedure and submit the same to Owner/PMC for approval.

A copy of the Audit Report containing the findings of the Audit team will be submitted to Owner/PMC. After completion of rectification/modifications/corrective actions on the issues indicated in Audit Report, Compliance Report shall be submitted by the CONTRACTOR to Owner/PMC for review.

Over and above the Contractor's Internal QA/QC Audits outlined above, Owner/PMC shall also reserve the right to conduct QA/QC audits at the frequency decided by them. CONTRACTOR shall participate and provide full support to the Audit Team and furnish all documents/reports/records as desired by the Audit Team. The CONTRACTOR shall take all actions required to comply with the findings of the Audit Report and issue regular Compliance Reports for the same to Owner/PMC till all the findings of the Audit Report are fully complied.

In case major Non conformities are observed during execution of the works Owner/PMC reserve the right to appoint an independent person/Third Party Agency to conduct QA/QC Systems Audit for full/part of the facilities being executed by the CONTRACTOR. This audit will be in addition to the audits described above and may be carried out intermittently/continuously for all or part of the facilities being executed by the CONTRACTOR. CONTRACTOR shall bear the total cost of such audits and shall participate & provide full support to the Audit Team and ensure compliance of the audit observations.

4.0 DOCUMENTATION AND RECORDS

All the necessary documentation & records shall be maintained by CONTRACTOR till completion of project and handed over to Owner/PMC in requisite copies as a part of completion documents. Wherever Owner/PMC personnel were directly involved particularly in witness and hold point, the copies of the records shall also be provided to personnel on completing inspection of those activities. The documentation & records shall include the following as a minimum but not limited to:

i) Approved Quality Assurance Plan
ii) Approved Inspection and Test Plans
iii) Inspection and test documents covering

a) Manufacturer Test Certificate
b) Material Receipt Report including Inspection Release Note, if applicable and Site Inspection and acceptance Report on quality and quantity of material
c) Site test/laboratory test Report reviewed by CONTRACTOR for acceptance vis-à-vis to contract/code requirements for materials.
d) In process Verification reports of CONTRACTOR representative and OWNER/ PMC as applicable
e) Final verification report including any test checks done for compliance
f) As-built vis-à-vis to contract/drawings including tolerances
g) As-built for erection
h) Non conformance resolution raised by CONTRACTOR/OWNER/ PMC
i) Concession/Deviation approval by Owner/PMC
j) Change order approval by Owner/PMC incase there is variation from contract
k) QA/QC Audit Reports and compliance Reports thereof
l) Mechanical Completion formats

APPENDIX-B

HEALTH, SAFETY AND

ENVIRONMENT (HSE) MANAGEMENT

DURING CONSTRUCTION

GENERAL REQUIREMENTS

1.0 Specification for Health, Safety and Environment (HSE) Management (Spec. No.6-82-0001) is required to be followed by CONTRACTOR during Construction Phase at site.

2.0 CONTRACTOR shall have a documented HSE policy to cover commitment of the organization to ensure Health, Safety and Environment aspects in the line of operation.

3.0 It is the responsibility of the CONTRACTOR to ensure that safe construction procedures are complied with. CONTRACTOR will also ensure that adequate First Aid medical facilities with trained personnel/ nurse (male) to administer First Aid with shed/ Bunker are available are available on round o Clock basis for emergency purpose and that safety practices as per the approved safety procedure are followed by his sub-contractors also.

CONTRACTOR to ensure safety measures at the minimum like:

a) The use of safety gadgets, viz. safety goggles, helmets, safety shoes, full body harness, provision of safety net for construction at higher elevations and provision of toe boards in scaffolding platforms, etc.
b) All hot works must be performed by ensuring compliance to the requirements as specified by the Owner from time to time.
c) Barricading of crane movement areas / Radiography areas
d) Proper earthing of equipments.
e) Proper shoring / strutting of Excavated Areas, as applicable.
f) Cylinders of inflammable gases to be stacked upright.
g) Storing of cylinders like Oxygen/argon/acetylene etc. requires PESO approval. Agency has to obtain necessary approvals from PESO and their guidelines to be followed.

To assist in the development of an effective safety program, a safety checklist for various jobs shall be developed by the CONTRACTOR and the same shall be adhered to by the Contractor's Site-In-charge.

The responsibilities of the CONTRACTOR will include but not limited to:

- Coordination and supervision of the details of the job safety programme.
- Initiation of accident reporting, investigation and follow-up actions.
- Preparation of periodic accident summaries.
- Periodic Accident Analysis Reports
- Tallying safety inspection of the job and submission of summary inspection report to OWNER/PMC.
- Obtaining work permits from the OWNER, wherever applicable.
- Check the fitness of cranes and other hoisting equipments on periodic basis/before all major lifts and submit to Owner/PMC valid/latest test certificates of tackles used for lifting.
- Submission of any other report required by Owner/ PMC.
- Conduct HSE Audit at predefined frequencies and assist OWNER/CONSULTANT/TPI during conductance of their HSE Audits.
- Ensure closure of NCs observed during the above audits.

All contract workman to be provided with color coded Boiler/ Safety Suits with contractor name and logo.

4.0 Guidelines on Safety Practices during Construction and Contractor Safety prepared by Oil Industry Safety Directorate (OISD) Nos. OISD-GDN-192 & OISD-GDN-207 shall be followed by the contractor at site. Safety Recommended Practices for Electrical System (OISD-RP-147) shall be followed by the contractor at site. These are supplementary requirements in addition to specification for Health, Safety and Environment (HSE) Management (Spec. No. 6-82-0001) to be followed by the CONTRACTOR at site.

5.0 Any Observation on Safety aspects, Owner/PMC shall raise observation in attached OSA format, which has to be acknowledged & compliance to be done by the contractor within the agreed time period.

ATTACHMENT-I

INSPECTION & TEST PLAN (ITP)

FOR

CONSTRUCTION WORKS

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5	Inspection &Test Plans for Electrical Works	6-82-2800	4
6	Inspection & Test Plan for Incoming Materials	6-82-1010	3

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INSPECTION & TEST PLAN (ITP) FOR MECHANICAL WORKS (EPCC/LSTK CONTRACTS)

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
4	15.06.2022	REVISED AND REISSUED	DK	DG	JPV	SM
3	23.07.2018	REVISED AND REISSUED	SKG	AP	AKK	RKT
2	09.11.2015	REVISED AND REISSUED	DJ	MKG	TKS	SC
1	04.07.2011	REVISED AND REISSUED	SM	SM	MKG	DM
0	31.03.2006	ISSUED AS STANDARD SPECIFICATION	AS	MPJ	RSG	VJN

Format No. 8-00-0001-F1 Rev. 0

Abbreviations:

A/G	:	Above Ground
AFC	:	Approved For Construction
AS	:	Alloy Steel i.e. Cr-Mo steels like A335 Gr P11, P5, P9, P22, etc.
CFB	:	Ceramic Fibre Blankets
CS	:	Carbon Steel
CSO	:	Car Seal Open
FD	:	Free Draught
GAD	:	General Arrangement Drawings
HIC	:	Hydrogen Induced Cracking
I/S	:	Inner Side
IBR	:	Indian Boiler Regulations
IMIR	:	Incoming Material Inspection Report
ID	:	Induced Draught
LO/ LC	:	Lock Open / Lock Close
LTCS	:	Low Temperature Carbon Steel
MT	:	Magnetic Particle Testing
NACE	:	National Association of Corrosion Engineers
NDT	:	Non Destructive Testing
NRV	:	Non Return Valve
O/S	:	Outer Side
ODC	:	Over Dimension Consignment
PMI	:	Positive Material Identification
PQR	:	Procedure Qualification Record
PT	:	Penetrant Testing
PWHT	:	Post Weld Heat Treatment
RF	:	Reinforcement
RT	:	Radiographic Testing
SS	:	Stainless Steel like A312 TP 304, 316, 321, 304L, 316L, 316Mo, etc.
SSCC	:	Sulphide Stress Corrosion Cracking
TSR	:	Tray Support Ring
UDFC	:	Under Down Flow Clearance
WPS	:	Welding Procedure Specification
WSC	:	Welding Specification Chart

Construction Standards Committee

Convenor: Sh. John Paul V, ED (Construction)

Members: Sh. Janak Kishore, ED (Projects)
Sh. Chinmoy Kapuria, Sr. GM (SCM)
Sh. Udayan Chakravarty, Sr. GM (Piping)
Sh. Ravindra Kumar, Sr. GM (Construction)
Sh. Debasish Ghosal, GM (Construction)
Sh. Pankaj Kumar Rai, DGM (Construction)

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GENERAL NOTE

1. The enclosed ITPs shall be followed for the works to be performed by the contractor. The provisions indicated for stage wise inspection by EIL/Owner (For specific activities), which may be modified in line with EIL scope of services as per the contract between EIL and Owner. Activities for which ITPs are not provided in this specification, contractor to develop and get the same approved by EIL/Owner before start of the work. In general role of EIL has been specified in the document. The role of owner to be specified during preparation of site specific ITPs.

2. Contractor to submit job procedures for the jobs for which ITP's are attached & job specific reporting formats with the aid of enclosed sample reporting formats to EIL/Owner for approval, before commencement of the activity. If the contractor has to deviate from the given ITP for a valid reason, he shall obtain prior written approval of EIL/Owner. Contractor to carry out 100% examination of all activities.

LEGEND

HP : Hold Point ;

An activity which requires witnessing/inspection/verification and acceptance by Owner/EIL before any further processing is permitted.
The Contractor shall not process the activity/item beyond a Hold Point without written approval by Owner/EIL except where prior written permission for further processing is available.

W : Witness Point ;

An activity which requires witnessing/inspection/verification by Owner/EIL when the activity is performed.
After proper notification has been provided (notification modalities and period shall be finalized before hand), the Contractor is not obliged to hold further processing if Owner/EIL is not available to witness the activity or does not provide comments before the date notified. Basis of acceptance shall be on review of Contractor generated report/document as per relevant technical specification.

Rw : Review of Contractor's documentation.

S : Surveillance Inspection by Owner/ EIL.
Monitoring or making observations to verify whether or not material/items or services conform to specified requirements. Surveillance activities may include audit, inspections, witness of testing, Review of quality documentation & records, personnel qualifications, etc.

WC : 100%Supervision and Examination by Contractor.

Responsibility for execution of the inspection/testing is with the Contractor; Owner/EIL only verifies examination or testing done by the Contractor at important stages.

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ITP NO: 2110

ABOVE GROUND PIPING

SL. NO	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CATC
A.	**PRIOR TO FABRICATION**				
1.	Incoming Material	WC	Note -1		
2.	Welding Filler Material Approval/Qualification a) Review of Manufacturer's Test Certificates/Documents & Sampling.	WC*	HP*	Rw*	Rw*
	b) Laboratory Testing, if any	WC	Rw	Rw	Rw
3.	WPS/PQR				
	a) Review of proposed procedure	WC	HP	Rw	Rw
	b) Welding of Test Coupons and subsequent testing, if applicable	WC	W	W	W
	c) Approval of final WPS/PQR	WC	HP	HP	HP
4.	Welder performance Qualification	WC	Rw	Rw	Rw
5.	Certification & approval of welders.	WC	HP	W	W
6.	NDT Procedure Qualification				
	i) Review of proposed procedure	WC	Rw	Rw	Rw
	ii) Witnessing of Proposed Procedure Testing	WC	W	W	W
	iii) Approval of Qualified Procedure	WC	HP	HP	HP
7.	Review of Joint numbering in Isometrics (Big & Small bore)/Sketches	WC	W	Rw	--
8.	Material traceability & Transfer of Heat Nos.	WC	HP	S	--

* **a)** *Notwithstanding any other tests/documentation required for qualification/approval of filler metals:*

i) For Alloy Steel & Stainless Steel welding filler metals, chemical analysis to be carried out for every batch.

ii) For Low Temperature Services piping, and for material class wherever impact requirement is specified in WSC, Impact testing to be carried out for every batch of the filler metal, to be witnessed by PMC/owner

b) *For NACE filler metals, corrosion tests like HIC, SSCC, etc. to be carried out for every batch. However, HIC/SSCC tests done earlier & duly witnessed by a reputed third party, will be acceptable.*

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ITP NO: 2110
ABOVE GROUND PIPING

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CATC
B.	**FABRICATION /ERECTION**				
1.	Material as per piping class (check w.r.t. approved colour coding procedure), Fit-up check and Traceability check.	WC	W	S	--
2.	Pre-heat (if any)	WC	S	--	--
3.	Certificate of purity of purging/shielding Gas (if any)	WC	Rw	--	--
4.	Purging rate (if any) and arrangement	WC	S	--	--
5.	Shielding rate (if any)	WC	S	--	--
6.	Baking of Electrodes	WC	S	--	--
7.	Inter-pass cleaning & Temperature check.	WC	S	--	--
8.	Visual Examination of completed welds	WC	W	S	S
9.	a) Monitoring of PWHT Cycle	WC	S	--	--
	b) Review of Time – Temperature graph	WC	Rw	Rw	--
10.	Hardness Check	WC	S	--	--
11.	a) PT/MT (Branch Joints)	WC	W	W	--
	b) PT /MT (Others)	WC	W	S	--
12.	a) Identification of Joints for Radiography (for Random radiography only)	WC	S	--	--
	b) Check shot for radiography	WC	HP	HP	HP
13.	Review of Radiographs interpreted by the Contractor	WC	HP	W	Rw
14.	Lifting arrangement (for critical piping only)	WC	Rw	Rw	Rw
15.	Test certificates for lifting tackles	WC	Rw	Rw	Rw
16.	Location and orientation of Branch connections	WC	Rw	Rw	-
17.	MUT activities at Site	WC	W	W	S
18.	PAUT/TOFD activity at Site	WC	S	S	S
19.	Interpretation of PAUT/TOFD	WC	HP	W	Rw
20.	Provision of Inst. Tappings	WC	W	W	-
21.	Provision of vents and drains	WC	Rw	Rw	-
22.	Correctness of type of supports, Anchors, Guides	WC	W	W	S
23.	Correctness of gaskets/ fasteners	WC	W	S	S
24.	Correctness of valves (NRV, Gate, Globe, control Valves etc.), steam traps and their direction of flow.	WC	HP	W	S
25.	Provision of cold pull, if any.	WC	W	W	-

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ITP NO: 2110
ABOVE GROUND PIPING

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
C	PROOF TESTING		CAT A	CATB	CATC
1.	Procedure Review	WC	Rw	Rw	Rw
2.	Scrutiny of test packs for Mechanical & NDT Clearance (Refer Format M-01)	WC	S	S	--
3.	Correctness of Testing arrangements. (Refer Format M-01)	WC	W	W	Rw
4.	Positive Material Identification as per specification after completion of installation.	WC	Rw	--	--
5.	Preparation of Punch list (Refer Format M-02)	WC	W	W	--
6.	Review of Punch List prepared by Contractor	WC	Rw	Rw	--
7.	Liquidation of check list, if applicable	WC	HP	HP	--
8.	a) Review of Calibration certificates of pressure Gauges (Refer Format M-03)	WC	Rw	Rw	--
	b) Field Calibration, if any	WC	S	--	--
9.	Air/Water Flushing (preliminary)	WC	S	S	--
10.	Visual inspection of all weld joints for leak during Pneumatic/ Hydro testing	WC	W	W	--
11.	Draining of Water & Air Drying (Refer Format M-04)	WC	S	S	--
12.	Removal of temporary blinds/supports(Refer Format M-04)	WC	W	S	--
13.	Boxing up including reinstallation of flappers of check valves	WC	S	--	--
14.	Review of Records of fasteners & gaskets	WC	Rw	Rw	Rw
15.	Torque tightening/ tensioning of flange joints, wherever applicable	WC	W	S	--
16.	Modification of Tested lines (Refer Format M-05)	WC	Rw	Rw	Rw
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

NOTE :

1) For Incoming Material Inspection, please refer ITP no: 6-82-1010
2) Pre-commissioning activities such as chemical cleaning, card board blasting, system testing are not covered by these ITP's. The contractor shall develop ITP's for such activities and obtain Owner/ PMC/ Licensor's approval.

CAT A: All services involving hydrogen and hydrogen bearing fluid., all piping above and including 600# rating, all SS, AS,NACE,LTCS, clad Inconel, piping, SHP/HP Steam piping.

CAT B: All CS piping for process lines up to 600 # (excluding), all Steam lines under purview of IBR other than category A, Jacketed piping.

CAT C: Piping for "D" class fluid, Non IBR portion of condensate & steam lines.

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ITP NO: 2120
COLUMN INTERNALS

SL. NO.	ACTIVITY	CONTRACTOR	EIL
			CAT A
	INSTALLATION OF COLUMN INTERNALS		
A.	Before Installation		
1.	Internal Installation Procedure including identification of confined space hazards & mitigation thereof	WC	Rw
2.	Material inspection	WC	Note-1
3.	Level check on TSRs	WC	S
4.	Check for down comer clearance and Tray clearance	WC	S
5.	Distance between TSRs	WC	S
B.	**After Installation - *Check for***		
1.	Exit weir height	WC	S
2.	UDFC	WC	S
3.	Tightness of bolts	WC	S
4.	Orientation and tightness of clamps	WC	S
5.	Provision of lock nuts/seal plates	WC	HP

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ITP NO: 2120
COLUMN INTERNALS

SL. NO.	ACTIVITY	CONTRACTOR	EIL
			CAT A
6.	Correctness of installation of shimming/bolting for top down comer	WC	HP**
7.	Correctness of gasket (if any)	WC	S
8.	Tray to tray distance and level of trays	WC	S
9.	Leak testing of seal pans as applicable	WC	S
10.	Damaged, missing valves and valve movements for valve trays	WC	S
11.	Fitting of proper valve combination	WC	S
12.	Damage to deck components	WC	S
13.	Level and alignment of inlet weir and exit weir	WC	S
14.	Check for proper location of slots on tray components	WC	S
15	Check for Gaps at down comer ends	WC	S
16	Removal of temporary plugs after testing	WC	S
17	Cleaning of all trays & inside of equipment	WC*	W
18	Certification of installation by Vendor's representative Final boxing up, if any.	WC*	HP**
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents		

*Vendor Representative to Check 100%
** By Owner/Process Licensor
NOTE : 1) For Incoming Material Inspection please refer ITP no: 6-82-1010

CAT A: All works

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ITP NO: 2130
FIRED HEATERS

SL. NO.	ACTIVITY	CONTRACTOR	EIL
			CAT A
A.	**PRIOR TO FABRICATION**		
1.	Incoming Material:	WC	Note - 1
2.	Welding Filler Material Approval/Qualification		
	a) Review of Manufacturer's Test Certificate/Documents	WC	HP*
	b) Laboratory testing, if any		
	i) Carbon Steel	WC	Rw
	ii) Alloy Steel/Stainless Steel	WC	W
3.	WPS/PQR		
	a) Review of proposed Procedure	WC	Rw
	b) Welding of Test Coupons and subsequent testing		
	i) Carbon Steel	WC	W
	ii) Alloy Steel/Stainless Steel	WC	W
	iii) All other materials including NACE CS, CS for H_2 Service	WC	W
	c) Approval of final WPS/PQR	WC	HP
4.	Welder performance Qualification Test	WC	S
5.	Certification & Approval of welders before deployment on job	WC	W
6.	i) NDT Procedure Qualification		
	a) Review of proposed Procedure	WC	Rw
	b) Witnessing of Proposed Procedure Testing	WC	W
	c) Approval of Qualified Procedure	WC	W
7.	Joint Numbering for coils/ pressure parts	WC	S
B.	**FABRICATION**		
	STEEL WORK		
1.	Materials as per AFC drawing	WC	S
2.	Dimensional check	WC	S
3.	Fit-up check	WC	S

* *Notwithstanding any other tests/documentation required for qualification/approval of filler metals:*

i) For Alloy Steel & Stainless Steel welding filler metals, chemical analysis to be carried out for very batch.

ii) *For NACE filler metals, corrosion tests like HIC, SSCC, etc. to be carried out for every batch. However, HIC/SSCC tests done earlier & duly witnessed by a reputed third party, will be acceptable.*

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ITP NO: 2130
FIRED HEATERS

SL. NO.	ACTIVITY	CONTRACTOR	EIL
			CAT A
4.	Radiography, as applicable		
	a) RT Marking (for random/spot radiography only)	WC	S
	b) RT Interpretation / Review	WC	W
5.	Completion of structures as per AFC drawings	WC	W
C	**COIL WORK**		
1.	a) Material as per specification (check w.r.t. approved colour coding procedure)	WC	W
	b) Dimensional checks	WC	S
	c) Fit-up check for butt joints and socket joints	WC	S
	d) Fit-up checks for branch joints	WC	S
	e) Cold Pull Check	WC	S
	f) Supports and anchor location	WC	S
2.	Pre-heat (if any)	WC	S
3.	Certificate of purity of purging/shielding Gas (if any)	WC	S
4.	Purging rate (if any) and arrangement	WC	S
5.	Shielding rate (if any)	WC	S
6.	Baking of Electrodes	WC	S
7.	Inter-pass cleaning & Temperature check	WC	S
8.	Visual check of completed welds	WC	S
9.	a)Monitoring of PWHT Cycle	WC	S
	b)Review of Time – Temperature graph	WC	W
10	Hardness Check		
	(i) For C.S. Coils	WC	S
	(ii) For A.S. Coils	WC	W
11.	PT/MT	WC	W
12.	Radiography marking (for Random Radiography only)	WC	W
13.	Radiography Interpretation/ Review	WC	W
14.	Check Shot for Radiography, if applicable	WC	W
15.	Clearance for Hydrostatic testing	WC	HP
16.	Positive Material Identification for base material and welds, as applicable	WC	W
17.	Hydrostatic Testing	WC	W

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ITP NO: 2130
FIRED HEATERS

SL. NO	ACTIVITY	CONTRACTOR	EIL
D.	**ERECTION**		**CAT A**
1.	Review of foundation check as per AFC drawing	WC	HP
2.	Lifting of radiant section columns and their alignment	WC	S
3.	Bottom plate fit-up & welding	WC	S
4.	Radiant shell courses fit-up & welding	WC	S
5.	Weld visual inspection	WC	S
6.	Review of radiographs interpreted by the contractors	WC	W
7.	Cutout		
	a) Marking for burners, sight doors, soot blowers	WC	S
	b) Marking for balance cut outs	WC	S
	c) Cutting	WC	S
8.	Coil erection in Radiant section		
	a) Fixing of coil support castings	WC	S
	b) Clearance for erection of coil	WC	S
	c) Alignment of completed coil work	WC	W
9.	Assembly and erection of convection box		
	a) Erection procedure Review	WC	S
	b) Structural including plate work	WC	S
	c) End tube sheets and intermediate tube sheets with support brackets	WC	S
	d) Clearance of coil erection	WC	W
	e) Erection of box (If applicable)	WC	W
10.	Check Shot for radiography for coil field joints, if applicable	WC	W
11.	Clearance for Hydrostatic test	WC	HP
12.	Hydrostatic test	WC	W

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ITP NO: 2130
FIRED HEATERS

SL. NO	ACTIVITY	CONTRACTOR	EIL
			CAT A
13.	Erection, fit-up & welding of stack		Rw
	a) Erection procedure	WC	Rw
	b) Erection	WC	S
	c) Alignment	WC	S
14.	Erection Fit-up, welding of ducts and its support structural	WC	S
15.	Radiography, as required on steel work		
	a) RT Marking	WC	S
	b) RT Interpretation	WC	W
16.	FD & ID Fan	WC	Note 4
17.	Installation of auxiliary equipment		
	a) Burner along with ignition system and transformer	WC	W
	b) Soot blower along with sequential control panel and electrical wirings	WC	W
	c) Damper and shut-off blades with control panel and winch	WC	W
	d) Air pre-heater (cast, glass, plate) and steam air heater	WC	W
	e) Skin thermocouples	WC	W
	f) Spring Supports	WC	S
18.	Erection of all platforms. Ladders, Hand rails & miscellaneous structures	WC	S
19.	Insulation/ refractory lining	WC	Note 3
20.	Final Painting	WC	Note 2
21.	Liquidation of checklist	WC	HP
22	Smoke testing of Heater	WC	W
23.	Final inspection and acceptance	WC	HP
	INSPECTION & TEST DOCUMENTS		
	Review of Test and Inspection documents	WC	Rw

NOTE :
1) For Incoming material Inspection please refer ITP no: 6-82-1010
2) For Painting works, please refer ITP No. 2190
3) For Insulation, please refer ITP No. 2100
4) For Rotary Equipment, please refer ITP No. 2160

CAT A: All works

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ITP NO: **2140**

REFRACTORY & INSULATION WORKS- FIRED HEATER

SL. NO.	ACTIVITY	CONTRACTOR	EIL
			CAT B
A.	**RADIANT SECTION**		
1.	**Radiant shell**		
	Fixing of Ceramic fibre blanket		
	i) Material inspection		
	Manufacturing test certificates	WC	Rw
	Testing, if any	WC	W
	ii) Clearance for hot work	WC	HP
	iii) Marking of studs	WC	S
	iv) Welding of studs with approved WPS&PQR	WC	S
	v) Surface cleaning	WC	**S**
	vi) Check for individual layers of ceramic fibre blankets and SS foils	WC	W
	vii) Check for overlap of ceramic blanket	WC	S
	viii) Fixing of speed fix washer and cup lock	WC	S
	ix) Cleaning and final inspection	WC	W
2.	**ARCH PLATE**		
	i) Material inspection		
	- Manufacturing test certificates	WC	Rw
	- Testing, if any	WC	W
	ii) Clearance for hot work	WC	HP
	iii) Marking of studs/anchors	WC	S
	iv) Welding of studs/anchors with approved WPS & PQR	WC	S
	v) Surface cleaning	WC	**S**
	vi) Check for individual layers of ceramic Fibre blankets (CFB) modules and SS foils	WC	S
	vii) Check for overlap of CFB and modules	WC	S
	viii) Cleaning and final inspection	WC	W

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ITP NO: **2140**

REFRACTORY & INSULATION WORKS- FIRED HEATER

SL. NO.	ACTIVITY	CONTRACTOR	EIL
			CAT B
3.	**FLOOR PLATE**		
	Laying of castable / fire bricks		
	i) Material inspection		
	- Manufacturing test certificates	WC	Rw
	- Testing, if any	WC	W
	ii) Clearance for hot work	WC	HP
	ii) Surface cleaning	WC	S
	iv) Check Shelf life prior to application	WC	W
	v) Check for undulations on floor	WC	S
	vi) Check for castable mix	WC	W
	vii) Check for proper compaction	WC	S
	viii) Check for thickness of castable	WC	S
	ix) Curing	WC	S
	x) Cleaning after laying of castable	WC	S
	xi) Check for cracks and repair	WC	W
	xii) Fixing of tar paper, if applicable	WC	S
	xiii) Cleaning and final inspection	WC	W
B.	**CONVECTION SECTION**		
	1) CONVECTION WALLS		
	Laying of castable		
	i) Material inspection		
	- Manufacturing test certificates	WC	Rw
	- Testing, if any - Manufacturing test certificates	WC	W

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REFRACTORY & INSULATION WORKS- FIRED HEATER

SL. NO.	ACTIVITY	CONTRACTOR	EIL
			CAT B
	ii) Clearance for hot work	WC	HP
	iii) Marking of studs/anchors	WC	S
	iv) Welding of studs/anchors with approved WPS & PQR	WC	S
	v) Surface cleaning	WC	W
	vi) Check for undulations on wall	WC	S
	vii) Check for castable mixing	WC	W
	viii) Check for proper compaction	WC	S
	ix) Check for thickness of castable	WC	S
	x) Curing	WC	S
	xi) Cleaning after laying of castable	WC	S
	xii) Check for cracks and repair	WC	W
	xiii) Cleaning and final inspection	WC	W
	2) END TUBESHEETS		
	Laying of castable		
	i) Material inspection		
	- Manufacturing test certificate	WC	Rw
	- Testing, if any	WC	W
	ii) Clearance for hot work	WC	HP
	iii) Marking of studs/anchors	WC	S
	iv) Welding of studs/anchors with approved WPR & PQR	WC	S
	v) Surface cleaning	WC	S
	vi) Check for castable mixing	WC	W
	vii) Check for proper compaction	WC	S
	viii) Check for thickness of castable	WC	S
	ix) Curing	WC	S
	x) Cleaning after laying of castable	WC	S
	xi) Check for cracks and repair	WC	W
	xii) Cleaning and final inspection	WC	W

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REFRACTORY & INSULATION WORKS- FIRED HEATER

SL.	ACTIVITY	CONTRACTOR	EIL
			CAT B
	3) BREECHING PLATE		
	Laying of castable		
	i) Material inspection		
	- Manufacturing test certificates	WC	Rw
	- Testing, if any	WC	W
	ii) Clearance for hot work	WC	HP
	iii) Marking of studs/anchors	WC	S
	iv) Welding of studs/anchors with approved WPR & PQR	WC	S
	v) Surface cleaning	WC	S
	vi) Check for undulations on plate	WC	S
	vii) Check for castable mixing	WC	W
	viii) Check for proper compaction	WC	S
	ix) Check for thickness of castable	WC	S
	x) Curing	WC	S
	xi) Cleaning after laying of castable	WC	S
	xii) Check for cracks and repair	WC	W
	xiii) Cleaning and final inspection	WC	W
	4) HEADER BOX		
	Laying of castable		
	i) Material inspection		
	- Manufacturing test certificates	WC	Rw
	- Testing, if any	WC	W
	ii) Clearance for hot work	WC	HP
	iii) Marking of studs/anchors	WC	S
	iv) Welding of studs/anchors with approved WPR & PQR	WC	S
	v) Surface cleaning	WC	S
	vi) Check for undulations on box	WC	S
	vii) Check for castable mixing	WC	W
	viii) Check for proper compaction	WC	S
	ix) Check for thickness of castable	WC	S
	x) Curing	WC	S
	xi) Cleaning after laying of castable	WC	S
	xii) Check for cracks and repair	WC	W
	xiii) Cleaning and final inspection	WC	W

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REFRACTORY & INSULATION WORKS- FIRED HEATER

SL. NO.	ACTIVITY	CONTRACTOR	EIL
			CAT B
	xiv) Surface cleaning	WC	S
	xv) Check for undulations on box	WC	S
	xvi) Check for castable mixing	WC	W
	xvii) Check for proper compaction	WC	S
	xviii) Check for thickness of castable	WC	S
	xix) Curing	WC	S
	xx) Cleaning after laying of castable	WC	S
	xxi) Check for cracks and repair	WC	W
	xxii) Cleaning and final inspection	WC	W
C	**STACK**		
	Laying of castable		
	i) Material inspection		
	- Manufacturing test certificates	WC	Rw
	- Testing, if any	WC	W
	ii) Clearance for hot work	WC	HP
	iii) Marking of studs/anchors	WC	S
	iv) Welding of studs/anchors with approved WPS & PQR	WC	S
	v) Surface cleaning	WC	S
	vi) Check for undulations on stack shell	WC	S
	vii) Check for castable mixing	WC	W
	viii) Check for proper compaction	WC	S
	ix) Check for thickness of castable	WC	S
	x) Curing	WC	S
	xi) Cleaning after laying of castable	WC	S
	xii) Check for cracks and repair	WC	W
	xiii) Cleaning and final inspection	WC	W

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ITP NO: **2140**

REFRACTORY & INSULATION WORKS- FIRED HEATER

SL. NO.	ACTIVITY	CONTRACTOR	EIL
			CAT B
D	**HOT AIR DUCT**		
	i) Material inspection		
	- Manufacturing test certificates	WC	Rw
	- Testing, if any	WC	W
	ii) Clearance for insulation	WC	HP
	iv) External Surface cleaning	WC	S
	iv) Provide spacer rings/anchors	WC	S
	v) Check for thickness of the mineral wool insulation	WC	S
	vi) Check for staggering of joints in insulation	WC	S
	vii) Check for providing expansion joints	WC	W
	viii) Overlapping of metal sheet as per specification	WC	S
	ix) Overlap on joints for Aluminium sheeting as per specification	WC	W
	x) Sealing Aluminium sheeting	WC	S
	Final inspection & acceptance	WC	W
E	**INSPECTION & TEST DOCUMENTS**		
	Review Test and Inspection Documents	WC	Rw

CAT B: All works.

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ITP NO: 2150

EQUIPMENT ERECTION (STATIC)

SL. NO.	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CAT C
	EQUIPMENT ERECTION (STATIC)				
1.	**BEFORE ERECTION**				
a.	Review of foundation acceptance report	WC	HP	Rw	Rw
b.	Incoming material	WC	Note-1	Note-1	Note-1
c.	Readiness for erection				
	i) Centre line marking on equipment and foundation	WC	S	--	--
	ii) Level of foundation (shims/ packing with marking to be prepared & kept ready)	WC	S	--	--
	iii) Correctness of no. & size of Foundation bolts	WC	S	--	--
	iv) Hole dia and no. of holes in base/ structure of equipment columns	WC	S	--	--
	v) Matching equipment base bolt holes with actual foundation bolt layout	WC	S	--	--
	vi) Marking orientation	WC	S	--	--
	vii) Checking the threads of bolts & nuts	WC	S	--	--
	viii) Chipping & roughening of foundation	WC	S	--	--
d.	Outside cleaning, coating/wrapping, painting (for underground equipment only)	WC	HP	W	--

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ITP NO: 2150

EQUIPMENT ERECTION (STATIC)

SL. NO	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CAT C
2.	**ERECTION SCHEMES FOR CRITICAL EQUIPMENTS**				
	a. Review of rigging procedures	WC	HP		--
3.	**SAFETY TEST**				
	a .Load test of cranes, lifting beams, slings and shackles, length and dia. of sling & condition of wire rope by competent authority	WC	Rw	Rw	Rw
4.	**DURING ERECTION**				
	a. Orientation to be checked	WC	S	--	--
	b. Placement of packing as per AFC drawing	WC	S	--	--
	c. Placement of Main & trailing crane as per approved rigging procedure	WC	S	--	--
	d. Orientation of equipment as per AFC drawing	WC	S	--	--
5.	**AFTER ERECTION**				
	a. Tightening of Bolts and Providing washers	WC	S	--	--
	b. Leveling and Alignment of equipments	WC	W	W	--
	c. Corresponding requirement elevation & distance between nozzles in special cases	WC	S	--	--
	d. Cleaning of Sleeves before grouting	WC	S	--	--
	e. Grouting	WC	S	--	--
	i) Acceptance of Specified grouting materials	WC	HP	Rw	Rw
	ii) Placement of grouting	WC	S	--	--
	iii) Curing of grout	WC	S	--	--
	f. Final tightening of bolts	WC	S	--	--

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ITP NO: 2150

EQUIPMENT ERECTION (STATIC)

SL. NO	ACTIVITY	CONTRACTOR	EIL		
			CAT A	CAT B	CAT C
6.	**PACKED EQUIPMENTS**				
	1. Before Installation				
	a. Identify the material, check thickness, dimensions, no. and angle of fingers of packing rings	WC	S	--	--
	2. During Installation				
	a. Degreasing and cleaning of packing material	WC	S	--	--
	b. Check packing support plate	WC	S	--	--
	c. Check for stacked or dumped packing as per specifications	WC	S	--	--
	d. Check for nesting	WC	S	--	--
	e. Check that packing's are touching bed limiter	WC	S	--	--
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

NOTE **:** 1) For Incoming material Inspection please refer ITP no: 6-82-1010

CAT A: Process columns & Reactors (including internals), Mounded Bullets, ODC's or any special type of equipment (Project specific)

CAT B: Vessels & exchangers above 5 T, Hoppers /bins, Incinerators, combustion chamber, Boilers and all other equipments not covered in "Cat A" and "Cat C"

CAT C Filters, Demister, Seal pots, All vessels/exchangers Up to 5T

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ITP NO: 2160

EQUIPMENT ERECTION ROTARY

SL. NO.	ACTIVITY	CONTRACTOR*	EIL		
			CAT A	CAT B	CAT C
1.	**PRE – ERECTION ACTIVITIES**				
	a. Review of foundation acceptance report	WC	HP	Rw	Rw
	b. Material Supply				
	- Owner's supply including templates, if any	WC	Rw	Rw	--
	- Contractor's supply & check testing, if any	WC	Note-1	Note-1	Note-1
	c. Readiness for erection				
	i. Level of foundation (shims/packing with markings to be prepared & kept ready)	WC	W	--	--
	ii. Marking/Centre line of foundation & equipment	WC	W	--	--
	iii. No./dia./length of anchor bolts, depth of pockets, verticality of pockets	WC	W	--	--
	iv. Chipping, roughing & cleaning of pockets/top of foundation	WC	HP	W	Rw
	v. Acceptance of grouting materials as per specifications/ Manufacturer's recommendations	WC	HP	Rw	Rw
2.	**LIFTING TACKLES**				
	a. Certificate from competent authority	WC	Rw	--	--
	b. Load test of Cranes/Lifting beams/slings/ shackles/ Wire ropes, etc. for weight of equipments to be handled	WC	Rw	--	--
3.	**VISUAL INSPECTION OF EQPT. TAG/IDENTIFICATION NO.**				
	a. For any damage	WC	S	--	--
	b. Free shaft rotation	WC	S	--	--
4.	Drilling & Tapping, holes in the base plate of eqpt. (if reqd.)	WC	S	--	--
5.	Approval of Rigging procedure	WC	HP	Rw	Rw

* Inspection by Vendor/Manufacturer for all critical equipments

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ITP NO: 2160

EQUIPMENT ERECTION ROTARY

SL. NO.	ACTIVITY	CONTRACTOR*	EIL		
			CAT A	CAT B	CAT C
6.	**DURING ERECTION**				
	a. Level/elevation of base frame	WC	S	--	--
	b. Checking of foundation bolts (for location, threading, greasing, etc.)	WC	S	--	--
	c. Checking orientation of equipment	WC	S	--	--
	d. Placement of Crane(s), if applicable	WC	S	--	--
	e. Elevation/level of equipment and placement of shims/packings as per AFC drawings	WC	S	--	--
	f. Distance between couplings	WC	S	--	--
	g. Rough alignment of equipment	WC	S	--	--
	h. Availability of Vendor's engineer at site (For critical equipments)	WC	S	--	--
	i. Cleaning of pockets/ grouting of foundation bolts' pockets/base frame	WC	W	--	--
	j. Erection of auxiliary equipment/ Accessories	WC	S	--	--
	k. Final alignment of equipment	WC	S	--	--
	- Without piping	WC	W	W	--
	- With piping (After tightening the flange bolts)	WC	HP	W	--
	1. All protection & safety guards installation	WC	S	--	--

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ITP NO: 2160

EQUIPMENT ERECTION ROTARY

SL. NO.	ACTIVITY	CONTRACTOR*	EIL		
			CAT A	CAT B	CAT C
7.	**POST ERECTION ACTIVITIES**				
	a. Curing of grout	WC	S	--	--
	b. Auxiliary connections to be mounted on equipments as per drawing	WC	S	--	--
	c. Final tightening of bolts	WC	S	--	--
	d. Chemical cleaning of equipment parts/ connected piping	WC	S	--	--
	e. Boxing up of equipment & connected piping	WC	S	--	--
	f. Log book maintenance (For rotating of shaft and any other activity to be performed as per vendor's recommendations)	WC	S	--	--
	g. No load run of motors	WC	W	W	Rw
	h. Re-coupling of motor & reconfirmation of alignment	WC	HP	W	Rw
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	S	--	--

* Inspection by Vendor/Manufacturer for all critical equipments

NOTE : 1) For Incoming material Inspection please refer ITP no: 6-82-1010

CAT A: Compressors, Pumps (ratings>15 KW), Turbines & Diesel Engines, Rotary Driers or Any special type of equipment (Project specific)

CAT B: All types of pumps excluding category A & C, Fans & Blowers Conveyors & Material handling Equipment

CAT C: Metering & Dosing Pumps, etc.

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ITP NO: 2170

INSTALLATION/ERECTION & TESTING OF CRANES (EOT/HOT)

SL.	ACTIVITY		EIL		
			CAT A	CAT B	CAT C
1.	BEFORE ERECTION				
	a. Execution scheme of equipment foundation	WC	Rw		
	b. Materials supply	WC	Note-1	Note-1	Note-1
	c. Readiness for erection	WC	W	--	--
	i. Structural steel girder span centre to centre & elevation difference	WC	W	--	--
	ii. Check centre to centre distance of rails, gaps, elevations, crab wheels distances	WC	W	--	--
	iii. Check buffer stops	WC	W	--	--
2	a. Erection and assembly of components like LT, Crane Girders, Crab, Platforms, etc.	WC	S	--	--
	b. Review of hoist ropes and assembly of hook blocks	WC	S	--	--
3.	a. Electrical installation, testing & no load test of motors	WC	S	--	--
	b. Coupling of motors to drivers	WC	S	--	--
4	NO LOAD TEST				
	a. Winding & unwinding test	WC	W	--	--
	b. Traversing test	WC	W	--	--
	c. Traveling test	WC	W	--	--
5.	LOAD TEST				
	a. Winding & unwinding test	WC	HP	W	Rw
	b. Traversing test	WC	HP	W	Rw
	c. Traveling test	WC	HP	W	Rw
	d. Load & over load testing	WC	HP	W	Rw
	e. Deflection of girder	WC	HP	W	Rw
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

NOTE : 1) For Incoming material Inspection please refer ITP no: 6-82-1010

CAT A: Special purpose M/C viz. Pot tending M/c
CAT B: All EOT cranes with capacity 10T and above
CATC : All EOT /HOT cranes with capacity below 10T

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ITP NO: 2180
STORAGE TANKS

SL. NO.	ACTIVITY	CONTRACTOR	EIL	
			CAT A	CAT B
A.	**PRIOR TO FABRICATION**			
1.	Review Acceptance Report of the tanks foundation	WC	HP	Rw
2.	Incoming Material	WC	Note-1	Note-1
3.	Welding Filler Material Approval / Qualification	WC*	Rw	Rw
	a) Review of Manufacturer's Test Certificate/Documents			
	b) Laboratory testing, if any			
	i) Carbon Steel	WC	W	--
	ii) Alloy Steel/Stainless Steel	WC	W	--
	iii) Low Temperature Services	WC	W	--
4.	WPS/PQR			
	a) Review of proposed procedure	WC	Rw	Rw
	b) Testing			
	i) Carbon Steel	WC	Rw	Rw
	ii) Alloy Steel/Stainless Steel	WC	W	W
	c) Approval of Final WPS/PQR	WC	W	W
5.	a) Welder performance Qualification Test	WC	W	W
	b) Certification & approval of welders	WC	W	W
6.	NDT Procedure Qualification			
	i) Review of proposed procedure	WC	Rw	Rw
	ii) Witnessing of the proposed procedure testing	WC	W	W
	iii) Approval of Qualified Procedure	WC	HP	HP
7.	Review of Joint numbering in drawings	WC	Rw	Rw
8.	Review fabrication, erection, testing Procedures for job	WC	Rw	Rw
B.	**FABRICATION/ERECTION BOTTOM**			
1.	Blast cleaning & painting of underside of bottom plates	WC	HP	S

* *Notwithstanding any other tests/documentation required for qualification/approval of filler metals :*

iii) For Alloy Steel & Stainless Steel welding filler metals, chemical analysis to be carried out for every batch.

iv) For Low Temperature application, and for material class wherever impact requirement is specified in WSC, Impact testing to be carried out for every batch of the filler metal, to be witnessed by PMC/Owner.

v) *For NACE filler metals, corrosion tests like HIC, SSCC, etc. to be carried out for every batch. However, HIC/SSCC tests done earlier & duly witnessed by a reputed third party, will be acceptable.*

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ITP NO: 2180
STORAGE TANKS

SL. NO	ACTIVITY	CONTRACTOR	EIL	
			CAT A	CATB
2.	Plate lay out, overlap and fit up	WC	S	--
3.	Sequence of welding	WC	S	--
4.	Size and positioning of backing plate for annular plates	WC	S	--
5.	Baking of electrodes	WC	S	--
6.	Inter-pass cleaning	WC	S	--
7.	Visual check of welding	WC	W	S
8.	PT/MT/NDT of annular plate butt welds and bottom plate butt welds (As applicable)	WC	W	S
9.	Vacuum box test for bottom plate welding	WC	W	S
	SHELL			
1.	Shell course alignments and fit-up of vertical and circumferential joints before welding	WC	W	S
2.	a) Check Shell diameter, circularity, perpendicularity, straight edge before welding.	WC	W	S
	b) Check Shell diameter, circularity, perpendicularity straight edge after welding,	WC	W	S
3	Visual check of welding and Back chipping	WC	S	-
4.	Inner side welding visual check	WC	S	-
5.	Location, size, alignment and fit-up of nozzles & other openings	WC	W	S
6.	R.F. Pads fit-up/welding	WC	S	-
7	PWHT of shell, RF pads, Nozzles, manholes, etc. (As applicable)	WC	S	S
8.	Radiography marking (for Random radiography only)	WC	W	W
9.	Curb angle and Wind girders fit-up/welding	WC	S	Rw

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ITP NO: 2180
STORAGE TANKS

SL. NO	ACTIVITY	CONTRACTOR	EIL	
			CAT A	CATB
10.	PT/MT of nozzles, wind girders and other attachments (as applicable).	WC	W	S
11.	RF pads pneumatic test	WC	W	W
12.	Shell to bottom fit up	WC	W	S
13.	Shell to bottom I/S welding root run visual/Oil chalk test	WC	W	S
14.	Shell to bottom O/S welding visual and PT	WC	W	S
15.	Fabrication and erection of stair ways	WC	S	--
16.	Cleats welding for insulation	WC	S	--
17.	Review of radiographs interpreted by the contractors	WC	HP	Rw
	FIXED ROOF			
1.	Blast cleaning and painting Roof Structure, underside of Roof plates	WC	W	S
2.	Location and Welding of Roof supports	WC	S	--
3.	Alignment and welding of Roof structures	WC	S	--
4.	Plate layout, overlap and fit-up	WC	S	--
5.	Visual check of roof welds	WC	S	--
6.	Location, size and alignment of roof nozzles, man-holes vents, etc.	WC	W	S
7.	PWHT (as applicable)			
	i) Procedure Review	WC	Rw	Rw
	ii) PWHT cycle monitoring	WC	W	--
	iii) Time-Temp Chart Review	WC	W	Rw
8.	RF pads fit-up & Welding	WC	S	--
9.	RF pad pneumatic testing	WC	W	S
10.	PT/MT of Nozzles, vents & other attachments	WC	W	S
11.	Welding of Roof plate with shell/ curb angle	WC	S	--

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ITP NO: 2180
STORAGE TANKS

SL. NO	ACTIVITY	CONTRACTOR	EIL	
			CAT A	CATB
	FLOATING ROOF			
1.	Temporary staging spacing and levels	WC	S	--
2.	Plate layout, overlap, fit-up/welding	WC	S	--
3.	Availability of approved calculations for design of buoys	WC	Rw	--
4.	Buoys fabrications	WC	S	--
5.	Vacuum testing of roof-plate welds	WC	W	--
6.	Location of sleeve supports	WC	S	--
7.	Pad plate welding with roof and sleeve support	WC	S	--
8.	Fixing and welding of Buoys	WC	S	--
9.	Initial – lift	WC	S	--
10.	Supports fixing through sleeves	WC	S	--
11.	Seal welding of support sleeves from beneath after dewatering	WC	S	--
12.	Air test of Buoys Pontoon welding	WC	S	--
13.	Location, fixing and welding of man holes, drains etc.	WC	W	--
14.	Shell to pontoon clearance	WC	HP	--
15.	Seal fixing	WC	HP	--
16.	Floating Roof Testing, as required e.g. flooding etc.	WC	HP	--

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ITP NO: 2180

STORAGE TANKS

SL. NO	ACTIVITY	CONTRACTOR	EIL	
			CAT A	CATB
C.	**TESTING**			
1.	Correctness of testing arrangements especially size of blind flanges/vents/drains/ temporary piping	WC	S	--
2.	Mechanical / Inspection clearances	WC	HP	HP
3.	Earthing of ladder & shell	WC	W	W
4.	Settlement readings during water filling	WC	W	Rw
5.	Hammer test	WC	W	W
6.	Air pressure test	WC	W	W
7.	Vacuum test	WC	W	W
8.	Roof collapsibility test in case of floating roof tanks	WC	W	W
9.	Calibration of tanks from Statutory authorities	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE:
1) For Incoming material Inspection please refer ITP No: 6-82-1010
2) For Painting works, please refer ITP No. 2190
3) For Insulation, please refer ITP No. 2200

CAT A: All Site fabricated steel storage tanks for process fluid /Hydrocarbon, floating roof, tanks having capacity600cum or 10m dia and 8 m height.

CAT B: Site fabricated steel storage tanks for Raw water, Fire water, waste water, DM water, etc. and all tanks not covered under "CAT A"

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ITP NO: 2190
PAINTING WORKS

SL. NO.	ACTIVITY	CONTRACTOR	EIL
			CAT B
A.	BEFORE FABRICATION		
1.	a) Approved supplier, product and supplier's materials test certificate	WC	Note 1
	b) Check manufacturing date, expiry period and shelf life	WC	Note 1
2.	a) Physical condition of materials; original manufacturers packing/ containers	WC	Note 1
	b) Confirm identification/ Transfer of identification of materials before painting	WC	Note 1
3.	a) Adequacy of blasting machine capacity for blast cleaning	WC	--
	b) Type and quality of abrasive being used for blast cleaning	WC	--
	c) Adequacy of Airless spray equipment, air spray equipment and paint brushes	WC	--
4.	Performance test of paint applicator and blast cleaning operator	WC	S
5.	Check quality of dry air for blast cleaning and spray application	WC	--
6.	Inspection of blast cleaning operation		
	- Inspect for surface cleanliness by visual stds. of ISO 8501	WC	--
	- Measurement of surface profile by Micrometer/Elkometer/Stylus instrument	WC	--
7.	Wet film thickness and over coating interval for each coat of paint during application	WC	--
8.	Dry film thickness after final coat	WC	S
9.	Inspection of final curing/ drying, adhesion, hardness, surface finish, sagging, hiding and pinhole detection	WC	--
10.	Painting identification band/ code, etc.	WC	--
11.	Acceptance prior to shifting to fabrication shop, if applicable	WC	Rw

CAT B: All works

Note: 1) For Incoming material Inspection please refer ITP no: 6-82-1010

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ITP NO: **2190**
PAINTING WORKS

SL. NO.	ACTIVITY	CONTRACTOR	EIL
			CAT B
B.	AFTER INSTALLATION		
1.	a) Approved supplier product : Suppliers materials test certificate	WC	Note 1
	b) Manufacturing date, expiry period and shelf life	WC	Note 1
2.	Physical condition of materials: original manufacturers packing/ containers	WC	Note 1
3.	Confirm completion of		
	c) Hydrostatic testing of piping	WC	--
	d) Mechanical clearance of structure & equipment's	WC	--
4.	a) Adequacy of surface preparation tools and tackles	WC	--
	b) Check the quality of surface preparation	WC	--
5.	a) Performance test for paint applicator for spray application	WC	Rw
	b) Adequacy of airless spray equipment and air spray equipment and paint brushes and quality of dry air for paint application	WC	--
6.	Wet film thickness and over coating interval for each coat of application	WC	--
7.	Dry film thickness after final coat	WC	S
8.	Identification of colour bands, direction marking	WC	--
9.	Identification of colour bands, direction marking	WC	--
10.	Final Acceptance	WC	W
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

CAT B: All works
Note :1) For Incoming material Inspection please refer ITP no: 6-82-1010

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ITP NO: **2200**

INSULATION WORKS

SL.	ACTIVITY	CONTRACTOR	EIL
			CATB
1.	**PRIOR TO APPLICATION OF INSULATION**		
	a. Material Test certificates from supplier of insulation material and acceptance thereof	WC	Note 1
	b. Check testing, if required	WC	Note 1
2.	**DURING APPLICATION OF INSULATION**		
	a. Surface preparation	WC	--
	b. Fixing of spacer rings and checking their spacing	WC	--
	c. Fixing of support rings and checking their spacing in case of vertical piping	WC	--
	d. Fixing of insulation lugs and angle rings in case of vessels, tanks, etc	WC	--
	e. Thickness of insulation	WC	--
	f. Aluminum foil for S.S. Piping/Vessels	WC	--
	g. Overlap of cladding at vertical and horizontal joints	WC	--
	h. Expansion joints, if any	WC	--
	i. Inspection windows	WC	--
	j. S.S. foil for S.S. piping	WC	--
	k. Final finish	WC	W
3.	**ADDITIONAL CHECKS FOR COLD INSULATION**		
	a. Wooden supports	WC	--
	b. Vapour barrier	WC	--
	c. Vapour sealant	WC	--
	d. Insulation coat	WC	--
	Review Test and Inspection Documents	WC	Rw

Note 1) For Incoming material Inspection please refer ITP no: 6-82-1010

CAT B: All works

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FORMAT NO: M-01

(Sheet 1 of 4)

CHECKLIST FOR MECHANICAL CLEARANCE – A/G PIPING

Project : _____	Report No : _____
Plant/Unit : _____	Date : _____
Contractor : _____	Area : _____
Loop No : _____	INCH MTR : _____

Line No (Isometric No.)	Rev.	GAD No.	Rev.	P&ID No.	Rev.

	Items to be checked		Compliance Status	Accepted by	
			OK/NA/PL (Note-1)	Contractor	EIL
1.	**Installation checked as per Isometric w.r.t.** CONFIGURATION : Route, plumb, elevation, Clearance for thermal expansion/ insulation BRANCH : Location, angle, orientation, type, RF pad, etc. STEAM TRAP : Direction				
2.	**Installation checked as per GAD w.r.t.** CONFIGURATION : Route, clearance for thermal expansion/insulation				
3.	Installation checked as per P&ID				
4.	Isometrics completed for **(enclosed**):				
	a. Joint Numbering (Shop & Field Welds)				
	b. Spool Numbering				
	c. As-built routing & dimensions				
5.	**Valves**(Check Rating, Gaskets, Flow Direction, Sheet No., Tag No., Spindle direction, CSO LO/LC, Damage, etc)	Nos			
	Gate Valves				
	Globe Valves				
	Check Valves				
	Control Valves Tag Nos.:				
	Safety Valves Tag Nos.:				
	Any other valves :				
6.	**Strainers** : Check for clearance, flow direction, elements				

Note-1: OK – Accepted, NA-Not applicable, PL – Punch listed

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FORMAT NO: M-01

(Sheet 2 of 4)

CHECKLIST FOR MECHANICAL CLEARANCE – A/G PIPING

	Item to check	Compliance Status	Accepted by	
		OK/NA/PL (Note-1)	Contractor	EIL
7.	**Flanged Joints**			
	Total Nos.			
	Check for type of flange			
	Check for Rating			
	Identification of Flange joints not subjected to hydro test in the Test Pack			
	Check for Alignment, (proper gap & parallelity)			
	Check for Correct Studs & nuts – dia., length, Material, uniform protrusion of studs, anti seize compound			
	Check for correct gasket (type, size, spec., thickness, etc.)			
	Torque values used for tightening			
8.	Seal Welding of Screwed Connections (if Required)			
9.	Vents/Drains as per Dwg and Provision of additional high point Vents and/or low point Drains, if reqd.			
10.	Reinforcement pads as per piping class			
11.	**Orifice Flanges :**			
	Check for Tag No., tapping orientation, tap valve, jack screw, straight run length of upstream & downstream			
12.	**Local Gauges :** Check for accessibility			
13.	Slope (When Applicable)			
14.	**Supports**			
	a) Guides, Cross Guides, Trunnion, etc.			
	i) Check for correct type, material & dimension			
	ii) Check welding			
	iii) Check for vent hole on pads (if applicable)			
	iv) Check offset for thermal expansion			
	v) Check clearance of guide			
	vi) Check U bolt for slide support			
	b) Spring Support			
	i) Verify tag no. and check details as per data sheet/spring set			
	ii) Check for locking arrangement and any damage during transit, etc.			
	vi) Check for completeness of installation as per drg. including welding of mounting cleat/ bracket			
	iv) Check for locking during installation and pressure test			
	c) Bracket Support & Inserts with Anchor Fasteners :			
	i) Check for members dimensions and materials			
	ii) Check for welding			
	iii) Check for bolting			
	iv) Check for appearance/ damage			

Note-1: OK – Accepted, NA-Not applicable, PL – Punch listed

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FORMAT NO: M-01
(Sheet 3 of 4)
CHECKLIST FOR MECHANICAL CLEARANCE – A/G PIPING

	Item to check	Compliance Status	Accepted by	
		OK/NA/PL (Note-1)	Contractor	EIL
15.	**Vents/ Drains :**			
	- As per drg.			
	- Orientation of valve handles			
	- Clearance for hose			
	- Requirement of additional vents/ drains (highest/lowest pt.)			
16.	**Earthings :**			
	a) Check for location			
	b) Check for dimension of lug welding			
17.	**Joists History sheets enclosed for :**			
17.1	Material Traceability as per Procedure No:_____ (refer enclosed suggested Format)			
17.2	Fit ups checked			
17.3	NDT Complete (Radiography, MT, PT, UT, PAUT)			
17.4	Stress Relieving & Hardness check complete			
17.5	Positive Material Identification **(PMI)**			
	Checked for Removal/Blinding-off of:			
	a. Control, Safety and Check Valves			
	b. In-Line Instruments			
	c. Rupture Discs			
	d. Equipment Nozzles			
	e. Others			
18.	Supports and Weld/Flanged/Screwed connections free from			
	insulation or other coverage`			
19.	Checked Installation of (Indicate Location in Drawings)			
	a. Temporary Blinds/Spades			
	b. Temporary Strainers			
	c. Temporary Dummy-Spools			
	d. Temporary Gaskets			
	e. Others			
20.	**Expansion Bellows -**			
	a) Checks prior to installations			
	- Physical damages			
	- Transit locks are intact			
	- Dimensions as per drgs.			
	b) Check during installation			
	- Parallelity of mating flanges			
	- Face to face dimension of mating flanges			
	- Concentricity of mating flanges			
	- No stress on expansion bellows			
	- Record			

Note-1: OK – Accepted, NA-Not applicable, PL – Punch listed

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FORMAT NO: M-01

(Sheet 4 of 4)

CHECKLIST FOR MECHANICAL CLEARANCE – A/G PIPING

	Item to check	Compliance Status	Accepted by	
		OK/NA/PL (Note-1)	Contractor	EIL
	c) Isolation during pressure tests			
	- Bellow mfg. recommendations on isolation of bellow during pr. Test to be followed			
	- If recommended expn. Bellow to be dropped during pr. Test.			
21.	Cleanliness Internally and Externally			
22.	Rotating Equipment Final Alignment Checked with piping			
23.	Removal of unwanted construction supports			
24.	Instrument tapings provided as per Drawing			
25.	**Physical-Walk-Through – The – Line,** checked for gross irregularities including physical damages, unwanted tacks, arc strikes, spatters and space for thermal expansion.			
Other :				
Remarks				
Reviewed by Contractor (minimum one level higher than checker)				
Contractor				
Sign :				
Name :	Designation :			
Date :				
EIL				
Sign :				
Date :				
Name :	Designation :			

Note-1: OK – Accepted, NA-Not applicable, PL – Punch listed

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FORMAT NO: M-02

HYDROTEST PACK PUNCH LIST

Project : _____	Report No : _____
Plan : _____	Date : _____
Contractor : _____	Area : _____
Loop No : _____	REF P & ID No. : _____

Description : _____

Ref Document : _____

Punch Item No.	Priority	Description of Punch Items	Location	Prepared By	Action By	Due date	Completion Acceptance

Priority: 1. Needed for pressure test, 2. Needed for Pre-Commissioning, 3. Needed for Commissioning 4. Needed for startup, 5. Needed for plant acceptance

Contractor :	**EIL** :
Sign :	Sign :
Date :	Date :
Name : Designation :	Name : Designation :

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FORMAT NO: M-03

RELEASE FOR HYDRO TEST– A/G PIPING

Project : _____	Report No : _____
Plan : _____	Date : _____
Contractor : _____	Area : _____
Loop No : _____	REF P & ID No. : _____
	INCH MTR : _____
	From _____ To _____

	Line No. (s)		Isometric No. (s)	P&ID No. (s)	

Test Medium :		Test Duration :	Design/Test Pressure :
Test Pressure Gauge No.	Range	Calibration Certificate No.:	Gauge Calibration Date:

Items to check		Accept		Witness
		Contractor	EIL	
	Field Installation Checklist Prior to Hydrotest Signed			
	Punch list Prepared			
	Pre – Hydrotest Punch items Cleared			
	Accessibility to Inspection/Witness Locations			
	Capacity of pressurizing pump checked			
	Cordon off area for high pressure testing, as required			
	Pre-Hydrotest flushing carried out			
	IBR/Others test Witnessing Required Yes No			
System Released for Pressure Testing :				

Contractor :	**EIL:**
Sign : Name :	Sign : Name :
Date :	Date :
Designation :	Designation:

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FORMAT NO: M-04

PIPING HYDROTEST RECORD – A/G PIPING

ACTIVITY	Date	Time
Water Filling and Venting started at		
Water Filling Completed		
Vents Closed		
Isolation of Pressurizing pump		
Test completed at :		
- Water drained		
- Air drying done		
- Temp Blinds Removed		
- Checked for reinstallation of a. Control & Safety vales b. On line Instruments c. Rupture disks d. Others		
- Cold setting of spring supports carried out		
- **Test Result**	☐ Acceptable	☐ Not Acceptable

Contractor :	**EIL** :
Sign :	Sign:
Date :	Date:
Name : Designation	Name: Designation:

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FORMAT NO: M-05

AUTHORISATION FOR MODIFICATION OF PIPING JOINTS

Indicative format for Authorizing/Recording of Modification of Piping Joints after Mechanical clearance /NDT Clearance/ Hydro Testing /Pneumatic Testing of pressure Test Packages/Loops in piping jobs.

Job No. :	Unit No.:	Report No:	Date:
Owner/Client : PMC : Contractor :		Pressure Test Package No.: System Name/No. : Previous Hydrotest Date :	

Drawing No	:	
Line No.	:	
Joint Nos. to be modified (attach sketch)	:	
Size & type of joint	:	
New Joint Nos.	:	
Deleted Joint Nos.	:	
Modification Joint Nos.	:	
Reason for Modification	:	

A) Proposed checks/NDT / Testing after Modification

1. Fit up and Traceability.:	☐				
2. PMI Checks :	☐	Mark '√' in box as necessary			
3. MPI Test :	☐	PT (root/final) :	☐	RT :	☐
4. PWHT/Hardness : Required. :	☐	Not Required. :	☐		
5. Hydrotesting:	☐	Pneumatic Test :	☐		

Authorized Signatory (note-1)

Name	
Signature	
Date	

B) Proposal Accepted by EIL (note-2)

	Area Co-ordinator	**Welding/ NDT Incharge**
Name		
Signature		
Date		

Clearance/Acceptance after modifications (All Supporting Documents enclosed)

Mechanical clearance: Contractor Mech.	☐	Signature.	EIL Mech.	☐ Signature.
NDT Clearance : Contractor QA/QC.	☐	Signature.	EIL Welding/NDT	☐ Signature.
Testing Acceptance : Contractor Mech.	☐	Signature.	EIL Mech.	☐ Signature.

Final acceptance after Modification

	Contractor	**EIL**
Name		
Signature		
Date		

Note: 1. Authorized signatory (*): RCM/ Site In charge of execution agency

2. RCM/SIC of EIL may seek opinion of Engineering, prior to acceptance of proposal from LSTK Contractor as necessary.

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FORMAT NO: M-06

Checklist for Erection of Static Equipment

(4 pages)

S. No.	Description	Status (OK / Not OK)	Contractor / TPI	EIL / Client	Remarks
1	**Shifting of Equipment (within site)**				
1.1	Equipment inspected at stores for damages (if any), Arrange for rectification at site/stores, including initiation of insurance claim process (if required).				
1.2	Detailed packing list checked & all loose items identified at stores/site.				
1.3	Special lifting tools & tackles (Spreader bar, lifting beams, shackles etc) if any supplied by Manufacturer/Licensor/Package vendor are identified and shifted to site.				
1.4	Manoeuvring plan identified and Checked by the TPI/Erection contractor for shifting the equipment from the store/ owner point to the designated erection area, including removal of site hindrances for safe movement of the equipment.				
1.5	ODC permits taken from all concerned (if applicable).				
1.6	Adequate height in saddle arrangement provided to carry out installation of Brackets/Insulation etc., at site (If applicable).				
2	**Safety/Training**				
2.1	Tool box talk (TBT) done.				
2.2	TBT conducted for shifting of equipment from one place to designated location.				
2.3	TBT conducted to the rigging team before erection of the equipment.				
2.4	Adequate ventilation are provided in the confined space (If applicable)				
2.5	Lower Explosive Limit (LEL) checked in the confined space before erection of the equipment (If applicable)				
2.6	High Tension (HT) line passing nearby erection area are within the safe distance limit (If applicable)				
2.7	Safe Access for removal of the sling after erection of the equipment checked.				
2.8	Health check of Man basket done before the erection of the equipment.				
2.9	Fitness Certificate availability for Rigging Team & Crane operator checked.				
2.10	Clear demarcation of risk prone area by HSE personnel & job engineer for barricading & ensuring the presence of only designated persons in the barricaded area during erection				
3	**Crain Detail Checking**				
3.1	Configuration of the crane				

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S. No.	Description	Status (OK / Not OK)	Contractor / TPI	EIL / Client	Remarks
3.2	Age of the crane				
3.3	Boom length and additional arrangements if any shall be indicated				
3.4	Operating radius				
3.5	Cumulative Lifting capacity within SWL				
3.6	Clearance between the equipment and boom				
3.7	Jacks of the crane are positioned in level and safe				
3.8	Barrication done in erection area				
3.9	Adequacy of Counter weight checked and weight of counter weight is embossed/marked				
3.10	Hindrance due existing facilities like drains, Culverts, trenches, any neighbouring foundation, structures, equipments etc., are identified and hindrance are removed before erection and same shall be marked in the scheme.				
3.11	Swing of Boom & counter weight doesn't foul with existing facilities				
3.12	The load chart of the cranes				
3.13	Capacity of the lifting tackles along with all the test certificates are found in order				
3.14	Availability of valid Load Test Certificate issued from Competent Authority/TPI for Main Crane				
3.15	Availability of valid Load Test Certificate issued from Competent Authority/TPI for Trailing Crane				
3.16	Availability of valid Test Certificate from Competent Authority/TPI for Rigging tools & tackles checked				
3.17	Crane safety indications checked				
3.18	Safe Load Indicator (SLI) checked				
3.19	Wind anemometer working indications checked				
3.2	Swing warning alarm/lights working checked				
3.21	Road block permits (if any) taken				
3.22	Intimated to other contractors nearby				

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S. No.	Description	Status (OK / Not OK)	Contractor / TPI	EIL / Client	Remarks
4	**Pre-Erection Activities at site**				
4.1	Ensure latest revision of Equipment drawing is available				
4.2	Ground compaction of crane & equipment placement area (Hard Stand), if applicable.				
4.3	Testing of Hard Stand, if required				
4.4	Work Permit availability before commencement of the job checked.				
4.5	Damages (if any) checked in equipment nozzle, instrument connection, saddles, structural clips etc. (after shifting to site).				
4.6	Damages (if any) checked on foundation bolt and greasing done.				
4.7	Centre line marking on equipment and foundation for checking verticality. If marking is under Insulation transfer marking outside insulation on equipment				
4.8	Ground compaction of crane & equipment placement area. Hard Stand, if applicable.				
4.9	Level/Elevation, Orientation of the foundation checked				
4.10	Correctness of no. & size of foundation bolts checked				
4.11	Check the size of opening is sufficient enough taking into account all projection of nozzles if equipment to be inserted through opening				
4.12	Hole dia. and no. of holes in case / structure of equipment columns checked				
4.13	Equipment base bolt holes matching with actual foundation bolt layout checked				
4.14	Thread of bolts & nuts checked				
4.15	Check any damages observed in the pre fixed internals like grid, Internal distributor, distributors etc.,				
4.16	Cleaning of Sleeves before erection checked				
4.17	Chipping & roughening of foundation checked				
4.18	Shims, levelling plates, wedges, sliding base plates installation checked				
4.19	Platform brackets installation checked				

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S. No.	Description	Status (OK / Not OK)	Contractor / TPI	EIL / Client	Remarks
4.20	Insulation done before the erection of the equipment				
4.21	Before erection of the equipment, equipment spring support installation at prescribed elevation checked as per the applicable drawings				
4.22	Touch up paint done as per the applicable painting spec and job specification				
5	**Erection Scheme**				
5.1	All details required in the rigging Scheme & procedure provided by agency/contractor				
5.2	Erection Scheme & Rigging procedure submitted by agency/contractor are approved				
5.3	Wire rope slings checked				
5.4	Spreader beam checked				
5.5	D Shackles checked				
5.6	Hook Blocks checked				
5.7	Orientation, length and size of lifting trunions checked for fouling of slings with any nozzle while lifting				
5.8	Equipment orientation w.r.t equipment GAD and piping GAD are matched				
6	**After Erection**				
a	Post erection the Temporary saddles used for equipment shifting and templates are shifted to designated location as per instruction of engineer in charge				
b	Tightening of bolts and providing washers checked				
c	Levelling and alignment of equipments checked				
d	Final tightening of bolts checked				
e	Sub assemblies and Commissioning spares etc., received along with equipment (if any) returned to store/owner				
f	Insulation rings checked and found in order				
g	Sub assemblies are installed & Commissioning spares returned to store/owner				
h	Erection of Davit, Checking welding of Sliding Link (if applicable)				
i	Welding of washers checked (if applicable)				
j	Check removal of temporary support of equipment both internal & external				

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सामान्य कार्यों (ईपीसीसी/एलएसटीके संविदाओं) के लिए निरीक्षण एवं परीक्षण योजना (आईटीपी)

INSPECTION & TEST PLAN (ITP) FOR GENERAL WORKS (EPCC/LSTK CONTRACTS)

Rev. No.	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
4	29.03.2024	REVISED AND REISSUED	DK	AC	RKS	MN
3	14.01.2019	REVISED AND REISSUED	SKG	AP	AKK	RKT
2	19.02.2016	REVISED AND REISSUED	DJ	AKM	TKS	SC
1	04.07.2011	REVISED AND REISSUED	SM	SM	MKG	DM
0	14.07.2006	ISSUED AS STANDARD SPECIFICATION	AS	MPJ	VNP	VJN

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Abbreviations:

AFC	:	Approved For Construction
CF	:	Ceramic Fibre
PMC	:	Project Management Consultant
SS	:	Stainless Steel like A312 TP 304, 316, 321, 304L, 316L, 316Mo, etc.

Construction Standards Committee

Convenor: Sh. R K Singh, ED (Construction)

Members:
Sh. D S N Murthy, GGM (Projects)
Sh. Chinmoy Kapuria, CGM (SCM)
Sh. Udayan Chakravarty, CGM (Piping)
Sh. Abhijit Chakraborty, GM (Construction)
Sh. Pankaj Kumar Rai, DGM (Construction)
Sh. Dhananjay, AGM (Construction)

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GENERAL NOTE

The enclosed ITPs shall be followed for the works to be performed by the contractor. The provisions indicated for stage wise inspection by EIL/Owner (For specific activities), may be modified in line with EIL scope of services as per the contract between EIL and Owner. Activities for which ITP's are not provided in this specification, contractor to develop and get the same approved by EIL/Owner before start of the work. In general, role of EIL has been specified in the document. The role of owner to be specified during preparation of site specific ITPs.

Contractor to submit job procedures for the jobs for which ITP's are attached & job specific reporting formats with the aid of enclosed sample reporting formats to EIL/Owner for approval, before commencement of the activity. If the contractor has to deviate from the given ITP for a valid reason, he shall obtain prior written approval of EIL/Owner. Contractor to carry out 100% examination of all activities.

LEGEND

HP : **Hold Point ;**

A point which requires witnessing/inspection/verification and acceptance by Owner/EIL before any further processing is permitted.
The Contractor shall not process the activity/item beyond a Hold Point without written approval by Owner/EIL except where prior written permission for further processing is available.

W : **Witness Point ;**

An activity which requires witnessing/inspection/verification by Owner/EIL when the activity is performed.
After proper notification has been provided (notification modalities and period shall be finalized before hand), the Contractor is not obliged to hold further processing if Owner/EIL is not available to witness the activity or does not provide comments before the date notified. In such cases, basis of acceptance shall be review of Contractor generated report/document as per relevant technical specification.

Rw : **Review** of Contractor's documentation.

S : **Surveillance** Inspection by Owner/ EIL.
Monitoring or making observations to verify whether or not material/items or services conform to specified requirements. Surveillance activities may include audit, inspections, witness of testing, Review of quality documentation & records, personnel qualifications, etc.

WC : **100%** Supervision and Examination by Contractor.

Responsibility for execution of the inspection/testing is with the Contractor; Owner/EIL only verifies examination or testing done by the Contractor at important stages

ITP NO: 2501

PAINTING WORKS

SL. NO.	ACTIVITY	CONTRACTOR	EIL
A.	**BEFORE FABRICATION**		
1.	Availability of Valid calibration certificates of instruments/ testing equipment's	WC	RW
2.	a) Approved supplier, product and supplier's materials test certificate	WC	Note 1
	b) Check manufacturing date, expiry period and shelf life	WC	Note 1
3.	a) Physical condition of materials; original manufacturers packing/ containers	WC	Note 1
	b) Confirm identification/ Transfer of identification of materials before painting	WC	Note 1
4.	a) Adequacy of blasting machine capacity for blast cleaning	WC	--
	b) Type and quality of abrasive being used for blast cleaning	WC	--
	c) Adequacy of Airless spray equipment, air spray equipment and paint brushes	WC	--
	d) Performance test for paint applicator for spray application and blast cleaning operator	WC	--
5.	Check quality of dry air for blast cleaning and spray application	WC	--
6.	Inspection of blast cleaning operation		
	- Inspect for surface cleanliness by visual stds. of ISO 8501	WC	--
	- Measurement of surface profile by Micrometer/Elkometer/Stylus instrument	WC	--
7.	Wet film thickness (including primer) and over coating interval for each coat of paint during application	WC	--
8.	Dry film thickness after final coat (wherever applicable)	WC	S
9.	Inspection of final curing/ drying, adhesion, hardness, surface finish, sagging, hiding and pinhole detection	WC	--
10.	Painting identification band/ code, etc.	WC	--
11.	Acceptance prior to shifting to fabrication shop, if applicable	WC	Rw

Note: 1) For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO: 2501

PAINTING WORKS

SL. NO.	ACTIVITY	CONTRACTOR	EIL
B.	**AFTER INSTALLATION**		
1.	a) Approved supplier product : Suppliers materials test certificate	WC	Note 1
	b) Manufacturing date, expiry period and shelf life	WC	Note 1
2.	Physical condition of materials; original manufacturers packing/ containers	WC	Note 1
3.	Confirm completion of		
	a) Hydrostatic testing of piping	WC	--
	b) Mechanical clearance of structure &equipment's	WC	--
4.	a) Adequacy of surface preparation tools and tackles	WC	--
	b) Check the quality of surface preparation	WC	S
5.	a) Performance test for paint applicator for spray application	WC	--
	b) Adequacy of airless spray equipment and air spray equipment and paint brushes and quality of dry air for paint application	WC	--
6.	Repairing / Touchup of shop applied paint, if required	WC	--
6.	Wet film thickness and over coating interval for each coat of application	WC	--
7.	Dry film thickness after final coat	WC	S
8.	Identification of color bands, direction marking	WC	--
9.	Review Test and Inspection Documents	WC	Rw
10.	Final Acceptance	WC	HP

Note: 1) For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO: 2505

INSULATION WORKS

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1.	**PRIOR TO APPLICATION OF INSULATION**		
	a. Material Test certificates from supplier of insulation material and acceptance thereof	WC	Note 1
	b. Check testing, if required	WC	Note 1
2.	**DURING APPLICATION OF INSULATION**		
	a. Surface preparation (Dryness, paint etc.)	WC	S
	b. Fixing of spacer rings and checking their spacing	WC	--
	c. Fixing of support rings and checking their spacing in case of vertical piping	WC	--
	d. Fixing of insulation lugs and angle rings in case of vessels, tanks, etc.	WC	--
	e. Thickness of insulation	WC	--
	f. Aluminum foil for S.S. Piping/Vessels	WC	--
	g. Overlap of cladding at vertical and horizontal joints	WC	--
	h. Expansion joints, if any	WC	--
	i. Inspection windows	WC	--
	j. S.S. foil for S.S. piping	WC	--
	k. Final finish	WC	W
3.	**ADDITIONAL CHECKS FOR COLD INSULATION**		
	a. Wooden supports	WC	--
	b. Vapour barrier	WC	--
	c. Vapour sealant	WC	--
	d. Insulation coat	WC	--
	Review Test and Inspection Documents	WC	Rw
4.	Final Acceptance	WC	HP

Note: 1) For incoming material inspection please refer ITP no: 6-82-1010.

ITP NO: 2510

REFRACTORY LINING

SL. NO.	ACTIVITY	CONTRACTOR	EIL
1	**PRIOR TO START OF LINING**		
	i) Material Test certificates from suppliers	WC	Note 1
	ii) Field tests and tests from approved laboratories, if applicable	WC	Note 1
	iii) Availability of Refractory specialist at site (Contactor's/ Vendor's)	WC	HP
	iv) Mockup applicable for castable lining	WC	S
2	**DURING LINING**		
	A) INSULATING FIRE BRICKS		
	i. Clearance for completion of structural works including cleats/ lugs/ anchors/ hooks, etc.	WC	--
	ii. Cleanliness of the surfaces to be lined	WC	--
	iii. Insulating layer application, wherever applicable	WC	--
	iv. Metal foil application, wherever applicable	WC	--
	v. Checking of bricks for their soundness (squareness, cracks and for any other damages)	WC	--
	vi. Mix proportion	WC	S
	vii. Laying of bricks as per specifications	WC	S
	viii. Line and verticality	WC	S
	ix. Identifying location of expansion joints	WC	S
	x. Filling expansion joints, wherever applicable	WC	S
	xi. Finishing works	WC	S

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ITP NO: 2510

REFRACTORY LINING

SL. NO	ACTIVITY	CONTRACTOR	EIL
	B) INSULATING CASTABLE CONCRETE		
	i. Clearance for completion of structural steel work including cleats/ support lugs/ anchors/hooks, etc.	WC	S
	ii. Cleanliness of the surface to be lined	WC	S
	iii. Insulating layer application, wherever applicable	WC	--
	iv. Metal foil application, wherever applicable	WC	--
	v. Fixing of wire mesh	WC	--
	vi. Fixing of shuttering/ scaffolding and providing pockets for pouring mortar	WC	--
	vii. Mix proportion	WC	
	viii. Identifying location of expansion joints	WC	--
	ix. Ramming of mortar for achieving uniform density	WC	--
	x. Filling expansion joints, wherever applicable	WC	--
	xi. Wetting of previous layer prior to casting the Construction joints	WC	--
	xii. Pointing	WC	--
	xiii. Curing	WC	--
3	Review Test and Inspection Documents	WC	Rw
4	Final Acceptance	WC	HP

Note: 1) For incoming material inspection please refer ITP no: 6-82-1010.

2) Surveillance/witness may be increased in case of boilers, heaters, etc.as per specific requirements given in the specifications.

ITP NO: 2515

CERAMIC FIBRE LINING

SL. NO	ACTIVITY	CONTRACTOR	EIL
1	**PRIOR TO START OF LINING**		
	i. Material Test certificates from suppliers	WC	Note 1
	ii. Field tests and tests from approved laboratories, if applicable	WC	Note 1
	iii. Availability of Refractory specialist at site (Contactor's/ Vendor's/PMCs)	WC	HP
2	**DURING LINING**		
	i. Clearance for completion of structural works including welding of cleats/ lugs/ anchors/hooks, etc.	WC	S
	ii. Cleanliness of surfaces to be lined	WC	--
	iii. Laying of Ceramic fibre blanket layer wise (As per AFC drawings)	WC	--
	iv. Provision of cups locks/ arrangement for CF lining holding	WC	--
	v. Identifying location of expansion joints	WC	S
	vi. Filling expansion joints as per specifications/ AFC drawings	WC	--
	vii. Finishing works	WC	S
3	Review Test and Inspection Documents	WC	Rw
4	Final Acceptance	WC	HP

Note: 1) For incoming material inspection please refer ITP no: 6-82-1010.

Format No.: G-01
FIELDPAINITNG PRIMER/FINISH PAINT FOR STRUCUTRAL STEEL

PROJECT :				FORMAT NO :
Name of Work :				REPORT NO :
FOA No :				
Drawing :				DATE :
Surface Preparation Method :-	Type of Primer/Finish Paint/Shade :-	Application Method :		Humidity :
Surface Preparation Standard :-		Paint Manufacturer :		Temperature :
Blasting Type:-	Batch No:	BT Certificate No :		Dew point :
(Shot & Grit/Copper Slag/Sand)	Base :	Shelf Life :		Weather Condition
B.T Certificate No of Shot & Grit:-	Hardness :			
	Calib. Certificate No: 1) Profile :-			
DRAWING NO :		GRID NO :		ELEVATION :

Sl. No.	Particulars/Item/Mark No	DESCRIPTION	MEASUREMENT				Coating Layer	Actual D.F.T. (In Micron)		Acceptance			Remarks
			L (mm)	B (mm)	THK (mm)	NOS		Required	Actual	Acc/Rej	Contractor	EIL	
1													
2													
3													
4													
5													

CONTRACTOR	EIL
Signature :	
Name :	
Date :	

Signature Not Verified

Digitally signed by MD MAZHER ALI
Date: 2026.03.17 18:02:13 IST
Location: eProcure-EPROC

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