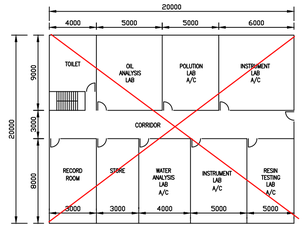
INDICATIVE FLOW DIAGRAM FOR UF+RO+MB DM PLANT

DILUENT WATER HEATING TANK (1 NO.)
ALKALI DAY TANKS (2 NOS.)
AC FILTER FOR ALKALI (1 NO.)
ALKALI PREP. TANK (1 NOS.)
ALKALI STORAGE TANK (2 NOS.)
ACID STORAGE TANKS (2NOS.)
ALKALI EJECTORS
ALKALI TRANSFER CUM RECIRCULATION PUMPS
ALKALI UNLOADING PUMPS
ACID UNLOADING PUMPS
ACID MEASURING TANK (2 NOS.)
ACID EJECTORS
ANTIOXIDANT DOSING PUMPS
ANTIOXIDANT DOSING TANKS
ANTISCALANT DOSING PUMPS
ANTISCALANT DOSING TANKS
LIME TANK FOR NEUTRALISATION
NEUTRALISATION PIT-II
NEUTRALISATION PIT-I
FROM ACID & ALKALI MEASURING TANKS
EFFLUENT DISPOSAL PUMPS
CARTRIDGE FILTERS (3 NOS.)
HIGH PRESSURE PUMPS (3 NOS.)
RO SKID 1
RO SKID 2
RO SKID 3
DEGASSER TOWER
(BLOWERS) 2 NOS.
RO PERMEATE STORAGE TANK
RO PERMEATE TRANSFER PUMPS
CEB TANK & DOSING FACILITY
(Ref. PE-DG-512-158-W001)
UF SKID 1
UF SKID 2
BASKET STRAINER
UF PERMEATE TRANSFER PUMPS
UF BACKWASH PUMPS
UF PERMEATE WATER STORAGE TANKS (2NOS.)
Overhead Water Tank (2 m3) with Inlet MOV, LG & LT

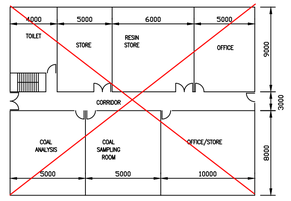
LEGEND

PI	PRESSURE INDICATOR (Local)		SILENCER
PT	PRESSURE TRANSMITTER		AIR FILTER
DPI	DIFFERENTIAL PRESSURE INDICATOR (Local)		EJECTOR
DPT	DIFFERENTIAL PRESSURE TRANSMITTER		CO_2 ABSORBER
LG	LEVELINDICATOR(LOCAL) REFLEX TYPE/FLOAT TYPE		OVER FLOW SEAL
LI	LEVELINDICATOR(LOCAL) REFLEX TYPE/FLOAT TYPE		RESIN TRAP
LT	ULTRASONIC TYPE LEVEL TRANSMITTER		DAMPER
FI	FLOW INDICATOR (Local)		DIAPHRAGM SEAL
FT	FLOW TRANSMITTER		ELECTRO-PNEUMATIC CONNECTOR
ZT	POSITION TRANSMITTER		CHANNEL
OC LS	OPEN & CLOSE LIMIT SWITCH		ORIFICE
FE	FLOW ELEMENT		SAMPLE VALVE
			SOLENOID VALVE
			SPRING TO CLOSE
			SPRING TO OPEN
			ALKALI LINE
			ACID LINE
			AIR LINE
		LG(R)	LEVEL GAUGE(REFLEX TYPE)
		LG(F)	LEVEL GAUGE(FLOAT TYPE)
		AE-PH	PH ANALYSER
		AE-RC	CHLORINE ANALYSER

AE-CC	CONDUCTIVITY ANALYSER
AE-SI	SDI ANALYSER
	DIAPHRAGM TYPE (SPRING TO OPEN)
	ELEC MOTOR
	SLUICE VALVE
	CHECK VALVE
	DIAPHRAGM VALVE
	GLOBE VALVE
	BUTTERFLY VALVE
	PLUG VALVE
	RELIEF VALVE
	M.S.GATE
	STRAINER
	PARSHALL FLUME
	PUMPS
	MOTORISED MODULATING VALVE
	WEIR TYPE GATE
	MOTORISED PLUG VALVE
	FLOAT VALVE
	CHECK VALVE
AE-TU	TURBIDITY ANALYSER
SDI-M	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						

Page 478 of 883

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

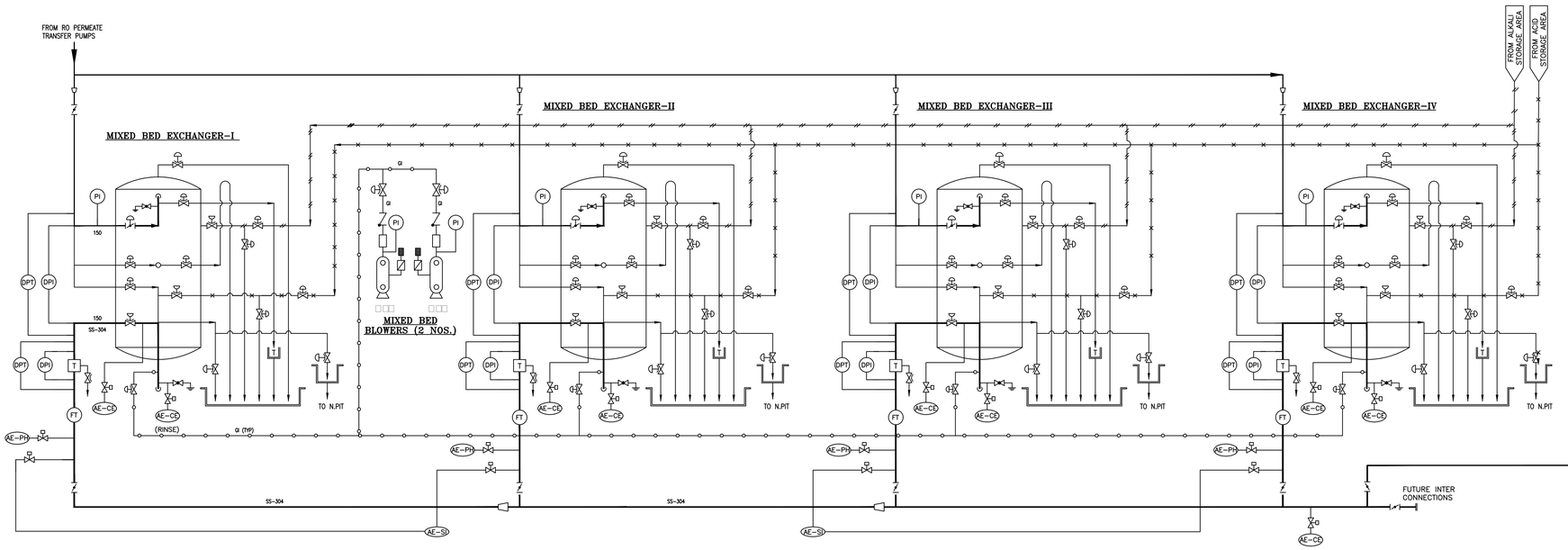
PROJECT: SINGRAULI SUPER THERMAL POWER PROJECT
STAGE-III (2 X 800MW)

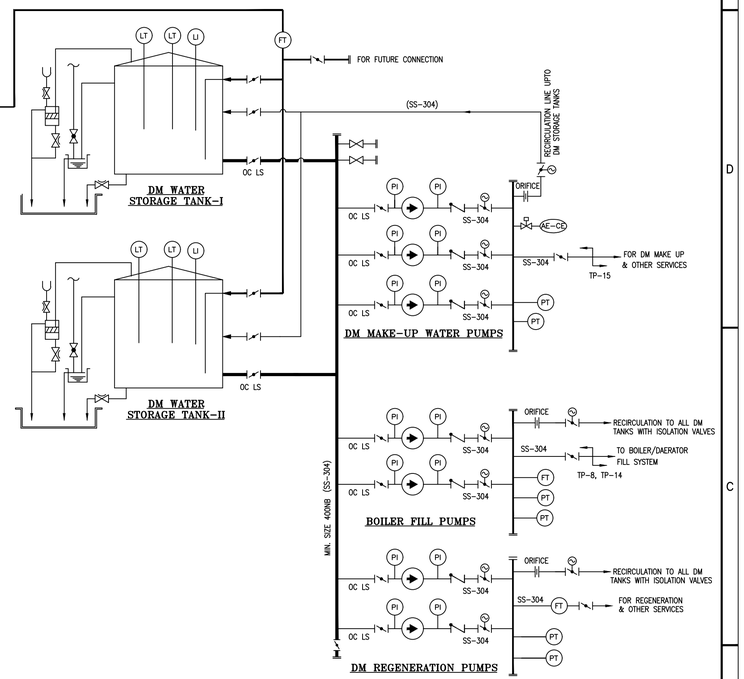
TITLE: P & I DIAGRAM FOR RO PLANT

SIZE	SCALE	DRG.NO.	REV.
A1	NTS	1150-999-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		
		SAMPLE VALVE		
SILENCER		PRESSURE RELIEF VALVE		
AIR FILTER		NON RETURN VALVE (FLOW LEFT TO RIGHT)		
STRAINER (Y–TYPE)		SOLENOID VALVE		
EJECTOR		PLUG VALVE		
CO_2 ABSORBER		SPRING TO CLOSE		
OVER FLOW SEAL		SPRING TO OPEN		
RESIN TRAP	LT T	ALKALI LINE		
FLOW INDICATOR		ACID LINE		
DIGITAL INDICATOR		AIR LINE		
DAMPER		LOCAL INSTRUMENT		
DIAPHRAGM SEAL		CONTROL INFORMATION ON CONTROL DESK/CRT		
DENSITY INDICATOR	DI	DISTRIBUTED CONTROL SYSTEM	DCS	
HOSE	H	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 PT's AND ONE NO. FT SHALL BE PROVIDED AT COMMON DISCHARGE OF PUMPS AND BLOWERS. (TYP.)
3. LT's and LG's 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.

FLOW DIAGRAM - 2

OPTION–2

FOR TENDER PURPOSE ONLY

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

PROJECT: SINGRAULI SUPER THERMAL POWER PROJECT
STAGE–III (2 X 800MW)

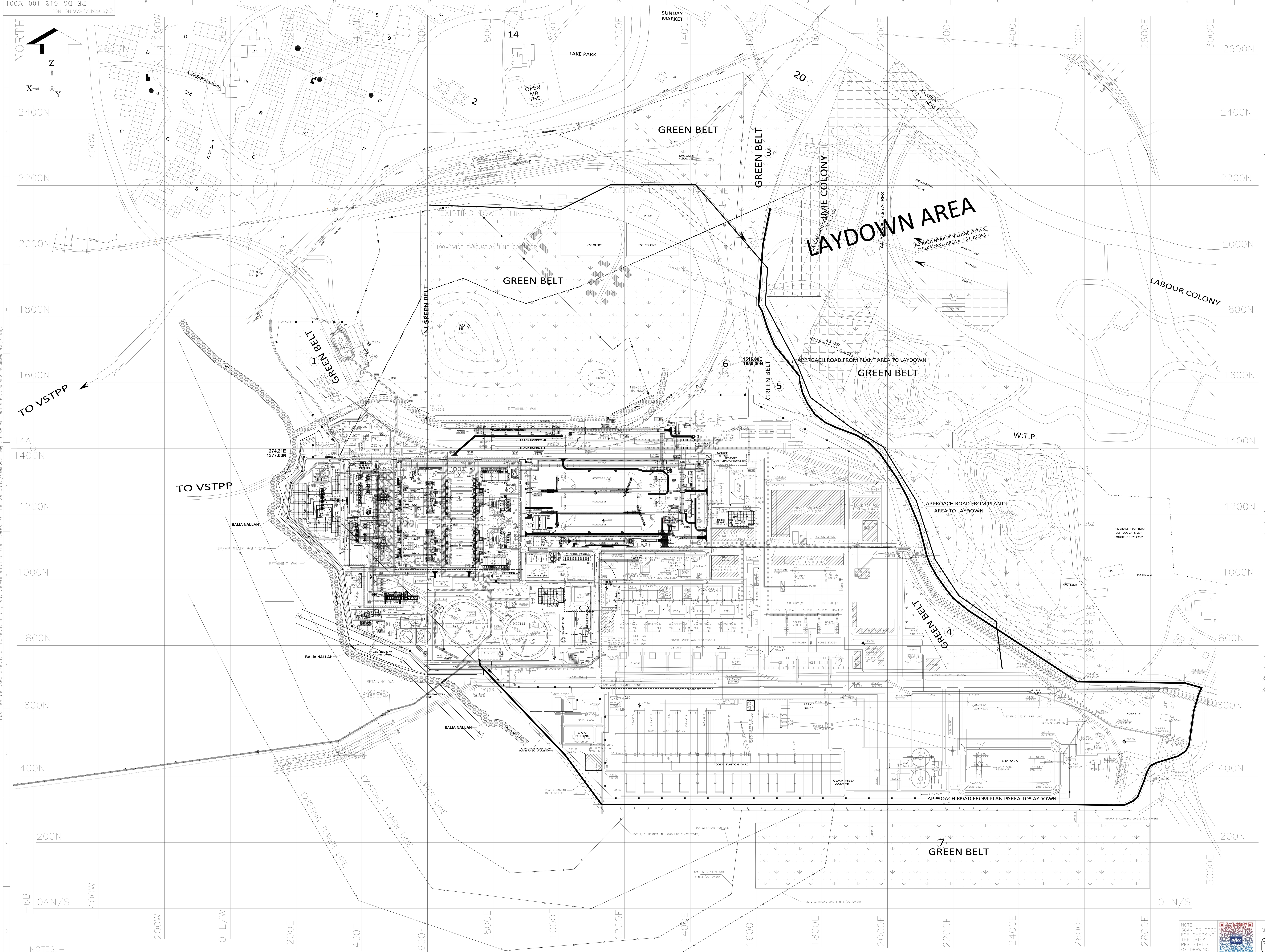
TITLE: P & I DIAGRAM FOR RO PLANT

SIZE	SCALE	DRG.NO.	REV.
A1	NTS	1150–999–POM–A–003 (SHEET 2 OF 2)	A

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

CAD FILE NAME : 1150–999–POM–A–003

ड्राइंग संख्या/DRAWING NO. PE-DG-512-100-M001



LIST OF BUILDING/EQUIPMENT SHOWN

NO	DESCRIPTION
1	SWITCHYARD
2	TRANSFORMER YARD
3	POWER HOUSE BUILDING
4	BOILER
5	MILL BAY
6	ELECTROSTATIC PRECIPITATOR
7	CHIMNEY
8	COAL STOCK YARD
9	FLY ASH CLASSIFIER HOPPER
10	CONTROL ROOM FOR CHP
11	PT PLANT
12	D.M PLANT(RO/CONVENTIONAL)
13	D.M. WATER TANKS & PUMP HOUSE
14	SEWAGE TREATMENT PLANT
15	EFFLUENT TREATMENT PLANT
16	CW TREATMENT PLANT
17	F.O.P.H.
18	O&M STORES
19	COOLING TOWER
20	C.W. PUMP HOUSE
21	PLANT CLO2 SYSTEM
22	COMPRESSOR HOUSE
23	FLY ASH SILO / ASH DESPATCH AREA
24	AUX. COOLING TOWER
25	ESP CUM FGD CONTROL ROOM
26	CONDENSATE STORAGE TANK
27	ASH COMPRESSOR HOUSE
28	CHEMICAL HOUSE-PT PLANT
29	SWITCHYARD CONTROL ROOM
30	ASH WATER TANK/ PUMP HOUSE
31	SAFETY CONTROL ROOM
32	CLARIFIED WATER TANK & PUMP HOUSE
33	SERVICE WATER TANK & PUMP HOUSE
34	CUSTOMER'S STORAGE SHEDS
35	PIPE CUM CABLE RACK
36	FIRE WATER PUMP HOUSE
37	CPU REGENERATION AREA
38	BOTTOM ASH (BA) SLURRY PUMP HOUSE
39	COAL SLURRY SETTLING POND
40	WATER SYSTEM CONTROL ROOM & ANNEX.
41	CHP PUMP HOUSE
42	AHP MCC-1 (42A), AHP MCC-3 (42C)
43	SERVICE BUILDING
44	CHP MCC-1 (44A), CHP MCC-2 (44B), CHP MCC-3 CUM AHP MCC-2 (44C)
45	HCSD CUM SILO UTILITY BUILDING
46	DEWATERING BIN
47	DOZER SHED
48	CRUSHER HOUSE (ISG)
49	GYPSUM DEWATERING BILDING
50	BALL MILL BUILDING
51	RAW WATER PUMP HOUSE & MCC
52	O&M WORKSHOP
53	SAFETY PARK
54	CSSP CLARIFIERS
55	FQA LAB
56	COMBINED ASH (CA) SLURRY PUMP HOUSE
57	FIRE WATER BOOSTER PUMP HOUSE
58	AUX. COOLING TOWER PH

LEGENDS:

1. ROADS
   (i) DOUBLE LANE
   (II) SINGLE LANE
2. EMBANKMENT
3. EXISTING BOUNDARY WALL
4. NEW BOUNDARY WALL
5. FENCING
6. RAILWAY SIDING
7. FACILITIES FOR STAGE-I/II
8. STAGE - III FACILITIES
9. FORMATION LEVEL
10. TRESTLE/PEDESTAL IN MAIN PLANT PACAKGE FOR STAGE-III
12. ISG PIPE RACK/PEDESTAL
11. RETAINING WALL
13. FENCING OF STAGE-III
14. SLOPE LINE
15. AREA MARKED FOR FGD STAGE I & II (LOT3)
16. CULVERT FOR REROUTED ASH PIPE STAGE I & II

NOTES:-

1. ALL DIMENSIONS AND CO-ORDINATES ARE IN MM UNLESS NOTED OTHERWISE.
2. a) THE FINISHED GRADED LEVEL (FGL) OF MAIN PLANT AREA (STACK TO SWITCH YARD) SHALL BE RL 276.0M
   b) FGL FOR COOLING TOWER AND PT PLANT AREA SHALL BE RL 275.5M.
   b) FGL FOR TRACK HOPPER & LAYDOWN AREA SHALL BE RL 281.0M.
   d) FFL(FINISHED FLOOR LEVEL) OF TG BUILDING SHALL BE RL 276.5M WHICH CORRESPONDS TO EL 0.0M FOR ALL REFERENCE.

REFERENCE DRG:

SL. No.	TITLE	DRG. NUMBER	SCOPE
1	GENERAL LAYOUT PLAN	1150-999-POC-F-001	NTPC

PROGRESSIVE DTD. 14.01.2025

पुनरीक्षण REV.	दिनांक DATE	परिवर्तितकर्ता ALTD	जांचकर्ता CHD	अनुमोदनकर्ता APPD	Description
01	21.10.24	ABH	PUNEET	BKA	1. DRAWING REVISED INLINE WITH NTPC OBSERVATIONS REFERENCE No. CC-ENGG-1150-001-301-POC-F-001 DTD. 17.07.2024 2. DRAWING REVISED INLINE WITH LATEST INPUTS/GA DRAWING OF VARIOUS BUILDINGS.
0A	09.07.24	ABH	PUNEET	BKA	1. DRAWING REVISED INLINE WITH NTPC OBSERVATIONS ON THE PLOT PLAN SUBMITTED BY BHEL VIDE EMAIL DTD. 01.05.2024 2. DRAWING GENERALLY REVISED INLINE WITH LATEST GA DRAWING OF VARIOUS BUILDINGS.

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

ग्राहक ड्राइंग संख्या CUSTOMER DRAWING NO. 1150-001-301-POC-F-001

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

कार्य संख्या JOB NO. 512
स्थिति STATUS CONTRACT
मुद्रण स्केल मीटर में PRINT SCALE IN METRE

परियोजना PROJECT: 2x800 मेगावाट सिंगरौली सुपर थर्मल पावर परियोजना चरण-III / 2x800 MW SINGRAULI SUPER THERMAL POWER PROJECT STAGE-III

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	ABH	-sd-	30.04.2024
डिजाइनकर्ता/DESN	PUNEET	-sd-	30.04.2024
जांचकर्ता/CHD	SK	-sd-	30.04.2024
अनुमोदनकर्ता/APPD	BKA	-sd-	30.04.2024

शीर्षक/TITLE: GENERAL LAYOUT OF PLANT

एमपीएल MPL | सिविल CIVIL | इलेक्ट्रिकल ELEC | एसएण्डसीई S&CE | डब्ल्यूएसई WSE | मैक्स MAX | विभाग DEPT. | स्केल SCALE- 1: 4000

ड्राइंग संख्या / DRAWING NO. PE-DG-512-100-M001
शीट SHEET 1 OF 1
पुनरीक्षण REV. 01A

ELECTRONIC FILE NAME : 40-PLOT PLAN-PE-DG-512-100-M001.dwg

फॉर्मेट साइज A0 FORMAT SIZE A0

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 (TYPE-A PACAKGES)

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.

DATA SHEET A FOR CHEMICAL DOSING SYSTEM (TYPE-B PACKAGE)

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 Schedule 40 (seamless)	ASTM A312 Gr. TP 304 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 (TYPE-B PACKAGE)

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	Ten per skid (Total Eighty)
2.2	Loose supply of filled Oxygen cylinders	Nil
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 20 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

DATA SHEET A FOR CHLORINE DI OXIDE DOSING SYSTEM (TYPE-A PACKAGE)

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] HCl- 2(1 W+ 1S), NaClO2- 2(1W+1S)	
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/ NaClO2 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%.

DATA SHEET A FOR LIME DOSING SYSTEM (TYPE-B PACKAGE)

S.No	DESCRIPTION	DATA
I	**GENERAL**	
1.	Project	**SINGRAULI SUPER THERMAL POWER PROJECT STAGE-III (2X800 MW)**
2.	End Customer	**NTPC**
3.	Service	**Continuous**
4.	Installation	**Inside the GDW Building**
5.	Quantity for Station	2 sets (1W+1S) Lime Feeding/Dosing system (1 no. twin feed Bucket Elevator with motorized Diverter Flap Gate.
II	**MANUFACTURER DETAILS**	
1.	a. Model	Bidder to Provide
2.	b. Type	Bidder to Provide
III	**OPERATING CONDITION**	
	Medium to be handled	Bulk Lime / Lime slurry
IV	**TECHNICAL DATA**	
A	**BUCKET ELEVATOR**	
1.	Qty.	1 No.
2.	Type	Continuous discharge type
3.	Material to be handled	Lime powder
4.	Bulk density	480 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/ 12-14 M approx. (Bottom to Top of Lime Silo). 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	Bidder to specify

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	**2-Way Diverter Flap Gate for Bucket Elevator**	
1.	Qty.	1 Nos.
2.	Inlet Flange Size	Bidder to specify
3.	Outlet Flange Size	Bidder to specify
4.	Angle of each Discharge Flange	15 ° / to suit
5.	Motor rating of actuator (W/V/F)	Bidder to specify
6.	MOC of Diverter Flap Gate	Bidder to specify
7.	Weight of Diverter Flap Gate	Bidder to specify
C	**LIME SILO**	
1.	Qty.	2 Nos. (1W+1S)
2.	Service/Application	Lime powder handling
3.	Location	Indoor (Gypsum Dewatering Building)
4.	Operating Pressure	Atmospheric
6.	Design Temperature	60 ^{O}C
7.	Design Code	IS 9178
9.	Silo Capacity	1 m^3 each/ To suit system requirement
10.	Silo Cylinder Diameter	1 m

11.	Silo Cylinder Height	To meet system requirement
12.	Total Silo Height	To meet system requirement
13.	Silo Bottom Cone Angle	70 °
14.	Material for Shell & Bottom Cone	IS 2062: 2011 E250 Quality BR
15.	Thickness of shell	10 mm (Min.) + 3 mm (min. corrosion allowance)
16.	Material of Silo cone internal lining (conical portion)	SS304
17.	Thickness 0f SS lining	4 mm
18.	Outlet of Cone Silo	To suit Screw conveyor
10.	Moisture contain in Lime powder	8%
11.	Lime Powder Particle size	During detailed engineering
12.	Bulk density of material	480 kg/m³ (volumetric) 640 kg/m³ (load/structural)
13.	Design Temperature	45°C / Ambient
D	**CHUTES AND HOPPERS**	
1.	Minimum Valley Angle	Bidder to Provide
2.	Material :	Bidder to Provide
	i) Chute work	Bidder to Provide
	ii) Sliding zones & adjacent sides	Bidder to Provide
	iii) No striking/ Non-sliding zones	Bidder to Provide
	iv) Chute with valley angle 80 degree	Bidder to Provide
	v) In the zone of magnetic field	Bidder to Provide
	vi) In the zone of flap gates	Bidder to Provide
	vii) Discharge Hoods overhead pulleys	Bidder to Provide
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
E	**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/m^3
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	Vendor 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	Vendor to confirm
22.	Trough Ends	Trough end to be provided at both drive and tail ends to support the central screw, and bearings 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
E	**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 and welded.
6.	Type of bearings	Spherical Roller Bearings
7.	Drive and tail end bearings	Anti-friction bearings with plumper block. Vendor to specify.
8.	Make of bearings	SAF/FAG/NTN / SIBCO / Equivalent
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
11.	Gasket	EPDM Rubber (5Thk)/ equivalent
12.	Connecting Chute	SS304
13.	Chain and sprocket should be of reputed make. Chain – EN24 Forged Hardness 350-400 BHN Sprocket – EN24 Forged Hardness 450-500 BHN	
F	**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
G	**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	To suit as per requirement
12.	Tank Top Style	Flat
13.	Tank Bottom Style	Flat
14.	Material for Shell, top & Bottom	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.
19.	Accessories	Each tank shall be provided with SS dissolving basket, Agitator of SS construction, drain, over flow and dosing connection, level transmitters, Agitators etc
H	**AGITATOR**	
1.	Qty.	2 Nos. (1 no per neutralization tank)
2.	Type	Top entry
3.	Location	Indoor (over Neutralisation Tank)
3.	MOC	Impeller & Shaft - Alloy 926
4.	Impeller Tip Speed	Must not exceed 12m/s
6.	Reduction Gear	To be provided as per applicability
I	**LIME SLURRY PUMPS**	
1.	Qty.	2 Nos. (1W+1S) common for Neutralization Tanks
2.	Type	Radial Split, Centrifugal, Continuous Duty
3.	Location	Indoor
4.	Rated Capacity Flow (m3/hr)	0.2-0.4 / to suit
5.	Rated Capacity Head (mWCI)	12 / 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
J	**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
K	**SUPPORTING STEEL STRUCTURE, PLATFORMS, RAILINGS, LADDERS**	
1.	Qty.	As per system requirements described in tech. spec. (for 2 no Lime Feeding/Dosing System)
L	**SURGE HOPPER**	
1.	Quantity	2 Nos.
2.	Material to be conveyed	Lime powder
3.	Location	Lime powder manual feed at inlet of bucket elevator
4.	Material of Construction	M.S-IS:2062 E250BR
5.	Thickness of rectangular sheet	6 mm.
6.	Thickness of pyramidal	6 mm.

7.	Thickness of liner (SS 304)	3 mm.
8.	Painting	As per Approved painting schedule
9.	Discharge surge hopper	250 NB
10.	Inlet of hopper	To suit lime bags unloading
M	**PNEUMATIC VIBRATOR**	
1.	Quantity	2 Nos.
2.	Purpose	Feed To bucket elevator
3.	Operating Type	Pneumatic
4.	Location	Below Surge Hopper
5.	Capacity	0.5 TPH
6.	Material to handle	Lime Powder
7.	Material size	Powder
8.	Size (width + length)	Suitable for 250 NB
9.	Vibration frequency	Bidder to Provide
10.	Type of mounting	Bidder to Provide
N	**VENT FILTER/ BAG FILTER**	
1.	Quantity	2 Nos.
2.	Type	Reverse pulse jet type with Blower
3.	Material to be handle	Lime Powder
4.	Working pressure	Atmospheric
5.	Location	Top of lime silo
6.	Capacity	Bidder to Provide
7.	Dust content of air coming out	< 30 mg /Nm^3
8.	Air to cloth ratio	1.5 m^3 /min/ m^3
9.	Size of pulse valve	Bidder to Provide
10.	Housing	M.S IS: 2062 E250BR 6 mm thick (Min.)
11.	Base frame	Plate -10 mm (Min.)
12.	BAG quantity	Bidder to Provide
13.	Cage quantity	Bidder to Provide
14.	Pulse valve	Bidder to Provide

15.	Timer card	1Nos. for each filter
16.	Painting	As per Approved painting schedule
17.	Coil voltage	230 VAC
18.	Pressure drop across filter	100 MMWC
19.	MATERIAL OF CONSTRUCTION OF FILTER	
20.	Dust collector body	M.S IS :2062E250 BR
21.	Air header	M.S IS:1239/3589 G.I PAINTED
22.	Bag cage	M.S IS: 280/SS
23.	Filter bag	Polyester needle felt non-woven
24.	Hose pipe	Reinforced rubber / M.S pipe
25.	Socket 25NB	M.S IS: 1239
26.	Differential pressure switch	1No. for Each Filter
27.	Pipe (Manifold)	IS: 1239(H)
O	**MANUAL SLIDE GATE**	
1.	Quantity	2 Nos.
2.	Purpose	Outlet to lime silo
3.	Location	Below Lime silo
4.	Size	250 NB
5.	Operating type	Manual operated (screw & Handwheel)
6.	Material to handle	Lime
7.	Material size	Powder
8.	MATERIAL OF CONSTRUCTION	
9.	Slide plate	6 mm thk. SS 304
10.	Body	CI/DI
11.	Hand wheel (manual efforts 15 kg)	2 Nos.
P	**MOTORISED SLIDE GATE**	

1.	Quantity	2 Nos.
2.	Purpose	Inlet to screw feeder
3.	Input Supply Voltage	415 V, 3 Ph ,50 Hz
4.	Location	Below Lime silo
5.	Size	Circular, 250 mm Dia.
6.	Operating type	Motorised with integral starter
7.	Material to handle	Lime
8.	MATERIAL OF CONSTRUCTION	
9.	Slide plate	6 mm thk. SS 304
10.	Body	CI/DI
Q	**ROTARY FEEDER**	
1.	Quantity	2 Nos.
2.	Material to be handle	Lime
3.	Location	Outlet to lime silo
4.	Capacity	0.5 Ton / hour
5.	Flap thick	5 mm
6.	No. of flap	8
7.	Flap MOC	SS-304
8.	Shaft dia at bearing	50 mm EN-8
9.	Drive	Geared motor of suitable KW
10.	Safety factor	1.2
11.	Body MOC	M.S-IS:2062 E250 BR

DATA SHEET A FOR SEWAGE TREATMENT PLANT (TYPE-A PACKAGE)

DATASHEET FOR DE-CENTRALISED SEWAGE TREATMENT PLANT -1 (NEAR ASH SILO 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	MSEP
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	MSEP
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	7 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 S7**	
17.1	MOC	RCC (Civil by BHEL)
17.2	Type	Covered at top, below ground
17.3	Capacity	3 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 S7 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 S7) included in Annexure XIII (Drawings).

DATASHEET FOR DE-CENTRALISED SEWAGE TREATMENT PLANT -2 (BETWEEN COAL STOCK YARD AND ESP/FGD CONTROL ROOM 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	MSEP
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	MSEP
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	15.5 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 S2 Transfer Pumps**	
16.1	Type	Vertical submersible grinder type
16.2	Quantity per sump	2 X 100 % (1W+1S)
16.3	Capacity	15 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 S5**	
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 S5 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 S6**	
19.1	MOC	RCC (Civil by BHEL)
19.2	Type	Covered at top, below ground
19.3	Capacity	4 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 S6 Transfer Pumps**	
20.1	Type	Vertical submersible grinder type
20.2	Quantity per sump	2 X 100 % (1W+1S)
20.3	Capacity	5 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 S7) included in Annexure XIII (Drawings).

DATASHEET FOR DE-CENTRALISED SEWAGE TREATMENT PLANT -3 (NEAR COOLING TOWER-1 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	MSEP
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	MSEP
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 S3**	
15.1	MOC	RCC (Civil by BHEL)
15.2	Type	Covered at top, below ground
15.3	Capacity	11 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 S3 Transfer Pumps**	
16.1	Type	Vertical submersible grinder type
16.2	Quantity per sump	2 X 100 % (1W+1S)
16.3	Capacity	15 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 S4**	

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 S4 Transfer Pumps**	
18.1	Type	Vertical submersible grinder type
18.2	Quantity per sump	2 X 100 % (1W+1S)
18.3	Capacity	10 m^3/h (Minimum)
18.3	MOC casing	Cast Iron to IS 210 FG 260 / CS ASTM A-216 Gr. WCB
16.9	MOC impeller	Stainless Steel AISI 304
16.10	MOC shaft	SS 410
16.11	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
16.12	Instrumentation	Pressure transmitters, Pressure gauges etc.
19.0	**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.
20.0	**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.
21.0	**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 S7) included in Annexure XIII (Drawings).

DATA SHEET A FOR EFFLUENT TREATMENT PLANT (TYPE-A PACKAGE)

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.	**FO WASTE WATER COLLECTION SUMP (E3)**	
a)	Number required	One (1) nos.
b)	Capacity (each), m3	As specified in FOHS area
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 FOHS area
12.	**FO WASTE WATER 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 FOHS area
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	10
g)	Pump Speed, RPM	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-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
14.	**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
15.	**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
16.	**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
17.	**MRS WASTE WATER SUMP UNIT-1 (E6)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	25 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
18.	**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.	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, 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	IS:2062 (minimum thickness 8 mm) with 2 coats of epoxy coating inside and outside.
	• Gland packing	TIWA
	• Gasket	Neoprene Rubber
	• Bolts & nuts	SS
	• Base plate and soleplate	CS (min. 10 thick)
19.	**MRS WASTE WATER SUMP UNIT-2 (E7)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	25 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
20.	**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-2 2. Waste water (containing coal laden particles) from Feeder and Tripper Floor 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, 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	IS:2062 (minimum thickness 8 mm) with 2 coats of epoxy coating inside and outside.
	• Gland packing	TIWA
	• Gasket	Neoprene Rubber
	• Bolts & nuts	SS
	• Base plate and soleplate	CS (min. 10 thick)
21.	**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
22.	**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
23.	**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 2 containing oil traces 2. Floor wash from APH UNIT 2 containing ash traces
24.	**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 2 containing oil traces 2. Floor wash from APH UNIT 2 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
25.	**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
26.	**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
27.	**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
28.	**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
29.	**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)	Two (2) 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
30.	**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	IS:2062 (minimum thickness 8 mm) with 2 coats of epoxy coating inside and outside.
	• Gland packing	TIWA
	• Gasket	Neoprene Rubber
	• Bolts & nuts	SS
	• Base plate and soleplate	CS (min. 10 thick)
31.	**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
o)	Inlet / Outlet quality for lamella clarifier/ tube settlers	Inlet quality (turbidity)- 500 NTU (max) Outlet quality (turbidity)- 10 NTU (max) Inlet oil content- 50 ppm (max) Outlet oil content- 5 ppm (max)
32.	**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
33.	**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	IS:2062 (minimum thickness 8 mm) with 2 coats of epoxy coating inside and outside.
	• Gland packing	TIWA
	• Gasket	Neoprene Rubber
	• Bolts & nuts	SS
	• Base plate and soleplate	CS (min. 10 thick)
34.	**TROLLEY MOUNTED SCREW PUMPS WITH SLOPE OIL TANK (1 set for each unit)**	
a)	Number required	Two (2W) sets
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 of various Areas
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
35.	**SLUDGE SUMP (E14)**	
a)	Number required	One (1) nos. (In two compartments).
b)	Effective Capacity, m3 (each compartment)	10 m3
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
36.	**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	IS:2062 (minimum thickness 8 mm) with 2 coats of epoxy coating inside and outside.
	• Gland packing	TIWA
	• Gasket	Neoprene Rubber
	• Bolts & nuts	SS
	• Base plate and soleplate	CS (min. 10 thick)
37.	**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/v 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 (in m3/hr) / Head	100 % requirement at full load condition of the plant / As per system requirement
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, °C	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
38.	**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
39.	**CHEMICAL STORAGE SPACE (In building)**	
	STORAGE AREA OF CHEMICALS	15 days
40.	**WEIGHING SCALE**	
a)	Type	Platform & dial type/Electronic Type
b)	Number	One (1)
c)	Capacity	0-500 Kgs
41.	**ELECTRIC HOIST**	
a)	Type	Electric monorail in chemical dosing area
b)	Number	One (1)
c)	Capacity	1 Ton
42.	**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.
43.	**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
44.	**FLUSHING PUMPS**	
a)	Number required	Two (1W+1S) nos.
b)	Pump Type/Pump casing Type	Horizontal Centrifugal / Radially Split 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 Requirement
i)	Material of Construction	
	• Casing	ASTM A351 CF8M
	• Impeller	ASTM A351 CF8M
	• Wearing Rings	SS-316
	• Shaft, Shaft coupling, shaft sleeves	SS 410
	• Bolts & nuts	SS
	• Base plate	CS (min. 10 mm thick)
45.	**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)
46.	**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:
47.	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
48.	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
49.	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
50.	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

		Butterfly Valves 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). Ball Valves 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 Check Valves Body – Cast iron IS 210 Gr. FG 260 or equivalent Disc/ door –ASTM A351 Gr. CF8 Hinged pin – SS 316 Piston – SS 316

DATA SHEET A FOR CONDENSATE POLISHING UNIT (TYPE-A PACKAGE)

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	46.86 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 800 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	46.86 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. Min 12.5 m3/hr (Flow) and 65M (head)
(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.)**	

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	**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
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
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.

DATA SHEET A FOR CW TREATMENT PLANT (TYPE-A PACKAGE)

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) Nos Safety Shower Cum Eye Wash.
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 <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 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.

DATA SHEET A FOR COAL HANDLING PLANT RUN-OFF WATER TREATMENT SYSTEM (TYPE-A PACKAGE)

1.	**TRANSFER PUMPS TREATMENT PLANT**	
1.1		**Clarifier feed Pumps (CSSP Area)**
1.2	Number	2X50%
1.3	Service	----------Intermittent----------
1.4	Capacity (Each)-Minimum	To suit net Clarifiers output of 3600 cum/hr and Head to meet the system requirement. i.e., each pump capacity shall be 1800 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**	
(I).	Suction Bell	2.5%NiCI; IS: 210Gr FG 260; S-0.1% & P-0.15% max.
(II).	Casing / Bowl	2.5%NiCI; IS:210Gr FG 260; S-0.1% & P-0.15% max.
(III).	Impeller	ASTM A351 CF8M
(IV).	Wearing rings (if applicable)	----------As per manufacturer's Std ----------
(V).	Impeller Shaft, Pump & line shaft	----------SS ASTM A 276 Gr. 410. ----------
(VI).	Shaft coupling	---------- SS ASTM A 276 Gr. 410 ----------
(VII).	Shaft sleeves	----------SS - ASTM –A 276 – 410 ----------
(VIII).	Shaft bearings	Cutless rubber with bronze retainer for bearings below minimum water level and Thordon type bearing for bearings above minimum water level
(IX).	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.

(X).	Shaft enclosing tube	---------- Not Applicable ---------
(XI).	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.
(XII).	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.
(XIII).	Matching flanges	Fabricated steel as per IS:2062
(XIV).	Stuffing box	2.5% NI-CI to IS:210 FG-260
(XV).	Gland	2.5% NI-CI to IS:210 FG-260
(XVI).	Gland packing	Impregnated TEFLON
(XVII).	Gaskets	Wire reinforced rubber gasket / Neoprene rubber / Compressed Asbestos Fiber
(XVIII).	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.
(XIX).	Base plate and Soleplate	Fabricated steel as per IS: 2062 (Minimum 10 thick)
(XX).	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 Sec-D of 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)	(3600 + 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.	Two (2) number
5.2	Material Of Construction	RCC (BHEL Scope)
5.3	Capacity (Design flow) min.	(1800 + 3% for sludge) Cum/hr each
6.	**HRSCC (HIGH RECOVERY SOLID CONTACT CLARIFIER)**	
6.1	Number	Two (2)
6.2	Design Capacity (Net output)	1800 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.
6.10	Desing Criteria	The overall area of the unit shall be based on an average flow velocity of 2.5 M3/M2/hr to 3 M3/M2/hr. Weir loading shall not exceed 300 M3/m/day, For uniform overflow over weirs, triangular notches (saw tooth weir) shall be provided as necessary. Clear width of the bridge shall not be less than 1200 mm. All the Reactor Clarifiers shall be equipped with full bridge.
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.	**-**	
8.1	-	
8.2	-	
9.	**SUITABLE ACCESSORIES**	
9.1	Access ladder, platform, staircase, hand railings etc.	Shall be provided of structural steel.
9.2	Walkway	Shall be provided with hand railings around launder periphery of width 1000 mm.
10.	**Distribution Chamber (Above ground)**	
10.1	Number of Basin	One (1) number in twin sections
10.2	Material of Construction	RCC (BHEL Scope)
10.3	Capacity of each section	500 Cum (minimum)
11.	**SLUDGE PIT**	
11.1	Number	One (1) (Under Ground) in twin section
11.2	Capacity (effective)	1 hrs of storage in each section.
11.3	Dimension	Suitable
11.4	Material	RCC with epoxy paint. (BHEL Scope)

11.5	Location	Shall be finalized during Detailed Engineering (DDE).
11.6	Special arrangement	Agitation/ recirculation line shall be provided in sludge transfer pit.
12.	**AIR BLOWER FOR SLUDGE PIT**	
12.1	Number	Two (1W+1S)
12.2	Type	Centrifugal /Twin Lobe Type
12.3	Duty	Intermittent
12.4	Capacity & Head	As required
12.5	MOC of casing and 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 Enclosure, Suction Filter, Silencer, relief Valve etc
12.8	Location	Outdoor
13.1	**FILTER PRESS**	
I.	Number	2 Nos
II.	Type	Automatic Chamber filter press with automatic filter cake removal and VFD driven
III.	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.
IV.	Sludge consistency required at outlet	20% to 25%
V.	No of cycle per filter press	As per supplier recommendation
VI.	Cycle time (hour)	As per supplier recommendation
VII.	Number of Recessed Plates and chambers	As per supplier recommendation
VIII.	Recessed Plate shifting	Automatic
IX.	**Material of Construction:**	
X.	Chassis Structure	MS with Epoxy coated
XI.	Filter / End Plates	Polypropylene
XII.	Wetted part (any)	MS with Epoxy coated suitable for intended application
XIII.	Type of Element	Recessed with Centre Feeding/ Polypropylene Membrane & Recessed with Centre Feeding
XIV.	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.
XV.	Cleaning system for filter press, plate & Filter clothe etc.	Suitable arrangement to be provided.
13.2	**Coagulant aid Dosing Tanks**	
a)	Number	Two (2)
b)	Type	Vertical cylindrical with dished end bottom & with cover at the top.
c)	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.
d)	Material of Construction	Carbon Steel internally rubber lined and externally painted with epoxy painting

e)	Agitator & Number	Motor driven with reduction gear unit One (1) per tank
f)	Agitator Shaft material	SS316
g)	Agitator Impeller material	SS316
13.3	**Pumps- Metering Pumps**	
a)	Number	Two (2x100%)
b)	Min Capacity (Each) cum/hr	As per system requirements.
c)	Head	As per system requirements.
d)	Type	Simplex hydraulically operated Diaphragm type
e)	Liquid to handled and concentration	PE Solution
f)	Capacity control	10 --100% of capacity manually by micrometer dial
g)	Pump stroke speed per minute	Maximum 100
h)	**Material of Construction:**	
I.	Liquid end (pump head valve, valve housing, etc) ,valve spring	AISI -316
II.	Diaphragm	PTFE
III.	Packing	PTFE
IV.	Shaft	Hardened steel EN8-BS-970)/ AISI-316
V.	Accessories	Pressure Dampeners, Safety Relief valves etc. required
13.	**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.
14.	**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]
15.	**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
16.	**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**

I.	Number	Two (2)	Two (2)	Two (2)	Two (2)	Two (2)
II.	Type	-	-	-	Vertical cylindrical with dished end bottom & with cover at the top.	Vertical cylindrical with dished end bottom & with cover at the top.
III.	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 capacity and a design dosage rate of 30 ppm minimum, Whichever is maximum.	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 of 30 ppm minimum, Whichever is maximum	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 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 maximum.
IV.	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	
V.	Agitator & Number	Motor driven with reduction gear unit One (1) per tank				
VI.	Dissolving Chamber For Each Tank	Required (Stainless steel Material)			Not Applicable	
VII.	Agitator Shaft material	SS316				
VIII.	Agitator Impeller material	SS316				

17.2	**Pumps- Metering Pumps**			
S.No	**Designation**	**Alum Dosing Pumps**	**Synthetic Flocculants Dosing Pumps**	**Coagulant aid Dosing Pumps**
I.	Number	Two (2x100%)	Two (2x100%)	Two (2x100%)
II.	Min Capacity (Each) cum/hr	As per system requirements.		
III.	Head	As per system requirements.		
IV.	Type	Simplex hydraulically operated Diaphragm type		
V.	Liquid to handled and concentration	Alum solution 10% W/V	-	-
VI.	Capacity control	10 --100% of capacity manually by micrometer dial		
VII.	Pump stroke speed	Maximum 100		

	per minute					
VIII.	**Material of Construction:**					
a.	Liquid end (pump head valve, valve housing, etc) ,valve spring	AISI -316				
b.	Diaphragm	PTFE				
c.	Packing	PTFE				
d.	Shaft	Hardened steel EN8-BS-970)/ AISI-316				
e.	Accessories	Pressure Dampeners, Safety Relief valves etc. As required				
17.	**Pumps- Horizontal Centrifugal Pumps**					
S.No	**Designation**	**Flushing/Cleaning Pump for Filter Press**	**Supernatant Transfer Pumps to CW Channel**	**Supernatant Transfer Pumps to WSWS/ETP**	**Lime Slurry Transfer Pumps**	**Lime Dosing Pumps**
18.1	Number	Two (1) (1W+1S)	Two (2) (2x50%)	Two (2) (2x100%)	Two (2) (1W+1S)	Two (2) (1W+1S)
18.2	Min Capacity (Each) cum/hr	To Suit Requirement of one (1) Filter Press.	1800 cum/hr	250 cum/hr	As per System Req.	As per System Req.
18.3	Operating Speed	----------1500 rpm (max)----------				
18.4	Pumps & Drives To be Designed for	----------Outdoor Duty----------				
18.5	Service of Duty	----------Continuous----------				
18.6	Type of Pump casing	----------Radially Split Type----------				
18.7	Type of Working Fluid	----------Service Water----------	Supernatant		Lime Solution (10% v/v)	Lime Solution (6% v/v)
18.8	Max. Water Temperature	45 Deg.C	45 Deg.C		80 Deg.C	80 Deg.C
18.9	Min. Water Temperature	33 Deg.C	33 Deg.C		40 Deg.C	40 Deg.C
18.10	Type of Lubrication	----------Grease----------				
18.11	Suction Condition	----------Flooded----------				
18.12	**Material of Construction**					
I.	Casing	ASTM A351 CF8M	ASTM A351 CF8M		2.5% Ni CI IS210 Gr FG 260	2.5% Ni CI IS210 Gr FG 260
II.	Impeller	ASTM A351 CF8M	ASTM A351 CF8M		ASTM A351 CF8M	ASTM A351 CF8M
III.	Wearing rings (If applicable)	----------SS316----------				
IV.	Shaft	----------SS410----------				
V.	Shaft Sleeves	----------SS410----------				
VI.	Stuffing Box	----------2.5% Ni CI IS210 Gr FG 260----------				

VII.	Gland	----------2.5% Ni CI IS210 Gr FG 260----------	
VIII.	Bolts & Nuts	Stainless steel for those coming in contact with water and for others, material shall be high tension carbon steel.	
IX.	Base Plates	----------Carbon Steel (Minimum 10 mm thick)----------	
18.13	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.	
18.14	Other Technical	Refer sub-section titled "General Technical Requirement of Pumps" in Sec-D of Technical Specification	
18.	**Pumps- Vertical Sump Pumps**		
S.No	**Designation**	**Sludge Transfer Pumps**	**Centrate Transfer Pump**
19.1	Number	Two (2x100%)	Two (2x100%)
19.2	Min Capacity (Each) cum/hr	As Per System Req.	
19.3	Operating Speed	1500 rpm (Maximum)	
19.4	Pumps & Drives To be Designed for	Outdoor Duty	
19.5	Service of Duty	Continuous	
19.6	Type of Pump	Vertical, non-clog, Sump pumps	
19.7	Type of Working Fluid	Sludge	
19.8	Type of Discharge	Above Floor Discharge	
19.9	Type of impeller	---------- open ----------	
19.10	Type of lubrication	----------grease ----------	
19.11	Suction condition	----------Submerged ----------	
19.12	Minimum Water level	---------- By Bidder ----------	
19.13	Maximum Water level	--------Local Finished Grade Level (FGL) -----	
19.14	Operating floor level	----------Minimum 500 mm above FGL ---------	
19.15	Type of shaft coupling	----------Flexible / Rigid ----------	
19.16	**Material of Construction**		
I.	Suction Bell/casing	2.5%NiCI; IS: 210Gr FG 260; S-0.1% max. & P-0.15% max.	
II.	Impeller	ASTM A351 CF8M	
III.	Shaft	SS410	
IV.	Shaft coupling	SS410	
V.	Shaft sleeves	SS410	
VI.	Column pipe & Discharge Pipe	CS as per IS2062 (Min. 8 mm thickness) with 2 coats of epoxy coating inside & outside.	
VII.	Shaft enclosing tube (If Applicable)	CS as per IS2062 (Min. 8 mm thickness) with 2 coats of epoxy coating inside & outside.	
VIII.	Stuffing box	2.5% NI-CI to IS:210 FG-260	
IX.	Gland	2.5% NI-CI to IS:210 FG-260	
X.	Gland packing	TIWA	
XI.	Gaskets	Neoprene rubber	

XII.	Bolts & nuts	Stainless steel.
XIII.	Base plate and Soleplate	Carbon Steel (Min.10 mm Thick)
19.17	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.
19.18	Other Technical	Refer sub-section titled "General Technical Requirement of Pumps" in Sec-D of Technical Specification
19.	**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 components such as valves, flanges etc. shall however be not less than that specified.	
20.	**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	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
21.2	Coagulant (Alum)	Rubber lined Steel/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/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 PRETREATMENT PLANT (TYPE-A PACKAGE)

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 -4100 CuM/Hr + water loss through desludging or min 3% whichever is maximum. PT-DM - 365 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	0.05 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 -4100 CuM/Hr + water loss through desludging or min 3% whichever is maximum . PT-DM - 365 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 flow).each	PT-CW -1850 CuM/Hr + water loss through desludging or min 3% whichever is maximum (each). PT-DM - 365 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 -365 Cum/Hr
6.3	Type	High Rate Solids Contact Type Clarifier (HRSCC).Circular Reactor Type.Clear width of the bridge shall not be less than 1200 mm. All the Reactor Clarifiers shall be equipped with full bridge.
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.
6.11	General design Criteria	The overall area of the unit shall be based on an average flow velocity of 2.5 m3/m2/hr to 3 m3/m2/hr. Weir loading shall not exceed 300 m3/m/day. For uniform overflow over weirs, triangular notches (saw tooth weir) shall be provided as necessary
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 160 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 . 160 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 FOR CHEMICAL HOUSE**	
17.1	Type	Electric operated including trolley and trailing cable.
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 (18% W/W) requirement of all the clarifiers operating at design capacity and a design dosage rate of 25 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 (Colony)	Two (2X100%)	Vertical Turbine (Wet pit) Type	50 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.
19.5	Potable Water Pumps (for PT CLO2 feed)	Two (2X100%)	Vertical Turbine (Wet pit) Type	As per CLO2 requiremen ts	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 (TYPE-A PACKAGE)

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 (DM Plant OPTION-1)/ UF FEED PUMP (DM plant OPTION-2) (FILTERED WATER PUMPS)**	
2.1	Number	3X100% (1W+2S)
2.2	Service	Continuous
2.3	Design Flow/Capacity and Head of each pump	Capacity: To suit net DM Plant output (Post UF) per stream of 150 CuM/Hr (Option -1)/ As per UF-RO-DM plant system design Head: Head as per 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	46 deg. C
2.10	Minimum water temperature	18 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) or As per system design
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	ASTM A 351 CF8M
2.18.2	Casing / Bowl	ASTM A 351 CF8M
2.18.3	Impeller	ASTM A351 CF8M
2.18.4	Wearing rings (if applicable)	SS-316
2.18.5	Impeller Shaft, Pump & line shaft	----------SS ASTM A 276 Gr. 410/SS-410 ----------
2.18.6	Shaft coupling	---------- SS ASTM A 276 Gr. 410/SS-410 ----------
2.18.7	Shaft sleeves	----------SS -ASTM –A 276 – 410/SS-410 ----------
2.18.8	Bolts & nuts	SS
2.18.9	Base plate and Soleplate	CS (Minimum 10 mm thick)
2.18.10	Shaft bearings	Cutless rubber with bronze retainer for bearings below minimum water level and Thordon type bearing for bearings above minimum water level
2.18.11	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.
2.18.12	Accessories to be provided with each pump	Companion flanges with nuts, bolts and gaskets, Positioning dowels, Eye bolts, lifting etc. Non –reverse ratchet shall be provided as per manufacturer's standard

		practice.
2.19	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system requirement.
3.0	**ACTIVATED CARBON FILTER (ACF)**	
3.1	Type	Vertical Shell Type with dished ends
3.2	Number	One number per DM 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) Successive back wash	24 Hrs
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	Minimum Two (2) Nos (each of minimum 600 MM).
3.15	Sight Window with minimum clear width of 75 mm	Minimum Two (2) Nos.
3.16	Location	Indoor
3.17	Free board (Min)	75%
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 requirement
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 bed depth of Resin for Counter current regenerated vessels over bed plate/header lateral.	1000 mm
4.10	Minimum bed depth of filter Resin for Co-current regenerated vessels over bed plate/header lateral (as applicable)	800 mm
4.11	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.
4.12	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
4.13	External Painting	Chlorinated Rubber paint
4.14	Manhole per vessel	Minimum Two (2) Nos (each of minimum 600 MM).
4.15	Sight Window with minimum clear width of 75 mm	Minimum Two (2) Nos.
4.16	Location	Indoor
4.17	Free board	100%
4.18	Accessories	Ladder and operating platform.
4.19	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system requirement.
4.20	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 High Capacity Polystyrene resin in Bead form.
5.9	Minimum bed depth of Resin for Counter current regenerated vessels over bed plate/header lateral.	1000 mm
5.10	Minimum bed depth of filter Resin for Co-current regenerated vessels over bed plate/header lateral (as applicable)	800 mm
5.11	Outlet Quality	Sodium leakage less than 2 ppm as CaCO3. Throughout the period between two regeneration.
5.12	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
5.13	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
5.14	External Painting	Chlorinated Rubber paint
5.15	Manhole per vessel	Minimum Two (2) Nos (each of minimum 600 MM).
5.16	Sight Window with minimum clear width of 75 mm	Minimum Two (2) Nos.
5.17	Location	Indoor
5.18	Free board	100%
5.19	Accessories	Ladder and operating platform.
5.20	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system required.
5.21	Regeneration Chemical	HCl as per IS 265 Tech. Grade.
6.0	**DEGASSER TOWER (FOR DM PLANT OPTION – I/ II)**	
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 (Option-1)/ As per RO-DM Plant system design requirement (Option -2).
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 content less than 5 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 requirement.
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 Tori spherical 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	Minimum 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 requirement.
8.0	**DEGASSED WATER TRANSFER PUMPS (FOR OPTION – I)/ RO PERMEATE TRANSFER PUMPS (FOR OPTION – II)**	
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. (Option-1)/As per RO-DM Plant system design (Option -2), Head as required for system requirement
8.4	Location	Outdoor
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 CS (IS 2062) - Minimum 10 mm thk., 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 requirement.
9.0	**DEGASSER BLOWER (FOR DM PLANT OPTION – I/ II)**	
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. (Option-1)/As per RO-DM Plant system design (Option -2), Head as required for system requirement
9.4	Location	Outdoor
9.5	Material of Construction	
9.5	Casing	Cast Iron to IS 210 FG 260 with FRP lined

9.5.1	Impeller	ASTM A 351 CF8M / FRP
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 requirement.
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 bed depth of Resin for Counter current regenerated vessels over bed plate/header lateral.	1000 mm
10.10	Minimum bed depth of filter Resin for Co-current regenerated vessels over bed plate/header lateral (as applicable)	800 mm
10.11	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
10.12	Internal Lining	Rubber Lining (Minimum 4.5 mm Thick)
10.13	External Painting	Chlorinated Rubber paint
10.14	Manhole per vessel	Minimum Two (2) Nos (each of minimum 600 MM).
10.15	Sight Window with minimum clear width of 75 mm	Minimum Two (2) Nos.
10.16	Location	Indoor
10.17	Free board	100%
10.18	Accessories	Ladder and operating platform.
10.19	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as

		min and as per system requirement.
10.20	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 bed depth of Resin for Counter current regenerated vessels over bed plate/header lateral.	1000 mm
11.10	Minimum bed depth of filter Resin for Co-current regenerated vessels over bed plate/header lateral (as applicable)	800 mm
11.11	Outlet Quality	Reactive Silica: Less than 0.2 ppm as SiO2. Conductivity: Less than 10 micromhos/cm at 25 Deg C.
11.12	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	Minimum Two (2) Nos (each of minimum 600 MM).
11.15	Sight Window with minimum clear width of 75 mm	Minimum 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 requirement.
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 (Total) Resin Bed depth of resin over bed plate/ header lateral	1000 mm
	Outlet Quality	Reactive Silica: Less than 0.01 ppm as SiO2. Iron as Fe: Not Detectable as per ASTM (ASTM-D-1068) Total Hardness: Not detectable pH value: 6.8-7.3 Conductivity: Less than 0.1 micromhos/cm at 25 Deg C.
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	Minimum Two (2) Nos (each of minimum 600 MM).
12.14	Sight Window with minimum clear width of 75 mm	Minimum 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 requirement.
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)- (FOR DM PLANT OPTION – I/ II)**	
13.1	Type	Rotary Twin Lobe type, Oil free type
13.2	Number	2x100% (1W+1S).
13.3	Design Flow/Capacity and Head of	To suit net DM Plant output (Post UF) per stream of 150

	each Blower	CuM/Hr and for N-pit air agitation (Option-1)/As per RO-DM Plant system design (Option -2). 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 requirement.
14.0	**UF FEED TANK**	
14.1	Type	Vertical cylindrical atmospheric
14.2	Design Standard (for diameter, length & thickness)	As per IS:803
14.3	Number	2x100% (1W+1S), One number per DM stream.
14.4	Net Capacity (minimum) each tank	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	Shell thickness	Bottom most layer: 10 mm (min.), Balance layer: 8 mm (min.)
14.7	Bottom plate thickness	10 mm (min.)
14.8	Roof Plate Thickness	6 mm (min.)
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
	Manholes	Minimum 2 numbers (one on the shell and other on the roof)
14.11	Accessories	Ladder and operating platform, Vent, Overflow and drain connections, Overflow seal, CO_2 absorbers in vent line, Hand railing on the roof of the tank all around the tank
14.12	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system requirement.
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-410
15.7	Operating Speed (Maximum)	----------1500 rpm ----------
15.8	Duty	Continuous
15.9	Hardware	Base plate: Fabricated Steel as per IS 2062 (Minimum 10 mm thick), 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 (FOR DM PLANT OPTION – I/ II)**	
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 / As per RO-DM Plant system design (Option -2)
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	10-35 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.
	Gross Maximum design flux rate	Not more than 60 l/m2/h
	Material	Polysulfone, PVDF or PES with spiral glass outer wraps
17.6	Type of membrane mounting	Horizontal/Vertical
17.7	Colloidal silica removal efficiency	99.5%
17.8	UF recovery	Not less than 92%
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 requirement.
18.0	**UF BACKWASH, UF FAST FLUSH PUMPS (as Applicable)**	
18.1	Type	Horizontal Centrifugal
18.2	Number for each application	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(Minimum 10 mm thick), 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 requirement.
19.0	**DM REGENERATION PUMPS (FOR DM PLANT OPTION – I/ II)**	
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 (Option-1)/As per RO-DM Plant system design (Option -2) & Head as per 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(Minimum 10 mm thick), 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 requirement.
20.0	**NEUTRALISATION PIT (N-PIT) (FOR DM PLANT OPTION – I/ II)**	
20.1	Type	Underground, rectangular or square
20.2	Number	One (1) no. with Twin (2) compartments
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 or (Minimum 300 m3 whichever is higher for DM plant for option1 & option 2] **+** [CPU regeneration (holding capacity of 150% of waste effluent generated from one regeneration of complete stream of cation, anion, MB and CPU service vessel].
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 requirement.
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 per system requirement.

21.4	Liquid to be handled	DM plant + CPU plant regeneration waste
21.5	Location/ suction condition	Pumps and drives to be designed for Outdoor duty; Suction from priming chamber/ submerged (suction from pit).
21.6	Type of Casing/ Impeller	Radially Split type (casing); Closed/ Semi-open (impeller)
21.7	Material of Construction	
21.7.1	Casing	ASTM A 351 CF8M
21.7.2	Impeller	ASTM A 351 CF8M
21.7.3	Wearing Rings	SS-316
21.7.4	Shaft, Shaft Sleeves, Coupling	SS -420
21.8	Operating Speed (Maximum)	----------1500 rpm ----------
21.9	Duty	2-4 hrs./ shift.
21.10	Hardware	Base plate: Fabricated Steel as per IS 2062(Minimum 10 mm thick), 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 requirement
22.0	**BACK WASH WASTE WATER COLLECTION PIT & SUMP (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 requirement.
23.0	**BACK WASH WASTE WATER RECIRCULATION CUM DISPOSAL 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(Minimum 10 mm thick), 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 requirement.
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)	As per system design or minimum 2 m3 (whichever is higher)
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 requirement.
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 requirement.
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 requirement.
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	3 Nos. (for Option -I) / 2 nos. (for Option -II)
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)	As specified in section -I A of this 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	Minimum 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 requirement.
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	2 nos.
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)	As specified in section -I A of this 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	Minimum 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 requirement.
29.0	**ALKALI TRANSFER CUM RECIRCULATION PUMP (FOR DM PLANT OPTION – I/ II)**	
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	
29.7.1	Casing	ASTM A 351 CF8M
29.7.2	Impeller	ASTM A 351 CF8M
29.7.3	Wearing Rings	SS-316
29.7.4	Shaft, Shaft Sleeves, Coupling	SS -410
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(Minimum 10 mm thick), 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 requirement.
30.0	**ACID MEASURING TANK (FOR DM PLANT OPTION – I/ II)**	
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) + 25% margin (option 1) / As per Bidder design for (option 2) or 2 m3 whichever is higher
30.6	Free board	300 mm

30.7	Shell/ Dished Material	MS: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 requirement.
31.0	**ALKALI PREPARATION TANK (FOR DM PLANT OPTION – I/ II)**	
31.1	Type	Vertical Cylindrical Atmospheric
31.2	Number	2x100 % (1W+1S) for Option -1 / 1x100 % (1W+0S) for Option -2
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 (option 1) / As per Bidder design for (option 2) or 5 m3 whichever is higher.
31.6	Free board	300 mm
31.7	Shell/Dished Material	MS: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 requirement.
32.0	**ALKALI DAY TANK (FOR DM PLANT OPTION – I/ II)**	
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 (option 1) / As per Bidder design for (option 2) or 2 m3 whichever is higher.
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 requirement.
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

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 to IS 2062 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 requirement.
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 or as per system requirement
34.5	Chemical to be handled	Brine Solution
34.6	Location	Indoor
34.7	Material of Construction	
34.7.1	Casing	ASTM A 351 CF8M
34.7.2	Impeller	ASTM A 351 CF8M
34.7.3	Wearing Rings	SS-316
34.7.4	Shaft, Shaft Sleeves, Coupling	SS -410
34.8	Hardware	Base plate: CS (10 mm thick), Bolts & Nuts -SS 316.
34.9	Accessories, Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system requirement.
35.0	**ACID MEASURING TANK (FOR N-PIT) (FOR DM PLANT OPTION – I/ II)**	
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)	As per system requirement or 1 m3 whichever is higher
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 requirement.
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 Tank (Net)	As per system requirement or 2 m3 whichever is higher
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 requirement.
37.0	**ACTIVATED CARBON FILTER (ACF) FOR ALKALI (FOR DM PLANT OPTION – I/ II)**	
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 flow (max)	15 CuM/Hr./SqM.
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	Minimum Two (2) Nos (each of minimum 600 MM).
37.14	Sight Window with minimum clear width of 75 mm	Minimum Two (2) Nos.
37.15	Location	Indoor
37.16	Free board	75% Minimum
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 requirement.
38.0	**ALKALI DILUTION WATER HEATING TANK (FOR DM PLANT OPTION – I/ II)**	
38.1	Type	Vertical cylindrical pressure vessel 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 + ACF's rejuvenation or minimum 10 CuM/Hr.
38.4	Design Pressure of Vessel (Min)	8 Kg/Sq.cm (g)

38.5	Design Temperature	80 Deg. C
38.6	Type of Heater	2x50% Electric.
38.7	Heating requirement of Heater	15 Deg C to 50 Deg C in 4 hours
38.8	Shell & Dish End Material	SS 316
38.9	Manhole per vessel	Two (2) Nos (each of minimum 600 MM).
38.10	Location	Indoor
38.11	Accessories	Ladder and operating platform.
38.12	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system requirement.
39.0	**UF CIP TANK (FOR DM PLANT OPTION – I/ II)**	
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 3 m3 whichever is higher.
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)/SS-316 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 requirement.
40.0	**UF CIP DOSING PUMP (FOR DM PLANT OPTION – I/ II)**	
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(Min 10 mm thick), 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 requirement.
41.0	**UF CEB TANK (FOR TYPE-I)- (FOR DM PLANT OPTION – I/ II)**	
41.1	Type	Vertical Cylindrical
41.2	Number	2x100% (1W+1S)
41.3	Capacity of Each Tank (Net)	Cleaning requirement of one UF System + 25% margin or 0.5 m3 whichever is higher.
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 requirement.
42.0	**UF CEB DOSING PUMP (FOR TYPE-I)- (FOR DM PLANT OPTION – I/ II)**	
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 requirement.	
43.0	**UF CEB TANK (FOR TYPE-2-OPTIONAL)- (FOR DM PLANT OPTION – I/ II)**		
43.1	Type	Vertical Cylindrical	
43.2	Number	2x100% (1W+1S)	
43.3	Capacity of Each Tank (Net)	Cleaning requirement of one UF System + 25% margin or 0.5 m3 whichever is higher.	
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 requirement.	
44.0	**UF CEB DOSING PUMP (FOR TYPE-2-OPTIONAL)- (FOR DM PLANT OPTION – I/ II)**		
44.1	Type	Simplex positive displacement hydraulic operated diaphragm type	
44.2	Number	2x100 % (1W+1S)	
44.3	Duty	Intermittent	
44.4	Capacity and Head	As per system requirement.	
44.5	Chemical to be handled	Chemical cleaning for UF system.	
44.6	Location	Indoor	
44.7	Liquid end (pump, head, valves, valve housing, valve spring, etc)	PP for all wetted parts	
44.8	Diaphragm material	PTFE	
44.9	Packing material	PTFE	
44.10	Hardware	Base plate: Fabricated Steel as per IS 2062, Bolts & Nuts SS 316.	
44.11	Instruments, Valves, Piping, etc	Shall be provided as indicated in 'Flow Diagram-1' as min and as per system requirement.	
45.0	**DOSING PUMPS**	**ACID**	**ALKALI**
45.1	Number (For DM plant Option -1)	Two (1W +1S) (2X100%) - nos.for SAC/WAC regeneration & Two (1W +1S) (2X100%)- nos. for MB regeneration	Two (1W +1S) (2X100%)- nos. for SBA/WBA regeneration & Two (1W +1S) (2X100%)- nos. for MB regeneration