VOLUME 2
OF
TENDER DOCUMENTS

Domestic Sewage Treatment Plant
TECHNICAL SPECIFICATIONS
BILL OF QUANTITIES
AND DRAWING

for
NCSCM
National Centre for Sustainable Coastal Management.
Anna University Campus, Chennai

Architects	HVAC Consultant
flying elephant STUDIO THEKAEKARA HOUSE BANASWADI 10TH MAIN 2ND G CROSS BANGALORE 560043 T & F 080 41614966 info@flyingelephant.in www.flyingelephant.in	McD BERL smart environs M/S. McD Built Environment Research Laboratory Pvt. Ltd. #1354,9th cross,80 feet road, JP Nagar, 1St phase, Bangalore-560078 Phone: 080-41214020 www.mcdberl.com

DOMESTIC SEWAGE TREATMENT PLANT

3. TECHNICAL SPECIFICATIONS

A. GENERAL

The main source of effluent is wastewater resulting from Toilet flushing and urinal flushing. The scope of work includes design, drawings, getting approvals from statutory bodies, construction, and erection and commissioning of domestic sewage treatment plant with electrical, mechanical and piping. The treated effluent should be fit to reuse for AC make up in cooling towers. The work is required to be carried out on a turnkey basis covering a guarantee of satisfactory performance as per the standards laid for a minimum of one year.

B BASIC DATA ON WASTEWATER (SEWAGE) (ASSUMED VALUES)

Quantity : 200 KLD

pH	:	6.0 – 8.5
BOD_5 @ 20 ºC	:	500 mg/L
COD	:	900 mg/L
TSS	:	400 mg/L
Oil & Grease	:	100 mg/L

C TREATED WATER QUALITY

Treated effluent quality shall be within the following values for various parameters, for typical reuse application of meeting Air conditioning make up water in cooling tower with water cooled Air conditioning system.

pH	:	6.8-7.5
BOD_5 @ 20 ºC	:	≤ 10 mg/L
COD	:	< 20 mg/L
E-Coli	:	Nil
Turbidity	:	≤ 2 NTU
Oil & Grease	:	Nil
Residual chlorine	:	≥1 mg/L

D THE TREATMENT PLANT (STP)

Based on the Raw Waste Water/ Treated effluent characteristics following treatment scheme is suggested:

The raw effluent is led by gravity into a Bar Screen Chamber provided with MS Bar Screen.

The screened effluent is collected in an equalization tank. This sump is provided to dampen the flow fluctuations and in order to keep the solids in suspension, pre-aeration is provided with coarse bubble tubular diffusers.

Sequential Batch Reactor (2 Nos)

The sequencing batch reactor (SBR) process is a sequential suspended growth process in which all major steps occur in the same tank in sequential order.
SBRs are a variation of the activated-sludge process. They differ from activated-sludge process because they combine all of the treatment steps and processes into a single basin, or tank, whereas conventional facilities rely on multiple basins.

Basic treatment Process

The operation of an SBR is based on a fill-and-draw principle, which consists of five steps – fill, react, settle, decant, and idle. These steps can be altered for different operational applications.

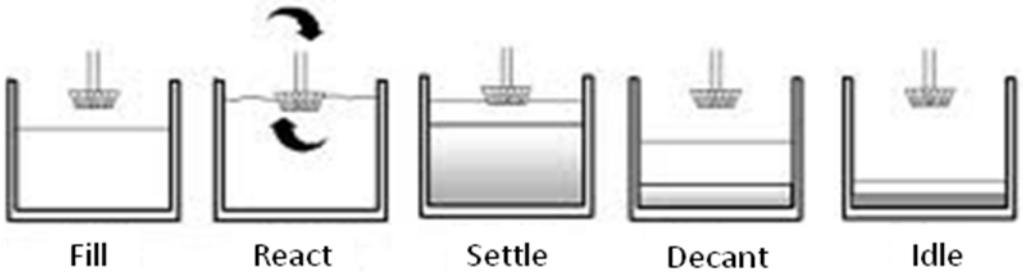
Fill: During the fill phase, the basin receives influent wastewater. The influent brings food to the microbes in the activated sludge, creating an environment for biochemical reactions to take place.

React: This phase allows for further reduction or "polishing" of wastewater parameters. During this phase, no wastewater enters the basin and the mechanical mixing and aeration units are on. Because there are no additional volume and organic loadings, the rate of organic removal increases dramatically.

Settle: During this phase, activated sludge is allowed to settle under quiescent conditions – no flow enters the basin and no aeration and mixing takes place. The activated sludge tends to settle as a flocculent mass, forming a distinctive interface with the clear supernatant.

Decant: During this phase, a decanter is used to remove the clear supernatant effluent.

Idle: This step occurs between the decant and the fill phases. During this phase, a small amount of activated sludge at the bottom of the SBR basin is pumped out – a process called wasting.



Pressure Sand and Carbon Filter

The process of passing the water through beds of sand or other granular materials is known as filtration. In this filter unit the water to be treated is passed under pressure. Broadly speaking, filters essentially consist of a thick layer of sand and the water is allowed to pass through it. Pressure sand filters remove turbidity, suspended particles, colour and odour that are present in wastewater.

Activated carbon is the most widely used substance for the removal of taste and odours, because it has excellent properties of attracting impurities, such as gases, finely divided solid particles and other liquid impurities. This filter unit also works in the same way as a pressure sand filter except for the fact that activated carbon is used in place of sand layer.

Mechanical Filter Press

Filter presses are facilities developed for the mechanical liquid-solid separation. The Filter Press is ideal for sludge dewatering and slurry dewatering in small volumes. Using a feeding pump the suspension will be led into the filter press and against a liquid-permeable filter cloth. During the process the retained solids form the sludge cake.

Chlorine Dozer

Chlorine is an effective disinfectant. The dosing of chlorine is carried out in a chlorine dosing tank.

Provide metering pump dosing capacity 4-6 LPH with 25 liters capacity dosing tank.
The excess sludge shall be pressed through an automatic hydraulic filter press and the cakes formed can be used as manure.

Treatment Plant Units

1. Bar screen chamber
2. Oil & Grease trap
3. Equalization tank
4. Pump-Cum-MCC Room
5. Sequencing Batch Reactor Tank
6. Decant Tank
7. Sand Filter & Activated Carbon filter
8. Chlorinator
9. Final treated effluent tank
10. Sludge holding tank
11. Filter press
12. Piping and cabling
13. LT power & Motor control panel

E DESIGN CRITERIA

The STP is designed on the basis of wastewater flow of **25 cum/day** for quality parameters as in Para B & C where the contractor desire to submit alternate offers for STP, these values shall form the design criteria for alternate designs. Alternate design shall be submitted as separate offer.

Further following design criteria have been followed in the design of STP in this tender.

Alternative, The Tenderer is requested to quote for STP with a SEQUENCING BATCH REACTOR (SBR)

1.1 Equalization Tank (Receiving Tank)

Capacity of Tank : 63m3

1.2 SBR Feed pumps : 18 m3/hr @ 10m Head (2W+ 1S).

Working hours : 12 Hrs

1.3 SBR Tanks - 2 nos

F: M Ratio	:	0.15
MLSS	:	4000 mg/lit
Oxygen requirement	:	2 kg/ kg of the BOD

1.4 Decant Tank

Detention time	:	6.0 hours based on hourly Flow of raw sewage.

1.6 Filter Feed pumps : 10 m3/hr @ 30 m Head (1W+ 1S).

Working hours : 20 Hrs

1.7 Pressure Sand & Activated Carbon Filter

Filtration Velocity	:	15 m3/m2/hr

1.8 Common Treated water tank

Detention time	:	12 hours based on hourly Flow of raw sewage.

1.9 Air Blowers : 260 m3/hr @ 4MWC, 0.45 kg/cm2(1W+ 1S).

F. SCOPE OF CONTRACT & DESCRIPTION OF WORK

SCOPE OF CONTRACT

The tender is invited on turnkey basis for Design, Engineering, Supply, Construction, Erection and Commissioning of Sewage Treatment Plant (STP), to give treated effluent quality as per standards as well as that specified in the Guarantee clause attached herewith & includes the following items which are within the scope of contract. The drawings attached herewith are preliminary. However, the successful contractor will be required to submit the Detailed Process & Structural drawings (shop drawings) incorporating the thicknesses of various structural members. These detailed drawings shall be submitted to Consultants for their comments & approval. All the works shall be carried out as per final "valid for construction drawings" only.

1.1 Civil works and structural steel fabrication works required for equipment, tanks for the Sewage treatment plant shall be done as required by civil contractor

1.2 Complete interconnecting piping between various units as per requirement including supply of all materials like pipes, fittings, all valves, gaskets, flanges, nuts and bolts including all materials required for necessary pipe supports and associated civil works, etc., complete.

1.3 Supply, erection and commissioning of all the equipments required for the sewage treatment plant as per the individual equipment specification and details given herewith.

1.4 All electrical works including all electrical motors for the various equipment, cabling, LT panel, starters, etc., will be provided by the contractor. The scope of work includes all necessary civil works like construction of panel foundations, cable trenches, cable supports, lighting of entire plant as per drawing etc., complete. Commissioning of all the equipment after the electricity is supplied will be within the scope of contract.

All temporary sheds, office, godowns, etc. required for storage of materials and for contractors supervisory personnel at site.

G. DETAILS OF CIVIL WORKS

Please refer the drawing no P-103 (Site Plan) location of STP and P-100 drawing for the dimensions of the tanks and schematic of STP.

Tenderers to reconfirm the adequacy of the sizes proposed.

Note: The above details are indicative only for the guidance of the contractor.

The successful contractor shall submit the details working/shop drawings for all civil works; related civil works for other process equipment, electrical works etc.

H DETAILS OF PIPING WORK

Following piping works including excavation, back filling, masonry / structural pipe supports, puddle flanges, concrete bedding, pipe specials and GM D/F Valves of LEADER (or approved CI valves or approved equivalent make only and or CI D/F Valves of KIRLOSKAR / SAUNDERS make only are all included in the scope of contract. The quantity and sizes of the pipes are indicative, the contractors to quote for the designed sizes of the pipes.

- 80 dia GI CL 'B" Tata/Jindal make from screen chamber to equalization tank appx.
- 65/50 dia GI CL 'B' Tata/Jindal make or pump suction and delivery to FAB Tank from equalization tank.
- 80 NB dia GI CL 'B' Tata/ Jindal make GI piping from FAB Tank to clarifier.
- 80 dia GI CL 'B' Tata/ Jindal make GI piping from Tube settler to treated effluent sump.
- 65/50 dia GI CL 'B' from treated effluent pumps to filters and 80 mm from AC filter outlet

1.0 G.I PIPES AND FITTINGS FOR WATER CONNECTIONS

1.1 G.I Pipes:

Generally G.I (Galvanized Iron) Pipes medium Class B TATA make shall be used for supply of water in the sewage treatment plant etc.,

For exposed pipes, the Clamps fixing shall be done by means of mild steel angle brackets and clamps, keeping the pipes not more than 200 mm clear of the wall. When it is concealed, the pipe chasing may be adopted. For pipes fixed in the ducts or recesses etc., provide sufficient space to work on the pipes with the usual tools. The pipes shall not ordinarily be buried in solid floors. Where unavoidable pipes may be buried for short distances provided adequate protection is given against damage and shall be fixed at a place a pipe is passing through a wall or floor to allow freedom for expansion and contraction and other movements. In the case, the pipes is embedded in walls or floors it should be painted with anti-corrosive bitu mastic of approved quality and pipe shall be wrapped in burlap or Hessian cloth impregnated with bitumen. The wrapping shall be made to fit tightly over the pipe and where wrapping with a new piece overlap the old pipe and where wrapping one joint it shall be tied with M.S wire or nylon thread. Where pipes are encased within chases made in the wall, they shall be fixed to the wall with M.S clamps so as to prevent movement before filling in and making good the chase.

All screwed tubes and sockets shall have pipe threads conforming to the requirements of IS: 554 - 1964 (or revised). Screwed tubes shall have taper threads while the sockets shall have parallel threads.

1.2 G.I Fittings:

The fittings shall be “R” Brand or approved equal conforming BIS.

The fittings shall have screw threads at the ends and conforming to the requirement of IS: 544-1955 (or revised). Female threads or fittings shall be parallel and male threads (except on running nipples and collars of unions) shall be taper. Unions shall be provided at regular intervals in the pipelines for easy maintenance / Repair / Replacement of pipes. The fitting shall be designated by the respective nominal bores of the pipes for which they are intended.

1.3 Cutting, Threading, Laying and Joining:

The pipes and fitting shall be inspected at site before use to ascertain that they conform to the specification. The defective pipes shall be rejected and removed from site. Where the pipes have to be cut or rethreaded, the ends shall be carefully filed out so that no obstruction to bore is offered. The ends of the pipes shall then be threaded conforming to the requirements of IS: 544-1955 with pipe dies and taps carefully in such a pieces are screwed together. The taps and dies shall be used only for the straightening screw threads which have become bent or damaged and shall not be used for turning of the threads so as to make them slack, as the later procedure may not result in a water tight joint. The screw threads of pipes and fittings shall be protected from damage until they are fitted.

1.4 Installation of pipes in trenches:

The pipes shall be painted with two coats of anti-corrosive bit mastic paint of approved quality and wrapped with Hessian cloth impregnated with bitumen. The pipes shall be laid on a sand cushion layer of 75-mm. river sand and filled with excavated earth. The surplus earth shall be disposed off as directed. The filling shall be done after testing & rectifying leakages and after final passing of work by Engineer In charge at site.

When the excavation is done in rocks the bottom shall be cut deep enough to permit the pipes to be laid on a sand cushion of minimum 75 mm. In case of bigger diameter pipes where the pressure is very high thrust blocks of cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate of 20 nominal size) shall be constructed on all bends to transmit the hydraulic thrust without impairing the ground and spreading it over a sufficient area, as directed by the Engineer In charge at Site.

COLOUR CODE FOR WATER SUPPLY PIPES

Color code for water supply pipes shall be as per standard requirement. Details as mentioned below.

COLOR CODE FOR GENERAL SERVICES

Sl No	Description	Ground Colour	First Colour Band	Second Colour Band
A	**WATER**			
1.0	Cooling	Sea green	French blue	
2.0	Boiler feed	Sea green	------	------
3.0	Condensate	Sea green	Light brown	------
4.0	Drinking	Sea green	French blue	Signal red
5.0	Treated	Sea green	Light orange	------
6.0	Cold water from storage tank.	Sea green	French blue	Canary yellow

1.6 TESTING

Before any pipes are painted or covered / buried, they shall be tested to a hydrostatic pressure of one and half times the working pressure. Pressure shall be maintained for at least eight hours without an appreciable drop in pressure. In addition to the sectional testing of water supply pipes, the contractor shall test the whole installation to the entire satisfaction of the Engineer. He shall rectify any leakages, failure of fittings or valves.

1.7 RECTIFICATION

Any leakage noticed shall be promptly attended by the contractor. If required the pipes and fittings shall be replaced to achieve an obsolutely watertight system at his own cost.

1.8 DISINFECTION OF THE PIPE NETWORK

The contractor to disinfect the entire water distribution network including the storage tanks at his own cost. The disinfection shall be done by using residual chlorine of 0.2 ppm for a period of 2 (two) hours. The entire chlorinated pipe network is to be flushed out with fresh water before the water supply system is put into operation for domestic usage.

1.10 EXTERNAL WORKS:

The galvanized iron pipes and fittings shall be laid in trenches. The widths and depth of the trenches for different diameters of the pipes shall be given as in the table below, and shall be deep enough to have a clear cover of at least 60cm over the top of pipes.

Dia. of pipe	Width of trench	Depth of trench
15mm to 50mm	30cm	60cm
65mm to 100mm	45cm	75cm
150mm	60cm	90cm

At joints the trench; width shall be widened where necessary. The work of excavation and refilling shall be done true to line and gradient.

The pipes shall be painted with two coats of anticorrosive bitumastic paint of approved quality and further wrapped with two coats of Hessian cloth and tied with G.I wire. The pipes shall be laid on a layer of 7.5cm sand and filled upto 15cm above the pipes. The remaining portion of the trench shall be then filled with excavated earth. The surplus earth shall be disposed off as directed.

When the excavation is done in rock the bottom shall be cut deep enough to permit the pipes to be laid on a cushion of sand minimum 7.5cm. In case of bigger diameter of pipes where the pressure is very high thrust blocks of

cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate of 20 nominal size) shall be constructed on all bends to transmit the hydraulic thrust without impairing the ground and spreading it over a sufficient area, as directed by the site engineer.

I GENERAL

1. The scope of Contract for Civil Works includes necessary hydraulic testing for water tightness/seepage as per relevant IS CODES FOR ALL WATER RETAINING STRUCTURES.

2. All expenses towards the testing including water, filling, dewatering and discharge shall be borne by the Contractor and the test shall be carried out till the structures are proved watertight and in presence of Consultants/Architects.

3. Scope of contract for piping includes construction of necessary masonry valve chambers min 900 x 900 wherever necessary, removable type MS painted covers and extension spindles for valves.

4. The entire STP is proposed to construct below ground level as per enclosed drawing.

5. Make of all piping/Equipments/Motors/Cables and Pumps shall be clearly stated in the offer shall be got approved by Consultant before Supply & Installation. The decision of Consultant in this regard shall be final and binding on the successful Contractor.

6. All equipment GA drawings shall be submitted to Consultant for approval prior to fabrication/ ordering. The fabricated and brought-out equipments shall be inspected at Contractor Works by Consultant and shall be dispatched to site only after obtaining clear dispatch instructions in writing from Consultant.

7. It is obligatory on the part of the intending bidder to visit the site of work prior to submitting the offer and familiarize himself with local/site /soil conditions, availability of men, Materials and Machinery for successful and timely execution of the works. No extra shall be paid in case Contractor fails to ascertain correct site conditions before submitting the offer.

8. All MS hand railing/ladders shall be given two coats of synthetic enamel paint over a coat of red-oxide primer or approved make and shade.

9. Any other item not specifically mentioned in this tender but is essential for proper and successful completion, commissioning and running of the STP for its commercial utilization is also to be included in the scope of contract.

J EQUIPMENT SPECIFICATION

a) MS Bar Screen

Quantity : 1 no.

Type : Manually cleaned with Hand rake

Size : 1000mm x 600mm x 900mm

Construction : In MS flats of size 20 x 6, c/c not more than 20mm/14mmwith necessary MS

flat 25 x 6 stiffeners. The whole unit shall be given 2 coats of epoxy based paint over a coat of epoxy based primer.

1 no MS handrail shall also be provided with GI pipe rod.

b) Raw Effluent Pump

Quantity : 2 nos. (1working + 1 standby)

Duty : To transfer Raw Effluent from Equalization Tank to SBR tank.

Type : Submersible non-clog pumps each to deliver 18 cum /h at 10 m head Grundfos, Kirloskar, STORK or equivalent make.

Motor : TEFC Motor, with IP-55 protection and suitable for 400/440 V, 50 Hz A/c supply of Grundfos, Kirloskar or siemens make.

Material of Construction : Body in CI and impeller in Bronze

Accessories : Air cock with priming funnel, flexible coupling with guard, Base frame, foundation bolts etc.,

c) Diffusers

Fine pore diffusers : One lot of 90 mm dia.1000mm long Membranes from EDI of USA/ SCOGEN make.

Coarse bubble diffusers : One lot of 90mm dia. 800mm long Max Air/Air flex diffusers EDI of USA make, type MAX AIR in PVC construction (for equalization Tank and treated effluent sump)

d) Air blowers (1+1) : 2 nos (1working + 1 standby) each
260 m^3 / hr @ 4 MWC, 0.45kg/cm2

e) Filter Feed Pumps

Quantity : 1working + 1 standby

Duty : To transfer clear water.

Type : Horizontal centrifugal non-clog open impeller, pumps each to deliver 10 cum /h at 30 M head Grundfos, Kirloskar, STORK or equivalent make.

Motor : TEFC Motor, with IP-55 protection and suitable for 400/440 V, 50 Hz A/c

Make : Grundfos, Kirloskar or siemens make.

Material of Construction : Body in CI and impeller in Bronze

Accessories : Air cock with priming funnel, flexible coupling with guard, Base frame, foundation bolts etc.,

f) Transfer Pumps

Quantity : 1 working + 1 standby

Duty : To transfer treated effluent

Type : Submersible non-clog pumps each to Deliver 10 cum/h at 10 M Head, Kirloskar, STORK Equivalent make.

Motor : TEFC Motor, with IP-55 Protection and suitable for 400/440 V, 50 HZ A/c supply of Kirloakar or siemens make.

Material of Construction : Body in CI and impeller in Bronze

Accessories : Air cock with priming funnel, Flexible Coupling with guard, Base frame, foundation Bolts etc.

g) Pressure Sand and Activated carbon filter

Quantity : 1 no. each filter

Flow rate : 12 m3/hr

h) Chlorinator

Quantity : 1 no. 5 LPH

Make : ASIA-LM1 / SAFEX

i) Sludge handling bag

Quantity : 1 No
MOC : SS suitable for sludge handling
Spare bags : 20

K DETAILS OF ELECTRICAL WORKS

1 No. LT Panel, cubicle type suitable for floor mounting and comprising incoming power control switch with HRC fuses, 5 nos Ammeters Voltmeter, Phase Indicating Lamps, MCBs and Starters for the feeders all complete. Also to be provided are two nos. Automatic Level Controller for actuating the Raw Effluent /Treated effluent. Necessary Auto manual Selector Switches shall also be provided.

3 nos. local push button starters shall also be provided near the Aerator equipments and mounted in weather proof enclosures.

Necessary power wiring by armoured PVC Cables or by PVC insulated wire in conduit from LT Panel to equipment motors and internal lighting of entire DSTP Plant as shown in the drawing.

Necessary earthing as per I.E. rules.

1 no spare feeder with MCB suitable for 5 HP shall also be provided in the LT Panel.

L TEST/TRIAL RUNNING AND COMMISSIONING

The Contractor shall have to test each equipment used for the plant for at least 72 hours continuous running with designed load and to the full satisfaction of Consultants. Any defects found, has to be rectified by the contractor at his own cost immediately and within reasonable time to be decided by client.

Necessary Instruments, Gauges, Labour/Supervisory Staff, Laboratory analysis etc., are to be furnished/ provided by the Contractor free of any cost to client.

M COMMISSIONING/HANDING OVER

During trial runs as described above, the Contractor shall satisfy Consultant in all respects regarding the satisfactory quality of effluent, quality of materials, equipments and workmanship used in the plant. Only after satisfying itself/ himself regarding the above points, client will takeover the plant and such date of taking over shall be deemed as date of commissioning for all purposes, guarantees, and payment terms mentioned elsewhere in this tender. The guarantee period described elsewhere in the tender shall start from the date of commissioning.

N GUARANTEE

The under mentioned clauses shall govern in case of any contrary provisions given elsewhere in the document.

Manufacturer's Guarantees

The manufacturer's guarantee for design, workmanship and performance for all bought out items shall be made available to the owner and shall be valid at least for the entire defects liability period.

In the event of failure of any particular equipment which fails more than three items during the guarantee period as mentioned in clause below, the contractor shall replace at his own cost that equipment. Manufacturer's/Contractor's guarantee, as mentioned in clause above, for such replaced equipment shall also be made available to the Owner and should be kept at least for one year from the date of last replacement.

Performance Guarantee

The Contractor shall give guarantee for a period of one year from the date of successful commissioning of the treatment plant against design, defective materials, workmanship, performance and guaranteed effluent quality. In the event the commissioning of the plant is not possible due to non-availability of effluent, contractor shall be issued mechanical completion certificate by client/consultant provided each equipment is tested satisfactorily as directed by Consultant. However, the contractor shall have to maintain the plant at his own cost, in such a case for a period for three months beyond which period, if he is required to maintain further, he will be paid extra at mutually agreeable rate. However, testing and commissioning of the plant shall be carried out by the Contractor during the Defects Liability Period. Any defects found in the workmanship, materials or performance of the plant shall be made good by the Contractor at his own expense within the time specified by client/consultant.

For this purpose, the retention amount will be as follows:

5% of the total value of Contract shall be retained. The Successful Tenderer as per general conditions of contract shall be retained till the completion of satisfactory commissioning as stated above. The contractor at his own expense shall start and commission, the plant and prove that it is giving satisfactory service and desired characteristic of the treated effluent, for two months before handing over the plant to the Owner. During this, the contractor shall train the Owner's operational stall without any extra cost to the Owner. The Contractor shall also have to guarantee the quality of the treated final effluent to meet the specification mentioned already. In case the quality of treated effluent varies from what is required, the contractor shall rectify the plant at no extra cost so as to achieve the requisite performance guarantee and satisfactory commissioning of the plant to the client/Consultant. In Case the contractor fails to achieve any of the aforesaid guarantees he will be penalized by an amount upto 10% (ten percent) of the total contract value. For this purpose any money due to the contractor shall be forfeited and adjusted against such penalty.

The contractor shall furnish the figures for average daily consumption of nutrients / Chemicals, if any.

All the above guarantees will be based on collection and analysis of samples as mentioned in clause below.

Oxygenation Capacity of Diffusers.

The contractor, if directed by Consultant, shall at his own cost prove the Oxygenation capacity guaranteed by him for the diffusers provided by conducting Oxygenation capacity tests on the unit by any standard and internationally recognized method to be approved by the Consultants.

O MECHANICAL GUARANTEES

The Contractor shall guarantee for a period of one year for the failure of any particular part of the equipment. In the event of failure of any particular part of the equipment more than three times during the guarantee period, it shall be replaced by the Contractor. In case it is found that the above mentioned failure is due to some other connected part of the equipment, that part shall also be rectified or replaced by the contractor to avoid such failures in the future. The guarantee for such replaced parts shall be extended by one year from the date of last replacement.

P COLLECTION AND ANALYSIS OF SAMPLES

The guaranteed effluent shall be based on complete analysis of samples collected after stabilization of the plant.

Q ANNUAL MAINTENANCE

The contractor shall include in the offer for maintaining the treatment plant including all the consumables etc., qualified personnel shall be posted on the site on shift basis, to take the sampling and carryout the tests. A complete record has to be maintained for all the tests carried out at regular intervals.

One operator per shift and one supervisor during general shift based on 2 shifts/day shall be posted. The senior chemist of the contracting firm shall visit at least once a week for monitoring plant operation.

Min. 2 nos. Raw Effluent and 2 nos. Treated Effluent samples per month shall be collected and got analyzed at the Board approved Laboratory. Also one Senior Mechanical Technician shall visit the plant for inspection and supervision of maintenance of all equipments.

R. LIST OF MAKES FOR STP

SL NO	DESCRIPTION	RECOMMENDED MAKES
1	BAR SCREEN	CONTRACTORS MAKE
2	RAW EFFLUENT PUMPS (SUBMERSIBLE)	GRUNDFOS/ KIRLOSKAR/JHONSON
3	COARSE BUBBLE DIFFUSER (90 Ø X 800 MM L)	EDI OF USA/ MAX AIR / SCOGEN
4	FINE PORE DIFFUSER (90 Ø X 800 MM L)	EDI OF USA/ SCOGEN
5	AIR BLOWERS	KAY INTERNATIONAL/EVEREST
6	FILTER FEED PUMPS	GRUNDFOS/ KIRLOSKAR/JHONSON
7	CHLORINATOR	ASIA LMI/SAFEX
8	PRESSURE SAND FILTER	CONTRACTORS MAKE
9	ACTIVATED CARBON FILTER	CONTRACTORS MAKE
10	LT PANEL	L&T
11	SINGLE SCREW DOUBLE STAGE PUMPS	HYDRO PROKAV/ ALPHA
12	CABLES	FINOLEX

DATA SHEET

CHEMICAL DOSING UNIT WITH METERING PUMP

TANK:

Capacity in Litre	:
Diameter	:
Height	:
Design flow	:
Chemicals required at	:
Design flow rate	:
Holding period	:
Dia of Inlet	:
Dia of Outlet	:
Dia of Drain	:

MATERIAL OF CONSTRUCTION

Tank	:
Valves	:
Piping	:

METERING PUMP

Make	:
Model No	:
Construction detail	:
Duty Conditions	:
Accessories Included With the pump	:

Note:

1) All information to be filled by Supplier
2) This Data Sheet to be filled for each unit separately

DATA SHEET

SEWAGE TRANSFER PUMPS

Make	:
Model	:
Type	:
Flow rate lts/Sec	:
Discharge pressure	:
Material	:
Casing	:
Impeller	:
Seal	:
Motor	:
Type	:
Make	:
Drive	:
Rating	:
RPM	:
Enclosure	:
Class of Insulation	:

DATA SHEET

FILTER FEED PUMPS

Make	:
Model	:
Type	:
Flow rate lts/Sec	:
Discharge pressure	:
Material	:
Casing	:
Impeller	:
Seal	:
Motor	:
Type	:
Make	:
Drive	:
Rating	:
RPM	:
Enclosure	:
Class of Insulation	:

DATA SHEET

TRANSFER PUMPS

Make	:
Model	:
Type	:
Flow rate lts/Sec	:
Discharge pressure	:
Material	:
Casing	:
Impeller	:
Seal	:
Motor	:
Type	:
Make	:
Drive	:
Rating	:
RPM	:
Enclosure	:
Class of Insulation	:

DATA SHEET

AIR BLOWERS

Blower Data

Make	:
Model	:
Services	:
Fluid handled	
Type	:
Flow rate m3/hr	:
Discharge pressure	:
Differential pressure	:
Operating Speed	:
BHP at Duty Point	:
Static weight with accessories	:
Material	:
Casing	:
Sealing	:
Recommended Motor	:
Frame Size	:
Opening	:

Material of Construction

Main Casing ,Side Plates & Rotor	:
Shafts	:
Gears	:
Base Frame	:

DATA SHEET

FINE BUBBLE DIFFUSERS

Make	:	
Shape of the diffuser	:	
Size	:	Dia90mm x 1000mm Long
Bubble Size	:	
Type of diffuser	:	
MOC of Membrane	:	
MOC of Diffuser Internals	:	
MOC of membrane clips	:	
MOC of diffuser male adopter	:	
Operating temperature of the membrane	:	
Temperature Tolerance	:	
Effective surface area of membrane per diffuser	:	
Optimum air throughput rate	:	
Pressure	:	

COARSE BUBBLE DIFFUSERS

Make	:	
Shape of the diffuser	:	
Size	:	Dia90mm x 800mm Long
Bubble Size	:	
Type of Membrane	:	
MOC of Membrane	:	
MOC of Diffuser Internals	:	
Effective surface area of membrane per diffuser	:	
Airflow per diffuser	:	
Pressure	:	

DATA SHEET

DATA TO BE FURNISHED BY THE CONTRACTOR AFTER AWARD OF CONTRACT AND `BEFORE' INSTALLATION

1. Quality Assurance Plan (QAP)
2. Detailed dimensioned general arrangement drawing of pump and driver.
3. Foundation drawing of pump and driver with static and dynamic loads, details of fixing, grouting and all relevant data required for design of foundation
4. Cross-section drawing of the pump with complete part list, materials of construction and relevant standards for each part
5. Pump performance curves flow rate Vs head, BKW, efficiency, NPSHR from zero flow to maximum flow and torque-speed curve
6. Scheme for pump sealing, lubrication and cooling
7. Driver dimensional drawing
8. Surface preparation and painting procedures
9. Catalogues, data sheets and drawings for instruments
10. Installation, operation and maintenance manual
11. Isolation pads and SS or Hot dip galvanized foundation bolts provided by the Contractor.
12. Cork-rubber make metallic bellows shall be provided at suction and discharge.
13. Pressure gauges with needle valve provided at suction and discharge lines.
14. All accessories provided to complete the pump installation.

DATA SHEET

CHECKLIST AND PERFORMANCE TEST DATA TO BE PROVIDED AFTER INSTALLATION

No	**Description**	**Unit**	**Time**			**Date**			**Remarks**
			10.00	12.00	14.00	16.00	18.00	20.00	
1.	Suction pressure	Kg/cm^2							
2.	Discharge pressure	Kg/cm^2							
3.	Water flow rate	M^3/hr							
4.	Current	Amps							
5.	Bed plate levels and alignment checks								
6.	Hydraulic test for casing at 1.5 times design pressure								
7.	Noise level from pump	1.8m dB							
8.	Discharge Vs head	Mtr							
9.	Discharge Vs efficiency								
10.	Discharge Vs BkW								

Run Test shall be conducted on the following Pumps.

1. Raw Effluent pumps.
2. Filter feed pumps.
3. Transfer Pumps

CHECKLIST AND PERFORMANCE TEST DATA TO BE PROVIDED AFTER INSTALLATION

A RAW WASTE WATER (SEWAGE)

Quantity : 200 KLD

pH	:
BOD_5 @ 20 ºC	:
COD	:
TSS	:
Oil & Grease	:

B TREATED WASTE WATER (SEWAGE) QUALITY

pH	:
BOD_5 @ 20 ºC	:
COD	:
E-Coli	:
Turbidity	:
Oil & Grease	:
Residual chlorine	:

McD Built Environment Research Laboratory Pvt Ltd

ABSTRACT FOR STP BOQ FOR NCSCM

PART	DESCRIPTION OF WORK	AMOUNT
I	STP ELECTRO MECHANICALS	
II	STP PANEL	
III	STATUTORY APPROVAL	
IV	OPERATION AND MAINTATENANCE	
TOTAL		
Add Vat @ ____% on ____%		
Add Service Tax @ ____% on _____%		
Grand Total		

Note: Provide details of Taxes included

McD Built Environment Research Laboratory Pvt Ltd

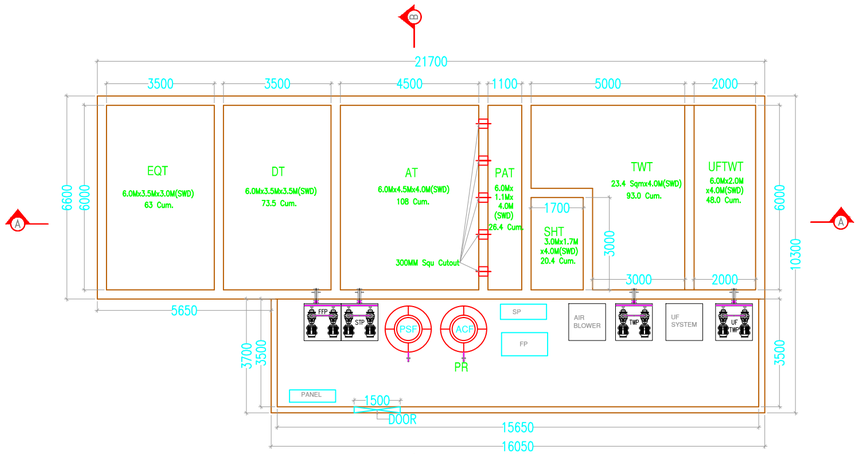
BILL OF QUANTITIES FOR STP FOR NCSCM

SL NO	DESCRIPTION OF WORK	TOTAL QUANTITY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	ADVANCED SEWAGE TREATMENT PLANT - 200 KLD				
	Note: All Quoted Equipments and Pumps are inclusive of all taxes				
I	**STP FOR ELECTROMECHANICAL EQUIPMENTS**				
	Design, Engineering, and providing all equipment /machinary at site, installation and commissioning of equipments/ electricals/ piping exclusive of all types of taxes and duties as described inspecificaation.				
	The approximate capacity of sewage treatement plant is 200KLD				
1	BAR SCREEN				
	Supplying, installing, testing and commissioning of bar screen consisting of 1no. of fine screen and one number coarse shall be provided in front of the intake works, so as to exclude the large sized particles with associated set of guide angles in MS flat of 6.0 mm thick and 50 mm wide kept inclined at 45 degree to the horizontal at 40mm c/c with one no. hand rack in GI. bar rack fabricated from SS-304 bars to the width of the screen chamber with a racking arm for manual operation.				
	Size : 1000 x 600	1	No.		
2	RAW SEWAGE PUMP				
	Supply, installation, testing & commissioning of Horizontal Centrifugal / Vertical Submersible sewage pumps with solid handling capacity up to 18 - 20 mm with CI casing & CI impeller complete with all accessories, motor of required capacity. The pumps will be complete with Delivery header with, pressure gauge on delivery line with isolation level controller (with wiring) to control the level of Sump automatically . Pumps & Other associated works & accessories, shall have following duty:				
	Make : Kirloskar / Johnson				
	Duty: 18 KLH @ 10 M head. (2W+1S)	3	No.		
3	COARSE BUBBLE DIFFUSER	12	No		
	Supply, installation, testing & commissioning of adequate capacities of coarse air diffusers in Equalization tank, Treatment tank, Sludge holding tank & other associated works & accessories etc.complete of size 80mm x 800 mm Wide band diffusers of Scogen / Equivalent Make				
4	FINE BUBBLE DIFFUSER	20	No		
	Supply, installation, testing & commissioning of adequate capacities of fine pore diffusers for SBR Reactors & other associated works & accessories etc.complete of size 90mm x 1000mm long - Tubular Memabrane Type Diffusers				
5	AIR BLOWER	2	No		
	Supply, installation, testing & commissioning of Twin type rotary air blowers for treatment tanks for the following capacity and pressure pressure through"V" belt or directly coupled through flexible coupling to a TEFC motor of suitable H.P suitable for 415 ± 10% volts, 3 phase, 50 cycles A/C supply. The blower & motor will be complete with base frame, header, valves, pressure gauge & other associated works & accessories etc.complete of Kay International Make				
	Duty: 260 M^3 /hr @ 0.45 KG/CM^2				

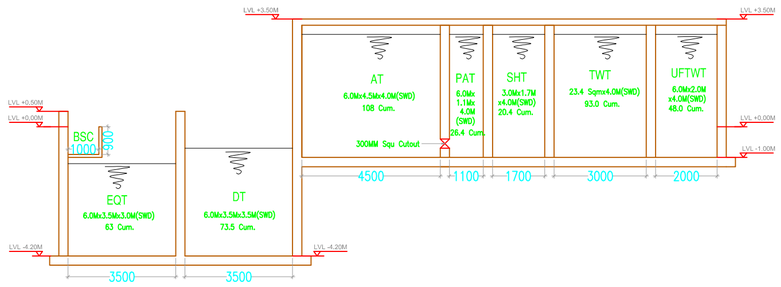
6	SLUDGE TRANSFER PUMP	1	No.		
	Supply, installation, testing and commissioning of Submersible / Centrifugal sludge transfer pump capable of solid handing upto 25mm as per manufacture specifications & other associated works & accessories etc.complete.				
	Make: Johnson / Approved Equivalent make				
	Duty: 10 KLH @10 M head. (1W+1S)				
7	FILTER FEED PUMP				
	Supply, installation, testing and commissioning of centrifugal self priming filter feed pump & other associated works & accessories & as per manufacture specifications below				
	Duty: 10 KLH @ 30 M head.	2	No.		
8	CHLORINATOR				
	Supply, installation, testing and commissioning of electronic metering type of Chlorine dosing pump & other associated works & accessories etc.complete.				
	Make : E- Dose	1	No.		
9	PRESSURE SAND FILTER				
	Supply, installation, testing and commissioning of Pressure Sand filter, of MS fabrication suitable for a loading rate of 12cum/hr/sqm & other associated works & accessories etc.complete.				
	Size : 1000 mm dia , HOS 1250mm	1	No.		
10	ACTIVATED CARBON FILTER				
	Supply, installation, testing and commissioning of Activated Carbon filter, of MS fabrication suitable for a loading rate of 12cum/hr/sqm & other associated works & accessories etc.complete.				
	Size : 1000 mm dia, Hos 1250mm	1	No.		
11	SLUDGE HANDLING - BAG FILTER				
	Supplying, fixing and commissioning of Bag Filter made of SS suitable for sludge handling, complete with all accessories and 20 spare bags suitable for 2 Bag system	1	No.		
12	DECANT MECHANISM	1	No		
	Supply , installation, testing and commissioning of 100 NB PLC Controlled automatic decant mechanism				
13	INTER UNIT PIPING				
	Supply,and fixing Plant Piping with CPVC / UPVC 10 Kg/sqcm pipes with fittings and approved make valves, gauges, instrumentation etc., for all plumbing lines and MS B Class pipeline with fittings for Blower Air Lines	1	Lot		
	T O T A L - I				

II	**STP PANEL**				
	Supply, installation, testing and commissioning of front operated, front access, totally enclosed, free standing, dust and vermin proof Panel **(Indoor type)** with IP 54 ingress protection, fabricated from 2 mm thick CRCA sheets, with hinged, gasketted and lockable doors including the cost of interconnections, copper crimping lugs, brass glands, bonding to earth and painting, suitable for use at 415 volts, 3 phase 4 wire 50 Hz system with 16 KA rupturing capacity at 415 volts complete.				
1	Electrical Motor Control Centre shall be suitable for all equipments connected to the STP with 3 Nos of spare feeders	1	Set		
2	**CABLES AND CABLE TERMINATIONS**				
	Inter Unit Cabling				
	Inter unit cabling for all equipments with necessary armoured/ unarmoured cables with necessary termination lugs, glands etc complete	1	Lot		
	TOTAL - II				
III	**STATUTORY APPROVAL**				
1	Commissioning and obtaining the statutory approvals from the concerned	1	Lot		
	T O T A L - III				
IV	**OPERATION AND MAINTATENANCE**				
1	Operation and maintenance with own staff and consumables as specified in the technical specifications	1	Year		
	TOTAL - IV				

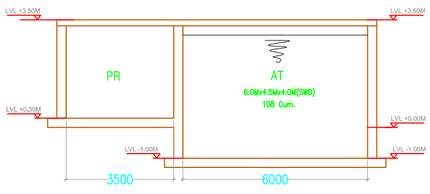
PRELIMINARY DRAWING FOR 200 KLD SEWAGE TREATMENT PLANT
SEQUENCING BATCH REACTOR



PLAN AT RAFT LEVEL



SECTION A-A

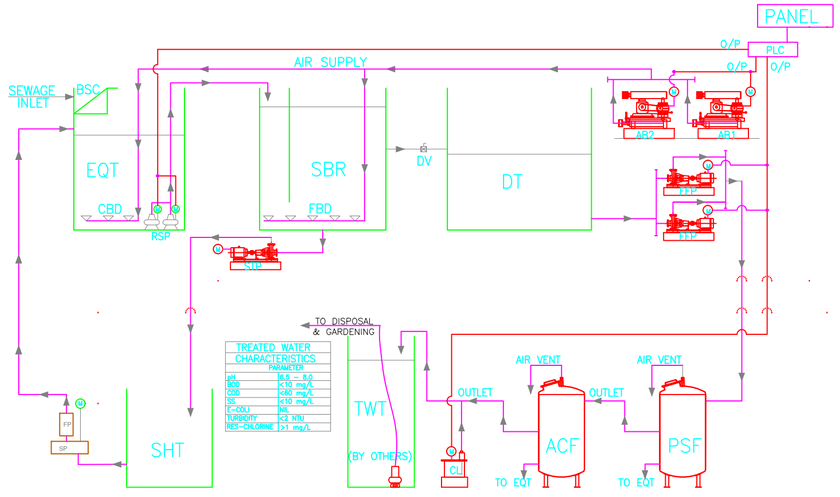


SECTION B-B

LIST OF CIVIL UNITS

MARK	DESCRIPTION
BSC	BAR SCREEN CHAMBER
EQT	EQUALISATION TANK
DT	DECANT TANK
AT	AERATION TANK
PAT	PRE AERATION TANK
TWT	TREATED WATER TANK
PR	PLANT ROOM
DOOR	MS DOOR
W	MS WINDOW

RAW SEWAGE CHARACTERISTICS	
PARAMETER	
FLOW	200 KLD
pH	7-10
BOD	250-350 mg/L
COD	500-600 mg/L
SS	150 mg/L



HYDRAULIC FLOW DIAGRAM

KEY PLAN

N

FOR TENDER

REV	DATE	DESCRIPTION	DRAWN	APPD
R0	27-12-13	FOR APPROVAL	MEL	

CLIENT

World Bank

PROJECT CONSULTANT

Mc D Built Environment Research Laboratory Pvt Ltd,
Green building,Sustainability and MEP services,
3rd Floor,CONCORD,#1354,9th Cross, 80ft Road,
33rd Main ,1st Phase, JP Nagar,Bangalore-560 078.
Ph:+91 80 41214020,URL: www.mcdberl.com

ARCHITECT

Flying Elephant Studio

PROJECT TITLE

NCSCM

DRAWING TITLE

SEWAGE TREATMENT PLANT PLAN & SECTION DETAILS

SCALE	DATE	DESIGNED	DRAWN	CHECKED	APPROVED
1:125	27-12-2013	PNR	MEL	PNR	

JOB NUMBER	DRAWING NUMBER	REVISION	SHEET
1348	P-100	R-0	A2