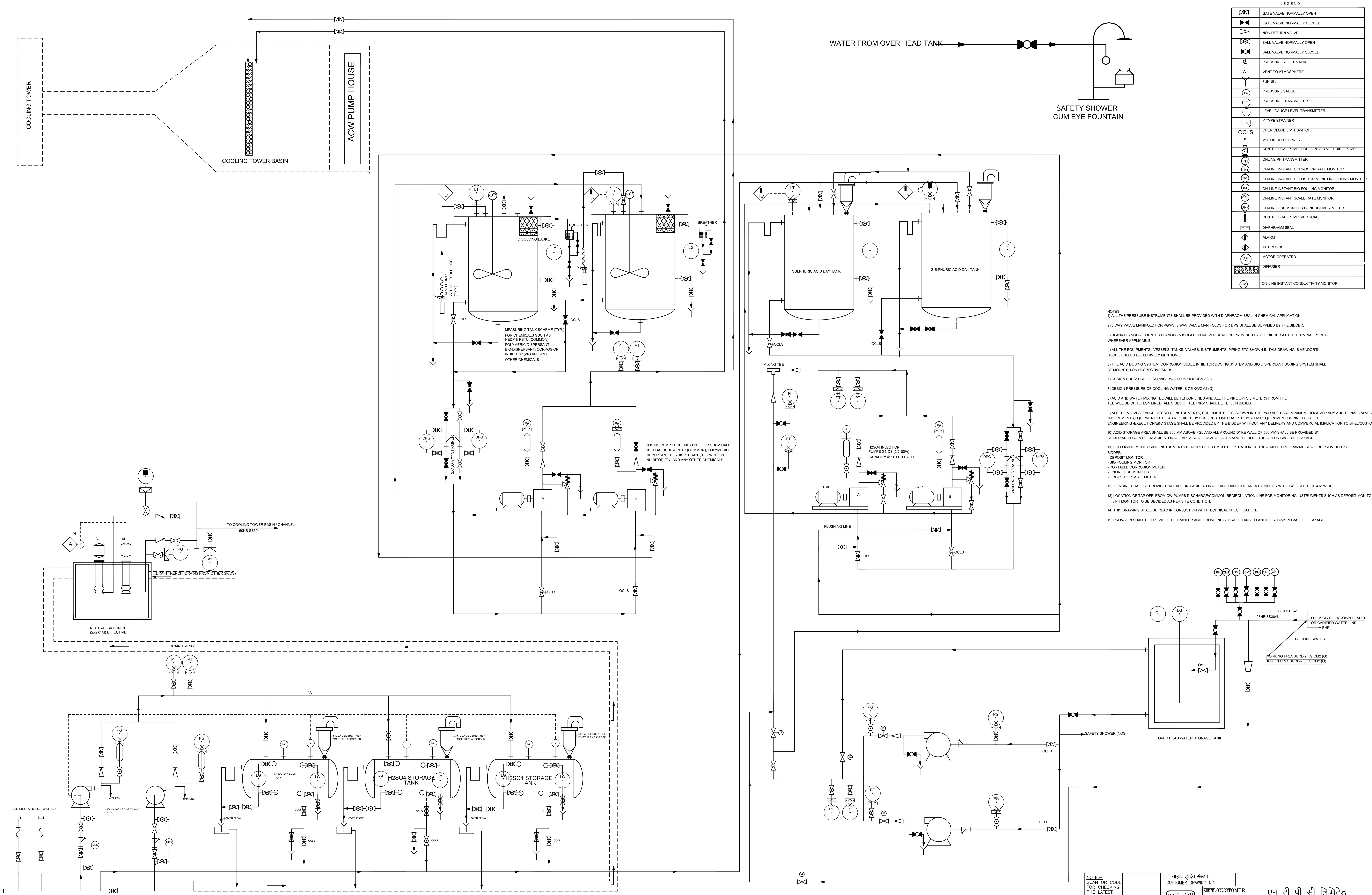

LEGEND

(symbol)	GATE VALVE NORMALLY OPEN
(symbol)	GATE VALVE NORMALLY CLOSED
(symbol)	NON RETURN VALVE
(symbol)	BALL VALVE NORMALLY OPEN
(symbol)	BALL VALVE NORMALLY CLOSED
(symbol)	PRESSURE RELIEF VALVE
(symbol)	VENT TO ATMOSPHERE
(symbol)	FUNNEL
PG	PRESSURE GAUGE
PT	PRESSURE TRANSMITTER
LT	LEVEL GAUGE LEVEL TRANSMITTER
(symbol)	Y TYPE STRAINER
OCLS	OPEN CLOSE LIMIT SWITCH
(symbol)	MOTORISED STIRRER
(symbol)	CENTRIFUGAL PUMP (HORIZONTAL) METERING PUMP
PH	ONLINE PH TRANSMITTER.
CMT	ON-LINE INSTANT CORROSION RATE MONITOR
DMT	ON-LINE INSTANT DEPOSITOR MONITOR/FOULING MONITOR
BMT	ON-LINE INSTANT BIO FOULING MONITOR
SMT	ON-LINE INSTANT SCALE RATE MONITOR
ORP	ON-LINE ORP MONITOR CONDUCTIVITY METER
(symbol)	CENTRIFUGAL PUMP (VERTICAL)
(symbol)	DIAPHRAGM SEAL
(symbol)	ALARM
(symbol)	INTERLOCK
M	MOTOR OPERATED
(symbol)	DIFFUSER
CM	ON-LINE INSTANT CONDUCTIVITY MONITOR

NOTES:

1) ALL THE PRESSURE INSTRUMENTS SHALL BE PROVIDED WITH DIAPHRAGM SEAL IN CHEMICAL APPLICATION.

2) 3 WAY VALVE MANIFOLD FOR PG/PS, 5 WAY VALVE MANIFOLDS FOR DPG SHALL BE SUPPLIED BY THE BIDDER.

3) BLANK FLANGES, COUNTER FLANGES & ISOLATION VALVES SHALL BE PROVIDED BY THE BIDDER AT THE TERMINAL POINTS WHEREVER APPLICABLE

4) ALL THE EQUIPMENTS , VESSELS, TANKS, VALVES, INSTRUMENTS, PIPING ETC SHOWN IN THIS DRAWING IS VENDOR'S SCOPE UNLESS EXCLUSIVELY MENTIONED.

5) THE ACID DOSING SYSTEM, CORROSION,SCALE INHIBITOR DOSING SYSTEM AND BIO DISPERSANT DOSING SYSTEM SHALL BE MOUNTED ON RESPECTIVE SKIDS.

6) DESIGN PRESSURE OF SERVICE WATER IS 10 KG/CM2 (G).

7) DESIGN PRESSURE OF COOLING WATER IS 7.5 KG/CM2 (G).

8) ACID AND WATER MIXING TEE WILL BE TEFLON LINED AND ALL THE PIPE UPTO 5 METERS FROM THE TEE WILL BE OF TEFLON LINED (ALL SIDES OF TEE) NRV SHALL BE TEFLON BASED.

9) ALL THE VALVES, TANKS, VESSELS, INSTRUMENTS, EQUIPMENTS ETC. SHOWN IN THE P&ID ARE BARE MINIMUM. HOWEVER ANY ADDITIONAL VALVES, INSTRUMENTS,EQUIPMENTS ETC. AS REQUIRED BY BHEL/CUSTOMER AS PER SYSTEM REQUIREMENT DURING DETAILED ENGINEERING /EXECUTION/E&C STAGE SHALL BE PROVIDED BY THE BIDDER WITHOUT ANY DELIVERY AND COMMERCIAL IMPLICATION TO BHEL/CUSTOMER.

10) ACID STORAGE AREA SHALL BE 300 MM ABOVE FGL AND ALL AROUND DYKE WALL OF 500 MM SHALL BE PROVIDED BY BIDDER AND DRAIN ROOM ACID STORAGE AREA SHALL HAVE A GATE VALVE TO HOLD THE ACID IN CASE OF LEAKAGE.

11) FOLLOWING MONITORING INSTRUMENTS REQUIRED FOR SMOOTH OPERATION OF TREATMENT PROGRAMME SHALL BE PROVIDED BY BIDDER:
- DEPOSIT MONITOR
- BIO FOULING MONITOR
- PORTABLE CORROSION METER
- ONLINE ORP MONITOR
- ORP/PH PORTABLE METER

12) FENCING SHALL BE PROVIDED ALL AROUND ACID STORAGE AND HANDLING AREA BY BIDDER WITH TWO GATES OF 4 M WIDE.

13) LOCATION OF TAP OFF FROM CW PUMPS DISCHARGE/COMMON RECIRCULATION LINE FOR MONITORING INSTRUMENTS SUCH AS DEPOSIT MONITOR / PH MONITOR TO BE DECIDED AS PER SITE CONDITION.

14) THIS DRAWING SHALL BE READ IN CONJUCTION WITH TECHNICAL SPECIFICATION.

15) PROVSION SHALL BE PROVIDED TO TRANFER ACID FROM ONE STORAGE TANK TO ANOTHER TANK IN CASE OF LEAKAGE.

NOTE:— SCAN QR CODE FOR CHECKING THE LATEST REV. STATUS OF DRAWING.

ग्राहक ड्राइंग संख्या / CUSTOMER DRAWING NO.

ग्राहक/CUSTOMER: एन टी पी सी लिमिटेड / N T P C LIMITED

कार्य संख्या- JOB NO. 508

स्थिति STATUS: CONTRACT

परियोजना PROJECT: 2x800 मेगावाट लारा सुपर थर्मल पावर परियोजना चरण–II / 2x800 MW LARA SUPER THERMAL POWER PROJECT STAGE–II

मुद्रण स्केल मीटर में PRINT SCALE IN METRE: 0 2 4 6 8 10 20 30 40 50

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
BHARAT HEAVY ELECTRICALS LTD
पावर सेक्टर/POWER SECTOR
परियोजना अभियांत्रिकी प्रबंधन
PROJECT ENGINEERING MANAGEMENT
नोएडा (उ॰प्र॰)/NOIDA (U.P.)

DEPT CODE: M

	नाम NAME	हस्ताक्षर SIGNATURE	दिनांक DATE
तैयारकर्ता/DRN	DEEPAK		08-7-24
डिजाइनकर्ता/DESN	VS/AKS		08-7-24
जांचकर्ता/CHD	JP		08-7-24
अनुमोदनकर्ता/APPD	SB		08-7-24

शीर्षक/TITLE

P & ID DIAGRAM FOR CW TREATEMENT SYSTEM

एमपीएल MPL	सिविल CIVIL	इलेक्ट्रिकल ELEC	एसएण्डसीई S&CE	डब्ल्यूएसई WSE	मैक्स MAX	विभाग DEPT.

स्केल – SCALE– NTS

ड्राइंग संख्या / DRAWING NO. PE–V0–508–156A–W001

शीट SHEET 1 OF 1 — पुनरीक्षण REV. 0

पुनरीक्षण REV.	दिनांक DATE	परिवर्तितकर्ता ALTD	जांचकर्ता CHD	अनुमोदनकर्ता APPD

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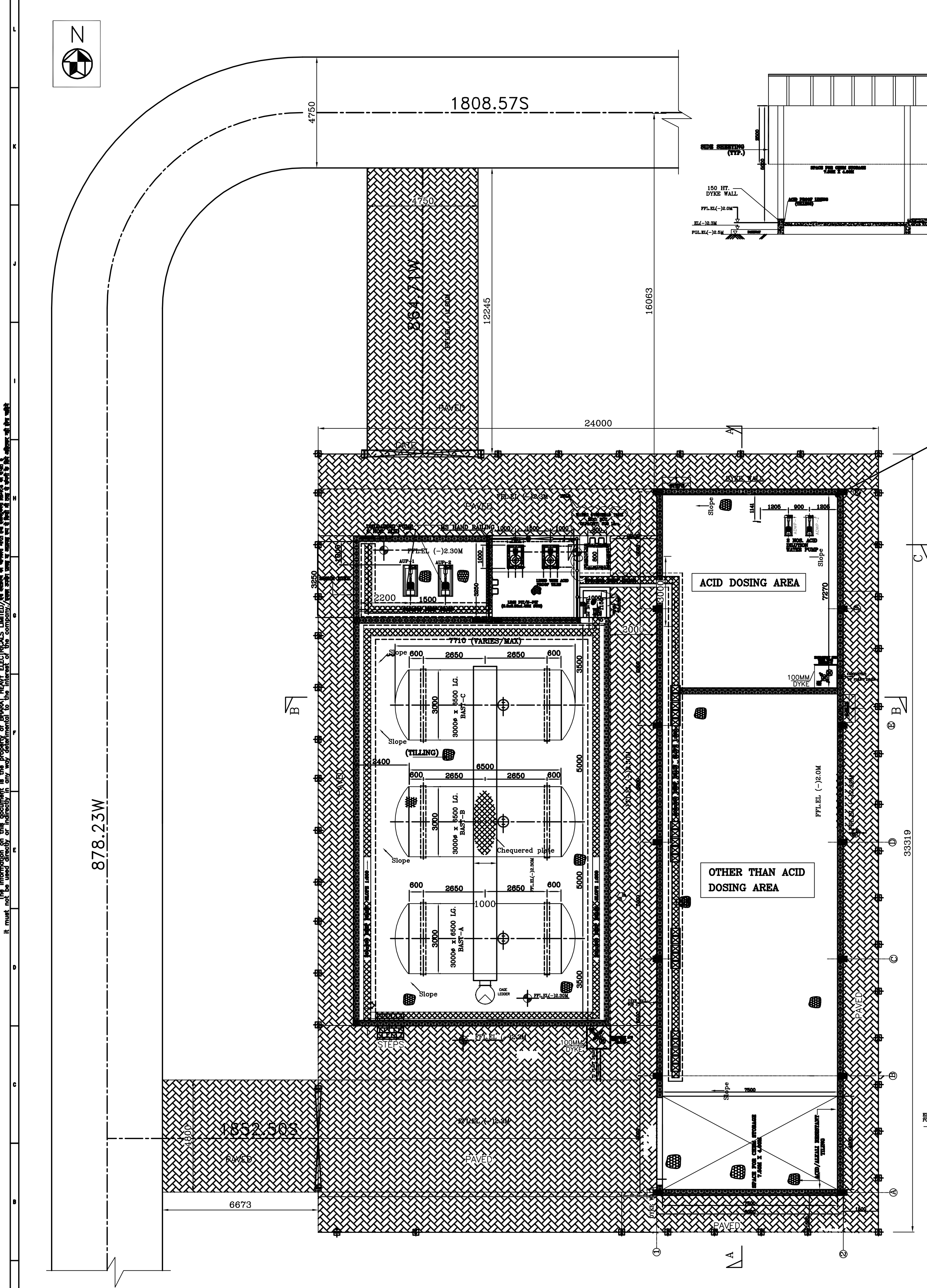
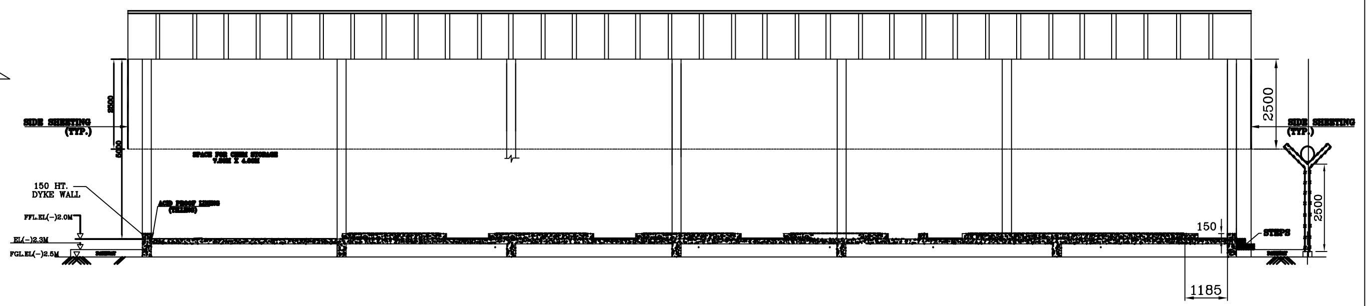
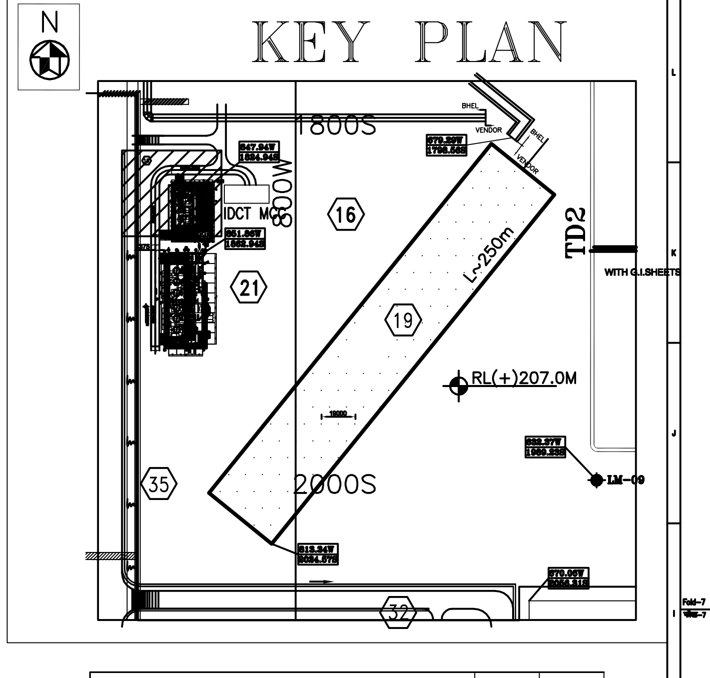
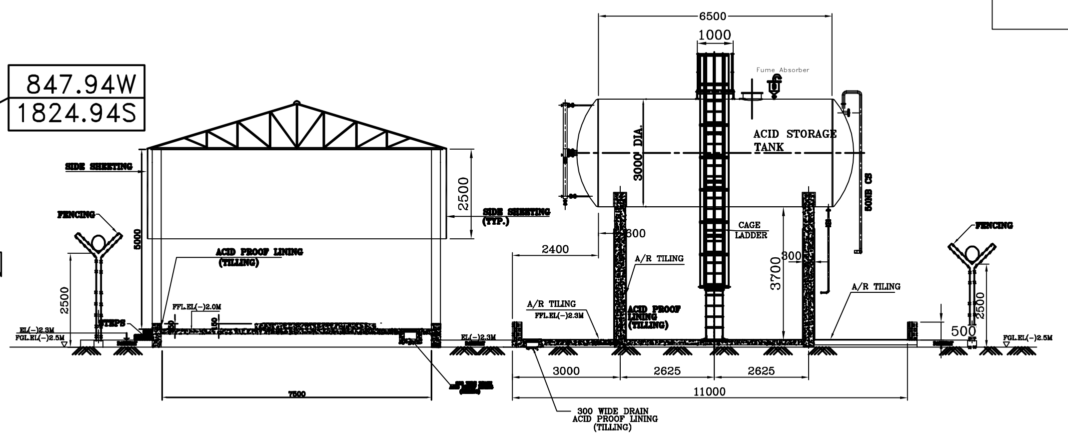




CROSS SECTION-A-A

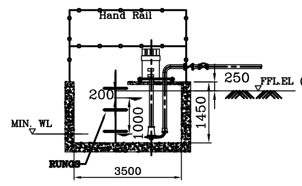




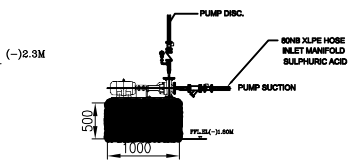
CROSS SECTION-B-B

UNIT DETAIL				
SL.NO.	DESCRIPTION	MINIMUM CAPACITY	WEIGHT	FOUNDATION
A	ACID (98% H2SO4) DOSING SYSTEM			
1	ACID STORAGE TANK (3 NOS)	50.0 CUM (Each Tank).	110.0 TON (each)	--
2	ACID UNLOADING PUMP (2 NOS)	10 m3/Hr (20 MWC Head).	120.0 kgs. (each)	HOLD
B	ACID (98% H2SO4) DOSING SYSTEM	SKID MOUNTED	26.0 TON	--
1	SULPHURIC ACID DAY TANK (2 NOS)	5870 Ltrs. (Each Tank).		HOLD
2	SULPHURIC ACID INJECTION PUMP (2 NOS)	DDE		HOLD
C	HEDP & PBTC DOSING SYSTEM	SKID MOUNTED	6.0 TON	--
1	HEDP & PBTC DOSING TANK (2 NOS)	650 Ltrs (Each Tank).		HOLD
2	HEDP & PBTC DOSING PUMP (2 NOS)	DDE		HOLD
D	POLYMER DISPERSANT DOSING SYSTEM	SKID MOUNTED	6.0 TON	--
1	POLYMER DISPERSANT DOSING TANK (2 NOS)	650 Ltrs (Each Tank).		HOLD
2	POLYMER DISPERSANT DOSING PUMP (2 NOS)	DDE		HOLD
E	BIO-DISPERSANT DOSING SYSTEM	SKID MOUNTED	6.0 TON	--
1	BIO-DISPERSANT DOSING TANK (2 NOS)	650 Ltrs (Each Tank).		HOLD
2	BIO-DISPERSANT DOSING PUMP (2 NOS)	DDE		HOLD
F	CORROSION INHIBITOR DOSING SYSTEM	SKID MOUNTED	6.0 TON	--
1	CORROSION INHIBITOR DOSING TANK (2 NOS)	650 Ltrs (Each Tank).		HOLD
2	CORROSION INHIBITOR DOSING PUMP (2 NOS)	DDE		HOLD
G	ACID DILUTION WATER PUMP (2 NOS)	DDE	120.0 kgs. (each)	HOLD
H	WATER OVER HEAD TANK	500 Ltrs (RCC).	--	HOLD
I	LIME PIT / N-PIT (1 NO)	15.35 m3	--	--
J	LIME PIT/N-PIT WASTE TRANSFER PUMPS (2 NOS)	DDE	120.0 kgs. (each)	HOLD

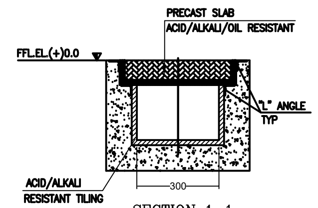
SL.NO.		DESCRIPTION
1	CDT/CDP	CORROSION INHIBITOR DOSING TANK/PUMP
2	BDT/BDP	BIO-DISPERSANT DOSING TANK/PUMP
3	PDT/PDP	POLYMER DISPERSANT DOSING TANK/PUMP
4	HPDT/HPDP	HEDP & PBTC DOSING TANK/PUMP
5	SADT	SULPHURIC ACID DAY TANK
6	ADWP	ACID DILUTION WATER PUMP



CROSS SECTION OF LIME PIT/N-PIT



PEDESTAL OF UNLOADING PUMP

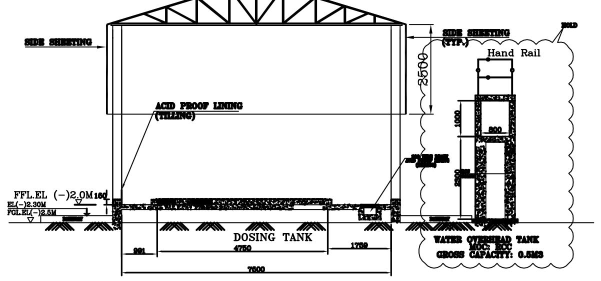


SECTION 1-1

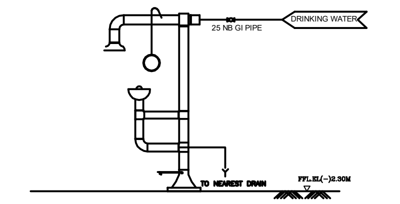
DDE = DURING DETAILED ENGINEERING

REFERENCE DRG. NO.

1. PROCESS DESIGN & EQUIPMENT SIZING CALCULATION FOR CWT (9587-001-136-PVM-U-211)
3. P&ID FOR CW TREATMENT PLANT (9587-001-136-PVM-F-206)



CROSS SECTION-C-C



EYE WASH CUM SAFETY SHOWER (2NOS.) (TYP)

NOTES:-

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE NOTED.
2. EL 0.0M CORRESPONDS TO RL(+)209.5M WHICH IS FFL.EL OF MAIN TG HALL.
3. FGL IN CWT PLANT AREA IS RL(+)207.0M.
4. ALL CHEMICAL HANDLING AREA TO BE ACID / ALKALI RESITANT TILING.
5. ALL DRAIN TRENCH COVER WITH PRECAST SLAB.
6. MINIMUM CLEAR HEIGHT OF 2.1 M METER SHALL BE PROVIDED FOR ALL PIPES, CABLE TRAYS AND ANY SUPPORTING STRUCTURE ETC,
7. ALL APPROACH LADDER AND OPERATION / MAINTENANCE PLATFORMS, HANDRAIL AS REQUIRED FOR VARIOUS ANY EQUIPMENT, VALVES AND INSTRUMENT SUPPORT TRESTLES, BRIDGES, BRACKETS BOLT NUTS, CLAMS, PIPE CROSS OVER ETC. FOR THE ASSOCIATED PIPING SHALL BE PROVIDED BY BIDDER.
8. REQUIRED PLATFORM, LADDERS ETC. TO FACILITATE APPROACH TO VARIOUS TANKS, MANHOLES/ HAND-HOLES, SIGHT-GLASS, OPERATION & MAINTENANCE OF VALVES, INSTRUMENTS ETC. SHALL PROVIDED BY BIDDER.

NOTE:- SCAN QR CODE FOR CHECKING THE LATEST REV. STATUS OF DRAWING.

ग्राहक ड्राइंग संख्या / CUSTOMER DRAWING NO.: 9587-001-136-PVM-F-207

ग्राहक/CUSTOMER: एन टी पी सी लिमिटेड / N T P C LIMITED

कार्य संख्या- JOB NO.: 508

स्थिति STATUS: CONTRACT

परियोजना PROJECT: 2x800 मेगावाट लारा सुपर थर्मल पावर परियोजना चरण-II / 2x800 MW LARA SUPER THERMAL POWER PROJECT STAGE-II

भारत हेवी इलेक्ट्रिकल्स लिमिटेड / BHARAT HEAVY ELECTRICALS LTD
पावर सेक्टर/POWER SECTOR
परियोजना अभियांत्रिकी प्रबंधन / PROJECT ENGINEERING MANAGEMENT
नोएडा (उ.प्र.)/NOIDA (U.P.)

DEPT CODE		नाम NAME	हस्ताक्षर SIGNATURE	दिनांक DATE
M	तैयारकर्ता/DRN	DEEPAK		08-5-24
	डिजाइनकर्ता/DESN	AKS		08-5-24
	जांचकर्ता/CHD	JP		08-5-24
	अनुमोदनकर्ता/APPD	SB		08-5-24

दिनांक DATE	परिवर्तन ALTD	जांचकर्ता CHD	अनुमोदनकर्ता APPD
23-7-24	DEEPAK	AKS	JP

REVISED AS PER NTPC COMMENTS RECEIVED ON 11-7-2024.

शीर्षक/TITLE: LAYOUT CUM CIVIL INPUT PLAN FOR CW TREATMENT PLANT

स्केल - SCALE- NTS

ड्राइंग संख्या/ DRAWING NO.: PE-DG-508-156-A007

शीट SHEET 1 OF 1 पुनरीक्षण REV. 01

फॉर्मेट साइज A0 / FORMAT SIZE A0

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COMPUTER FILE NAME : C:\ZZZ.dwg

SERVICE WATER
SERVICE WATER OVER HEAD TANK
BLANKED CONNECTION
OVERFLOW

LIME SLAKING TANK (2 NOS.)
LIME DOSING TANK (2 NOS.)
LIME SLURRY TRANSFER PUMP (2X100%)
LIME DOSING PUMPS (2X100%)
TO OWNER'S USE

CLARIFIER FEED PUMPS (2X50%)
DECANTED WATER SUMP (BHEL SCOPE)
PARSHALL FLUME(TYP.)
INLET CHAMBER
TELESCOPIC DEVICE
BAFFELE WALL (TYP.)
STILLING CHAMBER
TO SLUDGE SUMP

COAGULANT AID
LIME
ALUM
CLARIFIER # 1
Capacity (Net output)-2200 Cum/hr
FOR SAMPLING

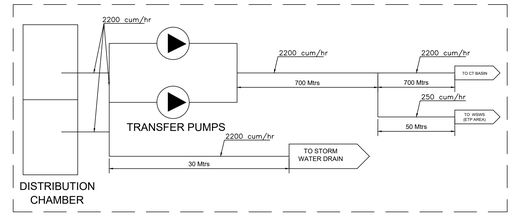
DISTRIBUTION CHAMBER
Capacity (Each Section)-500 Cum
Supernatent Transfer Pumps (2x50%)
Capacity (Each)-1100 Cum/hr (Min)
TO STORM WATER DRAIN

ALUM DOSING TANK (2 NOS.)
ALUM DOSING PUMPS (2X100%)

SYNTHETIC FLOCCULENT DOSING TANK (2 NOS.)
SYNTHETIC FLOCCULENT DOSING PUMPS (2X100%)

COAGULANT-AID DOSING TANK (2 NOS.)
COAGULANT AID DOSING PUMPS (2X100%)

DETAIL OF PIPING LENGTH FOR TREATED WATER



Lubrication Pumps (1W+1S)
For Clarifier Feed Pumps (If applicable)
SLUDGE FROM ALL THE CLARIFIERS
OTHER DRAIN FROM STILLING CHAMBER, INLET CHAMBER ETC.
NOZZLE
SECTION-A
SECTION-B
SUCTION FILTER
AIR BLOWER (2X100%)
FILTER PRESS 2 Nos.
SLUDGE TRANSFER PUMPS (3X50%)
FOR SLUDGE RECIRCULATION
SLUDGE PIT
Raised Platform
SOLID CAKE
CLEAR WATER
WASTE WATER
Flushing/Cleaning Pumps (1W+1S)
CENTRATE TRANSFER PUMPS (2X100%)
TO CLARIFIER

NOTES

1. PIPE LINE SIZE INDICATED ARE IN mm (NB).
   1.1. CARBON STEEL PIPING UP TO AND INCLUDING 150NB SHALL BE ERW, IS: 1239 (HEAVY GRADE)
   1.2. CARBON STEEL PIPING 200NB AND ABOVE SHALL BE IS:2062. ROLLED & WELDED CONFIRMING TO IS 3589.
2. THE P&I DIAGRAM INDICATES ONLY MINIMUM REQUIREMENT OF VALVES, INSTRUMENTATION ETC. BIDDER SHOULD FURNISH COMPLETE SCHEME IN ALL RESPECTS INCLUDING ALL INSTRUMENTS, VALVES ETC. FOR SMOOTH, SAFE, EFFICIENT,TROUBLE FREE OPERATION OF PLANT FOR BHEL / CUSTOMER APPROVAL DURING DETAILED ENGINEERING.
3. LIME SOLUTION HEADER SHALL COVER ALL THE CLARIFIERS BEFORE RETURNING TO THE PREPARATION/DOSING TANK .TAPPING FROM THIS HEADER SHALL BE TAKEN NEAR THE INDIVIDUAL CLARIFIER.
4. ALL VARIABLE FREQUENCY DRIVES (VFD) SHALL BE CONTROLLED FROM DDCMIS.
5. SUITABLE PERMANENT FLUSHING CONNECTION SHALL BE PROVIDED FOR ALL PIPIELINES CARRYING SLUDGE AND CHEMICAL LINES. IN CASE, ADEQUATE PRESSURE IS NOT AVAILALBLE, SEPARATE BOOSTER PUMPS (2X100%) SHALL BE PROVIDED FOR THE SAME.
6. ALL RECIRCULATION LINES SHALL BE PROVIDED WITH SUITABLE ORIFICE PLATE & SHALL BE DESIGNED BASED ON 50% OF EACH PUMP CAPACITY.
7. WIDTH OF GATES SHALL BE SAME AS THAT OF CHANNEL. CHANNEL WIDTH SHALL BE INCREASED LOCALLY, IF REQUIRED.
8. ALL THE PIPE AND VALVE SIZES AND ANY OTHER SIZES INDICATED IN THE DRAWING ARE MINIMUM REQUIREMENT. PIPE & VALVES SIZES SHELL BE INCREASED WHERE EVER REQUIRED TO MEET THE SYSTEM REQUIREMENT.
9. OVER FLOW & DRAINS FROM VARIOUS CHEMICAL TANKS & FLOOR WASH DRAINS OF CHEMICAL STORAGE CUM DOSING SHED SHALL BE LED TO THE COAL SLURRY SETTLING POND.
10. OVER FLOW & DRAINS FROM STRUCTURES AND PIPING HANDLING WASTE & TREATED WATER SUCH AS AERATOR, STILLING CHAMBER, INLET CHAMBER ETC. SHALL BE LED TO SLUDGE SUMP.
11. THE INSTRUMENTS, VALVES, PIPING, FITTINGS, ETC SHOWN IN P & ID ARE MINIMUM. THE ADDITIONAL VALVES, INSTRUMENTS, PIPING, FITTINGS ETC. SHALL ALSO BE INCLUDED AS INDICATED ELSEWHERE IN THE SPECIFICATION & BASED ON SYSTEM REQUIREMENT. THE P&ID TO BE READ IN CONJUNCTION WITH THE TECHNICAL DETAILS SPECIFIED IN OTHER PART OF TECHNICAL SPECIFICATION.

LEGEND

FLOAT VALVE	PARSHALL FLUME	DIAPHRAGM VALVE NORMALLY OPEN / NORMALLY CLOSED	LGR	LEVEL GAUGE (REFLEX TYPE)	NIDDLE VALVE
AIR BLOWER	PLUG VALVE	PNEUMATICALLY OPERATED	PI	PRESSURE INDICATOR	GATE VALVE (MOTORIZED–INCHING TYPE)
DIAPHRAGM SEAL	GATE VALVE	'Y' TYPE STRAINER	FI	FLOW INDICATOR	BUTTERFLY VALVE (MOTORIZED–INCHING TYPE)
OC–LS OPEN CLOSE LEVEL SWITCH	GLOBE VALVE	FUNNEL	FT	FLOW TRANSMITTER	
ISOLATION GATE	BALL VALVE	ORIFICE PLATE	MOV	MOTOR OPERATED	
ZT POSITION TRANSMITTER	BUTTERFLY VALVE	LEVEL SWITCH	LT	LEVEL TRANSMITER	
	PRESSURE RELIEF VALVE	PRESSURE SWITCH	DDC MIS	DISTRIBUTED DIGITAL CONTROL MONITORING AND INFORMATION SYSTEM (OWNER'S)	
	NON RETURN VALVE	LI LEVEL GAUGE			
	BUTTERFLY VALVE ELECTRICALLY OPERATED	LGF LEVEL GAUGE (FLOAT TYPE)		PUMP	

JOB No.	508
STATUS	CONTRACT
DISTRIBUTION	
TO	
No.OFF	

REV	DATE	ALTD	CHD	APPD

OWNER: NTPC
NTPC Limited
(A GOVERNMENT OF INDIA ENTERPRISE)
PROJECT: LARA SUPER THERMAL POWER PROJECT STAGE–II (2X800MW)
ENGG / SUB CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA
DEPT CODE: A

	NAME	SIGN	DATE
DRN			
DESN			
CHD			
APPD			

TITLE: P&I DIAGRAM FOR CHP RUN–OFF WATER TREATMENT SYSTEM

MPL	C	MSE	I	MAX	E	DEPT.	SCALE
						SIGN	
						DATE	

DRAWING No. PE–DG–508–157–W001
SHEET 01 OF 01 REV 00
SIZE–A1
Page 453 of 851

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COMPUTER FILE NAME : TAL5

FROM RAW WATER PUMP HEADER

BHEL ◁ ▷ BIDDER

TERMINAL POINT : 20M FROM AERATOR ℄

PUMP DISCHARGE FROM POTABLE WATER

LIME SLAKING TANK (2 NOS.)

AGITATOR (TYP.) · DISSOLVING BASKET (TYP.) · SAMPLING · TO SLUDGE SUMP · OC–LS

LIME SLURRY TANSFER PUMP (2X100%)

LIME SOLUTION PREPARTION TANK (3 NOS.)

LIME SOLUTION DOSING PUMPS (2X100%)

100NB

ALUM SOLUTION PREPARATION TANK (4 NOS.)

AGITATOR · SAMPLING · TO SLUDGE SUMP · OC–LS

ALUM DOSING PUMPS (PT CWI-4 NOS.)

COAGULANT-AID PREPARATION TANK (2 NOS.)

COAGULANT AID DOSING PUMPS (2X100%)

DAMPER (TYP.) · TO OWNER'S USE · TO TUBE SETTLER/LAMELLA · TO DM CLARIFIER ON CASE OF ION EXCHANGE BASED DM PLANT)

PAC PREPARATION /DOSING TANK (2 NOS.)

PAC DOSING PUMPS (2X100%) · TO CLARIFIERS

PAC UNLOADING / TRANSFER PUMPS (2X100%)

STORAGE TANK (PAC) CAP-15 cum.(Min) · Fume Absorber (TYP) · (TYP) PI · PT

2 NOS. 80MM DIA FLEXIBLE HOSES OF 20 M LENGTH

FECl3 PREPARATION /DOSING TANK (2 NOS.)

STORAGE TANK (FECl3) · Fume Absorber (TYP) · AGITATOR · SAMPLING · TO SLUDGE SUMP · OC–LS · TO DM CLARIFIERS

DOSING PUMPS (2X100%)

UNLOADING / TRANSFER PUMPS (2X100%)

2 NOS. 80MM DIA FLEXIBLE HOSES OF 20 M LENGTH

FECl3 STORAGE , PREPARATION & DOSING SYSTEM (IN CASE OF UF+RO BASED DM PLANT)

FILTERED WATER OVER HEAD TANK · BLANKED CONNECTION · TO CLO2 GEN PLANT · TO LUBRICATION & FLUSHING PUMP · TO SLUDGE PIT · TO FILTER BACK WASH PT–DM · TO FILTER BACK WASH PT–POTABLE

OVERFLOW TO FILTERED WATER TANK 150NB

FILTERED WATER FLUSHING LINE

LIME RECIRCULATION RING HEADER

LIME · ALUM · PAC · COAGULANT AID · VFD

TELESCOPIC DEVICE · PARSHALL FLUME(TYP.) · INLET CHAMBER · MS PIPE TO CLARIFIER · TO SLUDGE SUMP · FOR SAMPLING

TO FILTER BACKWASH SUMP

PT - CW CLARIFIER-1

PT - CW CLARIFIER-2

PT - CW CLARIFIER-3

FROM FILTER BACKWASH PUMP DISCHARGE · FROM CLO2 DOSING GENERATOR (CLO2 PACKAGE SCOPE) · BAFFELE WALL (TYP.) · BYPASS CHANNEL · WS–DDCMIS · ZT · AERATOR · CONTROL VALVE SYSTEM · STILLING CHAMBER

PT - DM CLARIFIER-1

(INST. BY BIDDER) INTERLOCK TO BE PROVIDED WITH INLET CONTROL VALVE (TYP)

CLARIFIED WATER DISTRIBUTION CHAMBER (BHEL'S SCOPE)

FILTER BACKWASH LINE · BACK UP LINE

GRAVITY FILTER · TO FILTER BACKWASH PIT

FROM CLO2 DOSING GENERATOR

FILTERED WATER RESERVOIR

POTABLE WATER PUMPS

POTABLE WATER FOR 1200 BUILDING · POTABLE WATER FOR PLANT DIST. (TP - SM FROM PUMP DISCHARGE) Pressure-6 kg/cm2 (g) · BHEL

SUCTION FILTER (TYP) · AIR BLOWER (2X100%)

FILTERED WATER RESERVOIR

DM PLANT FEED PUMPS & INSTRUMNET

DM WATER FOR DM PLANT (REF. P&ID FOR DM PLANT)

SUCTION FILTER · AIR BLOWER (2X100%)

OTHER DRAIN FROM STILLING CHAMBER, INLET CHAMBER ETC. · SLUDGE FROM ALL THE CLARIFIERS · OVERFLOW & DRAIN FROM CHEMICAL TANKS · SLUDGE FROM TUBE SETTLER / LAMELLA CLARIFIER

FROM PT-DM GRAVITY FILTERS · FROM PT-POTABLE GRAVITY FILTERS

INLET CHAMBER · NOZZLE · FILTER BACKWASH PIT-I · FILTER BACKWASH PIT-II · FILTER BACKWASH TRANSFER PUMPS (3X100%) · TO SITTLING CHAMBER · TO AGITATION OF PITS & PUMP

INLET CHAMBER FOR SLUDGE PIT · SLUDGE PIT COMP-1 · SLUDGE PIT COMP-2 · SLUDGE TRANSFER PUMPS (3X50%) · FOR SLUDGE RECIRCULATION · TO ASH SLURRY SUMP OF UNIT#1 · TO ASH SLURRY SUMP OF UNIT#2

(2W+1S)

LEGEND

	PLUG VALVE
	GATE VALVE
	GLOBE VALVE
	BALL VALVE
	BUTTERFLY VALVE
	PRESSURE RELIEF VALVE
	NON RETURN VALVE
	BUTTERFLY VALVE ELECTRICALLY OPERATED
	DIAPHRAGM VALVE NORMALLY OPEN / NORMALLY CLOSED
	PNEUMATICALLY OPERATED
	'Y' TYPE STRAINER
	FUNNEL
	ORIFICE PLATE
LS	LEVEL SWITCH
PS	PRESSURE SWITCH
LI	LEVEL GAUGE
LGF	LEVEL GAUGE (FLOAT TYPE)
LGR	LEVEL GAUGE (REFLEX TYPE)
PI	PRESSURE INDICATOR
FI	FLOW INDICATOR
FT	FLOW TRANSMITTER
	MOTOR OPERATED
LT	LEVEL TRANSMITTER
	DISTRIBUTED DIGITAL CONTROL MONITORING AND INFORMATION SYSTEM (OWNER'S)
	PUMP
	NIDDLE VALVE
	GATE VALVE (MOTORIZED–INCHING TYPE)
	BUTTERFLY VALVE (MOTORIZED–INCHING TYPE)

	FLOAT VALVE
	AIR BLOWER
	DIAPHRAGM SEAL
OC–LS	OPEN CLOSE LEVEL SWITCH
	ISOLATION GATE
ZT	POSITION TRANSMITTER
	PARSHALL FLUME
AE–TDS	CONDUCTIVITY ANALYSER (INDICATING CORRESPONDING TDS VALUES)

NOTES

1. PIPE LINE SIZE INDICATED ARE IN mm (NB).
   1.1. CARBON STEEL PIPING UP TO AND INCLUDING 150NB SHALL BE ERW, IS: 1239 (HEAVY GRADE)
   1.2. CARBON STEEL PIPING 200NB AND ABOVE SHALL BE IS:2062. ROLLED & WELDED CONFIRMING TO IS 3589.
2. THE P&I DIAGRAM INDICATES ONLY MINIMUM REQUIREMENT OF VALVES, INSTRUMENTATION ETC.BIDDER SHOULD FURNISH COMPLETE SCHEME IN ALL RESPECTS INCLUDING ALL INSTRUMENTS, VALVES ETC. FOR SMOOTH, SAFE, EFFICIENT,TROUBLE FREE OPERATION OF PLANT FOR BHEL / CUSTOMER APPROVAL DURING DETAILED ENGINEERING.
3. LIME SOLUTION HEADER SHALL COVER ALL THE CLARIFIERS BEFORE RETURNING TO THE PREPARATION/DOSING TANK .TAPPING FROM THIS HEADER SHALL BE TAKEN NEAR THE INDIVIDUAL CLARIFIER.
4. ALL VARIABLE FREQUENCY DRIVES (VFD) SHALL BE CONTROLLED FROM DDCMIS.
5. SUITABLE PERMANENT FLUSHING CONNECTION SHALL BE PROVIDED FOR ALL PIPIELINES CARRYING SLUDGE AND CHEMICAL LINES. IN CASE, ADEQUATE PRESSURE IS NOT AVAILALBLE, SEPARATE BOOSTER PUMPS (2X100%) SHALL BE PROVIDED FOR THE SAME.
6. ALL RECIRCULATION LINES SHALL BE PROVIDED WITH SUITABLE ORIFICE PLATE & SHALL BE DESIGNED BASED ON 50% OF EACH PUMP CAPACITY.
7. WIDTH OF GATES SHALL BE SAME AS THAT OF CHANNEL. CHANNEL WIDTH SHALL BE INCREASED LOCALLY, IF REQUIRED.
8. FOR OTHER NOTES PLEASE REFER SH 02 OF 02.

REV	DATE	ALTD	CHD	APPD

REV	DATE	ALTD	CHD	APPD

JOB No.	508
STATUS	CONTRACT
DISTRIBUTION	
TO	
No.OFF	

OWNER: NTPC

NTPC Limited
(A GOVERNMENT OF INDIA ENTERPRISE)

PROJECT: LARA SUPER THERMAL POWER PROJECT STAGE–II (2X800 MW)

ENGG / SUB CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
A	DRN			
	DESN			
	CHD			
	APPD			

TITLE: P&I DIAGRAM FOR PRE–TREATMENT PLANT

MPL	C	MSE	I	MAX	E	DEPT.	SCALE
						SIGN	
						DATE	

DRAWING No. PE–DG–508–158–W001

SHEET 01 OF 02 REV 00

SIZE-A1

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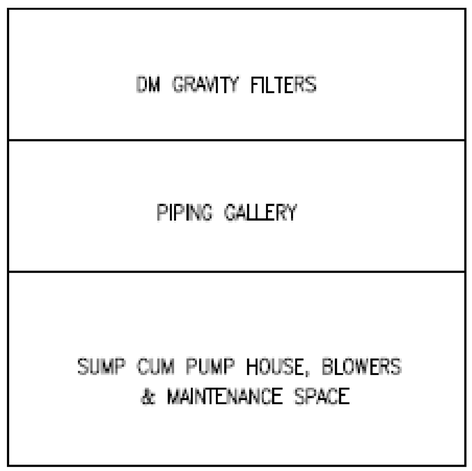
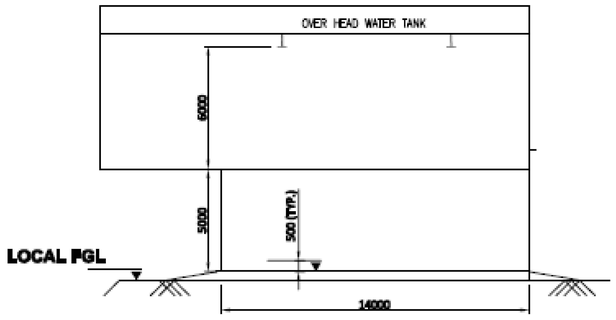
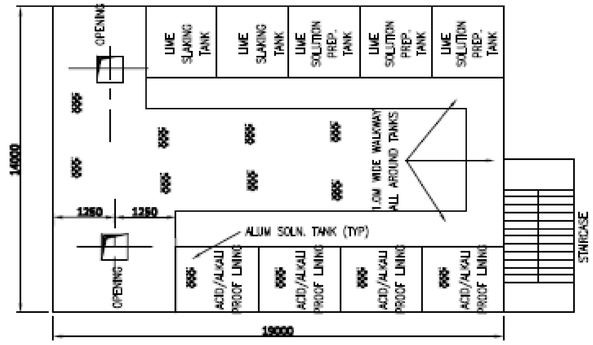


PLAN
OF GRAVITY FILTER HOUSE



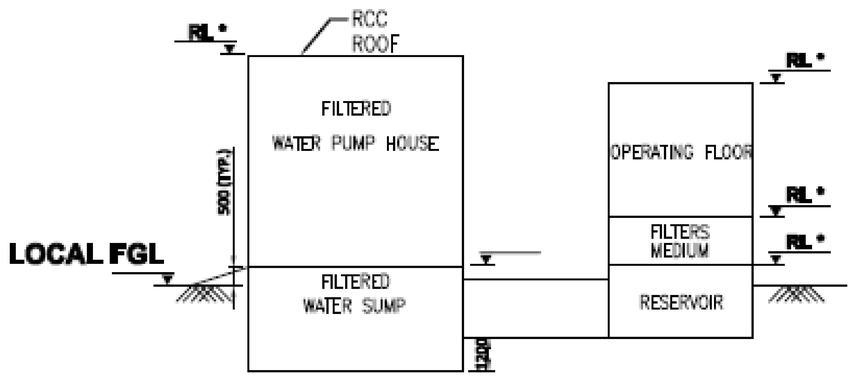
SECTION F-F

SECTION F-F
OF CHEMICAL HOUSE



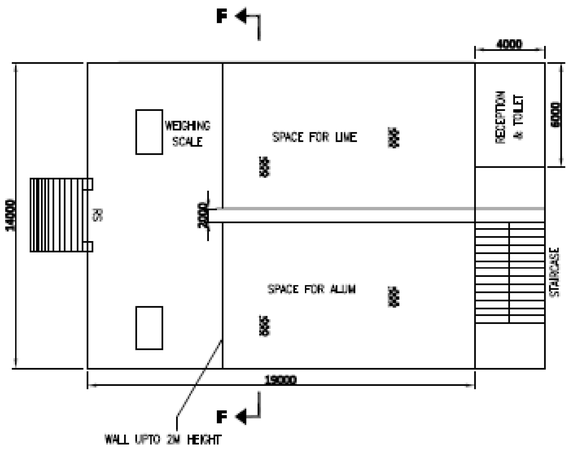
CHEMICAL HOUSE – FIRST FLOOR

FIRST FLOOR PLAN
OF CHEMICAL HOUSE



SECTION C-C

SECTION C-C
OF GRAVITY FILTER HOUSE



CHEMICAL HOUSE – GROUND FLOOR

GROUND FLOOR PLAN
OF CHEMICAL HOUSE

NOTES

1. ALL THE PIPE AND VALVE SIZES AND ANY OTHER SIZES INDICATED IN THE DRAWING ARE MINIMUM REQUIREMENT. PIPE & VALVES SIZES SHELL BE INCREASED WHERE EVER REQUIRED TO MEET THE SYSTEM REQUIREMENT.
2. OVER FLOW & DRAINS FROM VARIOUS CHEMICAL TANKS & FLOOR WASH DRAINS OF CHEMICAL HOUSE BUILDING (EXCEPT OVER FLOW O/H FILTERED WATER STORAGE TANK) SHALL BE LED TO THE PT PLANT CLARIFIER SLUDGE SUMP.
3. OVER FLOW & DRAINS FROM STRUCTURES AND PIPING HANDLING CLEAR RAW WATER, CLARIFIED WATER AND FILTERED WATER IN PTP SUCH AS AERATOR, STILLING CHAMBER, INLET CHAMBER ETC. SHALL BE LED TO BE TO FILTER BACK WASH SUMP.
4. OVER FLOW & DRAINS FROM FILTERED WATER RESERVOIR , FILTER WATER SUMP ETC. SHALL BE LED TO THE BACK WATER SUMP.
5. THE INSTRUMENTS, VALVES, PIPING, FITTINGS, ETC SHOWN IN P & ID ARE MINIMUM. THE ADDITIONAL VALVES, INSTRUMENTS, PIPING, FITTINGS ETC. SHALL ALSO BE INCLUDED AS INDICATED ELSEWHERE IN THE SPECIFICATION & BASED ON SYSTEM REQUIREMENT. THE P&ID TO BE READ IN CONJUNCTION WITH THE TECHNICAL DETAILS SPECIFIED IN OTHER PART OF TECHNICAL SPECIFICATION.
6. TENTATIVE ARRANGEMENT OF GRAVITY FILTER HOUSE AND CHEMICAL HOUSE IS INDICATED. BIDDER TO REFER SAME DURING DETAIL ENGINEERING.
8. FOR OTHER NOTES PLEASE REFER SH 01 OF 02.

ARRANGEMENT OF GRAVITY FILTER HOUSE & CHEMICAL HOUSE

REV	DATE	ALTD	CHD	APPD	REV	DATE	ALTD	CHD	APPD

JOB No. 508
STATUS CONTRACT
DISTRIBUTION
TO
No.OFF

OWNER: NTPC — NTPC Limited (A GOVERNMENT OF INDIA ENTERPRISE)
PROJECT: LARA THERMAL POWER PROJECT STAGE-II (2X800 MW)
ENGG / SUB CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD, POWER SECTOR, PROJECT ENGINEERING MANAGEMENT, NOIDA
DEPT CODE: A

	NAME	SIGN	DATE
DRN			
DESN			
CHD			
APPD			

TITLE: P&I DIAGRAM FOR PRE-TREATMENT PLANT

MPL	C	MSE	I	MAX	E	DEPT.	SCALE
						SIGN	
						DATE	

DRAWING No. PE-DG-508-158-W001
SHEET 02 OF 02 REV 00
SIZE-A1

INDICATIVE FLOW DIAGRAM FOR RESIN BASED DM PLANT

FROM FILTERED WATER PUMPS
(Ref. PE-DG-508-158A-W001)

SS-304

Overhead Water Tank (2 m3)
with Inlet MOV, LG & LT

FROM HOT WATER TANK OUTLET (TYP)

AC FILTER-I (R1a)

AC FILTER-II (R1b)

W.A. CATION EXCHANGER-I (R2a)

W.A. CATION EXCHANGER-II (R2b)

S.A. CATION EXCHANGER-I (R3a)

S.A. CATION EXCHANGER-II (R3b)

TO BACKWASH/ RINCE WASTE SUMP

TO N.PIT

FROM ACID EJECTORS (E1) SHEET 3 OF 3

AE-SA

TO DCS

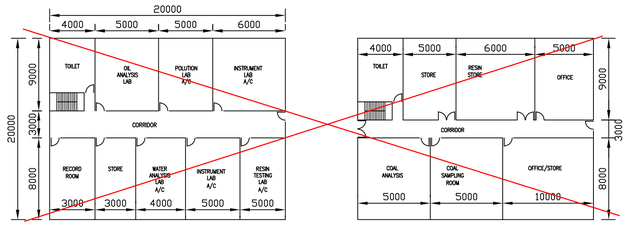
MSRL

BACKWASH/RINSE WASTE SUMP

With Re-circulation Facility.
ACF/ UF BACKWASH PIT

N.PIT

TO INLET OF PT-DM CLARIFIER



DM PLANT LAB BUILDING - FIRST FLOOR
CLEAR HEIGHT = 3.5M.

DM PLANT LAB BUILDING - GROUND FLOOR
CLEAR HEIGHT = 3.5M.

DEGASSER TOWER-I (D1a)

DEGASSER TOWER-II (D1b)

DEGASSER BLOWERS

(B1a)

(B1b)

(B2a)

(B2b)

DEG WATER STORAGE TANK-I (S1a)

DEG WATER STORAGE TANK-II (S1b)

RECIRCULATION LINE

OC-LS

TO N.PIT (TYP)

P2□

TO W.B. ANION EXCHANGER-II SHEET 2 OF 3

TO W.B. ANION EXCHANGER-I SHEET 2 OF 3

TO REGENERATION AREA SHEET 3 OF 3

DEGASSED WATER PUMPS

NOTES

1. THE SCHEME SHOWN IS INDICATIVE ONLY. CONTRACTOR SHOULD FURNISH COMPLETE SCHEME IN ALL RESPECTS DURING DETAILED ENGINEERING BASED ON TECHNICAL SPECIFICATION AND SYSTEM REQUIREMENTS. CONTRACTOR SHOULD FURNISH COMPLETE SCHEME IN ALL RESPECTS INCLUDING ALL INSTRUMENTS, VALVES ETC. FOR SMOOTH, SAFE, EFFICIENT, TROUBLE FREE OPERATION OF PLANT.
2. THIS DRAWING IS ONLY SHOWING MINIMUM REQUIREMENTS OF PIPING, VALVES, INSTRUMENTS ETC. THE CONTRACTOR SHALL SUPPLY ALL ADDITIONAL AND/OR NEW VALVES, EQUIPMENTS, INSTRUMENTS ETC. BASED ON SYSTEM REQUIREMENT. HOWEVER, BIDDER CAN SELECT THE DIFFERENT TYPE OF VALVES THAN SHOWN IN THIS DRG, IF OPTIONS ARE GIVEN IN THE SPECIFICATION FOR THOSE SERVICES.
3. FOR LEGEND REFER SHEET 2 OF 3 OF THIS DRAWING.
4. BIDDER IS TO RETAIN THE VESSEL NOS. & TAG NOS. AS SHOWN IN THEIR TENDER DRGS ALSO. THE SAME WILL BE FOLLOWED DURING DETAIL ENGG. ALSO. IF ADDITIONAL VALVES ARE REQUIRED, TAG NOS SHALL BE FOLLOWED AS PER THE SYSTEM INDICATED IN THIS DRG. IN ADDITION, KKS CODES ARE ALSO TO BE PROVIDED.
5. THIS DRAWING IS SHOWING MINIMUM REQUIREMENTS CONSIDERING COUNTER-CURRENT REGENERATION TECHNIQUE FOR BOTH SAC & SBA WITH WATER HOLD DOWN FOR BED COMPACTION. BIDDER HAS TO MODIFY THIS DRG. IN CASE HE IS QUALIFIED FOR A DIFFERENT REGENERATION TECHNIQUE AS PER THE SPECIFIED QUALIFYING REQUIREMENTS & SUPPLY THE SAME.
6. ALL PROCESS INSTRUMENTS IN ACID & ALKALI SERVICES ARE TO BE PROVIDED WITH DIAPHRAGM SEALS/COATED WITH ACID/ALALI RESISTANT MATERIAL.
7. BIDDER IS TO PROVIDE KKS CODES FOR ALL THE INSTRUMENTS AND DRIVES ALONG WITH THE INSTRUMENT TAG IN P&ID.
8. ALL ANALYSERS SHALL BE PROVIDED WITH ALL WEATHER PROTECTION & ENCLOSURE.
9. SEPARATE FUME ABSORBER SHALL BE PROVIDED FOR VENT LINES FROM ACID STORAGE TANKS AND ACID MEASURING TANKS.
10. FOR THE MEASUREMENT OF DP ACROSS VESSEL. THE TAPPINGS FOR DP TRANSMITTER & DP GAUGE SHALL BE TAKEN AFTER THE SERVICE INLET VALVE AND BEFORE THE SERVICE OUTLET VALVE.
11. ~~FOR TERMINAL POINT (TP) DETAILS REFER DRAWING NO.4548-001-POM-A-037 PLANT WATER SCHEME & TP DETAILS.~~
12. Two number PTs and one no. FT shall be provided at common discharge of Pumps and Blowers. (Typ.)
13. LTs and LGs shall be provided by the bidder in Filtered Water Storage Tank(s)/ Reservoir.
14. Piping from DM Feed Water Pumps to DM Plant shall be in bidder's scope.

REV.	DESCRIPTION	DRAWN	DESIGN	CHKD.	C	LAYOUT(M)	M	E	C&I	APPD	DATE
A	RELEASED FOR TENDER	TARUN			CLEARED BY						

FLOW DIAGRAM -1

OPTION-1
FOR TENDER PURPOSE ONLY

NTPC Limited
(A GOVT. OF INDIA INTERPRISE)
ENGINEERING DIVISION

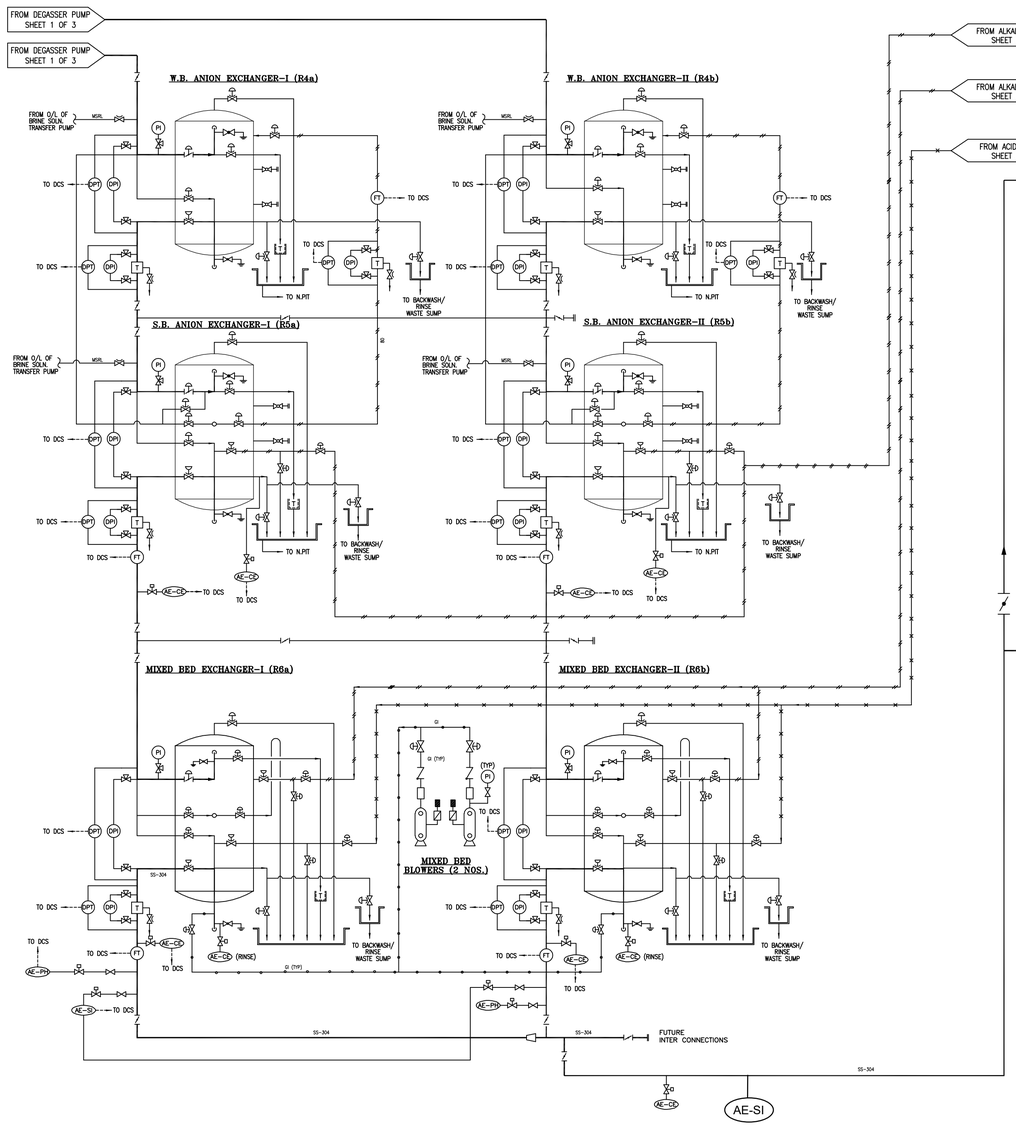
PROJECT: LARA SUPER THERMAL POWER PROJECT
STAGE-II (2 X 800MW)

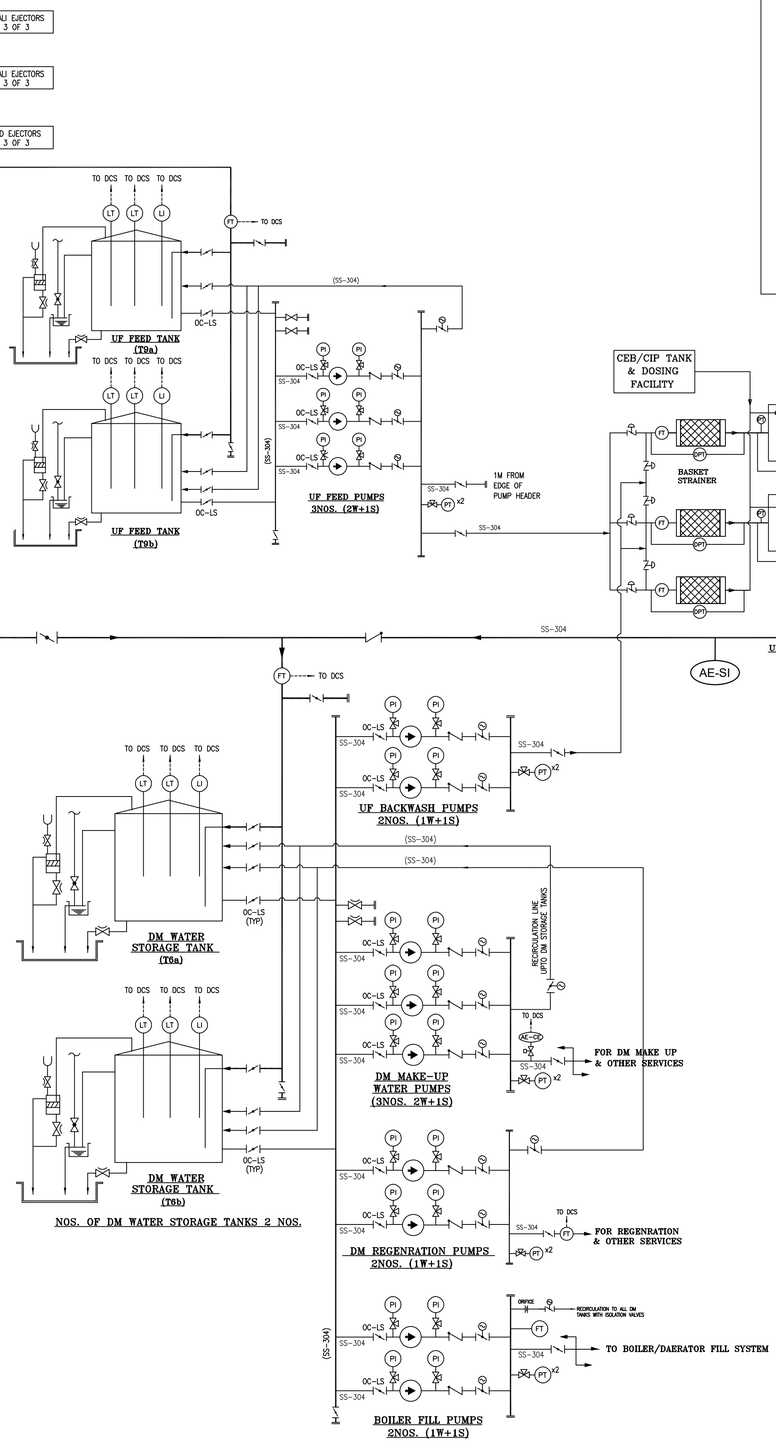
TITLE: P & ID FOR DEMINERALISING PLANT

SIZE	SCALE	DRG.NO.	REV.
A1	NTS	9587-999-POM-A-002 (SHEET 1 OF 3)	A

CAD FILE NAME : 9587-999-POM-A-002

INDICATIVE FLOW DIAGRAM FOR RESIN BASED DM PLANT





LEGEND

			NORMALLY OPEN	NORMALLY CLOSED		
PUMP (CENTRIFUGAL TYPE)					DI	DENSITY INDICATOR
MOTOR DRIVE		GATE VALVE			H	HOSE
FAN		GLOBE VALVE			DCS	DISTRIBUTED CONTROL SYSTEM
POSITIVE DISPLACEMENT TYPE FAN		DIAPHRAGM VALVE			MS	MILD STEEL
SILENCER		BUTTERFLY VALVE			AE-SI	Silica Analyser
AIR FILTER		SAMPLE VALVE				
STRAINER (Y-TYPE)		PRESSURE RELIEF VALVE				
EJECTOR		NON RETURN VALVE (FLOW LEFT TO RIGHT)				
CO_2 ABSORBER		SOLENOID VALVE				
OVER FLOW SEAL		PLUG VALVE				
RESIN TRAP		SPRING TO CLOSE				
FLOW INDICATOR		SPRING TO OPEN				
DIGITAL INDICATOR		ALKALI LINE				
		ACID LINE				
DAMPER		AIR LINE				
DIAPHRAGM SEAL		LOCAL INSTRUMENT				
ELECTRO-PNEUMATIC CONNECTOR		CONTROL INFORMATION ON CONTROL DESK/CRT				

NOTE :

1. DM WATER STORAGE TANK(S) ALONG WITH ITS ACCESSORIES ARE EXCLUDED FROM BIDDER'S SCOPE. HOWEVER, TWO NUMBER LTs PER DM WATER STORAGE TANKS SHALL BE PROVIDED BY THE BIDDER.
2. DM MAKE UP WATER PUMPS (3 NOS.) AND BOILER FILL PUMP (2 NOS.) ALONG WITH ITS ACCESSORIES ARE EXCLUDED FROM BIDDER'S SCOPE.

REV.	DESCRIPTION	DRAWN	DESIGN	CHKD.	C	LAYOUT(M)	M	E	C&I	APPD	DATE
					CLEARED BY						
A	RELEASED FOR TENDER	TARUN									

FLOW DIAGRAM -1

OPTION-1

FOR TENDER PURPOSE ONLY

NTPC Limited
(A GOVT. OF INDIA INTERPRISE)
ENGINEERING DIVISION

PROJECT: LARA SUPER THERMAL POWER PROJECT
STAGE-II (2 X 800MW)

TITLE: P & ID FOR DEMINERALISING PLANT

SIZE	SCALE	DRG.NO.	REV.
A1	NTS	9587-999-POM-A-002 (SHEET 2 OF 3)	A

CAD FILE NAME : 9587-999-POM-A-002

INDICATIVE FLOW DIAGRAM FOR DM PLANT

FROM F.W. OVERHEAD TANK
G.I.
G.I.
TO SAFETY SHOWERS (2 NOS.)
POLYPROPYLENE LINED MS
ACID FUMES
REFER NOTE 9 (SHEET 1 OF 3)

ACID STORAGE TANKS (3 NOS.)
(T1□)
(T1□)
(T1□)

WATER FOR DILUTION
POLYPROPYLENE LINED MS
INTER CONNECTION (FUTURE)
INTER CONNECTION (FUTURE)

ACID MEASURING TANK (2 NOS.)
(T2□)
(T2□)

FROM DEGASSER PUMP DISCHARGE
POLYPROPYLENE LINED MS
ACID EJECTOR (2 NOS.)
(E1□)
(E1□)
H1
H2
(P3□)
(P3□)
ACID UNLOADING PUMPS

CONCENTRATION ANALYSER
AE–C
DENSITY INDICATOR
DI
TO N.PIT
TO CATION EXCHANGER SHEET 1 OF 3
MSRL
DI
TO MIXED BED EXCHANGER SHEET 2 OF 3
MSRL
AE–C
CONCENTRATION ANALYSER
POLYPROPYLENE LINED MS

FROM OVER HEAD TANK
40 MS
LIME TANK FOR NEUTRALISATION
80
TO N.PIT
80 G.I.
DM PLANT WASTE
FROM ACID & ALKALI MEASURING TANKS
NEUTRALISATION PIT–II
NEUTRALISATION PIT–I
FILTER WATER
FROM OVER HEAD TANK
(P7□)
(P7□)
(P7□)
PRIMING CHAMBER (TYP)
AE–PH
RECIRCULATION LINE
MSRL
TO BOTTOM ASH SLURRY SUMP
EFFLUENT DISPOSAL PUMPS
To CMB.
(Valves to be provided in line with bottom ash slurry line).

WATER FOR DILUTION & FLUSHING FROM DM REGN PUMPS
SS–304
DILUENT WATER HEATING TANK (1 NO.) (R8)
TO N.PIT
TI
TT
TE
HEATER ELEMENT
TO N.PIT
ALKALI DAY TANK (2 NOS.)
(T5□)
(T5□)
TO N.PIT
AC FILTER FOR ALKALI (1 NO.)
DPT
DPI
T
ALKALI PREP. TANK (2 NOS.)
(T4□)
(T4□)
TO N.PIT (TYP)
ALKALI STORAGE TANK (2 NOS.)
(T8□)
(T8□)
4540–136–POM–A–002 (SHT. 2 OF 3)
TO N.PIT (TYP)
SS304
INTER CONNECTION (FUTURE) (2 NOS)
(P10□)
(P10□)
H1
H2
ALKALI UNLOADING PUMPS
(P5□)
(P5□)
ALKALI TRANSFER CUM RECIRCULATION PUMPS

ALKALI EJECTORS
(E2□)
(E2□)
FT
SS–304
SS304
CONCENTRATION ANALYSER
TO ACF VESSELS (TYP)
TO ANION EXCHANGERS SHEET 2 OF 3
TO MIXED BED EXCHANGER SHEET 2 OF 3
CONCENTRATION ANALYSER
BRINE SOLUTION PREPERATION TANK (1 NO.)
(T7)
TO WBA & SBA VESSELS INLET
MSRL
(P4□)
(P4□)
BRINE SOLUTION TRANSFER PUMPS

FLOW DIAGRAM -1

OPTION–1

FOR TENDER PURPOSE ONLY

NTPC Limited
(A GOVT. OF INDIA INTERPRISE)
ENGINEERING DIVISION

PROJECT: LARA SUPER THERMAL POWER PROJECT STAGE–II (2 X 800MW)

TITLE: P & ID FOR DEMINERALISING PLANT

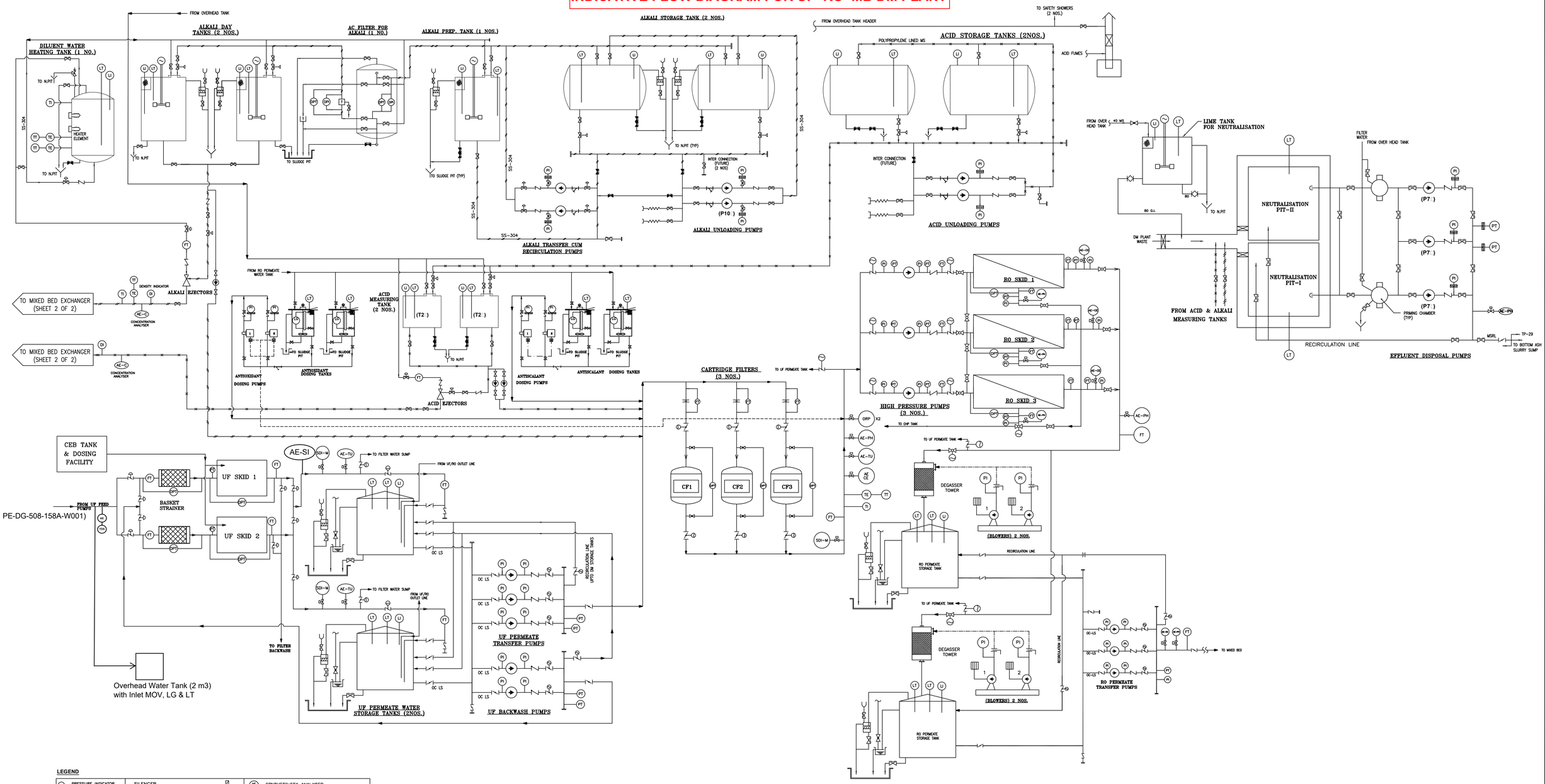
REV.	DESCRIPTION	DRAWN	DESIGN	CHKD.	CLEARED BY	APPD	DATE
A	RELEASED FOR TENDER	TARUN					

C | LAYOUT(M) | M | E | C&I

SIZE	SCALE	DRG.NO.	REV.
A1	NTS	9587–999–POM–A–002 (SHEET 3 OF 3)	A

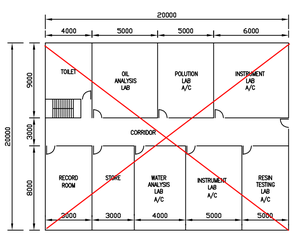
CAD FILE NAME : 9587–999–POM–A–002

INDICATIVE FLOW DIAGRAM FOR UF+RO+MB DM PLANT

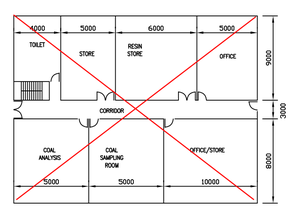


LEGEND

PI — PRESSURE INDICATOR (Local)	SILENCER	CONDUCTIVITY ANALYSER
PT — PRESSURE TRANSMITTER	AIR FILTER	SDI ANALYSER
DPI — DIFFERENTIAL PRESSURE INDICATOR (Local)	EJECTOR	DIAPHRAGM TYPE (SPRING TO OPEN)
DPT — DIFFERENTIAL PRESSURE TRANSMITTER	CO_2 ABSORBER	ELEC MOTOR
LG — LEVELINDICATOR(LOCAL) REFLEX TYPE/FLOOT TYPE	OVER FLOW SEAL	SLUICE VALVE
LI — LEVELINDICATOR(LOCAL) REFLEX TYPE/FLOOT TYPE	RESIN TRAP	CHECK VALVE
LT — ULTRASONIC TYPE LEVEL TRANSMITTER	DAMPER	DIAPHRAGM VALVE
FI — FLOW INDICATOR (Local)	DIAPHRAGM SEAL	GLOBE VALVE
FT — FLOW TRANSMITTER	ELECTRO–PNEUMATIC CONNECTOR	BUTTERFLY VALVE
ZT — POSITION TRANSMITTER	CHANNEL	PLUG VALVE
CC LS — OPEN & CLOSE LIMIT SWITCH	ORIFICE	RELIEF VALVE
FE — FLOW ELEMENT	SAMPLE VALVE	M.S.GATE
	SOLENOID VALVE	STRAINER
	SPRING TO CLOSE	PARSHALL FLUME
	SPRING TO OPEN	PUMPS
	ALKALI LINE	MOTORISED MODULATING VALVE
	ACID LINE	WEIR TYPE GATE
	AIR LINE	MOTORISED PLUG VALVE
	LEVEL GAUGE(REFLEX TYPE)	FLOAT VALVE
	LEVEL GAUGE(FLOAT TYPE)	CHECK VALVE
	PH ANALYSER	TURBIDITY ANALYSER
	CHLORINE ANALYSER	MANUAL SDI KIT WITH CONSUNABLES FOR SIX MONTHS OF OPERATION



DM PLANT LAB BUILDING – FIRST FLOOR
CLEAR HEIGHT = 3.5M.
(INCLUDING OVERHEAD WATER TANK OF 50M^3)



DM PLANT LAB BUILDING – GROUND FLOOR
CLEAR HEIGHT = 3.5M.

FLOW DIAGRAM - 2

OPTION–2
FOR TENDER PURPOSE ONLY

REV.	DESCRIPTION	DRAWN	DESIGN	CHKD.	C	LAYOUT(M)	M	E	C&I	APPD	DATE
A	RELEASED FOR TENDER	TARUN			CLEARED BY						

NTPC Limited
(A GOVT. OF INDIA INTERPRISE)
ENGINEERING DIVISION

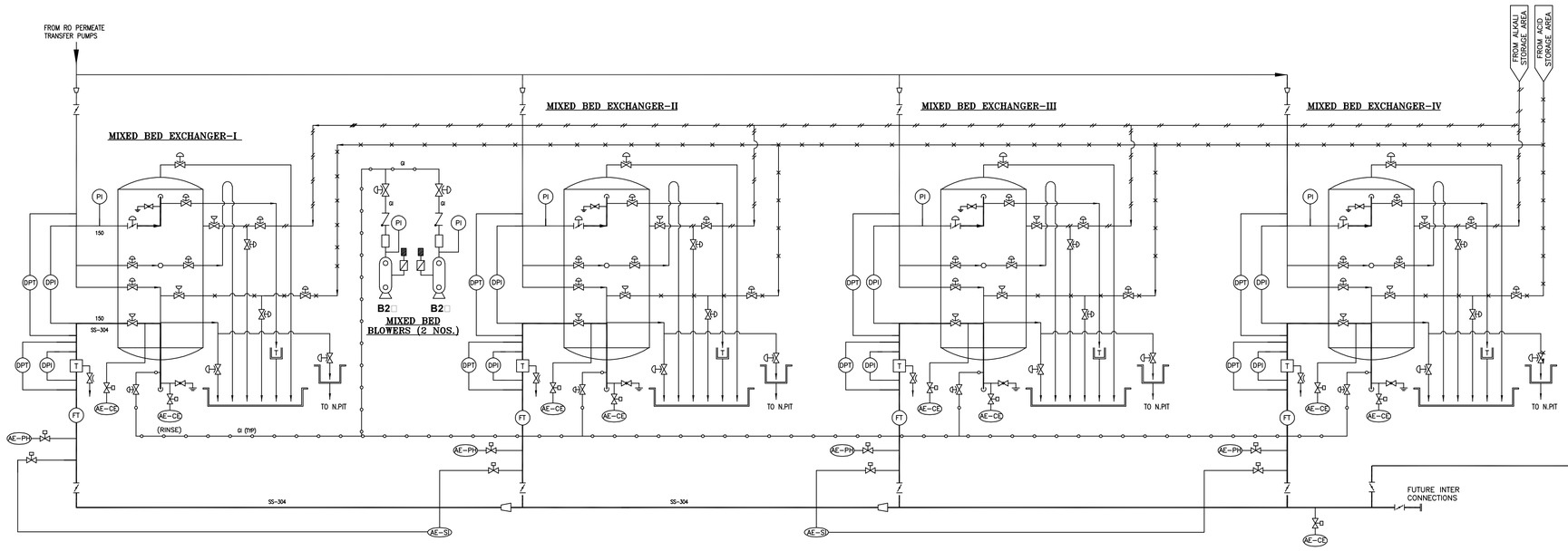
PROJECT: LARA SUPER THERMAL POWER PROJECT
STAGE–II (2 X 800MW)

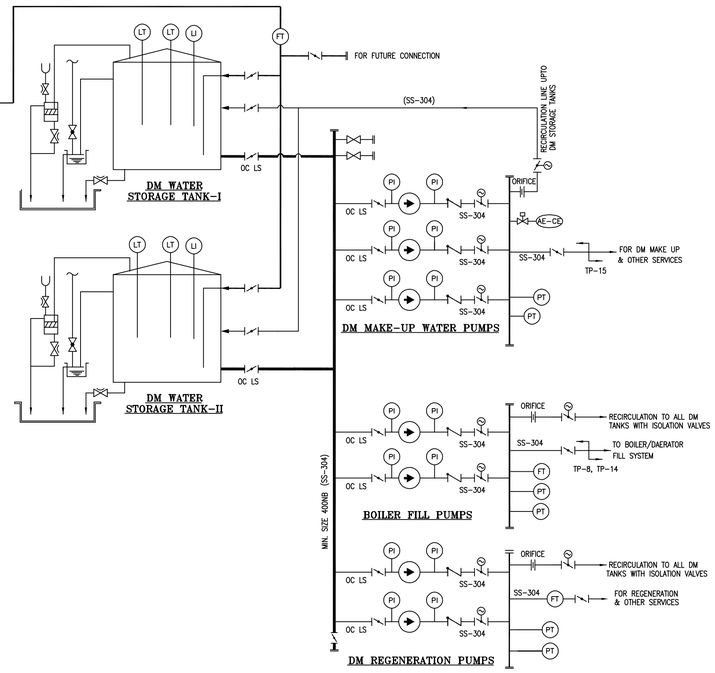
TITLE: P & I DIAGRAM FOR RO PLANT

SIZE	SCALE	DRG.NO.	REV.
A1	NTS	9587–999–POM–A–003 (SHEET 1 OF 2)	A

CAD FILE NAME : 9587–999–POM–A–003

INDICATIVE FLOW DIAGRAM FOR UF+RO+MB DM PLANT





LEGEND

			NORMALLY OPEN	NORMALLY CLOSED
PUMP (CENTRIFUGAL TYPE)		GATE VALVE		
MOTOR DRIVE		BALL VALVE		
FAN		DIAPHRAGM VALVE		
POSITIVE DISPLACEMENT TYPE FAN		BUTTERFLY VALVE		
SILENCER		SAMPLE VALVE		
AIR FILTER		PRESSURE RELIEF VALVE		
STRAINER (Y-TYPE)		NON RETURN VALVE (FLOW LEFT TO RIGHT)		
EJECTOR		SOLENOID VALVE		
CO_2 ABSORBER		PLUG VALVE		
OVER FLOW SEAL		SPRING TO CLOSE		
RESIN TRAP	LT T	SPRING TO OPEN		
FLOW INDICATOR		ALKALI LINE		
DIGITAL INDICATOR		ACID LINE		
DAMPER		AIR LINE		
DIAPHRAGM SEAL		LOCAL INSTRUMENT		
DENSITY INDICATOR	DI	CONTROL INFORMATION ON CONTROL DESK/CRT		
HOSE	H	DISTRIBUTED CONTROL SYSTEM	DCS	
		MILD STEEL	MS	
		ORIFICE		

NOTE :

1. FOR THE MEASUREMENT OF DP ACROSS VESSEL, THE TAPPINGS FOR DP TRANSMITTER & DP GAUGE SHALL BE TAKEN AFTER THE SERVICE INLET VALVE AND BEFORE THE SERVICE OUTLET VALVE.
2. Two number PTs and one no. FT shall be provided at common discharge of Pumps and Blowers. (Typ.)
3. LTs and LGs shall be provided by the bidder in Filtered Water Storage Tank(s)/ Reservoir.
4. Piping from UF Feed Water Pumps to DM Plant shall be in bidder's scope.
5. Scope and Details of backwash sump is applicable for RO based DM based plant as per Resin based DM plant.
6. DM WATER STORAGE TANK(S) ALONG WITH ITS ACCESSORIES ARE EXCLUDED FROM BIDDER'S SCOPE. HOWEVER, TWO NUMBER LTs PER DM WATER STORAGE TANKS SHALL BE PROVIDED BY THE BIDDER.
7. DM MAKE UP WATER PUMPS (3 NOS.) AND BOILER FILL PUMP (2 NOS.) ALONG WITH ITS ACCESSORIES ARE EXCLUDED FROM BIDDER'S SCOPE.

REV.	DESCRIPTION	DRAWN	DESIGN	CHKD.	C	LAYOUT(M)	M	E	C&I	APPD	DATE
					CLEARED BY						
A	RELEASED FOR TENDER	TARUN									

FLOW DIAGRAM - 2

OPTION-2

FOR TENDER PURPOSE ONLY

NTPC Limited
(A GOVT. OF INDIA INTERPRISE)
ENGINEERING DIVISION

PROJECT: LARA SUPER THERMAL POWER PROJECT
STAGE-II (2 X 800MW)

TITLE: P & I DIAGRAM FOR RO PLANT

SIZE	SCALE	DRG.NO.	REV.
A1	NTS	9587-999-POM-A-003 (SHEET 2 OF 2)	A

CAD FILE NAME : 9587-999-POM-A-003

ANNEXURE XIV

SUPERVISION SERVICES

SUPERVISION SERVICES FOR CHP-RUN-OFF WATER TREATMENT SYSTEM

1.0 SCOPE

Supervision of Complete civil structural, architectural & construction works of complete CHP-Run-Off Water Treatment System is in bidder's Scope of work. The duration of supervision shall be Ninety (90) man-days in multiple visits. The Ninety (90) man-days are to be considered as Ninety (90) working days at site excluding the travel time. The supervision charges shall be inclusive of charges of Air-Fair/Rail-Fair, Boarding/Lodging, Local conveyance, medical, insurance etc.

The scope includes supervision of complete civil work, construction works, structural & architectural works of complete CHP-Run-Off Water Treatment System area including but not limited to supervision of excavation, backfilling, encasing of pipes, foundation work of equipment, brick work, plastering, PCC work , painting work of civil structures, shuttering work, Pipe & cable pedestal construction work, associated walkways, pathways, interconnecting platforms, handrails, staircases, plinth protections, peripheral drains, acid & alkali resistance tiling/bricks work, grouting work of equipment foundations, fixing and supervision of any other civil works as specified elsewhere in the specification.

Bidder to consider supervision of the following major items of CHP-Run-Off Water Treatment System including but not limited to:

- Stilling Chamber, parshall flumes, Interconnecting channels, Bypass Channels, Inlet chambers, telescopic chambers etc.
- Clarifiers, outlet channels up to distribution tank etc.
- Chemical storage shed, including overhead water tanks, Chemical tanks, chemical storage area etc.
- Sludge Pit for Clarifiers including inlet & outlet chambers etc.
- Foundation of equipment, Pipe & cable pedestals, associated walkways, pathways, interconnecting platforms, RCC staircases, plinth protections, peripheral drains, filling and finishing works of openings in walls, floors, cladding, roof and cable trenches construction etc for the complete pretreatment plant as per technical specifications.

Complete civil analysis & design of all civil structural & architectural works of CHP-Run-Off Water Treatment System is in bidder's Scope of work. The corresponding electro-mechanical, civil structural, architectural & construction drawings shall be prepared by successful bidder during contract stage. Based on the drawings the civil structural, architectural & construction works shall be carried out by BHEL at the site under the supervision of successful bidder. In case any modification is required in the civil work already carried out based on final drawings, BHEL reserves the right to debit cost of such rework to successful bidder/vendor. Bidder to ensure that the civil structural, architectural & construction works meets the technical specification requirement which are necessary to meet the performance of complete CHP-Run-Off Water Treatment System.

Bidder to depute Qualified and experienced engineer/ supervisor for supervision of civil works at site. Correctness is to be ensured by engineer/ supervisor as per bidder's drawing requirements. In case any discrepancy found by engineer/ supervisor, then he has to immediately conveyed to BHEL's site in charge/ BHEL site package owner for rectification. Date of deputation shall be intimated by BHEL site once corresponding structure drawing prepared by Bidder shall be approved.

2.0 SUPERVISION SERVICES (PRE TREATMENT PLANT)

Supervision of Complete civil structural, architectural & construction works of complete Pre Treatment Plant is in bidder's Scope of work. The duration of supervision shall be One Hundred Eighty (180) man-days in multiple visits. The One Hundred Eighty (180) man-days are to be considered as One Hundred Eighty (180) working days at site excluding the travel time. The supervision charges shall be inclusive of charges of Air-Fair/Rail-Fair, Boarding/Lodging, Local conveyance, medical, insurance etc.

The scope includes supervision of complete civil work, construction works, structural & architectural works of complete pretreatment plant area including but not limited to supervision of excavation, backfilling, encasing of pipes, foundation work of equipment, brick work, plastering, PCC work , painting work of civil structures, shuttering work, Pipe & cable pedestal construction work, associated walkways, pathways, interconnecting platforms, handrails, staircases, plinth protections, peripheral drains, acid & alkali resistance tiling/bricks work, grouting work of equipment foundations, fixing and supervision of any other civil works as specified elsewhere in the specification.

Bidder to consider supervision of the following major items of Pre Treatment Plant including but not limited to:

- PT (CW & Potable System)-Aerator, Stilling Chamber, parshall flumes, Interconnecting channels, Bypass Channels, Inlet chambers, telescopic chambers etc.
- PT (DM System)-Aerator, Stilling Chamber, parshall flume, Interconnecting channels, Bypass Channel, Inlet chamber, telescopic chambers etc.
- PT (CW & Potable System)-Clarifiers, outlet channels up to clarified water storage tank & Gravity Filer-Potable water etc.
- PT (DM System)-Clarifier, outlet channel up to Gravity Filer-DM, etc.
- Gravity Filer House (PT-Potable & PT DM), including piping gallery house, filter water reservoirs, Filtered water pump house etc.
- Chemical House (PT-Potable & PT DM), including overhead water tanks, Chemical tanks, chemical storage area etc.
- Common Sludge Pit for PT- CW & DM system Clarifiers including inlet & outlet chambers etc.
- Filter backwash waste collection pit including inlet & outlet chambers.
- Foundation of Bulk chemical storage tanks, Unloading Pumps, Dyke area along with acid alkali resistance tiling/Lining.
- Foundation of equipment, Pipe & cable pedestals, associated walkways, pathways, interconnecting platforms, RCC staircases, plinth protections, peripheral drains, filling and finishing works of openings in walls, floors, cladding, roof and cable trenches construction etc for the complete pretreatment plant as per technical specifications.

Complete civil analysis & design of all civil structural & architectural works of Pre-Treatment Plant is in bidder's Scope of work. The corresponding electro-mechanical, civil structural, architectural & construction drawings shall be prepared by successful bidder during contract stage. Based on the drawings the civil structural, architectural & construction works shall be carried out by BHEL at the site under the supervision of successful bidder. In case any modification is required in the civil work already carried out based on final drawings, BHEL reserves the right to debit cost of such rework to successful bidder/vendor. Bidder to ensure that the civil structural, architectural & construction works meets the technical specification requirement which are necessary to meet the performance of complete Pre Treatment Plant.

Bidder to depute Qualified and experienced engineer/ supervisor for supervision of civil works at site. Correctness is to be ensured by engineer/ supervisor as per bidder's drawing requirements. In case any discrepancy found by engineer/ supervisor, then he has to immediately conveyed to BHEL's site in charge/ BHEL site package owner for rectification. Date of deputation shall be intimated by BHEL site once corresponding structure drawing prepared by Bidder shall be approved.

3.0 SUPERVISION SERVICES FOR LIME DOSING SYSTEM

Bidder to depute Qualified and experienced engineer/ supervisor for supervision of Erection and Commissioning at site. Correctness and correctness of E&C, done by BHEL is to be ensured by engineer/ supervisor as per bidder's drawing and system requirements. In case, any discrepancy is found by bidder, then he has to immediately convey it to BHEL's site incharge/ BHEL site package owner for rectification.

Supervision activity shall be starting after (approximately) four months from the date of material reaching at site, as per dispatch schedule given by BHEL before placement of order. BHEL site shall intimate date of deputation with 15 days advance notice (before start of erection).

The duration of supervision shall be Total thirty (30) man-days in two (2) visits. The thirty (30) man-days are to be considered as thirty (30) working days at site excluding the travel time and holidays. The supervision charges shall be inclusive of charges of Air-Fair/Rail-Fair, Boarding/Lodging, Local conveyance, medical, insurance etc.

ANNEXURE XV

PERCENTAGE BREAK UP OF PRICE FOR WATER TREATMENT PACKAGES

Bidder to submit BBU during detailed engineering after approval of Basic documents. BBU shall be equal to BOQ for the package and there shall be no price and delivery implication is applicable to BHEL/ customer for the same. Incomplete BBU shall not be review by BHEL.

1. Break-up (%) of Supply prices of each water treatment package shall be strictly followed by bidder during detailed engineering as per below mentioned criteria:

1.1 CHLORINE DI OXIDE DOSING SYSTEM

SL NO	TECHNICAL PARTICULARS	PERCENTAGE (%) OF SUPPLY BBU (To be used during contract execution for payment).
1.	Lump sum firm price for supply of Chlorine Di Oxide Generator	12 % of Total supply price of Chlorine di oxide dosing system
2.	Lump sum firm price for supply of atmospheric tanks	11 % of Total supply price of Chlorine di oxide dosing system
3.	Lump sum firm price for supply of Valves	12 % of Total supply price of Chlorine di oxide dosing system
4.	Lump sum firm price for supply of Instruments	25 % of Total supply price of Chlorine di oxide dosing system
5.	Lump sum firm price for supply of Pumps, agitators & strainers	25 % of Total supply price of Chlorine di oxide dosing system
6.	Lump sum firm price for supply of Piping & Fittings	9 % of Total supply price of Chlorine di oxide dosing system
7.	Lump sum firm price for preparation of drawings in 3D	1 % of Total supply price of Chlorine di oxide dosing system
8.	Lump sum firm price for supply of Balance items	5 % of Total supply price of Chlorine di oxide dosing system

1.2 SEWAGE TREATMENT PLANT

SL NO	TECHNICAL PARTICULARS	PERCENTAGE (%) OF SUPPLY BBU (To be used during contract execution for payment).
1.	Lump sum firm price for supply of Valves and oil skimmer	8% of Total supply price of Sewage Treatment Plant
2.	Lump sum firm price for supply of Instruments & Analysers	8% of Total supply price of Sewage Treatment Plant
3.	Lump sum firm price for supply of Pumps with motors & blowers with motors	15% of Total supply price of Sewage Treatment Plant
4.	Lump sum firm price for supply of Decentralised STP units with respective motor and accessories	45% of Total supply price of Sewage Treatment Plant
5.	Lump sum firm price for supply of Piping & Fittings	15% of Total supply price of Sewage Treatment Plant

6.	Lump sum firm price for preparation of drawings in 3D	1% of Total supply price of Sewage Treatment Plant
7.	Lump sum firm price for supply of Balance items	8% of Total supply price of Sewage Treatment Plant

1.3 EFFLUENT TREATMENT PLANT

SL NO	TECHNICAL PARTICULARS	PERCENTAGE (%) OF SUPPLY BBU (To be used during contract execution for payment).
1.	Lump sum firm price for supply of Valves	8% of Total supply price of Effluent Treatment Plant.
2.	Lump sum firm price for supply of Instruments & Analysers	25% of Total supply price of Effluent Treatment Plant.
3.	Lump sum firm price for supply of Pumps with motors & blowers with motors	15% of Total supply price of Effluent Treatment Plant.
4.	Lump sum firm price for supply of Agitators, Sluice gates, Centrifuge & Oil skimmer with respective motor and accessories	10% of Total supply price of Effluent Treatment Plant.
5.	Lump sum firm price for supply of Piping & Fittings	30% of Total supply price of Effluent Treatment Plant.
6.	Lump sum firm price for preparation of drawings in 3D	1% of Total supply price of Effluent Treatment Plant.
7.	Lump sum firm price for supply of Balance items	11% of Total supply price of Effluent Treatment Plant.

1.4 CONDENSATE POLISHING UNIT

SL NO	TECHNICAL PARTICULARS	PERCENTAGE (%) OF SUPPLY BBU (To be used during contract execution for payment).
1.	Lumpsum firm price for supply of Service vessels along with pre-filters	19% of Total supply Price of Condensate Polishing Unit.
2.	Lumpsum firm price for supply of Pressure vessels other than Service vessels & pre-filter	6% of Total supply Price of Condensate Polishing Unit.
3.	Lumpsum firm price for supply of Resin	14% of Total supply Price of Condensate Polishing Unit.
4.	Lumpsum firm price for supply of Atmospheric tank	10% of Total supply Price of Condensate Polishing Unit.
5.	Lumpsum firm price for supply of Low Pressure Valves	4% of Total supply Price of Condensate Polishing Unit.
6.	Lumpsum firm price for supply of High Pressure Valves	24% of Total supply Price of Condensate Polishing Unit.

7.	Lumpsum firm price for supply of Instruments & Analyser	9% of Total supply Price of Condensate Polishing Unit.
8.	Lumpsum firm price for supply of Rotary Equipment (Pumps, Blowers, Agitators etc.)	6% of Total supply Price of Condensate Polishing Unit.
9.	Lumpsum firm price for supply of Piping & Fittings	5% of Total supply Price of Condensate Polishing Unit.
10.	Lump sum firm price for preparation of drawings in 3D	1% of Total supply price of Condensate Polishing Unit.
11.	Lumpsum firm price for supply of Balance items	2% of Total supply Price of Condensate Polishing Unit.

1.5 CW CHEMICAL TREATMENT PLANT (CWT)

SL NO	TECHNICAL PARTICULARS	PERCENTAGE (%) OF SUPPLY BBU (To be used during contract execution for payment).
1.	Lump sum firm price for supply of Atmospheric Tanks	27% of Total supply price of CW Treatment Plant
2.	Lump sum firm price for supply of Valves	5% of Total supply price of CW Treatment Plant
3.	Lump sum firm price for supply of Instruments & Analysers	12% of Total supply price of CW Treatment Plant
4.	Lump sum firm price for supply of Pumps, Agitators & Strainers	8% of Total supply price of CW Treatment Plant
5.	Lump sum firm price for supply of Piping & Fittings	8% of Total supply price of CW Treatment Plant
6.	Lump sum firm price for preparation of drawings in 3D	1% of Total supply price of CW Treatment Plant
7.	Lump sum firm price for supply of Chemicals	35% of Total supply price of CW Treatment Plant
8.	Lump sum firm price for supply of Balance items	4% of Total supply price of CW Treatment Plant

1.6 CHP RUN OFF WATER TREATMENT PLANT (CHP WTP)

SL NO	TECHNICAL PARTICULARS	PERCENTAGE (%) OF SUPPLY BBU (To be used during contract execution for payment).
1.	Lump sum firm price for supply of Atmospheric tanks	8 % of Total supply price of Coal handling plant run-off water treatment plant package.
2.	Lump sum firm price for supply of Valves	24 % of Total supply price of Coal handling plant run-off water treatment plant package.

3.	Lump sum firm price for supply of Instruments	11 % of Total supply price of Coal handling plant run-off water treatment plant package.
4.	Lump sum firm price for supply of Pumps, Blowers, agitators & strainers	19 % of Total supply price of Coal handling plant run-off water treatment plant package.
5.	Lump sum firm price for supply of Piping & Fittings	12 % of Total supply price of Coal handling plant run-off water treatment plant package.
6.	Lump sum firm price for supply of mechanism for clarifier etc	21 % of Total supply price of Coal handling plant run-off water treatment plant package.
7.	Lump sum firm price for preparation of drawings in 3D	1 % of Total supply price of Coal handling plant run-off water treatment plant package.
8.	Lump sum firm price for supply of Balance items	4 % of Total supply price of Coal handling plant run-off water treatment plant package.

1.7 PRETREATMENT PLANT

SL NO	TECHNICAL PARTICULARS	PERCENTAGE (%) OF SUPPLY BBU (To be used during contract execution for payment).
1.	Lump sum firm price for supply of Atmospheric tanks.	8 % of Total supply price of Pre Treatment plant package.
2.	Lump sum firm price for supply of Valves.	24 % of Total supply price of Pre Treatment plant package.
3.	Lump sum firm price for supply of Instruments.	11 % of Total supply price of Pre Treatment plant package.
4.	Lump sum firm price for supply of Pumps, Blowers, agitators & strainers.	19 % of Total supply price of Pre Treatment plant package.
5.	Lump sum firm price for supply of Piping & Fittings.	12 % of Total supply price of Pre Treatment plant package.
6.	Lump sum firm price for supply of mechanism for clarifiers etc.	21 % of Total supply price of Pre Treatment plant package.
7.	Lump sum firm price for preparation of drawings in 3D.	1 % of Total supply price of Pre Treatment plant package.
8.	Lump sum firm price for supply of Balance items.	4 % of Total supply price of Pre Treatment plant package.

1.8 DM PLANT (RESIN BASED)

SL NO	TECHNICAL PARTICULARS	PERCENTAGE (%) OF SUPPLY BBU (To be used during contract execution for payment).
1.	Lumpsum firm price for supply of Pressure vessels.	14% of Total Supply price of DM Plant.
2.	Lumpsum firm price for supply of Resin.	19% of Total Supply price of DM Plant.

3.	Lumpsum firm price for supply of Atmospheric tank & UF Skid.	17% of Total Supply price of DM Plant.
4.	Lumpsum firm price for supply of Valves.	8% of Total Supply price of DM Plant.
5.	Lumpsum firm price for supply of Instruments & Analyzer.	12% of Total Supply price of DM Plant.
6.	Lumpsum firm price for supply of Rotary Equipments (Pumps, Blowers, Agitators etc.).	7% of Total Supply price of DM Plant.
7.	Lumpsum firm price for supply of Piping & Fittings.	15% of Total Supply price of DM Plant.
8.	Lumpsum firm price for preparation of drawing in 3D.	1% of Total Supply price of DM Plant.
9.	Lumpsum firm price for supply of Balance items.	7% of Total Supply price of DM Plant.

1.9 DM PLANT (RO BASED)

SL NO	TECHNICAL PARTICULARS	PERCENTAGE (%) OF SUPPLY BBU (To be used during contract execution for payment).
1.	Lumpsum firm price for supply of Pressure vessels.	8% of Total Supply price of DM Plant.
2.	Lumpsum firm price for supply of Resin.	6% of Total Supply price of DM Plant.
3.	Lumpsum firm price for supply of RO skids.	18% of Total Supply price of DM Plant.
4.	Lumpsum firm price for supply of Atmospheric tank & UF Skids.	15% of Total Supply price of DM Plant.
5.	Lumpsum firm price for supply of Valves.	8% of Total Supply price of DM Plant.
6.	Lumpsum firm price for supply of Instruments & Analyzer.	12% of Total Supply price of DM Plant.
7.	Lumpsum firm price for supply of Rotary Equipments (Pumps, Blowers, Agitators etc.).	10% of Total Supply price of DM Plant.
8.	Lumpsum firm price for supply of Piping & Fittings.	15% of Total Supply price of DM Plant.
9.	Lumpsum firm price for preparation of drawing in 3D.	1% of Total Supply price of DM Plant.
10.	Lumpsum firm price for supply of Balance items.	7% of Total Supply price of DM Plant.

DATASHEET A FOR CHEMICAL DOSING SYSTEM

S. No.	Description	Ammonia	NaOH
1.0	No. of skid(s)	Two (one per unit)	Four (two per unit)
2.0	Metering Tanks		
a	Number of tanks per skid	One	Not Applicable
b	Capacity in litres	125	Not Applicable
c	Type	Vertical cylindrical, dish end bottom tank	Not Applicable
d	Material of the tank	SS-304	Not Applicable
e	Thickness	Not less than 3 mm	Not Applicable
f	Design Standard	IS 803/API 650	Not Applicable
g	Free Board	300 mm	Not Applicable
3.0	Mixing cum storage tank		
a	Number of tanks per skid	One	One
b	Capacity in litres	2300	500
c	Type	Vertical cylindrical, dish end bottom tank	Vertical cylindrical, dish end bottom tank
d	Material of the tank	SS-304	SS-304
e	Thickness	Not less than 3 mm	Not less than 6 mm
f	Free Board	300 mm	300 mm
g	Motorised Stirrer	Propeller type with slow speed reduction gear unit	
h	Material of shaft and propeller	SS-316	SS-316
i	RPM of stirrer	Below 150 rpm	Below 150 rpm
j	Dissolving basket	NA	Provided (30 mesh), SS-316
k	Design Standard	IS 803/API 650	IS 803/API 650
3.0	Dosing pump		
a	Medium to be handled	Ammonia solution	NaOH solution
b	Type of pump	Positive displacement Plunger type variable stroke control metering pump	
c	Make of pump	Reputed indigenous	
d	No. of pump-motor assembly	Two (2X100%)	Two (2X100%)
e	Capacity	50 LPH	10 LPH
f	Discharge pressure	45 Kg/cm2 (g)	10 Kg/cm2 (g)
g	All Wetted parts of pumps	SS-316	SS-316
h	Pulsation Dampener	One per each pump discharge	One per each pump discharge
i	Connection at suction, position	1″ ANSI B16.5 #150, bottom	1″ ANSI B16.5 #150, bottom
j	Connection at discharge, position	1″ ANSI B16.5 #300, top	1″ ANSI B16.5 #300, top
k	Applicable standard	API 675	API 675
l	Type of stroke control	Local manual & automatic	
4.0	Strainers:		
4.1	No. of strainers	One	One
4.2	Type	Duplex type	Duplex type
4.3	Material of screen	SS-304	SS-304
4.4	Mesh Size	50 (BS)	50 (BS)
5.0	Drain & Overflow:		
5.1	Material	ASTM A312 Gr. TP 304	ASTM A312 Gr. TP 304

		Schedule 40 (seamless)	Schedule 40 (seamless)
5.2	Diameter	25 NB	25 NB
6.0	Vent & Sampling Pipe		
6.1	Material	ASTM A312 Gr. TP 304 Schedule 40 (seamless)	ASTM A312 Gr. TP 304 Schedule 40 (seamless)
6.1.1	Diameter	15 NB	15 NB
6.3	Drain Header:		
6.3.1	Material	ASTM A 312 GR TP 304 Sch 40	ASTM A 312 GR TP 304 Sch 40
6.3.2	Diameter	40 NB	40 NB
7.0	Valves:		
7.1	Body, Cover, Yoke & Trim Material	ASTM A182 Gr. TP 304	ASTM A182 Gr. TP 304
7.2	Design standard	ANSI B 16.34/API 602	ANSI B 16.34/API 602
7.3	Test standard	API 598	API 598
7.4	End Connections	SW ANSI B 16.11	SW ANSI B 16.11
7.5	Rating	---------Class ASA 800--------	---------Class ASA 800--------
7.6	Valve operation	Manual	Manual
7.7	Weld ends	Socket weld ends	Socket weld ends
7.8	Pressure relief valve		
7.8.1	Body, bonnet, disc, nozzle & spring	ASTM A182 Gr. TP 304	ASTM A182 Gr. TP 304
7.8.2	Inlet Connections	25 NB, Flanged, ANSI B16.5, 300#	25 NB, Flanged, ANSI B16.5, 300#
7.8.3	Outlet Connections	25 NB, Flanged, ANSI B16.5, 300#	25 NB, Flanged, ANSI B16.5, 300#
8.0	Fittings	Forged steel to A182 F304, Dimension to ANSI B 16.11 socket weld ends	Forged steel to A182 F304, Dimension to ANSI B 16.11 socket weld ends
9.0	Structural steel	IS 2062	IS 2062
10.0	Flanges-Pump Suction/Discharge	ANSI B 16.5 CL150/ANSI B 16.5 CL 300	ANSI B 16.5 CL150/ANSI B 16.5 CL 300
11.0	Hand pump with accessories.	One no. per skid	NA
12.0	Access ladder and platform	IS 2062	IS 2062
13.0	Nuts and Bolts	SS 304	SS 304

DATASHEET A FOR OXYGEN DOSING SYSTEM

Sl. No	Description	Parameter
Mechanical Items		
1.0	No. of skid(s)for project	Eight (Four per unit)
2.0	**Cylinders:**	
2.1	Quantity mounted on skid	Two per skid (Total Sixteen)
2.2	Loose supply of filled Oxygen cylinders	32 loose on a rack for each unit (Total 64)
2.3	Design Standard of empty oxygen cylinder	IS-7285 Part 1
2.5	Water Capacity	50 liters
2.6	Gas Capacity	10 m^3
2.7	Max Working pressure at 15^{O}C	204 Kg/cm^2
2.8	Painting of oxygen cylinder	As per IS 4379
2.10	Accessories	Two numbers (one per unit) Cylinder storing rack (MS), each with capacity to hold 24 cylinders
3.0	**All Tubing:**	
3.1	Material	SS 316
3.2	Diameter	15 NB (1/2" OD), 18 BWG
4.0	**Ball valves**	
4.1	Body, Bonnet, stem	SS 316
4.2	Trim Material	SS 316
4.3	Design standard	MSS-99-2010/ Equivalent
4.4	Test standard	MSS-99-2010/ Equivalent
4.5	Size	15 NB
4.6	End Connections	Ferruled
4.7	Rating	2000 PSI
4.8	Valve operation	Manual or pneumatic as per P&ID
5.0	**Check valves/ NRV**	
5.1	Body, cover, disc/piston & seat	SS 316
5.2	Design standard	MSS-99-2010/ Equivalent
5.3	Test standard	MSS-99-2010/ Equivalent
5.4	Size	15 NB
5.5	End Connections	Ferruled
5.6	Rating	2000 PSI
5.7	Valve operation	Manual
6.0	**Pressure relief valve**	
6.1	Type	Spring loaded, angle type
6.2	Body, bonnet, disc & nozzle	SS 316
6.3	Valve discharges to	Atmosphere (vent)
6.4	Back pressure	Constant
6.5	Set pressure	60 Kg/cm^2 (g) for skid 1 and 35 Kg/cm^2 (g) for skid 2
6.6	Inlet Connections	15 NB, Flanged/threaded, ANSI B16.5, 400# for skid at CPU outlet and 300# for skid at de aerator outlet
6.7	Outlet Connections	15 NB, Flanged/threaded, ANSI B16.5, 150#
6.8	Rating	2000 PSI
7.0	**Fittings**	Stainless steel to A276 or A479 F316
8.0	**Pressure Regulator**	
8.1	Quantity	Two per skid (total 16), each mounted on oxygen

		cylinder
8.2	Body & trim	SS 316/ Brass
8.3	Inlet connection	1/2"
8.4	Outlet connection	1/2"
8.5	Operating pressure	204 Kg/cm^2(g)
8.6	Set outlet Pressure	55 Kg/cm^2(g) for skid dosing at CPU outlet and 30 Kg/cm^2(g) for skid dosing at deaerator outlet
9.0	**Mass Flow Controller**	------SS 316, ANSI B 16.5 CL 400 -----
9.1	Expected Flow of O_2 in process	50-470 gm./ hr. (for skid dosing at deaerator outlet); 30-350 gm./ hr. (for skid dosing at CPU outlet)
9.2	**MOC-wetted parts**	SS 316
9.3	**Operating pressure**	Pressure reducing valve set pressure (refer P&IDs)
10.0	**Structural steel**	IS 2062
11.0	**Nuts & bolts**	SS 304
12.0	**Flanges**	SS 316, ANSI B 16.5 400# for skid at CPU outlet and 300# for skid at de aerator outlet

DATASHEET A FOR CHLORINE DI OXIDE DOSING SYSTEM

Sl no.	Description	Parameters
1.0	**ACID UNLOADING PUMPS**	
1.1	Number	Two (2) [1Working+1Standby]
1.2	Location	Outdoor
1.3	Duty	Intermittent
1.4	Fluid to be handled	33 % HCl
1.5	Service	To unload/ transfer HCL in acid storage tanks
1.6	Type of Pump	Horizontal Centrifugal
1.7	Design standard	As per IS-5120.
1.8	Rated Capacity (each)	10 CuM/Hr
1.9	Head to be developed at rated capacity (each)	15 MWC (minimum)
1.10	Material of Construction	Polypropylene or equivalent suitable for HCL
1.11	Type of drive	Electrical Motor
1.12	Maximum Pump Speed (RPM)	1500
1.13	Type of Sealing	Mechanical Seal
1.14	Sets of Hoses with coupling & Diaphragm type Isolation Valves	
1.14.1	Number of Sets Required	Two (2)
1.14.2	Size of hose/ Valve	80 mm NB
1.14.3	Length of hoses, each	10 meters (minimum)
1.14.4	Material of hose	Chemical resistant, UV inhibited PVC
1.15	Strainer	Y-Type strainer of MOC-PP (2X100%).
1.16	Accessories required for each pump	Coupling guard, drain plug, vent valve, suction hoses, isolation valves, Y- type strainers, pressure gauges etc.
2.0	**SODIUM CHLORITE UNLOADING PUMPS**	
2.1	Number	Two (2) [1Working+1Standby]
2.2	Location	Outdoor
2.3	Duty	Intermittent
2.4	Fluid to be handled	31 % NaClO2
2.5	Service	To unload/ transfer NaClO2 in NaClO2 storage tanks
2.6	Type of Pump	Horizontal Centrifugal
2.7	Design standard	As per IS-5120.
2.8	Rated Capacity (each)	10 CuM/Hr
2.9	Head to be developed at rated capacity (each)	15 MWC (minimum)
2.10	Material of Construction	Polypropylene or equivalent suitable for NaClO2
2.11	Type of drive	Electrical Motor
2.12	Maximum Pump Speed (RPM)	1500
2.13	Type of Sealing	Mechanical Seal
2.14	Sets of Hoses with coupling & Diaphragm type Isolation Valves	
2.14.1	Number of Sets Required	Two (2)
2.14.2	Size of hose/ Valve	80 mm NB
2.14.3	Length of hoses, each	10 meters (minimum)
2.14.4	Material of hose	Chemical resistant, UV inhibited PVC

2.15	Strainer	Y-Type strainer of MOC-PP (2X100%)	
2.16	Accessories required for each pump	Coupling guard, drain plug, vent valve, suction hoses, isolation valves, Y- type strainers, pressure gauges etc.	
3.0	**DOSING PUMPS**		
3.1		**ACID**	**NaClO2**
3.2	Number	• 2 Working + 1 Standby for CW CLO2 system • 1 Working + 1 Standby for PT CLO2 system	• 2 Working + 1 Standby for CW CLO2 system • 1 Working + 1 Standby for PT CLO2 system
3.3	Location	Indoor inside building	
3.4	Duty	Intermittent for CW CLO2 system Continuous for PT CLO2 system	
3.5	Type of Pump	Auto stroke controlled Electronic diaphragm type with turn down ratio 1:800	
3.6	Rated Capacity (each)	As per system requirement	
3.7	Head	As per system requirement	
3.8	Accessories	Suction strainer, Pulsation dampener and Safety Relief valves shall be provided by bidder at each pump discharge header etc.	
3.9	Material of construction	Polypropylene or equivalent suitable for HCL and NaClO2	
4.0	**DILUTION WATER PUMPS**		
4.1	Number	• 2 Working + 1 Standby for CW CLO2 system • 1 Working + 1 Standby for PT CLO2 system	
4.2	Location	Indoor inside building	
4.3	Duty	Intermittent for CW CLO2 system Continuous for PT CLO2 system	
4.4	Fluid to be handled	Circulating water for CW CLO2 system Potable Water for PT CLO2 system	
4.5	Service	For Dilution Purpose	
4.6	Type of Pump	Horizontal Centrifugal Non-Clog type VFD operated	
4.7	Design standard	As per IS-5120.	
4.8	Suction Condition	Flooded	
4.9	Rated Capacity	As per system requirement	
4.10	Head to be developed at rated capacity	As per system requirement	
4.11	Impeller type	Closed	
4.12	Maximum Pump Speed (RPM)	1500	
4.13	**Material of Construction**		
4.14	Casing	ASTM A 351 CF8M	
4.15	Impeller	ASTM A 351 CF8M	
4.16	Wearing Rings	SS 316	
4.17	Shaft	SS-410	
4.18	Shaft sleeve	SS-410	
4.19	Nuts and bolts	Stainless steel for those coming in	

		contact with water and for others, material shall be high tension carbon steel	
4.20	Stuffing box	2.5% Ni CI IS 210 Gr FG 210	
4.21	Gland	2.5% Ni CI IS 210 Gr FG 210	
4.22	Base plate	Carbon steel	
4.23	Accessories	a. Companion flanges with nuts, bolts and gaskets, internal piping with valves filters and instruments for sealing/ cooling/ lubrication system upto and including isolating valve etc. b. Positioning dowels, drain lugs, vent valve etc. c. Coupling guards, eye bolts, lifting etc.	
4.24	Type of Suction Strainer	Basket-Type strainer of MOC- SS 316 (2X100 %) for each CW and PT CLO2 system	
5.0	**NEUTRAILIZED WASTE TRANSFER PUMP**		
5.1	Number	Four (4) numbers [2Working + 2 Stand by]	
5.2	Location	Outside	
5.3	Duty	Intermittent	
5.4	Fluid to be handled	Neutralized waste	
5.5	Service	For Neutralized waste transfer	
5.6	Type of Pump	Horizontal Centrifugal	
5.7	Suction Condition	Flooded	
5.8	Rated Capacity	5 m3/hr (minimum)	
5.9	Head to be developed at rated capacity	As per system requirement	
5.10	Impeller type	Closed	
5.11	Maximum Pump Speed (RPM)	1500	
5.12	**Material of Construction**		
5.13	Casing	PP	
5.14	Impeller	PP	
5.15	Shaft	SS316	
5.16	Shaft sleeve	Ceramic	
5.17	Nuts and bolts	SS316	
5.18	Accessories	a. Companion flanges with nuts, bolts and gaskets, internal piping with valves filters and instruments for sealing/ cooling/ lubrication system upto and including isolating valve etc. b. Positioning dowels, drain lugs, vent valve etc. c. Coupling guards, eye bolts, lifting etc.	
5.19	Type of Suction Strainer	MOC PP, (2X100 %) for each CW and PT CLO2 system	
6.0	**CHLORINE DI OXIDE GENERATOR (Automatic)**		
6.1	Purpose	For CW system	For PT system
6.2	Number	Two (2)	Two (2)
6.3	Type	Submerged/ Encapsulated	Submerged/ Encapsulated

6.4	Capacity (minimum)	2 x 90 kg/h (2W)	2 x 12.5 kg/h (1W+1S)
6.5	Material of Construction	PVDF sandwiched with FRP protection for better reliability/ Equivalent PVDF	
6.6	Calibrator	One no. (1)	
6.7	Design pressure (minimum)	10 kg/cm2	
6.8	Solution of concentration	≤ 1500 mg/l	
7.0	**MATERIAL OF CONSTRUCTION OF PIPING AND VALVES**		
7.1	HCl/ $NaClO_2$ piping/ neutralizing waste transfer piping	CPVC as per ASTM D 1784 and F 441 & F 439 Schedule 80 which can withstand a temperature of minimum 85 deg C.	
7.2	All valves in Chemical dosing lines (Acid, Sodium chlorite, chlorine dioxide etc.), neutralizing waste transfer lines	Industrial grade CPVC PN16 rating (minimum).	
7.3	Service water/ Raw water/ Clarified water piping	IS-2062 Gr.-E-250B/ASTM A-36/ASTM A-53 type 'E' Gr. B/IS-3589 Gr. 410 /IS-1239 Heavy.	
7.4	Potable water/ Instrument air/ Service air piping	ASTM A-53 type E Gr. B galvanized/ IS 1239 Gr heavy galvanized/IS 3589 Gr 410 galvanized. Galvanized shall be to IS- 4736 or equivalent.	
7.5	Service water/ Potable water/ Raw water/ Clarified water valves	Cast iron for sizes 65NB and above; gunmetal for sizes 50 NB and below.	
7.6	Instrument air/ Service air valves	Cast carbon steel or forged carbon steel for sizes 65 mm NB & above and Gun metal for sizes 50 NB and below.	
7.7	Flushing arrangement with drain valves for chemical / waste lines	Carbon steel: IS 1239 Part-I (Heavy grade- Black)	
8.0	**Neutralization system for HCl**		
8.1	NaOH Tank	• 1 no. • MOC FRP • Minimum effective capacity: 600 Litre	
8.2	Dissolving basket	1 no. in each tank of FRP MOC	
8.3	Agitator	1 no. in each tank of SS 316/ MS FRP	
8.4	Instruments	2 nos. level transmitters 1 no. level gauge	
9.0	**Neutralization system for NaOCL2**		
9.1	Tanks	• 1 no. HCL tank • MOC FRP • Minimum effective capacity: 800 Litre	• 1 no. Na2SO3 tank • MOC FRP • Minimum effective capacity: 8000 Litre
9.2	Dissolving basket	1 no. in each tank of FRP MOC	
9.3	Agitator	1 no. in each tank of SS 316/ MS FRP	
9.4	Instruments	2 nos. level transmitters in each tank 1 no. level gauges in each tank	
10.0	**BULK HCL STORAGE TANKS**		
10.1	Chemical	HCl (33%)	
10.2	Quantity	3X100%	
10.3	Location	Outdoor	
10.4	Net effective storage capacity	Three (3) Nos (3x100%) of Bulk Acid	

		Storage Tanks (33% HCl) (Tanks shall have net effective storage capacity of 15 days (minimum 4 hours dosing/day in case of CW System and continuous dozing in case of PT system) requirement or 3 x 35 m3 whichever is higher excluding free board and dead storage).
10.5	MOC	FRP (with UV protection)
10.6	Thickness	Shell and top cover: 12 mm (minimum) Bottom: 14 mm (minimum)
10.7	Accessories	a. Nozzles b. Vents c. Fume collection/ absorber d. Density indicator e. drain, overflows f. Charging / maintenance platform
11.0	**BULK NaCLO2 STORAGE TANKS**	
11.1	Chemical	NaCLO2 (31%)
11.2	Quantity	3X100%
11.3	Location	Inside shed
11.4	Net effective storage capacity	Three (3) Nos (3x100%) of Sodium Chlorite Bulk Storage Tanks (31% NaClO2) (Tanks shall have net effective storage capacity of 15 days (minimum 4 hours dosing/day in case of CW System and continuous dozing in case of PT system) requirement or 3x 35 m3 whichever is higher excluding free board and dead storage).
11.5	MOC	FRP (with UV protection)
11.6	Thickness	Shell and top cover: 12 mm (minimum) Bottom: 14 mm (minimum)
11.7	Accessories	a. Nozzles b. Vents c. Fume collection/ absorber d. Density indicator e. drain, overflows f. Charging / maintenance platform
12.0	Grouting material	Shall be in bidder's scope.
13.0	Wrapping, coating and protection	Buried piping shall be protected as under (as per IS-10221). • Surface cleaning by wire brush, power tool cleaning etc. • Apply one coat of coal tar/primer/enamel. • Apply one layer of tape comprising of coal tar. Application of tape shall conform to AWWA C- 203/IS 10221 (Appendix-B) with Minimum thickness of tape as 4MM +10%.

DATASHEET A FOR LIME DOSING SYSTEM

SECONDARY CYCLONE OVERFLOW (TO BE NEUTRALISED) PARAMETERS		
SL. NO.	**DESCRIPTION**	**Parameters**
1	Secondary cyclone overflow from FGD	55.02 m3/hr
2	Operating Temp	59.5°C
3	Design Temp	70 °C
4	Solid (wt. %)	0.03
5	Density (kg/m3)	1024
6	pH before Neutralization	5.3
7	pH required after Neutralization	7
8	Chloride Cl- (mg/l)	25000
9	Purity of lime (%)	83%
10	Moisture	8%
11	Bulk density of material (Kg/m3)	450
TECHNICAL SPECIFICATION/ DATASHEET-MECHANICAL EQUIPMENT FOR LIME DOSING SYSTM		
A	**BUCKET ELEVATOR**	
1	Qty.	1 Nos.
2	Type	Continuous discharge type.
3	Material to be handled	Lime powder
4	Bulk density	450 kg/m³ (volumetric), 640 kg/m³ (load/ structural)
5	Capacity Rated / Design (TPH)	0.25/ 0.5
6	Speed (m/sec)	Bidder to specify.
7	Lift height (m)	To suit layout/ 12-14m approx. (Invert level of Pit below Finish Floor Level to Top of Lime Silo- As per enclosed drg). Bidder to accommodate ± 5 % variation in lift height without any price implication.
8	Bucket type	Bidder to specify.
9	Bucket size	Bidder to specify.
10	Bucket thickness / MOC	4 mm thk. / SS 304
11	Belt Specifications	Chain type with sprocket
12	Casing material of construction	MS, 6 mm thick. Top/ bottom casing, 4mm thk. Middle and hood casing
13	Pulley type	Bidder to specify
14	Head /Boot Pulley dia.	Bidder to specify
15	Bearing type	Spherical roller bearing of suitable size
16	Take up type	Bidder to specify
17	Motor type	As per Motor Specification
18	Motor KW	Bidder to specify
19	Gear box	Bidder to specify
20	Gear box ratio	Bidder to specify
21	High Speed coupling	Bidder to specify
22	Low Speed coupling	Bidder to specify
23	Hold back	Bidder to specify
24	Drive base frame	Bidder to specify

25	Zero Speed Switch	Required.
B	**LIME SILO**	
1	Qty.	2 Nos. (1W+1S)
2	Service/Application	Lime powder handling
3	Location	Indoor (Gypsum Dewatering Building)
4	Operating Pressure	Atmospheric
5	Design Temperature	60 OC
6	Design Code	IS 9178
7	Silo Capacity	1 m3 each/ To suit system requirement
8	Silo Cylinder Diameter	1 m
9	Silo Cylinder Height	To meet silo capacity.
10	Total Silo Height (with Free board)	
11	Silo Bottom Cone Angle	70 o
12	Material for Shell & Bottom Cone	IS 2062: 2011 E250 Quality BR
13	Thickness of shell	10 mm (Min.) + 3 mm (min. corrosion allowance)
14	Material of Silo cone internal lining (conical portion)	SS304
15	Thickness of SS lining	4 mm
16	Outlet of Cone Silo	To suit Screw conveyor
17	Lime Powder Particle size	During detailed engineering
18	Bulk density of material	450 kg/m³ (volumetric), 640 kg/m³ (load/ structural)
C	**CHUTES AND HOPPERS**	
1	Minimum Valley Angle	70 degree
2	Material:	
	I. Chute work	IS 2062: 2011 E250 Quality BR
	II. Sliding zones & adjacent sides	
	III. No striking/ Non-sliding zones	
	IV. Chute with valley angle 80 degree & above.	
	V. In the zone of magnetic field	
	VI. In the zone of flap gates	
	VII. Discharge Hoods overhead pulleys	
3	Inspection Doors	Bidder to provide.
4	Chute Construction	Bidder to provide.
	i) Corners	Bidder to provide.
	ii) Joints Bolted	Bidder to provide.
	iii) Bolt size	Bidder to provide.
	iv) Bolts spacing	Bidder to provide.
D	**a) SCREW CONVEYOR (DUTY PARAMETERS)**	
1	Orientation of screw Axis	Horizontal
2	Length of Screw Conveyor from Feed to Discharge end	2.5-3.0 m (approx.)/ To suit layout requirement
3	Quantity of Lime to be handled (Rated/ Design) TPH	To suit Process requirement/ 20 kg/ hr.

4	Material to be handled	Hydrated Pulverized Lime
5	Impurities	Traces of chloride
6	Type of Inlet feed	Vertical
7	Abrasiveness type	abrasive
8	Shape of dust	Spherical.
9	Hardness	Bond index = 3
10	Moisture contain	8%
11	Particle size	200 mesh
12	Bulk density of material	550 kg/m³
13	Design Temperature	45°C
14	Type of operation	Batch/ continuous
15	Place of application	Gypsum Dewatering Building
16	Type of Screw	Continuous helical spirally welded on central pipe.
17	Type of Trough	“U’’ Trough
18	Length of the screw flight and outlet spout size	Bidder to confirm.
19	Saddle supports for Trough	To be provided throughout the length of Trough.
20	Hanger bearing	Not to be used.
21	Diameter of the Screw and Pitch of the flight	Bidder to confirm.
22	Trough Ends	Trough end to be provided at both drive and tail ends to support the central screw, and earings with Plummer block (anti friction type) and to hold the sealing arrangement to avoid air ingress.
23	Seal type	Split gland type to be provided
24	Moisture content	8% (approx.)
25	Ambient Temperature	As per details in Project Information
26	Angle of repose for the dust	70 degree
27	Type of operation	Batch Operation
28	Measure for prevention of explosion	Not required
29	Whether Hygroscopic	Yes
30	Whether corrosive	Yes
D	**b) SCREW CONVEYOR (MOC)**	
1	Trough	3.15mm. thick min. SS304 (suitable MS supports to be provided).
2	End plate	SS304, thickness not less than 8mm
3	Screw flight	SS304, 3.15 thick minimum.
4	Central pipe (Holding the screw)	SS304, 3.15 thick minimum.
5	End shaft	EN24 shrink fitted with central pipe & welded.
6	Type of bearings	Spherical Roller Bearings
7	Drive and tail end bearings	Anti-friction bearings with plumper block.
9	Drive, Driven &Tightened Sprocket	EN24 (Forged with hardness 450 –500 BHN)
10	Top cover with inspection door (for extension outside portion Flanged Type).	SS304

12	Connecting Chute	SS304
13	Chain and sprocket	Chain – EN24 Forged Hardness 350-400 BHN Sprocket – EN24 Forged Hardness 450-500 BHN
E	**DETAILS OF DRIVE & DRIVE MOTOR (SCREW CONVEYOR)**	
1	Type of drive	Geared motor directly coupled to screw end or connected by chain and sprocket with suitable chain adjuster.
2	Type of gear box	Helical gear box (The gear motor assembly shall be of integral with flange mounted motor).
3	Whether zero speed switch/monitor Required.	No.
4	Support for Drive system	To be provided.
5	Safety Guards	To be provided
6	Drive Rating	To be indicated by the vendor. Necessary backup calculation substantiating the same to be furnished along with the offer
F	**NEUTRALISATION TANK**	
1	Qty.	2 Nos. (1W+1S)
2	Service/Application	Lime Neutralisation Tank
3	Location	Indoor
4	Operating Pressure	Atmospheric
5	Design Pressure	Design Liquid Level
6	Design Temperature	60 ^{O}C
7	Design Code	IS:803
8	Hydro Test	Full of Water
9	Tank Capacity Normal/Maximum	1.8 m^3 / 2.3 m^3 each to suit system requirement
10	Tank Diameter	1.5 m
11	Tank Height	1.8 m / To suit
12	Tank Top Style	Flat
13	Tank Bottom Style	Flat
14	Material for Shell, top & Bottom Cover	IS 2062: 2011 E250 Quality BR
15	Thickness of shell	As calculated from IS:803 + 3 mm (min. corrosion allowance)
16	Material of Tank internal lining	Chlorobutyl/ Bromobutyl Rubber
17	Thickness 0f lining	5 mm
18	Nozzle Schedule & Orientation	1 no. Inlet for service water, 1 no. outlet for Waste water tank & other nozzles as required in GA drg.
G	**AGITATOR**	
1	Qty.	2 Nos. (1 no per neutralization tank)
2	Type	Top entry
3	Location	Indoor (over Neutralisation Tank)
4	MOC	Impeller & Shaft - Alloy 926
5	Impeller Tip Speed	Must not exceed 12m/s
6	Reduction Gear	To be provided

H	**LIME SLURRY DOSING PUMPS**	
1	Qty.	2 Nos. (1W+1S in common for neutralization tanks)
2	Type	Radial Split, Centrifugal, Continuous Duty/ Suitable
3	Location	Indoor
4	Rated Capacity Flow (m3/hr)	0.2-0.4
5	Rated Capacity Head (mWC)	12 m/ to suit
6	Rated Capacity Power (KW)	Bidder to Provide
7	Power consumption (KW)	Bidder to Provide
8	Pump Speed (rpm)	Bidder to Provide
9	Motor Rating (KW)	Bidder to Provide
10	Motor Speed (rpm)	Bidder to Provide
11	Margins (Flow/Head) (%/%)	Bidder to Provide
12	Operation Pressure	Bidder to Provide
13	Design Pressure	Bidder to Provide
14	Material of Base plate	Bidder to Provide
15	Material of Casing	Bidder to Provide
16	Material of Shaft	Bidder to Provide
17	Material of Impeller	Bidder to Provide
18	No. of Bearings	Bidder to Provide
19	Type of Bearings	Heavy duty ball bearings
20	Type of coupling	Bidder to Provide
I	**SLURRY PIPES**	
1	Pipe size (mm)	Bidder to Provide
2	Type of Joints	Bidder to Provide
	Pipe to Pipe/Pipe to Fittings	Bidder to Provide
	Fittings	Bidder to Provide
3	Material / Thickness (mm) of Pipe	MSRL/ for pipes size lower than 3-inch abrasive resistant FRP material (silicon carbide coating on slurry exposed surface)
4	Material Thickness of lining	Bidder to Provide
5	Estimated Life of liners (hrs.)	Bidder to Provide
6	Slurry Solid concentration (w/w %)	Bidder to Provide
7	Slurry Settling Velocity (m/s)	Bidder to Provide
8	Pipe Velocity (m/s)	Bidder to Provide
J	**SUPPORTING STEEL STRUCTURE, PLATFORMS, RAILINGS, LADDERS**	
1	Qty.	As per system requirements (for 2 no Lime Feeding/ Dosing System)
K	**SURGE HOPPER**	
1	Quantity	2 Nos.
2	Material to be conveyed	Lime powder
3	Item	Surge hopper
4	Location	Lime powder manual feed at inlet of bucket elevator
5	Material of Construction	M.S-IS:2062 E250BR
6	Thickness of rectangular sheet	6 mm.

7	Thickness of pyramidal	6 mm.
8	Thickness of liner (SS 304)	3 mm.
9	Painting	As per attached painting schedule
10	Discharge surge hopper	250 NB
11	Inlet of hopper	To suit lime bags unloading
L	**PNEUMATIC VIBRATOR**	
1	Quantity	2 Nos.
2	Purpose	Feed To bucket elevator
3	Item	Pneumatic Vibrator
4	Operating Type	Pneumatic
5	Location	Below Surge Hopper
6	Capacity	0.5 TPH
7	Material to handle	Lime Powder
8	Material size	Powder
9	Size (width + length)	Suitable for 250 NB
10	Vibration frequency	Bidder to Provide
11	Type of mounting	Bidder to Provide
M	**VENT FILTER**	
1	Item	Vent Filter/ Bag Filter
2	Type	Reverse pulse jet type with Blower
3	Quantity / Tag No.	2 Nos.
4	Material to be handle	Lime powder
5	Working pressure	Atmospheric
6	Location	Top of lime silo
7	Vent filter capacity	Bidder to Provide
8	Dust content of air entering vent filter	Bidder to Provide
9	Dust content of air coming out from	< 30 mg /Nm³
10	Air to cloth ratio	1.5 m³ /min/ m³
11	Size of pulse valve	Bidder to Provide
12	Housing	M.S IS: 2062 E250BR 6 mm thick
13	Base frame	Plate -10 mm
14	BAG quantity	Bidder to Provide
15	Cage quantity	Bidder to Provide
16	Pulse valve	Bidder to Provide
17	Timer card	1 Nos.
18	Painting	As per approved painting schedule
19	Instrument air required @ 5-7 Kg/cm2	Bidder to Provide
20	Coil voltage	230 VAC
21	Pressure drop across filter	100 MMWC
22	Operating temperature	Bidder to Provide
23	MATERIAL OF CONSTRUCTION OF VENT FILTER	
24	Dust collector body	M.S IS :2062E250 BR
25	Air header	M.S IS:1239/3589 G.I PAINTED
26	Bag cage	M.S IS: 280/SS
27	Filter bag	Polyester needle felt non-woven
28	House pipe	Reinforced rubber / M.S pipe

29	Socket 25NB	M.S IS: 1239
30	Differential pressure switch	1 No
31	Pipe (Manifold)	IS: 1239(H)
N	**VENT FAN**	
1	Capacity	Bidder to Provide
2	Pressure	Bidder to Provide
3	Quantity	2 Nos.
4	Mounting and Type	Bidder to Provide
5	Motor	Bidder to Provide
O	**MANUAL SLIDE GATE**	
1	Quantity	2 Nos.
2	Purpose	Outlet to lime silo
3	Item	Manual Slide Gate
4	Location	Below Lime silo
5	Size	250 NB
6	Operating type	Manual operated (screw & Handwheel)
7	Material to handle	Lime
8	Material size	Powder
9	MATERIAL OF CONSTRUCTION	
10	Slide plate	6 mm thk. SS 304
11	Body	CI/DI
12	Hand wheel (manual efforts 15 kg)	2 Nos.
P	**MOTORISED SLIDE GATE**	
1	Quantity/ Tag	2 Nos.
2	Purpose	Inlet to screw feeder
3	Item	Motorised Slide Gate
4	Input Supply Voltage	415 V, 3 Ph ,50 Hz
5	Location	Below Lime silo
6	Size	Circular, 250 mm Dia.
7	Operating type	Motorised with integral starter
8	Material to handle	Lime
9	Material size	Powder
10	MATERIAL OF CONSTRUCTION	
11	Slide plate	6 mm thk. SS 304
12	Body	CI/DI
Q	**ROTARY FEEDER**	
1	Quantity	2 Nos.
2	Material to be handle	Lime powder
3	Item	ROTARY FEEDER
4	Location	Outlet to lime silo
5	Capacity	0.5 Ton / hour
6	RPM	Bidder to Provide
7	Rotary diameter	Bidder to Provide
8	Pipe diameter	Bidder to Provide
9	Flap thick	5 mm
10	No. of flap	8
11	Flap MOC	SS-304

12	Shaft dia at bearing	50 mm EN-8
13	Drive	Geared motor of suitable KW
14	Safety factor	1.2
15	Body MOC	M.S-IS:2062 E250 BR

DATASHEET A FOR SEWAGE TREATMENT PLANT

DATASHEET FOR DE-CENTRALISED SEWAGE TREATMENT PLANT -1 (NEAR SWITCHYARD AREA)

S.No.	DESCRIPTION	
1.0	**Capacity of STP**	25 m3/day
2.0	**Bar Screen Chamber**	
2.1	**Chamber**	
2.1.1	Quantity	1no. (1W)
2.1.2	MOC	RCC (Civil by BHEL)
2.1.3	Type	Below ground /above ground
2.1.4	Capacity	As per system requirement
2.2	**Bar Screen (Fine screen)**	
2.2.1	Quantity	1no. (1W)
2.2.2	MOC	SS316
2.2.3	Type	Below ground /above ground
2.2.4	Capacity	As per system requirement
3.0	**Oil & Grease chamber**	
3.1	Quantity	1 no. oil & grease chamber
3.2	Oil & grease chamber MOC	RCC (Civil by BHEL)
3.3	Oil & grease chamber capacity	As per process requirement
3.4	Oil Collection Can/tank	100 Ltrs. (MOC: HDPE)
4.0	**Oil Skimmer**	
4.1	Numbers Required	One (1) no. motor operated oil skimmer
4.2	Flow (m^3/hr)	As per process requirement
4.3	MOC	MS Epoxy painted
4.4	Type	As per process requirement
5.0	**DE-CENTRALISED STP MODULES/SKIDS**	
5.1	Capacity	25 m3/day
5.2	MOC	As per system requirement
6.0	**Sludge recirculation pump**	
6.1	**Option -I**	
6.1.1	Type	Submersible type
6.1.2	Quantity	2 Nos. (1W+1S)
6.1.3	Suction condition	Flooded.
6.1.4	Capacity	As per process requirement
6.1.5	Head	As per process requirement
6.1.6	MOC	
	• MOC casing	Cast Iron
	• MOC impeller	Stainless Steel AISI 304
	• MOC shaft	SS 410
6.1.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
6.1.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
6.2	**Option -II**	
6.2.1	Type	Horizontal Centrifugal type
6.2.2	Quantity	2 Nos. (1W+1S), all connected.
6.2.3	Suction condition	Flooded.
6.2.4	Capacity	As per process requirement
6.2.5	Head	As per process requirement
6.2.6	MOC	

	• Casing	Cast Iron IS:210 Gr FG 260
	• Impeller	Stainless steel CF 8M
	• Shaft & Shaft sleeve material	Stainless steel SS Gr. 304 & SS316
	• Packing seal	Mechanical type
	• Common base plate	Carbon steel IS:2062
6.2.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
6.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
7.0	**Air Blowers for sewage treatment skid**	
7.1	Numbers Required	2 nos. (1W+1S)
7.2	Type of Blower	Twin lobe type
7.3	Flow	As per process requirement
7.4	Head	As per process requirement
7.5	MOC	CI to IS 210 Gr. FG 260
7.6	Accessories	NRV, Safety valves, Silencer, PRV, Filter, etc
7.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS: 12615
7.8	Common Base plate/ mounting plate	MS as per IS 2062
7.9	Instrumentation	Pressure transmitters, Pressure gauges, Flow Transmitters etc.
8.0	**Filter Feed Tank**	
8.1	Numbers Required	One (1) no. and shall be in bidder's scope
8.2	Effective Capacity	6 hrs storage
8.3	MOC	As per supplier's recommendation
8.4	Instrumentation	Level indicating transmitters etc.
9.0	**Hypo Dosing System**	
9.1	**Hypo Dosing Tank**	
9.1.1	Numbers Required	One (1) no.
9.1.2	Effective Capacity	100 liters OR+ 24 hour storage requirement @ suitable dosing rate whichever is higher
9.1.3	MOC	FRP/HDPE/GRP
9.1.4	Instrumentation	Level indicator and level interlock for pumps.
9.2	**Hypo Dosing Pump for treated water tank**	
9.2.1	Quantity	Two (1W+1S) no.
9.2.2	Capacity	As per process requirement.
9.2.3	Type	Electronic dosing pump with auto stroke controller
9.2.4	MOC	PP
9.2.5	Instrumentation	Pressure transmitters, Pressure gauges etc.
10.0	**Filter Feed Pumps**	
10.1	**Option -I**	
10.1.1	Type	Submersible type
10.1.2	Quantity	2 Nos. (1W+1S)
10.1.3	Suction condition	Flooded.
10.1.4	Capacity	As per process requirement
10.1.5	Head	As per process requirement
10.1.6	MOC	
	• MOC casing	Cast Iron

	• MOC impeller	Stainless Steel AISI 304
	• MOC shaft	SS 410
10.1.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
10.1.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
10.2	**Option -II**	
10.2.1	Type	Horizontal Centrifugal type
10.2.2	Quantity	2 Nos. (1W+1S), all connected.
10.2.3	Suction condition	Flooded.
10.2.4	Capacity	As per process requirement
10.2.5	Head	As per process requirement
10.2.6	MOC	
	• Casing	Cast Iron IS:210 Gr FG 260
	• Impeller	Stainless steel CF 8M
	• Shaft & Shaft sleeve material	Stainless steel SS Gr. 304 & SS316
	• Packing seal	Mechanical type
	• Common base plate	Carbon steel IS:2062
10.2.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
10.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
11.0	**Multi Grade Filter**	
11.1	Quantity	1 no.
11.2	Capacity	As per system requirement
11.3	Design pressure	Shut off head of Filter feed pump + 5% margin
11.4	MOC	As per supplier’s recommendation
11.5	Media	To suit system requirement
11.6	Instrumentation	Differential Pressure transmitters, Pressure gauges etc.
12.0	**Activated Carbon Filter**	
12.1	Quantity	1 no.
12.2	Capacity	As per system requirement
12.3	Design pressure	Shut off head of Filter feed pump + 5% margin
12.4	MOC	As per supplier’s recommendation
12.5	Media	Activated Carbon
12.6	Instrumentation	Differential Pressure transmitters, Pressure gauges etc.
13.0	**Treated Water Tank**	
13.1	Number required	1 no. and shall be in bidder’s scope
13.2	Capacity	6hrs storage
13.3	MOC of tank	As per supplier’s recommendation
13.4	Instrumentation	Level transmitters etc.
14.0	**Treated Water Disposal Pumps**	
14.1	**Option -I**	
14.1.1	Type	Submersible type
14.1.2	Quantity	2 Nos. (1W+1S)
14.1.3	Suction condition	Flooded.
14.1.4	Capacity	2.0 m3/h (Minimum)
14.1.5	Head	25 mWC (Minimum)

14.1.6	MOC	
	• MOC casing	Cast Iron
	• MOC impeller	Stainless Steel AISI 304
	• MOC shaft	SS 410
14.1.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
14.1.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
14.2	**Option -II**	
14.2.1	Type	Horizontal Centrifugal type
14.2.2	Quantity	2 Nos. (1W+1S), all connected.
14.2.3	Suction condition	Flooded.
14.2.4	Capacity	2.0 m3/h (Minimum)
14.2.5	Head	25 mWC (Minimum)
14.2.6	MOC	
	• Casing	Cast Iron IS:210 Gr FG 260
	• Impeller	Stainless steel CF 8M
	• Shaft & Shaft sleeve material	Stainless steel SS Gr. 304 & SS316
	• Packing seal	Mechanical type
	• Common base plate	Carbon steel IS:2062
14.2.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
14.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
15.0	**Sewage Sump S1**	
15.1	MOC	RCC (Civil by BHEL)
15.2	Type	Covered at top, below ground
15.3	Capacity	10 m3
15.4	Accessories	Coarse bar screen (MOC: SS-316) at sump (S1) location
15.5	Instrumentation	Level indicator, Level transmitters etc.
16.0	**Sewage Sump S1 Transfer Pumps**	
16.1	Type	Vertical submersible grinder type
16.2	Quantity per sump	2 X 100 % (1W+1S)
16.3	Capacity	10 m3/h (Minimum)
16.4	MOC casing	Cast Iron to IS 210 FG 260 / CS ASTM A-216 Gr. WCB
16.5	MOC impeller	Stainless Steel AISI 304
16.6	MOC shaft	SS 410
16.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
16.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
17.0	**Sewage Sump S4**	
17.1	MOC	RCC (Civil by BHEL)
17.2	Type	Covered at top, below ground
17.3	Capacity	4 m3
17.4	Accessories	Coarse bar screen (MOC : SS-316) at sump (S1) location
17.5	Instrumentation	Level indicator, Level transmitters etc.
18.0	**Sewage Sump S4 Transfer Pumps**	

18.1	Type	Vertical submersible grinder type
18.2	Quantity per sump	2 X 100 % (1W+1S)
18.3	Capacity	10 m3/h (Minimum)
18.4	MOC casing	Cast Iron to IS 210 FG 260 / CS ASTM A-216 Gr. WCB
18.5	MOC impeller	Stainless Steel AISI 304
18.6	MOC shaft	SS 410
18.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
18.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
19.0	**MATERIAL OF CONSTRUCTION OF PIPING AND FITTINGS**	
19.1	MOC of Piping and fittings of handling sewage and treated sewage	HDPE as per ASTM D3350 CL 34543C, FM Class 150/ IS: 4984 or Equivalent
19.2	MOC of Piping and fittings of Chemical dosing	CPVC as per ASTM D 1784 and F 441 & F 439 Schedule 80.
19.3	MOC of service water piping	IS-2062 Gr.-E-250B/ ASTM A-36/ASTM A-53 type 'E' Gr.B/ IS-3589 Gr. 410 /IS-1239 Heavy.
19.4	MOC of compressed air piping (non submerged)	ASTM A-53 type E Gr. B galvanized/ IS 1239 Gr heavy galvanized/IS 3589 Gr 410 galvanized. Galvanized shall be to IS- 4736 or equivalent
19.5	MOC of compressed air piping (submerged)	CPVC as per ASTM D 1784 and F 441 & F 439 Schedule 80.
20.0	**Material of Construction valves**	
20.1	MOC of valves (sewage water, treated water and chemical dosing)	CPVC as per ASTM F441 CPVC 4120 Schedule 80/ equivalent.
20.2	MOC of compressed air valves	Cast iron for sizes 65NB and above; gunmetal for sizes 50 NB and below.
20.3	MOC of service water	Cast carbon steel or forged carbon steel for sizes 65 mm NB & above and Gun metal for sizes 50 NB and below.
21.0	**Chain Pulley Block**	
21.1	Quantity	1 No. Chain Pulley Block of adequate capacity with tripod arrangement, to meet the erection and maintenance requirements are to be provided by bidder

Note:
1. Sewage Lifting sump's depth may vary from 2.5 to 4.5 meters.
2. Bidder to adhere typical details shown for Sewage collection sumps (S1 to S6) included in Annexure XIII (Drawings).

DATASHEET FOR DE-CENTRALISED SEWAGE TREATMENT PLANT -2 (NEAR WTP AREA)

S.No.	DESCRIPTION	
1.0	**Capacity of STP**	25 m3/day
2.0	**Bar Screen Chamber**	
2.1	**Chamber**	

2.1.1	Quantity	1no. (1W)
2.1.2	MOC	RCC (Civil by BHEL)
2.1.3	Type	Below ground /above ground
2.1.4	Capacity	As per system requirement
2.2	**Bar Screen (Fine screen)**	
2.2.1	Quantity	1no. (1W)
2.2.2	MOC	SS316
2.2.3	Type	Below ground /above ground
2.2.4	Capacity	As per system requirement
3.0	**Oil & Grease chamber**	
3.1	Quantity	1 no. oil & grease chamber (if required 1 no. oil skimmer shall be provided by bidder)
3.2	Oil & grease chamber MOC	RCC (Civil by BHEL)
3.3	Oil & grease chamber capacity	As per process requirement
3.4	Oil Collection Can/tank	100 Ltrs. (MOC:HDPE)
4.0	**Oil Skimmer**	
4.1	Numbers Required	One (1) no. motor operated oil skimmer
4.2	Flow (m^3/hr)	As per process requirement
4.3	MOC	MS Epoxy painted
4.4	Type	As per process requirement
5.0	**DE-CENTRALISED STP MODULES/SKIDS**	
5.1	Capacity	25 m3/day
5.2	MOC	As per system requirement
6.0	**Sludge recirculation pump**	
6.1	**Option -I**	
6.1.1	Type	Submersible type
6.1.2	Quantity	2 Nos. (1W+1S)
6.1.3	Suction condition	Flooded.
6.1.4	Capacity	As per process requirement
6.1.5	Head	As per process requirement
6.1.6	MOC	
	• MOC casing	Cast Iron
	• MOC impeller	Stainless Steel AISI 304
	• MOC shaft	SS 410
6.1.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
6.1.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
6.2	**Option -II**	
6.2.1	Type	Horizontal Centrifugal type
6.2.2	Quantity	2 Nos. (1W+1S), all connected.
6.2.3	Suction condition	Flooded.
6.2.4	Capacity	As per process requirement
6.2.5	Head	As per process requirement
6.2.6	MOC	
	• Casing	Cast Iron IS:210 Gr FG 260
	• Impeller	Stainless steel CF 8M
	• Shaft & Shaft sleeve material	Stainless steel SS Gr. 304 & SS316
	• Packing seal	Mechanical type
	• Common base plate	Carbon steel IS:2062
6.2.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz,

		TEFC, Energy Efficiency Class IE-3 as per IS : 12615
6.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
7.0	**Air Blowers for sewage treatment skid**	
7.1	Numbers Required	2 nos. (1W+1S)
7.2	Type of Blower	Twin lobe type
7.3	Flow	As per process requirement
7.4	Head	As per process requirement
7.5	MOC	CI to IS 210 Gr. FG 260
7.6	Accessories	NRV, Pressure Gauge, Safety valves, Silencer, PRV, Filter, etc
7.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
7.8	Common Base plate/ mounting plate	MS as per IS 2062
7.9	Instrumentation	Pressure transmitters, Pressure gauges, Flow Transmitters etc.
8.0	**Filter Feed Tank**	
8.1	Numbers Required	One (1) no. and shall be in bidder's scope
8.2	Effective Capacity	6 hrs storage
8.3	MOC	As per supplier's recommendation
8.4	Instrumentation	Level indicating transmitters etc.
9.0	**Hypo Dosing System**	
9.1	**Hypo Dosing Tank**	
9.1.1	Numbers Required	One (1) no.
9.1.2	Effective Capacity	100 liters OR+ 24 hour storage requirement @ suitable dosing rate whichever is higher
9.1.3	MOC	FRP/HDPE/GRP
9.1.4	Instrumentation	Level indicator and level interlock for pumps.
9.2	**Hypo Dosing Pump for treated water tank**	
9.2.1	Quantity	Two (1W+1S) no.
9.2.2	Capacity	As per process requirement.
9.2.3	Type	Electronic dosing pump with auto stroke controller
9.2.4	MOC	PP
9.2.5	Instrumentation	Pressure transmitters, Pressure gauges etc.
10.0	**Filter Feed Pumps**	
10.1	**Option -I**	
10.1.1	Type	Submersible type
10.1.2	Quantity	2 Nos. (1W+1S)
10.1.3	Suction condition	Flooded.
10.1.4	Capacity	As per process requirement
10.1.5	Head	As per process requirement
10.1.6	MOC	
	• MOC casing	Cast Iron
	• MOC impeller	Stainless Steel AISI 304
	• MOC shaft	SS 410
10.1.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
10.1.8	Instrumentation	Pressure transmitters, Pressure gauges etc.

10.2	**Option -II**	
10.2.1	Type	Horizontal Centrifugal type
10.2.2	Quantity	2 Nos. (1W+1S), all connected.
10.2.3	Suction condition	Flooded.
10.2.4	Capacity	As per process requirement
10.2.5	Head	As per process requirement
10.2.6	MOC	
	• Casing	Cast Iron IS:210 Gr FG 260
	• Impeller	Stainless steel CF 8M
	• Shaft & Shaft sleeve material	Stainless steel SS Gr. 304 & SS316
	• Packing seal	Mechanical type
	• Common base plate	Carbon steel IS:2062
10.2.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
10.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
11.0	**Multi Grade Filter**	
11.1	Quantity	1 no.
11.2	Capacity	As per system requirement
11.3	Design pressure	Shut off head of Filter feed pump + 5% margin
11.4	MOC	As per supplier's recommendation
11.5	Media	To suit system requirement
11.6	Instrumentation	Differential Pressure transmitters, Pressure gauges etc.
12.0	**Activated Carbon Filter**	
12.1	Quantity	1 no.
12.2	Capacity	As per system requirement
12.3	Design pressure	Shut off head of Filter feed pump + 5% margin
12.4	MOC	As per supplier's recommendation
12.5	Media	Activated Carbon
12.6	Instrumentation	Differential Pressure transmitters, Pressure gauges etc.
13.0	**Treated Water Tank**	
13.1	Number required	1 no. and shall be in bidder's scope
13.2	Capacity	6hrs storage
13.3	MOC of tank	As per supplier's recommendation
13.4	Instrumentation	Level transmitters etc.
14.0	**Treated Water Disposal Pumps**	
14.1	**Option -I**	
14.1.1	Type	Submersible type
14.1.2	Quantity	2 Nos. (1W+1S)
14.1.3	Suction condition	Flooded.
14.1.4	Capacity	2.0 m^3/h (Minimum)
14.1.5	Head	25 mWC (Minimum)
14.1.6	MOC	
	• MOC casing	Cast Iron
	• MOC impeller	Stainless Steel AISI 304
	• MOC shaft	SS 410
14.1.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per

		IS : 12615
14.1.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
14.2	**Option -II**	
14.2.1	Type	Horizontal Centrifugal type
14.2.2	Quantity	2 Nos. (1W+1S), all connected.
14.2.3	Suction condition	Flooded.
14.2.4	Capacity	2.0 m3/h (Minimum)
14.2.5	Head	25 mWC (Minimum)
14.2.6	MOC	
	• Casing	Cast Iron IS:210 Gr FG 260
	• Impeller	Stainless steel CF 8M
	• Shaft & Shaft sleeve material	Stainless steel SS Gr. 304 & SS316
	• Packing seal	Mechanical type
	• Common base plate	Carbon steel IS:2062
14.2.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
14.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
15.0	**Sewage Sump S2**	
15.1	MOC	RCC (Civil by BHEL)
15.2	Type	Covered at top, below ground
15.3	Capacity	6 m3
15.4	Accessories	Coarse bar screen (MOC : SS-316) at sump (S1) location
15.5	Instrumentation	Level indicator, Level transmitters etc.
16.0	**Sewage Sump S2 Transfer Pumps**	
16.1	Type	Vertical submersible grinder type
16.2	Quantity per sump	2 X 100 % (1W+1S)
16.3	Capacity	10 m^3/h (Minimum)
16.4	MOC casing	Cast Iron to IS 210 FG 260 / CS ASTM A-216 Gr. WCB
16.5	MOC impeller	Stainless Steel AISI 304
16.6	MOC shaft	SS 410
16.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
16.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
17.0	**Sewage Sump S3**	
17.1	MOC	RCC (Civil by BHEL)
17.2	Type	Covered at top, below ground
17.3	Capacity	6 m3
17.4	Accessories	Coarse bar screen (MOC : SS-316) at sump (S1) location
17.5	Instrumentation	Level indicator, Level transmitters etc.
18.0	**Sewage Sump S3 Transfer Pumps**	
18.1	Type	Vertical submersible grinder type
18.2	Quantity per sump	2 X 100 % (1W+1S)
18.3	Capacity	5 m^3/h (Minimum)
18.4	MOC casing	Cast Iron to IS 210 FG 260 / CS ASTM A-

		216 Gr. WCB
18.5	MOC impeller	Stainless Steel AISI 304
18.6	MOC shaft	SS 410
18.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
18.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
19.0	**Sewage Sump S5**	
19.1	MOC	RCC (Civil by BHEL)
19.2	Type	Covered at top, below ground
19.3	Capacity	2 m3
19.4	Accessories	Coarse bar screen (MOC: SS-316) at sump (S1) location
19.5	Instrumentation	Level indicator, Level transmitters etc.
20.0	**Sewage Sump S5 Transfer Pumps**	
20.1	Type	Vertical submersible grinder type
20.2	Quantity per sump	2 X 100 % (1W+1S)
20.3	Capacity	10 m^3/h (Minimum)
20.4	MOC casing	Cast Iron to IS 210 FG 260 / CS ASTM A-216 Gr. WCB
20.5	MOC impeller	Stainless Steel AISI 304
20.6	MOC shaft	SS 410
20.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
20.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
21.0	**MATERIAL OF CONSTRUCTION OF PIPING AND FITTINGS**	
21.1	MOC of Piping and fittings of handling sewage and treated sewage	HDPE as per ASTM D3350 CL 34543C, FM Class 150/ IS: 4984 or Equivalent
21.2	MOC of Piping and fittings of Chemical dosing	CPVC as per ASTM D 1784 and F 441 & F 439 Schedule 80.
21.3	MOC of service water piping	IS-2062 Gr.-E-250B/ ASTM A-36/ASTM A-53 type 'E' Gr.B/ IS-3589 Gr. 410 /IS-1239 Heavy.
21.4	MOC of compressed air piping (non submerged)	ASTM A-53 type E Gr. B galvanized/ IS 1239 Gr heavy galvanized/IS 3589 Gr 410 galvanized. Galvanized shall be to IS- 4736 or equivalent
21.5	MOC of compressed air piping (submerged)	CPVC as per ASTM D 1784 and F 441 & F 439 Schedule 80.
22.0	**Material of Construction valves**	
22.1	MOC of valves (sewage water, treated water and chemical dosing)	CPVC as per ASTM F441 CPVC 4120 Schedule 80/ equivalent.
22.2	MOC of compressed air valves	Cast iron for sizes 65NB and above; gunmetal for sizes 50 NB and below.
22.3	MOC of service water	Cast carbon steel or forged carbon steel for sizes 65 mm NB & above and Gun metal for sizes 50 NB and below.
23.0	**Chain Pulley Block**	
23.1	Quantity	1 No. Chain Pulley Block of adequate

		capacity with tripod arrangement, to meet the erection and maintenance requirements are to be provided by bidder

Note:
1. Sewage Lifting sump's depth may vary from 2.5 to 4.5 meters.
2. Bidder to adhere typical details shown for Sewage collection sumps (S1 to S6) included in Annexure XIII (Drawings).

DATASHEET FOR DE-CENTRALISED SEWAGE TREATMENT PLANT -3 (NEAR CHP AREA)

S.No.	DESCRIPTION	
1.0	**Capacity of STP**	25 m3/day
2.0	**Bar Screen Chamber**	
2.1	**Chamber**	
2.1.1	Quantity	1no. (1W)
2.1.2	MOC	RCC (Civil by BHEL)
2.1.3	Type	Below ground /above ground
2.1.4	Capacity	As per system requirement
2.2	**Bar Screen (Fine screen)**	
2.2.1	Quantity	1no. (1W)
2.2.2	MOC	SS316
2.2.3	Type	Below ground /above ground
2.2.4	Capacity	As per system requirement
3.0	**Oil & Grease chamber**	
3.1	Quantity	1 no. oil & grease chamber
3.2	Oil & grease chamber MOC	RCC (Civil by BHEL)
3.3	Oil & grease chamber capacity	As per process requirement
3.4	Oil Collection Can/tank	100 Ltrs. (MOC: HDPE)
4.0	**Oil Skimmer**	
4.1	Numbers Required	One (1) no. motor operated oil skimmer
4.2	Flow (m^3/hr)	As per process requirement
4.3	MOC	MS Epoxy painted
4.4	Type	As per process requirement
5.0	**DE-CENTRALISED STP MODULES/SKIDS**	
5.1	Capacity	25 m3/day
5.2	MOC	As per system requirement
6.0	**Sludge recirculation pump**	
6.1	**Option -I**	
6.1.1	Type	Submersible type
6.1.2	Quantity	2 Nos. (1W+1S)
6.1.3	Suction condition	Flooded.
6.1.4	Capacity	As per process requirement
6.1.5	Head	As per process requirement
6.1.6	MOC	
	• MOC casing	Cast Iron
	• MOC impeller	Stainless Steel AISI 304
	• MOC shaft	SS 410
6.1.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
6.1.8	Instrumentation	Pressure transmitters, Pressure gauges etc.

6.2	**Option -II**	
6.2.1	Type	Horizontal Centrifugal type
6.2.2	Quantity	2 Nos. (1W+1S), all connected.
6.2.3	Suction condition	Flooded.
6.2.4	Capacity	As per process requirement
6.2.5	Head	As per process requirement
6.2.6	MOC	
	• Casing	Cast Iron IS:210 Gr FG 260
	• Impeller	Stainless steel CF 8M
	• Shaft & Shaft sleeve material	Stainless steel SS Gr. 304 & SS316
	• Packing seal	Mechanical type
	• Common base plate	Carbon steel IS:2062
6.2.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
6.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
7.0	**Air Blowers for sewage treatment skid**	
7.1	Numbers Required	2 nos. (1W+1S)
7.2	Type of Blower	Twin lobe type
7.3	Flow	As per process requirement
7.4	Head	As per process requirement
7.5	MOC	CI to IS 210 Gr. FG 260
7.6	Accessories	NRV, Pressure Gauge, Safety valves, Silencer, PRV, Filter, etc
7.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
7.8	Common Base plate/ mounting plate	MS as per IS 2062
7.9	Instrumentation	Pressure transmitters, Pressure gauges, Flow Transmitters etc.
8.0	**Filter Feed Tank**	
8.1	Numbers Required	One (1) no. and shall be in bidder's scope
8.2	Effective Capacity	6 hrs storage
8.3	MOC	As per supplier's recommendation
8.4	Instrumentation	Level indicating transmitters etc.
9.0	**Hypo Dosing System**	
9.1	**Hypo Dosing Tank**	
9.1.1	Numbers Required	One (1) no.
9.1.2	Effective Capacity	100 liters OR+ 24 hour storage requirement @ suitable dosing rate whichever is higher
9.1.3	MOC	FRP/HDPE/GRP
9.1.4	Instrumentation	Level indicator and level interlock for pumps.
9.2	**Hypo Dosing Pump for treated water tank**	
9.2.1	Quantity	Two (1W+1S) no.
9.2.2	Capacity	As per process requirement.
9.2.3	Type	Electronic dosing pump with auto stroke controller
9.2.4	MOC	PP
9.2.5	Instrumentation	Pressure transmitters, Pressure gauges etc.
10.0	**Filter Feed Pumps**	
10.1	**Option -I**	

10.1.1	Type	Submersible type
10.1.2	Quantity	2 Nos. (1W+1S)
10.1.3	Suction condition	Flooded.
10.1.4	Capacity	As per process requirement
10.1.5	Head	As per process requirement
10.1.6	MOC	
	• MOC casing	Cast Iron
	• MOC impeller	Stainless Steel AISI 304
	• MOC shaft	SS 410
10.1.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
10.1.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
10.2	**Option -II**	
10.2.1	Type	Horizontal Centrifugal type
10.2.2	Quantity	2 Nos. (1W+1S), all connected.
10.2.3	Suction condition	Flooded.
10.2.4	Capacity	As per process requirement
10.2.5	Head	As per process requirement
10.2.6	MOC	
	• Casing	Cast Iron IS:210 Gr FG 260
	• Impeller	Stainless steel CF 8M
	• Shaft & Shaft sleeve material	Stainless steel SS Gr. 304 & SS316
	• Packing seal	Mechanical type
	• Common base plate	Carbon steel IS:2062
10.2.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
10.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
11.0	**Multi Grade Filter**	
11.1	Quantity	1 no.
11.2	Capacity	As per system requirement
11.3	Design pressure	Shut off head of Filter feed pump + 5% margin
11.4	MOC	As per supplier’s recommendation
11.5	Media	To suit system requirement
11.6	Instrumentation	Differential Pressure transmitters, Pressure gauges etc.
12.0	**Activated Carbon Filter**	
12.1	Quantity	1 no.
12.2	Capacity	As per system requirement
12.3	Design pressure	Shut off head of Filter feed pump + 5% margin
12.4	MOC	As per supplier’s recommendation
12.5	Media	Activated Carbon
12.6	Instrumentation	Differential Pressure transmitters, Pressure gauges etc.
13.0	**Treated Water Tank**	
13.1	Number required	1 no. and shall be in bidder’s scope
13.2	Capacity	6hrs storage
13.3	MOC of tank	As per supplier’s recommendation
13.4	Instrumentation	Level transmitters etc.

14.0	**Treated Water Disposal Pumps**	
14.1	**Option -I**	
14.1.1	Type	Submersible type
14.1.2	Quantity	2 Nos. (1W+1S)
14.1.3	Suction condition	Flooded.
14.1.4	Capacity	2.0 m^3/h (Minimum)
14.1.5	Head	25 mWC (Minimum)
14.1.6	MOC	
	• MOC casing	Cast Iron
	• MOC impeller	Stainless Steel AISI 304
	• MOC shaft	SS 410
14.1.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
14.1.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
14.2	**Option -II**	
14.2.1	Type	Horizontal Centrifugal type
14.2.2	Quantity	2 Nos. (1W+1S), all connected.
14.2.3	Suction condition	Flooded.
14.2.4	Capacity	2.0 m3/h (Minimum)
14.2.5	Head	25 mWC (Minimum)
14.2.6	MOC	
	• Casing	Cast Iron IS:210 Gr FG 260
	• Impeller	Stainless steel CF 8M
	• Shaft & Shaft sleeve material	Stainless steel SS Gr. 304 & SS316
	• Packing seal	Mechanical type
	• Common base plate	Carbon steel IS:2062
14.2.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
14.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
15.0	**Sewage Sump S6**	
15.1	MOC	RCC (Civil by BHEL)
15.2	Type	Covered at top, below ground
15.3	Capacity	5 m3
15.4	Accessories	Coarse bar screen (MOC : SS-316) at sump (S1) location
15.5	Instrumentation	Level indicator, Level transmitters etc.
16.0	**Sewage Sump S6 Transfer Pumps**	
16.1	Type	Vertical submersible grinder type
16.2	Quantity per sump	2 X 100 % (1W+1S)
16.3	Capacity	5 m^3/h (Minimum)
16.4	MOC casing	Cast Iron to IS 210 FG 260 / CS ASTM A-216 Gr. WCB
16.5	MOC impeller	Stainless Steel AISI 304
16.6	MOC shaft	SS 410
16.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615

16.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
17.0	**MATERIAL OF CONSTRUCTION OF PIPING AND FITTINGS**	
17.1	MOC of Piping and fittings of handling sewage and treated sewage	HDPE as per ASTM D3350 CL 34543C, FM Class 150/ IS: 4984 or Equivalent
17.2	MOC of Piping and fittings of Chemical dosing	CPVC as per ASTM D 1784 and F 441 & F 439 Schedule 80.
17.3	MOC of service water piping	IS-2062 Gr.-E-250B/ ASTM A-36/ASTM A-53 type 'E' Gr.B/ IS-3589 Gr. 410 /IS-1239 Heavy.
17.4	MOC of compressed air piping (non submerged)	ASTM A-53 type E Gr. B galvanized/ IS 1239 Gr heavy galvanized/IS 3589 Gr 410 galvanized. Galvanized shall be to IS- 4736 or equivalent
17.5	MOC of compressed air piping (submerged)	CPVC as per ASTM D 1784 and F 441 & F 439 Schedule 80.
18.0	**Material of Construction valves**	
18.1	MOC of valves (sewage water, treated water and chemical dosing)	CPVC as per ASTM F441 CPVC 4120 Schedule 80/ equivalent.
18.2	MOC of compressed air valves	Cast iron for sizes 65NB and above; gunmetal for sizes 50 NB and below.
18.3	MOC of service water	Cast carbon steel or forged carbon steel for sizes 65 mm NB & above and Gun metal for sizes 50 NB and below.
19.0	**Chain Pulley Block**	
19.1	Quantity	1 No. Chain Pulley Block of adequate capacity with tripod arrangement, to meet the erection and maintenance requirements are to be provided by bidder

Note:
1. Sewage Lifting sump's depth may vary from 2.5 to 4.5 meters.
2. Bidder to adhere typical details shown for Sewage collection sumps (S1 to S6) included in Annexure XIII (Drawings).

DATASHEET A FOR EFFLUENT TREATMENT PLANT

1.	**TG UNIT-1A FLOOR WASH WATER SUMP (E1A)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	12 m3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	1. Floor wash from TG UNIT 1 containing oil traces 2. Oily effluent from TDBFP-B Unit-1
2.	**TG UNIT-1A FLOOR WASH WATER TRANSFER PUMPS**	
a)	Number required	Two (1W+1S) nos.
b)	Type	Vertical Screw type
c)	Location	Outdoor
d)	Fluid to be handled	1. Floor wash from TG UNIT 1 containing oil traces 2. Oily effluent from TDBFP-B Unit-1
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	25
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
3.	**TG UNIT-1B FLOOR WASH WATER SUMP (E1B)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	12 m3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	1. Floor wash from TG UNIT 1 containing oil traces 2. Oily effluent from TDBFP-A Unit-1 & MDBFP Unit-1 area 3. Oily effluent from COT/DOT area
4.	**TG UNIT-1B FLOOR WASH WATER TRANSFER PUMPS**	
a)	Number required	Two (1W+1S) nos.
b)	Type	Vertical Screw type
c)	Location	Outdoor
d)	Fluid to be handled	1. Floor wash from TG UNIT 1 containing oil traces 2. Oily effluent from TDBFP-A Unit-1 & MDBFP Unit-1 area 3. Oily effluent from COT/DOT area
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	25
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316

5.	**COT/DOT WASTE WATER COLLECTION SUMP (E1C)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	1 m3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	1. Oily effluent from COT/DOT area
6.	**COT/DOT WASTE WATER TRANSFER PUMPS**	
a)	Number required	Two (1W+1S) nos.
b)	Type	Horizontal Screw type
c)	Location	Outdoor
d)	Fluid to be handled	1. Oily effluent from COT/DOT area
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	2
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
7.	**TG UNIT-2A FLOOR WASH WATER SUMP (E2A)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	12 m3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	1. Floor wash from TG UNIT 2 containing oil traces 2. Oily effluent from TDBFP-B Unit-2
8.	**TG UNIT-2A FLOOR WASH WATER TRANSFER PUMPS**	
a)	Number required	Two (1W+1S) nos.
b)	Type	Vertical Screw type
c)	Location	Outdoor
d)	Fluid to be handled	1. Floor wash from TG UNIT 2 containing oil traces 2. Oily effluent from TDBFP-A Unit-2
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	25
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
9.	**TG UNIT-2B FLOOR WASH WATER SUMP (E2B)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	12 m3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	1. Floor wash from TG UNIT 2 containing oil traces 2. Oily effluent from TDBFP-A Unit-2 & MDBFP Unit-2 area

10.	**TG UNIT-2B FLOOR WASH WATER TRANSFER PUMPS**	
a)	Number required	Two (1W+1S) nos..
b)	Type	Vertical Screw type
c)	Location	Outdoor
d)	Fluid to be handled	1. Floor wash from TG UNIT 2 containing oil traces 2. Oily effluent from TDBFP-A Unit-2 & MDBFP Unit-2 area
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	25
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
11.	**TRANSFORMER YARD OILY WASTE SUMP UNIT-1 (E4)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	As specified in Transformer area Oil Water Separator, depth 4 m to 5 m
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	Oily effluent from Transformer area Oil Water Separator
12.	**TRANSFORMER YARD UNIT-1 OILY WASTE TRANSFER PUMPS**	
a)	Number required	Two (1W+1S) nos.
b)	Type	Vertical Screw type
c)	Location	Outdoor
d)	Fluid to be handled	Oily effluent from Transformer area Oil Water Separator
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	10
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
13.	**TRANSFORMER YARD OILY WASTE SUMP UNIT-2 (E5)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	As specified in Transformer area Oil Water Separator, depth 4 m to 5 m
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	Oily effluent from Transformer area Oil Water Separator
14.	**TRANSFORMER YARD UNIT-2 OILY WASTE TRANSFER PUMPS**	
a)	Number required	Two (1W+1S) nos.
b)	Type	Vertical Screw type
c)	Location	Outdoor

d)	Fluid to be handled	Oily effluent from Transformer area Oil Water Separator
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	10
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
15.	**MRS WASTE WATER SUMP UNIT-1 (E6)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	10 m3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	1. Floor wash waste (containing coal laden particles) from MRS area Unit-1 2. Waste water (containing coal laden particles) from Feeder and Tripper Floor Unit-1
16.	**MRS UNIT-1 OILY WASTE WATER TRANSFER PUMPS**	
a)	Number required	Two (1W+1S) nos.
b)	Type	Vertical Centrifugal type
c)	Location	Outdoor
d)	Fluid to be handled	1. Floor wash waste (containing coal laden particles) from MRS area Unit-1 2. Waste water (containing coal laden particles) from Feeder and Tripper Floor Unit-1
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	10
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260, S-0.1 (max.) P-0.15 (max.)
	• Stuffing box, Gland	2.5% Ni CI IS:210 GR. FG 260
	• Impeller	ASTM A351 CF8M
	• Shaft, Shaft coupling, shaft sleeves	SS 410
	• Column pipe & discharge pipe, shaft enclosing	CS as per IS:2062 or eq.
	• Gland packing	TIWA
	• Gasket	Neoprene Rubber
	• Bolts & nuts	SS
	• Base plate and soleplate	CS (min. 10 thick)
17.	**MRS WASTE WATER SUMP UNIT-2 (E7)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	10 m3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	1. Floor wash waste (containing coal laden particles)

		from MRS area Unit-2 2. Waste water (containing coal laden particles) from Feeder and Tripper Floor Unit-2
18.	**MRS UNIT-2 OILY WASTE WATER TRANSFER PUMPS**	
a)	Number required	Two (1W+1S) nos.
b)	Type	Vertical Centrifugal type
c)	Location	Outdoor
d)	Fluid to be handled	1. Floor wash waste (containing coal laden particles) from MRS area Unit-1 2. Waste water (containing coal laden particles) from Feeder and Tripper Floor Unit-1
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	10
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260, S-0.1 (max.) P-0.15 (max.)
	• Stuffing box, Gland	2.5% Ni CI IS:210 GR. FG 260
	• Impeller	ASTM A351 CF8M
	• Shaft, Shaft coupling, shaft sleeves	SS 410
	• Column pipe & discharge pipe, shaft enclosing	CS as per IS:2062 or eq.
	• Gland packing	TIWA
	• Gasket	Neoprene Rubber
	• Bolts & nuts	SS
	• Base plate and soleplate	CS (min. 10 thick)
19.	**SG UNIT-1 FLOOR WASH WATER SUMP (E8)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	105 M3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	1. Floor wash from SG UNIT 1 containing oil traces 2. Floor wash from APH UNIT 1 containing ash traces
20.	**SG UNIT-1 FLOOR WASH WATER TRANSFER PUMPS**	
a)	Number required	Two (2W) nos.
b)	Type	Vertical Screw type
c)	Location	Outdoor
d)	Fluid to be handled	1. Floor wash from SG UNIT 1 containing oil traces 2. Floor wash from APH UNIT 1 containing ash traces
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	105
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260

	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
21.	**SG UNIT-2 FLOOR WASH WATER SUMP (E9)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	105 M3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	1. Floor wash from SG UNIT 1 containing oil traces 2. Floor wash from APH UNIT 1 containing ash traces
22.	**SG UNIT-2 FLOOR WASH WATER TRANSFER PUMPS**	
a)	Number required	Two (2W) nos.
b)	Type	Vertical Screw type
c)	Location	Outdoor
d)	Fluid to be handled	1. Floor wash from SG UNIT 1 containing oil traces 2. Floor wash from APH UNIT 1 containing ash traces
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	105
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
23.	**ESP UNIT-1 FLOOR WASH WATER SUMP (E10)**	
f)	Number required	One (1) nos.
g)	Effective Capacity, m3	50 M3
h)	Material of Construction	RCC (IN BHEL SCOPE)
i)	Type	Underground, Rectangular with Flat bottom
j)	Type of fluid to be handled	Floor wash from ESP UNIT 1 containing ash traces
24.	**ESP UNIT-1 FLOOR WASH WATER TRANSFER PUMPS**	
a)	Number required	Two (1W+1S) nos.
b)	Type	Vertical Screw type
c)	Location	Outdoor
d)	Fluid to be handled	Floor wash from ESP UNIT 1 containing ash traces
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	50
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
25.	**ESP UNIT-2 FLOOR WASH WATER SUMP (E11)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	50 M3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom

e)	Type of fluid to be handled	Floor wash from ESP UNIT 2 containing ash traces
26.	**ESP UNIT-2 FLOOR WASH WATER TRANSFER PUMPS**	
a)	Number required	Two (1W+1S) nos.
b)	Type	Vertical Screw type
c)	Location	Outdoor
d)	Fluid to be handled	1. Floor wash from ESP UNIT 2 containing ash traces
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	50
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
27.	**WASTE SERVICE WATER SUMP (WSWS) (E12)**	
a)	Number required	One (1) nos. (In two compartments)
b)	Effective Capacity (each compartment), m3	250m3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Rectangular with Flat bottom, under ground
e)	Inlet arrangement	Inlet & Outlet chamber with interconnecting gates
f)	Oil removal arrangement	Two (2x100%) numbers Drum Type Oil skimmers and Two (2x100%) numbers trolley mounted Portable Oil Centrifuge.
g)	Oil collection drum (type/ capacity)	One (1) nos. MS Oil Drum (capacity: 200 litre)
h)	Oil Skimmer (each to be installed in each compartment of WSWS)	Type: Drum Capacity: As per system requirements Inlet Oil Level: 50ppm Oil Outlet guarantee: <5ppm MOC: As per system requirements Accessories: Power pack, motor, valves, control panel as required.
i)	Portable Oil Centrifuge	Type: Trolley Mounted Portable Oil Centrifuge Capacity: As per system requirements MOC: As per system requirements Accessories: motor, valves, control panel as required. Purpose: To collect and purify the oil of the WSWS
28.	**WSWS TRANSFER PUMPS**	
a)	Number required	Three (2W+1S) nos.
b)	Type	Vertical Centrifugal type
c)	Location	Outdoor
d)	Fluid to be handled	Effluent from WSWS
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	125
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260, S-0.1 (max.) P-0.15 (max.)

	• Stuffing box, Gland	2.5% Ni CI IS:210 GR. FG 260
	• Impeller	ASTM A351 CF8M
	• Shaft, Shaft coupling, shaft sleeves	SS 410
	• Column pipe & discharge pipe, shaft enclosing tube	CS as per IS:2062 or eq. (Min. Thickness 8 mm)
	• Gland packing	TIWA
	• Gasket	Neoprene Rubber
	• Bolts & nuts	SS
	• Base plate and soleplate	CS (min. 10 thick)
29.	**LAMELLA CLARIFIER/ TUBE SETTLER**	
a)	Number required	Two (1W+1S) nos.
b)	Material of Construction	RCC (IN BHEL SCOPE)
c)	Design Flow (Net Output of each clarifier), m3/hr	250
d)	Basis design and components	As per manufacturer standard
e)	Sludge Consistency	2% (minimum)
f)	Type	Counter Flow / Cross Flow
g)	Design Flow velocity	Not more than 5m3/hr/m2
h)	Flash Mixer tank & Flocculator tank	1x100% Flash Mixer Tank and 1x100% flocculation tank (for each Lamella Clarifier/ Tube Settler)
i)	No. of Flash Mixer (for each Lamella Clarifier/ Tube Settler)	One (1) number with required agitator Min. 1-minute storage for Flash Mixer Tank
j)	MOC of Agitator	SS 316
k)	No. of Flocculation Chamber (for each Lamella Clarifier/ Tube Settler)	One (1) number with required Flocculator Min. 10-minute storage for Flocculation Chamber
l)	MOC of Flocculator	SS 316
m)	Type of Fluid to be handled	Wastewater containing traces of oil, suspended solids.
n)	Accessories	Suitable sampling lines for performance monitoring
30.	**CENTRAL MONITORING BASIN (CMB) (E13)**	
a)	Number required	One (1) nos. (In two compartments)
b)	Effective Capacity (each compartment), m3	250m3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Rectangular with Flat bottom, Above ground
e)	Inlet arrangement	Inlet & Outlet chamber with interconnecting gates
31.	**CENTRAL MONITORING BASIN TRANSFER PUMPS**	
a)	Number required	Three (2W+1S) nos.
b)	Type	Horizontal Centrifugal type
c)	Location	Outdoor
d)	Fluid to be handled	Effluent from WSWS
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	125
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260, S-0.1 (max.) P-0.15 (max.)
	• Stuffing box, Gland	2.5% Ni CI IS:210 GR. FG 260

	• Impeller	ASTM A351 CF8M
	• Shaft, Shaft coupling, shaft sleeves	SS 410
	• Column pipe & discharge pipe, shaft enclosing tube	CS as per IS:2062 or eq. (Min. Thickness 8 mm)
	• Gland packing	TIWA
	• Gasket	Neoprene Rubber
	• Bolts & nuts	SS
	• Base plate and soleplate	CS (min. 10 thick)
32.	**TROLLEY MOUNTED SCREW PUMPS WITH SLOPE OIL TANK**	
a)	Number required	Two (2W) nos. (1 Set for each unit)
b)	Type	Trolley Mounted Screw type with Slope oil tank and Power station
c)	Location	Outdoor
d)	Fluid to be handled	Oily effluent from Transformers
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	10
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	15 mwc
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
j)	Slope Oil Tank	Capacity: 1m3 MOC: MSEP
33.	**SLUDGE SUMP (E14)**	
a)	Number required	One (1) nos. (In two compartments).
b)	Effective Capacity, m3 (each compartment)	6.25m3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Rectangular with Flat bottom, under ground
e)	Inlet arrangement	Inlet & Outlet chamber with interconnecting gates
34.	**SLUDGE SUMP TRANSFER PUMPS**	
a)	Number required	Two (1W+1S) nos.
b)	Type	Vertical sump type (Open Impeller, Non-clog type)
c)	Location	Outdoor
d)	Fluid to be handled	Effluent from WSWS
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	12.5
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260, S-0.1 (max.) P-0.15 (max.)
	• Stuffing box, Gland	2.5% Ni CI IS:210 GR. FG 260
	• Impeller	ASTM A351 CF8M
	• Shaft, Shaft coupling, shaft sleeves	SS 410
	• Column pipe & discharge pipe, shaft enclosing tube	CS as per IS:2062 or eq. (Min. Thickness 8 mm)

	• Gland packing	TIWA
	• Gasket	Neoprene Rubber
	• Bolts & nuts	SS
	• Base plate and soleplate	CS (min. 10 thick)
35.	**CHEMICAL DOSING FOR LAMELLA CLARIFIER/ TUBE SETTLER**	
	ALUM DOSING SYSTEM (DOSING RATE = 70 PPM)	
A.	**ALUM DOSING TANK**	
a)	Numbers required	Two (2) nos.
b)	Type	Vertical rectangular with flat bottom
c)	Type of fluid to be handled	10 % w/w Alum Solution.
d)	Effective capacity of each tank, m^3	Adequate to hold the quantity required for twelve (12) hours of operation for treatment of overall waste in LAMELLA CLARIFIER/ TUBE SETTLER + 20% margin excluding free board
e)	Design Pressure, Kg/sq. cm (g)	Atmospheric
f)	Material of Construction	RCC (IN BHEL SCOPE).
g)	Protection	
	• Internal	Acid Proof Tile Lining
	• External	Not applicable
h)	Agitator along with drive motor and all other accessories	
	• Number	One (1) per Tank
	• Material of Construction	SS 316
i)	Dissolving Basket	
	• Number	One (1) per Tank
	• Material of Construction	SS 316
B.	**ALUM SOLUTION DOSING PUMPS**	
a)	Number	Two (2) Number [1W+1S] for LAMELLA CLARIFIER/ TUBE SETTLER.
b)	Type of Pump	Positive displacement and Simplex Hydraulically operated diaphragm type with auto stroke adjustment.
c)	Location	Outdoor
d)	Fluid to be handled	10 % w/w Alum Solution.
e)	Service	To dose Alum solution to LAMELLA CLARIFIER/ TUBE SETTLER.
f)	Duty	Continuous and suitable for parallel operation
g)	Suction Condition	Flooded
h)	Rated Capacity, m^3/hr	100 % requirement at full load condition of the plant
i)	Range of Operation (%)	10 – 100
j)	Pump Speed, (RPM)	1500 (max.)
k)	Pump Stroke speed per minute	100 (max.)
l)	Material of construction	
	• Liquid end (Pump head Valve, valve spring, Housing, etc.)	AISI 316
	• Diaphragm, Packing	PTFE
	• Shaft	Hardened steel (EN8-BS-970)/ AISI-316
m)	Accessories	Pumps shall be provided with accessories such as Y-type suction strainers, check valves, pressure dampeners, Pressure Gauge,

		safety relief valves along with recirculation to tank etc
n)	Type of drive	Electrical Motor
	LIME DOSING SYSTEM (DOSING RATE = 30 PPM)	
C.	**LIME DOSING TANK**	
a)	Numbers required	Two (2) nos.
b)	Type	Vertical rectangular with flat bottom
c)	Type of fluid to be handled	6 % w/w Lime Solution.
d)	Effective capacity of each tank, m^3	Adequate to hold the quantity required for twelve (12) hours of operation for treatment of overall waste in LAMELLA CLARIFIER/ TUBE SETTLER + 20% margin excluding free board
e)	Design Pressure, Kg/sq. cm (g)	Atmospheric
f)	Design Temperature, 0C	80
g)	Material of Construction	RCC (IN BHEL SCOPE) with 2 coats of Bitumastic paint over 2 coats of primer.
h)	Protection	
	• Internal	Acid Proof Tile Lining
	• External	Not applicable
i)	Agitator along with drive motor and all other accessories	
	• Number	One (1) per Tank
	• Material of Construction	SS 316
j)	Dissolving Basket	
	• Number	One (1) per Tank
	• Material of Construction	SS 316
D.	**LIME SOLUTION DOSING PUMPS**	
a)	Number	Two (2) Number [1W+1S] for LAMELLA CLARIFIER/ TUBE SETTLER.
b)	Type of Pump	Screw type
c)	Location	Outdoor
d)	Fluid to be handled	6 % w/w Lime Solution.
e)	Service	To dose Lime solution to LAMELLA CLARIFIER/ TUBE SETTLER.
f)	Duty	Continuous and suitable for parallel operation
g)	Suction Condition	Flooded
h)	Rated Capacity, m^3/hr	100 % requirement at full load condition of the plant
i)	Range of Operation (%)	10 – 100
j)	Pump Speed, (RPM)	1500 (max.)
k)	Material of construction	
	Pump casing	2.5% Ni-Cast Iron to IS 210 FG 260
	Stator	EPDM rubber
	Impeller/Rotor	CF8M
	Shaft and shaft sleeve	SS 410
l)	Accessories	Pumps shall be provided with accessories such as Y-type suction strainers, check valves, pressure dampeners, Pressure Gauge, safety relief valves along with recirculation to tank etc
m)	Type of drive	Electrical Motor
36.	**AIR BLOWER FOR SLUDGE SUMP**	
a)	Number	Two (2) (2X100 %) for Sludge Sump

b)	Type	Rotary Twin Lobe Type
c)	Duty	Intermittent
d)	Capacity & Head	As required
e)	MOC of casing, cover, stator	CI as per IS 210 FG 260
f)	MOC of shaft	Carbon steel to BS-970 En-8/ANSI-I045
g)	Impeller/Lobes	Carbon steel to BS-970, EN9 Forged
h)	Accessories Required	Acoustic Enclosures, Suction Filter, Silencer, relief Valve etc
i)	Location	Outdoor
37.	**CHEMICAL STORAGE SPACE (In building)**	
	STORAGE AREA OF CHEMICALS	15 days
38.	**WEIGHING SCALE**	
a)	Type	Platform & dial type/Electronic Type
b)	Number	One (1)
c)	Capacity	0-500 Kgs
39.	**ELECTRIC HOIST**	
a)	Type	Electric monorail in chemical dosing area
b)	Number	One (1)
c)	Capacity	1 Ton
40.	**Safety arrangement**	
a)	**Safety shower and Eye wash fountain**	One (1) number safety shower and two (2) numbers eye wash fountain shall be provided by bidder
b)	**Personal protection**	Two sets of safety equipment each comprising PVC protection suits with hoods, rubber boots, face visors and thick PVC gauntlets shall be provided by the bidder.
41.	**OVERHEAD SERVICE WATER (E15)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	To cater the requirement of chemical preparation for Alum and Lime dosing for 24 hrs and flushing requirement of equipment.
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Rectangular with Flat bottom, Over head on EQMS Room
42.	**FLUSHING PUMPS**	
a)	Number required	Two (1W+1S) nos.
b)	Type	Horizontal Centrifugal type
c)	Location	Outdoor
d)	Fluid to be handled	Service Water
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	10
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260, S-0.1 (max.) P-0.15 (max.)
	• Stuffing box, Gland	2.5% Ni CI IS:210 GR. FG 260
	• Impeller	ASTM A351 CF8M
	• Shaft, Shaft coupling, shaft sleeves	SS 410

	• Column pipe & discharge pipe, shaft enclosing tube	CS as per IS:2062 or eq. (Min. Thickness 8 mm)
	• Gland packing	TIWA
	• Gasket	Neoprene Rubber
	• Bolts & nuts	SS for coming in water contact else CS
	• Base plate and soleplate	CS (min. 10 thick)
43.	**BELT TYPE OIL SKIMMER**	
a)	Type	Portable Belt Type Oil Skimmer
b)	Quantity	2 nos.
c)	Location	To be used portably in TG Area sumps E1A, E1B, E2A, E2B
d)	Capacity	To Cater the requirements for either above mentioned TG Area sumps
e)	MOC	As per system requirements
44.	**PIPING**	All the piping shall generally be conforming to the requirements specified in the Chapter titled “General Technical Requirement of Low Pressure Piping” considering the following aspects as minimum requirement:
	Service water/ Raw water/ Clarified water piping	IS-2062 Gr.-E-250B/ASTM A-36/ASTM A-53 type 'E' Gr. B/IS-3589 Gr. 410 /IS-1239 Heavy.
	Coagulant (Alum)	CPVC as per ASTM D 1784 and F 441 & F 439 Schedule 80
	Lime slurry/ Solution/ Suspensions	CPVC as per ASTM D 1784 and F 441 & F 439 Schedule 80
	Potable water/ Instrument air/ Service air piping	ASTM A-53 type E Gr. B galvanized/ IS 1239 Gr heavy galvanized/IS 3589 Gr 410 galvanized. Galvanized shall be to IS- 4736 or equivalent.
	Sludge	1) GRP as per ASTM D3517/ AWWA C950-88/AWWA M45 2) HDPE as per ASTM D3350 CL 34543C, FM Class 150/ IS:4984 or Equivalent for buried portion 3) Cast Iron Class A as per IS 1536 (for only from Lamella Clarifier/Tube Settler to Sludge Sump)
45.	**VALVES**	All the valves shall generally be conforming to the requirements specified in the Chapter titled “General Technical Requirement of Low-Pressure Piping” considering the following aspects as minimum requirement:
46.	Coagulant (Alum) Services	i. Type of Valves <u>For Isolation</u> a) Saunder’s Patented Diaphragm Valves b) Ball Valves in CPVC pipes <u>For non-return / Check</u> Swing Check type /Dual Plate type
		ii. Material of Construction Valves <u>Diaphragm Valves</u> a) Body shall be Cast Iron to IS: 210 Gr FG 260/ ASTM A 48 Cl.40; BS: 1452 Gr.220/Equivalent. OR Cast Steel to ASTM. A 216GR. WCB and Body shall

		be internally lined with Soft Natural rubber, Ebonite or Polypropylene b) Diaphragm shall be shall be of reinforced rubber /Hypalon/ approved equivalent c) Stem, Compressor & Bush shall be Stainless steel Construction Ball Valves in CPVC Pipe lines a) Body, Ball & stem shall be of CPVC b) Seat ring & Packing shall be EPDM / or equivalent <u>Check Valves</u> a) Body & Cover, Hinge Disk/Door shall be Cast Iron to IS: 210 Gr FG 260/ ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt and shall be lined with natural Rubber, PTFE or Viton or Stainless Steel – 316 b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB and shall be coated with PVDF, or suitable elastomer or Stainless Steel – 316 c) Disc facing ring and Body Seat rings shall be Stainless Steel d) Bearing bushes shall be SS – 316 e) Material of construction of spring in dual type valve shall be of INCONEL or better
47.	Lime slurry/Solution/ Suspensions	i. Type of Valves <u>For Isolation</u> Non-lubricated Plug Valves <u>For non-return / Check</u> Swing Check type /Dual Plate type
		ii. Material of Construction Valves <u>Plug Valves</u> a) Body shall be Cast Iron to IS: 210 Gr FG 260 / ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt b) Plug shall be Stainless steel to AISI 316 c) Body Sleeve & Seat shall be PTFE d) Gland & Gland nut shall be SS 304/316 e) Cover shall be of Cast Steel to ASTM A 216 Gr WCB <u>Check Valves</u> a) Body & Cover, Hinge Disk/Door shall be Cast Iron to IS: 210 Gr FG 260 / ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt and shall be lined with natural Rubber, PTFE or Viton or Stainless Steel – 316 b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB and shall be coated with PVDF, or suitable elastomer or Stainless Steel – 316 c) Disc facing ring and Body Seat rings shall be Stainless Steel d) Bearing bushes shall be SS-316 e) Material of construction of spring in dual type valve shall be of INCONEL or better
48.	Sludge	i. Type of Valves

		<u>For Isolation</u> Gate or Sluice or Knife edge type Slide Valves <u>For non-return / Check</u> Swing Check type /Dual Plate type
		ii. Material of Construction <u>Gate / Sluice / Knife Edge Slide Valve</u> a) Body,Disc : Cast Iron b) Stem : Stainless Steel AISI 420 d) Packing : PTFE e) Gland & Gland nut : AISI 420 f) Hand wheel : Cast Iron <u>Check Valves</u> a) Body & Cover, Hinge Disk/Door shall be Cast Iron BS:1452 Gr.220 or Eqvt b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB / High tensile Brass or BS: 2872 equivalent. c) Disc facing ring and Body Seat rings shall be Stainless Steel. d) Bearing bushes shall be Leaded tin Bronze. e) Material of construction of spring in dual type valve shall be of INCONEL or better
49.	For normal water (portable/service water) & Waste Water	i. Type of Valves <u>For Isolation</u> a) Butterfly or Saunder's Patented Diaphragm Valves upto 200 mm NB b) Butterfly type for Sizes 250 mm NB & above <u>For non-return / Check</u> a) Lift Check type/Swing Check /Dual Plate type for sizes upto 40 mm NB b) Swing Check or Dual Plate type valve for sizes 50 mm NB & above
		ii. Material of Construction Valves <u>Diaphragm Valves</u> The Diaphragm shall conform to following requirement i) Design standard: BS: 5156 or equivalent of required rating/ class. (Minimum rating of valves shall be PN 10). Type: Flanged and lined body ends, sealed bonnet, weir pattern, tight shut off type. a) Body, Bonnet: Cast iron IS 210 Gr. FG 260 or equivalent or Cast steel ASTM A-216 Gr. WCB b) Body lining : Soft natural rubber, ebonite, Polypropylene c) Hand wheel : Cast Iron

		d) Compressor : Stainless Steel e) Stem and Bush : Stainless Steel <u>Butterfly Valves</u> Butterfly valves shall be of Lugged-wafer type of low leakage rate confirming to AWWA-C-504 class 150 (min.) or BS:5155 PN 10 (min.) a) Body: ASTM A48, Gr. 40 with 2% Ni / IS: 210. Gr. FG-260, with 2% Ni / SG iron BSEN 1563, Gr EN GJS-400-15 with 2%Ni and epoxy coated. b) Disc: SS 316. c) Shaft: BS 970 431 S: 291 / EN 57, or AISI-410 or AWWA-permitted shaft material equivalent to EN-57/AISI-410 or better. d) Seat rings: 18-8 Stainless steel e) Seal: Nitrile rubber, EPDM, Hypalon All the butterfly valves shall be provided with Hand wheel or lever as per the requirements. All the butterfly valves shall be provided with an indicator to show the position of the disc. Flanges shall conform to ANSI B 16.5 Cl.150 (min). <u>Ball Valves</u> a) Type :Full bore b) Rating: PN 10 (min). c) Body: ASTM A216 Gr. WCB d) Ball: ASTM A276 TYPE 316 e) Seat ring: PTFE f) Stem: ASTM A276 TYPE 316 g) Seat: Nitrile rubber, PTFE <u>Check Valves</u> Body – Cast iron IS 210 Gr. FG 260 or equivalent Disc/ door –ASTM A351 Gr. CF8 Hinged pin – SS 316 Piston – SS 316

DATASHEET A FOR CONDENSATE POLISHING UNIT

1.0	**DESCRIPTION OF TURBO GENERATOR UNIT (TG) FOR WHICH CONDENSATE POLISHING IS TO BE PROVIDED :**	
(i)	No. of units	Two (2)
(ii)	Capacity of unit	800 MW
(iii)	Total flow in all the working service vessels (per unit)	1640 Tones per hour
2.0	**CONDENSATE POLISHER SERVICE VESSELS PER UNIT :**	
(i)	Number of condensate polisher service vessel	Three numbers (3X50%)
(ii)	Type of condensate polisher service vessel	Cylindrical / Spherical
(iii)	Capacity of each condensate polisher service vessel	50% of condensate flow
(iv)	Flow through each condensate polisher service vessel	820 Tones per hour
(v)	Operating pressure of each condensate polisher service vessel	29.0 kg./sq.cm (g)
(vi)	Design pressure of each condensate polisher service vessel	45.23 kg./sq.cm (g)
(vii)	Operating temperature of service vessel and their internals/ appurtenances including resin	52 degree Celsius.
(viii)	Design temperature of service vessel and their internals/ appurtenances	70 degree Celsius.
(ix)	Pressure drop	• 3.5 kg/sq cm (max, including CPU service vessels, pre filters, valves and fittings & resin traps connected with the unit) for clogged condition. • 2.1 kg/sq cm (max, including CPU service vessels, pre filters, valves and fittings & resin traps connected with the unit) for clean condition.
(x)	Design code of each condensate polisher service vessel	ASME sec VIII div 1 ed. 2010 or acceptable equivalent international standard.
(xi)	Material of construction of each condensate polisher service vessel	• Carbon steel plates to SA - 515/ 516 Gr. 70 with rubber lining inside. The lining shall be of rubber having a hardness of 65 plus/minus 5 shore-A meeting the requirements of IS: 4682, Part-I (4.5 mm thick Rubber lining in three layers). • Inlet water distributor: - Hub and internals diffuser splash plate or header and perforated laterals. Material of construction shall be SS-316 • Under drains: - Same as above with screened laterals with internal perforated pipes and rubber lined flat bottom.

(xii)	Resin traps at the outlet of each condensate polisher service vessel	Rubber lined steel construction and internals (cord & screen) shall be of JOHNSON SCREENS IRELAND or equivalent (SS-316) construction
2.1	**AIR-BLOWERS FOR RESIN MIXING (SERVICE VESSELS AREA) PER 660 MW TG UNIT**	
(i)	Number of air blowers per 800 MW TG Unit	Two (2x100%)
(ii)	Type of each air blowers	Centrifugal/Twin lobe type, oil free, positive displacement
(iii)	Duty	Intermittent
(iv)	Capacity & Head	As required
(v)	Pressure gauge	One per blower
(vi)	Location of each air blowers	Indoor
(vii)	Material of Construction	Casing, cover and stator – Cast Iron GR FG 260 to IS 210 Lobe/ Impeller – Cast Iron GR FG 260 to IS 210 Shaft – Carbon steel BS:970 En-8/ANSI-I045
(viii)	Accessories	Each blower shall be complete with motor, V-belt drive with belt guard, inlet filter/silencer, flexible couplings and discharge snubber, all mounted on a single base. Relief valve(s) shall also be provided.
2.2	**PRE FILTER**	
(i)	Number	Two (2X50%) for each 800 MW TG unit Total (4X50%) for station
(ii)	Type	Back washable (Horizontal / Vertical)
(iii)	Design code of each pre filter	ASME sec VIII div 1 (latest)
(iv)	Flow through each pre filter	820 Tones per hour
(v)	Operating pressure of each Pre Filter	29.0 kg./sq.cm (g)
(vi)	Design pressure of each Pre Filter	45.23 kg./sq.cm (g)
(vii)	Operating temperature of Pre Filter and their internals/ appurtenances	52.0 degree Celsius.
(viii)	Design temperature of Pre Filter and their internals/ appurtenances	70.0 degree Celsius.
(ix)	Pre –Filter Housing	2 nos. for each TG-unit
(x)	Mesh size	20 micron/ Proven Design
(xi)	Pre- Filter media (Cartridge)	PP material/ Proven Design.
(xii)	Absolute removal (Crud)	99.98%

(xiii)	Material of construction (shell & dished ends) of each pre filter	Carbon steel plates to SA - 515 / 516 Gr. 70 with rubber lining inside. The lining shall be of rubber having a hardness of 65 plus/minus 5 shore-A meeting the requirements of IS: 4682, Part-I.
2.3	**BACKWASH WATER COLLECTION TANK**	
(i)	Number	One (1) for each 800 MW TG unit
(ii)	Type	RCC Pit With Solvent Free Epoxy Coating.
(iii)	Capacity	Holding capacity shall be 1.5 times the capacity of condensate water required for backwashing of pre filter
2.4	**PRE FILTER BACKWASH WASTE WATER TRANSFER PUMPS**	
(i)	Number	Two (1 working+1 standby) for each 800 MW TG unit
(ii)	Type	Vertical Centrifugal
(iii)	Pump Speed	Maximum 1500 rpm
(iv)	Capacity & head	Designed for evacuating water from the backwash waste water tank before next filling and head as required.
(v)	Material of construction	
•	casing, impeller	SS316
•	Shaft	SS 316
•	shaft sleeve material	SS 316
(vi)	Recirculation line with pneumatic actuated regulating type diaphragm valve	Required

3.0	**EXTERNAL REGENERATION FACILITIES (One (1) set of external regeneration system common for all the condensate polishing plants shall be provided by bidder)**	
3.1	**REGENERATION PRESSURE VESSELS**	
(i)	Resin Separation & Cation Regeneration Vessel	One (1)
(ii)	Anion Regeneration Unit	One (1)
(iii)	Mixed Resin Storage unit	Two (2)
(iv)	Type	Vertical (Cylindrical)
(v)	Design code (pressure vessel other than service vessel)	ASME sec VIII div 1 (latest)
(vi)	Design pressure	8 Kg/cm2 (Minimum)

(vii)	Material of construction (shell & dished ends)	Carbon steel plates to SA - 515 / 516 Gr. 70 with rubber lining inside. The lining shall be of rubber having a hardness of 65 plus/minus 5 shore-A meeting the requirements of IS: 4682, Part-I		
(viii)	Resin traps at the common outlet header of regeneration vessels	rubber lined steel construction and internals (cord & screen) shall be (SS-316) construction		
(ix)	Accessories for each vessel	Lifting lugs and other structural works for each regeneration vessel to facilitate accessibility for operation and other equipments etc.		
3.2	**CHEMICAL HANDLING, PREPARATION & DOSING SYSTEM**			
a)	**Chemical Tanks**	**Alkali Preparation Tank**	**Alkali Day Tank**	**Acid Measuring Tank**
(i)	Number required	One (1) Number	One (1) Number	Two (2) Number
(ii)	Type	-- Vertical Cylindrical with dish end at bottom and cover at top; Atmospheric --		
(iii)	Useful capacity (Each)	Minimum 10 Cu.m	Each tank shall be adequate to hold chemical for 125% of one regeneration	
(iv)	Material	---------- M.S. with 4.5 mm thick rubber lining inside----------		
(v)	Accessories Required	Vent, Overflow, drain connection, manhole (only for alkali preparation tank), motor driven stirrer (only for alkali preparation tank & alkali day tanks), dissolving basket in SS 316 construction (only for alkali preparation & alkali day tanks), fume absorber/ CO_2 absorber, lifting lugs etc. as required by manufacturer's standard		
(vi)	Stirrer per tank	Slow speed stirrer driven by motor drive and reduction gear. Speed of stirrer = 200 RPM Max. Material of Construction of each stirrer and agitator = Stainless Steel – 316.		Not Applicable.
(vii)	Dissolving basket	One number per tank. Material of Construction of each dissolving basket – SS316.		Not Applicable.
b)	**Dosing Pumps**	**Acid**		**Alkali**
(i)	Number	Two (1Working +1Standby) (2X100%)		Two (1Working +1Standby) (2X100%)
(ii)	Type	---------- Simplex positive displacement type; hydraulically operated diaphragm type ----------		

(iii)	Whether suction strainer required	---------- Yes ----------	
(iv)	Accessories	----------As Required.----------	
(v)	Pressure Dampener	----------Two (2) ----------	
(vi)	External safety relief valve (in addition to in-built safety valve)	----------Two (2) ----------	
(vii)	Maximum pump stroke speed per minute	----------100 per minute----------	
(viii)	Material of construction		
1)	Liquid End (Pump Head, Valves, Valve housing, valve spring etc.).	PVC	AISI:316
2)	Diaphragm	PT.F.E.	P.T.F.E.
3)	Packing	P.T.F.E.	P.T.F.E.
4)	Shaft	---------- Hardened steel EN 8 (BS:970)----------	
5)	Worm & Worm Wheel (If Applicable)	----------Manganese Bronze----------	
6)	Connecting Rod	----------Manganese Bronze----------	
7)	Cross head Guide	---------- Bronze----------	
(ix)	Capacity & Head	----------As per system requirement ----------	

3.3 Activated Carbon Filter for Alkali

(i)	Number	One (1) number
(ii)	Type	Vertical cylindrical with dished end bottom
(iii)	Material of construction	Carbon steel plates to SA - 515 / 516 Gr. 70 with rubber lining inside. The lining shall be of rubber having a hardness of 65 plus/minus 5 shore-A meeting the requirements of IS: 4682, Part-I. Influent Distributor Material- SS 316
(iv)	Design code	ASME sec VIII div 1 ed. 2010 or acceptable equivalent international standard.
(v)	Size	10 M3/hr minimum (not less than the design capacity of alkali transfer cum recirculation pump)

(vi)	Bed depth of filter material	1 Meter (minimum)
(vii)	Flow velocity	12 m/hr (max).
(viii)	Seal	Teflon diaphragm
(ix)	Manhole	Two (2) nos. minimum each of Davit type and 600 mm dia.
(x)	Sight Windows	One (1) no. in backwash space
(xi)	Hand hole	One (1) no. of 150 mm dia for removal of activated carbon
(xii)	Accessories	Manhole, vent, drain, sample connection, level transmitter, lifting lugs etc.
3.4	**Alkali diluent water heating tank (Hot water tank)**	
(i)	Number	One (1) number
(ii)	Type/Capacity (Each)	Vertical Cylindrical with dished end with Electric heater (2X50%) / 120% of max water required for regeneration or 10 Cu. M whichever is higher.
(iii)	Design code	ASME sec VIII div 1 ed. 2010 or acceptable equivalent international standard.
(iv)	Temperature of alkali to be heated	To obtain temp. from 15 deg C to 50 deg C at alkali mixing feed out let within 5 hours.
(v)	Temp. Transmitter	Yes
(vi)	Burn out protection	Yes
(vii)	Material of construction of tank:	Carbon steel plates to SA - 515 / 516 Gr. 70 with rubber lining inside. The lining shall be of rubber having a hardness of 65 plus/minus 5 shore-A meeting the requirements of IS: 4682, Part-I.
(viii)	Accessories	Manhole, vent, drain, sample connection, level transmitter, lifting lugs, Pressure Relief Valve, Temperature Indicator & Switches etc.

3.5 DM water pumps

S. No.	Description / Data	DM Water (for Resin Transfer) Pumps	DM Water (for Regeneration) Pumps
(i)	Numbers. required	Two (1 working+1 standby) (2x100%)	Two (1 working+1 standby) (2x100%)
(ii)	Type	----------Horizontal, Centrifugal ----------	
(iii)	Pump Speed	----------Maximum 1500 rpm----------	
(iv)	Capacity & head of each pump	As required	As required

(v)	Liquid to be handled	DM Water	DM Water
(vi)	Type of Shaft sealing	Mechanical Seal	Mechanical Seal
(vii)	Material of construction		
a)	Casing & Impeller	----------ASTM A 351 CF 8M----------	
b)	Shaft	---------- SS 316----------	
c)	Shaft Sleeves	----------SS 410----------	
d)	Wear Rings & Mechanical Seal	----------As Per manufacturer's Standard----------	
(viii)	'Y' type strainer	----------One number per pump (Material shall be SS316)-------	
(ix)	Recirculation line with motor actuated regulating type butterfly valve	----------Required ----------	
(x)	Accessories	Coupling Guards, drain plug, Vent valve, Suction hoses, isolation valves, etc. as required as per manufacturer's standard	

3.6	**Air-blowers for Resin Mixing (Regeneration area)**	
(i)	Number	Two (1 working+1 standby)
(ii)	Type	Centrifugal/Twin lobe type
(iii)	Duty	Intermittent
(iv)	Capacity & Head	As required
(v)	Pressure gauge	One per blower
(vi)	Location	Outdoor
(vii)	Material of Construction	Casing, cover and stator – Cast Iron GR FG 260 to IS 210 Lobe/ Impeller – Cast Iron GR FG 260 to IS 210 Shaft – Carbon steel BS:970 En-8/ANSI-I045
(viii)	Accessories	Each blower shall be complete with motor, V-belt drive with belt guard, inlet filter/silencer, flexible couplings and discharge snubber, all mounted on a single base. Relief valve(s) shall also be provided.
3.7	**DM Waste Water Collection Tank**	
(i)	Number	One (1) Number
(ii)	Type	RCC Pit With Solvent Free Epoxy Coating.
(iii)	Capacity	Holding capacity shall be 1.5 times the capacity of DM water required for transferring resins or 50 cum whichever is higher.
3.8	**DM Waste Water Transfer pumps**	

(i)	Number	Two (1 working+1 standby) (2x100%)
(ii)	Type	Horizontal centrifugal single stage with priming system
(iii)	Pump Speed	Maximum 1500 rpm
(iv)	Capacity & head	Suitable to pump the total volume (Minimum 50 Cu.m/hr). Head to suit the requirement
(v)	Type of Shaft sealing	Mechanical Seal
(vi)	Material of construction	
•	casing, impeller	SS 316
•	Shaft	SS 316
•	shaft sleeve material	SS 316
(vii)	Recirculation line with pneumatic actuated regulating type diaphragm valve	Required
(viii)	Number of priming chambers	One (1)
3.9	**Lime Tank for N Pit**	
(i)	Number	One (1)
(ii)	Material of construction	SS 316
(iii)	Type	Vertical Cylindrical Atmospheric with dished bottom and cover at top
(iv)	Useful capacity	Adequate to hold quantity of alkali required for neutralization of excess acid in waste effluent generated due to single regeneration of a condensate polisher mixed bed with 25% overall margin or 2 cum whichever is higher.
(v)	Accessories Required	Vent, Overflow, drain connection, motor driven stirrer, dissolving basket (SS316), CO2 absorber, manhole, lifting lugs etc.
(vi)	Stirrer per tank	Slow speed stirrer driven by motor drive and reduction gear. Speed of stirrer = 200 RPM Max. Material of Construction of each stirrer and agitator = Stainless Steel – 316.
(vii)	Dissolving basket	One number. Material of construction: AISI-316
3.10	**Alkali Transfer Cum Recirculation Pumps**	
(i)	Chemical to be used	Sodium Hydroxide (5-50% Conc)

(ii)	Type	Horizontal Centrifugal	
(iii)	Numbers required	Two (1 working+1 standby)	
(iv)	Duty	Intermittent	
(v)	Capacity/ Head of Pump	As required or 10 Cum/hr (min.)/ As required or 10 MWC (min.) Whichever maximum.	
(vi)	Maximum Pump Speed	1500 rpm	
(vii)	Materials of construction	Stainless Steel-316	
(viii)	Pressure gauge	One per pump with Teflon diaphragm seal	
(ix)	Pressure Dampener	One per pump	
(x)	Reinforced Rubber hoses	Minimum two (2) nos. of size 80 mm NB of min. 10 m. with isolation valves	
(xi)	'Y' type strainer	One number per pump (Material shall be SS316)	
(xii)	Accessories required for each pump	Coupling guard, drain plug, vent valve, Suction hoses, isolation valves, Y- type strainers, pressure gauges, pulsation dampener etc. as required as per manufacturer's standard	
3.11	**Acid & Alkali Unloading Pumps**		
S. No.	Description / Data	Acid Unloading Pumps	Alkali Unloading Pumps
(i)	Chemical to be used	30-33% HCl	5 to 50% NaOH
(ii)	Type	Horizontal, Centrifugal	Horizontal, Centrifugal
(iii)	Numbers required	Two (1W+1S) (2x100%)	Two (1W+1S) (2x100%)
(iv)	Duty	Intermittent	Intermittent
(v)	Capacity/ Head of Pump	As required	As required
(vi)	Maximum Pump Speed	Maximum 1500 rpm	Maximum 1500 rpm
(vii)	Materials of construction	Polypropylene or equiv. for HCl	Stainless Steel-316
(viii)	Pressure gauge	One per pump with teflon diaphragm seal	One per pump with teflon diaphragm seal
(ix)	Pressure Dampener	One per pump	One per pump
(x)	Reinforced Rubber hoses	Minimum two (2) nos. of size 80 mm NB of min. 10 m. with isolation valves	Minimum two (2) nos. of size 80 mm NB of min. 10 m. with isolation valves
(xi)	'Y' type strainer	One number per pump	One number per pump

(xii)	Accessories required for each pump	Coupling guard, drain plug, vent valve, Suction hoses, isolation valves, Y- type strainers, pressure gauges, pulsation dampener etc. as required as per manufacturer's standard.	
3.12	**Effluent re-circulation cum-disposal pumps:**		
(i)	Number	Three (1 working+1 standby+1Maint. Standby)	
(ii)	Type	Horizontal centrifugal single stage with priming system	
(iii)	Capacity & head	Suitable to pump the total volume of one section in 8 hours (Minimum 50 Cu.m/hr). Head to suit the requirement	
(iv)	Type of Shaft sealing	Mechanical Seal	
(v)	Material of construction		
•	casing, impeller	Rubber lined/ FRP lined, CI IS: 210 FG 260	
•	Shaft	SS 316	
•	shaft sleeve material	SS 316	
(vi)	Recirculation line with pneumatic actuated regulating type diaphragm valve	Required	
(vii)	Number of priming chambers	Two (2)	
3.13	**Bulk Acid & Alkali Storage Tanks**		
S.No.	Description / Data	Acid Storage tanks	Alkali Storage Tanks
(i)	Numbers	Two (2)	Two (2)
(ii)	Dimensions (Diameter, length & thickness)	————As per BS: 2594 Latest Edition————	
(iii)	Useful capacity	Each tank to store 15 days requirement of all the units	
(iv)	Type & pressure class	Horizontal, with dished (Torospherical) ends/ Atmospheric	
(v)	MOC	————Mild Steel ————	
(vi)	Internal Painting/ lining	———Rubber lining (4.5 mm thick) ————	
(vii)	Concentration	30-33% HCl	48% NaOH
(viii)	Accessories	Vent, overflow, drain, sample connections, fume absorbers, manholes, operating platforms etc.	
4.0	**Piping**		
(i)	Resin Transfer piping material	Stainless steel type 304 Sch.40 (min.) seamless Velocity: 2.3-3 m/s	

(ii)	Service vessel Inlet piping material	ASTM A-106 Gr. B, seamless
(iii)	Service vessel Outlet piping material	ASTM A-106 Gr. B, seamless
(iv)	Pre filter Inlet piping material	ASTM A-106 Gr. B, seamless
(v)	Pre filter Outlet piping material	ASTM A-106 Gr. B, seamless
(vi)	Service vessel rinse piping material	ASTM A-106 Gr. B, seamless
(vii)	Piping handling Acid Service	carbon steel Polypropylene lined/CPVC as per ASTM F441 (Sch.80)
(viii)	Piping material for Alkali	SS 316 Sch-10 (min.)
(ix)	Piping material handling DM Water and Pre Filter backwash waste	Stainless steel SS 304 Schedule 40 (minimum)
(x)	Piping material for DM waste water	Stainless steel type 304 Sch.40 (Min)
(xi)	Instrument Air & service air piping material	hot dip galvanized (heavy grade) steel
(xii)	N-Pit waste water transfer Piping Material	MSRL
5.0	**Valves**	
(i)	Resin Transfer Line	Eccentric plug type/ball valve (full bore type) of Stainless steel construction (SS-316).
(ii)	Emergency bypass control valve	Double flanged/lugged wafer butterfly type. Isolation valves of wafer (lugged) type butterfly valves (resilient material seated, to ensure bubble-tight shut off) shall be provided on the upstream and downstream sides of the control valve. The material of construction of valves handling condensate in service vessel area shall be SS-316. Seat/seat rings should be of Teflon/titanium back up rings. Seal shall be of Teflon or equivalent
(iii)	Condensate on service vessel area	The material of construction of valves handling condensate in service vessel area shall be SS-316.
(iv)	Isolation Valves handling Chemicals (Acid, Alkali)	Isolation Valves handling Alkali, etc. shall be of diaphragm type in SS-316 construction Isolation Valves handling Acid (HCl) shall be of diaphragm type in MSRL (Mild steel Rubber lined) or CPVC construction
(v)	Isolation Valves handling DM water	Butterfly or gate or globe type and shall be of SS - 304 construction
(vi)	Non-return valves	Non-return valves shall be constructed of SS-304 for DM Water & SS-316 for alkali. For Hydrochloric acid, non-return valve shall be dual plate/swing check/lift ball check type of suitable material or as per manufacturer's standard practice.

(vii)	All valves in service vessels area where pressure may attain same as service vessel shall be designed for 300 lb. class minimum. However, Bidder to select the class/ pressure rating of the valves of service vessel area to meet the system design requirement. In case it has been found that the class/ pressure rating as required is higher than 300lb class then the same shall be considered by bidder in their scope.	
6.0	**SAFETY EQUIPMENT**	Four (4) sets of safety equipment [(Personal Protection Equipment (PPE)] comprising PVC protection suits with hoods, rubber boots, face visors and thick PVC gauntlets shall also be provided. Two (2) No. Personnel water drench shower/safety shower and eye bath shall also be provided.

DATASHEET A FOR CW TREATMENT PLANT

S. No.	Description	Parameters
1.0	**SULPHURIC ACID STORAGE TANKS**	
1.1	Numbers	Three (3) Numbers.
1.2	Location	Outdoor
1.3	Type	Horizontal cylindrical with dished (Tori spherical) ends.
1.4	Effective capacity	Min. 50 m^3 (each) or 15 days storage requirement (each) whichever is higher
1.5	Design Standard	As per BS:2594
1.6	**Material of Construction**	
1.6.1	Shell	MS as per IS 2062.
1.6.2	Dished Ends	MS as per IS 2062.
1.7	Minimum Thickness of Shell & Dished Ends	10 mm (minimum)
1.8	Instruments	As per P&ID.
1.9	Painting Externally	Externally painted with chlorinated Rubber paint.
1.10	Accessories	Accessories such as Manholes, staircase, operating platforms, ladders, vent, overflow & drain connections with valves, Fume/moisture absorbers shall be provided by bidder for each tank.
2.0	**SULPHURIC ACID UNLOADING PUMPS**	
2.1	Number	Two (2) [1Working+1Standby]
2.2	Location	Outdoor
2.3	Duty	Intermittent
2.4	Fluid to be handled	98% w/w Commercial Sulphuric Acid
2.5	Service	To unload Concentrated Sulphuric Acid from Tanker to Sulphuric Acid Storage Tank.
2.6	Type of Pump	Horizontal Centrifugal Non-Clog type
2.7	Design standard	As per IS-5120.
2.8	Suction Condition	Flooded
2.9	Rated Capacity (each)	10 CuM/ Hr
2.10	Head to be developed at rated capacity (each)	20 MWC (minimum)
2.11	**Material of Construction**	
2.11.1	Casing	Alloy -20.
2.11.2	Impeller	Alloy -20.
2.11.3	Wearing rings (as applicable)	Alloy -20.
2.11.4	Shaft	Alloy -20.
2.11.5	Shaft Sleeves	Alloy -20.
2.12	Type of drive	Electrical Motor
2.13	Maximum Pump Speed (RPM)	1500
2.14	Type of Sealing	Mechanical Seal
2.15	Nut and bolts	Alloy -20.
2.16	Sets of Hoses with coupling & Diaphragm type Isolation Valves	
2.16.1	Number of Sets Required	Two (2)
2.16.2	Size of hose/ Valve	80 mm NB
2.16.3	Length of hoses, each	20 meters (minimum)
2.16.4	Material of hose	Chemical resistant, UV inhibited PVC
2.17	Strainer	Y-Type strainer of MOC-PP (2X100%, 50 BS).
2.18	Pressure gauge	One per pump with Teflon diaphragm seal

2.19	Pulsation Dampener	One per pump
2.20	Accessories required for each pump	Coupling guard, drain plug, vent valve, suction hoses, isolation valves, Y- type strainers, pressure gauges, pulsation dampener etc.
3.0	**ACID DAY TANKS**	
3.1	Numbers	Two (2) [1Working+1Standby]
3.2	Location	Indoor under shed
3.3	Type	Vertical cylindrical with dished bottom & cover at top.
3.4	Type of fluid to be handled	98% w/w Commercial Sulphuric Acid.
3.5	Effective capacity	One day requirement/ min. 5870 lit. each whichever is higher
3.6	**Material of Construction**	
3.6.1	Shell	MS as per IS 2062.
3.6.2	Dished Ends	MS as per IS 2062.
3.7	Thickness	8 mm (minimum).
3.8	Instruments	As per P&ID.
3.9	Painting Externally	Externally painted with chlorinated Rubber paint.
3.10	Accessories	Accessories such as staircase, operating platforms, ladders, vent, overflow & drain connections with valves, Fume/moisture absorbers shall be provided for each tank.
4.0	**SULPHURIC ACID INJECTION PUMPS**	
4.1	Number	Two (2) [1Working+1Standby each]
4.2	Location	Indoor.
4.3	Duty	Continuous.
4.4	Type of Pump	Positive displacement, hydraulically operated Diaphragm.
4.5	Rated Capacity	As desired.
4.6	Range of Capacity/Stroke Adjustment	0 % - 100 % of capacity automatically by control system.
4.7	Head	As required.
4.8	Accessories	Pulsation dampener and Safety Relief valves shall be provided at each pump discharge header.
4.9	**Material of construction**	
4.9.1	Liquid end (pump head, valve, valve housing, etc.)	PP
4.9.2	Diaphragm	PTFE
4.9.3	Packing	PTFE
4.9.4	Housing	Alloy-20
4.9.5	Pump head	Alloy-20
4.9.6	Plunger	Alloy-20
4.9.7	Shafts(worm)	Hardened Steel (EN 19 / ASTM A 276 Gr. 410)
4.10	Type of drive	Electrical Motor
4.11	Rated speed (RPM)	1500 (maximum).
4.12	Pump stroke speed per minute	Maximum 100
4.13	Strainer	Y-Type strainer of MOC-PP (2X100%, 50 BS).
4.14	Pressure gauge	One per pump with Teflon diaphragm seal
4.15	Pulsation Dampener	One per pump
5.0	**CHEMICAL DAY TANKS (OTHER THAN ACID)**	
5.1	Numbers To be provided	Two (2) [1Working+1Standby] for each chemical used for CW Chemical treatment programme
5.2	Location	Indoor under shed.

5.3	Type	Vertical cylindrical with dished bottom & cover at top. Chemical adding facility from top (Preferably funnel type)
5.4	Effective capacity, in litres	One day req. or minimum 650 lit. each whichever is higher.
5.5	Material of Construction (Shell, Dished end & tope cover)	MS as per IS 2062 with RL (inside)
5.6	Shell (Internal) lining Material & Thickness	Rubber & Rubber Lining - minimum 4.5 mm thick (3 layer @1.5 mm thick each)
5.7	Thickness	Shell/ Dished-6 mm
5.8	Instruments	As per P&ID.
5.9	Number & Stirrers/agitator	One number per tank. Motor driven with reduction gear unit. Material of construction-SS316/ FRP lined
5.10	Accessories	Each tank shall be provided with one dissolving basket and a feed funnel at top cover of the tank to feed the solution. Material of Construction of dissolving basket shall be Stainless Steel – 316.
6.0	**CHEMICAL INJECTION PUMPS (OTHER THAN ACID)**	
6.1	Number	Two (2) [1Working+1Standby] for each chemical used for Chemical treatment programme
6.2	Location	Indoor under shed
6.3	Duty	Continuous.
6.4	Type of Pump	Positive displacement Diaphragm type reciprocating.
6.5	Rated Capacity	As desired.
6.6	Range of Capacity/Stroke Adjustment	0 % - 100 % of capacity automatically by control system.
6.7	Head	As required.
6.8	Accessories	Pulsation dampener and safety relief valve shall be provided at each pump discharge header.
6.9	**Material of construction**	
6.9.1	Liquid end (pump head, valve, valve housing, etc.)	SS 316
6.9.2	Diaphragm	PTFE
6.9.3	Packing	PTFE
6.9.4	Shaft	SS 410
6.10	Type of drive	Electrical Motor
6.11	Rated speed (RPM)	1500 (maximum).
6.12	Strainer	Y-Type strainer of MOC- SS 316 (2X100 %, 50 BS).
6.13	Pump stroke speed per minute	Maximum 100
6.14	Pressure gauge	One per pump with Teflon diaphragm seal
6.15	Pulsation Dampener	One per pump
7.0	**LIME PIT EFFLUENT DISPOSAL PUMPS**	
7.1	Number	Two (2) [1Working+1Standby]
7.2	Location	Outdoor
7.3	Duty	Intermittent
7.4	Type of Pump	Vertical Centrifugal Impeller – closed.
7.5	Speed	1500 rpm (max.)
7.6	Rated Capacity	10 M3/hr.(each)
7.7	Head	As required to pump the lime pit waste to Cooling tower basin
7.8	Material of construction	

7.8.1	Casing	SS316
7.8.2	Shaft	SS-316
7.8.3	Impeller	SS316
7.8.4	Wearing Rings	SS316
7.9	Type of drive	Electrical Motor
7.10	Rated speed (RPM)	1500 (maximum).
7.11	Pressure gauge	One per pump with Teflon diaphragm seal
8.0	**ACID DILUTION WATER PUMPS**	
8.1	Number	Two (2) [1Working+1Standby each]
8.2	Location	Indoor
8.3	Duty	Continuous.
8.4	Fluid to be handled	Cooling water.
8.5	Service	For Dilution Purpose (for acid dosing)
8.6	Type of Pump	Horizontal Centrifugal Non Clog type
8.7	Design standard	As per IS-5659 & IS-5120.
8.8	Suction Condition	Flooded
8.9	Rated Capacity	As desired.
8.10	Head to be developed at rated capacity	As per system requirement
8.11	Impeller type	Closed
8.12	Maximum Pump Speed (RPM)	1500
8.13	**Material of Construction**	
8.13.1	Casing	2.5% Ni CI to IS:210 Gr. FG-260
8.13.2	Impeller	Bronze to IS:318 Gr. I/II or SS-316
8.13.3	Wearing Rings	High leaded bronze to IS-318 Gr. V/ SS-316 in case of SS Impeller.
8.13.4	Shaft	SS-316
8.13.5	Shaft sleeve	SS-410
8.13.6	All fasteners	Stainless steel
8.13.7	Type of Suction Strainer	Y-Type strainer of MOC- SS 316 (2X100 %, 50 BS).
9.0	**MATERIAL OF CONSTRUCTION OF PIPING**	
9.1	For H_2SO_4 dosing and unloading system	Polypropylene lined Carbon steel
9.2		
9.3	For Chemicals other than acid	Stainless steel to ASTM A 312 TP 304 sch. 40 (minimum).
9.4	For Lime pit waste transfer line	Stainless steel to ASTM A 312 TP 304 sch. 40 (minimum).
9.5	Service water/ Raw water/ Clarified water piping	IS-2062 Gr.-E-250B/ASTM A-36/ASTM A-53 type 'E' Gr. B/IS-3589 Gr. 410 /IS-1239 Heavy.
9.6	Potable water/ Instrument air/ Service air piping	ASTM A-53 type E Gr. B galvanized/ IS 1239 Gr heavy galvanized/IS 3589 Gr 410 galvanized. Galvanized shall be to IS- 4736 or equivalent.
10.0	Structural Steel	IS 2062 Gr. B
11.0	Nuts and Bolts, fasteners (heavy duty)	SS304
12.0	**HAND PUMP**	
12.1	Numbers	One number for each chemical (other than acid)
12.2	Type	Hand operated chemical barrel pump
12.3	Working principle	Self-priming, hand operated
12.4	Material of construction	SS 316 & Teflon
12.5	Accessories	Hose pipe of 15 meters with each hand pump
13.0	**PIPE DIFFUSERS**	
13.1	Numbers	As per system requirement for each chemical shall be provided by bidder.

13.2	Material of Construction for chemicals other than Acid	SS-304
13.3	Material of Acid dosing system	SS-304L
14.0	**SAFETY EQUIPMENT**	Four (4) sets of safety equipment [(Personal Protection Equipment (PPE)] comprising PVC protection suits with hoods, rubber boots, face visors and thick PVC gauntlets shall also be provided by the bidder. Two (2) numbers safety shower units and adequate nos. of eye fountains to protect against any chemical hazard shall also be provided by the bidder.
15	**Valves**	
15.1	Waste effluent (neutralized)	**Type of Valves** • For isolation a) Butterfly or Saunder's Patented Diaphragm Valves up to 200 mm NB. b) Butterfly type for Sizes 250 mm NB & above. • For regulation / control a) Globe type for Sizes up to 50 mm NB. b) Globe or Butterfly type for Sizes 65 mm NB to 200 mm NB. • For non-return/ check a) Lift Check type/ Swing Check/ Dual Plate type for sizes up to 40 mm NB. b) Swing Check or Dual Plate type valve for sizes 50 mm NB & above.
		Material of Construction Valves • Diaphragm Valves a) Body shall be Cast Iron to IS: 210 Gr FG 260 OR Cast Steel to ASTM. A 216 GR. WCB/ Equivalent. and Body shall be internally lined with Soft Natural rubber, Ebonite or Polypropylene. b) Diaphragm shall be Reinforced rubber, Hypalon/ approved equivalent. Stem, Compressor & Bush shall be of Stainless Steel Construction. • Butterfly Valves a) Body shall be Cast Iron to ASTM A 48 Cl.40; BS: 1452 Gr.220 SG Iron - BS: 2789; Cast Iron to IS: 210 Gr FG 260/Equiv. OR Cast Steel - ASTM. A 216 GR. WCB; BS:1504 Eq. Gr/Equivalent OR Fabricated Steel as per ASTM A515 Gr.60/80 and Body shall be internally lined with natural rubber, Ebonite or Polypropylene b) Disc shall be Cast Iron IS: 210 Gr FG 260; ASTM A 48 Cl.40; BS: 1452, Gr.220, SG Iron - BS:2789 OR Cast Steel - ASTM A 216 Gr. WCB; BS:1504 Eq. Gr/ Equivalent OR

		Fabricated Steel as per ASTM A515 Gr.60/ 80 and Disc shall be internally lined with PVDF, natural rubber or Polypropylene. Alternatively, Disc of Stainless Steel-316 construction is also acceptable. c) Shaft shall be of Stainless steel to ASTM. A 296 Gr. CF8M/AISI 316/ AISI 420 /BS:970 Gr.316; BS: 970 Gr.420 S45. d) Seat rings shall be Nitrile rubber/ Hypalon/ Eqvt. • Globe Valves a) Body & Disc shall be Cast iron, Cast Iron to IS: 210 Gr FG 260 or Eqvt. and internally lined with natural rubber, Ebonite or Polypropylene. b) Stem shall be Stainless steel AISI 410/ 13% chrome steel c) Packing shall be PTFE d) Seat & Seat rings shall be Nitrile rubber or Hypalon. e) Hand wheel shall be Cast Iron or Equivalent. • Check Valves a) Body & Cover, Hinge Disk/Door shall be Cast Iron to IS: 210 Gr FG 260/ BS:1452 Gr.220 or Eqvt and shall be lined with natural Rubber, PTFE or Viton or Stainless Steel – 316 b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB and shall be coated with PVDF, or suitable elastomer or Stainless Steel – 316. c) Disc facing ring and Body Seat rings shall be Stainless Steel d) Bearing bushes shall be SS – 316. e) Material of construction of spring in dual type valve shall be of INCONEL or better.
15.2	Acid (Sulphuric) Service	**Type of Valves** • For Isolation a) Saunder's Patented Diaphragm Valves • For non-return/ check a) Swing Check type /Dual Plate type
		Material of Construction Valves • Diaphragm Valves a) Body shall be Cast Iron to IS: 210 Gr FG 260/ ASTM A 48 Cl.40; BS: 1452 Gr.220 OR Cast Steel to ASTM. A 216 GR. WCB. b) For Diluted Sulphuric acid, body shall be Teflon lined/ Alloy 20/ Hastealloy C/ Equivalent. c) Diaphragm shall be of reinforced TEFLON/

		Equivalent. d) Stem, Compressor & Bush shall be Stainless Steel Construction, Hand wheel shall be of Cast Iron. • Check Valves a) The complete valve shall be of Alloy- 20/ Hastelloy C / Equivalent.
15.3	Lime slurry/ Solution/ Suspensions	**Type of Valves** • For Isolation a) Non-lubricated Plug Valves • For non-return / Check a) Swing Check type /Dual Plate type
		Material of Construction Valves • Plug Valves a) Body shall be Cast Iron to IS: 210 Gr FG 260/ ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt. b) Plug shall be Stainless steel to AISI 316. c) Body Sleeve & Seat shall be PTFE. d) Gland & Gland nut shall be SS 304/ 316 e) Cover shall be of Cast Steel to ASTM A 216 Gr. WCB. • Check Valves a) Body & Cover, Hinge Disk/Door shall be Cast Iron to IS: 210 Gr FG 260 / ASTM A 48 Cl. 40; BS: 1452 Gr.220 or Eqvt. and shall be lined with natural Rubber, PTFE or Viton or Stainless Steel – 316 b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB and shall be coated with PVDF, or suitable elastomer or Stainless Steel – 316. c) Disc facing ring and Body Seat rings shall be Stainless Steel. d) Bearing bushes shall be SS-316. **e)** Material of construction of spring in dual type valve shall be of INCONEL or better.
	Valve handling speciality chemicals (Other than Acid)	**Type of Valves** • For Isolation a) Ball/ Gate Valves b) Saunder's Patented Diaphragm Valves up to 200 mm NB. • For non-return / Check Swing Check type /Dual Plate type **Material of Construction Valves** Gate/ Ball Valve: SS 304

		Diaphragm Valves a) Body shall be Cast Iron to IS: 210 Gr FG 260/ ASTM A 48 Cl.40; BS: 1452 Gr.220/Equivalent. OR Cast Steel to ASTM. A 216GR. WCB and Body shall be internally lined with Soft Natural rubber, Ebonite or Polypropylene b) Diaphragm shall be shall be of reinforced rubber / Hypalon/ approved equivalent c) Stem, Compressor & Bush shall be Stainless steel Construction For non-return / Check: SS 304
	Service water/ Potable water/ Raw water/ Clarified water valves	Cast iron for sizes 65NB and above; gunmetal for sizes 50 NB and below.
	Instrument air/ Service air valves	Cast carbon steel or forged carbon steel for sizes 65 mm NB & above and Gun metal for sizes 50 NB and below.

Note: -

a) The dosing point shall be suitable for proper mixing in the forebay and for the same, diffusers shall be provided.
b) All gasket used in the chemical site shall be from chemical proof material to relevant chemical.
c) All drains shall be connected with a lime pit.

DATASHEET A FOR CHP RUN OFF WTP

1.	**TRANSFER PUMPS TREATMENT PLANT**	
1.1	**CLARIFIER FEED PUMP (CSSP AREA)**	
1.2	Number	2X50%
1.3	Service	Intermittent
1.4	Capacity (Each)-Minimum	To suit net Clarifiers output of 2200 cum/hr and Head to meet the system requirement. i.e., each pump capacity shall be 1100 cum/hr+ water loss due to sludge.
1.5	Operating Speed (Maximum)	1500 rpm
1.6	Pumps & Drives to be designed for	Outdoor Duty
1.7	Service of duty	Continuous
1.8	Type of pump	Vertical Turbine (wet pit) Type and non-pull out type.
1.9	Type of Working Fluid	Decanted water
1.10	Maximum water temperature	36 deg C
1.11	Minimum water temperature	25 deg C
1.12	Type of Discharge	Above Floor discharge
1.13	Type of impeller	Closed / Semi-open
1.14	Type of lubrication	Self-water or grease
1.15	Suction condition	Submerged
1.16	Minimum Water level	By Bidder
1.17	Maximum Water level	Local Finished Grade Level (FGL)
1.18	Sump Invert level	As per design
1.19	Operating floor level	Minimum 500 mm above FGL
1.20	Type of shaft coupling	Flexible / Rigid
1.21	**Material of Construction**	
1.21.1	Suction Bell	2.5%NiCI; IS: 210Gr FG 260; S-0.1% & P-0.15% max.
1.21.2	Casing / Bowl	2.5%NiCI; IS:210Gr FG 260; S-0.1% & P-0.15% max.
1.21.3	Impeller	ASTM A351 CF8M
1.21.4	Wearing rings (if applicable)	As per manufacturer's Std
1.21.5	Impeller Shaft, Pump & line shaft	SS ASTM A 276 Gr. 410.
1.21.6	Shaft coupling	SS ASTM A 276 Gr. 410
1.21.7	Shaft sleeves	SS - ASTM –A 276 – 410
1.21.8	Shaft bearings	Cutless rubber with bronze retainer for bearings below minimum water level and Thordon type bearing for bearings above minimum water level

1.21.9	Column pipe	Fabricated steel as per IS: 2062 (minimum thickness shall not be less than 8 mm) with 2 coats of epoxy coating inside & outside.
1.21.10	Shaft enclosing tube	Not Applicable
1.21.11	Discharge Head	Fabricated steel as per IS:2062 (minimum thickness shall not be less than 8 mm) or Cast Iron with 2 coats of epoxy coating inside and outside.
1.21.12	Distance piece (if applicable)	Fabricated steel as per IS:2062(minimum thickness shall not be less than 10 mm) with 2 coats of epoxy coating inside.
1.21.13	Matching flanges	Fabricated steel as per IS:2062
1.21.14	Stuffing box	2.5% NI-CI to IS:210 FG-260
1.21.15	Gland	2.5% NI-CI to IS:210 FG-260
1.21.16	Gland packing	Impregnated TEFLON
1.21.17	Gaskets	Wire reinforced rubber gasket / Neoprene rubber / Compressed Asbestos Fiber
1.21.18	Bolts & nuts	Stainless steel AISI type 304/316 for those coming in contact with water and for others, material shall be high tension carbon steel.
1.21.19	Base plate and Soleplate	Fabricated steel as per IS: 2062 (Minimum 10 thick)
1.21.20	Accessories to be provided with each pump	a. Companion flanges with nuts, bolts and gaskets, Positioning dowels, Eye bolts, lifting etc b. Internal piping with valves filters & Instruments for sealing/ cooling/ lubrication system upto and including isolating valve etc as per requirement. c. Non –reverse ratchet shall be provided as per manufacturer's standard practice.
1.22	Other Technical	Refer sub-section titled "General Technical Requirement of Pumps" in Technical Specification
2.	**INLET VALVES**	
2.1	Inlet valves to Stilling Chamber	One (1) number motorized butterfly valve (Inching Type) located at inlet to stilling chamber along with one (1) number Manual butterfly valve.
2.2	Inlet valves size	Suitable to cater to total flow i.e. Same as that of Pipe Size
2.3	Control	Under "Auto" mode of flow control valve, valve shall automatically maintain the level of water in the Distribution Chamber, i.e valve shall automatically close when reservoir level becomes high.
3.	**STILLING CHAMBER**	

3.1	No.	One (1) Number
3.2	Purpose	To dampen out any turbulence of the incoming water.
3.3	Type of Construction	Circular/Rectangular
3.4	Capacity (Design flow)	(2200 + 3% for sludge) Cum/hr.
3.5	Material of construction	RCC (BHEL Scope)
3.6	Drain arrangement	Suitable draining arrangement shall be provided for the stilling chamber and drain lines shall be connected to sludge sump.
4.	**PARSHALL FLUME**	
4.1	No.	One (1) number
4.2	Purpose	To measure flow.
4.3	Material of construction	RCC (BHEL Scope)
5.	**INLET CHAMBER**	
5.1	Nos.	One (1) number
5.2	Material of Construction	RCC (BHEL Scope)
5.3	Capacity (Design flow) min.	(2200 + 3% for sludge) Cum/hr
6.	**HRSCC (HIGH RECOVERY SOLID CONTACT CLARIFIER)**	
6.1	Number	One (1)
6.2	Design Capacity (Net output)	2200 Cum/hr (each).
6.3	Type	Circular High Rate Solids Contact Reactor Type Clarifier (HRSC).
6.4	Material of Construction	RCC (BHEL Scope)
6.5	MOC of pipe from inlet channel to clarifier	Carbon Steel pipe encased with concrete for buried portion and externally epoxy painted inside the clarifiers.
6.6	Sludge Blow Off to sludge sump	By gravity through telescopic stand-pipe for continuous discharge and through motor operated blow-off valve for intermittent. (Suitable manhole arrangement shall be provided in sludge lines)
6.7	Sludge Blow Off- Pipe Material	CI class A as per IS: 1536)
6.8	Reaction Turbine	With variable frequency drive as per Manufacturer's Standard
6.9	Flushing Connection	Required.
7.	**CLARIFIER SCRAPPERS**	
7.1	Number required	One (1) assembly per clarifier.
7.2	Material	Mild steel (MS) with rubber inserts (With bitumastic paint protective coating)
7.3	Drive	Slow speed motor driven through reduction gear unit or Variable frequency Drive as per manufacturer's std.
8.	**SUITABLE ACCESSORIES OF CLARIFIER**	
8.1	Access ladder, platform, staircase, hand railings etc.	Shall be provided of structural steel.

8.2	Walkway	Shall be provided with hand railings around launder periphery of width 1000 mm.
9.	**Distribution Chamber (Above ground)**	
9.1	Number of Basin	One (1) number in twin sections
9.2	Material of Construction	RCC (BHEL Scope)
9.3	Capacity of each section	500 Cum (minimum)
10.	**SLUDGE PIT**	
10.1	Number	One (1) (Under Ground) in twin section
10.2	Capacity (effective)	1 hrs of storage in each section.
10.3	Dimension	Suitable
10.4	Material	RCC with epoxy paint. (BHEL Scope)
10.5	Location	Shall be finalized during Detailed Engineering (DDE).
10.6	Special arrangement	Agitation/ recirculation line shall be provided in sludge transfer pit.
11.	**AIR BLOWER FOR SLUDGE PIT**	
11.1	Number	Two (1W+1S)
11.2	Type	Centrifugal /Twin Lobe Type
11.3	Duty	Intermittent
11.4	Capacity & Head	As required
11.5	MOC of casing and lobes	CI as per IS 210 FG 260
11.6	MOC of shaft	Carbon steel BS-970 En-8/ANSI-I045
11.7	Accessories Required	Acoustic Enclosure, Suction Filter, Silencer, relief Valve etc
11.8	Location	Outdoor
12.	**FILTER PRESS**	
12.1	Number	2 Nos
12.2	Type	Automatic Chamber filter press with automatic filter cake removal and VFD driven
12.3	Flow rate	Each filter press shall be designed for the handling of total sludge generated while the other filter press will be under backwash/cleaning operation ensuring continuous desludging of the sludge generated.
12.4	Sludge consistency required at outlet	20% to 25%
12.5	No of cycle per filter press	As per supplier recommendation
12.6	Cycle time (hour)	As per supplier recommendation
12.7	Number of Recessed Plates and chambers	As per supplier recommendation
12.8	Recessed Plate shifting	Automatic
12.9	**Material of Construction:**	
12.9.1	Chassis Structure	MS with Epoxy coated
12.9.2	Filter / End Plates	Polypropylene
12.9.3	Wetted part (any)	MS with Epoxy coated suitable for intended

		application
12.9.4	Type of Element	Recessed with Centre Feeding/ Polypropylene Membrane & Recessed with Centre Feeding
12.9.5	Location	Filter press shall be located in the vicinity of clarifier at elevated RCC structure with platform for maintenance & operation with Solid cake removal from bottom. The clear water shall be routed to clarifiers through Pumping. Suitable collection & disposal arrangement (i.e. sump, Pumps (2x100%) along with associated pipping, instruments, valves etc) to be provided by bidder.
12.9.6	Cleaning system for filter press, plate & Filter clothe etc.	Suitable arrangement to be provided.
13.	**Coagulant aid Dosing System**	
13.1	**Coagulant aid Dosing Tank**	
13.1.1	Number	Two (2)
13.1.2	Type	Vertical cylindrical with dished end bottom & with cover at the top.
13.1.3	Capacity (Total)-	To hold coagulant for 24 hours requirement of all the Filter Press operating at design capacity and a design dosage rate of 2 ppm minimum, whichever is maximum.
13.1.4	Material of Construction	Carbon Steel internally rubber lined and externally painted with epoxy painting
13.1.5	Agitator & Number	Motor driven with reduction gear unit One (1) per tank
13.1.6	Agitator Shaft material	SS316
13.1.7	Agitator Impeller material	SS316
13.2	**Pumps- Metering Pumps**	
13.2.1	Number	Two (2x100%)
13.2.2	Min Capacity (Each) cum/hr	As per system requirements.
13.2.3	Head	As per system requirements.
13.2.4	Type	Simplex hydraulically operated Diaphragm type
13.2.5	Liquid to handled and concentration	PE Solution
13.2.6	Capacity control	10 --100% of capacity manually by micrometer dial
13.2.7	Pump stroke speed per minute	Maximum 100
13.2.8	**Material of Construction:**	
•	Liquid end (pump head valve, valve housing, etc), valve spring	AISI -316
•	Diaphragm	PTFE
•	Packing	PTFE
•	Shaft	Hardened steel EN8-BS-970)/ AISI-316
•	Accessories	Pressure Dampeners, Safety Relief valves etc.

		required				
14.	**CHEMICAL DOSING CUM STORAGE AREA**					
14.1	Number	One (1)				
14.2	Type	Shed. (BHEL Scope)				
14.3	Area dimensions	Shall be finalized during Detailed Engineering (DDE).				
14.4	Purpose	Location of all chemical dosing tanks including dosing facility of Coal slurry settling ponds, pumps & Storage of chemical required for Alum, Lime, coagulant aid and flocculants dosing for 15 days storage capacity.				
15.	**WEIGHING SCALE FOR CHEMICAL**					
15.1	Type	Platform & dial type./electronic type				
15.2	Number	Two (2) [One (1) Range 0-500 Kg & One (1) Range 0-2000 Kg]				
16.	**HOIST**					
16.1	Type	Electric operated				
16.2	Number	One (1).				
16.3	Capacity (Min)	1 Ton				
16.4	Design Standard	IS:3938 Class 2				
17.	**CHEMICAL DOSING SYSTEM**					
17.1	**Chemical tanks**					
S.No	**Designation**	**Lime Slaking Tanks**	**Lime Dosing Tanks**	**Alum Dosing Tanks**	**Synthetic Flocculants Dosing tanks**	**Coagulant aid Dosing Tanks**
17.1.1	Number	Two (2)	Two (2)	Two (2)	Two (2)	Two (2)
17.1.2	Type	-	-	-	Vertical cylindrical with dished end bottom & with cover at the top.	Vertical cylindrical with dished end bottom & with cover at the top.
17.1.3	Capacity (Total)-	To hold lime slurry (of about 10% W/V concentration from Quick lime of purity of 75% CaO) for 24 hours requirement of all the clarifiers operating at design	To hold lime solution (of about 6% W/V concentration) for 24 hours requirement of all the clarifiers operating at its design capacity and a design dosage rate	To store alum solution (of about 10% W/V concentration) for 24 hrs req. of all clarifier operating at its design capacity and a dosing rate of 70 ppm min, Whichever is maximum.	To hold coagulant for 24 hours requirement of all the clarifiers operating at design capacity and a design dosage rate of 2 ppm minimum, Whichever is	To hold coagulant for 24 hours requirement of all the clarifiers operating at design capacity and a design dosage

		capacity and a design dosage rate of 30 ppm minimum, Whichever is maximum.	of 30 ppm minimum, Whichever is maximum		maximum.	rate of 2 ppm minimum, Whichever is maximum.
17.1.4	Material of Construction	RCC (BHEL Scope) (With 2 Coats of Bitumastic Paint over 2 coats of Primer)		RCC (BHEL Scope) (With Acid/Alkali resistant Tiles)	Carbon Steel internally rubber lined and externally painted with epoxy painting	
17.1.5	Agitator & Number	Motor driven with reduction gear unit One (1) per tank				
17.1.6	Dissolving Chamber For Each Tank	Required (Stainless steel Material)			Not Applicable	
17.1.7	Agitator Shaft material	SS316				
17.1.8	Agitator Impeller material	SS316				
17.2	**Pumps- Metering Pumps**					
S.No	**Designation**	**Alum Dosing Pumps**	**Synthetic Flocculants Dosing Pumps**	**Coagulant aid Dosing Pumps**		
17.2.1	Number	Two (2x100%)	Two (2x100%)	Two (2x100%)		
17.2.2	Min Capacity (Each) cum/hr	As per system requirements.				
17.2.3	Head	As per system requirements.				
17.2.4	Type	Simplex hydraulically operated Diaphragm type				
17.2.5	Liquid to handled and concentration	Alum solution 10% W/V	-	-		
17.2.6	Capacity control	10 --100% of capacity manually by micrometer dial				
17.2.7	Pump stroke speed per minute	Maximum 100				
17.2.8	**Material of Construction:**					
•	Liquid end (pump head valve, valve housing, etc) ,valve spring	AISI -316				
•	Diaphragm	PTFE				
•	Packing	PTFE				
•	Shaft	Hardened steel EN8-BS-970)/ AISI-316				
•	Accessories	Pressure Dampeners, Safety Relief valves etc. As required				
17.3	**Pumps- Horizontal Centrifugal Pumps**					

S.No	Designation	Flushing/Cleaning Pump for Filter Press	Supernatant Transfer Pumps	Lime Slurry Transfer Pumps	Lime Dosing Pumps
17.3.1	Number	Two (1) (1W+1S)	Two (2) (2x50%)	Two (2) (1W+1S)	Two (2) (1W+1S)
17.3.2	Min Capacity (Each) cum/hr	To Suit Requirement of one (1) Filter Press.	1100 cum/hr	As per System Req.	As per System Req.
17.3.3	Operating Speed	1500 rpm (max)			
17.3.4	Pumps & Drives To be Designed for	Outdoor Duty			
17.3.5	Service of Duty	Continuous			
17.3.6	Type of Pump casing	Radially Split Type			
17.3.7	Type of Working Fluid	Service Water	Supernatant	Lime Solution (10% v/v)	Lime Solution (6% v/v)
17.3.8	Max. Water Temperature	45 Deg.C	45 Deg.C	80 Deg.C	80 Deg.C
17.3.9	Min. Water Temperature	33 Deg.C	33 Deg.C	40 Deg.C	40 Deg.C
17.3.10	Type of Lubrication	Grease			
17.3.11	Suction Condition	Flooded			
17.3.12	**Material of Construction**				
•	Casing	ASTM A351 CF8M	ASTM A351 CF8M	2.5% Ni CI IS210 Gr FG 260	2.5% Ni CI IS210 Gr FG 260
•	Impeller	ASTM A351 CF8M	ASTM A351 CF8M	ASTM A351 CF8M	ASTM A351 CF8M
•	Wearing rings (If applicable)	SS316			
•	Shaft	SS410			
•	Shaft Sleeves	SS410			
•	Stuffing Box	2.5% Ni CI IS210 Gr FG 260			
•	Gland	2.5% Ni CI IS210 Gr FG 260			
•	Bolts & Nuts	Stainless steel for those coming in contact with water and for others, material shall be high tension carbon steel.			
•	Base Plates	Carbon Steel (Minimum 10 mm thick			
17.3.13	Accessories to be provided with each pump	a. Companion flanges with nuts, bolts and gaskets, Internal piping with valves filters & Instruments for sealing/ cooling/ lubrication system up to and including isolating valve etc, b. Positioning dowels, drain plugs, vent valve etc c. Coupling guards, Eye bolts, lifting etc.			
17.3.14	Other Technical	Refer sub-section titled “General Technical Requirement of Pumps” in Sec-D of Technical Specification			

17.4	**Pumps- Vertical Sump Pumps**		
S.No	**Designation**	**Sludge Transfer Pumps**	**Centrate Transfer Pump**
17.4.1	Number	Two (2x100%)	Two (2x100%)
17.4.2	Min Capacity (Each) cum/hr	As Per System Req.	
17.4.3	Operating Speed	1500 rpm (Maximum)	
17.4.4	Pumps & Drives To be Designed for	Outdoor Duty	
17.4.5	Service of Duty	Continuous	
17.4.6	Type of Pump	Vertical, non-clog, Sump pumps	
17.4.7	Type of Working Fluid	Sludge	
17.4.8	Type of Discharge	Above Floor Discharge	
17.4.9	Type of impeller	open	
17.4.10	Type of lubrication	grease	
17.4.11	Suction condition	Submerged	
17.4.12	Minimum Water level	By Bidder	
17.4.13	Maximum Water level	Local Finished Grade Level (FGL)	
17.4.14	Operating floor level	Minimum 500 mm above FGL	
17.4.15	Type of shaft coupling	Flexible / Rigid	
17.4.16	**Material of Construction**		
•	Suction Bell/casing	2.5%NiCI; IS: 210Gr FG 260; S-0.1% max. & P-0.15% max.	
•	Impeller	ASTM A351 CF8M	
•	Shaft	SS410	
•	Shaft coupling	SS410	
•	Shaft sleeves	SS410	
•	Column pipe & Discharge Pipe	CS as per IS2062 (Min. 8 mm thickness) with 2 coats of epoxy coating inside & outside.	
•	Shaft enclosing tube (If Applicable)	CS as per IS2062 (Min. 8 mm thickness) with 2 coats of epoxy coating inside & outside.	
•	Stuffing box	2.5% NI-CI to IS:210 FG-260	
•	Gland	2.5% NI-CI to IS:210 FG-260	
•	Gland packing	TIWA	
•	Gaskets	Neoprene rubber	
•	Bolts & nuts	Stainless steel	
17.4.17	Base plate and Soleplate	Carbon Steel (Min.10 mm Thick)	
17.4.18	Accessories to be provided with each pump	d. Companion flanges with nuts, bolts and gaskets, Positioning dowels, Eye bolts, lifting etc e. Non –reverse ratchet shall be provided as per manufacturer's standard practice.	
17.4.19	Other Technical	Refer sub-section titled "General Technical	

		Requirement of Pumps" in Technical Specification
18.	**VALVES** All the valves shall generally be conforming to the requirements specified in the Chapter titled "General Technical Requirement of Low Pressure Piping" considering the following aspects as minimum requirement:	
18.1	Coagulant (Alum) and Coagulant aid Services	**i. Type of Valves** <u>For Isolation</u> a) Saunder's Patented Diaphragm Valves b) Ball Valves in CPVC pipes <u>For non-return / Check</u> Swing Check type /Dual Plate type
		ii. Material of Construction Valves <u>Diaphragm Valves</u> a) Body shall be Cast Iron to IS: 210 Gr FG 260/ ASTM A 48 Cl.40 ; BS: 1452 Gr.220/Equivalent. OR Cast Steel to ASTM. A 216GR. WCB and Body shall be internally lined with Soft Natural rubber, Ebonite or Polypropylene b) Diaphragm shall be shall be of reinforced rubber /Hypalon/ approved equivalent c) Stem, Compressor & Bush shall be Stainless steel Construction <u>Ball Valves in CPVC Pipe lines</u> a) Body , Ball & stem shall be of CPVC b) Seat ring & Packing shall be EPDM / or equivalent <u>Check Valves</u> a) Body & Cover, Hinge Disk/Door shall be Cast Iron to IS: 210 Gr FG 260/ ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt and <u>shall be lined with natural Rubber, PTFE or Viton</u> or Stainless Steel – 316 b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB and <u>shall be coated with PVDF, or suitable elastomer</u> or Stainless Steel – 316 c) Disc facing ring and Body Seat rings shall be Stainless Steel d) Bearing bushes shall be SS – 316 e) Material of construction of spring in dual type valve shall be of INCONEL or better
18.2	Lime slurry/Solution/ Suspensions	**i. Type of Valves** <u>For Isolation</u> Non-lubricated Plug Valves <u>For non-return / Check</u> Swing Check type /Dual Plate type
		ii. Material of Construction Valves <u>Plug Valves</u> a) Body shall be Cast Iron to IS: 210 Gr FG 260 / ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt b) Plug shall be Stainless steel to AISI 316 c) Body Sleeve & Seat shall be PTFE d) Gland & Gland nut shall be SS 304/316

		e) Cover shall be of Cast Steel to ASTM A 216 Gr WCB Check Valves a) Body & Cover, Hinge Disk/Door shall be Cast Iron to IS: 210 Gr FG 260 / ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt and shall be lined with natural Rubber, PTFE or Viton or Stainless Steel – 316 b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB and shall be coated with PVDF, or suitable elastomer or Stainless Steel – 316 c) Disc facing ring and Body Seat rings shall be Stainless Steel d) Bearing bushes shall be SS-316 e) Material of construction of spring in dual type valve shall be of INCONEL or better
18.3	Sludge	**i. Type of Valves** For Isolation Gate or Sluice or Knife edge type Slide Valves For non-return / Check Swing Check type /Dual Plate type **ii. Material of Construction** Gate / Sluice / Knife Edge Slide Valve a) Body, Disc : Cast Iron b) Stem : Stainless Steel AISI 420 d) Packing : PTFE e) Gland & Gland nut : AISI 420 f) Hand wheel : Cast Iron Check Valves a) Body & Cover, Hinge Disk/Door shall be Cast Iron BS:1452 Gr.220 or Eqvt b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB / High tensile Brass or BS: 2872 equivalent. c) Disc facing ring and Body Seat rings shall be Stainless Steel. d) Bearing bushes shall be Leaded tin Bronze. e) Material of construction of spring in dual type valve shall be of INCONEL or better
18.4	**Other Requirements:** 1) Butterfly valves shall conform to design standard latest revision of AWWA C-504/EN 593/equivalent standard of required class/rating. 2) Plug valves shall be designed as per BS: 5353 Cl.150 or equivalent. 3) Valves for alum solution shall be Saunders's patented Diaphragm type designed as per BS: 5156 or approved equivalent standard. 4) Sluice/Gate Valves shall conform to BS: 5150 (BS: 5163 PN 16) PN16, IS:14846 of rating PN 1.6 (min.). Stem, seat ring and wedge facing ring shall be of stainless steel construction. Other parts shall be as per IS: 14846 /BS:5163). Flanges shall be designed as per ANSI B 16.5 Cl. 150 (min.) to meet with the piping flanges. Valves shall be of outside screw and rising stem type. Gate valves for sizes below 50 NB and below shall conforms to IS:778 Class-2/ANSI B16.34 straight, rising stem; without side screw. 5) Sluice/Gate valves shall be provided with the following accessories in addition to the standard items:	

	a. Hand wheel b. Manual Gear reduction unit operator for valves 200 NB and above c. Bypass valve for valve of sizes 350 NB and above. d. Draining arrangement wherever required. e. Arrow indicating flow direction. f. Position indicator. g. Sluice/Gate Valves shall be provided with back seating bush to h. facilitate gland renewal during full open condition. 6) Design standard for Gates shall be IS: 3042 or Equivalent. Material of Construction a. Frame and Door: Cast Iron IS:210 Gr.260 b. Spindles, bolts & nuts: M.S. to IS:2062 c. Face & seat rings: Gun metal (as per IS: 3042). 7) All the parts of gates shall be applied with the coats of heavy duty bitumastic paint. Each of the gates shall be provided with hand wheel and a position indicator. 8) Sluice valve/knife edge type slide valves shall design by IS 14846. Plug valves shall be used for the application of lime slurry/lime solutions conforming to BS: 5353 Class 150 or Equivalent. 9) Valves will be used to start/stop or control flow. Gates will be primarily used for isolation of flow in open channels although these should be capable of throttling the flow too. However, contractor can provide either isolation gates or butterfly valves in various RCC tanks/pits/sumps such as sludge pit, distribution chamber etc. Sample valves will be used in sample collection lines. Unless otherwise specified all the valves shall be supplied with counter flanges by the Contractor. 10) All valves shall be suitable for service conditions i.e. flow, temperature and pressure under which they are required to operate. All the valves shall be of standard pressure rating of the relevant design standard. Nonstandard pressure rating shall not be accepted. The pressure and temperature rating of the valve shall not be less than the maximum expected pressure and temperature plus 5% additional margin of the system in which valves are proposed to be installed. The pressure rating of individual piping system components such as valves, flanges etc. shall however be not less than that specified.	
19.	**PIPING** All the piping shall generally be conforming to the requirements specified in the Chapter titled "General Technical Requirement of Low Pressure Piping" considering the following aspects as minimum requirement:	
19.1	Decanted & Supernatant water	Carbon Steel: IS: 1239 Part-I (Heavy grade-Black), ASTM-A-53 Type-E Grade B / ASTM A 36 /IS: 3589 - Grade 410; / IS-2062 Gr.-B (for fabricated from plates) / Equivalent
19.2	Coagulant (Alum)	Rubber lined Steel/CPVC Schedule 80
19.3	Lime slurry/Solution/ Suspensions	CPVC as per ASTM F441 CPVC 4120 Sch. 80
19.4	Coagulant aid Solution	Rubber lined Steel/CPVC as per ASTM F441 CPVC 4120, Schedule80/equivalent.
19.5	Sludge	1) GRP as per ASTM D3517/ AWWA C950-88/AWWA M45 2) HDPE as per ASTM D3350 CL 34543C, FM Class 150/ IS:4984 or Equivalent for buried portion
19.6	Chemical Waste from vessels and tanks	1) Rubber lined Steel (as referred above) 2) HDPE as per ASTM D3350 CL 34543C, FM Class 150/ IS: 4984 or Equivalent for buried portion.

DATASHEET A FOR PRETREATMENT PLANT

1.	**INLET VALVES**	
1.1	Inlet valves for PT-CW clarifiers & PT-DM clarifier. (Each)	One (1) number motorized butterfly flow control valve, located at inlet to each aerator, with manual upstream and downstream isolation valves along with by-pass motorized butterfly flow valve. Control valve shall have “auto manual” selection option, position indicator with “open-close” push buttons. Inching operation of valve shall be possible from DDCMIS.
1.2	Inlet control valve size	Suitable to cater to total flow
1.3	Code	AWWA – C 504/EN 593/Equivalent Std. of required class/rating.
1.4	Control	Under “ Auto” mode of flow control valve, valve shall automatically maintain the level of water in the clarified water reservoir, i.e valve shall automatically close when reservoir level becomes high.
2.	**AERATOR**	
2.1	Type	Cascade Type
2.2	Nos.	Two (2) [One (1) for PT-CW Clarifier and One (1) for PT-DM Clarifier]
2.3	Capacity (Design flow) Each.(Min.)	PT-CW -4212 CuM/Hr + water loss through desludging or min 3% whichever is maximum. PT-DM - 350 CuM/Hr + water loss through desludging or min 3% whichever is maximum.
2.4	Material of construction	RCC
2.5	Retention time	1 min
2.6	Surface flow rate	0.03 m^3/ hr/ m^2
3.	**STILLING CHAMBER**	
3.1	No.	Two (2) Numbers [One for PT-CW and one for PT-DM]
3.2	Purpose	To dampen out any turbulence of the incoming water.
3.3	Retention time	1 min minimum.
3.4	Velocity of water rise	0.05 m/sec
3.5	Capacity(Design flow)	PT-CW -4212 CuM/Hr + water loss through desludging or min 3% whichever is maximum . PT-DM - 350 CuM/Hr + water loss through desludging or min 3% whichever is maximum.
3.6	Material of construction	RCC
3.7	Drain arrangement	Suitable draining arrangement shall be provided for the stilling chamber and drain lines shall be connected to sludge sump.
4.	**PARSHALL FLUME**	
4.1	No.	Four (4) numbers [Three (3) for PT-CW and one (1) number PT-DM].
4.2	Purpose	To measure flow.
4.3	Material of construction	RCC
5.	**INLET CHANNEL & CHAMBER**	
5.1	Nos.	Four (4) numbers [Three (3) for PT-CW and One (1) for PT-DM].
5.2	Capacity (Design	PT-CW -1850 CuM/Hr + water loss through desludging or min 3%

	flow).each	whichever is maximum (each). PT-DM - 350 CuM/Hr + water loss through desludging or min 3% whichever is maximum (each).
5.3	MOC	RCC
6.	**HRSCC (HIGH RECOVERY SOLID CONTACT CLARIFIER)**	
6.1	Number	Four (4) [Three (3) numbers for PT-CW Clarifier and one (1) number PT-DM Clarifier]
6.2	Design Flow of each clarifier (Net output) (minimum)	PT-CW Clarifier -1850 Cum/Hr (each). PT-DM Clarifier -350 Cum/Hr
6.3	Type	High Rate Solids Contact Type Clarifier (HRSCC).Circular Reactor Type
6.4	MOC	RCC
6.5	MOC of pipe from inlet channel to clarifier	Carbon Steel pipe encased with concrete for buried portion and externally epoxy painted inside the clarifier.
6.6	Sludge Blow Off	By gravity through telescopic stand-pipe for continuous discharge and through manual operated blow-off valve for intermittent.
6.7	Sludge Blow Off- Pipe Material	CI class A as per IS: 1536)
6.8	Platform with hand railing	Shall be provided (1 meter wide all along Clarifier)
6.9	Rake bridge	Shall be provided.
6.10	Reaction Turbine (For Each Clarifier)	With variable frequency drive as per Manufacturer's Standard.
7.	**CLARIFIER SCRAPPERS**	
7.1	Number required	One(1) assembly per clarifier.
7.2	Material	Mild steel (MS) with rubber inserts (With bitumastic paint protective coating)
7.3	Traction drive	Slow speed motor driven through reduction gear unit or VFD as per manufacturer's std.
8.	**SUITABLE ACCESSORIES**	
8.1	Access ladder, platform, staircase, hand railings etc.	Shall be provided of structural steel.
8.2	Walkway	Shall be provided with hand railings around launder periphery of width 1000 mm.
8.3	Electrical requirements	For each HRSCC, one (1) Distribution Board to be located on HRSCC bridge for all drives of HRSCC bridge assembly.
9.	**SLUDGE PIT**	
9.1	Number	One (1) with two compartments.(Under Ground)
9.2	Capacity (effective) Each section	Not Less than 200 cum.
9.3	Dimension	Suitable
9.4	Material	RCC with epoxy paint.
9.5	Location	Shall be finalized during Detailed Engineering (DDE).
9.6	Special arrangement	Agitation/ recirculation line shall be provided in pit.
10.	**AIR BLOWER FOR SLUDGE PIT & BACKWASH PIT**	

10.1	Number	Two (1W+1S)
10.2	Type	Centrifugal /Twin Lobe Type
10.3	Duty	Intermittent
10.4	Capacity & Head	As required
10.5	MOC of casing, cover, stator and Impeller/lobes	CI as per IS 210 FG 260
10.6	MOC of shaft	Carbon steel BS-970 En-8/ANSI-I045
10.7	Accessories Required	Acoustic Enclosures. Suction Filter, Silencer, relief Valve etc
10.8	Location	Outdoor
11.	**GRAVITY FILTER**	
11.1	Number	Four (4) [Two (2X100 %) for PT-PW System and Two (2X100 %) for DM System]
11.2	Type	Twin Section
11.3	Design Capacity (each) Net Output	120 Cum/hr for PW System 150 Cum/hr for DM System for Option – 1 (ION EXCHANGE BASED DM PLANT) 240 Cum/hr for DM System for Option-2 (UF+RO+MB BASED DM PLANT)
11.4	Maximum Flow (each)	120 Cum/hr + 2% for PW System . 150 Cum/hr + 2% for Option – 1 (ION EXCHANGE BASED DM PLANT) 240 Cum/hr + 2% for Option-2 (UF+RO+MB BASED DM PLANT)
11.5	Media type	Sand/Anthracite coal.
11.6	Supporting Material	Graded Gravel
11.7	MOC	RCC
11.8	Back wash interval	24 hrs.
11.9	Free board	50%
11.10	Filter Flow Rate at max. flow rate	Not more than 5 m3/m2/hr
12.	**AIR BLOWER FOR FILTER**	
12.1	Number	Four (4) [Two (2X100 %) for PT-Potable Water System and Two (2X100 %) for DM System]
12.2	Type	Centrifugal /Rotary Twin Lobe Type
12.3	Duty	Intermittent
12.4	Capacity & Head	As required
12.5	MOC of casing ,cover ,stator & Impeller/Lobes	CI as per IS 210 FG 260
12.6	MOC of shaft	Carbon steel BS-970 En-8/ANSI-I045
12.7	Accessories Required	Acoustic Enclosures, Suction Filter, Silencer, relief Valve etc
12.8	Location	Outdoor
13.	**FILTER BACKWASH WASTE COLLECTION PIT**	
13.1	Number	One (1) with two Sections.

13.2	Capacity (effective) Each section	Not Less than 250 cum.
13.3	Dimension	Suitable
13.4	Material	RCC with Acid/Alkali Proof Lining.
14.	**FILTERED WATER RESERVOIR & PUMP HOUSE**	
14.1	Number	Two (2) numbers. [One (1) for PW System and One (1) for DM System]
14.2	Type	Twin Section
14.3	Effective capacity of each Section (minimum)	90 Cum for PW System & 200 Cum for DM System
14.4	Material	RCC.
14.5	Electric Monorail hoist in Filtered Water Pump house	One (1) No. of 2 ton Capacity (Minimum).
15.	**CHEMICAL HOUSE**	
15.1	Number	One (1).
15.2	Type	Two storied building of civil construction.
15.3	Building dimensions	As per dimensions given in P & ID of PT plant included in this specification
15.4	Ground floor	As indicated in P & ID of PT plant included in this specification
15.5	First floor	As indicated in P & ID of PT plant included in this specification
16.	**WEIGHING SCALE FOR CHEMICAL**	
16.1	Type	Platform & dial type./electronic type
16.2	Number	Two (2) [One of 0-500 Kg & One Of 0-2000 Kg]
17.	**MONORAIL HOIST**	
17.1	Type	Electric operated
17.2	Number	Two (2).
17.3	Capacity (each)	1 T
17.4	Design Standard	IS:3938 Class 2
18.	**CHEMICAL DOSING**	
18.1	**ALUM SOLUTION PREPARATION & DOSING SYSTEM**	
	a) Tank –	Number-Four (4) numbers Capacity (each)- To store alum solution (of about 10% W/V concentration) for 8 hrs req. of all clarifier operating at its design capacity and a dosing rate of 70 ppm min, Whichever is maximum. Material- RCC with acid/alkali resistant tiles. Dissolving basket (each tank)-SS 316 Motorized Stirrer (MOC (impeller & Shaft)-SS316)- One (1) number per tank
	b) Pump -	Number-(4x100%) (3W+1S),For PT-CW clarifier, (2x100%) (1W+1S) for PT-DM Clarifier for Option – 1 (ION EXCHANGE BASED DM PLANT) Type – Simplex hydraulically operated diaphragm type. Capacity- As per System Requirement.

		Capacity Controlled-10-100% of capacity manually by micrometer dial. Pump Stroke speed per minute.-100 (Max) Material of construction- Liquid end (pump head valve, valve housing, etc.), valve spring-AISI 316 Diaphragm-PTFE Packing-PTFE Shaft-Hardened steel (EN8-BS-970)/AISI-316
18.2	**FeCl3 SOLUTION PREPARATION & DOSING SYSTEM in case of OPTION-2 (UF+RO+MB BASED DM PLANT)**	
	a) Storage Tank –	Number- Two (2) numbers. Horizontal tank capacities of both tanks together shall be sized for one (1) month's storage, Type-Horizontal cylindrical with dished ends, atmospheric, above ground. MOC: MSRL
	b) Unloading Pumps-	Number-Two (2) numbers (1W+1S)
	a) Dosing Tank –	Number- Two (2) numbers. Type-Vertical cylindrical with dished end bottom & with cover at the top. Capacity (each)- To store **FeCl3** solution (of about 35 to 45% W/V concentration) for 8 hrs req. of DM clarifier operating at its design capacity and a dosing rate of 70 ppm min, Whichever is maximum. MOC: MSRL
	b) Dosing Pump -	Number-(2x100%) Type – Simplex hydraulically operated diaphragm type. Capacity- As per System Requirement. Material of construction- all wetted parts PP/PTFE).
18.3	**LIME PREPARATION & DOSING SYSTEM**	
	a) Lime Slaking Tank –	Number-Two (2) numbers lime slaking tanks Capacity (each) - To hold lime slurry (of about 10% W/V concentration from Quick lime of purity of 75% CaO) for 12 hours requirement of all the clarifiers operating at design capacity and a design dosage rate of 30 ppm minimum, Whichever is maximum. Material- RCC. with two (2) coats of bitumastic paint over two (2) coats of primer. Dissolving basket (each tank)-SS 316 Motorized Stirrer (MOC (impeller & Shaft)-SS316)- One (1) number per tank
	b) Lime Dosing Tank –	Number-Three (3) numbers lime solution dosing tanks. Capacity (Each)- To hold lime solution (of about 6% W/V concentration) for 8 hours requirement of all the clarifiers operating at its design capacity and a design dosage rate of 30 ppm minimum, Whichever is maximum. Material- RCC. with two (2) coats of bitumastic paint over two (2) coats of primer. Dissolving basket (each tank)-SS 316 Motorized Stirrer (MOC (impeller & Shaft)-SS316)- One (1) number per tank

	b) Pump-	Number-Two (2) numbers (1W+1S) lime slurry transfer pump & Two (2) numbers (1W+1S) lime solution dosing pump. Type – Horizontal Centrifugal non clogging type. Capacity- As per system requirement.
18.4	**COAGULANT AID DOSING SYSTEM. (CLARIFIERS)**	
	a) Tank –	Number- Two (2) numbers. Type-Vertical cylindrical with dished end bottom & with cover at the top. Capacity (each)- To hold coagulant for 12 hours requirement of all the clarifiers operating at design capacity and a design dosage rate of 2 ppm minimum, Whichever is maximum. Material- MSRL Motorized Stirrer (MOC (impeller & Shaft)-SS316)- One (1) number per tank
	b) Pump-	Number-Two (2) numbers (1W+1S). Type – Simplex hydraulically operated diaphragm type. Capacity- As per system requirements.
18.5	**PAC UNLOADING & DOSING SYSTEM.**	
	a) Storage Tank –	Number- Two (2) numbers. Horizontal tank Type-Horizontal cylindrical with dished ends, atmospheric, above ground. Capacity (each)- 15 cum. Material- MSRL (Dished End)
	b) Unloading Pumps-	Number-Two (2) numbers (1W+1S) Type – Horizontal Centrifugal non clogging type. Capacity- 10 cum/hr, Head.-10 mlc.
	a) Tank –	Number- Two (2) numbers. Type-Vertical cylindrical with dished end bottom & with cover at the top. Capacity (each)- To hold coagulant for 12 hours requirement of all the clarifiers operating at design capacity and a design dosage rate of 2 ppm minimum, Whichever is maximum. Material- MSRL (Dished End) Motorized Stirrer (MOC (impeller & Shaft)-SS316)- One (1) number per tank
	b) Dosing Pump -	Number-(2x100%) Type – Simplex hydraulically operated diaphragm type. Capacity- As per System Requirement. Material of construction- Liquid end (pump head valve, valve housing, etc) ,valve spring- AISI 316 Diaphragm-PTFE Packing-PTFE Shaft-Hardened steel (EN8-BS-970)/AISI-316

19. MOC and type of the pumps shall be as per the following details.

	Pump Description	Quantity	Pump Type	Capacity (min)	Material of Construction
19.1	Sludge disposal pumps	Three (3X50%)	Vertical sump pump	70 cum/hr (min) each	Shaft, Coupling & sleeves- SS 410 Impeller – ASTM A 351 CF8M Suction bell/Casing – 2.5% Ni CI IS 210 Gr. FG 260, S-0.1% max. P-0.15 % max.

					Column & discharge pipe-IS 2062 (Min. Thickness 8 mm) With 2 coats of epoxy coating inside and outside. Shaft enclosing tube (if applicable)- IS 2062 (Min. Thickness 8 mm) With 2 coats of epoxy coating inside and outside. Bolts & nuts- SS Base plate and Soleplate- CS (Min. 10 mm thick)
19.2	Gravity Filter Back wash water pumps	Two (2X100%)	Vertical sump pump (Suitable to handle Drains with particle size up to 40 mm)	Each pump shall be capable of evacuating the capacity of complete pit within 2 hours.	Shaft, Coupling & sleeves- SS 410 Impeller – ASTM A 351 CF8M Suction bell/Casing – 2.5% Ni CI IS 210 Gr. FG 260, S-0.1% max. P-0.15 % max. Column & discharge pipe-IS 2062 (Min. Thickness 8 mm) With 2 coats of epoxy coating inside and outside. Shaft enclosing tube (if applicable)- IS 2062 (Min. Thickness 8 mm) With 2 coats of epoxy coating inside and outside. Bolts & nuts- SS Base plate and Soleplate- CS (Min. 10 mm thick)
19.3	Potable Water Pumps (Plant)	Two (2X100%)	Vertical Turbine (Wet pit) Type	20 m3/hr (min.). each	Shaft, Coupling & sleeves- SS 410 Impeller – ASTM A 351 CF8M Suction bell/Casing – 2.5% Ni CI IS 210 Gr. FG 260, S-0.1% max. P-0.15 % max. Column & discharge pipe-Fabricated steel as per IS: 2062 (minimum thickness shall not be less than 8 mm) with 2 coats of epoxy coating inside & outside.
19.4	Potable Water Pumps (for PT CLO2 feed)	Two (2X100%)	Vertical Turbine (Wet pit) Type	As per CLO2 requirements	Shaft, Coupling & sleeves- SS 410 Impeller – ASTM A 351 CF8M Suction bell/Casing – 2.5% Ni CI IS 210 Gr. FG 260, S-0.1% max. P-0.15 % max. Column & discharge pipe-Fabricated steel as per IS: 2062 (minimum thickness shall not be less than 8 mm) with 2 coats of epoxy coating inside & outside.

20.	**VALVES**	All the valves shall generally be conforming to the requirements specified in the Chapter titled "General Technical Requirement of Low Pressure Piping" considering the following aspects as minimum requirement:
20.1	Coagulant (Alum) and Coagulant aid Services	**i. Type of Valves** For Isolation a) Saunder's Patented Diaphragm Valves b) Ball Valves in CPVC pipes For non-return / Check Swing Check type /Dual Plate type
		ii. Material of Construction Valves Diaphragm Valves a) Body shall be Cast Iron to IS: 210 Gr FG 260/ ASTM A 48 Cl.40 ; BS: 1452 Gr.220/Equivalent. OR Cast Steel to ASTM. A 216GR. WCB and Body shall be internally lined with Soft Natural rubber, Ebonite or Polypropylene b) Diaphragm shall be shall be of reinforced rubber /Hypalon/ approved equivalent c) Stem, Compressor & Bush shall be Stainless steel Construction Ball Valves in CPVC Pipe lines a) Body , Ball & stem shall be of CPVC b) Seat ring & Packing shall be EPDM / or equivalent Check Valves a) Body & Cover, Hinge Disk/Door shall be Cast Iron to IS: 210 Gr FG 260/ ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt and shall be lined with natural Rubber, PTFE or Viton or Stainless Steel – 316 b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB and shall be coated with PVDF, or suitable elastomer or Stainless Steel – 316 c) Disc facing ring and Body Seat rings shall be Stainless Steel d) Bearing bushes shall be SS – 316 e) Material of construction of spring in dual type valve shall be of INCONEL or better
20.2	Lime slurry/Solution/ Suspensions	**i. Type of Valves** For Isolation Non-lubricated Plug Valves For non-return / Check Swing Check type /Dual Plate type
		ii. Material of Construction Valves Plug Valves a) Body shall be Cast Iron to IS: 210 Gr FG 260 / ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt b) Plug shall be Stainless steel to AISI 316 c) Body Sleeve & Seat shall be PTFE d) Gland & Gland nut shall be SS 304/316 e) Cover shall be of Cast Steel to ASTM A 216 Gr WCB Check Valves a) Body & Cover, Hinge Disk/Door shall be Cast Iron to IS: 210 Gr FG 260 / ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt and shall be lined with natural Rubber, PTFE or Viton or Stainless Steel – 316 b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB and shall be coated with PVDF, or suitable elastomer or Stainless Steel – 316 c) Disc facing ring and Body Seat rings shall be Stainless Steel d) Bearing bushes shall be SS-316

		e) Material of construction of spring in dual type valve shall be of INCONEL or better
20.3	Sludge	**i. Type of Valves** For Isolation Gate or Sluice or Knife edge type Slide Valves For non-return / Check Swing Check type /Dual Plate type
		ii. Material of Construction Gate / Sluice / Knife Edge Slide Valve a) Body,Disc : Cast Iron b) Stem : Stainless Steel AISI 420 d) Packing : PTFE e) Gland & Gland nut : AISI 420 f) Hand wheel : Cast Iron Check Valves a) Body & Cover, Hinge Disk/Door shall be Cast Iron BS:1452 Gr.220 or Eqvt b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB / High tensile Brass or BS: 2872 equivalent. c) Disc facing ring and Body Seat rings shall be Stainless Steel. d) Bearing bushes shall be Leaded tin Bronze. e) Material of construction of spring in dual type valve shall be of INCONEL or better
20.4	**Other Requirements:** 1) Butterfly valves shall conform to design standard latest revision of AWWA C-504/EN 593/equivalent standard of required class/rating. 2) Plug valves shall be designed as per BS: 5353 Cl.150 or equivalent. 3) Valves for alum solution shall be Saunders's patented Diaphragm type designed as per BS: 5156 or approved equivalent standard. 4) Sluice/Gate Valves shall conform to BS: 5150 (BS: 5163 PN 16) PN16, IS:14846 of rating PN 1.6 (min.). Stem, seat ring and wedge facing ring shall be of stainless steel construction. Other parts shall be as per IS: 14846 /BS:5163). Flanges shall be designed as per ANSI B 16.5 Cl. 150 (min.) to meet with the piping flanges. Valves shall be of outside screw and rising stem type. Gate valves for sizes below 50 NB and below shall conforms to IS:778 Class-2/ANSI B16.34 straight, rising stem; without side screw. 5) Sluice/Gate valves shall be provided with the following accessories in addition to the standard items: a. Hand wheel b. Manual Gear reduction unit operator for valves 200 NB and above c. Bypass valve for valve of sizes 350 NB and above. d. Draining arrangement wherever required. e. Arrow indicating flow direction. f. Position indicator. g. Sluice/Gate Valves shall be provided with back seating bush to h. facilitate gland renewal during full open condition. 6) Design standard for Gates shall be IS: 3042 or Equivalent. Material of Construction a. Frame and Door : Cast Iron IS:210 Gr.260 b. Spindles, bolts & nuts: M.S. to IS:2062 c. Face & seat rings : Gun metal (as per IS: 3042). 7) All the parts of gates shall be applied with the coats of heavy duty bitumastic paint. Each of the gates shall be provided with hand wheel and a position indicator.	

	8) Sluice valve/knife edge type slide valves shall design by IS 14846. Plug valves shall be used for the application of lime slurry/lime solutions conforming to BS: 5353 Class 150 or Equivalent. 9) Valves will be used to start/stop or control flow. Gates will be primarily used for isolation of flow in open channels although these should be capable of throttling the flow too. However, contractor can provide either isolation gates or butterfly valves in various RCC tanks/pits/sumps such as sludge pit, distribution chamber etc. Sample valves will be used in sample collection lines. Unless otherwise specified all the valves shall be supplied with counter flanges by the Contractor. 10) All valves shall be suitable for service conditions i.e. flow, temperature and pressure under which they are required to operate. All the valves shall be of standard pressure rating of the relevant design standard. Nonstandard pressure rating shall not be accepted. The pressure and temperature rating of the valve shall not be less than the maximum expected pressure and temperature plus 5% additional margin of the system in which valves are proposed to be installed. The pressure rating of individual piping system component such as valves, flanges etc. shall however be not less than that specified.	
21.	**PIPING**	All the piping shall generally be conforming to the requirements specified in the Chapter titled "General Technical Requirement Of Low Pressure Piping" considering the following aspects as minimum requirement:
21.1	Raw water & Clarified water	Carbon Steel: IS: 1239 Part-I (Heavy grade-Black), ASTM-A-53 Type-E Grade B / ASTM A 36 /IS: 3589 - Grade 410; / IS-2062 Gr.-B (for fabricated from plates) / Equivalent
21.2	Coagulant (Alum) PAC Solution	Rubber lined Steel/CPVC Schedule 80 CPVC Schedule 80
21.3	Lime slurry/Solution/ Suspensions	CPVC as per ASTM F441 CPVC 4120 Sch. 80
21.4	Coagulant aid Solution	Rubber lined Steel (as refereed above)/CPVC as per ASTM F441 CPVC 4120, Schedule80/equivalent.
21.5	Sludge	1) GRP as per ASTM D3517/ AWWA C950-88/AWWA M45 2) HDPE as per ASTM D3350 CL 34543C, FM Class 150/ IS:4984 or Equivalent for buried portion
21.6	Chemical Waste from vessels and tanks	1) Rubber lined Steel (as referred above) 2) HDPE as per ASTM D3350 CL 34543C, FM Class 150/ IS: 4984 or Equivalent for buried portion.

DATA SHEET – A FOR DM PLANT

1.0	**DM PLANT STREAMS**	
1.1	Number	Two (2) [1 working +1 standby].
1.2	Stream Capacity	To suit net DM Plant output (Post UF) per stream of 150 CuM/Hr and Head to meet the system requirement.
2.0	**DM PLANT SUPPLY (FEED) PUMP (FILTERED WATER PUMPS)**	
2.1	Number	3X100% (1W+2S)
2.2	Service	Continuous
2.3	Design Flow/Capacity and Head of each pump	To suit net DM Plant output (Post UF) per stream of 150 CuM/Hr. Head as required for system requirement.
2.4	Operating Speed (Maximum)	----------1500 rpm ----------
2.5	Pumps & Drives to be designed for	----------Outdoor Duty ----------
2.6	Service of duty	----------Continuous ----------
2.7	Type of pump	Vertical Turbine (wet pit) Type and non-pull out type.
2.8	Type of Working Fluid	Filter water
2.9	Maximum water temperature	36 deg. C
2.10	Minimum water temperature	25 deg. C
2.11	Type of Discharge	----------Above Floor discharge----------
2.12	Type of impeller	----------Closed / Semi-open----------
2.13	Type of lubrication	----------Self-water or grease----------
2.14	Suction condition	----------Submerged----------
2.15	Sump Invert level	Consider 4.5-meter Depth (min)
2.16	Operating floor level	----------Minimum 500 mm above FGL---------
2.17	Type of shaft coupling	----------Flexible / Rigid----------
2.18	**Material of Construction**	
2.18.1	Suction Bell	2.5%NiCI; IS: 210Gr FG 260; S-0.1% & P-0.15% max.
2.18.2	Casing / Bowl	2.5%NiCI; IS:210Gr FG 260; S-0.1% & P-0.15% max.
2.18.3	Impeller	ASTM A351 CF8M
2.18.4	Wearing rings (if applicable)	----------As per manufacturer's Std ----------
2.18.5	Impeller Shaft, Pump & line shaft	----------SS ASTM A 276 Gr. 410. ----------
2.18.6	Shaft coupling	---------- SS ASTM A 276 Gr. 410 ----------
2.18.7	Shaft sleeves	----------SS -ASTM –A 276 – 410 ----------
2.18.8	Shaft bearings	Cutless rubber with bronze retainer for bearings below minimum water level and Thordon type bearing for bearings above minimum water level
2.18.9	Column pipe/Discharge Head	Fabricated steel as per IS: 2062 (minimum thickness shall not be less than 8 mm) with 2 coats of epoxy coating inside & outside.
2.19	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
3.0	**ACTIVATED CARBON FILTER (ACF)**	
3.1	Type	Vertical Shell Type with dished ends
3.2	Number	One number per stream.
3.3	Design Flow per Unit (Net)	To suit net DM Plant output (Post UF) per stream of 150 CuM/Hr.
3.4	Period Between Two (Design)	24 Hrs

	Successive back wash	
3.5	Design Surface Flow Rate at design flow (max)	15 CuM/Hr/SqM.
3.6	Design Pressure of Vessel (Min)	8 Kg/Sq.cm (g)
3.7	Type of Filter Media/Resin	Activated Carbon
3.8	Minimum Bed Depth of Filter media/resin	1200 mm (excluding supporting bed)
3.9	Supporting material for the fill	Graded gravel
3.10	Outlet Quality	Free Chlorine: Non-Detectable as per latest ASTM procedure. Organic Matter: Below Detectable limit. Turbidity: Less Than 0.5 NTU.
3.11	Shell & Dish End Material	● The pressure vessels shall be fabricated from carbon steel plates conforms to SA 515 Gr.70 or SA 516 Gr. 70 if the pressure vessels are designed as per ASME Section VIII. ● If the pressure vessels are designed as per IS 2825 following criterion shall be followed: The pressure vessels shall be fabricated of steel as per IS: 2002 Gr. 3 (normalized condition) or SA: 515/516 Gr. 70 (normalized), in case the vessels are designed as per Class 1 or Class 2 of IS: 2825. If the pressure vessels are designed as per Class 3 of IS: 2825, the material of construction shall conform to IS: 2062 or IS: 2002 Gr. 3 (Normalized quality).or SA 515 /516 Gr. 70
3.12	Internal painting	Epoxy paint
3.13	External Painting	Chlorinated Rubber paint
3.14	Manhole per vessel	Two (2) Nos (each of minimum 600 MM).
3.15	Sight Window with minimum clear width of 75 mm	Two (2) Nos.
3.16	Location	Indoor
3.17	Free board	100%
3.18	Accessories	Ladder and operating platform.
3.19	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
4.0	**ION EXCHANGER UNIT (WEAK ACID CATION EXCHANGER)-WAC**	
4.1	Type	Vertical Shell Type with Torishpherical dished ends
4.2	Number	One number per DM stream.
4.3	Design Flow per Unit (Net)	To suit net DM Plant output (Post UF) per stream of 150 CuM/Hr.
4.4	Period Between Two (Design) Successive back wash	12 Hrs.
4.5	Design Surface Flow Rate at design flow (max)	35 CuM/Hr/SqM.
4.6	Net Output between two successive regeneration	1800 CuM.
4.7	Design Pressure Of Vessel (Min)	8 Kg/Sq.cm (g)
4.8	Type of Filter Media/Resin	Weakly Acidic Carboxylic Group Resin
4.9	Minimum Resin Bed Dept	1000 mm

4.10	Shell & Dish End Material	● The pressure vessels shall be fabricated from carbon steel plates conforms to SA 515 Gr.70 or SA 516 Gr. 70 if the pressure vessels are designed as per ASME Section VIII. ● If the pressure vessels are designed as per IS 2825 following criterion shall be followed: The pressure vessels shall be fabricated of steel as per IS: 2002 Gr. 3 (normalized condition) or SA: 515/516 Gr. 70 (normalized), in case the vessels are designed as per Class 1 or Class 2 of IS: 2825. If the pressure vessels are designed as per Class 3 of IS: 2825, the material of construction shall conform to IS: 2062 or IS: 2002 Gr. 3 (Normalized quality).or SA 515 /516 Gr. 70
4.11	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
4.12	External Painting	Chlorinated Rubber paint
4.13	Manhole per vessel	Two (2) Nos (each of minimum 600 MM).
4.14	Sight Window with minimum clear width of 75 mm	Two (2) Nos.
4.15	Location	Indoor
4.16	Free board	100%
4.17	Accessories	Ladder and operating platform.
4.18	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
4.19	Regeneration Chemical	HCl as per IS 265 Tech. Grade.
5.0	**ION EXCHANGER UNIT (STRONG ACID CATION EXCHANGER)-SAC**	
5.1	Type	Vertical Shell Type with Torishpherical dished ends
5.2	Number	One number per DM stream.
5.3	Design Flow per Unit (Net)	To suit net DM Plant output (Post UF) per stream of 150 CuM/Hr
5.4	Period Between Two (Design) Successive back wash	12 Hrs
5.5	Design Surface Flow Rate at design flow (max)	35 CuM/Hr/SqM.
5.6	Net Output between two successive regeneration	1800 CuM.
5.7	Design Pressure Of Vessel (Min)	8 Kg/Sq.cm (g)
5.8	Type of Filter Media/Resin	Strongly Acidic Acidic High Capacity Polystyrene resin in Bead form.
5.9	Minimum Resin Bed Dept	1000 mm
5.10	Outlet Quality	Sodium leakage less than 2 ppm.
5.11	Shell & Dish End Material	● The pressure vessels shall be fabricated from carbon steel plates conforms to SA 515 Gr.70 or SA 516 Gr. 70 if the pressure vessels are designed as per ASME Section VIII. ● If the pressure vessels are designed as per IS 2825 following criterion shall be followed: The pressure vessels shall be fabricated of steel as per IS: 2002 Gr. 3 (normalized condition) or SA: 515/516 Gr. 70 (normalized), in case the vessels are designed as per Class 1 or Class 2 of IS: 2825. If the pressure

		vessels are designed as per Class 3 of IS: 2825, the material of construction shall conform to IS: 2062 or IS: 2002 Gr. 3 (Normalized quality) or SA 515 /516 Gr. 70
5.12	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
5.13	External Painting	Chlorinated Rubber paint
5.14	Manhole per vessel	Two (2) Nos (each of minimum 600 MM).
5.15	Sight Window with minimum clear width of 75 mm	Two (2) Nos.
5.16	Location	Indoor
5.17	Free board	100%
5.18	Accessories	Ladder and operating platform.
5.19	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system required.
5.19	Regeneration Chemical	HCl as per IS 265 Tech. Grade.
6.0	**DEGASSER TOWER**	
6.1	Type	Forced Draft Type
6.2	Number	One number per DM stream.
6.3	Design Flow per Unit (Net)	To suit net DM Plant output (Post UF) per stream of 150 CuM/Hr.
6.4	Fill material	Polypropylene or Equivalent
6.5	Shell Material	IS 2062
6.6	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
6.7	External Painting	Epoxy paint.
6.8	Outlet Quality	CO2 less than 2 ppm.
6.9	Location	Outdoor
6.10	Accessories	Ladder and operating platform.
6.11	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
7.0	**DEGASSER WATER STORAGE TANK**	
7.1	Type	Horizontal cylindrical atmospheric with dished ends
7.2	Number	One number per DM stream.
7.3	Capacity (Net)	To hold 30 minutes flow of each stream (Minimum 75 CuM)
7.4	Design Standard (for Diameter, Length & Thickness)	As per BS 2594. However, dished ends shall be of Torispherical type.
7.5	Shell/Dished Material	IS 2062
7.6	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
7.7	External Painting	Epoxy paint
7.8	Location	Outdoor
7.9	Free board	300 mm
7.10	Manhole per vessel	Two (2) Nos (each of minimum 600 MM).
7.11	Accessories	Ladder and operating platform.
7.12	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
8.0	**DEGASSED WATER PUMPS**	
8.1	Type	Horizontal Centrifugal

8.2	Number	3x100 % (1W+2S)
8.3	Design Flow/Capacity and Head of each pump	To suit net DM Plant output (Post UF) per stream of 150 CuM/Hr. Head as required for system requirement.
8.4	Location	Indoor
8.5	Type of Casing	Radially Split type
8.6	Material of Construction	
8.6.1	Casing	ASTM A 351 CF8M
8.6.2	Impeller	ASTM A 351 CF8M
8.6.3	Wearing Rings	SS 316
8.6.4	Shaft, Shaft Sleeves, Coupling	SS 410
8.7	Operating Speed (Maximum)	----------1500 rpm ----------
8.8	Duty	Continuous
8.9	Hardware	Base plate: Fabricated Steel as per IS 2062, Bolts & Nuts SS 316.
8.10	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
9.0	**DEGASSER BLOWER**	
9.1	Type	Centrifugal, Oil Free.
9.2	Number	2x100 % (1W+1S) Per stream, Two (2) Numbers per stream. Total Four (4) Numbers.
9.3	Design Flow/Capacity and Head of each Blower	To suit net DM Plant output (Post UF) per stream of 150 CuM/Hr. Head as required for system requirement.
9.4	Location	Indoor
9.5	Material of Construction	
9.5	Casing	Cast Iron to IS 210 FG 260
9.5.1	Impeller	ASTM A 351 CF8M
9.5.2	Shaft	EN-8 to BS-970
9.6	Operating Speed (Maximum)	----------1500 rpm ----------
9.7	Duty	Continuous
9.8	Hardware	Base plate: Fabricated Steel as per IS 2062, Bolts & Nuts SS 316.
9.9	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
10.0	**ION EXCHANGER UNIT (WEAK BASIC ANION EXCHANGER) - WBA**	
10.1	Type	Vertical Shell Type with Torishpherical dished ends
10.2	Number	One number per DM stream.
10.3	Design Flow per Unit (Net)	To suit net DM Plant output (Post UF) per stream of 150 CuM/Hr
10.4	Period Between Two (Design) Successive back wash	12 Hrs
10.5	Design Surface Flow Rate at design flow (max)	35 CuM/Hr/SqM.
10.6	Net Output between two successive regeneration	1800 CuM.
10.7	Design Pressure of Vessel (Min)	8 Kg/Sq.cm (g)
10.8	Type of Filter Media/Resin	Weak Base Tertiary Ammonia Group Resin
10.9	Minimum Resin Bed Dept	1000 mm
10.10	Shell & Dish End Material	● The pressure vessels shall be fabricated from

		carbon steel plates conforms to SA 515 Gr.70 or SA 516 Gr. 70 if the pressure vessels are designed as per ASME Section VIII. ● If the pressure vessels are designed as per IS 2825 following criterion shall be followed: The pressure vessels shall be fabricated of steel as per IS: 2002 Gr. 3 (normalized condition) or SA: 515/516 Gr. 70 (normalized), in case the vessels are designed as per Class 1 or Class 2 of IS: 2825. If the pressure vessels are designed as per Class 3 of IS: 2825, the material of construction shall conform to IS: 2062 or IS: 2002 Gr. 3 (Normalized quality).or SA 515 /516 Gr. 70
10.11	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
10.12	External Painting	Chlorinated Rubber paint
10.13	Manhole per vessel	Two (2) Nos (each of minimum 600 MM).
10.14	Sight Window with minimum clear width of 75 mm	Two (2) Nos.
10.15	Location	Indoor
10.16	Free board	100%
10.17	Accessories	Ladder and operating platform.
10.18	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
10.19	Regeneration Chemical	NaOH as per IS 252 Pure Grade available in Flakes or Lye Form.
11.0	**ION EXCHANGER UNIT (STRONG BASIC ANION EXCHANGER) - SBA**	
11.1	Type	Vertical Shell Type with Torishpherical dished ends
11.2	Number	One number per DM stream.
11.3	Design Flow per Unit (Net)	To suit net DM Plant output (Post UF) per stream of 150 CuM/Hr.
11.4	Period Between Two (Design) Successive back wash	12 Hrs
11.5	Design Surface Flow Rate at design flow (max)	35 CuM/Hr/SqM.
11.6	Net Output between two successive regeneration	1800 CuM.
11.7	Design Pressure of Vessel (Min)	8 Kg/Sq.cm (g)
11.8	Type of Filter Media/Resin	Strongly Base Type-I, High Capacity Polystyrene resin in bead form.
11.9	Minimum Resin Bed Dept	1000 mm
11.10	Outlet Quality	Reactive Silica: Less than 0.2 ppm as SiO2. Conductivity: Less than 10 micromhos/cm at 25 Deg C.
11.11	Shell & Dish End Material	● The pressure vessels shall be fabricated from carbon steel plates conforms to SA 515 Gr.70 or SA 516 Gr. 70 if the pressure vessels are designed as per ASME Section VIII. ● If the pressure vessels are designed as per IS 2825 following criterion shall be followed: The pressure vessels shall be fabricated of steel as per IS: 2002 Gr. 3 (normalized condition) or SA: 515/516 Gr. 70 (normalized), in case the vessels are designed as

		per Class 1 or Class 2 of IS: 2825. If the pressure vessels are designed as per Class 3 of IS: 2825, the material of construction shall conform to IS: 2062 or IS: 2002 Gr. 3 (Normalized quality).or SA 515 /516 Gr. 70
11.12	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
11.13	External Painting	Chlorinated Rubber paint
11.14	Manhole per vessel	Two (2) Nos (each of minimum 600 MM).
11.15	Sight Window with minimum clear width of 75 mm	Two (2) Nos.
11.16	Location	Indoor
11.17	Free board	100%
11.18	Accessories	Ladder and operating platform.
11.19	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
11.20	Regeneration Chemical	NaOH as per IS 252 Pure Grade available in Flakes or Lye Form.
12.0	**ION EXCHANGER UNIT (MIXED BED EXCHANGER) - MB**	
12.1	Type	Vertical Shell Type with Torishpherical dished ends
12.2	Number	One number per DM stream.
12.3	Design Flow per Unit (Net)	To suit net DM Plant output (Post UF) per stream of 150 CuM/Hr
12.4	Period Between Two (Design) Successive back wash	108 Hrs
12.5	Design Surface Flow Rate at design flow (max)	40 CuM/Hr/SqM.
12.6	Net Output between two successive regeneration	16200 CuM.
12.7	Design Pressure Of Vessel (Min)	8 Kg/Sq.cm (g)
12.8	Type of Filter Media/Resin	Strongly Acidic and Strongly Basic type-I resins. Both resins of high capacity Polystyrene resin in bead form.
12.9	Minimum Resin Bed Dept	1000 mm
12.10	Shell & Dish End Material	● The pressure vessels shall be fabricated from carbon steel plates conforms to SA 515 Gr.70 or SA 516 Gr. 70 if the pressure vessels are designed as per ASME Section VIII. ● If the pressure vessels are designed as per IS 2825 following criterion shall be followed: The pressure vessels shall be fabricated of steel as per IS: 2002 Gr. 3 (normalized condition) or SA: 515/516 Gr. 70 (normalized), in case the vessels are designed as per Class 1 or Class 2 of IS: 2825. If the pressure vessels are designed as per Class 3 of IS: 2825, the material of construction shall conform to IS: 2062 or IS: 2002 Gr. 3 (Normalized quality) or SA 515 /516 Gr. 70
12.11	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
12.12	External Painting	Chlorinated Rubber paint
12.13	Manhole per vessel	Two (2) Nos (each of minimum 600 MM).
12.14	Sight Window with minimum clear width of 75 mm	Two (2) Nos.

12.15	Location	Indoor
12.16	Free board	100%
12.17	Accessories	Ladder and operating platform.
12.18	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
12.19	Regeneration Chemical	HCl as per IS 265 Tech. Grade and NaOH as per IS 252 Pure Grade available in Flakes or Lye Form.
13.0	**BLOWER FOR MB (COMMON FOR MB AND N-PIT)**	
13.1	Type	Rotary Twin Lobe type.
13.2	Number	2x100% (1W+1S).
13.3	Design Flow/Capacity and Head of each Blower	To suit net DM Plant output (Post UF) per stream of 150 CuM/Hr. Head as per system requirement.
13.4	Location	Indoor
13.5	Material of Construction	
13.5	Casing	Cast Iron to IS 210 FG 260
13.5.1	Lobes	CS to BS 970, EN9 Forged
13.5.2	Shaft	CS to BS 970, EN9 Forged
13.6	Operating Speed (Maximum)	----------1500 rpm ----------
13.7	Duty	Intermittent
13.8	Hardware	Base plate: Fabricated Steel as per IS 2062, Bolts & Nuts SS 316.
13.9	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
14.0	**UF FEED TANK**	
14.1	Type	Vertical cylindrical atmospheric
14.2	Design Standard (for diameter, length & thickness)	As per BS: 2594.
14.3	Number	2x100% (1W+1S), One number per DM stream.
14.4	Net Capacity (minimum)	1 Hr storage Capacity of one UF stream to match with net output (Post UF) 150 CuM/Hr. + Water required for backwashing of UF membrane, Chemical preparation requirements Plus 5% margin over the above total requirements.
14.5	Shell/Dished Material	IS 2062
14.6	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
14.7	External Painting	Chlorinated Rubber paint
14.8	Free board	300 mm
14.9	Location	Outdoor
14.10	Free board	300 mm
14.11	Accessories	Ladder and operating platform.
14.12	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
15.0	**UF FEED PUMPS**	
15.1	Type	Horizontal Centrifugal
15.2	Number	3 x 50% (2W+1S)
15.3	Design Flow/Capacity and Head of each pump	To suit net DM Plant output (Post UF) per stream of 150 CuM/Hr. Head as required for system requirement.
15.4	Location	Indoor

15.5	Type of Casing	Radially Split type
15.6	Material of Construction	
15.6.1	Casing	ASTM A 351 CF8M
15.6.2	Impeller	ASTM A 351 CF8M
15.6.3	Wearing Rings	SS 316
15.6.4	Shaft, Shaft Sleeves, Coupling	SS 420
15.7	Operating Speed (Maximum)	----------1500 rpm ----------
15.8	Duty	Continuous
15.9	Hardware	Base plate: Fabricated Steel as per IS 2062, Bolts & Nuts SS 316.
15.10	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
16.0	**BASKET STRAINER FOR UF**	
16.1	Type	Horizontal Centrifugal
16.2	Number	2x100 % (1W+1S) Per stream, Two (2) Numbers per stream. Total Four (4) Numbers.
16.3	Design Flow	To suit net DM Plant output (Post UF) per stream of 150 CuM/Hr
16.4	Location	Indoor
16.5	MOC	SS 316
16.6	Size	100 microns
17.0	**UF SKID**	
17.1	Streams	2 Nos. (2x100%)
17.2	Feed temperature	20-36 Deg. C
17.3	Each Capacity (net) in CuM/Hr.	To Suit the net DM Plant output (Post UF) per stream of 150 cum/hr
17.4	Type of Operation	Automatic Back wash
17.5	UF membrane	MWCO not greater than 10000 Daltons.
17.6	Type of membrane mounting	Horizontal/Vertical
17.7	Colloidal silica removal efficiency	99.8%
17.8	UF recovery	Not less Than 95%
17.9	Make	KOCH/ MEMCOR/ NORRIT/ DOW/ TEAM.
17.10	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
18.0	**UF BACKWASH/ FAST FLUSH PUMPS**	
18.1	Type	Horizontal Centrifugal
18.2	Number	2x100% (1W+1S)
18.3	Design Flow/ Capacity and Head of each pump	To suit net DM Plant output (Post UF) per stream of 150 CuM/Hr. Head as required for system requirement.
18.4	Location	Indoor
18.5	Type of Casing	Radially Split type
18.6	Material of Construction	
18.6.1	Casing	ASTM A 351 CF8M
18.6.2	Impeller	ASTM A 351 CF8M
18.6.3	Wearing Rings	SS 316
18.6.4	Shaft, Shaft Sleeves, Coupling	SS 420

18.7	Operating Speed (Maximum)	----------1500 rpm ----------
18.8	Duty	Continuous and to be suitable for parallel operation.
18.9	Hardware	Base plate: Fabricated Steel as per IS 2062, Bolts & Nuts SS 316.
18.10	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
19.0	**DM REGENERATION PUMPS**	
19.1	Type	Horizontal Centrifugal
19.2	Number	2x100 % (1W+1S)
19.3	Design Flow/Capacity and Head of each pump	As required to regenerate WBA, SBA, MB Units and N-Pit + 20% margin. Head as required for system requirement.
19.4	Location	Indoor
19.5	Type of Casing	Radially Split type
19.6	Material of Construction	
19.6.1	Casing	ASTM A 351 CF8M
19.6.2	Impeller	ASTM A 351 CF8M
19.6.3	Wearing Rings	SS 316
19.6.4	Shaft, Shaft Sleeves, Coupling	SS 420
19.7	Operating Speed (Maximum)	----------1500 rpm ----------
19.8	Duty	Continuous and to be suitable for parallel operation.
19.9	Hardware	Base plate: Fabricated Steel as per IS 2062, Bolts & Nuts SS 316.
19.10	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
20.0	**NEUTRALISATION PIT (N-PIT) (FOR DM PLANT OPTION – I/ II)**	
20.1	Type	Underground, rectangular or square
20.2	Number	One (1) with Twin compartment
20.3	Material of Construction	RCC with Acid/ Alkali proof Tiles.
20.4	Capacity of each compartment (Net)	150% of waste effluent from one regeneration of complete stream of Cation (Weak and Strong), Anion (Weak and strong) and MB + 20% margin. (Minimum 300 CuM Capacity of each compartment).
20.5	Isolation Gate	Three (3) number at inlet of N-Pit with Acid/ Alkali proof chlorinated paint and rubber lined in wetted parts.
20.6	Free board	500 mm
20.7	Location	Outdoor
20.8	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
21.0	**N-PIT WASTE RE-CIRCULATION CUM DISPOSAL PUMPS (FOR DM PLANT OPTION – I/ II)**	
21.1	Type	Horizontal Centrifugal with priming system.
21.2	Number	3x100 % (1W+1S+1 Under Maintenance)
21.3	Design Flow/ Capacity and Head of each pump	Capacity to evacuate total pit in 3 hours. Head as required for system requirement.
21.4	Location/ suction condition	Outdoor; Suction from priming chamber/ submerged.
21.5	Type of Casing/ Impeller	Radially Split type (casing); Closed/ Semi-open (impeller)
21.6	Material of Construction	
21.6.1	Casing	ASTM A 351 CF8M

21.6.2	Impeller	ASTM A 351 CF8M
21.6.3	Wearing Rings	SS 316
21.6.4	Shaft, Shaft Sleeves, Coupling	SS 420
21.7	Operating Speed (Maximum)	----------1500 rpm ----------
21.8	Duty	2-4 hrs./ shift.
21.9	Hardware	Base plate: Fabricated Steel as per IS 2062, Bolts & Nuts SS 316.
21.10	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
22.0	**ACF AND UF BACK WASHED WATER PIT (FILTER BACKWASH PIT) (FOR DM PLANT OPTION – I/ II)**	
22.1	Type	Underground, rectangular or square.
22.2	Number	One (1) with Twin compartment
22.3	Material of Construction	RCC with Acid/ Alkali proof Tiles.
22.4	Capacity of each compartment (Net)	Minimum 180 CuM.
22.5	Isolation Gate	Three (3) number at Inlet of Pit with Acid/ Alkali proof chlorinated paint and rubber lined.
22.6	Location	Outdoor
22.7	Free board	300 mm.
22.8	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
23.0	**ACF AND UF BACK WASH WATER PUMPS (FOR DM PLANT OPTION – I/ II)**	
23.1	Type	Vertical Sump Pump, Non-Clog Type.
23.2	Number	2x100% (1W+1S)
23.3	Design Flow/Capacity and Head of each pump	Capacity to evacuate each section in 2 hours. Head as required for system requirement.
23.4	Location/ fluid	Outdoor/ Drains with particle size upto 40 mm
23.5	Type of Impeller	Open Type
23.6	Material of Construction	
23.6.1	Casing, Suction Bell	ASTM A 351 CF8M, SS 316
23.6.2	Impeller, Shaft Sleeve	ASTM A 351 CF8M, SS 316
23.6.3	Column Pipe & Discharge Pipe	SS 316
23.6.4	Shaft (Line and Pump)	ASTM A 276 Gr. 420
23.7	Operating Speed (Maximum)	----------1500 rpm ----------
23.8	Duty	Continuous and to be suitable for parallel operation.
23.9	Hardware	Base plate: Fabricated Steel as per IS 2062, Bolts & Nuts SS 316.
23.10	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
24.0	**FILTER WATER OVERHEAD TANK (FOR DM PLANT OPTION – I/ II)**	
24.1	Type	Rectangular or square
24.2	Number	One (1)
24.3	Material of Construction	RCC
24.4	Capacity (Net)	Minimum 2 CuM.
24.5	Location	Outdoor
24.6	Free board	300 mm
24.7	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1 or 2'

		as min and as per system required.
25.0	**CHEMICAL UNLOADING PUMP (FOR HCl) (FOR DM PLANT OPTION – I/ II)**	
25.1	Type	Horizontal Centrifugal
25.2	Number	2x100% (1W+1S)
25.3	Duty	Intermittent
25.4	Capacity and Head	20 CuM/Hr. and 20 MWC
25.5	Chemical to be handled	30-33% HCl as per IS 265
25.6	Material of Construction	Casing, impeller, wearing rings: PP; Shaft, shaft sleeve: PP/ EN8.
25.7	Sets of Hoses with coupling & Diaphragm type Isolation Valves	2 Sets each of 30 Meter. Material of Hose: Chemical resistant, UV inhibited PVC
25.8	Hardware	Base plate: Fabricated Steel as per IS 2062, Bolts & Nuts SS 316.
25.9	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
26.0	**CHEMICAL UNLOADING PUMP (FOR NaOH) (FOR DM PLANT OPTION – I/ II)**	
26.1	Type	Horizontal Centrifugal
26.2	Number	2x100 % (1W+1S)
26.3	Duty	Intermittent
26.4	Capacity and Head	20 CuM/Hr and 20 MWC
26.5	Chemical to be handled	48% NaOH as per IS 252
26.6	Material of Construction	Casing, impeller, wearing rings: SS316; Shaft, shaft sleeve: SS 316.
26.7	Sets of Hoses with coupling & Diaphragm type Isolation Valves	2 Sets each of 30 Meter. Material of Hose: Chemical resistant, UV inhibited PVC
26.8	Hardware	Base plate: Fabricated Steel as per IS 2062, Bolts & Nuts SS 316.
26.9	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
27.0	**BULK CHEMICAL STORAGE TANK (FOR HCl) (FOR DM PLANT OPTION – I/ II)**	
27.1	Type	Horizontal Cylindrical with Dished End
27.2	Number	3x100 % (1W+2S)
27.3	Design Standard	As per BS: 2594, Dished ends shall be of Torispherical type
27.4	Chemical to be handled	30-33% HCl as per IS 265
27.5	Capacity of Each Tank (Net)	To store 30 Days requirement of Chemical for regeneration of all operating DM Stream & N-pit neutralization + 5% margin or minimum as specified elsewhere in the technical specification.
27.6	Free board	300 mm
27.7	Shell/Dished Material	IS 2062 with minimum Thickness 12 mm.
27.8	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
27.9	External Painting	Epoxy paint
27.10	Manhole per vessel	Two (2) Nos (each of minimum 600 MM).
27.11	Location	Outdoor
27.12	Accessories	Ladder and operating platform.
27.13	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1 or 2' as min and as per system required.

28.0	**BULK CHEMICAL STORAGE TANK (FOR NaOH) (FOR DM PLANT OPTION – I/ II)**	
28.1	Type	Horizontal Cylindrical with Dished End
28.2	Number	2x100% (1W+1S)
28.3	Design Standard	As per BS: 2594, Dished ends shall be of Torispherical type
28.4	Chemical to be handled	48% NaOH as per IS 252
28.5	Capacity of Each Tank (Net)	To store 30 Days requirement of Chemical for regeneration of all operating DM Stream & N-pit neutralization + 5% margin or minimum as specified elsewhere in the technical specification.
28.6	Free board	300 mm
28.7	Shell/Dished Material	IS 2062 with minimum Thickness 12 mm.
28.8	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
28.9	External Painting	Epoxy paint
28.10	Manhole per vessel	Two (2) Nos (each of minimum 600 MM).
28.11	Location	Outdoor
28.12	Accessories	Ladder and operating platform.
28.13	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1 or 2' as min and as per system req.
29.0	**ALKALI TRANSFER CUM RECIRCULATION PUMP**	
29.1	Type	Horizontal Centrifugal
29.2	Number	2x100 % (1W+1S)
29.3	Duty	Intermittent
29.4	Capacity and Head	15 CuM/Hr. and 20 MWC
29.5	Chemical to be handled	48% NaOH as per IS 252
29.6	Location	Indoor
29.7	Material of Construction	Casing, impeller, wearing rings: SS 316; Shaft, shaft sleeve: SS 316.
29.8	Sets of Hoses with coupling & Diaphragm type Isolation Valves	2 Sets each of 20 Meter. Material of Hose: Chemical resistant, UV inhibited PVC
29.9	Hardware	Base plate: Fabricated Steel as per IS 2062, Bolts & Nuts SS 316.
29.10	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
30.0	**ACID MEASURING TANK**	
30.1	Type	Vertical Cylindrical Atmospheric
30.2	Number	2x100 % (1W+1S)
30.3	Design Standard	As per IS 803/ API 650
30.4	Chemical to be handled	30-33% HCl as per IS 265
30.5	Capacity of Each Tank (Net)	To Hold Chemical for one regeneration of one DM Stream (including MB) & N-pit neutralization + 25% margin or Minimum 2 CuM.
30.6	Free board	300 mm
30.7	Shell/ Dished Material	IS 2062 with minimum Thickness 6 mm.
30.8	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
30.9	External Painting	Chlorinated Rubber paint
30.10	Location	To be designed for outdoor duty.
30.11	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as

		min and as per system req.
31.0	**ALKALI PREPARATION TANK**	
31.1	Type	Vertical Cylindrical Atmospheric
31.2	Number	2x100 % (1W+1S)
31.3	Design Standard	As per IS 803/ API 650
31.4	Chemical to be handled	48% NaOH as per IS 252
31.5	Capacity of Each Tank (Net)	To Hold Chemical for one regeneration of one DM Stream (including MB) & N-pit neutralization + 25% margin or Minimum 5 CuM.
31.6	Free board	300 mm
31.7	Shell/Dished Material	IS 2062 with minimum Thickness 6 mm.
31.8	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
31.9	External Painting	Chlorinated Rubber paint
31.10	Location	To be designed for outdoor duty.
31.11	Accessories	Agitator (SS 316) with reduction gear, Dissolving Basket (SS 316), Ladder and operating platform.
31.12	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
32.0	**ALKALI DAY TANK**	
32.1	Type	Vertical Cylindrical Atmospheric
32.2	Number	2x100 % (1W+1S)
32.3	Design Standard	As per IS 803/ API 650
32.4	Chemical to be handled	NaOH as per IS 252
32.5	Capacity of Each Tank (Net)	To Hold Chemical for one regeneration of one DM Stream (including MB) & N-pit neutralization+ 25% margin or Minimum 2 CuM.
32.6	Free board	300 mm
32.7	Shell/Dished Material	IS 2062 with minimum Thickness 6 mm.
32.8	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
32.9	External Painting	Chlorinated Rubber paint
32.10	Location	To be designed for outdoor duty.
32.11	Accessories	Agitator (SS 316) with reduction gear, Dissolving Basket (SS 316), Ladder and operating platform.
32.12	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
33.0	**BRINE SOLUTION PREPERATION TANK**	
33.1	Type	Vertical Cylindrical
33.2	Number	1x100 % (1W+0S)
33.3	Design Standard	As per IS-803/ API 650
33.4	Chemical to be handled	Brine Solution (NaCl + NaOH)
33.5	Capacity of Each Tank (Net)	To store One Brine treatment requirement for one stream + 25% margin or Minimum 3 CuM.
33.6	Free board	300 mm
33.7	Shell/Dished Material	MS with minimum Thickness 6 mm.
33.8	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
33.9	External Painting	Epoxy Painted
33.10	Location	Indoor

33.11	Accessories	Agitator (SS 316) with reduction gear, Dissolving Basket (SS 316), Ladder and operating platform.
33.12	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
34.0	**BRINE SOLUTION TRANSFER PUMP**	
34.1	Type	Horizontal Centrifugal
34.2	Number	2x100 % (1W+1S)
34.3	Duty	Intermittent
34.4	Capacity and Head	10 CuM/Hr and 20 MWC
34.5	Chemical to be handled	Brine Solution (NaCl + NaOH)
34.6	Location	Indoor
34.7	Material of Construction	Casing, impeller, wearing rings: SS 316; Shaft, shaft sleeve: SS 410.
34.8	Hardware	Base plate: CS (10 mm thick), Bolts & Nuts SS 316.
	Accessories, Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
35.0	**ACID MEASURING TANK (FOR N-PIT)**	
35.1	Type	Vertical Cylindrical
35.2	Number	1x100 % (1W+0S)
35.3	Design Standard	As per IS: 803/ API 650
35.4	Chemical to be handled	30-33% HCl as per IS 265
35.5	Capacity of Each Tank (Net)	1 CuM (Minimum).
35.6	Free board	300 mm
35.7	Shell/Dished Material	IS 2062 with minimum Thickness 6 mm.
35.8	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
35.9	External Painting	Epoxy paint.
35.10	Location	Outdoor.
35.11	Accessories, Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
36.0	**LIME PREPARATION TANK (FOR N-PIT) (FOR DM PLANT OPTION – I/ II)**	
36.1	Type	Vertical Cylindrical/ Rectangular
36.2	Number	1x100 % (1W+0S)
36.3	Chemical to be handled	Lime solution.
36.4	Capacity of Each Tank (Net)	2 CuM (Minimum).
36.5	Free board	300 mm
36.6	Shell/Dished Material	RCC
36.7	Internal Lining	Epoxy painted.
36.8	Location	Outdoor
36.9	Accessories	Agitator (SS 316) with reduction gear, Dissolving Basket (SS 316), Ladder and operating platform.
36.10	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
37.0	**ACTIVATED CARBON FILTER (ACF) FOR ALKALI**	
37.1	Type	Vertical Cylindrical Pressure Vessel with dished ends
37.2	Number	1x100 % (1W+0S)
37.3	Design Flow per Unit (Net)	To suit the process requirement or minimum 10 CuM/Hr.
37.4	Design Surface Flow Rate at design	15 CuM/Hr./SqM.

	flow (max)	
37.5	Design Pressure Of Vessel (Min)	8 Kg/Sq.cm (g)
37.6	Type of Filter Media/Resin	Activated Carbon
37.7	Minimum Bed Depth of Filter media/ resin	1200 mm (excluding supporting bed)
37.8	Supporting material for the fill	Graded gravel
37.9	Outlet Quality	Free Chlorine: Non-Detectable as per latest ASTM procedure.
37.10	Shell & Dish End Material	● The pressure vessels shall be fabricated from carbon steel plates conforms to SA 515 Gr.70 or SA 516 Gr. 70 if the pressure vessels are designed as per ASME Section VIII. ● If the pressure vessels are designed as per IS 2825 following criterion shall be followed: The pressure vessels shall be fabricated of steel as per IS: 2002 Gr. 3 (normalized condition) or SA: 515/516 Gr. 70 (normalized), in case the vessels are designed as per Class 1 or Class 2 of IS: 2825. If the pressure vessels are designed as per Class 3 of IS: 2825, the material of construction shall conform to IS: 2062 or IS: 2002 Gr. 3 (Normalized quality).or SA 515 /516 Gr. 70
37.11	Internal painting	Epoxy paint
37.12	External Painting	Chlorinated Rubber paint
37.13	Manhole per vessel	Two (2) Nos (each of minimum 600 MM).
37.14	Sight Window with minimum clear width of 75 mm	Two (2) Nos.
37.15	Location	Indoor
37.16	Free board	100%
37.17	Accessories	Ladder and operating platform.
37.18	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
38.0	**ALKALI DILUTION WATER HEATING TANK**	
38.1	Type	Vertical Shell Type with dished ends
38.2	Number	1x100 % (1W+0S)
38.3	Design Flow per Unit (Net)	The tank shall be sized based on 125% of the regeneration water requirement of one anion and one mixed bed or minimum 10 CuM/Hr.
38.4	Design Pressure Of Vessel (Min)	8 Kg/Sq.cm (g)
38.5	Type of Heater	2x50% Electric.
38.6	Design Temperature	80 Deg. C
38.7	Shell & Dish End Material	SS 316
38.8	Manhole per vessel	Two (2) Nos (each of minimum 600 MM).
38.9	Location	Indoor
38.10	Accessories	Ladder and operating platform.
38.11	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
39.0	**UF CIP TANK**	
39.1	Type	Vertical Cylindrical

39.2	Number	2x100% (1W+1S)
39.3	Capacity of Each Tank (Net)	Cleaning requirement of one UF System+ 25% margin or Minimum 3 CuM.
39.4	Free board	300 mm
39.5	Shell/Dished Material	FRP with minimum Thickness 10 mm.
39.6	Location	Indoor
39.7	Accessories	Agitator (MS-FRP) with reduction gear, Ladder and operating platform.
39.8	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
40.0	**UF CIP DOSING PUMP**	
40.1	Type	Horizontal Centrifugal.
40.2	Number	2x100 % (1W+1S).
40.3	Duty	Continuous and to be suitable for parallel operation.
40.4	Capacity and Head	As per system requirement.
40.5	Chemical to be handled	Chemical cleaning for UF system.
40.6	Location	Indoor
40.7	Material of Construction	Casing, impeller, wearing rings: SS 316; Shaft, shaft sleeve: SS 410.
40.8	Hardware	Base plate: Fabricated Steel as per IS 2062, Bolts & Nuts SS 316.
40.9	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
41.0	**UF CEB TANK (FOR TYPE-I)**	
41.1	Type	Vertical Cylindrical Flat Bottom
41.2	Number	2x100% (1W+1S)
41.3	Capacity of Each Tank (Net)	Cleaning requirement of one UF System + 25% margin or Minimum 0.5 CuM.
41.4	Free board	300 mm
41.5	Shell/Dished Material	FRP with minimum Thickness 10 mm.
41.6	Location	Indoor
41.7	Accessories	Agitator (SS 316) with reduction gear, Dissolving Basket (SS 316), Ladder and operating platform.
41.8	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
42.0	**UF CEB DOSING PUMP (FOR TYPE-I)**	
42.1	Type	Simplex positive displacement hydraulic operated diaphragm type.
42.2	Number	2x100% (1W+1S)
42.3	Duty	Intermittent.
42.4	Capacity and Head	As per system requirement.
42.5	Chemical to be handled	Chemical cleaning for UF system.
42.6	Location	Indoor.
42.7	Liquid end (pump, head, valves, valve housing, valve spring, etc)	PP for all wetted parts
42.8	Diaphragm material	PTFE.
42.9	Packing material	PTFE.
42.10	Hardware	Base plate: Fabricated Steel as per IS 2062, Bolts &

		Nuts SS 316.
42.11	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
43.0	**UF CEB TANK (FOR TYPE-2-OPTIONAL)**	
43.1	Type	Vertical Cylindrical Flat Bottom
43.2	Number	2x100% (1W+1S)
43.3	Capacity of Each Tank (Net)	Cleaning requirement of one UF System + 25% margin or Minimum 0.5 CuM.
43.4	Free board	300 mm
43.5	Shell/Dished Material	FRP with minimum Thickness 10 mm.
43.6	Location	Indoor
43.7	Accessories	Agitator (SS 316) with reduction gear, Dissolving Basket (SS 316), Ladder and operating platform.
43.8	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
43.9	**UF CEB DOSING PUMP (FOR TYPE-2-OPTIONAL)**	
43.10	Type	Simplex positive displacement hydraulic operated diaphragm type
44.0	Number	2x100 % (1W+1S)
44.1	Duty	Intermittent
44.2	Capacity and Head	As per system requirement.
44.3	Chemical to be handled	Chemical cleaning for UF system.
44.4	Location	Indoor
44.5	Liquid end (pump, head, valves, valve housing, valve spring, etc)	PP for all wetted parts
44.6	Diaphragm material	PTFE
44.7	Packing material	PTFE
44.8	Hardware	Base plate: Fabricated Steel as per IS 2062, Bolts & Nuts SS 316.
44.9	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system req.
45.0	**PIPING (FOR DM PLANT OPTION – I/ II)**	
45.1	Filtered water, Service Water	Stainless Steel: Stainless Steel ASTM A 312 Gr. 304 Sch. 40/ Equivalent Seamless for Sizes 50 and above and welded for sizes 65 mm NB and above.
45.2	Demineralized water including UF, ACF and UF backwashed water.	**Stainless Steel:** Stainless steel to ASTM A312, Gr. 304 Sch.40s seamless for sizes 50mm and below and welded for sizes 65 mm NB and above.
45.3	Decationised & Deanionsed water and N-pit waste	**Rubber lined Carbon Steel:** IS:1239 Part-I (Heavy Grade - Black), ASTM-A-53 Type-E Grade B / ASTM A 36 / IS:3589 – Grade 410;/ ASTM A-36/ASTM - 53 Type- E, Grade B/ Equivalent and Galvanized to IS: 4736 or Equivalent internally lined with 3 mm thick Rubber of shore hardness 65 ± 5°A) Note: The inside surface of pipes shall be completely de-beaded and made suitable for rubber lining
45.4	Concentrated Hydrochloric Acid (5-30% Conc.)	CPVC Sch. 80 as per ASTM F441 CPVC 4120
45.5	Dilute Hydrochloric Acid (Less than	CPVC Sch. 80 as per ASTM F441 CPVC 4120

	5% Conc.)	
45.6	Alkali (Sodium Hydroxide) a) Strong (5% and above) b) Dilute (below 5%)	a) Stainless Steel SS-316L b) Polypropylene lined steel/CPVC as per ASTM F441 CPVC 4120 Schedule 80
45.7	Lime slurry/Solution/ Suspensions	CPVC Sch. 80 as per ASTM F441 CPVC 4120
45.8	Cleaning Solution Line	SS316 Sch. 40/ CPVC Sch. 80 as per ASTM F441 CPVC 4120
45.9	Chemical Waste from vessels and tanks	CPVC Sch. 80 as per ASTM F441 CPVC 4120
45.10	Instrument air	CS Galvanized as per IS 1239 Gr. B Galvanized
45.11	UF frontal	CPVC, Sch-80.
46.0	**VALVES (FOR DM PLANT OPTION – I/ II)**	As specified somewhere else in this specification.
47.0	**SAFETY EQUIPMENTS (FOR DM PLANT OPTION – I/ II)**	Six sets of safety equipment comprising PVC protection suits with hoods, rubber boots, face visors and thick PVC gauntlets shall also be provided. A personnel water drench safety shower with eye bath (2 Nos) shall be provided near acid alkali unloading/handling area.

48. UF-RO & MB PLANT

A	**Ultrafiltration unit (UF)**	
No	**Descriptions**	**Parameter /Data**
1)	Nos. of trains	2x60 %
2)	Feed Temperature	10-35 Deg C
3)	Recovery from UF	Not less than 92%
4)	UF Treated (Filtrate) Flow	Capacity of each UF to match with gross capacity of RO + water required for backwashing of UF+ Chemical preparation. Additional 5% margin over the total requirements
B	**Basket strainers**	
1)	MOC	SS-316
C	**UF permeate water storage tank**	
1)	Fluid to be Stored	Permeate Water produced from UF
2)	Type of Tanks	Vertical Cylindrical Atmospheric
3)	No of tanks	Two(2)
4)	Design Standard	IS : 803
5)	Effective capacity of Tank	Minimum 1 Hr. retention
6)	Material of construction	MS as per specified code
7)	Shell thickness	Bottom most layer : 10 mm (min.) Balance layer : 8 mm (min.)
8)	Bottom plate thickness	10 mm (minimum)
9)	Inside protection	Solvent free epoxy coating
10)	External painting	Epoxy coating.
11)	Accessories, Additional nozzle connections	Ref DM tank above

D. UF permeate transfer pumps		
No	**Description**	**Parameters/ Data**
1)	Purpose	To pump UF permeate to RO units via cartridge filters
2)	Type of pumps	Horizontal Centrifugal (With VFD)
3)	Design flow (Cum/hr)	To suit the gross capacity of RO system requirements
4)	Rated Head of pump in MWC	As per bidder's design

E. UF BACKWASH WATER PUMPS		
No	**Description**	**Parameters/ Data**
1)	Purpose	For backwashing and CEB of UF skids
2)	Design flow & head	As per bidder's design

49. CARTRIDGE FILTERS & RO TRAINS/STREAMS

A.	**Cartridge filters**	
1)	Filtration Capacity of each filter	Capacity one CF same as capacity of one (1) UF
2)	Numbers	One (1) for each RO stream with a common standby.
3)	Filter Casing & Internals	SS -316
B.	**RO trains /streams**	
1)	Number of trains	3x50% (2W+1S)
2)	Turn Down Capability	One or both the trains shall be operable as per requirement
3)	Design net capacity of each train (Permeate Flow)	Not less than 75 Cu.m/h
4)	Gross capacity of each train	Not less than 75 Cu.m/h +Internal consumption of RO system
5)	Number of Membrane (Block) per Train	One or more as per design
6)	No of Membranes per module	6 - 8
7)	Guaranteed Design Recovery	Not less than 85%
8)	Membrane type	Polyamide, Spiral wound
9)	Average Flux	<20 L/M^2h
10)	Fouling Allowance for design	Minimum 5% per year
11)	Salt passage increase	Minimum 10% per year
12)	End connectors	Victaulic coupling or equiv.(SS-316)
C.	**High pressure feed pump**	
1)	Purpose	To pump filtered water at the downstream of Cartridge filters up to the Degasser towers through RO trains.
2)	Number of pumps	One(1) per RO train
3)	Type of Pumps	Centrifugal with VFD
4)	Design flow rate of each Pump	To suit the Gross capacity of each RO train
5)	Rated Head	1.10 x (RO train Feed Pressure + frictional loss in the system)
6)	Service Duty	Continuous
7)	Type of pump casing	As per manufacturer's standard

D.	**RO Permeate water storage tanks**	
1)	Number required	Two (2)
2)	Effective Capacity of each tank	Minimum 1.5 Hr. retention
3)	Type and Pr. class	Vertical cylindrical atmospheric.
4)	Design Standard	As per IS: 803
5)	Material of construction	MS as per specified code
6)	Shell thickness Bottom plate thickness	Bottom most layer : 10 mm (min.), Balance layer : 8 mm (min.) : 10 mm (min.)
7)	Inside protection	Solvent free epoxy coating.
8)	External painting	Epoxy coating.
9)	Accessories, Additional nozzle connections	Ref DM tank above
E.	**CHEMICAL CLEANING SYSTEM**	
1.	**CHEMICAL TANKS**	
1)	Numbers Required	One (1)
2)	Effective Capacity	As per bidder's design
2.	**CHEMICAL CLEANING PUMPS**	
1)	Numbers Required	Two (2) (2x100%) (1W+1S)
2)	Type	Horizontal Centrifugal
3)	Design flow rate of each Pump	Suitable for cleaning of one (1) RO train/stream at a time.
F.	**FLUSHING SYSTEM**	
1)	Numbers of Flushing pumps Required	Two (2) (2x100%)
2)	Type	Horizontal Centrifugal
3)	Design flow rate of each Pump	Suitable for cleaning of one RO train/stream at a time
G.	**DEGASSER SYSTEM**	
1)	Degassed Tower, Degasser blower & pumps	Ref. for DM plant

50. MIXED BED (MB) POLISHER UNITS (RO PLANT)

1)	Type	Vertical shell type with dished ends
2)	Design flow per unit (net)	Not less than 75 m^3/hr
3)	Gross flow rate per MB unit	To be decided by bidder considering DM water required for regeneration.
4)	Service Cycle (period between two (2) successive regenerations)	24 hrs.
5)	Design surface flow rate at design flow	Not more than 35 M^3/M^2/hr
6)	Shell & dished end material	Mild steel as per specified code
7)	Shell lining	
	a)Material	Rubber
	b)Thickness	4.5 mm (minimum)
8)	External painting	Chlorinated rubber paint
9)	Manhole	Two (2) per vessel (Min.)
10)	Sight windows	Two (2) minimum per vessel (Minimum clear width shall be 75 mm)
11)	**Resins**	
	a)Type	Strongly acidic and strongly basic Type-I, both the resin shall be of high capacity polystyrene resins in bead form.
	b)Regeneration	By HCl and NaOH
	c)Total resin bed depth	1.0 M (min)
12)	**Air-blowers for Mixed Beds**	
	Number	Two (2x100%)
	Type	Centrifugal/Twin lobe type
	Capacity & Head	As required

51. Data sheet for UF/RO other system

A.	**SMBS & Antiscalant dosing system**		
1)		**SMBS dosing tank**	**Anti scalant dosing tank**
	No of tanks	2 W	2W
	Capacity	500 Lit (Min)	500 Lit (Min)
	MOC	MSRL / FRP	MSRL / FRP
	Tank Mixer/Agitator	Turbine Agitator	Turbine Agitator
	MOC of Mixer/Agitator	SS-316	SS-316
2)		**SMBS dosing pumps**	**Antiscalant dosing pumps**
	No.	2(1W+1S)	2(1W+1S)
	Type	Positive displacement	Positive displacement
	MOC	PP	PP

B. UF Permeate transfer pumps and UF backwash water pumps

description		**UF permeate transfer pumps**	**UF filtrate cum backwash water pumps**
1)	Purpose	To pump UF permeate to RO units via cartridge filters	To pump UF permeate to UF storage tank and backwashing of UF
2)	Type of pumps	Horizontal Centrifugal	Horizontal Centrifugal with VFD
3)	Design flow rate of each pump	To suit the gross capacity of RO requirements	As per bidder's design

TECHNICAL DATA SHEET-A FOR CHAIN PULLEY BLOCKS WITH / WITHOUT TROLLEY

A. GENERAL INFORMATION		
1	Type	Chain pulley block with/ without travelling trolley
2	Design	As per IS: 3832
i)	Selection criteria	Chain pulley block of suitable capacity, lift, and travel length shall be provided for handling of items weighing from 500kg upto 1.6T and / or having lifting height less than 10m. The hoist capacity shall be selected considering 25% margin over the weight of heaviest component /equipment to be handled.
3	Duty Class	Class –2 as per IS: 3832
B. TECHNICAL PARAMETERS / DESIGN FEATURES		
4	**Hoisting Mechanism**	
a)	Type	Hand operated gear transmission
b)	Hook	Point hooks with shank, as per IS: 15560, swivelling with safety latch
c)	Hook bearing	Thrust ball bearing of hook suspension
d)	Gears / pinion	Spur / Helical
i)	Material	As per IS 3832
ii)	Type of bearing used	Antifriction ball bearing / Roller
e)	Ratchet Pawl & Wheel	
i)	Material	Steel, hardened and tempered
ii)	Hardness	The hardness of the pawl tip shall not be less than 40HRC and that of ratchet is not less than 30HRC.
iii)	Type of bearing used	Antifriction ball bearing / Roller
f)	Load Chain	Link type, T (8), As per ISO: 3077 / IS-3109/IS-6216
g)	Load chain wheel material	As per IS 3832 / pressed steel
h)	Hand Chain (For hoist)	Link type, Mild steel (grade 30) as per IS 2429 Part I / II
i)	Hand chain wheel (with flanges) material	As per IS 3832 / pressed steel
j)	Method of lubrications	Grease
k)	Brakes	Screw and friction disc type
5	**Trolley & Bridge Drive**	**(Applicable for CPB with trolley only)**
a)	Trolley	Geared (Manually operated)
i)	Material of frame	Rolled structural steel (IS:2062 Grade A or B)
b)	Hand Chain For trolley	Link type, Mild steel (grade 30) as per IS 2429 Part I / II
c)	Trolley Wheel material	Carbon steel
i)	Type of bearing used	Antifriction ball bearing

d)	Gears / pinion	Spur / Helical
i)	Material	As per IS 3832
ii)	Type of bearing used	Antifriction ball bearing / Roller
e)	Method of lubrications	Grease
6	**SPECIFIC REQUIREMENT FOR CHAIN PULLEY BLOCKS FOR HAZARDOUS AREA:**	
a)	MOC for Ratchet wheel, chain guides and gears:	HTB2 / Solid construction in aluminium bronze or phosphor bronze
b)	MOC for hand chain wheel:	Solid construction/ rims of aluminium bronze or phosphor bronze / HTB2
c)	MOC for hand chain wheel guide	Solid construction in aluminium bronze or phosphor bronze / HTB2
d)	MOC for Un-geared & geared wheels	HTB2/PB-4 lining on trolley wheels
C. TESTING AND INSPECTION		
7	Inspection and Testing	As per Quality Plan.

TECHNICAL DATA SHEET-A FOR ELECTRIC HOIST

S.N.	Description	Technical Particulars	
1	Name of the manufacturer	As per sub vendor list	
2	Design, fabrication and testing of the crane confirm to standard / code number	IS: 3938	
i)	Selection criteria	For handling of items weighing 2T and / or having lifting height more than 10m. The hoist capacity shall be selected considering 25% margin over the weight of heaviest component /equipment to be handled.	
3	Duty	Class II	
4	Suitable for indoor/ outdoor	Indoor duty	
5	Capacity (T), Lift (m) & travel (m)	Refer- TABLE-1	
6	Operation from	Pendent push button	
7	Design amb.	50 deg.	
8	Speed with full load	Full speed	Creep speed
a	Main Hoist (M/Min.)	3	* project specific
b	CT motion (M/Min.)	10	* project specific
9	**COMPONENT DETAILS**		
9.1	Structure	MS Fabricated	
9.2	Rope details		
a	Standard	IS:2266	
b	Construction	Extra flexible plough steel / 6 x 36 construction, Tensile designation min 1770 KN	
c	Factor of safety	As per IS 3938	
d	Type of core	Steel/ fibre	
9.3	Rope drum	Design as per IS 3938	
a	Material	Seamless pipe ASTM -106 Gr.A/ B	
b	Flange / flangeless	Flanged	

9.4	Sheaves details	Design as per IS 3938	
a	Material	Fe 410 WA IS: 2062 Gr. B / CS Gr. 280-520 IS: 1030 Design as per IS: 3938- 1999	
b	Type of guards provided	Fabricated from rolled steel plate	
9.5	Gear box details		
a.	Type of mounting of gear box	Horizontal / Vertical	
b.	Classification	Suitable for M5 duty	
d.	Type of gears	Spur/Helical	
e	Type of lubrication (grease / splash / pump lubrication)	Splash Lubrication	
f	Hardness (BHN)	as per IS 3938	
g.	Material(gear/pinions)	Main Gears EN 9/ 55C8/ IS2707 Gr. 1or 2. Pinions EN 19/EN 24.	
		Hardness conforming to IS: 3938 (latest edition)	
		Gears to be hardened, tempered & heat treated as per IS 4460	
h.	Gear box housing material	Cast / Fabricated & stress relieved	
I	Noise level	85 db	
j	Standard conforming to	IS: 4460 / AGMA	
9.6	Lifting hooks	Point hook with shank with safety latch Swivelling type as per IS: 15560. Material shall be class 1A / 3 as per IS 1875 for L/M grade hook respectively	
9.7	Brakes (Per motor)	Main Hoist	Cross travel
a	Type of brake	DCEM	DCEM
b	Number provided	1 no.	1 no.
c	Braking capacity of each brake	150% of rated torque	125% of rated torque
9.10	Wheels		
a.	Material	Grade C55Mn75 of IS 1570 (Part 1 and Part 2/Sec 2) or 42CrMo4 or equivalent as per IS 3938-2020.	
b.	Hardness	200 BHN	
c.	Process of hardening	Volume hardening	
d	Type	Single flanged	
e	Specification conforming to	IS: 3938	
f	Arrangement of lubrication	Grease	
9.11	**Buffers**		
a	**Type**	Spring loaded type. Buffers shall have sufficient energy absorbing capacity to bring unloaded crane / trolley (loaded crane in the case of stiff masted cranes) to rest from a speed of 50 percent of the rated speed at a deceleration rate not exceeding 5 m/s2.	

b	**Details of end stop**	MS
9.12	**Bearings**	Antifriction ball / roller bearings (Life- 10,000 working hours.)
10	Motors	
a	Type	Squirrel cage
b	Enclosure	TEFC
c	Voltage, phase and frequency	3 Ph, 4 wire, 415V ±10%, 50 Hz ±5% Combined voltage & frequency variation = 10% absolute
d	Rated capacity (KW)	Motor rating shall be selected keeping margin of 15% over the maximum power requirement.
e	Service class	S4
f	Number of starts/ hour	150 starts / hr
g	Pull out torque	The pull-out torque of the motor will not be less than 225 % of the full load torque.
h	Qnty	For Main hoist: one no. For Cross travel: one no.
11	Power conductors (DSL) & Cables	
a.	Design Criteria	Cable from main isolating switch (1.5M above operating floor) to motor terminal shall be so sized that the voltage drop does not exceed 2% of rated voltage at motor terminals.
b.	Type	LT: PVC shrouded GI conductor bus bar. CT: Flexible trailing cable/ T- track arrangement
c.	LT POWER CABLES	XLPE insulated & PVC insulated
c.1	1.1 KV grade XLPE power cables	1.1 KV grade XLPE power cables shall have multi stranded compacted aluminium conductor (tensile strength of more than 100 N/ sq.mm), XLPE insulated, PVC inner-sheathed (black colour as per IS:5831), Armoured (For single core Armoured cables, armouring shall be of aluminium wires H4 grade. For multicore Armoured cables armouring shall be of galvanized steel round wire/strip), PVC FRLS outer-sheathed (black colour) conforming to IS: 7098. (Part-I).
c.2	1.1KV grade PVC power cables	1.1KV grade PVC power cables shall have multi stranded aluminium conductor (compacted type for sizes above 10 sq.mm), PVC Insulated, PVC inner sheathed ((black colour as per IS:5831)) Armoured (For single core Armoured cables, armouring shall be of aluminium wires H4 grade. For multicore Armoured cables armouring shall be of galvanized steel round wire/strip), PVC FRLS outer-sheathed (black colour) conforming to IS:1554 (Part-I).
c.3	LT Control Cables	LT Control Cables are Cu conductor 1.5 sq mm, PVC insulated, PVC inner sheath, GS wire/strip armoured and FRLS PVC outer sheath confirming to

		IS 1554 Part-1. Standard control cable sizes shall preferably be 3CX1.5, 5CX1.5, 7CX1.5 & 10CX1.5mm2, 14CX1.5 mm2.	
c.4	1.1 kV grade trailing cables	1.1 kV grade trailing cables shall have tinned copper (class 5) conductor, insulated with heat resistant elastomeric compound based on Ethylene Propylene Rubber (EPR) suitable for withstanding 90 deg.C continuous conductor temperature and 250deg C during short circuit, inner sheathed with heat resistant elastomeric compound, nylon cord reinforced, outer-sheathed with heat resistant, oil resistant and flame-retardant heavy-duty elastomeric compound conforming to IS 9968.	
d.	Size	a) Rated current of the equipment b) The voltage drop in the cable, during motor starting condition, shall be limited to 10% and during full load running condition, shall be limited to 3% of the rated voltage. c) Short circuit withstand capability Derating factors for various conditions of installations (variation in ambient temperature, grouping of cables) shall be considered while cable sizing. d) DSL shall be sized as it can cater max. load requirement for all cranes running on the same DSL + 40% margin e) Min. power cable size shall be minimum 2.5 mm2 for Cu/ Minimum 6mm2 for Aluminium f) Min. power cable size shall be minimum 2.5 mm2	
e.	Length	Suitable for bay length	
12	Control panel		
a	Material	Rolled sheet steel 2mm size	
b	Numbers and location	One each for Protective, MH, AH, CT and LT located on bridge platform.	
c	Degree of Protection	IP 54	
d	Features	Each panel shall have internal illumination with fluorescent lamp and thermostat-controlled space heater, suitable for operation on 240V 1-ph 50 Hz supply. Lamps and heater circuits shall have individual ON-OFF Switches.	
13	Cable (Fixed)	Power	Control
a	Material	Stranded Copper/ Stranded Aluminium	Stranded Copper
b	Size	Minimum 2.5 mm2 for Cu/ Minimum 6mm2 for Aluminium	Minimum 1.5 mm2
c	Voltage grade	1100V grade PVC cables with extruded inner sheath	1100 Volt grade flexible, heat resistant, insulated switchboard wires
14	Limit switches		
a.	Type	For MH: Rotary gear + Gravity	

		For CT: Lever type (one way/ two way)
b.	Number provided	For MH: 1+1
		For CT: 2/1
c	Control voltage / Enclosure	110 V/ IP 55
15	Power Supply	One (1) no 415 V, 3 phase, 4 wire supply at operating floor at centre/end of bay through an isolation switch placed at 1.5 m from operating floor.
17	Control Transformer	1 no, 415/110V (to be sized for 20% margin)
18	Hand rail pipes	32 mm NB heavy duty GI pipes as per IS 1239 having top and bottom rail at height of 1000 mm and 600 mm and vertical post spacing not exceeding 1500 mm with provision of kick plate (100 mm high and 6mm thick)
19	Isolating switch	
a.	Main isolating cum changeover switch (01 no.), mushroom type emergency STOP push buttons at centre of bay length (to be decided during detail engineering). Additionally Two nos. maintenance isolator shall be placed at gantry girder level at suitable distance for maintenance of the cranes	
b.	BHEL will provide two number 415 V AC (3 PHASE 4 WIRE) supply feeder only up to isolating cum changeover switch. Any other voltage level (AC/DC) required will be derived by the vendor.	
c.	Motor starter shall be part of crane control panel.	
20	Earthing	G.I / Copper
21	**Consumables**	
	The Bidder's scope includes requirements of consumables such as oils, lubricants including grease, servo fluids, cadmium compounds, gases and essential chemicals etc. Consumption of all these consumables till handing over shall also be included in the scope of the Bidder. Bidder shall also supply a quantity of the full charge of each variety of lubricants, servo fluids, gases, chemicals etc. used which is expected to be utilized till handing over. This additional quantity shall be supplied in separate Containers.	

B	**Maintenance tools & tackles**	One set contains following		
	Item description	Qnty	UOM	
a.	Complete set of ring spanners	1	set	
b.	Complete set of screwdrivers (Min. 6 Nos., Indicate the sizes)	1	set	
c.	Adjustable Spanner	1	no.	
d.	Insulated plier	1	no.	
e.	Wrench spanner	1	no.	
f.	Grease Gun	1	no.	
g.	Oil Gun.	1	no.	
h.	Hand Lamp.	1	no.	
i.	Line tester	1	no.	
j.	O&M Manual	1	no.	
k.	Steel box to place above tools & manual	1	no.	
C	**Erection & Commissioning Spares**	One set contains following		

	Item description	Qnty	UOM	
a.	Oil seal for each gear box	2	nos.	
b.	Indicating lamps of each color	2	nos.	
c.	Push button of each type and rating	2	nos.	
d.	Auxiliary Contactor of each rating	2	nos.	
e.	Limit switches	2	set	
f.	Touch up paints for structural component	10	Ltr.	

SECTION- I B

SPECIFIC TECHNICAL REQUIRMENT-ELECTRICAL

SPECIFIC TECHNICAL REQUIREMENTS: ELECTRICAL

1.0 Scope for supply, and erection & commissioning of various equipment forming part of electrical system for this package shall be as per Annexure–I [Scope of Work (Electrical)].

2.0 Make of all electrical equipment/ items supplied shall be reputed make. Same shall be subject to approval of BHEL/customer after award of contract without any commercial implications. Tentative make list of various Electrical items (Motors/ lugs/glands) is attached.

3.0 All QPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.

4.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

4.1 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical/ quality assurance requirements stipulated.

4.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.

5.0 LIST OF ENCLOSURES

5.1 Electrical scope between BHEL & vendor (Annexure-I).
5.2 Technical specification - Motors (Annexure-II).
5.3 Datasheets –Motor (Annexure-III)
5.4 Quality Plan for motors. (Annexure-IV)
5.5 Load data format (Annexure-V).
5.6 Tentative make list for electrical items (motor, lugs, glands) (Annexure-VII)
5.7 Explanatory note for Cable routing & Cable schedule format (Annexure-VI)

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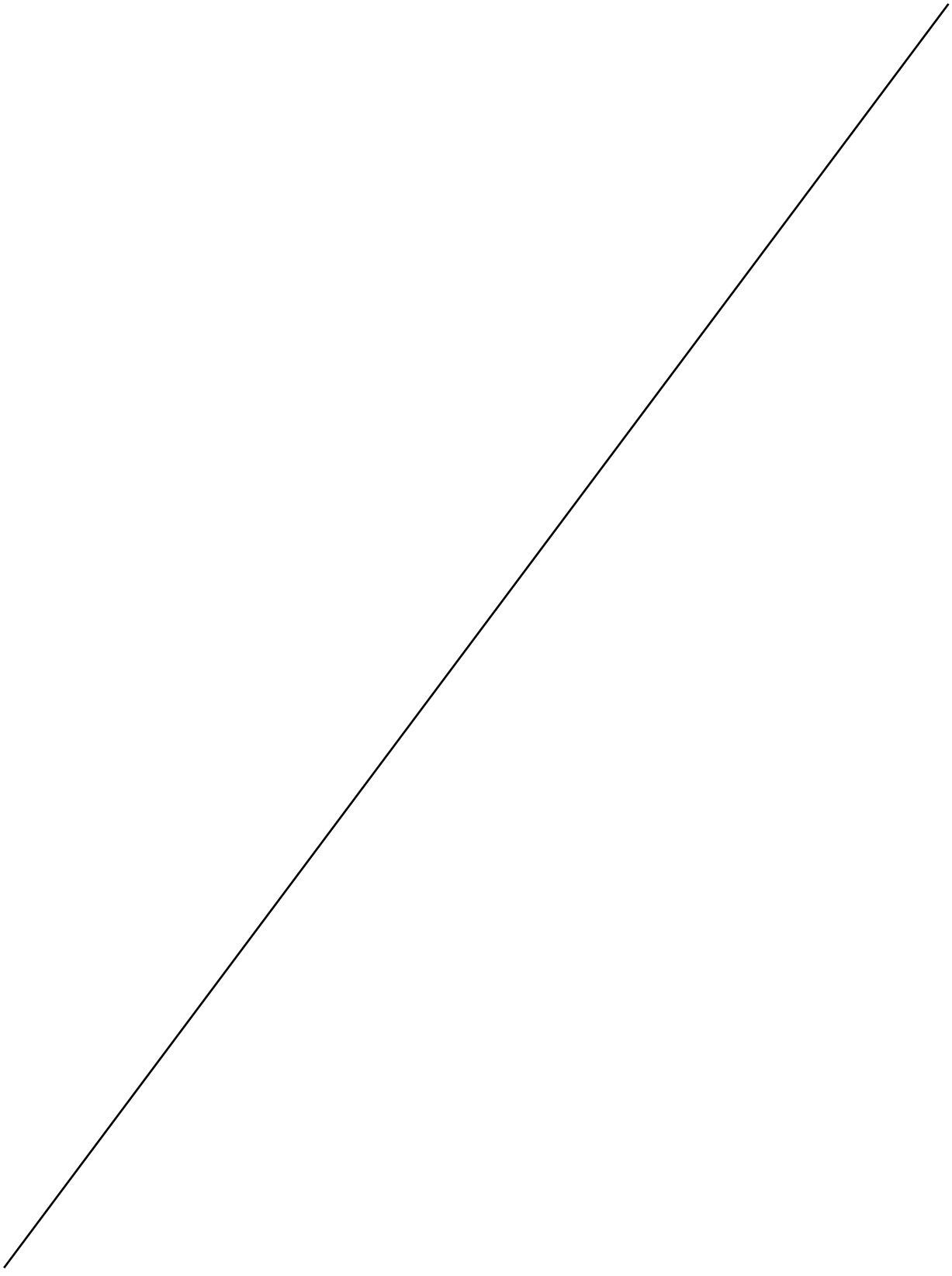

STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR FOR SKID MOUNTED SYSTEM

PACKAGE: PTP/DMP/ETP/STP/CWT/CLO2/CHP Run off WTP/CPU
SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT
PROJECT: LARA SUPER THERMAL POWER PROJECT STAGE-II (2X800 MW)
SPECIFICATION NO. PE-TS-508-404-W001
PROJECT:

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC	BHEL	BHEL	a) 240 V AC (supply feeder)/415 V AC (3 PHASE 4 WIRE) supply shall be provided by BHEL as per load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. b) Emergency supply feeder provided (if required) shall be 3 phase 3 wire only. Any other voltage level (AC/DC/Single ph emergency AC) required will be derived by the vendor. c) 230 V AC UPS Power supply shall be provided by BHEL at a single point, All necessary hardware for deriving other power supply from given feeder shall be in Vendor's scope.
2	Local control panel	Vendor	Vendor	Refer C & I specification for details
3	Local Push Button Station (for motors)	BHEL	BHEL	Located near the motors.
4	Power cables, control cables and screened control cables for a) both end equipment in BHEL's scope b) both end equipment in vendor's scope c) one end equipment in vendor's scope	 BHEL BHEL BHEL	 BHEL Vendor BHEL	1. For 4.b) & c): Sizes of cables required shall be informed by vendor at contract stage (based on inputs provided by BHEL) in the form of cable listing. Finalisation of cable sizes shall be done by BHEL. Vendor shall provide lugs & glands accordingly. 2. Termination at BHEL equipment terminals by BHEL. 3. Termination at Vendor equipment terminals by Vendor.

STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR FOR SKID MOUNTED SYSTEM

PACKAGE: PTP/DMP/ETP/STP/CWT/CLO2/CHP Run off WTP/CPU
SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT
PROJECT: LARA SUPER THERMAL POWER PROJECT STAGE-II (2X800 MW)
SPECIFICATION NO. PE-TS-508-404-W001

5	Junction box for control & instrumentation cable (if applicable)	Vendor	Vendor	Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 10-12 mtrs) and trunk cable.
6	Cable trays, accessories & cable trays supporting system. 100/50 mm cable trays/Galvanised steel cable troughs for local cabling	BHEL BHEL	BHEL Vendor	Local cabling from nearby main route cable tray (BHEL scope) to equipment terminal (vendor's scope) shall be through 100/ 50 mm. cable trays/ conduits/ Galvanised steel cable troughs as per approved layout drawing during contract stage.
7	Any special type of cable like compensating, co-axial, prefab, MICC & fibre optical	Vendor	Vendor	Refer C&I portion of specification for scope of fibre Optical cables if used between PLC/ microprocessor & DCS.
8	Equipment grounding	BHEL	BHEL	Within the skid. All equipment metallic enclosures / frames, metal structure etc. shall be grounded at two points each to the nearest grounding points / risers provided by BHEL.
9	Motors with base frame and fixing hardware for motors.	Vendor	Vendor	Makes shall be subject to customer/ BHEL approval at contract stage.
10	Cable glands, lugs and bimetallic strip for equipment supplied by Vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power and control cables.
11	Conduit and conduit accessories for cabling between equipments supplied by vendor.	Vendor	Vendor	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537.
12	Lighting	BHEL	BHEL	--
13	Below grade grounding	BHEL	BHEL	
14	a) Input cable schedules (C & I) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
15	Any other equipment/material/service required for completeness of system based on the system offered by	Vendor	Vendor	--

	vendor (to ensure trouble free and efficient operation of the system).			
16	Electrical Equipment GA drawing & skid GA drawing	Vendor	-	For necessary interface review.
17	Electrical Equipment & cable tray layout drawings	Vendor	-	For ensuring cabling requirements are met, vendor shall furnish Electrical equipment layout & cable tray layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipment requiring cabling, and shall incorporate cable trays routing details marked on the drawing as per PEM interface comments. Cabling arrangement of the same (wherever overhead cable trays, trenches, cable ducts, conduits etc.) shall be decided during contract stage. Electrical equipment layout & cable tray layout drawing shall be subjected to BHEL/ customer approval without any commercial implications to BHEL.

NOTES:

1. Make of all electrical equipment/ items supplied shall be reputed make & shall be subject to approval of BHEL/customer after award of contract.
2. All QPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.
3. In case the requirement of Junction Box arises on account of Power Cable size mis-match due to vendor engineering at later stage, vendor shall supply the Junction Box for suitable termination.
4. Vendor shall indicate location of Electronic Earth pit in their Civil assignment drawing.

STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR FOR SKID MOUNTED SYSTEM (FOR EPC PROJECTS)

PACKAGE: CDS/LDS/ODS
SCOPE OF VENDOR: SUPPLY
SPECIFICATION NO. PE-TS-508-404-W001
PROJECT:

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC	BHEL	BHEL	a) 240 V AC (supply feeder)/415 V AC (3 PHASE 4 WIRE) supply shall be provided by BHEL as per load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. b) Emergency supply feeder provided (if required) shall be 3 phase 3 wire only. Any other voltage level (AC/DC/Single ph emergency AC) required will be derived by the vendor. c) 230 V AC UPS Power supply shall be provided by BHEL at a single point, All necessary hardware for deriving other power supply from given feeder shall be in Vendor's scope.
2	Local control panel	Vendor	Vendor*	Refer C & I specification for details (with in skid)
3	Local push buttons	BHEL	BHEL	If applicable
4	Power cables, ordinary control cables and screened control cables	Vendor	Vendor*	Within the skid. If starters are in MCC, then outside skid, cables scope shall be as per note no. 1.
5	Junction box for control & instrumentation cable (if applicable)	Vendor	Vendor*	Within Skid
6	Any special type of cable like compensating, co-axial, prefab, MICC & fibre optical	Vendor	Vendor*	Within the skid
7	Equipment grounding	BHEL	BHEL	All equipment metallic enclosures / frames, metal structure etc. shall be grounded at two points each to the nearest grounding points / risers provided by BHEL.

STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR FOR SKID MOUNTED SYSTEM (FOR EPC PROJECTS)

PACKAGE: CDS/LDS/ODS

SCOPE OF VENDOR: SUPPLY

SPECIFICATION NO. PE-TS-508-404-W001

8	Motors with base frame and fixing hardware for motors.	Vendor	Vendor*	Makes shall be subject to customer/ BHEL approval at contract stage.
9	Cable glands, lugs and bimetallic strip for equipment supplied by Vendor	Vendor	Vendor*	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power and control cables.
10	Below grade grounding	BHEL	BHEL	
11	a) Input cable schedules (C & I) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
12	Electrical Equipment GA drawing & skid GA drawing	Vendor	-	For necessary interface review.

NOTES:- 1. If motor starters are provided in main MCC then BHEL will provide power & control cable including supply, laying & termination.

2. All QPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.

*E &C by vendor during factory assembling of the skid.

TECHNICAL DATA - PART - A

SL.NO	DESCRIPTION	UOM	DETAIL
1.0	**DESIGN CODES & STANDARDS**		
1.1	Three phase induction motors :		IS15999, IEC:60034, IS: 12615, IS: 325
1.2	Single phase AC motors		IS:996, IEC:60034
1.3	Energy Efficient motors		IS 12615, IEC:60034-30
1.4	Crane duty motors		IS:3177, IS/IEC:60034
1.5	Mechanical Vibration of Rotating Electrical Machines with Shaft Heights 56 mm and Higher - Measurement, Evaluation and Limits of Vibration Severity		IS 12075/IEC 60034-14
1.6	Designation of Methods of Cooling of Rotating Electrical Machines		IS 6362
1.7	Designation for types of construction and mounting arrangement of rotating electrical machines		IS 2253
2.0	**DESIGN /SYSTEM PARAMETERS**		
2.1	Rated voltage	V	415
2.2	Frequency	Hz	50
2.3	Permissible variations for		
a)	Voltage	%	+/-10
b)	Frequency	%	(+)3 to (-)5
c)	Combined	%	10 (absolute sum)
2.40	System fault level at rated voltage for 1 sec	kA	50
2.4	Short time rating for terminal boxes for 0.25 sec	kA	50
2.5	Type of motors		a) Squirrel cage induction motor suitable for direct-on-line starting (for non- VFD motors). b) Motor operating through VFD shall be suitable for inverter duty with VPI insulation.
2.6	Efficiency class		*Continuous duty LT motors upto 50 KW Output rating (at 50 deg.C ambient temperature), shall be super Premium Efficiency class-IE4, 50-200 KW shall be of Premium Efficiency class – IE3,conforming toIS 12615, or IEC:60034-30.*
2.8	Rating		
a)	Motor duty		Continously rated-S1
b)	Design margin over continous max. demand of the driven equipment (min)		10%
3.0	**CONSTRUCTION FEATURES**		
3.1	Winding		Electrolytic grade Copper conductor
3.2	Enclosure Details		
a)	Degree of protection		
	i) Indoor motors		IP 55
	ii) Outdoor motors		IP 55