TECHNICAL SPECIFICATION

The primary purpose of this section is to provide basic data such as the wastewater quantity & quality, and the treatment plant scheme. The rationale behind the selection of treatment system is also presented. The quantity of the combined effluent discharged from the septage is likely to be as indicated in the bid document. This shall be taken as the design capacity of the FSTP in 5KLD. The characteristic of raw effluent from the processing plant is given in bid document. The desired treated effluent characteristics, which the Contractor shall guarantee, are also specified in bid document

TABLE OF CONTENT

1. INTRODUCTION 4
1.1 Project Background 4
1.2 Project City and City Profile 4
1.3 Existing Sanitation System 4
1.4 Purpose and Outcome of the Project 4
2. FECAL SLUDGE TREATMENT PLANT 5
2.1 Area Description and Land Availability 5
2.2 Design Criteria 6
2.3 Process Description 6
2.3.1 Preliminary treatment 6
2.3.2 Primary treatment 7
2.3.3 Secondary treatment 7
2.3.4 Tertiary and/or Advanced treatment 7
2.4 Process Units 7
2.5 Process Design 8
2.6 Salient Features of FSTP 9
2.7 Minimum Number of Units 9
3. TECHNICAL DETAILS OF FSTP UNITS 9
3.1 Inlet Chamber 9
3.2 Sewage Collection Cum Bio-Digester Tank 9
3.3 Fecal Sludge Transfer Pump 10
3.4 Primary lamella clarifier 11
3.5 Ozoneter 11
3.6 Aeration for MBBR1-MBBR2 12
3.7 MBBR System 12
3.8 Bio Media 12
3.9 Twin Lobe Rotary air Blower 13
3.10 Primary Aeration Tank MBBR1 13
3.11 Secondary Aeration Tank MBBR2 13
3.12 Secondary Lamellar Clarifiers 14
3.13 Sludge Drying Bed 14
3.14 Holding Sump 14
3.15 Filter Feed Pump 14
3.16 Clear Water Collection Tank 14
3.17 Media Gravel Filter (MGF) 15
3.18 Activated Carbon Filter 15
4. DETAILS OF INTERCONNECTING PIPING 16
5. DETAILS OF ELECTRICAL WORKS 17
5.1 Level control Switches 17
5.2 Electrification of Plant Shed: - 17
5.2.1 Control Panel 17
5.2.2 Cabling 17
6. DETAILS OF CIVIL WORKS 18
7. MAKES OF EQUIPMENTS 19

1. INTRODUCTION

1.1 Project Background

Ambikapur is the model city for the country in showcasing 100% efficiency in door-to-door collection of municipal solid waste. As a part of Swachh Bharat Mission in 2015, the Municipal Corporation launched Swachh Ambikapur Mission and the city was awarded as 'India's Cleanest City' in Swacchta Surveskshan 2017 amongst cities with population less than 2 Lakh. But management of other sanitation waste, like liquid waste and septage are equally important component of Swacch Bharat Mission which involves safe containment, collection, transportation, treatment and disposal of fecal sludge or sewage. Thus, to ensure 100% safe handling of sludge, a fecal sludge treatment plant is required in Ambikapur.

1.2 Project City and City Profile

Ambikapur is a Class-I city located in the Surguja district of Chhattisgarh. It is located 338 km from Raipur, 177 km from Korba and 224 km from Bilaspur. It is surrounded by Lakhanpur Tehsil towards South, Surajpur Tehsil towards west, Lundra Tehsil towards East, Rajpur Tehsil towards North.Ambikapur is well connected to major cities in Chhattisgarh such as Raipur, Bilaspur, Durg, Bhilai, Korba and Raigarh. It is also well connected to nearby cities like Varanasi, Renukoot in U.P (170 km), Raipur (345 km) and Gadhwa in Jharkhand (160 km).

The city has an area of 35.36 sq.km. and a population of 1,45,300 persons as on 2017. The corporation area is divided into 48 wards with 29,112 households.

1.3 Existing Sanitation System

In Ambikapur, individual households have their latrines connected to septic tanks and overflow is discharged in to surface drains. Commercial, industrial and other institutional housing also have septic tanks and outlets are connected to the drainage through soak pit. There is no centralized sewerage system in Ambikapur.

At present, there are 2 desludging trucks of 2500 L capacity available with the Nagar Nigam which provide septage cleaning services. Further, 2 more desludging trucks of 3000 L capacity are under procurement and 1 small truck of 1000 L capacity and 1 suction-cum-jetting machine of 9000 L capacity are proposed under AMRUT City Mission.

The households request the Nagar Nigam to provide desludging services by making an application. The average frequency for cleaning of septic tanks is about 10-15 years. At present, no sludge/ sewage treatment facility is available in and around the city.Thus, there is an utmost need of faecal sludge treatment facility in the town for safe and sustainable disposal of collected sludge.

1.4 Purpose and Outcome of the Project

Considering the population of 1,45,300 persons with 29,112 households in the city, and a desludging interval of 8 years, a treatment plant of capacity 50 KLD is required in Ambikapur for 2017. But as a pilot project, the purpose of this project is to set up a Fecal Sludge Treatment Plant of 5 KLD design capacity.

The result of successful implementation of such pilot will allow ULB to replicate the same to fulfill the demand of septage treatment. This pilot project is also intended to facilitate demand for sanitation solutionsto replicate in other project towns.

The outcome of successful implementation of this project will be improved urban sanitation service delivery in the state.

2. FECAL SLUDGE TREATMENT PLANT

All organic waste disposal in India is a burning problem. The problem has further aggravated in rural places in India & responsible for spreading of Water Born Diseases like Typhoid, Cholera, Shigellosis, Amoebic Dysenteries and Diarrhoea etc. With help of this BIO-STP Technology it can be overcome with all these problems and make India's environment better to live.

The waste shall be treated in Fecal sludge Treatment Plant by biological treatment.Keeping in view the site requirements, ULB has decided to have Fecal sludge Treatment Plant of capacity 5 KLD.The plan for the Fecal sludge Treatment Plant on the basis of 24 hrs. biological operation and 8 hrs. mechanical operation.

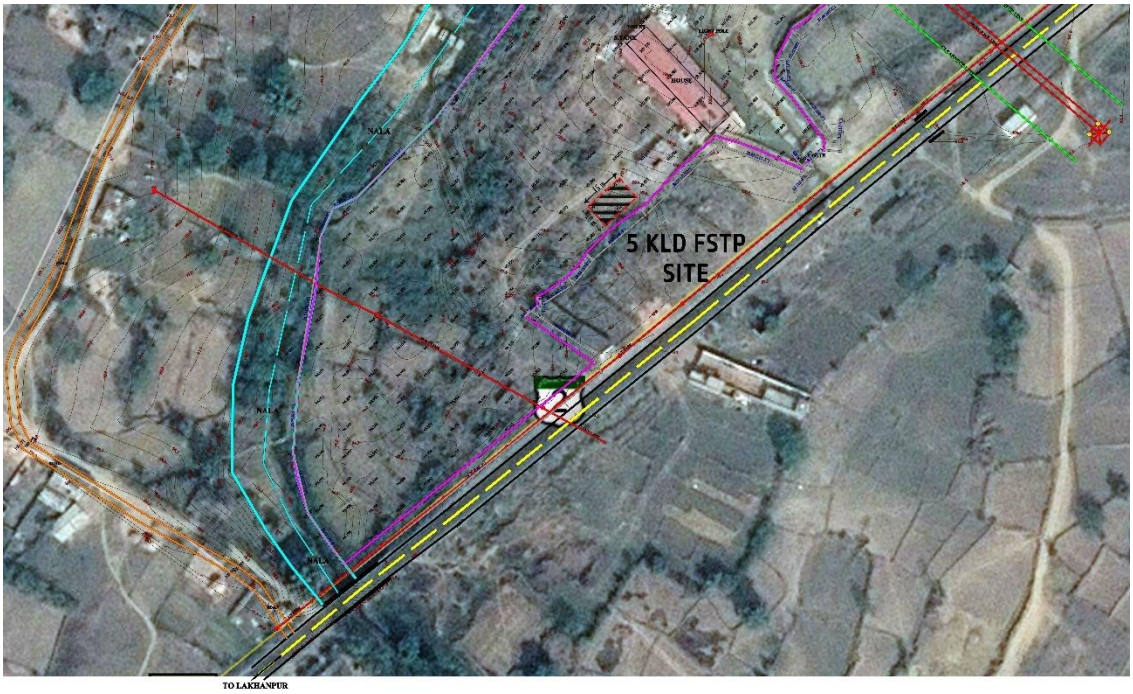
The NIT is for design, supply, erection, installation, commissioning and testing of Fecal sludge Treatment Plant (FSTP) with all interconnecting piping works, mechanical, electrical, instrumentation works, civil works etc. as per the scope of supply. It will bring down the values of all the parameters in the treated septage within the permissible norms fixed by State Pollution Control Board.

A Fecal sludge Treatment Plant has been to be designed, constructed, implemented and operated based on UpdatedTechnology - HYBRID Process of Bio-treatment with + MBBR Technology and upgraded clarifier.

Conventional method is not encouraged in this bid. The advantages compared to conventional biological process are given below. In general, the main advantages shown by latest process compared to conventionalbiological processes are:

- Education in the volume of the biological reactor because it uses a support or carrier that gives a high specific surface.
- It does not require reactor biomass recirculation – This gives rise to the fact that the biomass does not depend on the final separation of the sludge and as a consequence typical problems found in conventional activated sludge processes related to the sedimentation properties of the sludge (filamentous bulking, etc.).
- The operation and control is simple for this type of processes. On the one hand the process avoids blockage problems and consequently regular cleaning period, in addition it is not necessary to control the sludge purging since the system keeps the biomass in the reactor until it comes off the support.

2.1 Area Description and Land Availability



The land for the treatment planthas been identified within the Sanitary Park. Allocated area for FSTP is about 400 sqm. The site is situated at the south side of Sanitary Park. It has an exclusive access road which is presently unmetalled.

The area is slopy towards south, with an average slope of 1m in 20m. Average ground level is 570 m msl. There is a canal flowing at the west side of the site.

2.2 Design Criteria

The term sewage sludge is generally used to describe residuals from centralized wastewater treatment, while the term septage is used to describe the residuals from septic tanks. Fecal sludge: Fecal sludge is the solid or settled contents of pit latrines and septic tank srequires aerobic treatment including polishing treatment to make it suitable for reuse gardening purpose. The design criteria for septage treatment plant on following parameters as under:

SR.NO	Parameter	INLET	OUTLET
1	FLOW	5 CUM/DAY	
2	PH	6.5 to 8.5	6.5-9.5
3	SUSPENDED SOLIDS	250 mg/Li. Max	10 mg/lit Max
4	BOD	1000-1600 mg/Li. Max	<10
5	COD	3000-5200 mg/Li. Max	<50
6	TSS	As Per Report	< 150
7	OIL & GREASE	50 mg/Li. Max	<10

Treated effluent quality shall meet out standards as given in the Outlet Parameter, which shall be considered as the **functional guarantee parameter** from quality point of vies.

The No. of hours to calculate the average flow has been taken as 20 hrs to ensure nearly continuous operation for the Lamella Clarifier With Aeration. The peak factor of 2.0 has been considered to calculate the peak flow.

Sl.No.	TYPE OF INFLUENT	QUANTITY
a.	WASTE WATER (SEWAGE)	5KLD
b.	AVERAGE FLOW	1.25 KL/HR
c.	PEAK FLOW	2.01 KL/HR

2.3 Process Description

Residential usually through it's waste sewage into rivers/canals etc. Before flowing this liquid to outward, the plant which treats this sewage to a harmless form for the environment is known as Fecal sludge Treatment Plant (FSTP). FSTP not only covers the mechanisms but also the processes, to used treat water that have been polluted in some way by man-made industrial or commercial activities prior to its release either into the environment or re-use.

The FSTP designed to treat sewage coming from different areas of the plant. The treatment of different type of sewage varies with the characteristics of sewage / septage. Wastewater treatment consists of a combination of physical, chemical, and biological processes and operations to remove solids, organic matter and, sometimes, nutrients from wastewater. General terms used to describe different degrees of treatment, in order of increasing treatment level, are preliminary, primary, secondary, and tertiary and/or advanced wastewater treatment. In some countries, disinfection to remove pathogens sometimes follows the last treatment step.

2.3.1 Preliminary treatment

The objective of preliminary treatment is the removal of coarse solids and other large materials that are found in septage. Removal of these materials is necessary to enhance the operation and maintenance of subsequent treatment units. Preliminary treatment operations typically include inlet chamber and, in some cases, breaking of large objects into the smaller objects.

2.3.2 Primary treatment

Primary treatment usually includes the removal of large solids from the wastewater via physical settling or filtration. The objective of primary treatment is the removal of settleable organic and inorganic solids by biodegradable dissolved anaerobic biological process bio digester, and the removal of materials that will float (scum) by skimming. Approximately 25 to 50% of the incoming biochemical oxygen demand (BOD5), 50 to 70% of the total suspended solids (SS), and 65% of the oil and grease areremoved during primary treatment. Some organic nitrogen, organic phosphorus, and heavy metals associated with solids are also removed during bio digester but colloidal and dissolved constituents are not affected. The septage from bio digester units is referred to as primary effluent.

2.3.3 Secondary treatment

The objective of secondary treatment is the further treatment of the sewage from primary treatment to remove the residual organics and suspended solids. Secondary treatment typically removes the smaller solids and particles remaining in the wastewater through fine filtration aided by the use of lamella clarifier settler or through the use of microbes, which utilize organics as an energy source. In most cases, secondary treatment follows primary treatment and involves the removal of biodegradable dissolved and colloidal organic matter using aerobic biological treatment processes. Aerobic biological treatment is performed in the presence of oxygen by aerobic microorganisms (principally bacteria) that metabolize the organic matter in the wastewater, thereby producing more microorganisms and inorganic end-products (principally CO2, NH3, and H2O). Several aerobic biological processes are used for secondary treatment differing primarily in the manner in which oxygen is supplied to the microorganisms and in the rate at which organisms metabolize the organic matter.

This step removes stubborn contaminants that primary treatment was not able to clean up. Wastewater effluent becomes even cleaner in this treatment process through the use of stronger and more advanced treatment systems. Individual treatment processes are necessary to remove nitrogen, phosphorus, additional suspended solids, refractory organics, heavy metals and dissolved solids. Because advanced treatment usually follows high-rate secondary treatment, it is sometimes referred to as primary treatment. However, advanced treatment processes are sometimes combined with primary treatment (e.g. chemical addition to primary lamella clarifiers, primary aeration or secondary aeration & secondary lamella clarifier basins to remove phosphorus) or used in place of secondary treatment (e.g. overland flow treatment of primary effluent).

2.3.4 Tertiary and/or Advanced treatment

Tertiary treatment is the next wastewater treatment process after secondary treatment. The effluent from ozone, directly pumped to a Multi grade filter for removal of particulate matter. The effluent will be then taken through an activated carbon column for removal of trace Organics and pollutants (chlorine, color, trace organics etc.). Backwash of filters will be provided to remove trapped impurities and regenerate the output of filters on regular intervals.

Chlorination of treated effluent will be provided before final outlet with help of hypo solution dosing @ 3 to 5 ppm with help of dosing pump of 10% concentrated hypo chloride solution. It is recommended to kill Pathogenic bacteria, germs presence in treated effluent.

2.4 Process Units

The process units along with their brief purpose to be used for the treatment of theeffluent are given in the following table.

S.N.	PROCESS UNIT	BRIEF PURPOSE
01	02	03
1	Inlet chamber	Inlet for septage
2	Sewage collection cum bio-digester	Fordegradation of Bio degradable solids
3	Sump well	For anoxi and uplift to lamella

4	Primary Lamella clarifier	For flash mix, flocculation, oil & grease partially, settling settaleble solids
5	Ozonetion	For removing odor ,reduce bod & cod , kill bacteria .
6	PRIMARY AERATION tank MBBR-1	To provide air for biological treatment with MBBR media
7	Secondary AERATION tank MBBR-2	To provide air for biological treatment with MBBR media
8	Secondary lamella clarifier	Settling settaleble solids
9	Sludge Drying bed	Final solid liquid separation
10	Pressure sand filter	For removing the fine Biomass escaping the Tube/Lameller settler
11	Activated carbon filter	For removing the odor and colour
12	Treated water tank	For collecting treated effluent

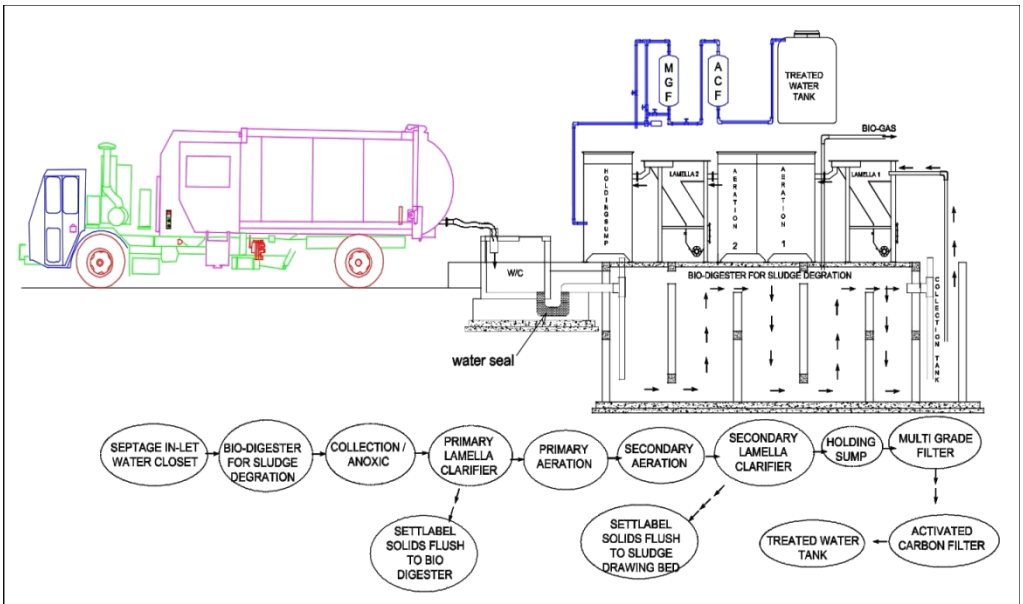
2.5 Process Design

The Contractor shall design the Treatment Plant for the design capacity mentioned above. The design shall achieve the treated effluent quality stipulated in the table above.

The Contractor shall design and build a water treatment plant giving due consideration for the construction, reliability in conformity to the treated water quality requirements, working within the space available, minimizing waste, optimizing the use of chemicals and power, managing the replacement of parts and materials, and providing operation and maintenance services. After Commissioning of the WTP, the Contractor shall operate and maintain the plant.

Based on the dimensions of process facilities determined and size of the associated equipments/ structures, the general layout of the plant shall be developed by the contractor.

Average Treatment Scheme shall be as:
Stage 1: Primary Treatment - Inlet Chamber & Biological treatment (bio digester),sump well.
Stage 2: Secondary or Chemical treatment - Primary lamella clarifier (Inlet Chamber, Oil & Grease Removal Tank) , ozone dosing, aeration tank 1,aeration tank 2 & secondery lamella clarifier
Stage 3: Tertiary treatment - holding sump, Pressure Sand Filter & Activated Carbon Filter, treated water tank.



FLOW CHART /SECTION PLAN FOR SEPTAGE WORK

2.6 Salient Features of FSTP

Few mandatory salient features are listed below:

1. The technology shall provide the high quality stabilize biological & lamella clarifier settler media of best quality, thus preventing algae formation.
2. The technology shall emphaseson always been on quality so that the system provided should have the least recurring maintenance costs.
3. The proposal shall accommodate stand by pumps and motors.

2.7 Minimum Number of Units

S.N.	DESCRIPTION	MINIMUM QUANTITY
1.	Inlet Chamber	1 No.
2.	Collection cum bio digester	1 No.
3.	Flower type sellter	1 lot
4.	Sump well	1 No.
5.	Primary Lamella Clarifier	1 No
6.	MBBR media	1 lot
7.	Air diffusers	1 lot
8.	Primary Aeration Tank MBBR1	1 No
9.	Secondary Aeration Tank MBBR2	1 No
10.	Secondary Lamella Clarifier	1 No
11.	Sludge Drying Bed	2 Nos.
12.	Holding Sump	1 No
13.	Final Treated Water Tank	1 No
14.	Air blower	2 Nos. (1+1)
15.	Sewage Lift Pump	2 Nos. (1+1)
16.	Filter Feed Pump	2 Nos. (1+1)
17.	Ozoneter	2 Nos. (1+1)
18.	Multi Grade Sand Filter (MGF)	1 No
19.	Activated Carbon filter (ACF)	1 No
20.	Control Penal	1 No
21.	Power Cables	1 No
22.	Pipes, Pipe Fittings, Valves, Pressure Gauge, and other accessories	1 lot

3. TECHNICAL DETAILS OF FSTP UNITS

3.1 Inlet Chamber

The first unit of Primary treatment is the Inlet Chamber, in which the sludge will be discharge from vacuum emptier. The detailed description of individual units & their functions are given below.

Location	Inlet chamber
Application	Screening of floatable matter
MOC	civil

3.2 Sewage Collection Cum Bio-Digester Tank

The process under this technology shall culminate in to treated effluent which is free from Pathogens and is also environmentally acceptable. The technology shall have major components:

A- Low temp active inoculums/AMI
B- Bio-Digesters

A consortium of Anaerobic Microbial Inoculums (AMI) has to be formulated and adopted to work at temperature varies from -52°C to 50°C. This is the component which shall act as inoculums (seed material) to the bio digester and converts the organic waste into biogas and carbon dioxide. The anaerobic process inactivates the pathogens responsible for water borne diseases. The optimum temperature is maintained by microbial heat, insulation of the reactor. The Outlet from bio digester is directly fed into the Reed Bed System, the final effluent is clear clean water.

This technology shall preferably be developed by DRDO-Ministry of Defense which would be an innovative technology for disposal of Organic waste in eco-friendly manner in bio digesters. These bio digester can function at any atmospheric temp between -55°C to 60°C. The bacterial consortium degrades night soil at temp as low as -55°C and produces colorless, odorless and inflammable biogas containing 50%-70% methane.

The main constituents of bio digesters are AMI which is filled into the bio digester in a capacity of 40% to the volume of bio digesters tank. Black & Grey water from Housing Multiplexes, Villages, and Public Places could be connected to the bio digester. Night soil degradation occurs through microbial reaction which would converts it into biogas & Clean Water.

The smell of night soil, the disease causing organisms in the night soil and the solid matter shall be eliminated totally. On dry weight basis 90% of the solid waste shall be reduced. The gaseous effluent (Biogas) is continuously let off to the atmosphere/Bio-Gas can be used for various energy incentive activities like cooking, water and room heating. Liquid effluent can be drained to any surface or soak pit without any environmental hazards.

Application	To store incoming effluent for uniform quality and continuous feeding of effluent
Location	After inlet chamber
MOC	Civil
Size	Suitable to handle 15-20 M3/day

3.3 Fecal Sludge Transfer Pump

Duty of this pump is to transfer raw septage from bio digester to primary lamella clarifiers tank.

Driving method directly shall be coupled through a flexible coupling. Driving machine Energy Efficient Electric motor- Eff. 1, TEFC, IP 55, rated for continuous duty, Class B insulation, industrial squirrel cage induction type, suitable for 415 V, 50 Hz. A/C supply.

- Type Horizontal, centrifugal, non-clog open impeller type, self-priming pump
- Material of construction - Cast Iron
- Capacity 1 M3/hr, 10 mt. WC total head
- No. of units required 2 Nos. (1 working + 1 Standby)
- Accessories to be supplied with each pump:
- MABT/FABT
- Flexible coupling with guard
- NRB
- Common MS base frame for pump and motor with grouting bolts.

Driving coupling shall be provided with a guard and motor shall be provided with GI sheet 20-gauge thick cover for protection from rain and dust.

Location	After Collection Sump well
Application	To feed effluent to next level
Size	Centrifugal , Horizontal , Self-priming , Monoblock

3.4 Primary lamella clarifier

Alamella clarifierorinclined plate settler(IPS) is a type ofsettlerdesigned to remove particulates from liquids. They use a series of inclined plates. These inclined plates provide a large effective settling area for a small footprint. The inlet stream is stilled upon entry into the clarifier. Solid particles begin to settle on the plates and begin to accumulate in collection hoppers at the bottom of the clarifier unit. The sludge is drawn off at the bottom of the hoppers and the clarified liquid exits the unit at the top over.

Design parameterclarification is to be achieved by providing either a lamella clarifier. The clarifiers are to be designed /checked for average as well as peak flow conditions.

In case of tube settler loading rate shall be worked out on the effective surface area.

Designed flow maximum	2810 Ltr / Hr.
Flash mix. Tank volume	70-120 Ltr.
Flocculation tank volume	78 Ltr.
Total pre- treatment volume	95 – 98 Ltr.
Effluent piping connection	50 mm dia & 150 mm flange
Solids discharge connection	50 mm dia & 150 mm flange
Sludge capacity	158.76 Ltr.
Plate area	3.62 Sqm
Liquid volume	669.06 li.
Retention time @ maximum flow rate	18 minutes
Designed solids removal	95+ % @ 200ppm infuluent
Under flow solids	1-2 % solids

Location	After bio digester
Application	To removes solid particulates or suspended solids
Capacity	Suitable to handle 5 kld
Description	With Tube setting and collection compartments with sludge withdrawal system
MOC	MS With Under Lining FRP

3.5 Ozoneter

Ozonewastewater treatment is a method that is increasing in popularity. An ozonegenerator is used to break down pollutants in the water source.

- The generatorsconvert oxygen into ozone by using ultraviolet radiation or by an electricdischarge field.
- Ozone is a very reactive gas that can oxidise bacteria, moulds, organic material and other pollutants found in water.
- Using ozone to treatwastewater has many benefits:
  - Kills bacteriaeffectively.
  - Oxidises substances such as iron and sulphur so that they can be filtered out of the solution.
  - There are no nastyodours or residues produced from the treatment.
  - Ozone converts backinto oxygen quickly, and leaves no trace once it has been used.
- The disadvantages ofusing ozone as a treatment for wastewater are:
  - The treatmentrequires energy in the form of electricity; this can cost money and cannot work when the power is lost.
  - The treatment cannotremove dissolved minerals and salts.
  - Ozone treatment cansometimes produce by-products such as bromate that can harm human health sif they are not controlled.

	Ozoneter
Location	Near Clarifier
Application	To dose the ozone
Capacity	5 gm
Type	Electronic

3.6 Aeration for MBBR1-MBBR2

The aeration system shall be suitable to provide a mixing pattern that causes the media to be thoroughly mixed through the whole depth, width and length of the reactor volume and prevents media from floating at the tank surface or in the corners of the basin.

The diffusion of aeration shall be done through fine bubble diffusers or coarse bubble diffusers or arrangement of pipes with holes or combination of all that.

The air quantity required shall be suitable to provide sufficient oxygen for aerobic bio degradation of the inlet organic matter. The air shall be supplied by positive displacement, roots type air blower. Blowers shall have minimum 50% standby arrangement.

The oxygen requirement for BOD removal shall not be less than 1.2 kg. O2/kg of BOD removed. The air quantity required shall be sufficient for maintaining minimum 2PPM necessary dissolved oxygen. Oxygenation shall be calculated considering the field correction factors of as Alpha not more than 0.95 and beta not more than 0.65. The air supplied shall be sufficient to maintain complete mixing condition and floatation of the bio media.

3.7 MBBR System

There shall be minimum 2 Nos. MBBR Reactors based on attached growth process for biological stabilization. Design para meters for reactors and bio media shall be as under: -

Design Para meters:

Average Flow	-	5 KLD
Peak Flow	-	12 KLD
No of Reactors	-	Min 2 Nos
Operation of reactors	-	preferably in series
Minimum HRT(combined for all reactors)	-	3-4 hrs of Avg flow
DO level during aeration face	-	Min 2 ppm
Free Board	-	Min 0.5 m

i) The reactor is designed to take care of organic load during peak sewage flow period also.
ii) Necessary provision to bye pass reactors during maintenance period is considered
iii) Scouring of waste water from each reactors for maintenance period is considered.

3.8 Bio Media

The specification of Bio media is as under: -

Material	:	Polypropylene/Polyethylene, non-degradable and UV stabilized from virgin material
Specific gravity	:	0.95 -0.98 gm/cm3
Effective surface area for microbial attachment	:	To be proposed by the bidder. Maximum allowed value for design is 400 m2 / m3
BOD loading on media	:	
Ist stage reactor	:	Not more than 300gm/m2 of effective area/day
2nd stage reactor	:	Not more than 50gm/m2 of effective area/day
Media Volume	:	Not less than 20% of the basin volume

Location	Under aeration tank 1-2
Application	For connecting air diffusers for diffused aeration)
MOC	MSEP/GI
Accessories	Complete with piping, valves and other accessories

3.9 Twin Lobe Rotary air Blower

Blower package shall include but not be limited to drive guards, base with vibration isolators, pressure gauges, temperature gauges, temperature switches, inlet filters, and inlet silencers, pressure relief valves, valve interconnecting piping. Complete blower unit and motor mounted on a common base plate. Blowers shall provide a firm air supply capacity. The control system shall rotate duty and standby blowers as per requirement. The motor shall have a TEFC enclosure and operate on 415 volts, 3 phase, and 50 Hz power supply. Isolation butterfly valves shall be cast-iron wafer-type with a disk of bronze or stainless steel. The noise level at 1.00 M from blower s is below 85 dB level.

Aeration in Eq. Tanks is required to prevent the waste water from becoming septic and odorous hence the bidders should design the coarse bubble aeration system so as to provide min. air requirements as per recommended norms required for mixing and aeration in Eq. Tanks.

Oxygen in MBBR Reactor is required for proper mixing as well as to supply oxygen for biological oxidation of COD/BOD. The bidders should design the complete fine bubble diffused aeration system along with air blower capacity to meet the requirements.

Location	Near the Aeration Tank
Application	Supply of air in aeration tank
Capacity	10 m3/hr
Pressure	.3 kg/cm2
MOC	

3.10 Primary Aeration Tank MBBR1

Location	After collection sump Tank
Application	To removes solid particulates or suspended solids
Capacity	Suitable to handle 5 kld
Description	With Tube setting and collection compartments with sludge withdrawal system
MOC	MS With Under Lining FRP

All other technical data mention above in relevant section.

3.11 Secondary Aeration Tank MBBR2

Location	After Aeration Tank mbbr1
Application	To removes solid particulates or suspended solids
Capacity	Suitable to handle 5 kld
Description	With Tube setting and collection compartments with sludge withdrawal system
MOC	MS With Under Lining FRP

All other technical data mention above in relevant section.

3.12 Secondary Lamellar Clarifiers

Location	After Aeration Tank MBBR2
Application	To removes solid particulates or suspended solids
Capacity	Suitable to handle 5 kld
Description	With Tube setting and collection compartments with sludge withdrawal system
MOC	MS With Under Lining FRP

All other technical data mention above in relevant section.

3.13 Sludge Drying Bed

The sludge retained at the bottom of the Bio digester reactor shall be pumped into each drying bed. Sludge drying beds are open tanks filled with sand and graded gravel. Each sludge drying bed is designed for 5 cum of fecal sludge. The bed shall be minimum 600mm deep with graded aggregate layers. The percolate shall be recycled to the system.

3.14 Holding Sump

Location	After secondary lamella clarifier
Application	To removes solid particulates or suspended solids
Capacity	Suitable to handle 5 kld
Description	With Tube setting and collection compartments with sludge withdrawal system
MOC	MS With Under Lining FRP

3.15 Filter Feed Pump

- Duty: To pump effluent from filter feed sump to MGF & ACF for tertiary treatment in series
- Driving method Directly coupled through a flexible coupling
- Type Horizontal centrifugal, mono block type,
- No. of units required 2 Nos. (1 working &1 standby)
- pumps to be supplied Accessories to be supplied with each pump:

Location	Before Pressure Sand Filter
Application	To feed the treated water to PSF and for backwashing
Size	Centrifugal, monoblocK.
Capacity	2 m3/hr

3.16 Clear Water Collection Tank

Location	After acf
Moc	Civil/ms/sintex
Capacity	Suitable to handle 5 M3/day

3.17 Media Gravel Filter (MGF)

Pressure sand filter consists of a pressure vessel shall be provided. A pressure filter could be either vertical or horizontal-fitted with a set of frontal pipe work and valves, graded sand supported by layers of graded under bed consisting of pebbles and silex, a top distributor to distribute the incoming water uniformly throughout the cross section of the filter, and an under drain system to collect filtered water. In pressure sand filter raw water shall flow down wards through the filter bed and as the suspended matter there shall be steady rise in the loss of head as the filtration process continues and the flow reduces once the pressure drop across the filter is excessive.

The Filter vessel shall be designed as a pressure vessel (it consists of a straight cylindrical shell, with convex dish-shaped ends welded to the top and bottom). The vessel should be designed to withstand a pressure of 5 kg/cm2. In this vessel, a bolted dish at the top for ease of maintenance shall be provided. A hand-hole of > 200 mm dia shall be provided at the bottom of the cylinder, to facilitate removal of media from the vessel at the time of servicing. A set of pipes, valves, bypass line, backwash water line etc. shall also provide to facilitate operations such as filtration, bypass (during servicing), backwash etc. Pressure gauges shall be provided at the inlet and outlet, to monitor the pressure drop across the filter or FRP vessel for 1500lit. /hour

Location	After Holding Sump
Application	Remove fine suspended solids
Moc	MS/FRP
Size	Suitable to handle 10 M3/day
Media	Under bed with sand, Gravels and Pebbles
Operation	Semi-automatic (Manual Operation)

3.18 Activated Carbon Filter

Carbon is a substance that has a long history of being used to adsorb impurities and is perhaps the most powerful adsorbent known to man. One pound of carbon contains a surface area of roughly 125 acres and can absorb literally thousands of different chemicals. Activated carbon is carbon which has a slight electro-positive charge added to it, making it even more attractive to chemicals and impurities. As the water passes over the positively charged carbon surface, the negative ions of the contaminants are drawn to the surface of the carbon granules. There are two principal mechanisms by which activated carbon removes contaminants from water; adsorption and catalytic reduction, a process involving the attraction of negatively-charged contaminant ions to the positively-charged activated carbon. Organic compounds are removed by adsorption and residual disinfectants such as chlorine and chloramines are removed by catalytic reduction.

The Filter vessel shall be designed as a pressure vessel (it consists of a straight cylindrical shell, With convex dish-shaped ends welded to the top and bottom). The vessel should be designed to withstand a pressure of 5 kg/cm2. In this vessel, a bolted dish at the top for ease of maintenance shall be provided. A hand-hole of > 200 mm dia. shall be provided at the bottom of the cylinder, to facilitate removal of media from the vessel at the time of servicing. A set of pipes, valves, bypass line, backwash water line etc. shall also provide to facilitate operations such as filtration, bypass (during servicing), backwash etc. Pressure gauges shall be provided at the inlet and outlet, to monitor the pressure drop across the filter. or FRP vessel for 1500lit. /hour

Location	After Sand Filter
Application	Remove fine suspended solids and odour
MOC	MS/FRP
Size	Suitable to handle 10 M3/day
Media	Activated Carbon
Operation	Semi-automatic (Manual Operation)

4. DETAILS OF INTERCONNECTING PIPING

The piping & valves shall be complete interconnecting piping for the effluent treatment plant between various units. The piping & valves shall be designed based on the design flow of the effluent / sludge /chemicals etc as per requirement and the total schematic drawing is to be submitted for approval.

Pipe line for effluent pumping will be 50 mm OD with 6 kg/ Sq. Cm and gravity pipe line will be 110 mm OD with 6 kg/ Sq Cm. All HDPE piping is to be of approved make and of ISI mark (IS-14333:1996) of suitable grade PE 63/80/100 grade and pressure ratings. All Effluent valves should be Wafer type butterfly valves with Heavy duty cast iron body, flow control lever, seating of EPDM / Nitrile rubber type, and disc of SS 316 of approved makes.

The piping & valves will be complete interconnecting piping for the effluent treatment plant between various units. The piping & valves shall be designed based on the design flow of the effluent / sludge /chemicals etc as per requirement and the total schematic drawing is to be submitted for approval.

All Effluent valves should be Wafer type butterfly valves with Heavy duty cast iron body, flow control lever, seating of EPDM / Nitrile rubber type, and disc of SS 316 of approved makes.

This shall include the interconnecting pipeline between different units of STP as given below:

Description	Supply of interconnecting piping, fitting & valves for STP units
MOC	UPVC/MS/pvc
Make	Supreme/Astral/Jindal/Aashirwad/Equivalent
Pressure	@4 kg pressure

Notes:

(a) All pipe network shall be designed for peak flow.
(b) Combination of pipes and channels can be used for conveyance of waste water as per requirement of site conditions.
(c) The sizes of pipes shall be calculated to meet following criteria
  (i) Air pipe velocity range 12 - 18 m/Sec
  (ii) Water/Waste water pipes 0.6 - 2 m/ Sec
  (iii) Sludge Pipe 0.8 – 1.2 m/sec

Piping shall include specials like elbows, wyes, Butter Fly Valves, Sluice Valves and Non return valves etc.

5. DETAILS OF ELECTRICAL WORKS

5.1 Level control Switches

Level control Switches: (Cable Float Switches Round Type) : 01 Lot

Level switches consisting of suitable sensor, contactor module providing signals for low level and high level in the raw effluent collection sump and should facilitate automatic start & stop of the raw effluent pumps. Bidders to note that the raw dairy effluent in the collection sump consists of floating oil & fat along with suspended organic matter.

Low cost polypropylene level switch
Hermetically moulded, double chamber
Mercury free operated micro switch
Direct pump controls up to 1.1 kW
Adjustable switch differential
Low specific weight of the floating body

Specifications of Level Switches: - 01 Lot
Length: minimum 5 meter
Switch rating: 250 V AC, 15 A
Temperature: 0 °C to 50 °C
Pressure: max. 2 bar
Protection: IP 68

Specifications of Level Controller Unit: -01 Lot

Mounting	:	Suitable for Panel Mounted
Level Controller Unit Size	-	72 mm x 72 mm x 120 mm
Input	-	2 x Micro Switch Contact
Power Supply	-	230 V & 50 Hz
Output	-	1 x Realy-1 No + 1NC, 230 V, 5 A

5.2 Electrification of Plant Shed: -

Supply, fixing, wiring and commissioning of approved make of Distribution board with suitable DP incomer and enough number of SP outgoing MCB's.

5.2.1 Control Panel

Control Panel – 1no.

Location	Machinery room
Description	Control pannel will be industrial cubical type, with non compartment, dust and vermin proof, wall mounted. One incoming feeder will be provided which will have amp-meter, voltmeter, indicating lamps and energy meter. Outgoing feeders will be as per drives of mechanical equipment. Each outgoing feeder shall have 1 No MCB, contactor, overload relay, on/off push button, indicating lamp, neutral link and one set ofterminal block. Panel will be epoxy coated.
Make of switchgears	L&T/Siemens/Equivalent

5.2.2 Cabling

Description	Electrical cabling shall be provided from control panel to various units of effluent treatment plant
Size of cable	As per the capacity of the motors / drives
MOC	Copper
Make	CCI/Polycab/Kalinga Equivalent

6. DETAILS OF CIVIL WORKS

Contractor shall construct all civil units and supportings for mechanical units. He shall design the structures after proper soil investigation.

The following units are given below.

S. N.	Description	Dimensions	Qty.	MOC
I.	Foundation for Electro Mechanical Equipments	To be designed by Contractor	Lot	RBB/Brickwork
II.	Collection Tank cum bio digester	To be designed by Contractor	01	RBB/Brickwork
III.	Inlet Chamber	To be designed by Contractor	01	RBB/Brickwork
IV.	Machinery Room Shed	To be designed by Contractor	01	RBB/Brickwork
V.	Guard room shed	To be designed by Contractor	01	RBB/Brickwork
VI.	Fencing boundary wall flooring etc	To be designed by Contractor	01	RBB/Brickwork/ Structural steel
VII.	Any Other required for fulfillment of FSTP	To be designed by Contractor	-	-

Water retaining structures shall be of M30 Concrete and Fe500 reinforcement steel. Specification of Civil works shall be as per the item description in State PWD Schedule or PHED Schedule. If any item is not available in state schedule, CPWD schedule shall prevail.

7. MAKES OF EQUIPMENTS

The following is the list of products and name of the approved manufacturer against each product. The bidder shall quote rates for the various items of works using these products.

S. No.	Name of Equipment	Recommended Makes
01	**02**	**03**
1.	Self-Priming Horizontal pump	Kirolskar/ CRI/Shakti/Lubi/Eq
2.	Horizontal Centrifugal Pumps	Kirolskar/ CRI/Shakti/Lubi/Eq
3.	Air Diffusers	OTT/EDI/S.Cogen/Eq
4.	Upflow Filter , MBBR & Tube deck Media	Guddi Plasticon/ Airfin/Eq
5.	Flow meter	Emerson/ Toshbro/Flowtech/Eq
6.	Air Blowers	Everest/ Blowvacc/ Usha/Eq
7.	Pressure Sand filter	M.S.: – As per OEM FRP: Aventura/Astral/Starlite M.S.: – As per OEM
8.	Activated carbon filter	FRP: Aventura/Astral/Starlite
9.	Electric motors	Kirloskar/Crompton/Eq
10.	MS pipeline	Tata / Jindal/Eq
11.	Non Return valve	Kirloskar/Eq
12.	Butterfly valve	Jayhaiwa/Eq
13.	Ball valve	Zoloto/Eq.
14.	HDPE/ PVC pipeline	Supreme/ Hasti/ Reliance/Eq
15.	Electric cables	Polycab /CCI/Eq
16.	Pressure gauge	H-Guru/ Feibig/Eq.
17.	Level controller	L&T/selec/Eq.

Any other make of product, not approved below, shall not be allowed for use in this work unless specifically approved / accepted by the purchaser after establishing its technical suitability, price, availability & effect on price quoted by bidder for the item where this item is being used.