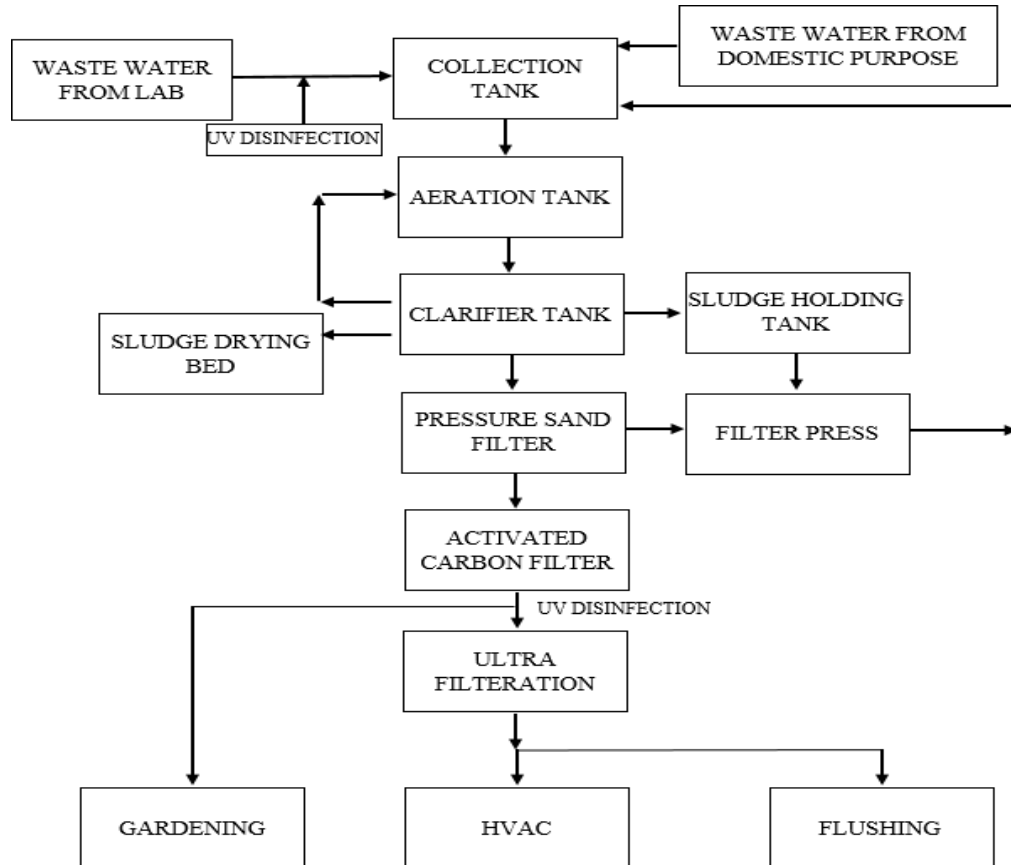




6.3.1 WASTE WATER TREATMENT



Design Calculation:

Combined Effluent Treatment Plant with capacity of 3000 KLD.

Raw Water Combined Effluent Characteristics

Parameters	Unit	Range
pH		6 - 8
Total Suspended Solids	mg/l	50 - 200
BOD 3 days @ 27°C	mg/l	100 - 350
COD	mg/l	400 - 900
Oil & Grease	mg/l	2 - 25

Treated Water Combined Effluent Characteristics

Parameters	Unit	Range
pH		6.5 - 9
Total Suspended Solids	mg/l	20
BOD 3 days @ 27°C	mg/l	10

COD	mg/l	50
Ammonical Nitrogen (NH ₄ - N)	mg/l	5
Total Nitrogen (N - Total)	mg/l	10
Total Coliform	MPN/100 mL	<100
Fecal Coliform	MPN/100 mL	<100

Collection Tank

Retention Time	: 4 Hrs
Average Flow Rate	: 3000/24
125 m ³ /hr Volume of the Equalization Tank Required	: 500 cum
Size of the tank existing	: 6.0 m Dia x 6.0 m LD
Size of the tank proposed	: 8.5 m Dia x 6.0 m LD
Total capacity of the tank provided	- 509.85 Cum.

Hence the collection tank provided is adequate to treat the volume of combined effluent generated.

Aeration Tank

Flow (Q)	: 3000 Cum/day.
Inlet B.O.D (So)	: 350 mg/l
MLSS (X)	: 3000 mg/l
(F/M)	: 0.2
(F/M)	: (Q*So)/(X*V)
Volume of aeration tank required	- 1750 Cum.
Quantity	: 4 Nos.
Size of the tank provided	
Aeration Tank - I	: 20.0m x 10.0m x 2.5m (500 Cum)
Aeration Tank - II	: 15.0m x 20.0m x 2.4m (720 Cum)
Aeration Tank - III	: 15.0m x 20.0m x 2.4m (720 Cum)
Aeration Tank - IV	: 15.0m x 20.0m x 2.4m (720 Cum)

Volume of aeration tank provided is 2660 cum.

Clarifier tank

Combined effluent generation	: 3000 KLD
Recirculated Flow, say 50%	: 1500 KLD
Total volume of combined effluent	: 4500 KLD
Average	: 187.5 cum/hr
Retention time provided	- 4 hrs.
Volume of tank required	- 750 m ³
Size of the tank (Existing)	- 12.0 Dia x 6.0 m.
Size of the tank (proposal)	- 5.0 m
Dia x 6.0 m. Total Volume of clarifier tank provided is	796.75 cum.

Pressure Sand Filter (2 nos.)

Flow for one filter	- 1500 KLD
Average Flow	- 63 cum.
Assuming velocity of 10 Cum/hr/Sq.m	
Area of filter required	- 63/10 = 6.3 m ² .

Pressure Sand Filter - I

Diameter of the filter provided	- 2.0 m
Area of the filter	- 3.14 Sq.m
Height of pressure sand filter provided	- 2.0 m
Size of the PSF – I	- 2.0 m Dia x 2.0 m HOS

Pressure Sand Filter - II

Diameter of the filter provided	- 2.4 m
Area of the filter	- 4.52 Sq.m
Height of pressure sand filter provided	- 1.5 m
Size of the PSF – II	- 2.4 m Dia x
1.5 m HOS Total area of pressure sand filter provided	- 7.66 Sq.m

Activated Carbon Filter (3 Nos)

Flow for one filter	- 1000 KLD
Average Flow	- 42 cum.
Assuming velocity of 10 Cum/hr/Sq.m	
Area of filter required	- $42/10 = 4.2 \text{ m}^2$.

Activated Carbon Filter – I

Diameter of the filter provided	- 1.5 m
Area of the filter	- 1.77 Sq.m
Height of pressure sand filter provided	- 1.75 m
Size of the ACF – I	- 1.5 m Dia x 1.75 m HOS

Activated Carbon Filter – II

Diameter of the filter provided	- 1.2 m
Area of the filter	- 1.13 Sq.m
Height of pressure sand filter provided	- 1.70 m
Size of the ACF – II	- 1.2 m Dia x 1.70 m HOS

Activated Carbon Filter – III

Diameter of the filter provided	- 2.5 m
Area of the filter	- 4.91 Sq.m
Height of pressure sand filter provided	- 1.85 m
Size of the ACF – III	- 2.5 m Dia x
1.85 m HOS Total area of Activated Carbon Filter provided	-
7.66 Sq.m	

Sludge Drying Bed (10 nos.)

Sludge applied to drying beds	: @ 100 kg/MLD
Sludge applied	: 250 kg/day
Specific gravity	: 1.015
Solid content	: 1.5%
Volume of the sludge	:
16.42 cum/day Considering monsoon etc, total no. of cycle in one year: 33 Nos.	
Period of each cycle	: $365/11 = 33 \text{ days}$.
Volume of sludge per cycle	: 181 cum.

Spreading a layer of 0.6 m / cycle area of beds required: 181/0.6
 = 302 Sq.m Total area of sludge drying bed required : 302 Sq.m

Sludge drying bed provided

No. of beds : 10 nos.
 Dimension of each bed : 6.0 m x 6.0 m
 Area of each bed : 36 Sq.m

Filter Press

Average Flow - 3000 m³/day.
 BOD - 350 mg/l
 BOD Load - 1050 kg/day
 TSS Load - 900 kg/day
 Total Sludge - 1950 kg/day
 Considering moisture percentage - 35%
 Cake Holding capacity / day - 1700 x 100/65 = 2615.3 litres
 Filtration time for one batch - 3hrs.
 Plate size - 610 mm x 610 mm.
 Cake Volume / chamber - 7.10 litres/chamber.
 7 Batch per day - 2615.3/7 = 373.6 litres (say 374 litres)
 Nos. of Chamber required - 374/7.1 = 53 (Approx.)
 Nos. of plate required 54

Specification of Combined ETP Units (3000 KLD)

S. No	Description	Quantity	Existing	Proposed
			Size of the units	Size of the units
1.	Collection - I	1	6.0 Dia x 6.0 m LD	-
2.	Collection - II	1	-	8.5 m Dia x 6.0 m LD
3.	Aeration Tank - I	1	20.0m x 10.0m x 2.5m	-
4.	Aeration Tank - II	1	15.0m x 20.0m x 2.4m	-
5.	Aeration Tank - III	1	15.0m x 20.0m x 2.4m	-
6.	Aeration Tank - IV	1	15.0m x 20.0m x 2.4m	-
7.	Clarifier tank - I	1	12.0 Dia x 6.0 m.	-
8.	Clarifier tank - II	1	-	5.0 m Dia x 6.0 m
9.	Pressure Sand Filter - I	1	2.0 m Dia x 2.0 m HOS	-
10.	Pressure Sand Filter - II	1	2.4 m Dia x 1.5 m HOS	-
11.	Activated Carbon Filter - I	1	1.5 m Dia x 1.75 m HOS	-
12.	Activated Carbon Filter - II	1	1.2 m Dia x 1.70 m HOS	-
13.	Activated Carbon Filter - III	1	2.5 m Dia x 1.85 m HOS	-
14.	Sludge drying bed	10	6.0 m x 6.0m	-
15.	UV Disinfection system	1	30 m ³ /hr	-
16.	UV Disinfection system	1	50 m ³ /hr	-
17.	Filter Press	54	-	610 mm x 610 mm

Photographs of the Combined Sewage Treatment Plant at SRIHER Campus



Existing Combined ETP 2500 KLD Capacity



Collection Tank



Bar Screen Chamber



Aeration Tank



Clarifier Tank



PSF and ACF



UF Treatment System



UV Treatment System



Sludge Drying Bed



Toilet Flushing Automatic System

Dr. P.V. VIJAYARAGHAVAN
Vice-Chancellor
SRI RAMACHANDRA
INSTITUTE OF HIGHER EDUCATION & RESEARCH
(Licensed to be Unaffiliated)
Purur, Chennai-600 116