

TECHNICAL SPECIFICATIONS

SECTION - I

WATER SUPPLY PUMPS & EQUIPMENTS AND WATER TREATMENT UNITS ETC.

1.0 Pumps and Water Treatment Equipment

- 1.1 Work under this sub-head consists of furnishing all labour, materials, equipment and accessories necessary and required to completely install pumping system for various water supply services and water treatment as per drawings, specified hereinafter and given in the Bill of Quantities.
- 1.2 Without restricting to the generality of the foregoing, the work of pumps and water treatment equipment shall include the followings:
- a) Filter feed pumps.
 - b) Domestic water transfer pumps for different building
 - c) Pump Automation through Motorize valve.
 - d) Sump pumps for drainage.
 - e) Water treatment unit consisting of DMF and chlorination etc.
 - f) Motor control panels, power and control cabling and allied electrical works.
 - g) Pipes, valves, accessories, hangers, supports, delivery and suction feeders and connection to proposed pipe work.

1.3 Source of Water Supply:

All the water supply requirement o shall be meeting from tube well / bore well water supply.

1.4 QUALITY OF RAW WATER (ASSUMED)

Parameters	Values
Colour Hazen Units	< 5
Odour	objectionable
Taste	unagreeable
Turbidity, NTU	3.90
pH	7-7.5
Total Dissolved solids mg/l	700
Chloride (as Cl) mg/l	36
Total hardness (as CaCo3) mg/l	250
Iron (as Fe) mg/l	Nil
Coliform Organism / 100 ml.	Nil
E coli/100ml	absent



2.0 PUMP SET

2.1 Water Supply Pumps

(These specifications are applicable for all clear water pumps and as specified in Bill of Quantities)

- 2.1.1 Water supply pumps shall be suitable for clean water. Pumps shall be single or multistage, monoblock horizontal, vertical, centrifugal pumps with cast iron/stainless steel body and stainless steel/bronze impeller, stainless steel shaft and coupled to a TEFC electric motor by means of a flexible coupling or as specified in bill of quantities. Each pump should operate a curve 10m below specified head.
- 2.1.2 Pump and motor shall be mounted on a common M.S. structural or C.I. base plate or as required as per site conditions.
- 2.1.3 Each pump shall be provided with a totally enclosed fan cooled induction motor of required H.P. and RPM specified in the bill of quantities and as per requirement.
- 2.1.4 Each pumping set shall be provided with a 150mm dia or of suitable size gunmetal "Bourden" type pressure gauge with gunmetal isolation cock and connecting piping.
- 2.1.5 Provide vibration-eliminating pads appropriate for each pump.
- 2.1.6 Provide rate of flow measuring meter with bypass arrangement with every set of pumps as shown on the drawings and given in the bill of quantities (to be paid separately).
- 2.1.7 All water supply pumps shall be provided with mechanical seals, of required specifications.

3.0 SUMP PUMP

- 3.1 Sump pumps shall be submersible type for lifting domestic sewage or muddy water/drainage as specified in Bill of Quantities. Pump with impeller of approved material shall be mounted on waterproof motor. The impeller shall be suitable for handling solids upto 46-100mm dia. or as specified in Bill of Quantities.
- 3.2 The pump shall automatically operate with high water level and stop at low water level in the sump by means of "Electronic Level Controller", of the approved make.
- 3.3 The sump pumps shall be complete in all respect and shall be installed as per manufacturer's requirement as shown in the drawing. All accessories shall be In-Built as per manufacturer's specification.

4.0 CABLES

- 4.1 Contractor shall provide all power & control cables from the source available at site to motor control center and from the motor control center to various motors, level controllers and other control devices. Any other power or control cable required to complete the scope of work shall be in the scope of contractor.
- 4.2 Cables shall conform to I.S: 1554 and carry ISI mark.
- 4.3 Wiring cables shall conform to I.S 694.
- 4.4 All power and wiring cables shall be aluminum conductor PVC insulated armored and PVC sheathed of 1100 volts grade.
- 4.5 All control cables shall be copper conductor PVC insulated armored and PVC sheathed 1100 Volt grade.

4.6 All cables shall have stranded conductors. The cables shall be in drums as far as possible and bear manufacturer's name.

4.7 All cable joints shall be made in approved manner as per standard practice.

5.0 CABLE TRAYS

5.1 Contractor shall provide M.S slotted cable trays at locations as shown on the drawings and of sizes as given in the bill of quantities.

5.2 Cable trays shall be supported from the bottom of the slab at intervals of 60cms at both ends by anchor fasteners. Cost of MS angle, rods and anchor fasteners etc. shall be included in the rate of the tray and no separate payment shall be made on this account.

5.3 Cost of clips, bolts, nuts, support rods and any other materials required to fix the trays in proper manner shall be included in the rate for trays.

6.0 CONTROL PANELS / STARTERS

6.1 Switch board cubicles of approved type shall be fabricated from 16-gauge M.S. sheet with dust and vermin proof construction. It shall be painted with powder-coated finish of approved make and shade. It shall be fitted with suitable etched plastic identification plates for each motor. The cubicle shall comprise of the followings:- (Switch gear as given in the bill of quantities).

- a) Incoming main isolation MCCB of required capacity.
- b) Fully Aluminum taped Bus Bar of required capacity.
- c) Isolation MCCB one for each motor.
- d) Fully automatic as specified D.O.L./Star Delta starters suitable for motor H.P. with push buttons -one for each motor and on/off indicating neon lamps. (DOL upto 7.5 HP and Star Delta from more than 7.5 H.P)
- e) Single phase preventor of appropriate rating for each motor.
- f) Panel type ampere meters one for each motor with selector switch.
- g) Panel type voltmeter on incoming main with rotary selector switch to read voltage between phase to neutral and phase-to-phase.
- h) Neon phase indicating lamps for incoming main and on/off indicating lamps for each motor.
- i) Rotary switch for manual or auto operation for each pump (manual/auto off).
- j) Fully taped separate aluminum bus bars of required capacity and with required outlets.
- k) Space for liquid level controllers as specified + 1 extra space.
- l) The panel shall be pre-wired with colour-coded wiring. All interconnecting wiring from incoming main to switch gear, meters and accessories within the switchboard panel.
- m) Provision of main incoming cables from the top of the panel.

6.2 All switch gears and accessories shall be of approved make such as "Siemens, English Electric, Larsen & Toubro" or equivalent, or as specified.

- 6.3 Switchboard cubicles shall be floor or wall mounted type as recommended by manufacturers. All floor-mounted switchboard shall rest on minimum 225mm high platform. The contractor shall provide the shop drawings for base and panels.

7.0 VIBRATION ELIMINATORS

Provide on all suction and delivery lines double flanged reinforced neoprene flexible pipe connectors. Connectors should be suitable for a working pressure of each pump. Length of the connector shall be as per manufacturer's details.

8.0 WATER FILTER

- 8.1 Water filter shall be of dual filter media pressure filter downward or upward flow type suitable for a rate of filtration given in bill of quantities.

- 8.2 Filter shall be vertical type of required diameter. The shell shall be fabricated from M.S. plate suitable to withstand a working pressure given in bill of quantities. The minimum thickness of shell will be 8mm and dished ends shall be 10mm. The filter shall have at least one pressure tight manhole cover or as specified in Bill of Quantities.

Filter shall be provided with screwed or flanged connections for inlet, outlet, individual drain connections and all other connections necessary and required. Filter shall be painted inside with two or more coats of non-toxic corrosion resistant paint, one coat of red oxide primer outside with two or more coats of synthetic enamel paint of approved shade.

8.3 Under Drain System

Filter shall be provided with an efficient under drain system comprising of collecting pipes, gunmetal/polypropylene nozzles of manufacturer's design. The entire under drain system be provided on M.S. plate or cement concrete supports.

8.4 Face Piping

Complete uPVC frontal face piping (10 kg/cm² rating conforming to IS:4985) and valves battery with CI Butterfly valves, pressure gauges and sampling points at inlet and outlet. etc. covering all functions of service, backwash, rinse, air release etc.

8.5 Accessories

Each filter shall be provided with following accessories:-

- a) Air release valve with connecting piping.
- b) 100mm dia dial bourden type gunmetal pressure gauges with gunmetal isolation cock and connecting piping on inlet and outlet.
- c) Sampling cocks on raw water inlet and filtered water outlet.
- d) Individual drain connection with gunmetal fullway valve.
- e) Connection with valve for air scouring.

9.0 PIPING

- 9.1 Pipes for suction and delivery shall be galvanised/M.S tube (heavy duty) conforming to I.S:1239 upto 150mm dia and as per I.S:3589 for dia 200mm and above or as specified in bill of quantities. The M.S flanges shall conform to I.S:6392-1971.

- 9.2 Gate valve and check valve above 65mm dia shall be C.I. double flanged conforming to I.S:780 manufactured by the reputed manufacturers or C.I. double flanged

butterfly valves as specified in bill of quantities or elsewhere or as per approval of Engineer-in-charge.

9.3 Full way and check valves 65mm dia and below shall be gunmetal tested to 20Kg/cm² pressure certified and conforming to I.S:778.

9.4 Suction strainer or foot valves shall be C.I., confirming to I.S:4038 - 1979, as specified in bill of quantities.

9.5 **Joints**

All pipes and fittings shall be provided with flanged joints, with flanges either screwed or welded complete and jointed with 1.5mm thick gasket complete with nuts, bolts and washers etc.

9.6 **Testing**

All G.I./M.S pipes (except fire pipe) shall be tested hydrostatically for a period of 30 minutes to a pressure of 7 Kg/cm² without drop in pressure and all G.I./M.S pipes for fire shall be tested hydrostatically for a period of 30 minutes to a pressure of 12.5 Kg/cm² without drop in pressure.

10.0 **MEASUREMENTS**

10.1 Raw water, garden pump and fire pumps shall be measured by numbers and hydro pumps and sump pumps shall be measured by sets and shall include all items as given in the bill of quantities.

10.2 Motor control panel and level controllers shall be measured by numbers.

10.3 Pipes for suction and delivery header and mains shall be measured per linear metre along the centre line of the pipe and shall be inclusive of all fittings.

10.4 Cable trays and cables shall be measured per linear meter.

10.5 Structural clamps including hangers shall be measured by weight calculated from sections used. No separate payment shall be admissible for bolts, anchor bolts, rawl plugs etc.

10.6 No separate payment shall be made for making connections of the existing service lines to the pumps. Vibration eliminator pads are included in the scope of this work.

11.0 **GUARANTEE**

11.1 The contractor shall submit a warranty for all equipment, materials and accessories supplied by him against manufacturing defects, malfunctioning or under capacity functioning.

11.2 The form of warranty shall be as approved by the Engineer-in-charge.

11.3 The warranty shall be valid for a period of one year from the date of commissioning and handing over.

11.4 The warranty shall expressly include replacement of all defective or under capacity equipment, Engineer-in-charge may allow repair of certain equipment if the same is found to meet the requirement for efficient functioning of the system.

11.5 The warranty shall include replacement of any equipment found to have capacity lesser than the rated capacity as accepted in the contract. The replacement equipment shall be approved by the Engineer-in-charge.

LIST OF APPROVED MAKES

- 1 All materials and equipment used in execution of work shall be of approved makes listed below. Any make offered by Tenderer other than the approved makes will be subject to the approval of Owner/ Architect/ Consultant/ Interior Designer. If other makes are offered, the same shall be clearly indicated in tender.
- 2 Contractor shall list out the makes of equipment and materials offered during tender stage itself. Decision about the final selection of the make from the makes included in Agreement shall rest with the Owner/ Architect/ Consultant as applicable.

Pumps : KSB /WILLO/ Grundfoss

Water Treatment System:

Filters/Softner :- Doshion / KWT / Riasa

Chemical Dosing Pumps/Tanks :- UEM / 3SW/KWT

GI/MS Pipe :- Jindal Hissar / Surya Prakash

Fittings :- R Brand / Unik

Butterfly Valves :- AIP/SANT/SKS

Ball Valves :- AIP / SANT / CIM

Check Valve / Y STARAINER :- AIP / SANT /CIM

Vibration Eliminator :- Resistoflox, Noida/ Dwren - Calcutta

LEVEL CONTROLER / INDICATOR :- ADVANCE / AIP / FLOW LINE

BUTTERFLY VALVE WITH ACTUATOR :- AIP / AUDCO

Electrical:

a) Starter : L & T/ Siemens

b) SFUs : L&T/ Siemens

c) Cables : Finolex/ Bonton

d) Liquid Level Controller : Femack/Minitec

e) MCCB Series) : ABB (Imported)/ Merlin Gerin (French /Mitsubishi

f) MCB : Legrand (Imported)/ Merlin Gerin (France) / Hager (Imported)

g) Panel : Tricolite Industries/ Installation control panel /risha Control



SECTION - II

SEWAGE TREATMENT PLANT

Special Conditions of Contract

1.0 Scope

1.1 Work under this contract consists of:

- 1.1.1 Detailed engineering design of all plan areas, section, mechanical, electrical and piping systems according to the current and applicable BIS codes as applicable. The proposed plans of the STP shall be subject to the approval of the Architect / Consultant.
- 1.1.2 The execution of the Civil & Structural Works shall be done by a civil engineering contractor separately as per plan, section & details submitted by vendor.
- 1.1.3 Design, manufacture, assembly, installation, testing and commissioning of the main treatment units in MS FRP tanks , mechanical equipment for the packaged type Sewage Treatment Plant (STP) of capacity and design parameters given in BOQ & specifications broadly comprising of:
 - a. Diffused aeration system comprising of non-metallic piping floating diffusers to be provided in the equalization tank, main aeration unit, settling tank and sludge holding tank.
 - b. Twin lobe air blowers with belt drive, electrical motors, piping headers, piping connections to all units.
 - c. Pumping sets from equalization tank to STP, effluent, post filtration and final effluent disposal pumps as per design requirements.
 - d. Final effluent disposal through Activated Carbon Filter (ACF) & Dual Media Filter (MGF), for final disposal /reuse in Horticulture use.
 - e. Motor control centres, cabling from MCC to all units, all instrumentation, and measuring devices and earthing of equipment. All electrical works to be carried out guidelines as per detailed annexure enclosed.
 - f. Instrumentation and chemical test kit as specified.
- 1.1.4 Drain channel, sump with a drainage submersible pump (1 working + 1 standby) with pipe work, valves and discharge pipe up to nearest external manhole in plant room shall be provided by others.
- 1.1.5 Provide water meter on outgoing treated effluent for measuring the outflow.

1.2 The work includes:

- 1.2.1 Mechanical & Electrical works
- 1.2.2 Piping as specified.



- 1.2.3 Testing, commissioning and operation of plant with water and under load conditions.

2.0 Work by other agencies

- 2.1 Construction of all architectural, civil and structural works related to the construction of the building, its internal lighting, mechanical ventilation, sludge disposal system.
- 2.2 Incoming power connection, electrification of pump house.
- 2.3 Incoming sewer / rising main connection to the plant.
- 2.4 Connection from final effluent tank / pump to point of use for reuse or for disposal in accordance with approval of the State Board for Prevention and Control of Pollution.
- 2.5 Battery limits of the contractor's works are within the plant room.

3.0 Power supply

- 3.1 Power will be available at 410/220 V, 3/single phase, 4 wire 50 cycles earthed neutral system. All equipment shall be suitable for a variation of $\pm 10\%$. Any equipment /component operating at other than the above power supply shall be provided with necessary transformers and related accessories.

4.0 Specifications

- 4.1 The specifications lay down minimum standards of equipment and workmanship. Should the tenderer wish to depart from the specifications either on account of manufacturing practices, their own patented process or for any other reasons, he should submit a deviation statement to clearly draw attention to the proposed departures and submit such complete information, drawings and specifications to enable the relative merits of the deviations to be fully understood on a separate annexure.
- 4.2 In the absence of any deviations, it will be deemed that the tenderer accepts the tender specifications and accept the compliance with all statutory provisions and local codes.

5.0 Alternate Designs

- 5.1 The Consultant will consider favourably any other process of sewage treatment than what is broadly specified in this tender document if the same is proven more efficient, has low energy consumption, able to handle wider variation in influent load, can be located on space available and simple to operate.
- 5.2 Alternate designs must meet the basic design criteria of the flow and effluent characteristics specified and accepted to the Statutory Approval Authority & Pollution Control Board.



6.0 Shop Drawings

The contractor shall submit shop drawings as follows:

- 6.1 On award of the work, he shall submit GA drawing, PIB diagrams, plant layout with basic dimensions, flow diagram with levels of elements.
- 6.2 Fabrication and equipment layout piping, valves and all other information required for installation.
- 6.3 Electrical layouts, detail of all MCC, cable sizing and system diagrams and earthing system.
- 6.4 Piping layout with pipe dia. slopes, fixing arrangements.
- 6.5 Three copies of the shop drawings shall be submitted for initial scrutiny. On approval of the same contractor shall submit six copies of the same incorporating corrections etc. Two sets will be stamped "GOOD FOR CONSTRUCTION" by the Consultant and returned to the contractor.

7.0 Other Submittals

- 7.1 Contractor shall furnish four sets of folders giving:
 - a. Catalogues and technical information sheets of equipment to be installed.
 - b. Performance curves, foundation details and fixing arrangements.
- 7.2 Contractor's proposal for testing procedures for individual equipment and for overall testing of the plant.
- 7.3 Submittals shall be separate for:
 - a. Mechanical and Piping works
 - b. Electrical Works
- 7.4 All shop drawings and submittals mentioned above shall be approved by Architect and two sets duly stamped shall be returned to the contractor for execution of the works.

8.0 Execution of Work.

- 8.1 All work shall be executed only in accordance with the approved shop drawings and other submittals. Contractor shall ensure that all inserts, support plates, puddle flanges and other items required to be incorporated during execution shall be placed in position as per his own requirements during execution of the works.
- 8.2 All special tools and tackle required for erection and assembly of the equipment covered by the contract shall be obtained by the contractor himself. All other materials such as



foundation bolt nuts, etc. required for the installation of the plant and equipment shall be supplied by the contractor and are part of the contract.

9.0 Testing & Handing Over

- 9.1 The contractor shall carryout tests on different equipment as required in the presence of the Consultant or his representative in order to enable him to determine whether the plant, equipment and installation comply with the specifications, local codes and in accordance with the letter and intents of the specifications.
- 9.2 The installation shall be handed over to the Engineer in Charge only on successful completion, operational tests and acceptance of the effluent quality by the municipal/ pollution control and statutory authorities.

10.0 Statutory Permissions

- 10.1 Contractor shall submit a write-up of process of the plant, drawings, design parameters flow and PIB diagrams as necessary and required for submission to the State pollution control authority.
- 10.2 Contractor shall furnish at his own cost, analysis of influent at source (for evaluation) as well as that of influent at the holding tank of the STP and the effluents from the STP for submitting to State Pollution Control Board and any other statutory authority whose approval is required.
- 10.3 Contractor shall perform all testing and operation of the plant in presence of the Pollution Control Board if so stipulated by them.
- 10.4 Contractor to obtain all statutory approval as required for PCB or any other approval. Only official fee will be reimbursed to contractor by the Owner.

11.0 Completion documents

On successful completion of the entire work, the contractor shall submit 4 sets of following documents to Architect.

- 11.1 A brief write-up of process, day to day operating and maintenance instructions.
- 11.2 List of approved chemicals and procedure for storage and safety norms.
- 11.3 Completion drawing and data, catalogues, performance charts, technical data sheets and equipments installed.
- 11.4 Manufacturer's maintenance and operating instructions for mechanical and electrical equipment.
- 11.5 Laminated and framed "As Built" drawings with plans, section, process flow diagrams, pipe runs, levels and final disposal point schedule of equipment installed with all their model Nos. plate data and date of installation.



11.6 Test readings of Influent & Effluent parameters taken at final handing over time

11.7 NOC (No Objection Certificate) from State Pollution Control Board and any other statutory authority whose approval is required.

12.0 Performance Guarantee

12.1 Equipment supplied and installed shall be guaranteed to yield the specified effluent standards which must meet and accepted with the requirements of local authorities.

12.2 The guarantee implicitly includes replacement of the entire plant on failure to meet desired effluent parameters, replacement of individual equipment or repairs as warranted. Decision on each and every aspect on this matter shall rest with the Consultant and shall be final and binding on the contractor.

13.0 Defects Liability

All equipment and the entire installation shall be guaranteed against defective materials and workmanship for a **period of 12 months** reckoned after taking over of system by Owner along with the documentation. During the defects liability period, the contractor shall replace defective parts and components free of cost. Rectification or repair may be permitted in case the defect is of minor nature.

14.0 Deviations from tender specifications

14.1 Tenderer may indicate their comments only as deviations from the conditions stipulated herein. Wholesale submission of their own conditions and/or printed conditions in disregard of the conditions stipulated herein shall not be binding on this tender.

14.2 All deviations technical and commercial shall be clearly given in Section VIII including any alternate design offered by the contractor.

14.3 No corrections, erasure etc. of this document shall be accepted.



Design Parameters

Sewage Characteristics

1. Project Description

1.1 Level : Under Ground

2.0 Design Consideration

2.1 Capacity (Max). : 50 m³/day

2.2 Area Available :

2.3 Final Invert Level of sewer line : .

2.2 Operation : Hospital Sewage and Effluent (round the clock)

2.3 Influent

- a) pH : 7.5 to 8.5
- b) BOD 5 days @ 20°C. : upto 200-250 mg/l
- c) Suspended solids (SS) : upto 200-400 mg/l
- d) Oil & grease : 30 mg/l
- e) COD : upto 400-500 mg/l

2.4 Effluent (Final) after filtration)

- a) BOD 5 days @ 20°C. : less than 10 mg/l
- b) Suspended solids (SS) : less than 10 mg/l
- c) Oil & grease : less than 1mg/l
- d) COD : less than 50 mg/l
- e) pH : 6.5 - 8

3.0 Salient Features

3.1 The plant should be suitable for low/peak flow in line with Hospital usage.

3.2 The plant should not create any noise, with no nuisance on fly or mosquito and no foul odours.

3.3 The plant should work without the use of in-organic chemical additives

3.4 The plant should be provided with tertiary treatment in form of dual media/activated carbon filter to provide zero bacteriological standard for reuse on:

- a) Flushing

4.0 Offer

4.1 Quotation with breakdown price on items to be listed as per design parameter for technology

4.2 List of equipment with sizes of tank/other items, plan, section and schematic flow diagram

4.3 Electrical load demand, with operational hours on daily basis, operational cost of system including cost of one year of maintenance with consumables, spares etc.



- 4.4 List of items for civil works with cost breakdown or sizes and details as an optional quote separately.
- 4.5 Training of site staff for operation of the plant.
- 5.0 General**
- 5.1 The plant should be eco friendly
- 5.2 Approval from local/pollution control board authority shall be obtained by the contractor.

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Technical Specifications

1.0 Basis of Design

- 1.1 The capacity/ rating of pumps and equipment etc. shall hold good for the capacity of 45 m³/day and shall be good for meeting the treated parameters requirement as follows:
- a. Permissible limit as prescribed in IS: 2490 (Part-I)-1974 and environment (Protection) Rules 1986.
 - b. Water (Prevention and Control of Pollution) Act, 1977 & 1978.
 - c. Environment (Protection) Act, 1986.
 - d. Environment (Protection) Rules, 1986.
 - e. Hazardous Wastes (Management & Handling) Rules, 1989.
 - f. Manufacturer, Storage and Import of Hazardous Chemicals Rules, 1989.
 - g. Manufacturer, use import and storage and hazardous Micro-Organizers, Genetically Engineered organizations or Cell Rules, 1989.
 - h. Manual on sewage & sewage treatment - CPHEEO
 - i. The Public Liability Insurance Act, 1991.
 - j. All standards as laid down by Central Pollution Control Board and any other relevant statutory authority.
 - k. 100% recycle of waste water and removal of sludge in cake form, no water to be discharged outside the premises.

2.0 Sewage Treatment Plant

2.1 General

- 2.1.1 The sewage treatment plant (STP) system outlined in this section specifies the system design, manufacture, supply and installation of a standard FAB based plant.
- 2.1.2 The work shall be carried out in a manner consistent with good practice in the local market.
- 2.1.3 A qualified and experienced Engineer shall be engaged for site supervision.
- 2.1.4 The Contractor shall submit analytical test reports of effluent water samples after the commissioning or after the system is put into operation or as required by the Consultant.
- 2.1.5 First 2 months – 30 days



- 2.1.6 The report shall contain analysis of all data related to those requirements laid down by the local Authorities.
- 2.1.7 The effluent from the Sewage Treatment Plant shall be suitably treated and the effluent water recovered shall be used for irrigation purposes/ flushing system/ etc.

2.2 Description of Process

The treatment process shall comprise the following stages:

- Physical treatment : Fine bar-screening / Oil & Grease Chamber
- Equalization / Collection tank: flow equalization with air mixing
- Biological treatment : FAB based
- Final sedimentation : Settler tank
- Water reclamation : tertiary filtration and sterilization
(For cooling tower make up)
- Sludge disposal: In cake form through Filter Press or
(Transfer through a screwed type pump to municipal tanker)

2.3 Performance Criteria of the Plant

- 2.3.1 Raw sewage will be brought into the Sewage Treatment Plant. The Contractor shall receive sewage from this point to the treatment plant for treatment process.
- 2.3.2 The treatment plant shall be designed to treat the above basic characteristics expected in the raw sewage.
- 2.3.3 Treated effluent shall be connected to a tertiary filtration plant to treat and shall be use for irrigation purpose and Flushing purposes.

2.4 Process Description

2.4.1 Inlet Screen Chamber / Oil & Grease Chamber

Raw sewage shall flow into the inlet screen chamber by gravity. Large solids particles shall be intercepted by a fine screen. Then there shall be Oil & Grease Tank. Sewerage will then flow into Equalization / Collection Tank The incoming sewage shall be mixed in the EQT and fine bubble aeration shall be maintained.

2.4.2 Equalization / Collection Tank

The equalization tank shall be designed to provide a minimum storage of 2 hours at peak flow while pumping. Submersible pumps as per schedule shall be provided with level switch control and automatic cut-in of the standby unit.

An aeration system similar to the FAB tank shall be provided for mixing and aerating the sewage.

2.4.3 FAB Tank

Sewage shall be retained in the FAB tank for a minimum of 7-8 hours and subjected to biochemical oxidation by fine bubbles aeration. The FAB Biodeck media shall be installed in the form of rectangular blocks & shall be float in the form of layers not more than 600 mm vertical height. The media shall be corrugated type & shall facilitate cross flow for better air distribution. The media shall be duly glued as per manufacturers recommendations.

2.4.4 Tube Settler Tank

The sewage after bio-oxidation shall enter the hopper bottom sedimentation tank where the sludge effectively settles to the tank bottom. The clear effluent shall weir into the Intermediate Tank for UV treatment.

The activated sludge collected in the sludge tank shall be returned to the FAB tank for further oxidation of the incoming organic matter. Excessive sludge shall be wasted in the sludge holding tank.

PVC tube deck media is to be installed in Tube Settler Tank. The media shall installed at 60° angle with the horizontal and the total vertical height when installed should be 750 mm. The media shall be duly glued using recommended material and shall be installed as per the drawing to be given by the vendor as per manufacturer's recommendation.

2.4.5 Intermediate Tank

The effluent shall be retained in the baffle walled cleared water tank for a minimum of 30 minutes for effective disinfection prior to discharge through UV system.

2.4.7 Then will be Treated Water Tank (TWT).

3.0 EQUIPMENT

The following give the minimum requirements of the different components of the system.

All equipment and components of the system shall be of top quality construction and shall be corrosion resistant.

3.1 Fine Screening Equipment

Bar screen shall be of 304 stainless steel constructions. Drip trays shall be provided for holding and drainage of the screenings. A manual by-pass screen of 30mm opening with stainless steel drip tray shall be provided. An isolation valve shall be provided to divert the flow to the by pass screen when the screen requires service.

3.2 Air Blowers

Air blowers shall be provided with standby arrangement. Blowers shall be either of positive displacement or centrifugal with pressure vessel type complete with motor, base-plate, inlet filter, intake silencer and off-load starting system outlet silencer, anti-vibration damper, flexible coupling, filter restriction indicator, non-return valve, pressure

relief valve, V-belt system or direct drive coupling. The casing rotor shall be of cast iron construction. Bearings and gears shall be grease lubricated.

3.3 Air Diffusers

Air diffusers shall be made to provide a uniform distribution of fine bubble air release performance in the system. The air diffuser shall be either made of elastomeric rubber membrane or composed of crystalline fused aluminum oxide with a suitable ceramic bonding material.

Membrane endurance shall be more than 180,000 expansion/contraction cycles.

The Contractor shall submit calculation to justify the diffuser selection and air requirement during the detailed design.

3.4 Sewage Pumps

Working and standby sewage pumps shall be provided.

Each shall be of submersible type c/w guide base to facilitate ease of removal, lift chain and automatic discharge connection.

3.5 Settling Tanks

Settling tanks shall include baffles to prevent short circuiting.

3.7 Tertiary Treatment

This tertiary treatment shall be provided for the effluent used for irrigation and flushing of tower make-up water tank/flushing system.

The tertiary treatment plant shall comprise of the pressure sand filters and activated carbon filters. This shall be sized to accommodate 100% of the effluent discharge flow rate and shall achieve the performance as outlined and described in Design Criteria.

3.8 Electrical Control

The operation of the treatment process shall be fully automatic.

A completely assembled and pre-wired control panel consisting of weatherproof cabinet shall be furnished. The control panel shall contain all metering and status indicators, motor starters, program timers, on-off-auto change-over switches and duty selectors for equipment.

3.9 Other Equipment

Any other necessary accessories, such as buffer, riser, scum removal devices, partition, control panel, collection devices, etc. for all the tanks and pumps (where necessary) shall be provided in order to provide a fully working systems.



3.10 Piping Materials

uPVC	:	Submerged air piping
MS epoxy	:	Air piping and pumped effluent riser (Non submerged)
uPVC piping	:	Pumped effluent (submerged) & tank over flow pipe line.

3.11 Valves

The Contractor shall supply and install all isolating valves and control valves as indicated on the drawings and as required for the proper and efficient operation and maintenance of the entire systems.

All valves supplied shall be suitable for the working pressure and test pressure of the system as specified elsewhere in this specification.

All valves shall be full line size.

Furnish all valves and accessory materials necessary in the piping whether or not shown on drawings as flows.

Plastic or metal plates (rustless) shall be provided to indicate the open / close status as well as the use of each valve in the pump and tank rooms.

4.0 PIPE SUPPORTS

4.1 General Support

Tender drawings indicate schematically the size and location of pipes. The Contractor, on the award of the work, shall prepare detailed working drawings, showing the cross-sections, longitudinal sections, details of fittings, locations of isolating and control valves, drain and air valves, and all pipe supports. He must keep in view the specific openings in buildings and other structure through which pipes are designed to pass.

Piping shall be properly supported on, or suspended from, on stands, clamps, hangers as specified and as required. The Contractor shall adequately design all the brackets, saddles, anchor, clamps and hangers, and be responsible for their structural stability.

Pressure gauges shall be provided as shown on the approved drawings. Care shall be taken to protect pressure gauges during pressure testing.

6.0 INSTALLATION

The Contractor shall check the associated civil work prior to the installation of any item of machinery and advise the Consultant, in writing, of any deviation of such work from the specified details.

The machinery shall be accurately installed to correct dimensions, alignments, levels, etc., all as indicated on the final drawings. The machinery shall be mounted on flat steel packing pieces of thickness suitable to take up variations in level of the concrete foundations. Suitable packing pieces shall be located adjacent to each holding down bolt and shall be properly bedded by grinding the concrete surface to a smooth, level finish. The machinery shall be aligned and levelled and the nuts of the holding down bolts tightened with a spanner of normal length. The



base plates shall be packed with grout after the machinery has been run and checked by the Consultant for stability and vibration.

Installation shall include the provision and fixing of all necessary holding down bolts, washers, nuts etc.

7.0 TESTING

The performance of the system shall be demonstrated by taking hourly samples of the raw sewage and final effluent over a twelve hour period. The sample shall be taken at periods approximately the flow rates specified by the plant. The sample shall be combined and a 5-day BOD shall be run, the results of which must verify the capacity of the treatment plant prior to acceptance.



ELECTRICAL INSTALLATION

1.1 SCOPE

The scope of this section comprises of fabrication, supply, erection, testing and commissioning of Motor Control Centre (MCC), wiring and earthing of all Sewage Treatment Plant equipment, components and accessories.

1.2 MOTOR CONTROL CENTRES

1.2.1 Switchboard cubicles of approval type shall be fabricated from 2mm thick CRC sheet with dust and vermin proof construction. It shall be painted with powder coating of approved make and shade. It shall be fitted with suitable etched plastic identification plates for each motor. The cubicle shall comprise of the following (Switchgear as given in the schedule of quantities):

- a. Incoming MCCB of required capacity.
- b. MCCB / MPCB – one for each motor.
- c. Fully automatic DOL/Star Delta starters suitable for motor DOL upto 7.5 H.P.; Star / Delta for 10 H.P. and above H.P. with push buttons one for each motor and On / Off indicating neon lamps.
- d. Single phasing preventor of appropriate rating for each motor.
- e. Rotary duty selector switch
- f. Panel type ampere meters one for each motor shall be with rotary selector switch to read line currents.
- g. Panel type voltmeter on Incoming main with rotary selector switch to read voltage between phase to neutral and phase to phase.
- h. Neon phase indicating lamps and indicating lamp for each motor and on incoming mains.
- i. Rotary switch for manual or auto operation for each pump.
- j. Fully taped separate aluminium bus bar of required capacity for normal and emergency supply where specified.
- k. Space for liquid level controllers and other equipment specified separately in the contract / given in the schedule of quantities.
- l. The panel shall be pre-wired with colour-coded wiring. All interconnecting wiring from incoming main to switchgear, meters and accessories within the switchboard panel. Wiring shall have suitable copper or aluminium ferrules.

1.2.2 Switchboard cubicle shall be floor or wall mounted type as directed by the Engineer-in-charge.



LIST OF APPROVED MAKES OF MATERIALS

S.No.	Description	Makes
1.	Submersible Sump Pumps	: Willo / ITT/Grundfos
2.	Blowers	: Beta/Everestt/KEY/Akash
3.	Filter Feed Pumps/Irrigation Pumps/Flushing Pumps	: Kirlosker / Willo
4.	Bar Screen	: UEM/Riasa/KWT
5.	STP Panel / DB	: Ambit/ Adlec/Vee/Tricloite
6.	Cables	: Finolex/ Bonton / Kalinga
7.	Centrifuge/Filter Press	: Alfa Lava/3SW/Humboldt/Riasa
8.	Air Diffusers	: Rehau / Walkton/EDI
9.	UV Lamp	: Alfa/Sukruit/3SW
10.	Butterfly Valves	: Audco/ Kartar /Sant
11.	Electro Magnetic Flow metre	: Forbes Marshall/ Hach/3SW
12.	Dosing Pump	: Prominent/ Riasa/Grundfos/Asia LMI
13.	MBBR/Tube Deck Media	: Cooldeck/MM Aqua
14.	uPVC Fittings	: Astral / ajay / Ashirwad
15.	Level Controllers	: Minilec/ Pune Techtral
16.	UF Integrator	: UEM/KWT/3SW
17.	Starter	: L&T/ MG /ABB
18.	Multigrade Filter/Activated Carbon Filter	: Doshion/Riasa/KWT
19.	MCB	: Legrand (Imported)/ Merlin Gerin (France)/ Hager (Imported)
20.	Meters (Digital type)	: Conzerv/ Ducati/ Elmeasure/ Secure

