

SECTION – 5f

FUNCTIONAL GUARANTEES OF THE PLANT

FUNCTIONAL GUARANTEES OF THE PLANT

(To be completed by the Bidder)

1. General

This document sets out the functional guarantees required to be provided by the Bidder for assessing the performance of the Works. These guarantees shall be used by the Employer to evaluate Bidder's satisfactory performance during the Tests after Completion, and also throughout the Operation and Maintenance Period.

The Bidder shall complete the following sections and provide values for the electrical energy usage and chemical usage for the Works covered under the contract, based on the raw sewage flows and characteristics and specified treated sewage and sludge quality requirements as given in Section 7 of tender document.

1.1 Functional Guarantees

1.1.1 Plant Effluent and Sludge Quality

The Bidder guarantees that the plant effluent and sludge quality requirements specified in Section 5 will be fully and completely met, under either actual or simulated design raw sewage flows, loadings, and characteristics, as demonstrated by the Tests after Completion. The bidder further guarantees that the specified requirements will continue to be fully and completely met throughout the Operation and Maintenance Period.

1.1.2 Electrical Energy Usage per Unit Volume of Raw Sewage

The Bidder guarantees that electrical energy usage of various components of the Works will not exceed the values listed in the table below, as demonstrated by the Tests after Completion and throughout the Operation and Maintenance Period.

P Name	As mentioned in Tender Notice	Guaranteed Power Consumption for each STPs in the Contract (kWh / day)	Guaranteed Power Consumption for each STPs in the Contract (kWh/ month)
SPS Capacity (cum/day)	As mentioned in Tender Notice	P_G	$P_G \times 365/12$
The consumption of Energy during the Tests after Completion is	Not more than:kWh / per cubic		

guaranteed to be:	meter (Cum) of plant effluent		
STP Capacity (cum/day)	As mentioned in Tender Notice	P_G	P_G x 365/12
The consumption of Energy during the Tests after Completion is guaranteed to be:	Not more than:kWh / per cubic meter (Cum) of plant effluent		

In case the inlet flow to the plant is below 50% of the designed capacity, the power consumption guarantee shall be proportionately relaxed to maximum 50% of the stipulated guaranteed power consumption.

The power guarantee will be used to arrive at C_P to compare the actual power consumption with, during actual operation in lieu with penalty clause as per Section 7, Clause 5.1.

The Guaranteed power consumption for all the units in the STPs shall be justified as per Electrical load list cum power consumption statement provided below:

(BOD removal of minimum 300mg/l or higher as accessed by the bidder to be considered while calculating aeration power requirement)

Item No	Equipment Name	Working units (Nos.)	Efficiency of Equipment (%)	B kW for operation	Motor Efficiency (%)	Motor Rating (kW)	Operating hours (h/day)	Total Power Consumption (kWh/day)
	SPS							
1.	Raw Sewage Pump							
2.	Mechanical Coarse Screen							
3.	Screw Conveyor							
4.	Electric hoist							
	Total							
1.	Mechanical Fine Screen							
2.	Belt Conveyor							
3.	Grit Mechanism							
4.	Grit Classifier Mechanism							
5.	Organic Return Pump							
6.	Anoxic / Anaerobic Tank Mixer							
7.	Process Air Blower							
8.	Secondary Clarifier mechanism							
9.	Pump : Thickener Feed / RAS / WAS / Internal recirculation							

10.	Clarifier Mechanism							
11.	Filter Feed Pumps							
12.	Backwash Pumps							
13.	Air Scour Blowers							
14.	Gravity Sludge Thickener							
15.	Thickener Dilution water Pumps							
16.	Digester Feed Pumps							
17.	Sludge Digester mixers							
18.	Flaring System							
19.	Thickened Sludge Sump Mixers / Blowers							
20.	Centrifuge Feed Pumps							
21.	Centrifuge with VFD							
22.	Supernatant / Centrate Recirculation pump(s)							
23.	Polyelectrolyte (PE) Tank Agitator (s)							
24.	Polyelectrolyte (PE) dosing pump (s)							
25.	Coagulant Tank Agitator(s)							
26.	Coagulant dosing pump(s)							
27.	Chlorine Booster pump(s)							

28.	NaOH recirculating Pump(s)							
29.	Service Water pumps							
30.	Drain Pumps							
31.	Lighting & Ventilation/ Air conditioner Loads							
32.	Motorised Gates/ Valves							
33.	EOT crane for blowers/pumps/equipments							
34.	Equalization tank pumps							
35.	Any other as required							
	Total							

Note: Format given above is indicative only. Bidder shall incorporate all the equipment (required for successful operation of plant) as per selected process in Power consumption Statement and accordingly arrive on guaranteed power consumption.

1.1.3 Chemical Usage per Unit Volume of Plant Effluent

1.1.3.1 Chlorine Usage per Unit Volume of Plant Effluent

Plant Name	As mentioned in Tender Notice	Total Guaranteed Chlorine Consumption for each STPs in the Contract (Kg/day)
Plant Capacity (cum/day)	As mentioned in Tender Notice	
The consumption of Chlorine during the Tests after Completion is guaranteed to be:	Not more than:kg per cubic meter (cum) of plant effluent	

1.1.3.2 Dewatering Polymer Usage per Unit Volume of Plant Effluent for Biological Sludge

Plant Name	As mentioned in Tender Notice	Total Guaranteed Polymer Consumption for each
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Plant Capacity (cum/day)	As mentioned in Tender Notice	STPs in the Contract (Kg/day)
The consumption of dewatering Polymer (polyelectrolyte) during the Tests after Completion is guaranteed to be:	Not more than:kg per cubic meter (cum) of plant effluent	

1.1.3.3 Coagulant/ Other Chemical Usage per Unit Volume of Plant Effluent (if required)

Plant Name	As mentioned in Tender Notice	Total Guaranteed Coagulant Consumption for each STPs in the Contract (Kg/day)
Plant Capacity (cum/day)	As mentioned in Tender Notice	
The consumption of Coagulant during the Tests after Completion is guaranteed to be:	Not more than:kg per cubic meter (cum) of plant effluent	

~~1.1.4 Land Requirement~~

The Bidder shall have to submit the extent of land requirement in Technical Bid duly justified in the Layout Plan . Land requirement has to accommodate all the following:

- ~~A 1 Treatment plant with all the process units and associated buildings and structures of proposed capacity, to achieve specified treated sewage quality with internal roads of minimum 4.5 meters width~~
- ~~A 2 Green zone of min. 33% along the compound wall (A2= 33% A1)~~
- ~~A 3 Sludge drying bed (SDB) for 25% of sludge generated (only area to be marked)~~
- ~~A 4 Additional land for future expansion (for ultimate flow)~~
- A 5 Compound wall all along the plot boundary as specified in Section 7.
- B 1 The Bidder shall have to submit the extent of land requirement in Technical Bid duly justified in the Layout Plan. In case of any contradiction, area guaranteed in Section 7 shall be considered final.

BREAKUP OF LAND REQUIREMENT

Sl.	Description of Unit	Land Required (In
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No.		m2)
1	STP with Tertiary treatment units (if required)	
2	Deodorization of Primary and Sludge Treatment Units and UF or Cloth Media Disc Filtration for Reuse (future units).	
3	Green zone of minimum 33% shall be provided all along compound wall	
4	Sludge drying bed (SDB) for 25% of sludge generated (future use)	
5	Additional land for 2nd Phase	
	Total Area	

Notes:

- 1 The Bidder shall have to submit the extent of land requirement in Technical Bid duly justified in the Layout Plan. The excess usage over and above the land requirement proposed by the bidder in the layout plan shall be deducted from his payment towards capital cost at prevailing Jantri rates of location.
2. The bidder shall utilize the maximum area of land allocated for the STP in this project. The remaining quantum of land shall be left vacant for future augmentation of STP in future.

Section - 5g

Technical Datasheet for Process and Civil (To be furnished by Bidder for Each STP covered in this tender)

S. No.	Units		STP-1	STP-2	STP-3	STP-4
1	General and Process for STP					
(a)	Total head loss (m) in STP (from water level in inlet chamber of STP to water level in effluent channel of chlorine contact tank) at peak flow with one unit of each process out of service					
2	Sewage Treatment Plant					
(a)	Fine Screen Influent Channel					
	(i)	Size of channel (m)				
	(ii)	Size of incoming pumping main (m)				
	(iii)	No. and size of gated openings weir gates				
	(iv)	Max, Average, and Min water levels (m)				
(b)	Fine Screen Channels					
	(i)	No. of units				
	(ii)	Capacity of each unit (MLD)				
	(iii)	Size of channel (m)				
	(iv)	Max, Average, and Min water levels (m)				
	(v)	Head loss (m)				
(c)	Fine Screen Effluent/Grit Basin Effluent Channel					
	(i)	Size of channel (m)				
	(ii)	No. and size of gated openings and type of gates – Screen Effluent				
	(iii)	No. and size of gated openings and weir gates – Grit Basin Influent				
	(iv)	Max, Average, and Min water levels (m)				
(d)	Grit Basins					
	(i)	Particle size to be removed (mm)				
	(ii)	Specific gravity				
	(iii)	Efficiency of removal (%)				
	(iv)	Size of grit basin influent structure (m)				

	(v)	Grit Basins - Number - Capacity, each MLD - Size, each (m)				
	(vi)	Surface overflow rate ($\text{m}^3/\text{m}^2/\text{day}$)				
	(vii)	Max, Average, and Min water levels in grit chamber (m)				
(e)	Grit Basin Effluent Channel					
	(i)	Size of channel (m)				
	(ii)	No. and size of gated openings and type of gates				
	(iii)	Max, Average, and Min water levels (m)				
	(iv)	Size of Bypass channel/pipe (m)				
(f)	Primary Clarifier Distribution Structure					
		- Size of inlet channel - No. of branches - Size of each branch (m) - Size of weir gates (m)				
(g)	Primary clarifiers					
		- No. of clarifiers - Capacity, each MLD - Diameter each (m) - Surface area each (m^2) - HRT (Hrs) - Side water depth (m) - Surface overflow rate ($\text{m}^3/\text{m}^2/\text{day}$) - Bottom floor slope - Center column diameter (mm) - Inlet Pipe Diameter (mm)				
(h)	Primary Sludge Pumping Station					
		- Pump station building size (m) - All building slab elevations (m) - Dia. (mm) and length (m) of rising main				
(i)	Aeration/SBR/MBR Basin Influent Channel					
		- Size of channel - No. of distribution branches				

		<ul style="list-style-type: none"> - Size of each branch (m) - No. and size of gated openings and weir gates (m) - Size of Bypass channel/pipe (m) - Max, Average, and Min water levels (m) 				
(j)	Aeration Basins (Applies to Non-SBR STPs only)					
	(i)	<ul style="list-style-type: none"> - No. of basins - Length-to-width ratio for each basin 				
	(ii)	Process info <ul style="list-style-type: none"> - Total volume (m³) - Total HRT (Hrs) - Total SRT (days) - Overall Length and Width for all basins (m) - Overall F/M ratio (Kg BOD removed/ Kg MLVSS/ day) - Return Activated Sludge (RAS) ratio - RAS “From” and “To” locations 				
	(iii)	Aerobic Zones <ul style="list-style-type: none"> - No. of zones per basin - Volume per basin (m³) - Total Aerobic volume (m³) - Aerobic length-to-width ratio for each basin - Aerobic volume as fraction of total volume - Side-Water Depth (SWD) (m) - Aerobic MLSS (mg/l) - Aerobic MLVSS (mg/l) 				
	(iv)	Hydraulic info <ul style="list-style-type: none"> - Aeration basin internal baffle weir elevations (m) - Max, Average, and Min water levels in all zones (m) 				
(k)	SBR Basins (Applies to SBR STPs only)					
	(i)	- No. of basins				

	<ul style="list-style-type: none"> - Max, Average, and Min water levels (m) - Volume per basin at (m3) <ul style="list-style-type: none"> - Min water level - Average water level - Max water level - Total volume at (m3) <ul style="list-style-type: none"> - Min water level - Average water level - Max water level - Total HRT at max water level (Hrs) - Total SRT excluding settling, decant, waste, and idle times (days) - SRT (days) - MLSS at (mg/L) <ul style="list-style-type: none"> - Min water level - Average water level - Max water level - MLVSS at (mg/L) <ul style="list-style-type: none"> - Min water level - Average water level - Max water level - No. of cycles per day per basin - Total cycle time (minutes) - Detailed breakdown of cycle time components (e.g., fill, react, mix, aerate, settle, decant, idle, waste, etc.) (minutes) - Length, width, and side-water depth of each basin (m) - Overall Length and Width for all basins (m) - Overall F/M ratio (Kg BOD removed/ Kg MLVSS/ day) - Mixed Liquor Recycle (MLR) ratio (if applicable) - MLR "From" and "To" locations 				
(l)	Aeration Basin Effluent Channel (Not applicable to SBRs)				

		<ul style="list-style-type: none"> - Size of channel (m) - No. and size of gated openings and weir gates (m) 				
(m)	MBR Basins (Applies to MBR STPs only)					
		<ul style="list-style-type: none"> - No. of basins - Max, Average, and Min water levels (m) - Volume per basin (m³) - Total volume (m³) - Length, width, and side-water depth of each basin (m) - Overall Length and Width for all basins (m) 				
(n)	Process Air Blower Building/MBR Equipment Building					
	(i)	Inside dimensions of blower/ MBR equipment room (Length x Width) (m)				
	(ii)	Inside dimensions of panel room (Length x Width) (m) Area allocated for loading / unloading (m ²)				
	(iii)	Height of Building (m)				
(o)	Secondary clarifier(s) Distribution Structure (not applicable to SBRs or MBRs)					
		<ul style="list-style-type: none"> - No. of branches - Size of each branch box (m) - Type of arrangement for equal dist. of flow - No. and size of gated openings and weir gates (m) 				
(p)	Secondary clarifiers (not applicable to SBRs or MBRs)					
		<ul style="list-style-type: none"> - No. of clarifiers - Capacity, each (MLD) - Diameter, each (m) - Surface area each (m²) - Total HRT (Hrs) - Side water depth (m) - Surface overflow rate at average flow (m³/m²/day) 				

		<ul style="list-style-type: none"> - Surface overflow rate at peak flow ($\text{m}^3/\text{m}^2/\text{day}$) - Solids loading rate at average flow ($\text{Kg}/\text{m}^2/\text{day}$) - Bottom floor slope - Diameter of Inlet Pipe (mm) - Diameter of center column (mm) 				
(q)	Return Activated Sludge Pumping Station					
	(i)	Dia. (mm) and length (m) of rising main for RAS				
	(ii)	Dia. (mm) and length (m) of rising main for WAS				
	(iii)	Size of RAS Pumps Station Building (m)				
	(iv)	All building slab elevations (m)				
(r)	Chlorine Contact Tank Influent Channel					
		<ul style="list-style-type: none"> - Size of channel - No. and size of gated openings and weir gates (m) - Size of bypass channel/pipe (m/mm) 				
(s)	Chlorine Contact Tank(s)					
	(i)	Number of tanks				
	(ii)	Volume of each tank (m^3)				
	(iii)	Total hydraulic retention time (all tanks) at peak flow (min.)				
	(iv)	Overall Length and Width of all tanks (m)				
	(v)	No. of passes per tank				
	(vi)	Pass width (m)				
	(vii)	Max, Average, and Min water depth (m)				
	(viii)	Total length of travel of liquid per tank (m)				
	(ix)	Effective length-to-width ratio				
	(x)	Length and size, invert level of final effluent pipe/conduit to disposal point (m)				
(t)	Overall Length and Width of all tanks (m)					
		- Size of channel (m)				

		- No. and size of gated openings and weirs or gates (m) - Diameter (mm) and length (m) of effluent outfall pipe to receiving water body				
(u)	Chlorination Building					
	(i)	Inside dimensions of chlorinator room (m)				
	(ii)	Inside dimensions of chlorine tonner room (m) Area allocated for loading / unloading (m ²)				
	(iii)	Height of Building (m)				
(v)	Chemical Building					
	(i)	Inside dimensions of alum storage room (m)				
	(ii)	Inside dimensions of alum solution tank room (m) Area allocated for loading / unloading (m ²)				
	(iii)	Height of Building (m)				
(w)	Gravity Sludge Thickener Distribution Structure					
		- Size of inlet chamber (m) - No. of branches - Size of each branch (m) - No. and size of gated openings and weir gates (m)				
(x)	Gravity sludge thickeners					
		- No. of thickeners - Diameter each (m) - Surface area each (m ²) - Side water depth (m) - Surface overflow rate (m ³ /m ² /day) - Solids loading rate (Kg/m ² /day) - Bottom floor slope				
(y)	Thickened Sludge Pumping Station					
	(i)	Building inside dimensions (m)				
	(ii)	All building slab elevations (m)				
	(iii)	Dia. (mm) and length (m) of rising main				

(z)	Anaerobic Sludge Digester(s)					
		<ul style="list-style-type: none"> - Type/Shape - No. of units - Full inside dimensions, each (m) - SRT (days) - Side water depth (m) - Bottom floor shape and description - Diameter (mm) and length (m) of inlet and outlet pipes 				
(aa)	Digested Sludge/Bioas Storage Tank(s)					
		<ul style="list-style-type: none"> - Type/Shape - No. of units - Full inside dimensions, each (m) - Sludge HRT (days) - Gas HRT (hours) - Side water depth (m) - Bottom floor slope - Diameter (mm) and length (m) of inlet and outlet pipes 				
(ab)	Digester Building					
	(i)	Building inside dimensions (m)				
	(ii)	Height of Building (m)				
	(iii)	All building slab elevations (m)				
	(iv)	Dimensions of all internal areas and spaces within building (m)				
(af)	Sludge Dewatering Building					
	(i)	Building inside dimensions (m)				
	(ii)	Height of Building (m)				
	(iii)	All building slab elevations (m)				
	(iv)	Dimensions of all internal areas and spaces within building (m)				
(ag)	Plant Water Pumping Station					
	(i)	Full dimensions of structure (m)				
	(ii)	All structural slab elevations (m)				
	(iii)	Dia. (mm) and length (m) of rising main				
(ah)	Plant Drain Pumping Station					

	(i)	Full dimensions of structure (m)				
	(ii)	All structural slab elevations (m)				
	(iii)	Dia. (mm) and length (m) of rising main				
(ai)	Administration cum Laboratory Building					
	(i)	Inside Dimensions of building (m x m)				
	(ii)	Inside Dimensions of office room (m x m)				
	(iii)	Inside Dimensions of SCADA room (m x m)				
	(iv)	Inside Dimensions of laboratory room (m x m)				
	(v)	Inside Dimensions of conference hall (m x m)				
	(vi)	Inside Dimensions of administrative room (m x m)				
	(vii)	Inside Dimensions of store room (m x m)				
	(viii)	Inside Dimensions of Pantry/Kitchen (m x m)				
	(ix)	Inside Dimensions of Toilet (m x m)				
	(x)	Inside Dimensions of other room if any (m x m)				
	(xi)	Height of Building (m)				
(aj)	Maintenance Workshop/ Store room (for plant capacity equal to and more than 20 MLD)					
	(i)	Inside Dimensions of Maintenance Workshop/Store room (m x m)				
	(ii)	Height of Building (m)				
	Area allocated for transformer yard (m ²)					
(ak)	Size of DG set room for STP (m x m x m)					
(al)	Size of Switch Gear room (m x m x m)					
(am)	Area allocated for transformer yard (m ²)					
(an)	No. and Size of MCC rooms (m x m x m)					
	Width and Height of entrance gate (m) and wicket gate (m) with arrangement for cow guard					
(ao)	Size of security shed (m x m x m)					
(ap)	Area allocated for green belt (m ²)					
(aq)	Area allocated for two wheeler and four wheeler parking (m ²)					
(ar)	Width and length of approach road to site (m)					

(as)	Width and length of roads inside the plant (m)				
(at)	Internal drainage, water supply, and waste water disposal				
(i)	No. and Size of bore/tube well (mm)				
(ii)	Storm water drain provision (size, length in m)				
(iii)	Water Supply and Sewerage Provision (Yes/No) - Capacity and size of water storage tank (m3) - Capacity and size of overhead tank (m3) Capacity and size of septic tank (if required) (m3)				
(iv)	Nos. and size of Culverts, road crossing, etc.				
(au)	Reclamation / Site Development – If Applicable				
(i)	Proposed area of Reclamation (m2)				
(ii)	Top levels after Reclamation (m)				
(iii)	Average depth of filling (m)				
(iv)	Total quantity of earth required (m3)				
(v)	Side slope of the filling				
(vi)	Slope protection measures				
(vii)	Proposed compaction equipment to be deployed (Type and No.)				
(viii)	Test apparatus to be provided in field soil laboratory				
(ix)	Proposed open channel dimension - Top width (m) - Bottom width (m) - Side slope - Longitudinal slope Length (m)				
(x)	Bottom slope protection for open channel				
(xi)	Proposed equipment (type and number) for excavation, handling, transporting				
(xii)	Borrow pit				

		- Name of the Location (s) - Area (m ²) - Type of soil in general				
(av)	Miscellaneous					
	The Bidder shall list here details of any other / additional items					

Note:

- 1) Sizes of units shall mean Length x Width x Depth/Height as applicable and shall be expressed in “metres” unless otherwise stated.
- 2) Bidder shall furnish details in above table and write “NIL” wherever not applicable to the respective plant depending upon the process.

Section – 5h

Technical Datasheet for Mechanical

(To be furnished by Bidder for each STP covered in this tender)

3.1.1 Mechanical Fine Screen – Bar Screen

S. No.	Description	Units	Particulars			
			STP- 1	STP- 2	STP- 3	STP- 4
(a)	General					
	(i) Make					
	(ii) Model					
	(iii) Quantity (W+s)	Nos.				
	(iv) Type					
(b)	Screen					
	(i) Clear Spacing	mm				
	(ii) Width	mm				
	(iii) Height	mm				
	(iv) Raking speed	m/min				
	(v) Motor rating	kW				
	(vi) Water Level	m				
(c)	Materials of Construction					
	(i) Frame					
	(ii) Rake carriage					
	(iii) Screen bars					
	(iv) Fasteners					
	(v) Canopy					
(d)	Belt Conveyor System					
	(i) Material of belt					
	(ii) Width of conveyor	mm				
	(iii) Speed of conveyor	m/sec				
	(iv) Thickness of belt and ply rating					
	(v) Make of the belt					
	(vi) Motor rating	kW				

	(vii) Safety device					
(e)	Screw Conveyor System					
	(i) Make					
	(ii) Material					
	(iii) Speed	rpm				
	(iv) Motor rating	kW				
	(v) Size of screw	mm				
	(vi) Angle of screw	deg				
(f)	Unit Control Panel					
	(i) Make					
	(ii) Over all dimensions	mm x mm x mm				
	(iii) Degree of protection					
	(iv) Timer <ul style="list-style-type: none"> • Make • Type 					
(g)	Wash System (water)					
	(i) Operating Pressure	bar				
	(ii) Flow Rate	ltrs. /Sec				
	(iii) Source for Back Wash					

3.1.2 Mechanical Fine Screen – Rotary Drum Screen (For MBR process)

S. No.	Description	Units	Particulars			
			STP-1	STP-2	STP-3	STP-4
(a)	General					
	(i) Make					
	(ii) Model					
	(iii) Quantity (W+s)	Nos.				
	(iv) Type					
(b)	Screen					
	(i) Width	mm				
	(ii) Height	mm				
	(iii) Spacing/Opening	mm				
	(iv) Water Level	m				

	(v) Drum Size					
	(vi) Raking Speed	m/min				
	(vii) Motor rating	kW				
(c)	Materials of Construction					
	(i) Screen					
	(ii) Drum					
	(iii) Rake					
	(iv) Fasteners					
	(v) Screw conveyor					
	(vi) Chute					
	(vii) Canopy					
(d)	Screw Conveyor System					
	(i) Type					
	(ii) Width/diameter of conveyor	mm				
	(iii) Speed of conveyor	m/sec				
	(iv) Motor rating	kW				
(e)	Unit Control Panel					
	(i) Make					
	(ii) Over all dimensions	mm x mm x mm				
	(iii) Degree of protection					
	(iv) Screen operations control <ul style="list-style-type: none"> • Make • Type 					
(f)	Wash System					
	(i) Operating Pressure	bar				
	(ii) Flow Rate	ltrs./sec				
	(iii) Source for Wash water					

3.1.3 Grit Removing Equipment

S. No.	Description	Units	Particulars			
			STP-1	STP-2	STP-3	STP-4
(a)	General					

	(i) Make					
	(ii) Model					
	(iii) Quantity (W+s)					
	(iv) Type					
(b)	Reduction Gear					
	(i) Make					
	(ii) Type					
(c)	Drive Motor					
	(i) Make					
	(ii) Speed	rpm				
	(iii) Rating	kW				
(d)	Materials of Construction					
	(i) Scraper					
	(ii) Frame					
	(iii) Walkway					
(e)	Classifier Mechanism					
	(i) Make					
	(ii) Type					
	(iii) Peripheral velocity	m/sec				
	(iv) Size of the Equipment <ul style="list-style-type: none"> Diameter Height 	mm				
	(iv) Drive System <ul style="list-style-type: none"> Make of reduction gear Make of motor 					
	(v) Material of rake					
	(vi) Safety device					
(f)	Screw Conveyor System					
	(i) Type					
	(ii) Width/diameter of conveyor	mm				
	(iii) Speed of conveyor	m/sec				
	(iv) Motor rating	kW				
(g)	Organic Return Pumpset					
	(i) Make &Type of <ul style="list-style-type: none"> Pump 					

	• Motor					
	(ii) Motor rating	kW				
	(iii) Materials of Construction					
	• Casing					
	• Impeller					
	• Shaft					
	• Seal					
(h)	Belt Conveyor System					
	(i) Material of belt					
	(ii) Width of conveyor	mm				
	(iii) Speed of conveyor	m/sec				
	(iv) Thickness of belt and ply rating					
	(v) Make of the belt					
	(vi) Motor rating	kW				
	(vi) Safety device					

3.1.3.1 Grit Mechanism

Grit removal system		Technical Particulars			
		STP-1	STP-2	STP-3	STP-4
No of units	:				
Type	:				
Design criteria	:				
Degree of separation b/w inlet and outlet	:				
Headloss	:				
Grit removal efficiency	:				
Grit chamber upper section diameter	:				
Inlet/effluent width					
Max flow level upper chamber					
Min. Total vortmax depth					
Lower chamber depth					
Inlet height					
Lower chamber diameter					
Performance p					
Voltage					

Frequency					
Nominal current					
Rotational speed					
Make					
No of units					
Type					
Design criteria					
Degree of separation b/w inlet and outlet					
Headloss					
Grit removal efficiency					
Grit chamber upper section diameter					
Inlet/effluent width					
Max flow level upper chamber					
Min. Total vormax depth					
Lower chamber depth					
Inlet height					
Lower chamber diameter					
Paddle driving motor: totally enclosed squirrel cage motor with ip65 protection in accordance to vdi/iso standards. Gear reducer to include anti-friction bearings with high overhung load properties, and double lip temperature oil seals.					
Performance p					
Voltage					
Frequency					
Nominal current					
Rotational speed					
Make					

3.1.3.2 Grit Classifier Cum Washer

No of unit	Technical Particulars			
	STP-1	STP-2	STP-3	STP-4
Feed with grit/water mix				
Maximum possible solid amount (dependent on raw material)				
Reductions of organics to				
Guaranteed separation efficiency of				
For grit or grain size				
Surface overflow rate				
Overflow weir load				
Maximum handleable mineral grain size				

Connection dimensions:				
Inflow				
Process flow				
Organic discharge outlet				
Connection for service water				
Wash water demand				
Drain outlet for complete for complete plant evacuation				
Overall dimensions (mm) l x w x h				
Through screw drive motor:				
Performance p				
Voltage u				
Frequency				
Nominal current in				
Rotational speed n				
Make				
Protection grade				
Stirrer drive motor:				
Performance p				
Voltage u				
Frequency				
Nominal current in				
Rotational speed n				
Make				
Protection grade				
Drive motor for organic discharge (electric valve):				
Performance p				
Voltage u				
Frequency				
Make				
Protection grade				
Pressure probe:				
Supply voltage				
Output signal				
Measuring range				
Make				
Process connection				
Solenoid valve:				

Supply voltage				
Performance				
Make				
Process connection				

3.1.4 Clarifiers

E	Sub S. No.	Description	Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(A)		<u>Primary Clarifiers</u>					
(a)		General					
	(i)	Number					
	(ii)	Flow per clarifier	cum/hr				
	(iii)	Up flow rate	m/h				
	(iv)	Diameter	m				
	(v)	Liquid depth each	m				
	(vi)	Free board	m				
	(vii)	Volume	cum				
(b)		Scraping mechanism:					
	(i)	Make					
	(ii)	Type					
	(iii)	Size (Diameter x SWD x FB)	m				
	(iv)	Scraper speed	rpm				
	(v)	Peripheral velocity	m/sec				
	(vi)	Design Torque	N-m				
	(vii)	Feed well size	mm				
	(viii)	Walkway (width x Height)	mm				
	(ix)	Weir plate size(Thick x width)	mm				
	(x)	Safety device					
(c)		Speed reduction drive					
	(i)	Make					
	(ii)	Type					
	(iii)	Speed reduction ratio					
	(iv)	Torque					
	(v)	Lubrication type					
(d)		Surface preparation & Protection:					
	(i)	Wetted parts					
	(ii)	Exposed parts					
		Material of construction:					

(e)	(i)	Bridge and Superstructure					
	(ii)	Feed well					
	(iii)	Walkway Chequered Plates					
	(iv)	Squeegees					
	(v)	Weir plate					
	(vi)	Clamps & Hardware					
(f)		Motor:					
	(i)	Motor rating	kW				
	(ii)	Motor speed	rpm				
	(iii)	Motor Make					
	(iv)	Protection					
(B)		<u>Secondary Clarifiers</u>					
(a)		<u>General</u>					
	(i)	Number					
	(ii)	Flow per clarifier	cum/hr				
	(iii)	Diameter	M				
	(iv)	Up flow rate	m/h				
	(v)	Liquid depth each	M				
	(vi)	Free board	M				
	(vii)	Volume	cum				
	(vii)	Safety device					
(b)		Scraping mechanism:					
	(i)	Make					
	(ii)	Type					
	(iii)	Size (Diameter x SWD x FB)	M x M x M				
	(iv)	Scraper speed	rpm				
	(v)	Peripheral velocity	m/sec				
	(vi)	Torque rating	N-m				
	(vii)	Feed rate per Clarifier	cum/hr				
	(viii)	Feed well size	Mm				
	(ix)	Walkway (width x Height)	Mm				
	(x)	Weir plate size (Thick x width)	Mm				
(c)		Speed Reduction Drive					
	(i)	Make					
	(ii)	Type					
	(iii)	Speed Reduction Ratio					
	(iv)	Torque					

	(v)	Lubrication Type					
(d)		Surface preparation & Protection:					
	(i)	Wetted parts					
	(ii)	Exposed parts					
(e)		Material of construction:					
	(i)	Bridge and Superstructure					
	(ii)	Feed well					
	(iii)	Walkway Chequered Plates					
	(iv)	Squeegees					
	(v)	Weir plate					
	(vi)	Clamps & Hardware					
(f)		Motor:					
	(i)	Motor rating	kW				
	(ii)	Motor speed	Rpm				
	(iii)	Motor Make					
	(iv)	Protection					

3.1.5 Primary Sludge Pumpset

S. No.	Description		Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)		General					
	(i)	Make					
	(ii)	Model					
	(iii)	Type					
	(iv)	Quantity (W+S)	No.s				
(b)		Performance					
	(i)	Capacity	cu.m/hr				
	(ii)	Total head	m/c				
	(iii)	Speed	rpm				
	(iv)	Overall efficiency (Pump + Motor)	%				
	(v)	Motor Rating	kW				
(c)		Materials of Construction					
	(i)	Casing					
	(ii)	Rotor					
	(iii)	Stator					
	(iv)	Line Shaft					
	(v)	Mechanical Seal					
	(vi)	Base Plate					

	(vii)	Delivery pipe and diameter					
(d)		Weight	Kgs				
(e)		Testing & Inspection:					
	(i)	Pump performance testing standard					
	(ii)	Maximum Noise level	dB(A)				
	(iii)	Maximum velocity of vibration	mm/sec				

3.1.6 Fine Bubble Air Diffusers

S. No.	Description	Units	Particulars			
			STP-1	STP-2	STP-3	STP-4
(a)	General					
	(i) Make					
	(ii) Model					
	(iii) Type					
	(iv) Diffuser OD x Length	mm x mm				
	(v) Aeration/SBR Basin Dimensions (L x W x SWD)	mm x mm				
	(vi) Design Air-Flow per Aeration/SBR Basin (Maximum/Average)	Nm ³ /hr				
	(vii) Quantity per Aeration/SBR Basin	No.				
	(viii) Quantity in Aeration Basin Zone 1/Zone 2/...	No.				
	(ix) Weight per Diffuser	Kg				
	(x) Design air flow per diffuser	m ³ /hr				
	(xi) Efficiency per diffuser	%				
(b)	Diffuser Membrane					
	(i) Type-self cleaning (Yes/No)					
	(ii) No. of Membranes - Total					
	(iii) Membrane Material					
	(iv) Means of attachment					
	(v) Membrane OD X Length	mm x mm				
	(vi) Pore size (Average)	mm				
	(vii) No. of Pores per length of Diffuser	No./m				
	(viii) Bubble size (Avg)	mm				
(c)	Diffuser Assembly					
	(i) Make					
	(ii) Type					

	(iii)	Length x Width	mm x mm				
	(iv)	Material of Construction					
	(v)	Coupling Type <ul style="list-style-type: none"> • Make • Model/Size 					
	(vi)	Diffuser Assembly Weight	Kg				
(d)		Materials of Construction					
	(i)	Diffuser Tube					
	(ii)	Membrane					
	(iii)	Pipe clamps & Hardware					
	(iv)	Pipe Grid					
(e)		Performance					
	(i)	SOTE Oxygen transfer rate <ul style="list-style-type: none"> • Clear water • Field 	%				
	(ii)	Zone of influence	m				
	(iii)	Zone of oxygenation	m				
	(iv)	Depth of mixing	m				
	(v)	Velocity thro' the Diffuser	m/sec				
		- Diffuser Head loss & Efficiency V/s - Submergence Curve attached Diffuser Grid Drawing with retrievable arrangement details attached	Yes/No Yes/No				

3.1.7 Process Air Blowers

S. No.	Description	Units	Particulars			
			STP-1	STP-2	STP-3	STP-4
(a)	General					
	(i) Make					
	(ii) Type					
	(iii) Quantity (W+S)	Nos.				
	(iv) Capacity at NTP	m3/min				
	(v) Design maximum discharge pressure	mlc				
	(vi) Efficiency	%				
	(vii) Speed, blower	rpm				
	(viii) Absorbed power	kW				

	(ix)	Motor rating	kW				
	(x)	Speed, motor	rpm				
	(xi)	Noise level at Duty Point in dB(A) at 1.86 m from the unit	dB(A)				
	(xii)	Vibration	mm/sec				
	(xiii)	With Acoustic Hood	dB(A)				
	(xiv)	Without Acoustic Hood	dB(A)				
	(xv)	Weight – Blower	kgs				
	(xvi)	Maximum lifting weight	kgs				
	(xvii)	Dimensions (L x W x H)	m x m x m				
	(xviii)	Coupling Type					
	(xix)	Coupling Make					
	(xx)	Cooling System					
(b)		Material of construction:					
	(i)	Casing					
	(ii)	Impeller/Lobes					
	(iii)	Shaft					
	(iv)	Common Base frame					
	(v)	Orientation					
(c)		Acoustic Hood:					
	(i)	Type					
	(ii)	Material of Construction					
(d)		Inlet/Outlet silencer					
	(i)	Type					
	(ii)	Make					
	(iii)	Filter media					
	(iv)	Mean air velocity	m/s				
(e)		Noise reduction (mean) Air release valves					
	(i)	Number	Nos.				
	(ii)	Diameter	mm				
	(iii)	Type					
	(iv)	Set pressure	bar				
	(v)	Make					
(f)		Delivery non-return valves					
	(i)	Number	Nos.				
	(ii)	Diameter	mm				

	(iii)	Type					
	(iv)	Make					
(g)		Delivery isolation valves					
	(i)	Number	Nos.				
	(ii)	Diameter	mm				
	(iii)	Type					
	(iv)	Make					

3.1.8 RAS Pump set

S. No.	Description		Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)		General					
	(i)	Make					
	(ii)	Model					
	(iii)	Type					
	(iii)	Quantity (W+S)	Nos.				
(b)		Performance					
	(i)	Capacity	cu.m/hr				
	(ii)	Total head	mlc				
	(iii)	Speed	rpm				
	(iv)	Overall efficiency (Pump + Motor)	%				
	(v)	Motor Rating	kW				
(c)		Materials of Construction					
	(i)	Impeller					
	(ii)	Casing					
	(iii)	Shaft					
	(iv)	Delivery pipe and diameter					
	(v)	Mechanical Seal					
(d)		Weight	Kg				
(e)		Accessories and piping as specified (Provided / Not provided)					
(f)		Testing & Inspection:					
	(i)	Pump performance testing standard					
	(ii)	Maximum Noise level	dB(A)				
	(iii)	Maximum velocity of vibration	mm/sec				
(g)		Motor:					
	(i)	Make					
	(ii)	Type					

	(iii)	Model					
	(iv)	Quantity (W+S)					
	(v)	Rating	kW				
	(vi)	Weight	kgs				

3.1.9 Manually Operated Travelling Crane/Monorail Travelling Trolley –RASPS

S. No.	Description		Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)		Make					
	(i)	Crane					
	(ii)	Chain pulley block					
	(iii)	Trolley					
(b)		Crane					
	(i)	Capacity	Tonne				
	(ii)	Type					
	(iii)	Lift	m				
	(iv)	Span	m				
	(v)	Hook approach	m				
	(vi)	Rail size	kg/m				
	(vii)	Crane girder size	mm				
	(viii)	Type of brake					

3.1.10 Electrically Operated Travelling Crane

S. No.	Description		Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)		Make					
	(i)	Item					
	(ii)	Make					
	(iii)	Type					
	(iv)	Class of Crane (design standard)					
	(v)	Chain Pulley Block					
	(vi)	Method of operation					
	(vii)	Lift-Vertical					
	(viii)	Span					
	(ix)	Size of Span girder					
	(x)	Long/ circular distance travelled					
	(xi)	Track for long & cross travel					
	(xii)	Long Rail Track size					
	(xiii)	Long Travel Drive					

	(xiv)	No. of falls					
	(xv)	Type of Suspension					
	(xvi)	Lift					
(b)		Material of Construction					
	(i)	Hook	Tonne				
	(ii)	Shaft					
	(iii)	Wire Rope	m				
	(iv)	Trolley	m				
	(v)	Induction Motor	m				
	(vi)	Induction Motor	kg/m				
	(vii)	Cables (On /Off & Control	mm				

Note : RASPS - Return Activated Sludge Pumping Station

3.1.11 Chlorination System

S. No.	Sub S. No.	Description	Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)		Automatic Changeover Device					
	(i)	Make					
	(ii)	Type					
	(iii)	Quantity (W+S)					
	(iv)	Model					
(b)		Chlorinator					
	(i)	Make					
	(ii)	Type					
	(iii)	Quantity (W+S)					
	(iv)	Model					
	(v)	Max capacity	kg/hr				
	(vi)	Min Capacity	kg/hr				
	(vii)	Accuracy as a percent of actual rate in the operating range	±%				
	(viii)	Details of Instruments mounted					
	(ix)	Cabinet Material					
(c)		Chlorine load Cell (weighing scale)					
	(i)	Make					
	(ii)	Type					
	(iii)	Range					

	(iv)	Quantity (W+S)					
(d)		Chlorine leak detector					
	(i)	Make					
	(ii)	Type					
	(iii)	Range					
	(iv)	Quantity (W+S)					
	(v)	Location					
	(vi)	Adjustable range of Alarm					
	(vii)	State whether separate alarms for leak detection and leak detector equipment failure are provided					
(e)		Chlorine Tonners and Roller supports					
	(i)	Make					
	(ii)	Type					
	(iii)	Quantity (W+S) - Chlorine tonners - Roller supports	Nos				
	(iv)	Tonner capacity	Kgs				
	(v)	Material of construction:					
		Body					
		Rollers					
		Bush					
(f)		Liquid Chlorine Pipe work, valves and fittings:					
	(i)	Make					
	(ii)	Type					
	(iii)	Quantity (W+S)	nos				
	(iv)	Rating					
(g)		Material of construction:					
	(i)	Pipe					
	(ii)	Fittings					
	(iii)	Valves					
	(iv)	Type					
	(v)	Body					
	(vi)	Shaft					
	(vii)	Plug/Disc/Diaphragm					
(h)		Valve Actuator:					
	(i)	Make					
	(ii)	Type					

	(iii)	Model					
(i)		Pressure Gauges:					
	(i)	Make					
	(ii)	Type					
	(iii)	Range					
(j)		Gas Chlorine Pipe work, valves and fittings:					
	(i)	Make					
	(ii)	Type					
	(iii)	Quantity (W+S)					
	(iv)	Rating					
(k)		Material of construction:					
	(i)	Pipe					
	(ii)	Fittings					
	(iii)	Valves					
	(iv)	Type					
	(v)	Quantity					
	(vi)	Body					
	(vii)	Shaft					
	(viii)	Plug/Disc/Diaphragm					
(l)		Valve Actuator:					
	(i)	Make					
	(ii)	Type					
	(iii)	Quantity (W+S)	nos				
	(iv)	Model					
(m)		Pressure Gauges:					
	(i)	Make					
	(ii)	Type					
	(iii)	Range					
(n)		Chlorine Ejectors:					
	(i)	Make					
	(ii)	Type					
	(iii)	Quantity (W+S)	nos				
	(iv)	Model	Nos.				
	(v)	Rating					
	(vi)	Material of construction:					
	(vii)	End connections					
(o)		Tonner lifting Beam with Hooks					

	(i)	Make					
	(ii)	Quantity (W+S)					
	(iii)	Material of construction					
(p)		Chlorine Tonner weighing equipment					
	(i)	Make					
	(ii)	Type					
	(iii)	Quantity (W+S)					
	(iv)	Range					
	(v)	Accuracy					
(q)		Safety Equipment:					
	(i)	Make:					
	(ii)	Quantity:					
	(iii)	Type:					
	(iv)	Self contained breathing apparatus quantity					
	(v)	Positive air-line breathing apparatus quantity					
	(vi)	Instant action resuscitators quantity					
	(vii)	Safety clothing complete set quantity					
	(viii)	Emergency showers quantity					
	(ix)	Eye Baths quantity					
	(x)	Portable compressor, recharging cylinder, quick release coupling complete set quantity					
(r)		Chlorine Gas scrubber :					
	(i)	Make					
	(ii)	Type					
	(iii)	Model					
	(iv)	Quantity (W+S)					
	(v)	Rating	kW				
	(vi)	Weight	kg				
	(vii)	Capacity	Kgs				
	(viii)	Caustic pump capacity/head	Cum/hr				
	(ix)	Blower capacity/pressure	Cum/hr				

3.1.12 Chlorine Building Ventilation

S.	Sub S.	Description	Units	Particulars
----	--------	-------------	-------	-------------

No.	No.						
				STP-1	STP-2	STP-3	STP-4
		Chlorine cylinder room					
(a)		Exhaust fans:					
	(i)	Make					
	(ii)	Model					
	(iii)	Quantity(W+S)					
	(iv)	Capacity	m3/s				
	(v)	Speed	rpm				
	(vi)	Motor rating	kW				
(b)		Ducting					
	(i)	Standard					
	(ii)	Type					
	(iii)	Dimension					
	(iv)	Material					
(c)		Chlorinator Room:					
	(i)	Exhaust fans					
	(ii)	Make					
	(iii)	Model					
	(iv)	Quantity (W+S)					
	(v)	Capacity	m3/s				
	(vi)	Speed	rpm				
	(vii)	Motor rating	kW				
(d)		Ducting					
	(i)	Standard					
	(ii)	Type					
	(iii)	Dimension					
	(iv)	Material					

3.1.13 Cranes Hoists

S. No.	Sub S. No.	Description	Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)		<u>Chemical Handling Crane</u>					
	(i)	Make					
	(ii)	Type and class					
	(iii)	Safe working Load	tonne				
	(iv)	Hoist speed high/low	m/min				

	(v)	Long Travel speed	m/min				
	(vi)	Cross travel speed	m/min				
	(vii)	Span	m				
(b)	<u>Hoisting Rope:</u>						
	(i)	Diameter					
	(ii)	Construction					
	(iii)	Quality of steel					
	(iv)	Minimum Breaking Load	Kgs				
	(v)	Factor of safety					
(c)	<u>Motors for Hoist/Long travel/cross travel :</u>						
	(i)	Make					
	(ii)	Type					
	(iii)	Rating					
(d)	<u>Details of Brakes for Hoist/cross travel/Long travel:</u>		kW				
	(i)	Make					
	(ii)	Design Holding Torque					
	(iii)	Net weight					
(e)	<u>Electric Hoist – MLR Pump Area</u>						
	(i)	Make					
	(ii)	Type and class					
	(iii)	Safe working Load	tonne				
	(iv)	Hoist speed high/low	m/min				
	(v)	Long Travel speed	m/min				
	(vi)	Cross travel speed	m/min				
	(vii)	Span	m				
(f)	<u>Hoisting Rope:</u>						
	(i)	Diameter	mm				
	(ii)	Construction					
	(iii)	Quality of steel					
	(iv)	Minimum Breaking Load	kgs				
	(v)	Factor of safety					
(g)	<u>Motors for Hoist/Long travel/cross travel</u>						
	(i)	Make					
	(ii)	Type					
	(iii)	Rating	kW				
(h)	<u>Details of Brakes for Hoist/cross travel/Long travel:</u>						

	(i)	Make					
	(ii)	Design Holding Torque	N-mm				
	(iii)	Net weight	kgs				
(i)	<u>Dewatering Building-Crane</u>						
	(i)	Make					
	(ii)	Type and class					
	(iii)	Safe working Load	tonne				
	(iv)	Hoist speed high/low	m/min				
	(v)	Long Travel speed	m/min				
	(vi)	Cross travel speed	m/min				
	(vii)	Span	m				
(j)	<u>Hoisting Rope:</u>						
	(i)	Diameter					
	(ii)	Construction					
	(iii)	Quality of steel					
	(iv)	Minimum Breaking Load	kg				
	(v)	Factor of safety					
(k)	<u>Motors for Hoist/Long travel/cross travel :</u>						
	(i)	Make					
	(ii)	Type					
	(iii)	Rating	kW				
(l)	<u>Details of Brakes for Hoist/cross travel/Long travel:</u>						
	(i)	Make					
	(ii)	Design Holding Torque	N.m				
	(iii)	Net weight	kg				
(m)	<u>EOT Crane– Process Air Blower Room</u>						
	(i)	Make					
	(ii)	Type and class					
	(iii)	Safe working Load	tonne				
	(iv)	Hoist speed high/low	m/min				
	(v)	Long Travel speed	m/min				
	(vi)	Cross travel speed	m/min				
	(vii)	Span	m				
(n)	<u>Hoisting Rope:</u>						
	(i)	Diameter	mm				
	(ii)	Construction					
	(iii)	Quality of steel					

	(iv)	Minimum Breaking Load	kgs				
	(v)	Factor of safety					
(o)	<u>Motors for Hoist/Long travel/cross travel :</u>						
	(i)	Make					
	(ii)	Type					
	(iii)	Rating	kW				
(p)	<u>Details of Brakes for Hoist/cross travel/Long travel:</u>						
	(i)	Make					
	(ii)	Design Holding Torque	N-mm				
	(iii)	Net weight	kgs				

3.1.14 Plant Water Pumps

S. No.	Sub S. No.	Description	Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)	(i)	Tank capacity	cum				
	(ii)	Tank Dimensions	mm				
(b)		Pump					
	(i)	Pump Make					
	(ii)	Type					
	(iii)	Model					
	(iv)	Quantity (W+S)	Nos.				
	(v)	Capacity	m ³ /s				
	(vi)	Head	mlc				
	(vii)	Shut off Head	metres				
	(viii)	NPSH required	metres				
	(ix)	Submergence required	metres				
	(x)	Efficiency	%				
	(xi)	Absorbed power at duty point	kW				
	(xii)	Motor rating	kW				
	(xiii)	Speed	rpm				
(c)		Material of construction:					
	(i)	Casing					
	(ii)	Impeller					
	(iii)	Shaft					
	(iv)	Sleeves					
	(v)	Sealing					

	(vi)	Discharge size	mm				
	(vii)	Suction size	mm				
	(viii)	Flange Drilling standard:					
	(ix)	Weight (Pump + Motor)	kgs				
(d)		Testing & Inspection:					
	(i)	Pump performance testing standard					
	(ii)	Maximum Noise level	dB(A)				
	(iii)	Maximum velocity of vibration	mm/sec				
(e)		<u>Motor:</u>					
	(i)	Make					
	(ii)	Type					
	(iii)	Model					
	(iv)	Quantity (W+S)					
	(v)	Rating	kW				
	(vi)	Weight	kgs				

3.1.15 Gates⁺

S. No.	Sub S. No.	Description	Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)	(i)	Make					
	(ii)	Model					
	(iii)	Quantity (W+S)					
	(iv)	Service					
	(v)	Type					
	(vi)	Spindle Type					
	(vii)	Size	mm x mm				
	(viii)	Weight	kgs				
	(ix)	Seating Head	m				
	(x)	Unseating Head	m				
(b)		Material of construction:					
	(i)	Wall Thimble					
	(ii)	Gate					
	(iii)	Frame					
	(iv)	Spindle					
	(v)	Stem coupling					
	(vi)	Seating face					

	(vii)	Wedge					
	(viii)	Headstock					
	(ix)	Gear House cover & stem guide					
	(x)	Lift Nut					
	(xi)	Fasteners & Anchors					
	(xii)	Lifting mechanism, Gear House & stem guide					
(c)		Gate Actuators +					
	(i)	Make					
	(ii)	Type					
	(iii)	Model					
	(iv)	Service					
	(v)	Number	Nos				
	(vi)	Motor Rating	kw				
	(vii)	Motor speed	rpm				
	(viii)	Protection					
	(ix)	Gear Reducer Make					
	(x)	Type					

+Bidder to provide above details for each size of Gate and Service

3.1.16 Valves

S. No.	Sub S. No.	Description	Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)		Butterfly valves :#					
	(i)	Make					
	(ii)	Type					
	(iii)	Model					
	(iv)	Service					
	(v)	Quantity (W+S)	Nos.				
	(vi)	Size	mm				
	(vii)	Rating	PN				
	(viii)	Test pressure	bar				
		Material of construction					
	(ix)	Body					
	(x)	Disc					
	(xi)	Sealing face					
	(xii)	Shaft					

		Gear Reducers					
	(i)	Make					
	(ii)	Material					
	(iii)	Flange Drilling standard					
(b)		Butterfly Valve Actuators #					
	(i)	Make					
	(ii)	Type					
	(iii)	Model					
	(iv)	Service					
	(v)	Quantity (W+S)	Nos.				
	(vi)	Motor rating	kW				
	(vii)	Design Torque	N-m				
	(viii)	Time for full open to full close	seconds				
(c)		Plug valve					
	(i)	Make					
	(ii)	Type					
	(iii)	Model					
	(iv)	Service					
	(v)	Quantity (W+S)	Nos.				
	(vi)	Size	mm				
	(vii)	Rating	PN				
	(viii)	Test pressure	bar				
	(ix)	Body material					
(d)		Non-return valves #					
	(i)	Make					
	(ii)	Type					
	(iii)	Model					
	(iv)	Service					
	(v)	Quantity (W+S)	Nos.				
	(vi)	Size	mm				
	(vii)	Rating	PN				
	(viii)	Test Pressure	bar				
	(ix)	Design standard					
	(v)	Flange drilling standard					
(e)		Material of construction:					
	(i)	Body					
	(ii)	Disc/plates					
	(iii)	Spring					

	(iv)	Shaft					
(f)		Sluice valves :[#]					
	(i)	Make					
	(ii)	Type					
	(iii)	Model					
	(iv)	Service					
	(v)	Number	Nos				
	(vi)	Size	mm				
	(vii)	Rating	PN				
	(viii)	Test pressure	bar				
		Material of construction					
	(ix)	Body					
	(x)	Gate					
	(xi)	Sealing face					
	(xii)	Shaft					
		Gear Reducers					
	(i)	Make					
	(ii)	Material					
	(iii)	Flange Drilling standard					
(g)		Sluice Valve Actuators [#]					
	(i)	Make					
	(ii)	Type					
	(iii)	Number					
	(iv)	Motor rating	kW				
	(v)	Design Torque	N-m				
	(vi)	Time for full open to full close	seconds				
(h)		Knife Gate valves :[#]					
	(i)	Make					
	(ii)	Type					
	(iii)	Model					
	(iv)	Service					
	(v)	Number					
	(vi)	Size	mm				
	(vii)	Rating	PN				
	(viii)	Test pressure	bar				
	(ix)	Body material					
	(x)	gate material					
	(xi)	Sealing face material					

	(xii)	Shaft material					
	(xiv)	Gear Reducers :					
	(xv)	Make					
	(xvi)	Material					
	(xvii)	Flange Drilling standard					
(i)		Knife Gate Valve Actuators[#]					
	(i)	Make					
	(ii)	Type					
	(iii)	Number					
	(iv)	Motor rating	kW				
	(v)	Design Torque	kg-m				
	(vi)	Time for full open to full close	seconds				
(j)		Telescopic valve					
	(i)	Make					
	(ii)	Quantity (W+S)	Nos.				
	(iii)	Type					
	(iv)	Pressure rating	PN				
	(v)	Diameter /size	mm				
	(vi)	End connection					
	(vii)	Material of construction:					
	(viii)	Valve Body					
	(ix)	Spindle					
	(x)	Disc/gate					
	(xi)	Lining					
	(xii)	Fasteners					
(k)		Dual Plate Check Valve					
	(i)	Make					
	(ii)	Quantity (W+S)	Nos.				
	(iii)	Type					
	(iv)	Pressure rating	PN				
	(v)	Manufacturing Standard					
	(vi)	Diameter /size	mm				
	(vi)	Maximum permissible leakage	bar				
	(vii)	Maximum pressure drop at design flow rate	m				
		Material of construction:					
	(viii)	Body					
	(ix)	Disc					

	(x)	Door & Door Face					
	(xi)	Stop, hinge pin & washer					
	(xii)	Seat ring (Disc)					
	(xiii)	Seat ring (Body)					
	(xiv)	Spring					
	(xv)	Hardware					
	(xvi)	End Cover					
(I)		Expansion Bellows					
	(i)	Make					
	(ii)	Quantity (W+S)	Nos.				
	(iii)	Type					
	(iv)	Pressure rating	PN				
	(v)	Manufacturing Standard					
	(vi)	Diameter /size	mm				
		Material of construction:					
	(vii)	Bellows / Collar / Internal sleeve					
	(viii)	Limit Rods					
	(ix)	Nut & lock nut					
	(x)	Lugs / Flanges / Welded					

Bidder to provide above details for each size, type of Valve and Service

3.1.17 Gravity Thickeners

S. No.	Sub S. No.	Description	Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)	(i)	Make					
	(ii)	Type					
	(iii)	Quantity (W+S)	Nos.				
	(iv)	Size (Diameter x SWD x FB)	m				
	(v)	Scraper speed	rpm				
	(vi)	Peripheral Velocity	m/s				
	(vii)	Design Torque	N-m				
	(viii)	Feed rate per thickener	cum/hr				
	(ix)	Feed well size	mm				
	(x)	Walkway (width x Height)	mm				
	(xi)	Weir plate size (Thick x width)	mm				
(b)		Surface preparation & protection:					
	(i)	Wetted parts					

	(ii)	Exposed parts					
(c)		Material of construction:					
	(i)	Bridge and Superstructure					
	(ii)	Feed well					
	(iii)	Shaft					
	(iv)	Walkway Gratings					
	(v)	Squeegees					
	(vi)	Weir plate					
	(vii)	Clamps & Hardware					
(d)		Motor :					
	(i)	Motor rating	kW				
	(ii)	Motor speed	rpm				
	(iii)	Make					
	(iv)	Protection					

3.1.18 Thickened Sludge Pumps

E	Sub S. No.	Description	Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)	(i)	Make					
	(ii)	Type					
	(iii)	Quantity (W+S)					
	(iv)	Capacity	cum/hr				
	(v)	Head	m/c				
	(vi)	Efficiency	%				
	(vii)	Max.solid size	mm				
	(viii)	Speed	rpm				
	(ix)	Motor rating	kW				
	(x)	Quantity (W+S)					
(b)		Material of construction:					
	(i)	Casing					
	(ii)	Rotor					
	(iii)	Stator					
	(iv)	Line shaft					
	(v)	Sealing					
	(vi)	Base Plate					
	(i)	Protection					

	(ii)	Flange drilling standard					
	(iii)	Suction diameter	mm				
	(iv)	Discharge diameter	mm				
	(v)	Coupling type/make					

3.1.19 Sludge Storage Tank Stirrer

S. No.	Sub S. No.	Description	Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)	(i)	Make					
	(ii)	Type					
	(iii)	Model					
	(iv)	Quantity (W+S)					
(b)		Material of construction:					
	(i)	Casing					
	(ii)	Impeller					
	(iii)	Shaft					
	(iv)	Mechanical seal					
	(v)	Guide mechanism with winch					
(c)		Design/Construction features					
	(i)	Impeller Diameter	mm				
	(ii)	Rotation speed	rpm				
	(iii)	Immersion depth	mm				
	(iv)	Absorbed power	kW				
	(v)	Maximum Lifting weight	kgs				
(c)		Motor					
	(i)	Make					
	(ii)	Rating	kW				
	(iii)	Protection					
	(iv)	Voltage	V				
	(v)	Frequency	Hz				
	(vi)	Insulation					
	(vii)	Rated speed	rpm				

3.1.20 Polyelectrolyte Dosing Pumps

S. No.	Sub S. No.	Description	Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)		Pumps					

	(i)	Make					
	(ii)	Type					
	(iii)	Quantity (W+S)	nos				
	(iv)	Model					
	(v)	Capacity max/min	l/s				
	(vi)	Head	mlc				
	(vii)	Stroke adjustment	mm				
	(viii)	Stroking speed max/min	spm				
	(ix)	Casing material					
	(x)	Diaphragm material					
	(xi)	Shaft material					
	(xiii)	Motor rating	kW				
	(xiv)	Motor Make					
(b)		Polyelectrolyte preparation Tank:					
	(i)	Make					
	(ii)	Model					
	(iii)	Quantity (W+S)					
	(iv)	Size (Diameter x Height)	m x m				
	(v)	Material of construction					
(c)		Poly solution Agitator					
	(i)	Make					
	(ii)	Model					
	(iii)	Type					
	(iv)	Quantity (W+S)					
	(v)	Motor rating	kW				
	(vi)	Motor speed	rpm				
	(vii)	Mixer speed	rpm				
	(viii)	Impeller material					
	(ix)	Shaft material					
	(x)	Solids recovery					

3.1.21 Centrifuge Feed Pumps

S. No.	Sub S. No.	Description	Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
	(i)	Make					
	(ii)	Type					
	(iii)	Model					

	(iv)	Quantity (W+S)					
	(v)	Capacity	l/s				
	(vi)	Head	m/c				
	(vii)	Efficiency	%				
	(viii)	Max. Solid size	mm				
	(ix)	Power absorbed	kW				
	(x)	Speed	Rpm				
	(xi)	Motor rating	kW				
	(xii)	Motor Make					
(b)		Material of construction:					
	(i)	Casing					
	(ii)	Rotor					
	(iii)	Stator					
	(iv)	Line shaft					
	(v)	Sealing					
	(iv)	Base Plate					
(c)		Design/Construction features					
	(i)	Impeller Diameter	mm				
	(ii)	Rotation speed	rpm				
	(iii)	Immersion depth	mm				
	(iv)	Absorbed power	kW				
	(v)	Maximum Lifting weight	kgs				
(c)		Construction Features					
	(i)	Flange drilling standard					
	(ii)	Suction diameter	mm				
	(iii)	Discharge diameter	mm				
	(iv)	Coupling type/make					

3.1.22 Centrifuges / Filter Press

S. No.	Sub S. No.	Description	Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)	(i)	Make					
	(ii)	Type					
	(iii)	Model					
	(iv)	Quantity (W+S)	No.s				
	(v)	Feed rate per centrifuge	cum/hr				
	(vi)	Mass feed rate					

	(vii)	% dried solids					
	(viii)	Noise level (dBA) at 1m distance from the Machine	dB(A)				
	(ix)	Vibration level					
	(x)	Bowl Diameter	mm				
	(xi)	Bowl length	mm				
	(xii)	Taper Angle	degrees				
	(xiii)	Bowl speed	rpm				
	(xiv)	Centrifugal force	Kgf				
	(xv)	Gear Box ratio					
	(xvi)	Overall Dimension	mm				
	(xvii)	Weight (Centrifuge + Motor)	kgs				
	(xviii)	Protection of centrifuge					
(b)		Material of construction:					
	(i)	Bowl					
	(ii)	Scroll					
	(iii)	Blade					
	(iv)	Scroll lead face protection					
	(v)	Casing-Upper & Lower					
	(vi)	Wear protection					
(c)	I	Motor :					
	(i)	Make					
	(ii)	Motor rating(Main Drive)	kW				
	(iii)	Motor speed	rpm				
	(iv)	Make of Motor					
	(v)	Insulation class					
	(vi)	Enclosure					
	(vii)	Voltage & Frequency					
	II	Motor -Main drive					
	(i)	Make					
	(ii)	Motor rating(Main Drive)	kW				
	(iii)	Motor speed	rpm				
	(iv)	Make of Motor					
	(v)	Insulation class					
	(vi)	Enclosure					
	(vii)	Voltage & Frequency					
	III	Motor -Back drive					

	(i)	Make					
	(ii)	Motor rating(Main Drive)	kW				
	(iii)	Motor speed	rpm				
	(iv)	Make of Motor					
	(v)	Insulation class					
	(vi)	Enclosure					
	(vii)	Voltage & Frequency					

3.1.23 Cake Hopper

S. No.	Sub S. No.	Description	Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)	(i)	Make					
	(ii)	Model					
	(iii)	Type					
	(iv)	Capacity	Kgs/min.				
	(v)	Dimensions	mxm				
	(vi)	Material of Construction					
(b)		Motor					
	(i)	Make					
	(ii)	Rating	kW				
	(iii)	Speed	rpm				
	(iv)	Insulation class					
	(v)	Enclosure					
	(vi)	Voltage & Frequency					

3.1.24 Belt Conveyor system

S. No.	Sub S. No.	Description	Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)	(i)	Make					
	(ii)	Model					
	(iii)	Type					
	(iv)	Quantity (W+S)	nos				
	(v)	Capacity	Kgs/min.				
	(vi)	Length of conveyor	m				
	(vii)	Angle of Inclination					

	(viii)	Belt width	mm				
	(ix)	Jointing detail/type					
	(x)	Belt rating					
	(xi)	Belt speed					
	(xii)	Belt scraper-Type / No.					
(b)		Motor					
	(i)	Make	`				
	(ii)	Rating	kW				
	(iii)	Speed	rpm				
	(iv)	Insulation class					
	(v)	Enclosure					
	(vi)	Voltage & Frequency					

3.1.25 Air-conditioning Equipment (For SCADA Room)

S. No.	Sub S. No.	Description	Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)	(i)	Make					
	(ii)	Model					
	(iii)	Type					
	(iv)	Capacity	TR				
	(v)	Quantity	Nos.				
	(vi)	Motor Rating	kW				
	(vii)	Air-Ducting:					
	(viii)	Material					
	(ix)	Size					
	(x)	Quantity					
	(xi)	Whether all the required accessories are provided	Yes/No				

3.1.26 Gas Flare system

S. No.	Sub S. No.	Description	Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)	(i)	Make					
	(ii)	Model					
	(iii)	Type					
	(iv)	Capacity					
	(v)	Quantity (W+S)					

	(vi)	Height					
	(vii)	Diameter					
	(viii)	Material of Construction :					
	(ix)	Frame					
	(x)	Flame Tube					
	(xi)	Combustion Chamber					

3.1.27 Plant water Pumps

S. No.	Sub S. No.	Description	Units	Particulars			
				STP-1	STP-2	STP-3	STP-4
(a)	(i)	Make					
	(ii)	Type					
	(iii)	Service/Location					
	(iv)	Quantity (W+S)	Nos.				
	(v)	Capacity	cum/hr				
	(vi)	Head	mlc				
	(vii)	Efficiency	%				
	(viii)	Power absorbed	kW				
	(ix)	Speed	rpm				
	(x)	Motor rating	kW				

Note: Bidder shall furnish details in above table and write “NIL” wherever not applicable

Section – 5i

TECHNICAL DATASHEETS FOR ELECTRICAL WORKS

TECHNICAL DATA SHEETS (ELECTRICAL WORKS)

TABLE OF CONTENTS

Sr. No.	Description
1.0	11 KV Two Pole Structure
2.0	Distribution transformer 11 kV /0.433 kV
3.0	11 kV Metal Enclosed Switchgear
4.0	415V Metal Enclosed Switchgear (Main PMCC/MCC Panel /PDB/DB)
5.0	415 V APFC Panel
6.0	Power, Control, Instrumentation Cables
7.0	Earthing and Lightning Protection Systems
8.0	Lighting & Receptacle System
9.0	Maintenance-free Sealed Lead Acid / Ni-Cd Battery
10.0	Battery, Battery Charger & D.C. Distribution board
11.0	Equipments
12.0	Diesel Standby Generator Set
Note:	
1.0	Technical Schedules cover only salient features of equipment offered by the Contractor. The Contractor shall certify that the specification requirements are fully complied with, except those specifically brought out in Schedule of Deviations from Technical Specification.
2.0	For (*) items, Bidder to provide Quantity/ Ratings based on Design Criteria & Specification requirements. Ratings & Configuration, wherever specified (in Technical specifications/ Data Sheets/ Price Schedule/ SLD) for equipments, shall be minimum requirements. Electrical Switchgears/ Distribution Board Configuration (components/ equipment/ protections/ metering/ instruments) shall be as per indicated in typical reference SLDs & in line with design criteria & specification requirements.
3.0	Bidder to provide completely filled data sheets for the below mentioned equipments. As applicable, separate data sheets needs to be filled for each equipment/ system covered under STP Scheme.

1.0 11 KV TWO / FOUR POLE STRUCTURE:

- a. For installed (1W+1S) transformers cumulative rating \leq 800 KVA, Four Pole Structure/ 2 Nos. of DP structure complete with all accessories as per requirement.
- b. For installed (1W+1S) transformers cumulative rating $>$ 800 KVA, single Two Pole Structure complete with all accessories. Point of Supply Breaker Panel/RMU as per requirement.

(A) LIGHTNING ARRESTERS:

Sr. No.	Description	Unit	Particulars	To be confirmed by Bidder
1.0	General			
1.1	Designation		Lightning Arrester	
1.2	Make		As per approved make list	
1.3	Applicable Standards		As per Tender Specification	
1.4	Type		Station Class type	
1.5	Quantity (Min. 3 nos. per D.P.Structure)	Nos.	As Per Requirement	
1.6	Installation		Outdoor	
1.7	System voltage, No of Phases & Frequency	kV	11kV, 3 Phase & 50 Hz	
2.0	Ratings			
2.1	Rated arrester voltage	kV	9	
2.2	Rated frequency	Hz	50	
2.3	Nominal discharge current of 8/20 microwave shape (Station class)	KA	10	
2.4	Basic Insulation level of equipments to be protected			
a)	Impulse withstand (1.2*50 micro sec)	KV(P)	75	
b)	1 min. Power frequency withstand voltage	KV	28	
2.5	Terminations - Clamps & Connectors suitable for ACSR conductor provided		Provided.	
3.0	Arrestor housing			

3.1	Minimum creepage distance	mm	25 mm / kV	
3.2	Minimum cantilever strength of arrester assembly	kN	Bidder to Furnish	
4.0	GA drawing Indicating Height, Weight, overall dimensions and mounting arrangement details		Bidder to Furnish	

(B) ISOLATOR (G.O.D)

Sr. No.	Description	Unit	Particulars	To be confirmed by Bidder
1.0	General			
1.1	Designation		Isolator (Gang Operated Disconnectors)	
1.2	Make		As per approved make list	
1.3	Applicable Standards		As per Tender Specification	
1.4	Type		Vertically mounted Double Air Break Central Rotating Type	
1.5	Quantity (1 Set per D.P. Structure)	Sets	As Per Requirement	
1.6	Installation		Outdoor	
1.7	System voltage, No of Phases & Frequency	kV	11 KV, 3 Phase & 50Hz	
2.0	Design Requirements			
2.1	Ambient temperature	°C	50	
2.2	Rated Current	*A	As per System Requirement	
2.3	Short Time Rating	KA	26.2 KA for 1 sec	
2.4	Insulation level	Full/ Reduced	Full	
2.5	Phase spacing as per IS/CBIP & to suit BIL & Lightning Impulse Voltage	*mm	Bidder to Furnish	
2.6	Earthing switch required to be provided and interlocked with main switch		Yes	
2.7	Height of mounting above GL	mm	As per IS/CBIP	
2.8	Operating device for Isolator		Yes	

	with Earth Switch – Manual with Operating handle with reduction gear and suitable electro- mechanical interlock.			
2.9	Orientation of operating mechanism box W.R.T isolator		Suitably mounted on DP	
2.10	Auxiliary contacts (6NO+6NC) Make before break		Yes/ No	
3.0	Insulator Data			
3.1	Rated voltage	KV	11	
3.2	1 min. Power frequency wet flash-over voltage	KV	28	
3.3	Impulse flash-over : Positive wave(1.2*50 micro sec)	Kv (peak)	Bidder to Furnish	
3.4	Impulse withstand (1.2*50 micro sec)	kV (peak)	75	
3.5	Creepage distance	mm	25 mm per kV	
3.6	Minimum Cantilever strength	kN	Bidder to Furnish	
4.0	GA drawing Indicating Height, Weight, overall dimensions and mounting arrangement details		Bidder to Furnish	

(C) DROP OUT FUSE (DO FUSE)

Sr. No.	Description	Unit	Particulars	To be confirmed by Bidder
1.0	General			
1.1	Designation		DO Fuse	
1.2	Make		As per approved	
1.3	make list			
1.4	Applicable Standards		As per tender	
1.5	Quantity (1 Set per D.P. Structure)	Sets	As Per Requirement	
1.6	Installation		Outdoor	
1.7	System voltage, No of Phases & Frequency	kV	11 KV, 3 Phase & 50Hz	
2.0	Rating			
2.1	Rated Current	*A	Bidder to Furnish	
2.2	Insulator Rating Insulator Creepage Distance		12 kV Porcelain 25 mm / kV	

	Insulator Impulse withstanding		As per relevant IS	
2.3	Fuse Carrier		Bakelite Tube	
2.4	Contacts		Spring Loaded Phosphor Bronze	
3.0	Operating Mechanism		12 KV 4 element type operating rod	
4.0	Connection Details		ACSR Conductor	

2.0 DISTRIBUTION TRANSFORMER

Sr. No.	Description	Unit	Particulars	To be confirmed by Bidder
1.	Manufacturer's Name And Country Of Manufacture		Bidder To Furnish	
2.	Applicable Standards		As Per Specifications	
3.	Quantity	Nos.	As Per BOQ	
4.	Application / Designation		Power Distribution	
5.	System Voltage - Nominal - Highest	Kv Kv	11 12	
6.	Method of Connection HV Winding LV Winding		Delta Star	
7.	Rated Frequency	Hz	50	
8.	Type Of Winding / Material		Two Winding /Copper	
9.	3 Phase / Single Phase Unit		3 Ph Unit	
10.	Rating of Each Unit	KVA	As Per BOQ	
11.	Voltage Rating	KV/ KV	11 / 0.433	
12.	Cooling		ONAN	
13.	Percentage Impedance at Principal Tap & Without Negative Tolerance	%	As Per IS 1180:2014 & its latest amendment	
14.	Over fluxing Withstand Capability		(110% Continuous)	
15.	Vector Group		Dyn11	
16.	Winding Insulation (HV & LV)		(Uniformly Insulated)	

17.	Short Circuit Current	Ka	26.2	
18.	Maximum Duration Of Fault	Sec.	1 Sec	
19.	Insulation Withstand Voltage			
a)	1 Min Power Frequency Withstand Voltage (Dry & Wet) - HV (11 Kv)/ LV (0.433 Kv)	Kv	28/ 3	
b)	Lightning Impulse Withstand Voltage - HV (11 Kv)/ LV (0.433 Kv)	Kv (Peak)	75/ NA	
20.	TEMPERATURE RISE (H Factor of Max. 1.3 As Per IEC 60354 To Be Considered)			
a)	Maximum Ambient Air	⁰ c	50	
b)	Yearly Average Air (Minimum)	⁰ c	32	
c)	Temperature Rise Of Top Oil By Thermometer (Maximum)	⁰ c	50	
d)	Maximum Temperature Rise of Windings By Resistance (Maximum)	⁰ c	55	
e)	Hot Spot Temperature (Maximum)	⁰ c	98	
f)	Loading Combination For Which Above Temperature Rises Are Applicable			
21.	<u>Weights</u>		Bidder To Furnish	
a)	Core Winding Assembly	Kg		
b)	Oil	Kg		
c)	Tank, Coolers and Fittings	Kg		
d)	Total	Kg		
e)	Un-tanking Weight	Kg		
f)	Minimum Clearance Height for Lifting Core and Windings From Tank	Mm		
22.	Maximum Flux Density			
a)	At Rated Voltage	Wb/M ²	1.6	
b)	At 110% Rated Voltage	Wb/M ²	1.76	
23.	Current Density		Bidder To Furnish	
a)	HV	A/Cm ²		
b)	LV	A/Cm ²		
24.	<u>GUARANTEED LOAD LOSSES</u>	KW	As Per IS 1180-2014 & its latest	

	AT RATED CURRENT AT 75°C WINDING TEMPERATURE (WITHOUT IS POSITIVE TOLERANCE) i) 100% LOAD ii) 75% LOAD iii) 50% LOAD		amendment As per energy efficiency level-2 new amendment	
25.	<u>Guaranteed No Load Losses</u> (Core Loss And Dielectric Loss) At 100% Rated Voltage And Frequency (Without Is Positive Tolerance)	Kw	As Per IS 1180- 2014 & its latest amendment As per energy efficiency level-2 new amendment	
26.	Guaranteed No-Load Current: A. When Excited From LV Side At 100% Rated Voltage B When Excited From LV Side At 110% Rated Voltage	A A	Bidder To Furnish	
27.	Guaranteed Efficiency i) At 75 °c ii) At Unity P.F iii) At Full Load		Bidder To Furnish	
28.	Regulation: At Full Load, 0.8 P.F At 75°C Winding Temperature	%	Bidder To Furnish	
29.	Core:			
a)	Material of Core Lamination		CRGO/ MOH	
b)	Insulation of Core Lamination		Bidder To Furnish	
30.	Winding			
a)	Class of Insulation		Bidder To Furnish	
b)	Material		Copper	
31.	Tapping			
a)	Tapping On Winding	HV/LV	HV	
b)	Whether On Load / Off-Circuit		OLTC / OCTC	
c)	Tapping Range	%	(-) 15% To (+) 5% for OLTC (-) 10% To (+) 5% for OCTC	

d)	Tapping Step	%	In Steps Of 1.25% for OLTC In Steps Of 2.5% for OCTC	
32.	Parallel Operation		No	
33.	Terminal Bushings		HV / LV	
a)	Rated Voltage Class –	KV	11/ 0.433	
b)	Rated Current Class –	A	Bidder To Specify	
c)	Impulse (1.2/ 50 □ Sec. Wave Withstand) –	Kvp	75	
d)	One Minute Power Frequency Withstand (Dry & Wet)	Kv (Rms)	28	
e)	Minimum Clearance In Air (Ph- Ph/Ph-Gnd)	mm/ Kv	25	
f)	Minimum Creepage Distance (Total)	Mm	Bidder To Furnish	
g)	Protected Creepage Distance	Mm	Bidder To Furnish	
h)	Voltage Tap For Use With Potential Device	Reqd./ Not Reqd.	Bidder To Furnish	
34.	<u>Bushing CT, If Required</u>	Reqd./ Not Reqd.	Not Required	
a)	BCT Core No.			
b)	CT Ratio			
c)	Class			
d)	VA Burden	VA		
e)	Knee Point Voltage (vk)	V		
f)	Magnetizing Current (Ie.) mA at (vk /2)	V		
g)	Secondary Resistance (Rct)	Ohms		
35.	<u>Terminal Connections</u> Rigid Bus/ ACSR Conductor / Air Insulated Cable Box With Disconnecting Chamber/ Bus Duct		As Per System Requirement	
36.	All The Accessories, Protections, Equipments - Compliance With Specification, SLD & Data Sheet		Yes/ No	

	Requirements.			
37.	No of Units to Be Subjected to Acceptance Tests		Each Unit	

3.0 11 kV METAL ENCLOSED SWITCHGEAR

Sr. No.	Description	Unit	Particulars	To be confirmed by Bidder
1	Make		As per approved list	
2	Applicable Standards		As per Tender Specification	
3	Overall dimensions of HT Metal Enclosed Switchgear panel (Length x Depth x Height)	mm	Bidder to Furnish	
4	Quantity	Nos.	As per Specification Requirement & ref. SLD.	
5	HT Switchgear and Bus bar Ratings			
a)	Rated voltage phase and frequency		11 KV, 3 Ph, 50 Hz	
b)	System Neutral Earthing		Effectively Earthed	
c)	Maximum system voltage	KV	12	
d)	1 Min Power Frequency Withstand Voltage	kV (rms) 1 min	28	
e)	Lightning Impulse Withstand Voltage	kV (peak)	75	
f)	Short time (1 Sec.) at rated voltage	kA (rms)	18.4	
g)	Short time (3 Sec.) at rated voltage	kA (rms)	Bidder to Furnish	
h)	Dynamic Rating	kA (peak)	60	
i)	Reference Ambient Temperature	°C	50	
j)	Continuous current rating of Bus bars under site reference Ambient Temperature	A	Minimum as per BOQ	
k)	Maximum Temp. of Bus bar & Droppers / Connectors under ambient condition	°C	As per IS 8623 and IEC 60947	
l)	Material of Bus bar		Copper / Tinned Aluminum	

m)	Bus bar insulation		Fully insulated encapsulation by heat shrinkable colored PVC sleeves and tapes.	
6	Switchgear Constructional Requirements			
a)	Type of Construction		As per IS : 3427 IEC : 60265 & its latest amendment	
b)	Thickness of sheet steel (i) Frame, Frame enclosures, doors, covers and partitions	mm	Bidder to Furnish	
c)	Degree of protection		IP 4X	
d)	Color finish shade		Interior : Bidder to Furnish	
			Exterior : Bidder to Furnish	
e)	Earthing Bus - Material - Size		Cu. / Al suitable for Max.SC rating for 1 sec)	
f)	Earthing conductor (Main grid) - Material - Size		GI suitable for Max.SC rating for 1 sec)	
g)	Minimum clearances in air of live parts		As per IS std. & to suite BIL	
h)	Cable entry		Bottom	
7	Breaker Particulars	-		
a)	Circuit Breaker Type	-	VCB	
b)	Voltage, Frequency, & No.Of Phases	Volts, Ph Hz	12kV, 3 Ph, 50 Hz	
c)	Rated Operating Duty	-	O-3 Min-Co-3 Min-Co	
d)	Rated Current At Reference Site Ambient Temperature	-	Minimum As Per BOQ	
	Rated Breaking Current	Ka (Rms)	28	
e)	Rated Making Current	Ka (Peak)	75	
f)	Short Time Current Withstand For 1 Sec. Duration.	Ka (Rms)	18.4	
g)	Asymmetrical Breaking			

	Current			
	(A) Ac Component	Ka (Rms)	Bidder To Furnish	
	(B) D.C. Component	Ka	Bidder To Furnish	
h)	Total Opening Time	Cycles / Msec	Bidder To Furnish	
i)	Total Closing Time	Cycles / Msec	Bidder To Furnish	
j)	Operating Mechanism, Type	-	Motor Charged Spring, Manual Trip & Close Facility Also To Be Provided	
k)	Minimum No. Of Auxiliary Contacts	-	6 No. + 6 No. For Purchaser's Use	
8	Auxiliary Control Voltage		Bidder To Furnish	
	(A) For Closing/Tripping Coil	Volts	<input type="checkbox"/> Ac <input type="checkbox"/> Dc	
	(B) For Spring Charging Motors	Volts	<input type="checkbox"/> Ac <input type="checkbox"/> Dc	
	(C) For Space Heaters & Lighting	Volts	<input type="checkbox"/> Ac <input type="checkbox"/> Dc	
9	Breaker Application		Bidder To Furnish	
	(A) Transformer Control		Yes / No	
	(B) Motor Control		Yes / No	
	(C) Furnace Control		Yes / No	
	(D) Capacitor Control		Yes / No	
10	Vacuum Contactor	-	Bidder To Furnish	
a)	Application (Controlled Equipment)	-	Motor / Capacitor	
b)	Max. System Voltage & Frequency	V. Hz.	12kv, 3 Ph, 50 Hz	
11	Mechanism			
a)	Spring Charging	-	Yes / No	
b)	Type	-	Ac / Dc / Universal	
c)	Rating Voltage	V	11kv	
d)	Rating	Kw	Bidder To Furnish	
11	Disconnectors			
a)	Application (Controlled Eqpt.)	-	Transformer Capacitor	
b)	Type	-	On Load Off Load	
c)	Rated Current At Reference	-	Minimum As Per	

	Site Ambient Temperature		BOQ	
d)	Rated Making & Breaking Capacitive Current	A	Bidder To Furnish	
e)	S.C. Withstand Currents	-		
	A) Momentary	Ka (Peak)	75	
	B) 1 Sec. Current	Ka (Rms)	28	
f)	Operating Mechanism Closing & Opening		Motorized Manual	
g)	Control Voltage	Volts	<input type="checkbox"/> Ac <input type="checkbox"/> Dc	
h)	Minimum No. Of Aux. Contacts	-	2 No. + 2 Nc.	
i)	HRC Fuses (Rating To Suit Application)		Required / Not Required	
12	Current Transformer			
a)	Type		Cast Resin Bar Primary	
b)	System Voltage & Frequency		11kv, 3 Ph, 50 Hz	
c)	Class Of Insulation		Class-B Or Better	
d)	Rated Primary Current & Ratio		Min. As Per SLD	
e)	Accuracy Class & Burden	For Metering	Min. C10.5/1.0/As Per Dwgs.	
		For Prot.	Min. 5P10 /As Per Dwgs.	
f)	Short Time 1 Sec. Current Rating & Dynamic Rating	Ka (Rms) Ka (Peak)	28 75	
g)	Core Balance CTs Shall Be Suitable For Cable Sizes Of The Respective Feeders And Shall Be Complete With Suitable Supports.	-	Bidder To Furnish	
13	Voltage Transformers			
a)	Type	<input type="checkbox"/>	Cast Resin	
b)	Rated Voltage		11kv, 3 Ph, 50 Hz	
c)	Primary (P1)	Volts	Bidder To Furnish	
d)	Secondary (S1)	Volts	Bidder To Furnish	
e)	Secondary (S2)	Volts	Bidder To Furnish	
f)	Method Of Connection			
g)	Primary (P1)		Star Earthed	

h)	Secondary (S1)		Star Earthed	
i)	Secondary (S2)		Open Delta Star Earthed	
j)	Rated Voltage Factor	-		
k)	Class Of Insulation	-	Class – B Or Better	
l)	Provision Of PT & Alarm On Eathing Trolley		Yes / No	
14	H.V. Fuses			
a)	Rated Current	A	Bidder To Furnish	
b)	Voltage Class	kV	Bidder To Furnish	
c)	Sym. Interrupting Rating	KA (Rms)	28	
d)	Type		Digital/ Analogue	
e)	Accuracy Class	-	Class 1 Or Better	
15	Relays			
a)	Type	-	Electro Magnetic Solid State Numerical	
b)	Other Specification	-		
16	List Of Essential Spares		Bidder To Furnish	
16.1	One Complete Pole Of Each Breaker			
	A. Rating	Set		
	A. Rating	Set		
	A. Rating	Set		
16.2	Loose Breaker Complete With Operating Mechanism And Truck Mounted			
	A. Rating	Set		
	A. Rating	Set		
	A. Rating	Set		
	A. Rating	Set		
16.3	Closing & Tripping Coils Set	□		
16.4	Spring Charging Mechanism	Set		
16.5	Spring Charging Motor Alone	Set		
16.6	Set Of Gaskets For All Ratings	Set		

16.7	Vacuum Contactors			
	One Complete Set	Ea		
	Operation Coil Set	Ea		
16.8	Bus bar Support Insulators	Set		
16.9	Auxiliary Switch Assembly	Ea		
16.10	Limit Position Switch	Ea		
16.11	Local/Remote Selector Switch	Ea		
16.12	Breaker Control Switch	Ea		
16.13	Bus Seal Off Bushing	Set		
16.14	Protective Relays :	-		
	Device No. Relay Function	Set		
	49 Thermal Overload	Set		
	50 S/C Phase Short Circuit	Set		
	50 N Earth Short Circuit	Set		
	51 Phase Overload	Set		
	51 N Earth Overload	Set		
	50 LR Locked Rotor	Set		
	27 Under Voltage	Set		
	64 Residual Current	Set		
	86 Lockout (Master)	Set		
	87 T Transformer Differential	Set		
	95 Fuse Failure	Set		
16.15	Aux.Relays of All Config.	Set		
16.16	Timers Of All Ratings	Set		
16.17	Indicating Lamp	-		
	Red, Yellow, Blue, Green, Amber	Set		
16.18	Cast Resin Current Transformer	Set	One No. Of Each Rating	
16.19	Cast Resin Voltage Transformer	Set	One No. Of Each Rating	
16.20	Instruments			
	Ammeter	Set		
	Voltmeter	Set		
	Wattmeter	Set		

	Watt Hour Meter	Set		
16.21	Fuses			
	HRC HV For VT	Ea		
	HRC LV Of Different Ratings	Set		
	Notes : Apart From Above List of Spares, Bidder to Indicate List of Recommended Spares For 5 Years of Trouble Free Operation.			

4.0 415V METAL ENCLOSED SWITCHGEARS

Sr. No.	Description	Unit	Particulars	To be confirmed by Bidder
1	Make		As per approved list	
2	Applicable Standards		As per Tender Specification	
3	Overall dimensions of 415V Metal Enclosed Switchgear panel (Length x Depth x Height)	mm	Bidder to Furnish	
4	Quantity	Nos	As per Specification Requirement & ref. SLD.	
5	415 V Switchgear and Bus bar Ratings			
a)	Rated voltage phase and frequency		415 V, 3 Ph 50 Hz	
b)	Type of Construction ACB- EDO MCCB – Fixed Type		Metal Enclosed, modular Type Front operated Draw out / Fixed type, construction as per Form 4 of IS 8623/ IEC 60439 & its latest amendment	
c)	Maximum system voltage	V	415 +10%	
d)	One minute power frequency voltage			
	i) Power circuits	V	2500	
	ii) Control circuits	V	1500	
	iii) Aux. Circuits connected to Sec of CTS	V	1500	
e)	Continuous current rating of Bus bars under site reference Ambient Temperature and type Bus Bar Material	A	Minimum as per SLD & specification Aluminum (Al)	
f)	Bus bar insulation		Fully insulated encapsulation by heat shrinkable coloured PVC	

			sleeves and tapes.	
g)	Reference Ambient Temperature	o C	50o C	
h)	Maximum Temperature of Bus bars, Droppers and Contacts at Continuous current rating under site ambient temperature	o C	85° C for non silver plated joints 105° C silver plated joints	
i)	Short Circuit current with stand for Busbars and droppers (i) Short time 1 sec	kA (rms)	Bidder to Furnish based on Design requirements	
6	Switchgear Constructional Requirements			
a)	Type of Construction		Single front type as per Form 4 of IS 8623 / IEC 60439	
b)	Thickness of sheet steel (i) Frame, Frame enclosures, doors, covers and partitions	mm	CRCA Sheet – 2.0 Partition – 2.0 Load bearing Members -2.5 mm Gland Plate – 3 mm	
c)	Degree of protection		IP 54 for Indoor IP 55 for Outdoor	
d)	Color finish shade		Interior : Glossy white	
			Exterior : Light grey semi glossy Shade 631 of IS-5	
e)	Earthing Bus - Material - Size		Al suitable for Max.SC rating for 1 sec)	
f)	Earthing conductor (Main grid) - Material - Size		GI suitable for Max.SC rating for 1 sec)	
g)	Minimum clearances in air of live parts (i) Phase to Phase (ii) Phase to Earth	Mm Mm	As per IS std. & to suite BIL 25 mm 20 mm	
h)	Cable entry to cubicles		Bottom	
7	Instrumentation Transformers			
a)	Current transformer			
i)	Make		As per approved make list	
ii)	Ratio		.../ 5A - As per Requirements	

iii)	Burden	VA	15 Minimum	
iv)	Accuracy Class (Metering)		1.0	
v)	Accuracy Class (Protection)		5P20	
b)	Voltage transformer			
i)	Make		As per approved list	
ii)	Ratio		$415/\sqrt{3}$ / $110 \sqrt{3}$ - As per Requirements	
iii)	Burden	VA	50 VA Minimum	
iv)	Accuracy Class (Metering)		1.0	
v)	Accuracy Class (Protection)		3P	
8	Switchgear, Starters & Other Components		Minimum requirements as per SLD, Design Criteria & Specification requirements (Yes / No)	

5.0 415V APFC PANEL

Sr. No.	Description	Unit	Particulars	To be confirmed by Bidder
1	Capacitor Bank Panel Particulars			
a)	Make		As per approved make list	
b)	Applicable Standards		As per Tender Specification	
c)	Quantity		As per BOQ	
d)	Rated Capacity	KVAR	* Bidder to furnish as per design requirement.	
e)	Capacitor losses (i) For complete bank (ii) For individual units	Watts Watts	0.5W/ kVAr 0.2W/ kVAr	
f)	Rated voltage	V	415	
g)	Rated frequency and phases		50 Hz, 3 Phase	
h)	Ambient temperature	°C	50	
i)	Cable gland required		Yes	
j)	Size of cable		As per design Requirements	
k)	Cable entry		Bottom	
2	Unit Capacitors			
a)	Rated voltage	V	415V	
b)	Standard Rated Output per bank at 415V	KVAR	5 / 10 / 15 / 25 / 50 / 100 KVAR	

c)	Maximum over voltage the unit capacitor is capable of withstanding continuously	%	As per IS 13585	
d)	Type		Double Layer APP	
3	Constructional Requirement			
a)	Overall dimensions of Capacitor control panel (Length x Depth x Height)	Mm	Pl. Furnish	
b)	Thickness of sheet steel i) Frame, Frame enclosures, doors covers and partition	mm	CRCA - 2.0 Partition-1.6 Gland plate -3	
c)	Degree of protection		IP 4X	
d)	Color finish shade		Interior : RAL 7032	
			Exterior : RAL 7032	
e)	Earthing bus	Material	GI	
		Size	mm x mm	* Bidder to furnish as per design requirement.
f)	Earthing conductor	Material	GI	
		Size	mm x mm	* Bidder to furnish as per design requirement.
4	Design Requirements			
a)	Insulation level	kV (rms)	2.5	
b)	Capacitor bank connection		Delta	
c)	Short circuit withstand for busbars Short time (1 sec)	kA (rms)	*	
d)	Type of switching		Automatic switching responsive to power factor through power factor sensing relay	
e)	Switching steps	Min. 8	As Per Requirements	
f)	Rating of contactor		AC 6b Duty - To suit KVAR unit	
g)	Incomer switch current rating	150% of rated	* As Per Requirements	
h)	Busbars		Al	

6.0 POWER, CONTROL & INSTRUMENTATION CABLES

Sr. No.	Description	Unit	Particulars	To be confirmed by Bidder
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1	11 kV (E), multi strand, Al, XLPE insulated, inner & outer extruded PVC sheathed, GI armoured power cable (as required)	LS	As per IS 7098 Part -II & its latest amendment	
a)	Make		As per approved	
b)	Applicable Standards		As per Tender Specification	
2	1.1 kV, multi strand Cu/ Al, XLPE insulated, inner & outer extruded PVC sheathed, GI armoured power/submersible cable (Cu conductor cable & GI round wire armoring for sizes upto 4 sq mm & below, for balance all, above 4 sq. mm conductor size- Al conductor & GI flat strip armoring) (Cu conductor, double PVC sheathed, water tight, flexible cable for submersible pump application)	LS	As per IS 7098-Part -I & its latest amendment	
a)	Make		As per approved list	
b)	Applicable Standards		As per Tender Specification	
3	1.1 kV, multi-strand Cu, XLPE insulated, inner & outer extruded PVC sheathed, GI armoured control cables	LS	As per IS 7098 & its latest amendment	
a)	Make		As per approved list	
b)	Applicable Standards		As per Tender Specification	
c)	GENERAL			
	Type of Cable Gland (Suitable for Cable Size as per requirement)		Double compression brass type	
	Type of Cable Lugs (Suitable for Cable Size & material or bimetallic - as per requirement)		Crimping type	
	All Cable accessories as per specification requirements to be provided.		Yes/No	

7.0 EARTHING AND LIGHTNING PROTECTION SYSTEM

Sr. No.	Description	Unit	Particulars	To be confirmed by Bidder
1	Main Earthing Grid		To Suite as per Maximum SC Rating &	

			Design	
2	Conductor Leads To Equipment		(Minimum 2 distinct earthing leads for equip. having > 125V & 1 earthing lead for equip. with < 125V)	
3	Other Items			
(a)	Main lighting D.B, Control panels and sub-lighting distribution boards	Mtr.	GI, 25x6mm	
(b)	Hand Rails	Mtr.	GI, 25x3	
(c)	Cable trays	Mtr.	GI, 25x3	
(d)	Tanks	Mtr.	GI, 25x3	
(e)	Junction boxes	Mtr.	GI wire, 8 SWG	
(f)	Lighting fixtures, single phase receptacles, lighting conduits,	Mtr.	GI wire, 12 SWG	
(g)	Push button stations, limit switches,	Mtr.	GI wire, 12 SWG	
(h)	Crane rail,	Mtr.	GI, 25x3 mm	
(i)	Street lighting, flood lighting poles and junctions boxes,	Mtr.	GI, 25x3mm	
(j)	Metallic noncurrent carrying structures,	Mtr.	GI, 25x3 mm	
4	Lightning Conductors	Mtr.		
(a)	Lightning protection down comers for building,	Mtr.	GI, 25x6 mm	
(b)	Lightning protection horizontal roof conductor for building	Mtr.	GI, 25x6 mm	
5	Electrodes			
(a)	Pipe electrode	Nos.	-Heavy duty GI pipe 4500 mm long, 40NB (Quantity to achieve ≤ 1 Ohm earth resistance based on 50 ohm- m or higher resistivity on the basis of actual measurement whichever is higher) - Minimum 4 Nos. of 600mm x 600mm x 3.15 mm for each transformer	
(b)	Plate Electrode		-Minimum 2 Nos. 300mm x 300mm x 3.5 mm for each 11 kV DP Structure	

6	Earthing Resistance to be achieved	Ohm	1	
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8.0 LIGHTING & RECEPTACLE SYSTEM AND EQUIPMENT

Sr. No.	Description	Unit	Particulars	To be confirmed by Bidder
1	System Particular			
(a)	Voltage			
	(i) 3 Phase, 4 wire 50 Hz system			
	• Rated	V	415	
	• Maximum	V	476	
	(ii) D.C. system			
	• Rated	V	110	
(b)	One minute withstand voltage		2000 V AC.	
(c)	System short-circuit level			
	(i) At 415 V, A.C.	kA (rms)	10	
	(ii) At 110 V.D.C.	kA (D.C.)	6	
(d)	Reference ambient temperature		450 C	
2	Distribution Board/Panels			
(a)	Make		As per approved list	
(b)	Applicable Standards		As per Tender Specification	
(c)	Main, floor mounted distribution boards			
	(i) Main LDB (A.C.)		As per requirement	
	• Bus bars		Al	
	• Bus bar current rating	A	As per requirement	
	• Incoming		As per requirement	
	• Outgoing		As per requirement (With Minimum 2 spare feeders)	
	• Cable entry		Bottom	
	• Location		Indoor	

	• Earthing terminals		50x8 mm GI flat	
	(ii) Emergency lighting panel		As per requirement	
	• Bus bar		Copper	
	• Bus bar current rating	A	As per Requirement	
	• Incoming and outgoing feeders		As per requirements (With Minimum 2 spare feeders)	
	• Cable entry		Bottom	
	• Location		Indoor	
	• Earthing terminals		50x6 mm GI flat	
(d)	Sub DBs, wall/structure mounting panels			
i)	SLDB for indoor area		As per requirement	
	• Bus bars		Copper	
	• Bus bar current rating	A	As per requirement	
	• Incoming and outgoing feeders		1 No. Incoming TPN MCB * (Minimum32A) with ELCB As per requirement Outgoing 10/16A MCB SPN and DP ELCB per phase with PPI (With Minimum 2 spare feeder circuits; a single circuit consists of SPN MCBs for R,Y, B phase)	
	• Cable entry		Bottom/Top	
	• Location		Indoor	
ii)	SLDB for outdoor area		As per requirement	
	• Bus bars		Copper	
	• Bus bar current rating	A	As per requirement	
	• Incoming		1No.-Incoming * A TPN MCB (Minimum32A) with ELCB- with timer (0-24 hours)	
	• Outgoing		As per requirement Outgoing 10/16 A SPN MCB with switch contactors. (With Minimum 2 spare feeder circuits; a single circuit consists of SPN MCBs for R,Y, B phase)	
	• Cable entry		Bottom/Top	

	• Location		Indoor	
(e)	Paint Finish			
i)	Color shade		Interior : Glossy white	
			Exterior : Light gray semi glossy Shade 631 of I.S:5	
ii)	Epoxy paint required		Yes.	
(f)	Earthing terminals suitable for conductor			
i)	Size	mm x mm	25x3 flat	
ii)	Material		G.I.	
3	Receptacle Units			
(a)	Make			
(b)	Decorative (complete with flush/surface mounted boxes/cover plates etc.)			
i)	3 pin 1-ph & N with switch and plug tops	A	5/15 A, Indoor Type	
(b)	Industrial (complete with surface mounted, pre fabricated CRCA boxes)			
i)	3 Pin, 230V AC		As per required	
	With ELCB(30mA) & plug	A	15A, Indoor Type	
ii)	5 pin, 3 Ph, 415V With ELCB(30mA) & plug With ELCB(30mA) & plug	A A	As per required 63A, Outdoor type 32A, Indoor type	
4	Lighting Wires			
(a)	Make 1100V,PVC insulated:		As per approved list	
(b)	Conductor		Stranded Copper	
(c)	Size (Sizes mentioned are minimum & size to be decided on circuit load & voltage drop criteria)	Core x mm2	Lighting 2x1Cx1.5 mm2 Receptacle / Sockets Decorative 2x1Cx1.5mm2 Industrial 1ph - 2x1Cx4 mm2 3ph – 4Cx 6 /16 mm2	
5	Conduits			

(a)	Make			
(b)	Material		Galvanized steel	
(c)	Size	mm	20	
6	Street Light Poles And Flood Light Poles			
(a)	Make		As per Approved list	
(b)	Street Light Pole			
i)	Enclosed dwg. No.:		Ref. Typical Drawing attached with Specs.	
ii)	Total Height:	m	8.5/10/12	
iii)	Quantity:	Nos.	As per requirement	
(c)	Junction Box with Pole			
i)	Enclosed dwg. No.:		Pl. furnish.	
ii)	No. of cable entries:	Nos.	Two	
iii)	Cable entry suitable for :		4C-10/16 mm ² Al. Conductor, PVC insulated, armoured cable	
iv)	Earthing terminal suitable for		25x3 mm GS Flat	
(d)	Floodlight Light Pole			
i)	Total height	Mtr.	8.5/10/12/High Mast	
ii)	No. of floodlights to be fixed per pole	No.	Minimum One/as required	
iii)	Painted		Yes	
iv)	Earthing terminal suitable for	mm x mm	25x3	
v)	Quantity :	Nos.	As per requirement	
7	Luminaire (Lighting fixture complete with prewired control gear terminal block & suitable lamps)	LS	As per specification requirement	
8	<p>Note: Supply of conduits, wires/cables, all fixing hardware, terminal connectors, cable termination kits and associated accessories for -lighting, receptacles, earthing, cabling & wiring works, required Civil works etc. shall be included in Contractor's scope.</p> <p>All ELCBs for lighting circuit shall be with 100mA sensitivity.</p> <p>All ELCBs for receptacle circuit shall be with 30mA sensitivity.</p>			

9.0 MAINTENANCE FREE SEALED LEAD ACID / Ni-Cd BATTERY

Sr. No.	Description	Unit	Particulars	To be confirmed by Bidder
1	Application		Control & annunciation	
2	Type of battery		Maintenance free sealed lead acid	
3	Number of battery banks required (for 110V DC)	No.	* As per design requirement.	
4	Ambient conditions		Min. Temp. - 20° C	
			Max. Temp 50° C	
5	D.C. system voltage	V	110	
6	Ampere hour capacity of battery at 27 Deg. C at 10 hour rate to give final cell voltage of 1.75 volts/cell	Ah	* As per BOQ & design requirement.	
7	Momentary load/duration	A	* A for one minute	
8	Emergency load/duration	A	* A for two hours	
9	Continuous load/duration	A	* A for ten hours	
10	Cell voltage - initial/final	V	1.14/1.42 V	
11	Mounting arrangement		Multi tier	
12	Charging method proposed		Float & Float cum boost charging	

10.0 BATTERY CHARGER AND D.C. DISTRIBUTION BOARD

Sr. No.	Description	Unit	Particulars	To be confirmed by Bidder
10.1	General			
(a)	Number required			
	(i) Battery charger	Nos	* As per design requirement.	
	(ii) D.C. Distribution board			
(b)	DC System Voltage (Nominal)	V	110	
(c)	DC System Earthing		Unearthed	
(d)	Ambient Design Temperature	Deg. C	50	
(e)	Busbars	-	Copper	
10.2	DC Bus Load			
(a)	Total continuous DC load	A	* As per design	

			requirement.	
(b)	Short time loads (Additional to continuous loads) (i) DC lights/Facia lamps (ii) Starting current and duration of Largest Connected DC Motor	A A Secs	As per design requirement. As per design requirement.	
10.3	Battery Details			
(a)	Float/Trickle charging current of battery	mA	*As per design requirement.	
(b)	Boost Charging Current of Battery (Maximum)	A	*As per design requirement.	
(c)	Boost Charging Voltage of Battery (maximum)	V	*As per design requirement.	
(d)	Maximum Time for Boost charging of Battery	hr	*As per design requirement.	
(e)	Battery capacity & no. of cells	Ah	*As per design requirement.	
		Nos.	*As per design requirement.	
10.4	AC System Data			
(a)	Supply	Voltage	V	415
		Phase		3
		Frequency	Hz	50
(b)	(i) Variation in supply Voltage	%	±10	
	(ii) Variation in supply frequency	%	±5	
(c)	Short Circuit level	kA	10	
(d)	Type of earthing		Solid earthing	
10.5	Performance			
(a)	DC voltage setting adjustment for float charger		±10% of nominal voltage	
(b)	Voltage stabilization for constant voltage regulator		±1% of set D.C. voltage, with	

			AC input variation and DC load variation from 0 to 100%	
(c)	Maximum permissible variation in DC voltage (no load to full load)		±1%	
(d)	D.C. voltage setting adjustment for boost charging		70% to 100% of max. boost charging voltage	
(e)	D.C. current adjustment for boost Charging		30% to 100% of max. boost charging current	
(f)	Current stabilization for constant current regulator for boost charger		□ 2%	
(g)	Minimum permissible power factor to rated continuous load		0.8	
(h)	Permissible ripple content at rated continuous load		3% (maximum)	
10.6	Miscellaneous			
(a)	Cable entry		Bottom	
(b)	Cable Sizes			
	(i) Battery	sq.mm	*As per design requirement.	
	(ii) DC output	sq.mm	*As per design requirement.	
	(iii) AC input	sq.mm	*As per design requirement.	
(c)	Relay for auto changeover from Float to boost mode to be provided (in case of float-cum-boost charger)		Yes	
(d)	Constructional Features for Battery Charger & D.C. Distribution Board			
	(i) Thickness of sheet steel Frame, Frame enclosures, doors, covers and partition	mm	CRCA rolled 2.0	
	(ii) Degree of protection		IP 42	

	(iii) Colour finish shade		Interior RAL 7032	
			Exterior : RAL 7032	
	(iv) Earthing bus	Material	Copper	
		Size	mm	25 x 6
	(v) Earthing conductor	Material	GS	
		Size	mm	50x 6

11.0 EQUIPMENTS DETAILS

Sr. No.	Description	To Be Filled By Bidder			
	<u>Location</u>				
		Make & Model No.	Yes/ No		
1.	<u>Relay</u>				
1.1	Instantaneous Over Current & Earth Fault Protections (50 & 50N) (Element Of Numerical Relay)				
1.2	IDMT Over Current & Earth Fault Protections (51 & 51N) (Element Of Numerical Relay)				
1.3	Master Trip / Lock Out Relay (86) (Separate Relay)				
1.4	Stand By Earth Fault Relay (51ns) (Separate Relay)				
1.5	Under Voltage/ No Voltage (27) & Over Voltage Relay (59)				
1.6	Trip Circuit Supervision Relay (95)				
1.7	Auxiliary Relay (Separate Relays Based On Requirements, With At Least One Spare Element)				
1.8	Automatic Voltage Regulator (Separate Device)				
1.9	Microprocessor Based Battery Charger Controller				
1.10	Motor Protection Relay (98) (Comprehensive Motor Protection Relay for Motor Ratings of 132 kW & above)				
2.	Switchgear	Application	Make & Model No.	Rating / Release Type	Yes / No
2.1	ACB	Above 630A	As Per		

			Approved Make List	Minimum As Per BOQ & SpeRequir ements		
2.2	MCCB	Up to 630 A	As Per Approved Make List			
2.3	MCB		As Per Approved Make List			
2.4	Fuse		As Per Approved Make List			
3.	Starters (Including All Components For Type-2 Co-Ordination)	Application (Provide Feeder Range For Which It Is Applicable)	Make	Type -2 Co-Ordination (With MCCB) Ensured – Yes/No	Yes	
3.1	D.O.L.	Up to 5.5 KW	As Per Approved Make List	Yes		
3.2	Star-Delta	Above 5.5 KW & upto 15 KW		Yes		
3.3	Auto Transformer Starter (ATS)	Above 15 KW & Upto 75 KW		--		
3.4	SOFT STARTER (µp Based)	Above 75 KW	As Per Approved Make List	Yes		
4	Meters	Application	Make & Model No.	Type	Size	
4.1	Ammeter	Minimum As Per SLD & Specification Requirements	As Per Approved Make List			
4.2	Voltmeter					
4.3	MFM		As Per Approved Make List			
4.4	TVM /Tariff Meter (As Per GEB Requirements)	(As Per GEB Requirements)				
5	Annunciators	Quantity	Make & Model No.	Indication Lamp Type		
5.1	8 Window					
5.2	16 Window					

6	Whether Detailed Literature For All The Above (Item 1 To 5) Items Enclosed With Tender (Yes / No)	
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12.0 Diesel Standby Generator Set

Sr. No.	Description	Unit	Particulars	To be filled by Bidder
1.				
(a)	Set Manufacturer		GUDC Approved	
(b)	Quantity & Type	Nos	Bidder to Provide	
(c)	Applicable Standard		Bidder to Provide	
(d)	Rating	kVA	Bidder to Provide	
(e)	Method of starting		Bidder to Provide	
(f)	No. Of Phases, Rated Voltage, Frequency, PF and Speed		Bidder to Provide	
(g)	Overload capacity		Bidder to Provide	
(h)	Provision of Acoustic enclosure		Bidder to Provide	
(i)	Provision of AMF Control Panel for all the DG Sets	Yes/No	Yes	
2.	Alternator			
(a)	Manufacturer		GUDC Approved	
(b)	Type		Bidder to Provide	
(c)	Applicable Standard		Bidder to Provide	
(d)	Rating	kVA	Bidder to Provide	
(e)	Voltage	V	Bidder to Provide	
(f)	Number of phases		Bidder to Provide	
(g)	Frequency	Hz	Bidder to Provide	
(h)	Power Factor		Bidder to Provide	
(i)	Rated Current	A	Bidder to Provide	
(j)	Overload Capacity		Bidder to Provide	
(k)	Class of Insulation		Bidder to Provide	
(l)	Degree of protection		Bidder to Provide	
(m)	Winding Connection		Bidder to Provide	
(n)	Short circuit current		Bidder to Provide	
(o)	Type of rotor bearings		Bidder to Provide	
(p)	Provision of temperature sensors in stator windings		Bidder to Provide	

(q)	Exciter		Bidder to Provide	
(i)	Make		GUDC Approved	
(ii)	Type		Bidder to Provide	
(iii)	Applicable Standard		Bidder to Provide	
(r)	AVR		Bidder to Provide	
(i)	Make		Bidder to Provide	
(ii)	Type		Bidder to Provide	
(iii)	Applicable Standard		Bidder to Provide	
(s)	Voltage regulation		Bidder to Provide	
(t)	Outgoing Cable		Bidder to Provide	
(i)	Make		GUDC Approved	
(ii)	Type		Bidder to Provide	
(iii)	Applicable Standard		Bidder to Provide	
(iv)	Size		Bidder to Provide	
(u)	Winding material		Bidder to Provide	
(v)	Rating of biggest motor which can be started on DOL		Bidder to Provide	
(w)	Details of protection		Bidder to Provide	
(x)	Efficiency		Bidder to Provide	
3.	Diesel Engine			
(a)	Manufacturer			
(b)	Type		Bidder to Provide	
(c)	Applicable Standard		Bidder to Provide	
(d)	Rating	HP	Bidder to Provide	
(e)	Speed	rpm	Bidder to Provide	
(f)	Number of Cylinders		Bidder to Provide	
(g)	Number of Strokes		Bidder to Provide	
(h)	Type of Starting		Bidder to Provide	
(i)	Duty		Bidder to Provide	
(j)	Overload Capacity		Bidder to Provide	
(k)	Radiator		Bidder to Provide	
(i)	Make		GUDC Approved	
(ii)	Type		Bidder to Provide	
(iii)	Fan power		Bidder to Provide	
(iv)	Cooling air flow		Bidder to Provide	
(l)	Exhaust system		Bidder to Provide	
(i)	Type of Silencer		Bidder to Provide	

(ii)	Exhaust temperature gauge range		Bidder to Provide	
(m)	Governor		Bidder to Provide	
(i)	Make		GUDC Approved	
(ii)	Type		Bidder to Provide	
(iii)	Applicable Standard		Bidder to Provide	
(iv)	Class of governor		Bidder to Provide	
(n)	Cooling Water System		Bidder to Provide	
(i)	Water temperature		Bidder to Provide	
(ii)	Water Pressure		Bidder to Provide	
(iii)	System Capacity		Bidder to Provide	
(iv)	Provision of High water temperature and low water level switches		Bidder to Provide	
(o)	Lubricating oil system		Bidder to Provide	
(i)	Grade of Oil		Bidder to Provide	
(ii)	Oil Pressure		Bidder to Provide	
(iii)	Oil temperature		Bidder to Provide	
(iv)	Sump Capacity		Bidder to Provide	
(v)	Oil Consumption per 100 hours		Bidder to Provide	
(vi)	Recommended time period of Oil Change		Bidder to Provide	
(p)	Fuel		Bidder to Provide	
(i)	Fuel Specification		Bidder to Provide	
(ii)	Fuel Consumption at rated Capacity		Bidder to Provide	
(q)	Day oil tank		Bidder to Provide	
(i)	Capacity	Litres	Bidder to Provide	
(ii)	Provision of Level Gauge		Bidder to Provide	
(r)	Bulk Storage tank		Bidder to Provide	
(i)	Location		Bidder to Provide	
(ii)	Type		Bidder to Provide	
(iii)	Capacity		Bidder to Provide	
(s)	Starting system		Bidder to Provide	
(t)	Type of cooling		Bidder to Provide	
(u)	Exhaust system		Bidder to Provide	
4.	AMF Control Panel			
(i)	Make		GUDC Approved	

(ii)	Type		Bidder to Provide	
(iii)	Applicable Standards		Bidder to Provide	
(iv)	Constructional Features		Bidder to Provide	
(a)	Thickness of sheet steel Frame, Frame enclosures, doors covers and partition	mm	Bidder to Provide	
(b)	Colour finish shade - Interior		Bidder to Provide	
(c)	Colour finish shade - Exterior		Bidder to Provide	
(d)	Degree of Protection		Bidder to Provide	
(e)	AMF Features Provided as per Technical Specification	Yes/ No	Bidder to Provide	
5.	Protections, Alarm, Indications & Control whether provided as per Specification	Yes/ No	Bidder to Provide	
6.	Acoustic Enclosure		Bidder to Provide	
(i)	Make		GUDC Approved	
(ii)	Type		Bidder to Provide	
(iii)	Applicable Standards		Bidder to Provide	
(iv)	Constructional Features		Bidder to Provide	
(a)	Thickness of sheet steel Frame, Frame enclosures, doors covers and partition	mm	Bidder to Provide	
(b)	Degree of Protection		Bidder to Provide	
(c)	Acoustic material		Bidder to Provide	
(ii)	Sound level at 1m distance		Bidder to Provide	
(iii)	Whether certified to meet emission norms	Yes/ No	Bidder to Provide	
7	Battery		Bidder to Provide	
(i)	Make		GUDC Approved	
(ii)	Type		Bidder to Provide	
(iii)	Applicable Standards		Bidder to Provide	
(iv)	Voltage		Bidder to Provide	
(v)	Capacity at 10 hours rate		Bidder to Provide	
(vi)	Number of successive starting permissible		Bidder to Provide	
8	Battery Charger			
(i)	Make		GUDC Approved	
(ii)	Type		Bidder to Provide	
(iii)	Applicable Standards		Bidder to Provide	

(iv)	AC Input to Charger		Bidder to Provide	
(v)	DC Output of Charger		Bidder to Provide	

I /We are bound to supply the above Item of stated manufacture having rated capacity, material of construction and other requirements mentioned in the data sheet

Sign. of Contractor

Section – 5j

DATASHEET FOR INSTRUMENTATION AND CONTROL WORKS

TABLE OF CONTENTS

Sr. No.	Description
1.	Instruments / Process Analyzers
1.1.	Full Bore Electromagnetic Flow Transmitter
1.2.	Open Channel Flow Transmitter
1.3.	Pressure Gauge
1.4.	Pressure Transmitter
1.5.	Pressure Switch
1.6.	Ultrasonic type Level Transmitter
1.7.	Hydrostatic Type Level Transmitter
1.8.	Displacer Type Level Switch
1.9.	Float & Board Type Level Indicator
1.10.	pH sensor and Transmitter
1.11.	Turbidity sensor and Transmitter
1.12.	Chlorine sensor and Transmitter
1.13.	Dissolved Oxygen sensor and Transmitter
1.14.	TSS sensor and Transmitter
1.15.	TOC / COD / BOD sensor and Transmitter
1.16.	Digital Process Indicator (Panel Mounted)
1.17.	Laboratory equipments
2.	Automation Equipments
2.1.	PLC and SCADA System
2.2.	UPS System
3.	Cables
3.1.	Instrument Signal Cables
3.2.	RTD cables
3.3.	Thermocouple cables
3.4.	Control cables
3.5.	Power cables

1. Fields Instruments / Process Analyzers

1.1. Technical Particulars- Full Bore Electromagnetic Flow Transmitter:

Sr. No.	Description	Particulars	To be filled by Bidder
1	General		
1.1	Make	As per approved vendor list	
1.2	Item	Full Bore Electromagnetic Flow Meter	
1.3	Service	Common Header of Pump Discharge	
1.4	Fluid	Sewage Water	
1.5	Area Classification	Non Hazardous / Hazardous	
2	Flow Sensor		
2.1	Type	DC pulsed	
2.2	Electrode / Sensor MOC	Hast alloy C	
2.3	Flow Tube MOC	SS304	
2.4	Coil Housing MOC	Non corrosive (SS 304) or Die cast aluminium with anti-corrosive grade paint suitable for application	
2.5	Grounding Ring MOC	SS 304	
2.6	Liner MOC	PTFE	
2.7	Process Connection	Flanged	
2.8	Flange MOC	CS	
2.9	Housing Protection	IP 68	
2.10	Pressure Rating	16 Kg/cm ²	
2.11	Temperature	50 °C Ambient	
2.12	Size(mm)	To suit mains flow parameters, with pipe reducers provided as necessary	
3	Flow Indicator and Transmitter		
3.1	Type	Microprocessor Based, Remote Mounted	
3.2	Power Supply	230 VAC Line Power	
3.3	Accuracy	± 0.5 % of measured value	
3.4	Repeatability	+/-0.1%	
3.5	Transmitter Protection	IP67	
3.6	Transmitter MOC	Dia-cast Aluminium with PU finish / Polycarbonate	
3.7	Output	One Current – 4 to 20 mA (isolated) proposanal to flow rate Hart (version 6 or above) One Scalable Pulse One Status Output	

3.8	Communication	Modbus RS485	
3.9	Display	2 Line Backlit LCD, Programmable	
3.10	Maximum Digit Display	8 Digit	
3.11	Indication on Display	<p>Actual Flow Rate / Instantaneous Flow Rate Cumulative Forward Flow Cumulative Reverse Flow Cumulative Flow / Sum / Totalizers Alarm Five (5) digit backlit/Normal LCD, for flow rate in m3/hr. Eight (8) digit backlit/Normal LCD for totalized flow in ML</p> <ul style="list-style-type: none"> • Display with 8 digits for main information. <p>Index, menu and status symbols for dedicated information</p> <ul style="list-style-type: none"> • Key for toggling through the information and reset customer totalizers and call-up function • Selectable default information and accessible menus: <ul style="list-style-type: none"> - Operator - Meter - Service - Data Logger 	
3.12	Zero and Span adjustment	Factory set Password protection of all parameters and hardware protection of calibration and revenue parameters.	
3.13	Facility for on line diagnosis	<p>Required as following: Diagnostic</p> <ul style="list-style-type: none"> • Continuous self test shall include <ul style="list-style-type: none"> - Coil current to drive the magnetic field - Signal input circuit - Data calculation, handling and storing • Features <ul style="list-style-type: none"> - Alarm statistics and 	

		logging for fault analyzing -Electrode impedance to check actual media contact -Flow simulation to check pulse and communication signal chain for correct scaling -Number of sensor measurements (excitations) -Transmitter temperature -Low impedance alarm for change in media -Flow alarm when defined high flow exceeds -Verification mode for fast measure performance check -Statistic flow and consumption data	
3.14	Cable Gland	Required	
3.15	Cable Length (sensor to transmitter)	10 Meter minimum or suit to site	
3.16	Data Protection:	<ul style="list-style-type: none"> • All data shall be stored in an EEPROM. • Totalized statistic shall be backed up every 10 min • Power consumption and temperature Measurement statistic at every 4 hour • Minimum 30 days of data shall be stored in EEPROM. • Password protection of all parameters and hardware protection of calibration and revenue parameters. 	
3.17	Power Supply in case of Raw power is not available	External AC/DC power supply required with 8 hour battery back up	
4	Flow Indicator and Integrator (Panel Mounted)		
4.1	Type	Electronic, Microprocessor based, single unit for flow indicator and integrator.	
4.2	Display	Digital, LED display	
4.3	Digit Height	14 mm or Higher	
4.4	No. of Digits a) Flow indicator Flow integrator	4 Digits 8 Digits	
4.4	Input	4-20 mA DC (Isolated)	
4.5	Zero and span adjustment	Required	
4.6	Manual Reset Facility	Required (shall be	

	for flow integrator	protected)	
4.7	Engineering Units for Flow rate indicator	m ³ /hr	
4.8	Battery backup for flow integrator	Required	
4.9	Retransmitted output	Required	

1.2. Technical Particulars- Open Channel Flow Transmitter:

Sr. No.	Description	Particulars	To be filled by Bidder
1	General		
1.1	Make	As per approved vendor list	
1.2	Item	Open Channel Flow Meter	
1.3	Service	Open Channel	
1.4	Fluid	Sewage Water	
1.5	Area Classification	Non Hazardous / Hazardous	
2	Flow Sensor		
2.1	Type	Ultrasonic	
2.2	Sensor MOC	PP / PVDF	
2.3	Seal MOC	EPDM	
2.4	Sensor Housing MOC	Diacast Aluminium with PU finish / Polycarbonate	
2.5	Process Connection	Flanged	
2.6	Flange MOC	PP / CS	
2.7	Housing Protection	IP 68	
2.8	Temperature compensation	Required	
2.9	Swirling arm Arrangement for mounting of sensor	Required for access during maintenance	
2.10	Size(mm)	To suit Open Channel flow parameters	
2.11	Pressure Rating (Kg/cm ²)	Atmospheric	
2.12	Temperature	50 °C Ambient	
3	Flow Indicator and Transmitter		
3.1	Type	Microprocessor Based, Remote Mounted	
3.2	Power Supply	230 VAC Line Power	
3.3	Accuracy	± 0.5 % of measured value	
3.4	Repeatability	+/-0.1%	
3.5	Transmitter Protection	IP67	

3.6	Transmitter MOC	Dia-cast Aluminium with PU finish / Polycarbonate	
3.7	Output	One Current – 4 to 20 mA (isolated) proportional to flow rate Hart (version 6 or above) One Scalable Pulse One Status Output	
3.8	Communication	Modbus RS485	
3.9	Display	2 Line Backlit LCD, Programmable	
3.10	Maximum Digit Display	8 Digit	
3.11	Indication on Display	Actual Flow Rate / Instantaneous Flow Rate Cumulative Flow / Sum / Totaliser Alarm Five (5) digit backlit/Normal LCD, for flow rate in m ³ /hr. Eight (8) digit backlit/Normal LCD for totalized flow in ML • Display with 8 digits for main information. Index, menu and status symbols for dedicated information • Key for toggling through the information and reset customer totalizer and call-up function • Selectable default information and accessible menus: - Operator - Meter - Service Data Logger	
3.12	Zero and Span adjustment	Factory set Password protection of all parameters and hardware protection of calibration and revenue parameters.	
3.13	Facility for on line	Required as following:	

	diagnosis	<p>Diagnostic</p> <ul style="list-style-type: none"> • Continuous self test shall include <ul style="list-style-type: none"> - Signal input circuit - Data calculation, handling and storing • Features <ul style="list-style-type: none"> - Alarm statistics and logging for fault analyzing - Transmitter temperature - Flow alarm when defined high flow exceeds - Verification mode for fast measure performance check - Statistic flow and consumption data 	
3.14	Cable Gland	Required	
3.15	Cable Length (sensor to transmitter)	10 Meter minimum or suit to site	
3.16	Data Protection:	<ul style="list-style-type: none"> • All data shall be stored in an EEPROM. • Totalizers statistic shall be backed up every 10 min • Power consumption and temperature Measurement statistic at every 4 hour • Minimum 30 days of data shall be stored in EEPROM. • Password protection of all parameters and hardware protection of calibration and revenue parameters 	
3.17	Power Supply in case of Raw power is not available	External AC/DC power supply required with 8 hour battery back up	
4	Flow Indicator and Integrator (Panel Mounted)		
4.1	Type	Electronic, Microprocessor based, single unit for flow indicator and integrator.	
4.2	Display	Digital, LED display	
4.3	Digit Height	14 mm or Higher	
4.4	No. of Digits a) Flow indicator	4 Digits	

	b) Flow integrator	8 Digits	
4.4	Input	4-20 mA DC (Isolated)	
4.5	Zero and span adjustment	Required	
4.6	Manual Reset Facility for flow integrator	Required (shall be protected)	
4.7	Engineering Units for Flow rate indicator	m ³ /hr	
4.8	Battery backup for flow integrator	Required	
4.9	Retransmitted output	Required	

1.3. Technical Particulars- Pressure Gauge:

Sr. No.	Description	Particulars	To be filled by Bidder
1	General		
1.1	Make	As per approved vendor list	
1.2	Item	Pressure Gauge	
1.3	Service	Pump/Blower Discharge, Pump/Blower Discharge Common Header	
1.4	Fluid	Sewage Water, Air	
1.5	Area Classification	Non Hazardous / Hazardous	
2	Pressure Gauge		
2.1	Type	Bourdon	
2.2	Sensor and other wetted parts M.O.C	SS 316	
2.3	Process connection	½” NPT (M)	
2.4	Dial size	150 mm	
2.5	Material of dial	Aluminium with white back ground and black numerals	
2.6	Glass	Shatterproof	
2.7	Housing material	Die cast aluminium with epoxy coating	
2.8	Accuracy	±1% of full scale or better	
2.9	Over range protection	125% of maximum pressure	
2.10	Gauge Protection	IP65	
2.11	Temperature	50 °C Ambient	
2.12	Range	As per pump design	

		(Range to be finalised during detailed engineering without any cost implication)	
2.13	Accessories	<ul style="list-style-type: none"> • Snubber • 3 way isolation valve • Impulse tubing, fittings All other installation hardware	
2.14	Diaphragm Seal M.O.C	SS316	
2.15	3 Way Isolation Valve M.O.C	SS316	
2.16	Impulse Tube Fitting M.O.C	SS316	

1.4. Technical Particulars- Pressure Transmitter:

Sr. No.	Description	Particulars	To be filled by Bidder
1	General		
1.1	Make	As per approved vendor list	
1.2	Item	Pressure Transmitter	
1.3	Service	Pump/ Blower Discharge Common Header	
1.4	Fluid	Sewage Water	
1.5	Area Classification	Non Hazardous / Hazardous	
2	Pressure Sensor		
2.1	Type	Diaphragm / piezoelectric	
2.2	Sensor and other wetted parts M.O.C	SS 316	
2.3	Process connection	½" NPT (F)	
2.4	Sensor Fill Fluid	Silicon Oil	
2.5	Temperature	50 °C Ambient	
2.6	Range	As per pump design (Range to be finalised during detailed engineering without any cost implication)	
3	Pressure Transmitter		
3.1	Type	SMART Type / Microprocessor Based, Head Mounted	
3.2	Power Supply	230 VAC Line Power / 24 VDC	
3.3	Accuracy	± 0.1 % of measured value	

3.4	Response Time	100 ms	
3.5	Transmitter Protection	IP67	
3.6	Transmitter MOC	SS316 /Diacast Aluminium with PU finish	
3.7	Output	One Current – 4 to 20 mA (isolated) proposanal to pressure Hart (version 6 or above)	
3.8	Display	Alphanumeric LCD Type, Programmable	
3.9	Over range protection	125% of maximum pressure	
3.10	Zero and span adjustment	Required	
3.11	Cable Gland	Required	
3.12	Accessories	<ul style="list-style-type: none"> • Snubber • 3 way isolation valve • Impulse tubing, fittings • Mounting Bracket • Tag Plate All other installation hardware	
3.13	Diaphragm Seal M.O.C	SS316	
3.14	3 Way Isolation Valve M.O.C	SS316	
3.15	Impulse Tube Fitting M.O.C	SS316	
4	Digital Pressure Indicator (Panel Mounted)		
4.1	Type	Electronic, Microprocessor based	
4.2	Display	Digital, LED display	
4.3	Digit Height	14 mm or Higher	
4.4	No. of Digits - Pressure indicator	8 Digits	
4.5	Input	4-20 mA DC (Isolated)	
4.6	Zero and span adjustment	Required	
4.7	Engineering Units for - Pressure indicator	Kg / Cm ²	
4.8	Battery backup for flow integrator	Required	
4.9	Retransmitted output	Required	

1.5. Technical Particulars- Pressure Switches:

Sr. No.	Description	Particulars	To be filled by Bidder
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1	General		
1.1	Make	As per approved vendor list	
1.2	Item	Pressure Switch	
1.3	Fluid	Sewage Water	
1.4	Area Classification	Non Hazardous / Hazardous	
2	Pressure Sensor		
2.1	Type	Diaphragm / piezoelectric	
2.2	Sensor and other wetted parts M.O.C	SS 316	
2.3	Process connection	½” NPT (F)	
2.4	Temperature	50 °C Ambient	
2.5	Range	As per pump design (Range to be finalised during detailed engineering without any cost implication)	
2.6	Accuracy	+ /- 1% of full scale or better	
2.7	Range	As per pump design, Adjustable setting over full span and as per P&ID.	
2.8	Over range Protection	125% of range	
2.9	Body Material of casing	Die Cast Aluminium / non-corrosive	
2.10	Set point adjusting scale	Required	
2.11	Accessories	<ul style="list-style-type: none"> • Snubber • 3 way isolation valve • Impulse tubing, fittings All other installation hardware	
2.12	Diaphragm Seal M.O.C	SS316	
2.13	3 Way Isolation Valve M.O.C	SS316	
2.14	Impulse Tube Fitting M.O.C	SS316	

1.6. Technical Particulars- Ultrasonic type Level Transmitter:

Sr. No.	Description	Particulars	To be filled by Bidder
1	General		
1.1	Make	As per approved vendor list	
1.2	Item	Level Transmitter	
1.3	Service	Sump / Tank	

1.4	Fluid	Sewage Water, Chemical Water	
1.5	Area Classification	Non Hazardous / Hazardous	
2	Level Sensor		
2.1	Type	Ultrasonic	
2.2	Sensor MOC	PP / PVDF	
2.3	Seal MOC	EPDM	
2.4	Sensor Housing MOC	Diacast Aluminium with PU finish / Polycarbonate	
2.5	Process Connection	Flanged	
2.6	Flange MOC	PP / CS	
2.7	Housing Protection	IP 68	
2.8	Temperature compensation	Required	
2.9	Swirling arm Arrangement for mounting of sensor	Required for access during maintenance	
2.10	Size(mm)	To suit Sump / Tank Height	
2.11	Pressure Rating (Kg/cm2)	Atmospheric	
2.12	Temperature	50 °C Ambient	
3	Level Transmitter		
3.1	Type	Microprocessor Based, Remote Mounted	
3.2	Power Supply	230 VAC Line Power	
3.3	Accuracy	± 0.1 % of measured value	
3.4	Repeatability	+/-0.1%	
3.5	Transmitter Protection	IP67	
3.6	Transmitter MOC	Diacast Aluminium with PU finish / Polycarbonate	
3.7	Output	One Current – 4 to 20 mA (isolated) proposanal to Level Hart (version 6 or above)	
3.8	Display	2 Line Backlit LCD, Programmable	
3.9	Maximum Digit Display	8 Digit	

3.10	Indication on Display	Actual Sump / Tank Level Alarm	
3.11	Zero and Span adjustment	Factory set Password protection of all parameters and hardware protection of calibration and revenue parameters.	
3.12	Cable Gland	Required	
3.13	Cable Length (sensor to transmitter)	10 Meter minimum or suit to site	
4	Digital Level indicator (Panel Mounted)		
4.1	Type	Microprocessor based	
4.2	Display	Digital LED display	
4.3	Digit Height	14 mm or higher	
4.4	No. of Digits	3 ½	
4.5	Input	4-20 mA DC with HART protocol (version 6 or above)	
4.6	Zero & Span Adjustment	Required	
4.7	Engineering Units for display	Meters and %.	
4.8	Accuracy	±0.1 % of span	
4.9	Enclosure Material	Non corrosive	
4.10	Retransmission output	Isolated 4-20 mA DC-2nos.	
4.11	Powersupply to Transmitter	24 V DC	
4.12	Alarm outputs	1NO+1NC for high and Low-Low alarms (adjustable)	

1.7. Technical Particulars- Hydrostatic Type Level Transmitter:

Sr. No.	Description	Particulars	To be filled by Bidder
1	General		
1.1	Make	As per approved vendor list	
1.2	Item	Level Transmitter	
1.3	Service	Aeration Tank	
1.4	Fluid	Sewage Water, Chemical Water	
1.5	Area Classification	Non Hazardous / Hazardous	
2	Level Sensor		
2.1	Type	Hydrostatic	

2.2	Sensor MOC	SS316	
2.3	Process Connection	Flanged	
2.4	Flange MOC	PP / CS	
2.5	Housing Protection	IP 68	
2.6	Temperature compensation	Required	
2.7	Swirling arm Arrangement for mounting of sensor	Required for access during maintenance	
2.8	Size(mm)	To suit Sump / Tank Height	
2.9	Pressure Rating (Kg/cm ²)	Atmospheric	
2.10	Temperature	50 °C Ambient	
3	Level Transmitter		
3.1	Type	Microprocessor Based, Remote Mounted	
3.2	Power Supply	230 VAC Line Power	
3.3	Accuracy	± 0.1 % of measured value	
3.4	Repeatability	+/-0.1%	
3.5	Transmitter Protection	IP67	
3.6	Transmitter MOC	Diacast Aluminum with PU finish / Polycarbonate	
3.7	Output	One Current – 4 to 20 mA (isolated) proposanal to Level Hart (version 6 or above)	
3.8	Display	2 Line Backlit LCD, Programmable	
3.9	Maximum Digit Display	8 Digit	
3.10	Indication on Display	Actual Sump / Tank Level Alarm	
3.11	Zero and Span adjustment	Factory set Password protection of all parameters and hardware protection of calibration and revenue parameters.	
3.12	Cable Gland	Required	
3.13	Cable Length (sensor to transmitter)	10 Meter minimum or suit to site	

4	Digital Level indicator (Panel Mounted)		
4.1	Type	Microprocessor based	
4.2	Display	Digital LED display	
4.3	Digit Height	14 mm or higher	
4.4	No. of Digits	3 ½	
4.5	Input	4-20 mA DC with HART protocol (version 6 or above)	
4.6	Zero & Span Adjustment	Required	
4.7	Engineering Units for display	Meters and %.	
4.8	Accuracy	±0.1 % of span	
4.9	Enclosure Material	Non corrosive	
4.10	Retransmission output	Isolated 4-20 mA DC-2nos.	
4.11	Powersupply to Transmitter	24 V DC	
4.12	Alarm outputs	1NO+1NC for high and Low-Low alarms (adjustable)	

1.8. Technical Particulars- Displacer Type Level Switch:

Sr. No.	Description	Particulars	To be Filled By Bidder
1	General		
1.1	Make	As per approved vendor list	
1.2	Item	Level Switch	
1.3	Service	Sump / Tank	
1.4	Fluid	Sewage Water	
1.5	Area Classification	Non Hazardous / Hazardous	
2	Level Sensor		
2.1	Type	Displacer	
2.2	Flexible Rope MOC	PP / SS316	
2.3	Displacer MOC	PP / SS316	
2.4	Spring Housing	PP / SS316	
2.5	Process connection	Flanged	
2.6	Process connection MOC	PP	
2.7	Switching Type	Micro switch	
2.8	Switching Contacts	2 SPDT, 5A	

2.9	Housing material	Die cast aluminium with epoxy coating	
2.10	Protection Class	IP65	
2.11	Perforated Still well	PP	
2.12	Temperature	50 °C Ambient	
2.13	Range	As per Sump / Tank design (Range to be finalised during detailed engineering without any cost implication)	

1.9. Technical Particulars- Float & Board Type Level Indicator:

Sr. No.	Description	Particulars	To be filled by Bidder
1	General		
1.1	Make	As per approved vendor list	
1.2	Item	Level Indicator	
1.3	Service	Sump / Tank	
1.4	Fluid	Sewage Water, Chemical Water	
1.5	Area Classification	Non Hazardous / Hazardous	
2	Level Indicator		
2.1	Type	Float and Board	
2.2	Construction	Guided	
2.3	Measuring Range	To Suit Sump / Tank Height	
2.4	Travel	Full Range	
2.5	Float	SS316	
2.6	Float / Guide wire Rope	SS316	
2.7	Calibrated Gauge Board	6" wide x aluminium powder coating with black graduations and numerical	
2.8	Pointer	Red, powder coated steel with measuring rope holder	
2.9	Protection Conduit	Vertical and Horizontal limb in galvanized steel	
2.10	Elbow pulley	Cadmium plated steel or PP pulley with PTFE bush and SS shaft housed in weather proof aluminium or PP enclosure	
2.11	Tensioner	Cadmium plated steel spring housed in CS or PP enclosure	

2.12	Anchor	SS316 plate (25mm x 6mm thick plate to be welded at bottom of sump / tank at site)	
2.13	Rope Fastener	SS316	
2.14	Gauge Brackets	Powder Coated Steel	
2.15	Counter weight for rope type probe to keep it straight	Required	
2.16	Spacers between the probes to avoid entangling with each other	Required	

1.10. Technical Particulars- pH sensor and Transmitter:

Sr. No.	Description	Particulars	To be filled by Bidder
1	General		
1.1	Make	As per approved vendor list	
1.2	Item	pH Sensor & Transmitter	
1.3	Service	Inlet & Outlet of STP, After Alum Dosing	
1.4	Fluid	Sewage Water, Chemical Water	
1.5	Area Classification	Non Hazardous / Hazardous	
2	pH Sensor		
2.1	Type	Electrode	
2.2	Principle	Potentiometric measurement	
2.3	Range	0 to 14 pH	
2.4	Material	Glass	
2.5	Max Process temperature	50°C	
2.6	Max Process pressure	6bar	
2.7	temperature sensor	Pt100	
2.8	Connection	Analog / digital connection with Transmitter	
2.9	Ingres protection	IP68	
2.10	Resolution	0.01pH, Temp 0.1°C	
2.11	Calibration data	Inbuilt calibration &	

		application data storage in sensor / Transmitter	
2.12	Sensor capability	The sensor connection should be able to withstand corrosion , moisture , and can be also connected under water	
2.13	Data safety	The sensor / transmitter should store on-board calibration data , diagnostics information	
3	pH Transmitter		
3.1	Type	Microprocessor Based, Remote Mounted	
3.2	Output	4-20 mA analog outputs	
3.3	Supply voltage	230 V AC, 50Hz	
3.4	Material	Field Housing : ABS PC	
3.5	Display	LC display with backlight, two lines, with status indicators	
3.6	Electromagnetic compatibility	interference emission and interference immunity acc. to EN 61326-1:2006	
3.7	Protection class of field housing	≥ IP 65	
3.8	Ambient temperature	-20 ... +60 °C	
3.9	Self-Diagnostic feature	Required	
3.10	Transmitter channels	Two channel minimum required	

1.11. Technical Particulars- Turbidity sensor and Transmitter:

Sr. No.	Description	Particulars	To be filled by Bidder
1	General		
1.1	Make	As per approved vendor list	
1.2	Item	Turbidity Sensor & Transmitter	
1.3	Service	Inlet & Outlet of STP, After Clarifloculator	
1.4	Fluid	Sewage Water, Chemical Water	
1.5	Area Classification	Non Hazardous / Hazardous	
2	Turbidity Sensor		
2.1	Principle	Nephelometric measuring principle 90° NIR scattered light	

		according to ISO 7027. Measurement at wavelength of 860nm	
2.2	Measurement range	0.000 – 4000 display range up-to 9999 FNU/NTU	
2.3	Material	Sensor shaft : Stainless steel 1.4404 (AISI 316 L) Optical window : sapphire O-rings : EPDM	
2.4	Max Process temperature	50°C	
2.5	Max Process pressure	10bar	
2.6	Connection	Fixed cable connection	
2.7	Ingres protection	IP68	
2.8	Additional Certifications	Calibration certification	
2.9	Resolution	0.0015 FNU	
2.10	Inaccuracy	2% ± 0.01 FNU	
2.11	Repeatability	< 0.5% of measured value (range 0 to 10 NTU/FNU)	
3	Turbidity Transmitter		
3.1	Type	Microprocessor Based, Remote Mounted	
3.2	Transmitter system	4 wire with analog outputs	
3.3	Supply voltage	230 V AC, 50Hz	
3.4	Material	Field Housing : ABS PC	
3.5	Display	LC display with backlight, two lines, with status indicators	
3.6	Electromagnetic compatibility	interference emission and interference immunity acc. to EN 61326-1:2006	
3.7	Protection class of field housing	≥ IP 65	
3.8	Ambient temperature	–20 ... +60 °C	
3.9	Self-Diagnostic feature	Required	
3.10	Transmitter channels	Two channel minimum required	

1.12. Technical Particulars- Chlorine sensor and Transmitter:

Sr. No.	Description	Particulars	To be filled by Bidder
1	General		
1.1	Make	As per approved vendor list	

1.2	Item	Residual Chlorine Sensor & Transmitter	
1.3	Service	Chlorine Contact Tank	
1.4	Fluid	Sewage Water	
1.5	Area Classification	Non Hazardous / Hazardous	
2	Residual Chlorine Sensor		
2.1	Type	Free Chlorine	
2.2	Principle	Optical / Amperometric measurement of free chlorine.	
2.3	Measurement range	0,01 - 5ppm free chlorine	
2.4	pH Compensation	Required , add on pH sensor for compensation	
2.5	Material	Sensor shaft : PVC	
		Membrane : PTFE	
		Membrane cap :PBT (GF30); PVDF	
2.6	Process temperature	2°C - 45°C	
2.7	Max Process pressure	1 bar	
2.8	temperature sensor	Pt100	
2.9	Connection	Analog / digital connection with Transmitter	
2.10	Ingres protection	IP68	
2.11	Resolution	0.01mg/l	
2.12	Inaccuracy	1% of measured value	
2.13	Sensor capability	The sensor connection should be able to withstand corrosion , moisture without loss of any data	
3	Residual Chlorine Transmitter		
3.1	Type	Microprocessor Based, Remote Mounted	
3.2	Output	4-20 mA analog outputs	
3.3	Supply voltage	230 V AC 50Hz	
3.4	Material	Field Housing : ABS PC	
3.5	Display	LC display with backlight, two lines, with status indicators	
3.6	Electromagnetic compatibility	interference emission and interference immunity acc. to EN 61326-1:2006	

3.7	Protection class of field housing	≥ IP 65	
3.8	Ambient temperature	–20 ... +60 °C	
3.9	Self-Diagnostic feature	Required	
3.10	Transmitter channels	Two channel minimum required (Chlorine +pH)	

1.13. Technical Particulars- Dissolved Oxygen sensor and Transmitter:

Sr. No.	Description	Particulars	To be filled by Bidder
1	General		
1.1	Make	As per approved vendor list	
1.2	Item	DO Sensor & Transmitter	
1.3	Service	Aeration Tank	
1.4	Fluid	Sewage Water	
1.5	Area Classification	Non Hazardous / Hazardous	
2	Dissolved Oxygen Sensor		
2.1	Principle	Optical / Luminescent / Fluorescence technology	
2.2	Measurement range	0 – 20 mg/L(ppm)	
2.3	Material		
	Wetted Parts	Silicone and SS316 TI	
	Sensor	POM Polyoxymethylene or equiv ,	
2.4	Max Process temperature	50°C	
2.5	Max Process pressure	10bar	
2.6	Connection	Fixed cable connection	
2.7	Ingres protection	IP68	
2.8	Additional Certifications	Calibration certification	
2.9	Resolution	0.01 mg/l	
2.10	Inaccuracy	< 5 % of the measured value or 1 % of full scale	
2.11	Repeatability	< 0.5% of measured value (range 0 to 10 NTU/FNU)	
3	Dissolved Oxygen Transmitter		
3.1	Type	Microprocessor Based, Remote Mounted	
3.2	Transmitter system	4 wire with analog outputs	

3.3	Supply voltage	230 V AC, 50Hz	
3.4	Material	Field Housing : ABS PC	
3.5	Display	LC display with backlight, two lines, with status indicators	
3.6	Electromagnetic compatibility	interference emission and interference immunity acc. to EN 61326-1:2006	
3.7	Protection class of field housing	≥ IP 65	
3.8	Ambient temperature	–20 ... +60 °C	
3.9	Self-Diagnostic feature	Required	
3.10	Transmitter channels	Two channel minimum required	

1.14. Technical Particulars- TSS sensor and Transmitter:

Sr. No.	Description	Particulars	To be filled by Bidder
1	General		
1.1	Make	As per approved vendor list	
1.2	Item	Suspended Sensor & Transmitter	
1.3	Service	Inlet & Outlet of STP	
1.4	Fluid	Sewage Water	
1.5	Area Classification	Non Hazardous / Hazardous	
2	Suspended Solid Sensor		
2.1	Principle	Light scattering at 90deg & 135deg four beam pulsed method with wavelength at 860nm+/- 30nm	
2.2	Measurement range	0 to 4g/L	
2.3	Material	Sensor shaft : Stainless steel 1.4404 (AISI 316 L) Optical window : sapphire O-rings : EPDM	
2.4	Max Process temperature	50°C	
2.5	Max Process pressure	10bar	
2.6	Connection	Fixed cable connection	
2.7	Ingress protection	IP68	
2.8	accuracy	< 5 % of the measured value or 1 % of full scale	

3	Suspended Solid Transmitter		
3.1	Type	Microprocessor Based, Remote Mounted	
3.2	Transmitter system	4 wire with analog outputs	
3.3	Supply voltage	230 V AC, 50Hz	
3.4	Material	Field Housing : ABS PC	
3.5	Display	LC display with backlight, two lines, with status indicators	
3.6	Electromagnetic compatibility	interference emission and interference immunity acc. to EN 61326-1:2006	
3.7	Protection class of field housing	≥ IP 65	
3.8	Ambient temperature	-20 ... +60 °C	
3.9	Self-Diagnostic feature	Required	
3.10	Transmitter channels	Two channel minimum required	

1.15. Technical Particulars- TOC / COD / BOD sensor and Transmitter:

Sr. No.	Description	Particulars	To be filled by Bidder
1	General		
1.1	Make	As per approved vendor list	
1.2	Item	TOC / COD / BOD Sensor & Transmitter	
1.3	Service	Inlet & Outlet of STP	
1.4	Fluid	Sewage Water	
1.5	Area Classification	Non Hazardous / Hazardous	
2	TOC / COD / BOD Sensor		
2.1	Measuring principle	UV photometric - SAC [Spectral absorption coefficient] method, Measurement at 254 nm without any sampling /conditioning requirements	
2.2	Process temperature	50°C	
2.3	Process pressure	10 bar	
2.4	Sensor Ingress Protection rating	IP 68	
2.5	Maximum measured error	2 % of upper end of measuring range	

2.6	Measuring range	COD/BOD: 0 to 75mg/L, 370 mg/L, 1000 mg/L	
		TOC: 0 to 30mg/L, 150mg/L, max up to 410mg/L	
2.7	Repeatability	0.5 % of end of measuring range (for homogeneous medium)	
2.8	Drift	Less 0.2 % of end of measuring range per week	
3	TOC / COD / BOD Transmitter		
3.1	Type	Microprocessor Based, Remote Mounted	
3.2	Transmitter system	4 wire with analog outputs	
3.3	Supply voltage	230 V AC, 50Hz	
3.4	Material	Field Housing : ABS PC / Polycarbonate	
3.5	Display	LC display with backlight, two lines, with status indicators	
3.6	Electromagnetic compatibility	Interference emission & immunity as per EN 61326-1:2006, class A	
3.7	Protection class of field housing	≥ IP 65	
3.8	Ambient temperature	-20 ... +60 °C	
3.9	Self-Diagnostic feature	Required	
3.10	Transmitter channels	Two channel minimum required	

1.16. Technical Particulars- Digital Process Indicator (Panel Mounted):

Sr. No.	Description	Particulars	To be filled by Bidder
1	General		
1.1	Make	As per approved vendor list	
1.2	Item	Process Indicator	
1.3	Service	Panel Mounted	
1.4	Area Classification	Non Hazardous	
2	Process Indicator		
2.1	Type	Microprocessor based	
2.2	Display	Digital LED display	
2.3	Digit Height	14 mm or higher	
2.4	No. of Digits	3 ½	
2.5	Input	4-20 mA	

2.6	Zero & Span Adjustment	Required	
2.7	Engineering Units for display	Required (User Defined)	
2.8	Accuracy	±0.1 % of span	
2.9	Enclosure Material	Non corrosive Polycarbonate or better	
2.10	Retransmission output	Isolated 4-20 mA DC-2 nos	
2.11	Power supply to Transmitter	230VAC / 24 V DC	
2.12	Alarm outputs	1NO+1NC for high and Low alarms (adjustable)	

1.17. Typical Laboratory equipments to be provided are detailed as below:

Sr. No.	Description	Unit	Qty	To be filled by Bidder (Yes / No)
1	Comparator test set for residual chlorine or chloroscope	No.	1	
2	Multi parameter (pH & Conductivity Meter)	No.	1	
3	Mains operated pH meter completed with one calomel electrode and glass electrode	No.	1	
4	Photoelectric calorimeter / Spectrophotometer	No.	1	
5	Water bath with 6 to 8 concentric holes and discs, electrically heated	No.	1	
6	Hot plates	No.	25	
7	Distilled water plant	No.	1	
8	Demineraliser	No.	1	
9	Refrigerator (280 litres capacity) double door	No.	1	
10	Muffle furnace	No.	1	
11	Electric oven	No.	1	
12	Magnetic' stirrer	No.	1	
13	Analytical balance with weight box	No.	1	
14	Jar-Test apparatus (Phipps & Bird)	No.	1	
15	Centrifuge	No.	1	
16	Gas cylinder if gas supply is not available	No.	1	
17	Fume cupboard	No.	2	
18	Depth Sampler	No.	2	
19	Total Organic Analyser	No.	1	

20	Sieve shaker with standard sieves and two pan balance weighing up to 200gm samples	No.	1	
21	Equipment Needed For Bacteriological Examination			
22	Hot Air Oven	No.	1	
23	Autoclave	No.	1	
24	Incubator 37°C or 44°C (Water/Air-Jacketed)	No.	1	
25	Binocular microscope	No.	1	
26	pH Meter	No.	1	
27	Pipette Box (Stainless Steel)	No.	10	
28	Wooden Racks/Aluminium Racks	No.	5	
29	Wire Baskets	No.	10	
30	Cotton/ Aluminium Foils	No.	10	
31	Burners (Bunsen) With Pilot Lamp	No.	3	
32	Suction Flask (1 Litre Cap)	No.	2	
33	Suction Pump	No.	1	
34	Sampling Bottles	No.	10	
35	Measuring Cylinders (1000 ML, 500 ML, 200 ML, 100 ML, 50 ML, 25 ML)	Set	3	
36	Vacuum pump	No.	1	
37	Soxhlet extraction unit	No.	1	
38	Kjeldhal digestion unit	No.	1	
39	Weighing Balance (max 10kg)	No.	1	
40	Laminar Air Flow chamber	No.	1	
41	Bacteriological Media	No.	1	
42	M. Endo Broth (dehydrated)	No.	1	
43	Lactose or Lauryl Tryptose broth	No.	1	
44	Mac Conkey broth	No.	1	
45	Brilliant Green Bile Lactose Broth	No.	1	
46	Total Plate Count Agar	No.	1	
47	Peptone/Tryptone Water	No.	1	

2. Automation Equipments

2.1. Technical Particulars (PLC & SCADA System)

Sr. No.	Description	Particulars	To be filled by Bidder
1	General		

1.1	Make	As per approved vendor list	
1.2	Item	PLC System	
1.3	Service	Plant Automation	
1.4	Area Classification	Non Hazardous	
2	PLC System		
2.1	Type of Control system	Programmable Logic Controller (PLC)	
2.2	Offered PLC System configuration and PLC system hardware	Latest system available / being supplied in the international market by the manufacturer with proven performance record for the similar type of application	
2.3	Operating System windows based	Windows –XP/7 or latest.	
2.4	Hierarchical protection for operator & engineer functions	Multi-level security required	
2.5	UPS – Input-415V AC, 3Ø, 50 Hz Output- 230 V AC, 1Ø, 50 Hz	UPS of adequate capacity with battery back-up of min. 1hour (SMF Nickel-Cadmium batteries).	
2.6	No of UPS feeders (outgoing)	Bidder to indicate	
2.7	UPS sizing	Bidder to indicate. Adequate capacity UPS considering 30 % spare load.	
2.8	UPS Battery back-up time	Min. One (1) hour	
2.9	Response time (Maximum) for		
2.10	Analog input	250 m sec	
2.11	RTD	1 sec	
2.12	Digital Input / output	25 - 50 m sec	
2.13	Loop cycle time inclusive of controller processing time	250 m sec (Analog); 100 m sec (Digital)	
2.14	Auto switchover time to backup/redundant component at a) Processor level b) Communication level	Instantaneous and bump-less (Bidder to indicate the time)	

	c) Power supply level		
2.15	Card changeover, card wiring removal or communication cable change shall be possible on-line (PLC running) without causing any process interruption	PLC Card removal shall be hot swappable.	
2.16	Display Call up time in HMI monitor	1 sec or better	
2.17	Dynamic update time of parameters in the HMI monitor for measurement and control	1 sec. or better	
2.18	Spare capacity required in the control processor considering spare I/O channels and future I/O modules to be located in the spare I/o slots	Minimum 20 %	
2.19	Output status on controller failure	Configurable in engineering station	
2.20	Output status on power supply failure	Configurable for switching to fail safe mode	
2.21	Status indication for each channel in DI / DO card	LED indication required	
2.22	Power supply healthiness status in all modules	LED indication required	
2.23	Optical Isolation with IPR for DI / DO	Required	
2.24	Galvanic isolation for AI / AO	Required	
2.25	Fuse Protection for AI / DI modules	Required	
2.26	Fused terminals with LED indications for each DO and also for Power supply to PLC	Required	
2.27	All I/O module status monitoring (Channel & Module level) in PLC system HMI & shall be from same processor family.	Required	
2.28	Self-diagnostics for all PLC modules	Required	
2.29	Control processor with floating point arithmetic	64 bit processor	

	capability		
2.30	Capacity of RAM	2 MB minimum	
2.31	Spare capacity in RAM	Minimum 50 % including spare I/Os	
2.32	Processor Redundancy	Required. Dual redundant hot stand-by, Physical cable connectivity between primary and secondary controllers, loading of programs in primary controller alone.	
2.33	Power supply source redundancy with Auto changeover scheme.	Required. Shall be implemented at each PLC side.	
2.34	Power supply module redundancy in the PLC panel	Required	
2.35	Communication module redundancy	Required	
2.36	Failure of communication module/ data bus/ communication bus/Power supply module shall not lead to change over of Processor/CPU	Required	
2.37	Network & Network module redundancy	Required	
2.38	Hot redundant connectivity between processor to I/O rack	Required	
2.39	Primary and secondary indication on controllers	LED indication & also in MMI required	
2.40	Memory expandability	150% of offered capacity	
2.41	RAM with Battery back up	Minimum 72 hr without power.	
2.42	Supply of Flash RAM for memory /Program retention	Required	
2.43	Closed loop control	Redundant I/O system	
2.44	Open loop control (Logic, protection & interlock)	Non-redundant I/O modules	
2.45	Maximum number of channels in I/O modules- Analog I/O modules RTD, Thermocouple	8 Channels (Differential type) 16 Channels	

	Digital I/O modules	16 Channels	
2.46	Input–Output Philosophy		
2.47	Motor	<p>Digital Input: Local / Remote Selector-1 No Run Feedback- 1 No Stop Feedback- 1 No Over Load Feedback- 1 No Digital Output: Start Command- 1 No Stop Command-1 No Analog Input: Speed Feedback (Applicable for VFD driven Pump)-1 No Vibration Sensor Feedback(Applicable for MV Motor)- 6 Nos Analog Output: Speed Reference (Applicable for VFD driven Pump)-1 No RTD Input: Windings & DE / NDE Bearings Temperature (Applicable for motor having winding and bearing RTDs)- 8 Nos</p>	
2.48	Pump / Blower	<p>Analog Input: Pressure Transmitter- 1 No (wherever continuous Pressure monitoring is required) Flow Transmitter- 1 No (wherever continuous Flow monitoring is required)</p>	
2.49	Motorized Valve	<p>Digital Input: Local / Remote Selector-1 No Open Feedback- 1 No Close Feedback- 1 No Over Load Feedback- 1 No Torque Switch Feedback- 1 no Digital Output: Open Command- 1 No Close Command-1 No Analog Input:</p>	

		Position Feedback (Applicable for Modulated Control Valve)-1 No Analog Output: Position Reference (Applicable for Modulated Control Valve)-1 No	
2.50	Breaker	Digital Input: Local / Remote Selector - 1 No ON Feedback- 1 No OFF Feedback- 1 No Master Trip Relay Operated- 1 No Digital Output: ON Command- 1 No OFF Command-1 No	
2.51	Transformer	Digital Input: Oil Level Low Alarm-1 No Oil Temperature High- 1 No Oil Temperature Very High-1 No Winding Temperature High- 1 No Winding Temperature Very high-1 No Buchholz Alarm-1 No Buchholz Trip-1 No Pressure Relief Device Trip -1 No OLTC Fault-1 No	
2.52	Sump / Tank	Digital Input: Level Very High-1 No Level High -1 No Level Low-1 No Level Very Low-1 No Analog Input: Level Transmitter- 1 No (wherever continuous Level monitoring is required)	
2.53	Power supply to the field transmitters	Analog input module shall drive the connected field transmitter on 2 wire loop	
2.54	Interrogation voltage for Digital signals	24 V DC	
2.55	Concept of I/O grouping	a) No two identical / similar equipment shall be grouped in the	

		<p>same I/O module</p> <p>b) I/Os related to equipment and I/Os related to its associated auxiliaries shall be connected to different modules.</p> <p>c) Inputs and outputs shall not be combined in a single module.</p>	
2.56	USB ports on Operator station	4 nos.	
2.57	DVD R/W drives on Operator Station	One(1)	
2.58	Displays on HMI monitor	Process mimic displays, trend displays, system status, alarm displays, logs / reports etc. HMI software shall have minimum 100 pages with unlimited tags.	
2.59	Minimum no of plant mimics configurable	100	
2.60	Time activated logs	Periodic logs, shift report, daily report, status change log, Control system fault log	
2.61	Operator Work Station (OWS)	<p>One no. Industrial grade OWS shall be considered.</p> <ul style="list-style-type: none"> - Intel I5/ I7, Minimum 3.6 GHz processor or latest - 22” LED Monitor - 8 GB RAM min or better - 1 TB HDD - ASCII keyboard - DVD R/W Drive - Workstation model <p>Original OS & antivirus</p>	
2.62	Engineering Work Station cum OWS	<p>One no. industrial grade EWS cum OWS shall be considered.</p> <ul style="list-style-type: none"> - Intel I5 / I7, Minimum 3.6 GHz processor or latest - 22” LED Monitor - 8 GB RAM min or better - 1TB HDD - DVD R/W Drive - QWERTY Keyboard - Workstation model <p>Original OS & antivirus</p>	
2.63	Annunciation System	Integral to the PLC	

2.64	Printers	One A3/A4 size colour laser jet printer (600 DPI resolution) shall be provided	
2.65	Hot Spare I/O modules	20 % (wired up & mounted) hot spare modules for each type of I/O module shall be provided in the panel	
2.66	Spare Channels in each I/O Module used	20 % (wired up) spare channels over the entire population of each type of module.	
2.67	Spare slots in the I/O rack (wired with connector)	20% additional slots/base in each rack shall be provided which shall be wired with connectors for future provision. This is in addition to the required 20 % (wired & mounted) hot spare modules.	
2.68	Fuse with led indication for I/O channels	<ul style="list-style-type: none"> - Individual for analog signals - Group of max 8 for digital channels 	
2.69	PLC hardware	G3 rated	
2.70	SER	SER in PLC is envisaged for electrical signal only.	
2.71	Interposing Relays	24 V DC with freewheeling diode across the coil – Relay contact rating A at 230 V AC	
2.72	Panels / Cabinets	Self Standing type with maximum height of 2200mm	
2.73	Mechanical features	a) 2 mm thick CRCA steel sheet for panel walls. 3mm thick removable gland plate b) 2.5 mm thickness for double doors c) Panel - door switch d) Fans and louvers e) Paint as per RAL 7035 f) Automated panel Illumination by push buttons g) Suitable enclosure protection h) Anti-vibration pad of	i)

		minimum 15mm thickness.	
2.74	Panel Earthing	Safety earth for enclosure and Electronic earth for PLC system.	
2.75	Control room	Air Conditioned.	
2.76	Quality Assurance	As per quality plan to be approved by the Purchaser / Engineer	
2.77	Inspection Requirements	Factory Acceptance Test & Site Acceptance Test as per procedure approved by the Purchaser / Engineer.	
2.78	Communication	The communication shall be redundant between the control processors and HMI as well as across processors and transmission rate shall be minimum 100 MBPS / 1GBPS through multiport switch having FO ports, ensuring adequate number of spare ports. Also communication between control processors and I/O shall be redundant. PLC shall be provided with required number of Modbus ports. PLC shall have time synchronisation facility with master clock directly connected to PLC cards.	
2.79	Undertaking for Spares & support	OEM's undertaking shall be furnished for Spares & service support for minimum 15 years.	
2.80	Make of PLC	As per Approved List.	
	Control Cabinets/ Consoles:		
2.81	Type & Constructional Features	<ul style="list-style-type: none"> Indoor, Self Standing type with maximum height of 2200 mm Sheet Steel Thickness - 2.0 mm thick CRCA sheet for panel walls. 3mm thick removable gland plate. Pant Finish as per RAL- 	

		7032. • Enclosure Protection – IP54 • Anti-vibration pad of minimum 15 mm thickness.	
2.82	Accessories	• Panel - door switch • Fans and louvers • Panel Illumination Lamps	
2.83	Consoles & Chairs	Consoles for OWS, EOWS & Printers. Two (2) nos. operator chairs (revolving type)	
2.84	Software:		
	PLC Development License Software	Required	
	SCADA Development License Software	Required	
	SCADA Run Time License Software	Required	
	Work Station Operating System License Software	Required	
	Air Conditioner:		
	Air Conditioner minimum 2 Ton, 5 Star Rating with Copper Tubing, Fittings & Accessories.	Required	

2.2. Technical Particulars (UPS System)

Sr. No.	Description	Particulars	To be filled by Bidder
1	General		
1.1	Make	As per approved vendor list	
1.2	Item	UPS	
1.3	Service	Instrumentation & Automation System	
1.4	Area Classification	Non Hazardous	
2	UPS		
2.1	Input	415V, 3P / 240V 1P AC (to be decided during detailed engineering)	
2.2	Output	230V AC, 50 Hz	
2.3	UPS Capacity	*KVA (* KVA rating shall be finalized during detailed engineering)	

2.4	UPS Battery back-up time	Minimum 60 min.(SMF NI-CD)	
2.5	No of UPS feeders (outgoing)	As per system requirement.	
2.6	UPS Type	Online, Double Conversion, Industrial	
2.7	Rectifier Charger Type	SCR / IGBT Based	
2.8	Static Inverter Type	SCR / IGBT Based	
2.9	Static Transfer Switch Type	SCR-SCR Based	
2.10	Bypass	Solid State Static Bypass with Isolation in matching cubical	
2.11	Manual Bypass Switch Type	Change over	
2.12	Battery Type	SMF NI-CD	
2.13	Isolation Transformer	Required, Built in within UPS- Input Side & Output Side	
2.14	Degree of Protection	IP41 or better	
2.15	Cable Entry	Back Side Bottom	
2.16	Communication - SNMP Card & MODBUS	Required	
2.17	Potential Free Contacts	<ul style="list-style-type: none"> - Rectifier Trip - Inverter Trip - Load on Battery - Battery low Pre-alarm - Load on Static Bypass - One Relay contact for each, Rating – 1A/230 VAC OR 2A / 12 VDC 	
2.18	Drawings / Documents	SLD, GA, Power & Control Wiring Diagram & Foundation Details, Type Test Certificate, FAT/SAT Procedure	
2.19	Reference standard	IEC 62040-3 or equivalent	

3. Cable

3.1. Instrument Signal Cables (4 – 20 mA or Switch Contacts):

Sr. No.	Description	Particulars	To be filled by Bidder
1	Conductor		
i)	Single / Multi Pair	7 stranded / 0.53 mm dia (1.5 mm ²) stranded annealed tinned copper	

		conductors of electrolytic grade copper.	
2	Insulation	Cross-linked Polyethylene (XLPE) as per BS 5308/IS 7098	
3	Inner & outer sheath	PVC, fire retardant, low smoke, low halogen, low toxic, polymeric compound.	
4	Pairs	Two insulated conductors shall be uniformly twisted together to form a pair at least 10 twists per metre.	
5	Maximum DC resistance	Shall not exceed 12.3 ohms/ km at 20°C for cables with 1.5 mm conductor.	
6	Mutual capacitance	BS 5308 Part 1	
7	L/R ratio of adjacent cores / pairs	BS 5308 Part 1	
8	Shield	Shield shall be aluminium backed mylar / polyester tape bonded together with the metallic side down helically applied with either side having 25% overlap and 100% coverage. The minimum shield thickness shall be 0.05 mm in case of single pair and 0.075 mm in case of multi pair cable.	
9	Drain wire	Drain wire shall be provided for individual pair and overall shield with 0.5 mm ²) multistranded bare tinned annealed copper conductor continuously	

		<p>in contact with aluminium side of shield.</p> <p>The drain wire resistance including shield shall not exceed 30 ohm/km.</p> <p>Electrostatic noise rejection ratio shall be over 76 dB.</p>	
10	Colour coding	<p>Individual pair core insulation : Blue & Black</p> <p>Inner jacket : Black</p> <p>Outer jacket: Blue for intrinsically safe application and blue with black bands (4 bands at 90° apart) for non IS applications.</p>	

3.2. RTD cables:

Sr. No.	Description	Particulars	To be filled by Bidder
1	Conductor Single / Multi Triad	7 stranded / 0.53 mm dia (1.5 mm ²) annealed tinned copper conductors of electrolytic grade copper.	
2	Insulation	Cross-linked Polyethylene (XLPE) as per BS 5308 / IS 7098	
3	Inner & outer sheath	PVC, fire retardant, low smoke, low halogen, low toxic, polymeric compound.	
4	Triads	Three insulated conductors shall be uniformly twisted together to form a Triad at least 10 twists per metre.	

5	Maximum DC resistance	Shall not exceed 12.3 ohms/ km at 20°C for cables with 1.5 mm ² conductor	
6	Mutual capacitance	BS 5308 Part 1	
7	L/R ratio of adjacent triads	BS 5308 Part 1	
8	Shield	Shield shall be aluminium backed mylar / polyester tape bonded together with the metallic side down helically applied with either side having 25% overlap and 100% coverage. The minimum shield thickness shall be 0.05 mm in case of single triad and 0.075 mm in case of multitriad cable	
9	Drain wire	Drain wire shall be provided for individual pair and overall shield With 0.5 mm ² multistranded bare tinned annealed copper conductor continuously in contact with aluminium side of shield. The drain wire resistance including shield shall not exceed 30 ohm/km. Electrostatic noise rejection ratio shall be over 76 dB.	
10	Colour coding	Core insulation : Red, Yellow and Blue Inner jacket : Black Outer jacket: Blue for	

		intrinsically safe application and blue with black bands (4 bands at 90° apart).	
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3.3. Thermocouple cables:

Sr. No.	Description	Particulars	To be filled by Bidder
1	Conductor Single pair cable	16 AWG or 1.5 mm ² solid conductors Conductor material should be as follows: K type T/C – Nickel / Chromium; Nickel / Aluminium (KX), Class 1	
2	Insulation	Cross-linked Polyethylene (XLPE) as per BS 5308 / IS 7098 Colour code: Nickel / Chromium: Green Nickel/Aluminium: White	
3	Pairs	Two insulated conductors shall be uniformly twisted together to form a pair at least 10 twists per metre. The lay length of adjacent pairs/Triads in case of Multipair cables shall not be equal, to reduce cross-talk.	
4	Mutual capacitance	BS 5308 Part 1	
5	L/R ratio of adjacent triads	BS 5308 Part 1	
6	Core inductance	Shall not exceed 4 mH /km. However, for J-type thermocouple inductance could be 8 mH/km.	
7	Shield	Shield shall be aluminium backed mylar / polyester tape bonded together with the metallic side down helically applied with either side having 25% overlap and 100% coverage. The minimum shield thickness shall be 0.05 mm in case of single pair	

		and 0.075 mm in case of multi pair cable	
8	Drain wire	Drain wire shall be provided for individual pair and overall shield with 0.5 m m ² multistranded bare tinned annealed copper conductor continuously in contact with aluminium side of shield. The drain wire resistance including shield shall not exceed 30 ohm/km. Electrostatic noise rejection ratio shall be over 76 dB.	
9	Colour coding	Outer sheath colour - Green Inner sheath colour - Black	

3.4. Control cables:

Sr. No.	Description	Particulars	To be filled by Bidder
1	Conductor 2 Core / Multi-core type	7 stranded / 0.53 mm dia (1.5 mm ²) annealed tinned copper conductors of electrolytic grade copper.	
2	Insulation	Cross-linked Polyethylene (XLPE) as per BS 5308 / IS 7098	
3	Inner & outer sheath	PVC, fire retardant, low smoke, low halogen, low toxic, polymeric compound.	
4	Maximum DC resistance	Shall not exceed 12.3 ohms/ km at 20°C for cables with 1.5 mm ² conductor	
5	Core Identification	IS : 1554 / BS 6746	

3.5. Power cables:

Sr. No.	Description	Particulars	To be filled Bidder
1	Conductor	7 stranded / 0.67 mm dia (2.5 mm ²) annealed tinned copper conductors of electrolytic grade copper.	

		<p>The size of the conductor specified here is minimum however; the exact size of the conductor shall be selected based on the length of cable and power consumption. For higher conductor Sizes, aluminium can be considered.</p>	
2	Insulation	<p>Cross-linked Polyethylene (XLPE) as per BS 5308 / IS 7098</p>	
3	Core Identification	IS-1554 / BS 6746	
4	Colour coding	<p>Outer sheath colour Black</p> <p>Neutral wire insulation colour – Black</p> <p>Phase wire insulation colour – Red</p> <p>Ground wire insulation colour - Green –</p>	