SRI SIVASUBRAMANIYA NADAR COLLEGE OF ENGINEERING

(An Autonomous Institution)
Kalavakkam – 603 110

OPERATIONS

3.1 Potable water use per person

3.2 Potable water use per square meter

Submitted to

The Sustainability Tracking, Assessment & Rating System (STARS)

3.1 Potable water use per person

Performance year for water use 2023-2024

https://www.wri.org/applications/aqueduct/water-risk-atlas/#/?advanced=false&basemap=hydro&indicator=w_awr_def_tot_cat&lat=30&lng=-80&mapMode=view&month=1&opacity=0.5&ponderation=DEF&predefined=false&projection=absolute&scenario=optimistic&scope=baseline&threshold&timeScale=annual&year=baseline&zoom=3

- Potable water from off-site sources -487 KLD
- Potable water from on-site sources -NIL
- Full-time equivalent student enrollment-1047
- Full-time equivalent of employees-411

https://www.ssn.edu.in/wp-content/uploads/2024/02/7.1.4_Water-conservation.pdf

3.2 Potable water use per square meter

- Gross floor area of building space: 1,41,764 Sqm

SRI SIVASUBRAMANIYA NADAR COLLEGE OF ENGINEERING

(An Autonomous Institution)
Kalavakkam – 603 110

OPERATIONS

3.3 Systems for Water Recovery and Return

Submitted to

The Sustainability Tracking, Assessment & Rating System (STARS)

3.3 Systems for water recovery and return

- Narrative providing an overview of the institution's on-site rainwater harvesting systems

At SSN College, a comprehensive rainwater harvesting system has been implemented, featuring 418 percolation pits, 12 storage wells, and a rainwater trench system. The percolation pits are strategically located across the campus to capture runoff water and recharge the groundwater table, while the storage wells conserve rainwater for non-potable uses, reducing dependency on external sources. The rainwater trenches guide surface runoff to designated areas, preventing waterlogging and promoting efficient groundwater recharge. This initiative not only supports sustainable water management but also serves as a practical demonstration of environmental stewardship. As a result, the campus is more self-sufficient and resilient in water resource management, contributing to a sustainable future.

Percolation Pit – 418 Nos (2207.83 cu.m)

Rainwater storage Well – 12 Nos (7234.56 cu.m)

Rainwater Trench (Approx. 39049.2 cu.m)

(Photographs, cross section ad other details are enclosed in the folder)

- Narrative an overview of the institution's on-site water recovery and reuse systems

The sewage from the building along with wastewater from toilets and kitchens etc., would be treated in the sewage treatment plant. Sewage treatment plant design shall be as per CPCB & SPCB norms. The sewage treatment plant for the entire campus capacity is 500 KLD (Existing 100 KLD and New STP 400 KLD) designed to treat combined sewage (i.e., soil and wastewater). The treatment shall have extended aeration with SBR technology. After the treatment, the water will be used for landscape irrigation purposes.

The Sequencing Batch Reactor (SBR) is an activated sludge process designed to operate under sequences for the various phases of biological treatment where aeration and sludge settlement both occur in the same tank. SBR systems contain either two or more reactor tanks that are operated in parallel, or one equalization tank and one reactor tank.

Total Water required on campus: 487 KLD
Total Wastewater generated on campus: 438 KLD
Total capacity of the STP system on campus: 500 KLD

- Narrative providing an overview of the institution's on-site green infrastructure

Green Buildings: SSN implements energy-efficient building designs, renewable energy installations, and sustainable materials in its infrastructure.

Sustainable Landscaping: The campus features native plants to manage stormwater and support local biodiversity.

Water Management: Systems for rainwater harvesting, low-flow fixtures, and eco-friendly wastewater treatment reduce water consumption and promote reuse.

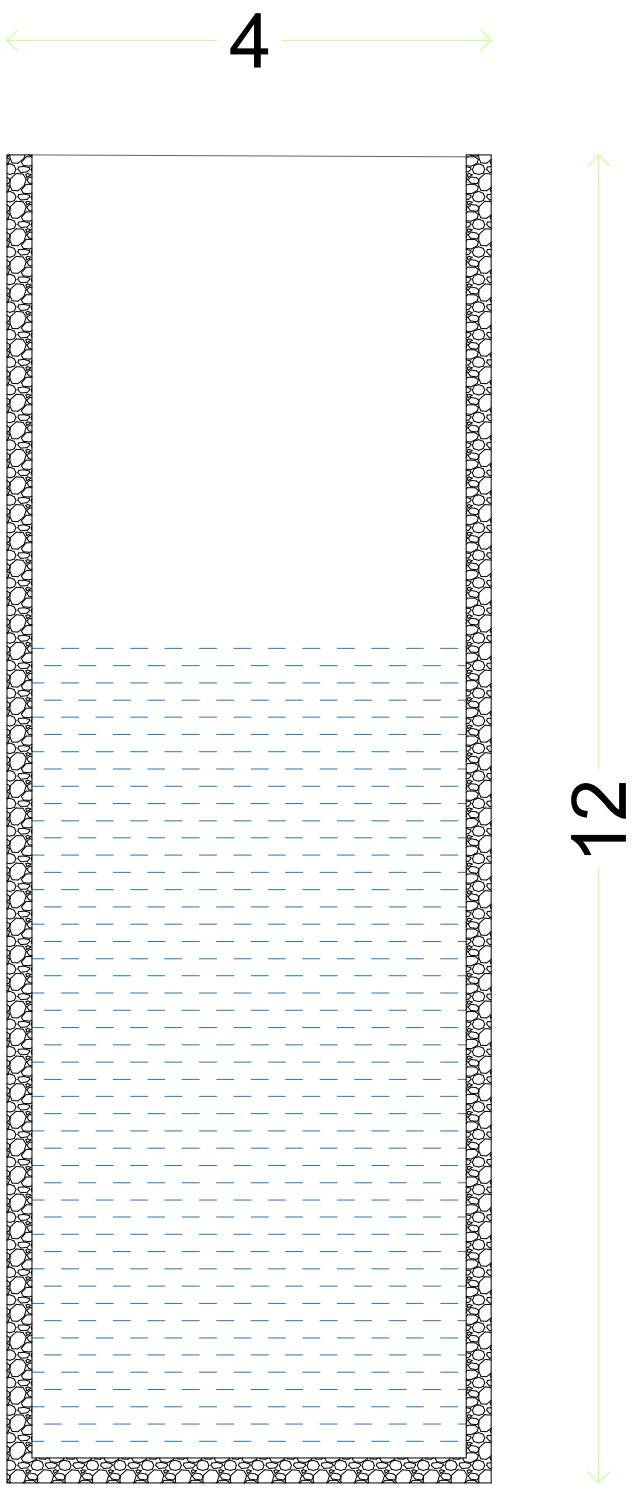
Sustainable Transportation: shuttle services encourage eco-friendly commuting options.

Waste Management: Comprehensive programs for recycling, composting, and proper e-waste disposal minimize environmental impact.

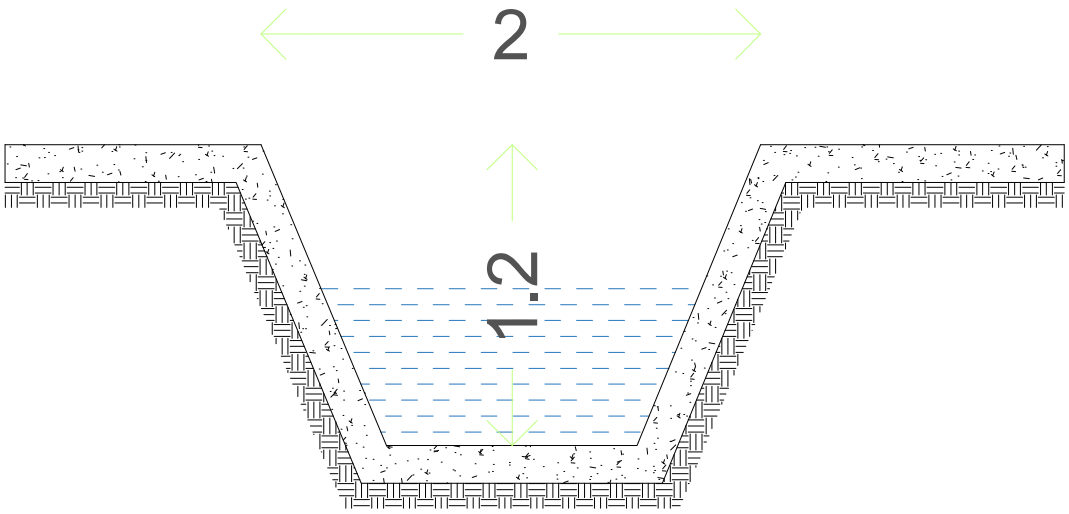
Renewable Energy: Solar panels and other renewable energy systems are deployed to decrease reliance on non-renewable energy sources.

Community Engagement: Sustainability workshops, green campus initiatives, and educational programs involve the campus community in environmental efforts.

Energy and Water Audits: Regular audits are conducted to monitor resource usage and identify areas for improvement.



SECTION THROUGH WELL



SECTION THROUGH TRENCH

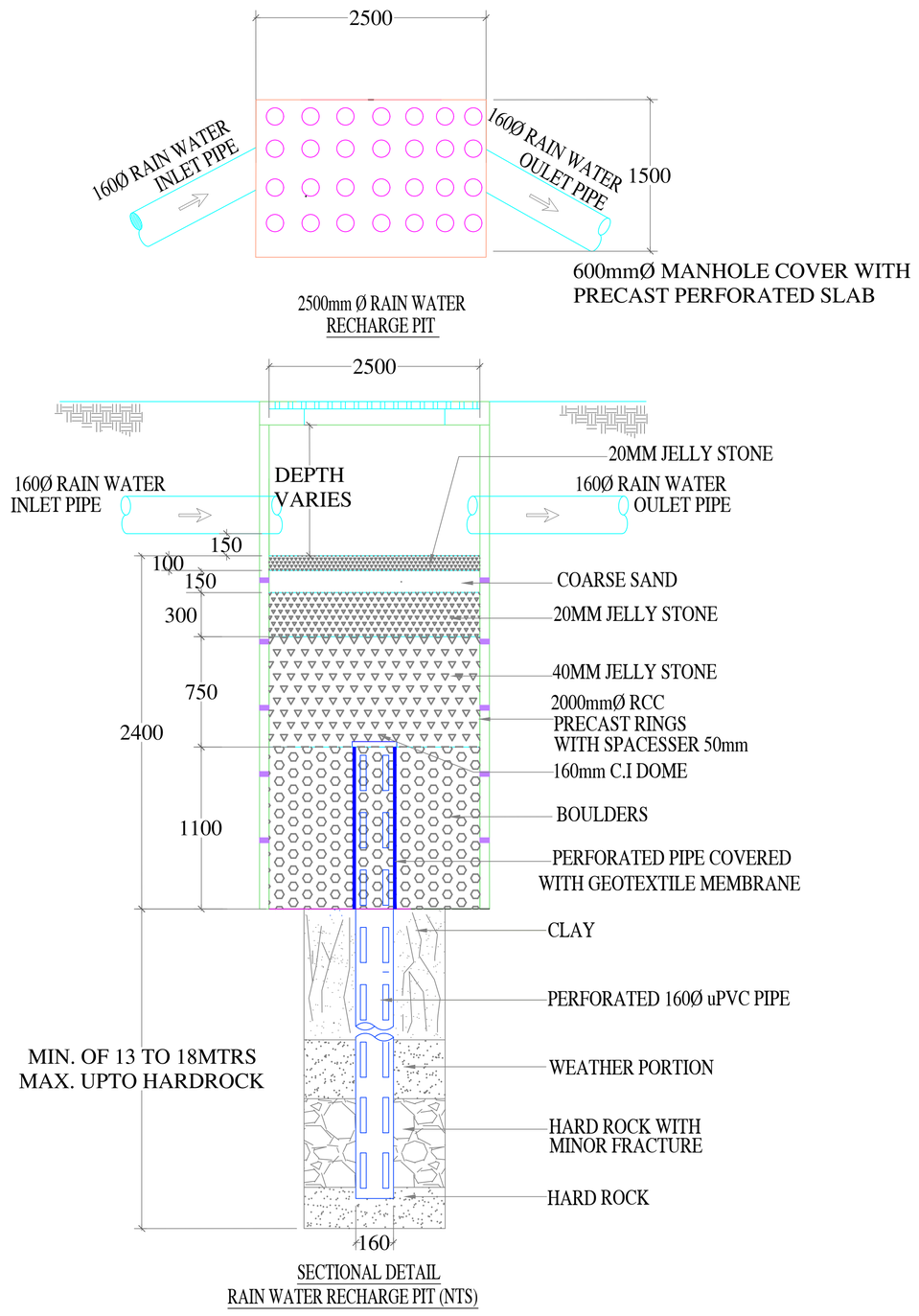
Rain water Harvesting

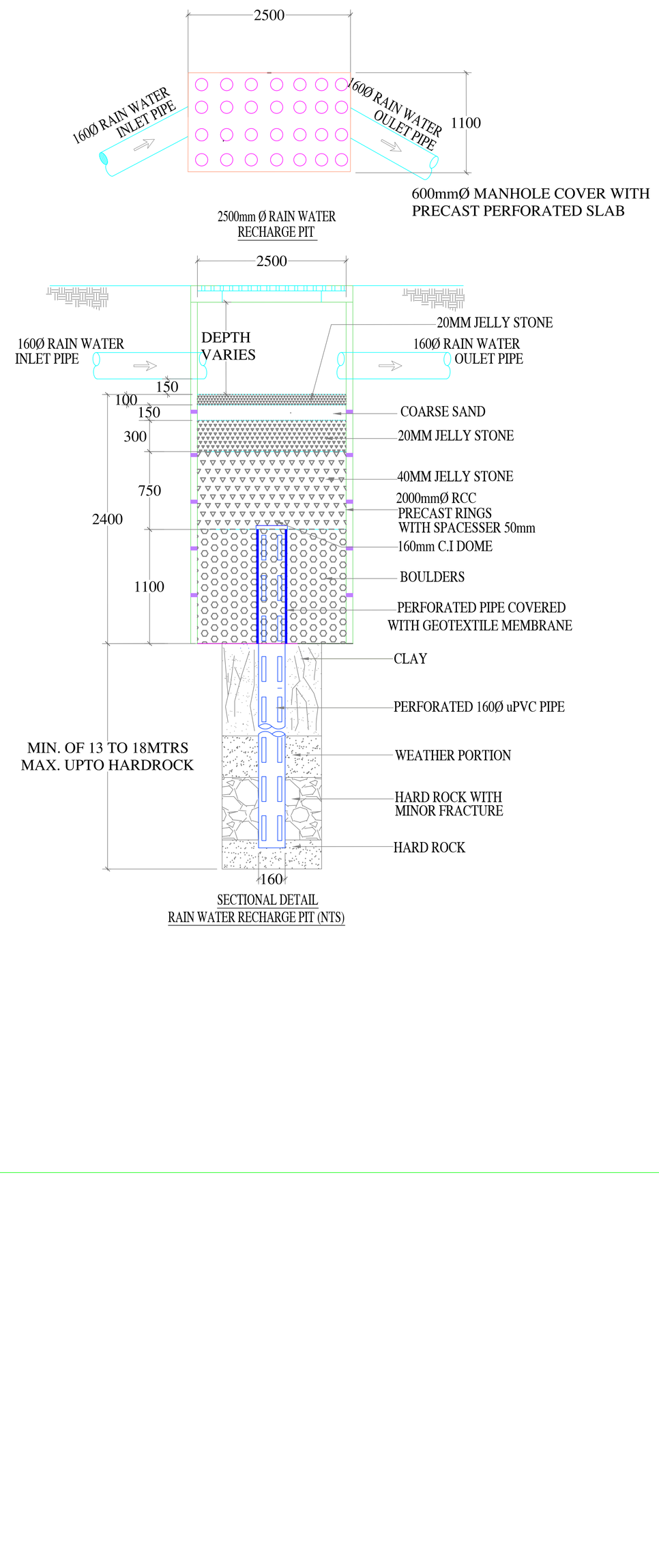
Details of Rain Water Harvesting Pits

S.No	Name of the Buildings	No of Floors	No of RWH Pits	Size of the RWH Pits	Type of Construction	Remarks
A	**Educational Area :**					
1	Administration Block	GF	4	2.50x1.10 M	Framed Structure with RCC Roof	
2	Core Lab	G+1	2	2.50x1.10 M	Framed Structure with RCC Roof	
3	Workshop	GF	2	2.50x1.10 M	Framed Structure with part RCC Roof & part sheet roofing	
4	Mechanical Block	GF	34	2.50x1.10 M	Framed Structure with RCC Roof	
5	Innovation/Incubation Centre	GF	4	2.50x1.10 M	Framed Structure with RCC Roof	
6	ECE Block	G+1	5	2.50x1.10 M	Framed Structure with RCC Roof	
7	ECE Annexure	G+2		2.50x1.10 M	Framed Structure with RCC Roof	
8	Central Library & Computer Centre	G+1	9	2.50x1.10 M	Framed Structure with RCC Roof	
9	Career Development Centre	G+2		2.50x1.10 M	Framed Structure with RCC Roof	
10	School of Management	GF	20	2.50x1.10 M	Framed Structure with RCC Roof	
11	Humanities Block	G+2	11	2.50x1.10 M	Framed Structure with RCC Roof	
12	CSE Block	G+1	10	2.50x1.10 M	Framed Structure with RCC Roof	
13	IT Block	G+1	10	2.50x1.10 M	Framed Structure with RCC Roof	
14	SASE Block	G+1	4	2.50x1.10 M	Framed Structure with RCC Roof	
15	Bio Medical & Chemical Engineering Block	G+3	25	2.50x1.10 M	Framed Structure with RCC Roof	
16	EEE Block (including Research Centre, Civil Engg and exam. Hall)	G+3	28	2.50x1.10 M	Framed Structure with RCC Roof	
17	SSN Crest	G+1	3	2.50x1.10 M	Framed Structure with RCC Roof	
18	CSE Annex Block (G+3)	G+3	5	2.50x1.25 M 2.50x1.50 M	Framed Structure with RCC Roof	
19	Academic Block of SNU	G+3	7	2.50x1.25 M	Framed Structure with RCC Roof	
	Total		**183**			
B	**Common Facilities**					
1	Primary Substation	GF	Nil	2.50x1.10 M	Framed Structure with RCC Roof	
2	Sports Comlex	G+1	6	2.50x1.10 M	Framed Structure with part RCC Roof & part sheet roofing	
3	Main Auditorium (1000 Seating Capacity)	G+2	4	2.50x1.10 M	Framed Structure with part RCC Roof & part sheet roofing	
4	Central Canteen (736 Seating Capacity)	G+1	3	2.50x1.10 M	Framed Structure with RCC Roof	
5	Mini Auditorium (300 Seating Capacity) at Workshop block	GF	4	2.50x1.10 M	Framed Structure with part RCC Roof & part sheet roofing	
6	Secondary Substation	GF	Nil	2.50x1.10 M	Framed Structure with RCC Roof	
7	Guest House (6 Guest Rooms)	G+1	3	2.50x1.10 M	Framed Structure with RCC Roof	
8	OHT & UG sump		NA		Framed Structure with RCC Roof	

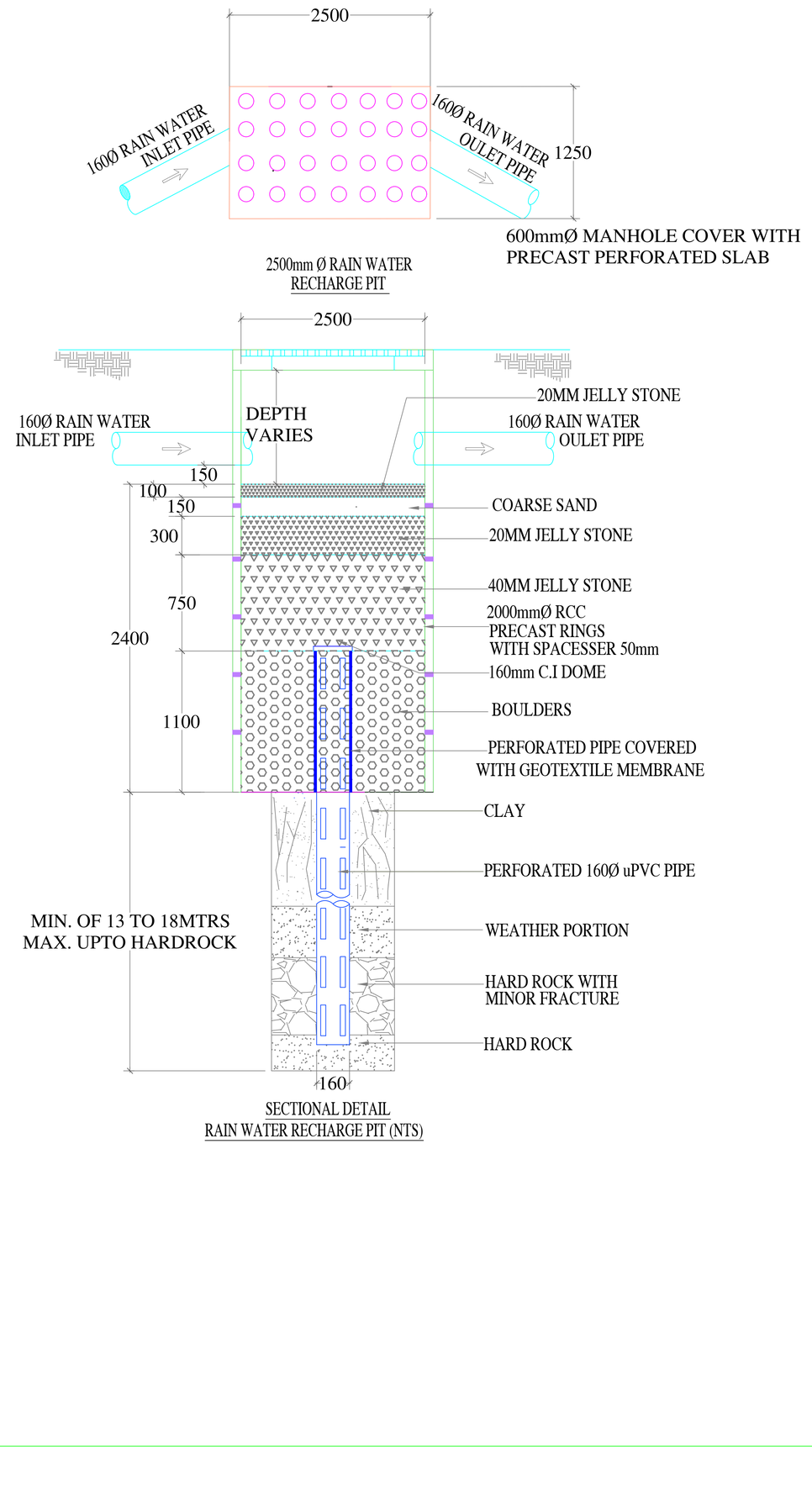
9	Store Cum Toilet at Play Ground	GF	Nil		Framed Structure with RCC Roof	Connects to Drain
10	Drivers Shed	GF	Nil		Framed Structure with Sheet Roofing	Connects to Drain
11	Cricket Pavilion	G+1	Nil		Framed Structure with RCC Roof. Gallery covered with Tensile roofing	Connects to Drain
12	Grand Entry(With Car Park,Roads etc-Total Area 0.5 lakh Sq.ft)	GF	Nil		Framed Structure with RCC Roof	Connects to Drain
13	Clock Tower (Vama Sundari Park-Total Area 2.4 Lakh Sq.ft)	NA	Nil		Framed Structure with RCC Roof	Connects to Drain
14	Football Stadium	G+1	2	2.50x1.10 M	Framed Structure with RCC Roof. Gallery covered with Tensile roofing	
15	Parents Waiting Hall	GF	Nil		Framed Structure with RCC Roof	Connects to Drain
16	Toilet Block for Mini Auditorium	G+1	NA		Framed Structure with RCC Roof	
17	Open Air Theatre Phase-I	GF	1	2.50x1.10 M	Framed Structure with part RCC Roof & part sheet roofing	
18	Research Lab	GF	NA		Framed Structure with RCC Roof	
19	Sports Complex Annex		7	2.50x1.50 M	Framed Structure with part RCC Roof & part sheet roofing	
	Total		**30**			
C	**Students Living Area**					
1	Gents Hostel –I & Dining Hall	G+3	6	2.50x1.10 M	Framed Structure with RCC Roof	
2	Gents Hostel –II & Dining Hall (96 Rooms) [Gen.H-II -3819 + Din. - 523]	G+3	8	2.50x1.10 M	Framed Structure with RCC Roof	
3	Gents Hostel-III (PG) (75 Single Rooms)	G+3	6	2.50x1.10 M	Framed Structure with RCC Roof	
4	Gents Hostel-IV (for 1st Year Students) [284 Capacity]	G+3	18	2.50x1.10 M	Framed Structure with RCC Roof	
5	Gents Hostel –V-UG	G+3	11	2.50x1.10 M	Framed Structure with RCC Roof	
6	Gents Hostel – VI (PG) including International students	G+3	10	2.50x1.10 M	Framed Structure with RCC Roof	
7	PG Gents Hostel -VII (PG & International Blocks)	G+3	6	2.50x1.10 M	Framed Structure with RCC Roof	
8	Dining Hall for Gents Hostel (Total seating capacity - 560)	G+1	5	2.50x1.10 M	Framed Structure with RCC Roof	
9	Ladies Hostel –I (88 Double Rooms)	G+3	4	2.50x1.10 M	Framed Structure with RCC Roof	
10	Ladies Hostel –II (48 Rooms)	G+3	10	2.50x1.10 M	Framed Structure with RCC Roof	
11	Ladies Hostel-III (for 1st Year Students) (142 Capacity)	G+3	7	2.50x1.10 M	Framed Structure with RCC Roof	
12	Ladies Hostel –IV-UG	G+3	8	2.50x1.10 M	Framed Structure with RCC Roof	
13	PG Ladies Hostel -V (A Block)	G+3	20	2.50x1.10 M	Framed Structure with RCC Roof	
14	PG Ladies Hostel -V (B Block)	G+3		2.50x1.10 M	Framed Structure with RCC Roof	
15	UG Girls Hostel-VI	G+3	10	2.50x1.10 M	Framed Structure with RCC Roof	
16	Dining Hall for Ladies Hostels GF-861.31+FF-1578.32	G+1	2	2.50x1.10 M	Framed Structure with RCC Roof	
17	Cloth Drying Area for Ladies Hostels	GF	3	2.50x1.10 M	Framed Structure with Sheet Roofing	
18	Cloth Drying Area for Gents Hostels	GF	1	2.50x1.10 M	Framed Structure with Sheet Roofing	
	Total		**135**			

D	**Residential Area :**					
1	"A" Type Quarters (VC Residence) (1 No.)	G+1	1	2.50x1.10 M	Load Bearing wall with RCC Roof	
2	"B" Type Quarters (Professors Quarters - 6 Nos.)	G+1	12	2.50x1.10 M	Load Bearing wall with RCC Roof	
3	"C" Type Quarters (Ass.Professors Quarters - 4 Nos.)	G+1	5	2.50x1.10 M	Load Bearing wall with RCC Roof	
4	"C" Type Quarters (Ass.Professors Quarters - 6 Nos.)	G+2	5	2.50x1.10 M	Load Bearing wall with RCC Roof	
5	"E" Type Quarters (Lecturers Quarters - 12 Nos.)	G+1	12	2.50x1.10 M	Load Bearing wall with RCC Roof	
6	"E" Type Quarters (Lecturers Quarters - 18 Nos.)	G+2	12	2.50x1.10 M	Load Bearing wall with RCC Roof	
7	"F" Type Quarters (Lab Assitant Quarters - 6 Nos.)	G+2	4	2.50x1.10 M	Load Bearing wall with RCC Roof	
8	"G" Type Quarters (Lab Attender Quarters - 12 Nos.)	G+1	7	2.50x1.10 M	Load Bearing wall with RCC Roof	
9	Staff Quarters Block A	Stilt+8	6	2.50x1.50 M	Framed Structure with RCC Roof	
10	Staff Quarters Block C	Stilt+9	6	2.50x1.50 M	Framed Structure with RCC Roof	
	Total		**70**			
	Grand Total in Nos		**418**			


2500
160Ø RAIN WATER INLET PIPE
160Ø RAIN WATER OULET PIPE
1500
600mmØ MANHOLE COVER WITH PRECAST PERFORATED SLAB
2500mm Ø RAIN WATER RECHARGE PIT
2500
DEPTH VARIES
160Ø RAIN WATER INLET PIPE
160Ø RAIN WATER OULET PIPE
20MM JELLY STONE
150
100
150
300
750
2400
1100
COARSE SAND
20MM JELLY STONE
40MM JELLY STONE
2000mmØ RCC PRECAST RINGS WITH SPACESSER 50mm
160mm C.I DOME
BOULDERS
PERFORATED PIPE COVERED WITH GEOTEXTILE MEMBRANE
CLAY
PERFORATED 160Ø uPVC PIPE
WEATHER PORTION
HARD ROCK WITH MINOR FRACTURE
HARD ROCK
MIN. OF 13 TO 18MTRS
MAX. UPTO HARDROCK
160
SECTIONAL DETAIL
RAIN WATER RECHARGE PIT (NTS)



SECTIONAL DETAIL
RAIN WATER RECHARGE PIT (NTS)


2500
160Ø RAIN WATER INLET PIPE
160Ø RAIN WATER OULET PIPE
1250
600mmØ MANHOLE COVER WITH PRECAST PERFORATED SLAB
2500mm Ø RAIN WATER RECHARGE PIT
2500
DEPTH VARIES
160Ø RAIN WATER INLET PIPE
160Ø RAIN WATER OULET PIPE
20MM JELLY STONE
150
100
150
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750
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COARSE SAND
20MM JELLY STONE
40MM JELLY STONE
2000mmØ RCC PRECAST RINGS WITH SPACESSER 50mm
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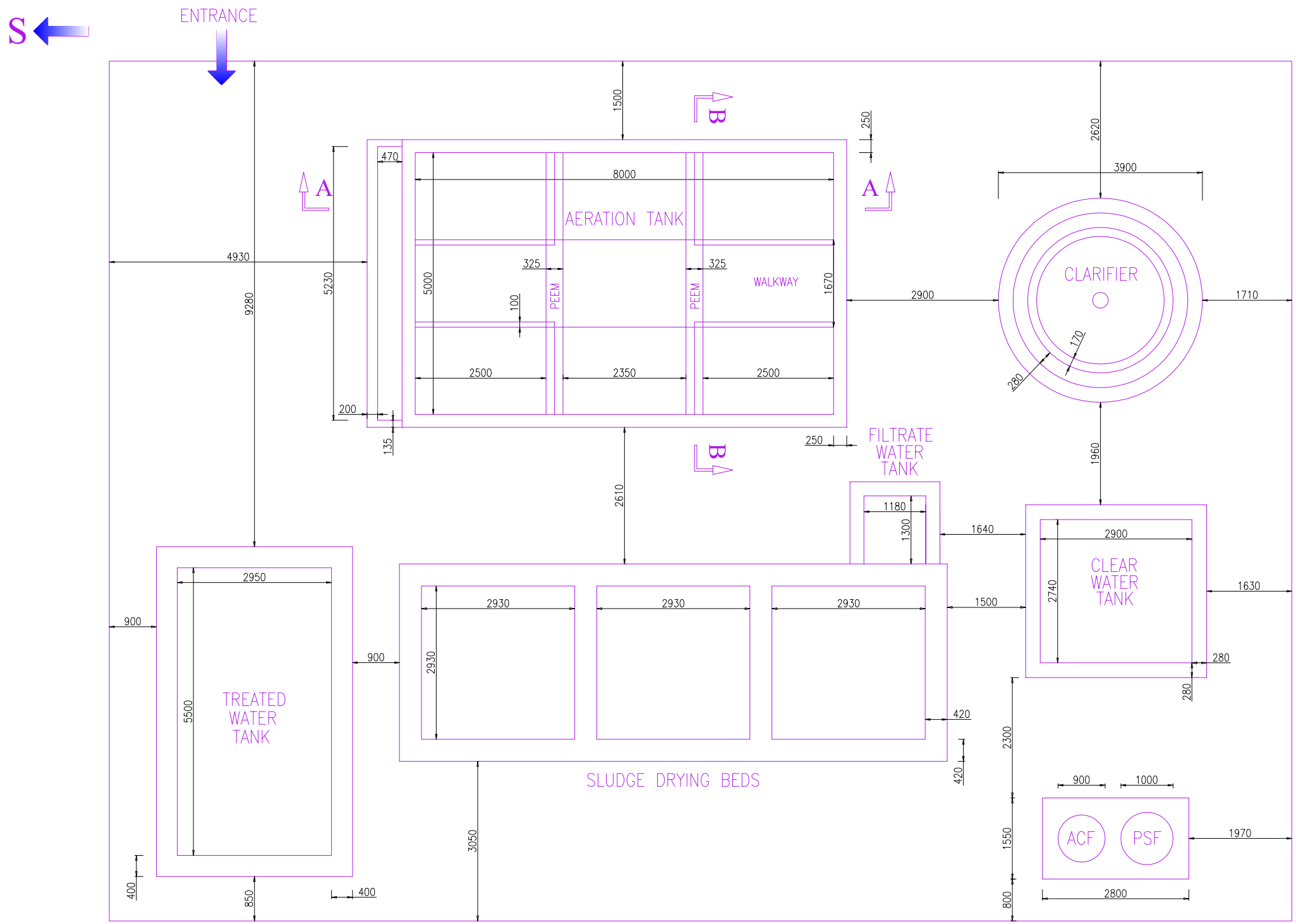
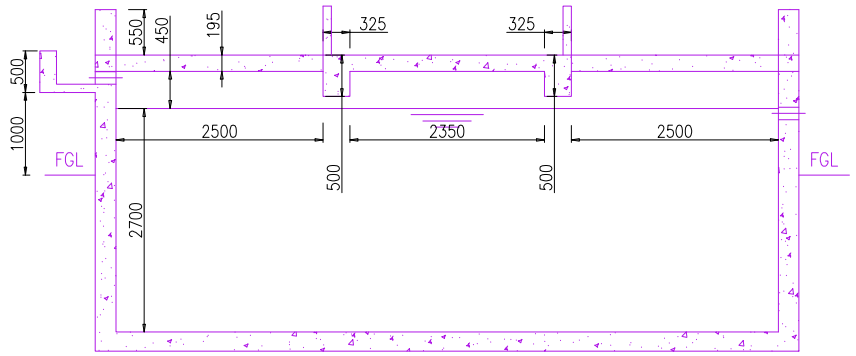
PERFORATED PIPE COVERED WITH GEOTEXTILE MEMBRANE
CLAY
PERFORATED 160Ø uPVC PIPE
MIN. OF 13 TO 18MTRS MAX. UPTO HARDROCK
WEATHER PORTION
HARD ROCK WITH MINOR FRACTURE
HARD ROCK
160
SECTIONAL DETAIL
RAIN WATER RECHARGE PIT (NTS)

DRAWING No. WTTAC/SSN/STP/01

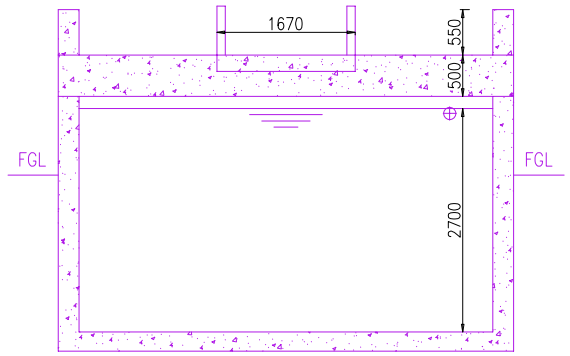
REV No. 00



PLAN



SECTION AA



SECTION BB

NOTE:-
1. ALL DIMENSION ARE IN MM U.O.S

WATER TREATMENT TECHNOLOGIES AND CHEMICALS
CHENNAI & COIMBATORE

CLIENT :-
M/S. SSN COLLEGE OF ENGINEERING
CHENNAI

PROJECT:
SEWAGE TREATMENT PLANT – 100KLD

	NAME	SIGN
DRN.	S. Raj	
CHD	C. R. Selvin	
APPD	S.P.L	

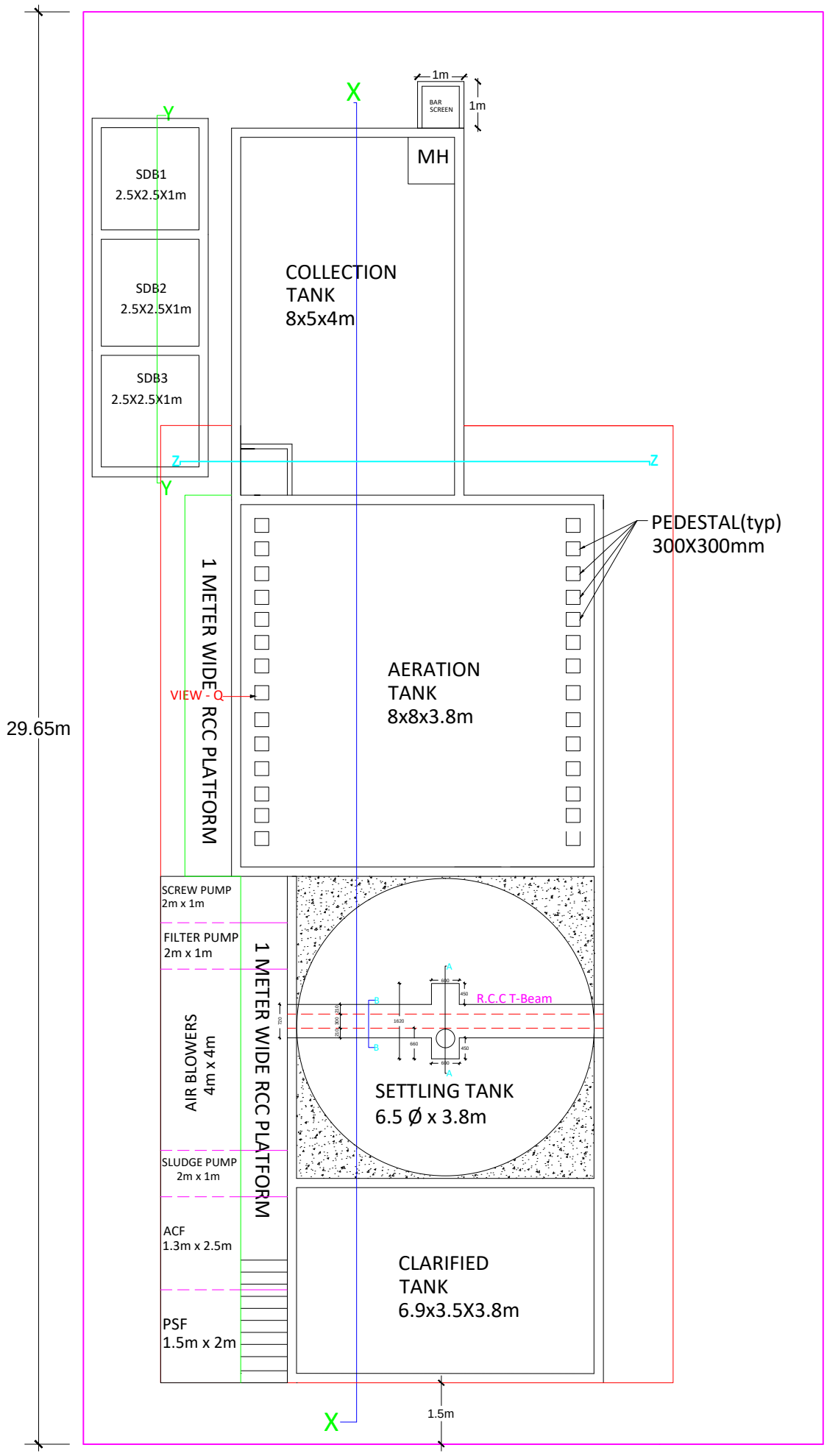
TITLE: PLANT LAYOUT (EXISTING)

SCALE NTS

DRAWING No. WTTAC/SSN/STP/01

REV No. 00

LAYOUT OF SEWAGE TREATMENT PLANT- 400KLD FROM NORTH SIDE OF EXISTING STP



SCREW PUMP
2m x 1m

FILTER PUMP
2m x 1m

AIR BLOWERS
4m x 4m

1m WIDE PLATFORM

SLUDGE PUMP
2m x 1m

ACF
1.3m x 2.5m

PSF
1.5m x 2m

1. All dimensions are in meter and millimeter unless otherwise noted.
2. No dimension shall be scaled, follow written dimension given in the DRG.
3. All grade of concrete and steel shall be M20 and Fe-500
4. Use PPC cement conforming to IS:1489 and steel conforming to IS:1786
5. Clearcover:Slabs-20mm;Beams-25mm;Columns-40mm;Footings-50mm.
6. Development length shall be 50 times dia of reinforcement
7. Based on the soil report the SBC values are taken.
8. Water used for construction shall be the potable water.
9. Cube strength of concrete shall be checked for 7 days and 28days periodically.
10. Equivalent % of reinforcement is allowed.
11. All fabricated Rft. will be checked by the authorized person.

PROJECT BY:
Global Recruiters & Envirobio Advance Technologies
No : 4-B, Thulukkanathamman Koil 11th Street
Pallikaranai , Chennai - 600 100.
Mobile : 8344311777 / 8344311888
email : eaka.globalenviro@yahoo.com

STRUCTURAL CONSULTANTS:
Dr.R.BASKAR A.M.I.E, M.E(struct),Ph.D(struct)
SPAN CHECK ASSOCIATES
NO. 9, Sivapuri Quarters, Annamalinagar
CHIDAMBARAM - 608 001
PHONE: 98426 80513
Email: rajaram_baskar@rediffmail.com

PROJECT NO: NVL-04-17
FILE LOCATION AND SOFTWARE VER: SYS-2/Consultancy: ACAD-2011-WIN
DRAWN BY:R.KEERTHANA
SCALE: NTS
STATUS: FOR APPROVAL
REVISION: 01
DATE OF ISSUE:24.02.2018
SHEET NO:03

TITLE: OVERALL LAYOUT

PROJECT: SEWAGE TREATMENT PLANT - 400KLD

CLIENT :
SSN College of Engineering
Rajiv Gandhi Salai (OMR)
Kalavakkam - 603 110

Structural detailing at kalavakkam

CHENNAI
TESTING LABORATORY PRIVATE LIMITED
Testing redefined
CIN : U74999TN2008PTC067568

www.ctllabs.in
www.foodenvironmenttesting.com

TEST REPORT

Report Number and date	**CTL/CH/N-25715/2021-22 & 03.01.2022**		
Sample Number	**N-25715/21-22**		
Customer Name & Address	**M/s. Sri Sivasubramaniya Nadar (SSN) College of Engineering,**		
	Rajiv Gandhi Salai (OMR), Kalavakkam – 603 110, Tamilnadu.		
SAMPLE DETAILS			
Sample Description By Customer	**STP Outlet Water [STP Plant 500 KLD]**		
Quantity Received	2 Litres	**Sampled By**	Customer
Date of Receipt	27.12.2021	**Sample Condition**	Good & Received in Plastic Container
Analysis Starting Date	27.12.2021	**Analysis Completion Date**	01.01.2022

Test Results:

The above sample tested as received, and results are as follows:

S. NO	PARAMETERS	METHOD	UNITS	RESULTS	LIMITS*
1	pH @ 25°C	4500-H^+-B -APHA 23rd Ed.2017	-	7.8	5.5 to 9.0
2	Total Dissolved Solids (TDS)	2540-C-APHA 23rd Ed.2017	mg/l	526	-
3	Total Suspended Solids (TSS)	2540-D-APHA 23rd Ed.2017	mg/l	10	Max. 30
4	Biochemical Oxygen Demand (BOD) 3 days at 27°C	5210-B-APHA 23rd Ed.2017	mg/l	7	Max. 20
5	Chemical Oxygen Demand (COD)	5220-B-APHA 23rd Ed.2017	mg/l	28	-
6	Chloride as Cl	4500-Cl^--B-APHA 23rd Ed.2017	mg/l	65	-
7	Sulphate as SO_4	4500-SO_4-E-APHA 23rd Ed.2017	mg/l	37	-
8	Oil & Grease	5520-O&G-B APHA 23rd Ed.2017 (Partition Gravimetric Method)	mg/l	< 2	-

Max. - Maximum

*Limits as per TNPCB Norms for Treated Sewage

REMARKS: The sample meets the requirement of TNPCB with respect to the parameters tested.

*****END OF REPORT*****

For Chennai Testing Laboratory Pvt ltd

Authorised Signatory
A. RAJKUMAR
Technical Manager
(CHEMICAL)

A - Super 19 | T.V.K. Industrial Estate | Guindy | E-mail : chennaitestinglab@gmail.com
Chennai - 600 032 | Tamil Nadu | India | Telefax : +91-44-2250 1757

OPERATION AND MAINTENANCE MANUAL

FOR

SEWAGE TREATMENT PLANT – 500 KLD

CLIENT:

SSN COLLEGE OF ENGINEERING

Rajiv Gandhi Salai (OMR),
Kalavakkam,
Kanchipuram District - 603 110.

PREPARED BY:

GLOBAL RECRUITERS &
ENVIROBIO ADVANCE TECHNOLOGIES
No. 4B, Thulukkanathamman Koil 11th Street,
Pallikaranai,
Chennai - 600 100.
Tel: 044- 60504556
Mobile: 8344311777 / 8344311888
E-mail: eaka.globalenviro@yahoo.com /
great.consultancy@yahoo.com

TABLE OF CONTENT

TREATMENT PHILOSOPHY

BASIS OF DESIGN (Quantity & Quality):

The sewage water generated from Toilets, Canteen & bathrooms are expected to be average daily flow of 500 Kilo Liters/day.

The ave. flow / hour : 20 m3/hr.

Plant Operating Hours : 20 Hrs/day.

THE QUALITY OF THE RAW SEWAGE IS CONSIDERED AS

PH	6.5 – 7.5
Suspended Solids	150 mg/l
BOD	350 mg/l
COD	700 mg/l
Oil & Grease	50 mg/l

TREATED WASTE WATER (SEWAGE) QUALITY:

Pollution Control Board (PCB) stipulated the following parameters for pollutants and the treated water quality shall be well below the limits specified below:

CHARACTERISTICS OF TREATED SEWAGE:

S.No	PARAMETERS	UNITS	TNPCB LIMITS
1.	pH	-	5.5 - 9.0
2.	BOD 25^{o} C at 5 days	ppm	<20
3.	COD	ppm	<250
4.	Total Dissolved Solids	ppm	<2100
5.	Total Suspended Solids	ppm	<30
6.	Oil & grease	ppm	<10

PROCESS DESCRIPTION

STP SCHEME:

The planned sewage treatment scheme is designed to treat the wastewater from bathrooms, canteen & Toilet and reuse the treated water for Gardening. The treatment scheme is designed to deliver the treated water quality norms stipulated by the Pollution Control Board (PCB), in order to conserve the water.

A brief description of the process involved in treating the sewage is given below:

The STP is based on the aerobic 'FBBR' system. The wastewater is collected through piping network involving inspection chambers and manholes, in the collection well and drained to the raw sewage collection/equalization tank through bar screen.

The homogenized sewage is transferred /pumped at 20 cu.m/hr to the Aeration tank using Raw sewage pumps. The Aeration tank has a retention time of 12 hours and provided with air grid to maintain the required Dissolved Oxygen levels of 2- 3 mg/lit. In Aeration tank, biomass media is provided for maintaining the required volume of microbes in the aeration tank. The microbes are attached on the surface area of the media that move along with water in aeration tank. The moving or fluidized state will be maintained by aeration.

Any excess flow from the raw sewage pump will be returned back to the collection tank so that the wastewater in the tank is always in a homogenized condition. The air shall be supplied through diffusers fitted to twin lobe blowers for adequate aeration. The biologically treated water from aeration tank is settled in secondary settling tank for biomass settling.

The treated water after filtration shall be let into the treated water tank.

The solid and liquid separated in the settling tank. The over flow from the Settling tank is collected in filter feed tank (Clarified water tank) for filtration.

The Sludge collected in the bottom of the settling tank is re circulated through pump to the aeration tank. Excess sludge is transferred to sludge drying beds for drying. Part of the sludge will be sent to filter press for dewatering.

The treated sewage water is disinfected using chlorine by dosing sodium hypochlorite then filtered through Pressure Sand Filter and Activated Carbon Filter for removal of suspended impurities and traces of organics. The Filtered water shall be stored and reused suitably for gardening.

THE TREATMENT STEPS:-

The Steps involved in treating the sewage water of flow 500 KLD for the above influent characteristics is envisaged as given below:

1. Bar Screen
2. Collection Sump
3. Aeration Tank
4. Settling Tank
5. Clarified Water Tank
6. Hypo Dosing System
7. Pressure Sand Filter
8. Activated Carbon Filter
9. Treated Water Tank
10. Sludge Drying Beds
11. Filter Press

THE DESCRIPTION OF THE TREATMENT PROCESS:-

1. Bar screen:-

The bar screen is provided to remove the solid inorganic particles like plastics, stones etc. from entering into the sewage collection sump. It can be removed manually and cleaned when it is choked or blocked.

2. Sewage collection Sump:-

The Sewage collection sump is provided to homogeneous the influent flow thereby helping the safe operation of the sewage treatment plant and it will be provided with sufficient retention time to avoid any surge created due to peak flow of the sewage the rain water must not enter the sewage collection sump due to in order to avoid the overflowing of the sewage collection sump.

3. Aeration tank:-

The aeration tank provided with the 'Fluidized Bed Bio Reactor' the homogenized sewage is transferred / pumped at 20 cu.m/hr flow rate to the aeration tank using raw sewage pumps. In Aeration tank, biomass media is provided for maintaining the required volume of microbes in the aeration tank. The microbes are attached on the surface of the Bio media that move along with water in aeration tank. The moving or fluidized state will be maintained by aeration. Air to the bacteria is supplied by the twin lobe air blowers through fine pore diffuser membranes in the aeration tank.

The aeration tank has a retention time of 12 hrs and provided with air grid to maintain the required dissolved oxygen levels of 2-3 mg/lit. The dissolved organic matters are biologically degraded by the acclimatized microbes in the aeration tank. COD and BOD due to organic compounds are reduced to desired levels by maintaining sufficient Biomass in the aeration tank. Recycling of biomass is carried out to maintain MLSS

4. Settling tank:-

The aerated biomass overflows in to the settling tank provided with racker arm mechanism and the biomass sludge settles down and the clear STP treated water overflows into the clarified water tank and the settled sludge is removed using the sludge recirculation pump the settle sludge is called as 'Activated Sludge' and this Activated sludge contains lot of bacteria's and this sludge can be recalculated into the aeration tank for maintaining the Biomass concentration and the excess sludge created during the process gets separated to the sludge drying beds.

5. Clarified water Tank:-

The clear water overflows from the Settling tank into the clarified water tank provided with a retention time of 4 hrs to the hold the STP treated water before being filtered for removing the suspended particles present in the water. Thereby it acts as a surge protector and helps in providing constant feed flow to the filters without affecting the equilibrium of the system.

6. Hypo Dosing System:-

The Sodium hypo chlorite is dosed in the Filter feed line to disinfect the bacteria's present in the water and maintain a free chlorine level of 1ppm. The dosage is done using a P.P. Electronic metering pump and the Solution preparation tank is provided for preparing the Hypo solution at desirable level.

7. Pressure Sand Filter:-

The pressure sand filter is provided to remove the suspended particles present in the clarified water by using different level of sand and pebbles media kept at variable sizes in a uniform row one above the another.

8. Activated Carbon Filter:-

The Activated carbon filter is provided to remove the traces of hypo and purify the Sand filtered water there by removing the harmful poi sonic s present in the water by using different level of Activated carbon media of Iodine value of 600 kept in a uniform row one above the another.

9. Treated Water Tank:-

The Treated water tank is provided to collect the filtered water and it can be disposed for gardening.

10. Sludge Drying Bed:-

The excess sludge removed from the settling tank is pumped to the sludge drying bed by using sludge recirculation pump and the sludge is allowed to dry in the sludge drying bed latter the dried sludge can be removed manually and it can be used for manure in the gardens since this dried activated sludge is rich in nitrogen, phosphorous which are effective manures for the growth of the plants.

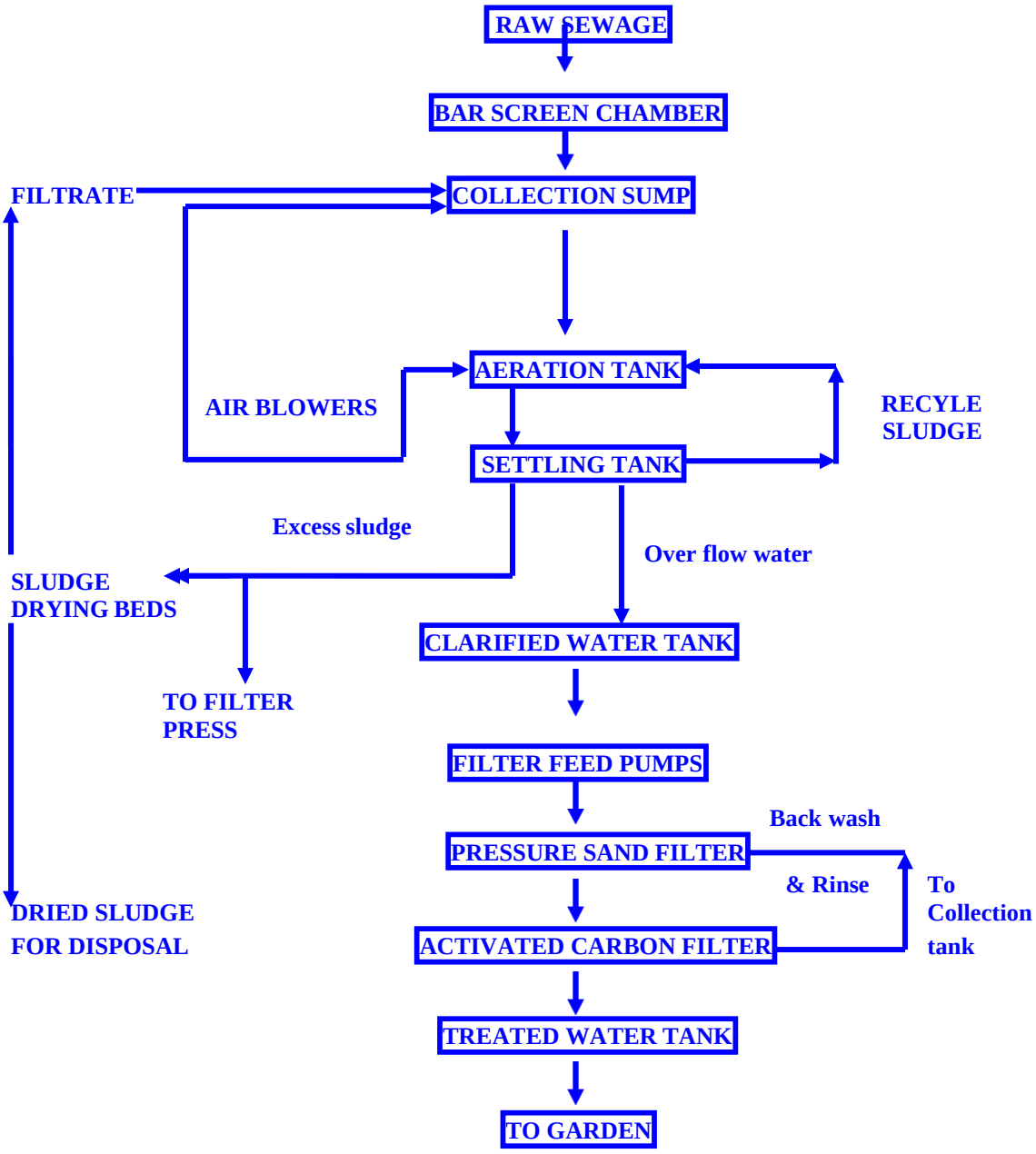
11. Filter Press:-

The Sludge collected in the bottom of the settling tank is transferred through pump to the filter press to dewater the sludge and it is compacted to be stored.

Filter press is a device which is used for separating suspended solids from the liquids.

In the recessed type, the slurry is fed through the central inlet and the solids are retained in the recess between the plates, while the filtrate is collected through the corners.

PROCESS FLOW DIAGRAM - 500 KLD STP (SSNCE)



Technical Specification for the Equipments supplied for Sewage Treatment Plant - 500 KLD

SEWAGE TREATMENT PLANT		
Bar Screen (Coarse & Fine)		
S.No	**Description**	**Specification**
Bar Screen data		
1	Quantity	2 Nos
2	Bar size	1.0 m (B) x 1.0 m (H)
3	MOC	SS (Bar)
4	Thickness	4 mm
5	Painting	Anti corrosive (MS Frame)

SEWAGE TREATMENT PLANT		
Raw Sewage Transfer Pump		
S.No	**Description**	**Specification**
Pump data		
1	Quantity	2 Nos (1W + 1S)
2	Type	Submersible pumps
3	Flow rate	20 cum/hr
4	Head	12 m
5	Power	3 HP, 2.2 KW
6	MOC	CI
7	Model	STPM 32
8	Make	CROMPTON

Equipment Name	STP - 500 KLD
Purchase order No	WO / 141 / SSNCE / 2017 - 18

SEWAGE TREATMENT PLANT

Air Blower

S.No	Description	Specification
Blower data		
1	Quantity	2 Nos (1+1)
2	Type	Twin Lobe Rotary
3	Pressure	0.4 kg/cm2
4	Air flow rate	500 cum/hr
5	Power	10.06 BHP
6	Speed	1213 RPM
7	Model	59 AC
8	Make	Kay International
9	MOC	CI
10	Motor Power / RPM	15 HP / 1440
11	Make	Kirloskar

SEWAGE TREATMENT PLANT

Diffuser membrane For Collection tank (Coarse) & Aeration tank (Fine)

S.No	Description	Specification
Coarse Bubble Diffuser membrane data		
1	Quantity	1 Lot
2	MOC	fEPDM
FBBR Membrane data		
3	Quantity	1 Lot
4	Size	Dia 90mm x 1m long
5	Make	Energy Equip.
6	MOC	fEPDM

Bio mass carrier Media for Aeration tank

Quantity : 1 Lot
Duty : To provide required surface area for microbes Growth.
Type : Fluidisable Bio media, Non Clogging.
MOC : PP

SEWAGE TREATMENT PLANT		
Clarifier mechanism (Racker arm / Scrapper arm)		
S.No	**Description**	**Specification**
Racker arm Data		
1	Quantity	1 No
2	Type	Central driven
3	Duty	To settle the suspended particle at bottom
4	Rake dia	2.5 m
5	Feed well size	600 mm dia x 1250 mm (H)
6	Gear box with motor	1 No
7	Make of Gear box	Elecon / eq.
8	Make of Motor	Kirloskar / eq.
9	MOC of Motor	CI
10	Motor Power / RPM	2 HP / 1440

Equipment Name	STP - 500 KLD
Purchase order No	WO / 141 / SSNCE / 2017 - 18

SEWAGE TREATMENT PLANT

Recirculation Sludge pumps

S.No	Description	Specification
Pump data		
1	Quantity	2 Nos (1 + 1)
2	Type	Coupled Set
3	Capacity	10 cum/hr
4	Head	10 m Head
5	Power	3 HP
6	RPM	2800
7	Model	SP2HM
8	Make	Kirloskar

SEWAGE TREATMENT PLANT

Filter feed pumps

S.No	Description	Specification
Pump data		
1	Quantity	2 Nos (1 + 1)
2	Type	Submersible
3	Capacity	40 cum/hr
4	Head	25 m
5	Power	7.5 HP
6	RPM	2900
7	MOC	CI
8	Model	STPC 7.52
9	Make	CROMPTON

SEWAGE TREATMENT PLANT

Chlorine dosing system

S.No	Description	Specification
	Pump data	
1	Quantity	2 nos
2	Capacity	6 LPH
3	Pressure	4.0 kg/cm2
4	Model	FE-104
5	Make	Focus Eng.
	Dosing Tank data	
6	Quantity	2 Nos
7	Type	Cylindrical Vertical
8	Capacity	100 lit
9	MOC	HDPE
10	Make	Focus Eng.

SEWAGE TREATMENT PLANT

Pressure Sand Filter

S.No	Description	Specification
	Vessel data	
1	Quantity	1 no
2	Type	Vertical Floor mounted
3	Flow rate	20 cum/hr
4	Diameter	1500 mm
5	HOS	2000 mm
6	MOC	MS – Epoxy
7	Working pressure	3.0 kg/cm2
8	Piping	65 NB
9	Valves	Butterfly valves
10	Media	Sand, Pebbles & Silex

11	Shell thickness	6 mm
12	Dish thickness	8 mm
13	Make	Fabricated -MS

SEWAGE TREATMENT PLANT

Activated Carbon Filter

S.No	Description	Specification
Vessel data		
1	Quantity	1 no
2	Type	Vertical Floor mounted
3	Flow rate	20 cum/hr
4	Diameter	1300 mm
5	HOS	2500 mm
6	MOC	MS – Epoxy
7	Working pressure	3.0 kg/cm2
8	Piping	65 NB
9	Valves	Butterfly valves
10	Media	Sand, Pebbles. Silex & Activated Carbon
11	Shell thickness	6 mm
12	Dish thickness	8 mm
13	Make	Fabricated -MS

SEWAGE TREATMENT PLANT

Inter Connecting Piping System

S.No	Description	Specification
Water System		
1	Quantity	1 lot
2	MOC	UPVC / PVC – 6 kg
3	Make	Supreme / Finolex / eq.

Equipment Name	STP - 500 KLD
Purchase order No	WO / 141 / SSNCE / 2017 - 18

Air System		
1	Quantity	1 lot
2	MOC	MS / GI – B class
3	Make	Jindal / Surya / eq.
Ball valve data		
1	Make	1 lot
2	Type	One way
3	Size	As per the requirement
4	Make	Kissan / Prince / eq.
Butterfly valve		
1	Quantity	1 lot
2	Purpose	For PSF & ACF
3	Make	Intervalve / eq.
Non Return Valve data		
1	Type	1 lot
2	Size	As per requirement
3	Make	Intervalve / eq.

SEWAGE TREATMENT PLANT

Electrical & Instrument system

S.No	Description	Specification
Electrical panel System & Cabling data		
1	Quantity	1 lot
2	Type	Floor mounted
3	Sheet thickness	1.6 mm
4	Incoming ammeter	1 No
5	Incoming voltmeter	1 No
6	Outgoing	MCB
7	Make of starters	L & T
8	Make of meters	Havells / L & T
9	Cabling	Finolex / eq.
10	Make of panel	Reputed

Instrument Data		
1	Pressure Gauge	1 lot
2	Range	0 – 4 Kgs/cm2
3	Size	4 inch
4	Make	H-guru / eq.

INSTRUMENTATIONS & CONTROL

Pressure Gauge

Nos. Offered	:	1 Lot
Make	:	ORG. / WAREE/ H-Guru / Eq.
Size/ Range	:	0-7 kg with bush adaptor

Float Switch

Nos. Offered	:	2 Nos.
Make	:	KISKIP/ Equivalent

Flow Meter

DIGITEL FLOW METER:
(for STP Treated water)

Qty	:	1 No
Model	:	FT - 650
Type	:	Full Bore type
Size	:	3"
Range	:	1000 - 20000LPH
Sensor	:	Single
Make	:	Aster
Type of Mount	:	Online

pH Meter

Nos. Offered : 1 No.
Make : AQUASOL
Type : Pen type

TDS Meter

Nos. Offered : 1 No.
Make : HM
Type : Pen type

FRC Kit

Nos. Offered : 1 No.
Make : Chlorotex

TECHNICAL SPECIFICATIONS FOR FILTER PRESS

FILTER PRESS		
	Measures	**Description**
1.	Type	Sliding
2.	**Plate Size**	**470 x 470 mm**
3.	**No. of Plates**	**10 Nos.**
4.	**No. of Chambers**	**9 Nos.**
5.	**Cake holding Capacity**	**53 Ltrs**
6.	Filtration Area	3 Sq.m
7.	Operating Pressure	8 Bar
8.	Operating temperature	90ºC
9.	**Plate Shifting**	**Manual**
FILTER PLATES		
10.	**Type**	**Recessed**
11.	Material	Polypropylene, Virgin

12.	Thickness	73 mm ± 2 mm
13.	**Cake Thickness**	**40 mm ± 2 mm**
14.	Feeding	Central
15.	**Discharge**	**Side, Single open**
16.	Surface	Piped buttons with smooth finish
STRUCTURE		
17.	Fixed Head	MS, Fabricated & Machined
18.	Hydraulic Head	MS, Fabricated
19.	Slider Head	MS, Fabricated & Machined
20.	Slider Head Mounting	Over Guide Rollers
21.	Tie Bar	Mild Steel & radio graphed with SS Gladding
22.	Support Stand	MS, Fabricated
23.	**Plate Closing**	**Manual Hydraulic**
24.	Load Holding	By Check Valve
25.	Painting	2 Coats of Zinc Chromate Primer & 2 Coats of epoxy Paint

- Including Screw pump - 2 Nos

  Motor Make: Kirloskar
  Power: 2 HP

- Iincluding filter cloth, Inter connecting Valves, Pipe & fittings

S. No	Specification of Product	Qty
1.	**OIL SKIMMER - SINGLE BELT (MS)** • Belt Material : PU • Belt Thickness: 2 mm, Belt Width : 240 mm • Depth : 2000 mm • No. of Belt : 1 No • Belt Speed : 16 RPM • Supply : Single Phase • Operating voltage: 230 V AC, 25 W • MOC : Mild Steel Powder Coated • Idle roller fall protection • Oil carrying capacity: 25 - 45 LPH	1 No

Technical Specification for the CIVIL Tanks of Sewage Treatment Plant - 500 KLD

SEWAGE TREATMENT PLANT

Bar Screen Chamber

S.No	Description	Specification
Tank data		
1	Quantity	1 No
2	Capacity	1 cum
3	Length	1.0 m
4	Width	1.0 m
5	Liquid Depth	0.8 m
6	Total Depth	1.0 m
7	MOC	RCC

SEWAGE TREATMENT PLANT

Collection Sump

S.No	Description	Specification
Tank data		
1	Quantity	1 No
2	Capacity	150 cum
3	Length	8.0 m
4	Width	5.0 m
5	Liquid Depth	3.8 m
6	Total Depth	4.0 m
7	MOC	RCC

SEWAGE TREATMENT PLANT		
Aeration Tank (12 Hrs Retention time)		
S.No	**Description**	**Specification**
Tank data		
1	Quantity	1 No
2	Capacity	240 cum
3	Length	8.0 m
4	Width	8.0 m
5	Liquid Depth	3.6 m
6	Total Depth	3.8 m
7	MOC	RCC

SEWAGE TREATMENT PLANT		
Settling tank (6 Hrs Retention time)		
S.No	**Description**	**Specification**
Tank data		
1	Quantity	1 no
2	Capacity	120 cum
3	Dia	6.5 m
4	Liquid Depth	2.8 m (1m - Hopper bottom)
4	Total Depth	3.8 m
5	MOC	RCC

SEWAGE TREATMENT PLANT

Clarified water tank

S.No	Description	Specification
Tank data		
1	Quantity	1 no
2	Capacity	75 cum
3	Length	6.9 m
4	Width	3.5 m
4	Liquid Depth	3.1 m
5	Total Depth	3.8 m
6	MOC	RCC

SEWAGE TREATMENT PLANT

Sludge Drying Beds

S.No	Description	Specification
Tank data		
1	Quantity	3 Nos
2	Total Volume	28 cum
3	Length	2.5 m
4	Width	2.5 m
4	Media Depth	0.7 m
5	Sludge Application Depth	0.5 m
6	Total Depth	1.5 m
7	MOC	RCC

OPERATIONAL CONTROL INSTRUCTION

STP Instruction :

1. The waste water from Toilet, Bathroom, Canteen and housekeeping water are drained to STP through sewage pipe.

2. The sewage water from collection sump is pumped to aeration tank (not more than 20 m3 per hour) and switch off the pump when the waste water level is low(visual check at the tank).

3. Ensure aeration tank air blower always on condition (use alternate blower for continuous running)

4. The air is passed (Max 0.4 bar pressure) in aeration tank to remove soluble organics so as to bring down BOD level to the described level (BOD <20 mg/lit).

5. To collect 1 liter of biologically treated water from aeration tank and allow settling down for 30 min. and note down the SSV30 growth (To check the Sludge Volume at least twice/shift). SSV30 should be 100 - 350 ml/liter. If it is less than the required level add 17 kgs of Urea, 5 kgs of MOP along with 500grams of Bio-culture in an aeration tank. During chemical addition at the aeration tank, switch off the raw sewage transfer pump for 2 hours.

6. Ensure biologically treated water flowing to the Secondary Settling tank continuously

7. In case of breakdown of Secondary Settling tank, stop pumping raw sewage into Aeration tank, rectify Secondary Settling tank and then allow flow to Secondary Settling tank. Also raw sewage taken by lorry for CETP treatment till the problem is set right.

8. Check if the sludge settled at the bottom of the tank and clear water goes to filter feed tank.

9. Drain the Sludge at sludge drying bed if SSV30 more than 350 ml/liter

10. Re circulate the sludge to Aeration tank by 50 - 75% of valve open condition always.

11. Do the backwash and rinse once in a day and that water should sent to Collection tank.

12. Add sodium hypo Chlorite to filter feed tank at 0.2 ppm to 1ppm before filtration.

13. The final treated water is used for gardening.

14. The dried sludge is used as manure for gardening.

STANDARD OPERATING PROCEDURE (SOP) FOR SEWAGE TREATMENT PLANT

FLOW RATE (sewage) - 500 KL / day (Design)

1. Raw sewage will enter into the Bar screen chamber and reach Equalization tank by gravity. All suspended solids above 8 mm size are removed at this stage.

2. Equalized and mixed sewage is pumped into Aeration tank. Part of the flow is recycled into collection sump to maintain steady operation on a continuous basis and Air is supplied by the Air blower to avoid waste water septicity, methane emission & maintain proper mixed condition in the collection sump.

3. The biological oxidation of organic matter will take place in the aeration tank. Air to the bacteria is supplied by the Air blowers through diffuser system. 'DO' (Dissolved Oxygen) is maintained in the aeration tank. (As per TNPCB Standard 'DO' should be 2ppm).

4. Sewage from Aeration tank will go to Secondary settling tank by gravity where bio mass is separated and re circulated into aeration tank for maintaining 'Mixed Liquor Suspended Solids' (MLSS / SSV_{30}) concentration. Excess sludge is sent to sludge drying beds for drying. Part of the sludge is sent to filter press for dewatering.

5. Clarifier overflow is collected in the clarified water tank and chlorinated for disinfection.

6. The Clarifier overflow water is pumped through two stage filters. At this stage the PSF & ACF will remove the suspended solids, turbidity and trace of free residual chlorine.

7. Clear overflow is disposed off on land for gardening and will meet standards.

8. Filtrate from drying bed is returned to Equalization tank

9. Cake is scrapped and removed from drying beds & filter press periodically and disposed off.

10. Nutrient minerals: Minerals nutrients are necessary for the growth and activities of bacteria. Carbon, nitrogen, phosphorus, and sulfur are the most important elements. Traces of calcium, magnesium, potassium and iron are also needed. These nutrients are added along with Bio culture for maintenance of biomass.

11. Hypo chlorite dosing system: Chlorine will kill bacteria present in water it also oxidizes the organic substances and for that reason is a good reagent for preventing reproduction of micro organism in water. To start chemical dosing, ensure that there is adequate solution level of hypochlorite in the tank, the suction/delivery tubing is Connected and the suction tubing is dipped into the solution. Then switch on the pump & adjust the dosing, rate (10% w/v sodium hypo.) To desire value by means of the Stroke-frequency knobs provided in the pump.

Solution preparation: Flush the tank thoroughly with filter water and drain down. Fill the tank up to desired level with the help of pre mark level in the tank for Preparation of 10% w/v solution. Pour out the desired quantity of dosing chemicals.

BACKWASH OF FILTER BED (PSF & ACF):

TIME: 10-15 MINUTE OR TILL THE WATER IS CLEAR.

1. Open the air release valve so as to de-pressure the vessel and then close it.

2. Open the back wash valve fully, to start back washing the filter bed.

3. Backwashing should be continued until the water is completely clear, subject to a minimum duration of 10 minutes.

4. Close the backwash valve and open the air release valve. Service inlet valve when all the air has been expelled from the unit and water starts flowing out from the air release line, close the service inlet and air release valves respectively.

RINSE OF FILTER BED (PSF & ACF):

1. Open service inlet valve to air release valve when water come out full before through air release, open rinse outlet valve.

2. After rinsing the unit for 10 minutes checks the quality of water. If satisfactory close rinse outlet valve

3. Open air release valve. When water starts coming through air release pipe. Close air release & service inlet valves respectively.

Note:

While the filter is in service, the product water quality and the pressure drop across the filter should be regularly monitored and recorded. When pressure increase is above 0.5 - 1.0 kg/cm2 or unit outlet observed quality deteriorating then back wash and rinse the filters immediately. Since the quality is not retained after back wash and rinse change the filter media immediately.

OPERATION PROCEDURE:

FILTERS:

Water from main inlet header is connected to the filters.

Filter operation consists of various steps, which are as follows.

- **a. Service cycle**
- **b. Backwash**
- **c. Rinsing**

a. SERVICE CYCLE:

In the service cycle first the water enters into the filter through the inlet valve and it is further distributed through the inlet distribution system by providing an inverted

funnels, by which inlet water velocity is reduced to 1.0 m/s. Which avoids direct impinging of water on the bed and the inlet turbidity of the water will be 20 ppm before passing through the filter bed. Then the water passes through the filter media where the turbidity is removed and the filtered outlet water turbidity will be <5.0 ppm. The filtered water is then collected through the holes provided in the lateral pipes. All the lateral pipes are connected to the common header where the filter water is collected and the whole arrangement is called bottom collection system. From the collection system the water comes out through outlet valve and the line is connected to the treated water tank. A sample from the outlet line pressure gauge drain valve has to be taken and tested at lab for the presence of turbidity.

During this cycle valve is kept in service position. The outlet water is taken to treated water tank for re-use

b. <u>BACKWASH:</u>

Backwash of filter is done to remove the clogged matter formed on the top surface of the filter media. During backwash the water enters from bottom of filter and passes through media and collects the turbidity present on top surface of the filter bed and then the dirty water comes out through the backwash outlet valve and the dirty water flows to the collection pit provided near the system. Then the dirty water is taken to the Sewage Collection Sump by means of closed drain trench.

First ensure that the enough water is available in the clarified water tank then keep the valve in back wash mode to enable the water to enter from bottom and comes out. The backwash has to be carried out for 10 minutes (or) until the backwash water seems to be clear. The backwash flow rate shall be $20m^3$/hr.

C. **RINSING:**

Rinsing of filter is carried out to remove any traces of impurities that are left out during the backwash cycle and setting of bed. The flow of water is from top to bottom.

At the beginning of this cycle the inlet valve and then open rinse outlet valve up to the required flow and remaining valves should be closed. The rinsing Operation has to be done for 5 minutes and the rinse flow rate is 20m^3/hr. After rinsing above valves are closed and the system is ready for service.

GENERAL SUGGESTION & RECOMMENDATION:

- The PSF & ACF Filter will remove the suspended solids, odour, turbidity and trace of free residual chlorine. However the quality of output water also depends upon the filter performance. Filter back wash & rinse to be done minimum once in a shift in order to maintain TSS level. However in case of any disturbance in turbidity of feed water, frequency of filter back wash is to be increased. If the filtration process is not effectively done, the filter media for PSF & ACF should be changed (At least once in a year).

TIME DURATION AND FLOW RATES FOR THE ABOVE PROCESS

S.No.	Description	Flow rate (m^3/hr)	Time	Water source
a.	Service	20m3	8 hours	Clarified water
b.	Backwash	20m3	10 minutes	Clarified water
c.	Rinse	20m3	5 minutes	Clarified water

TROUBLE SHOOTING IN FILTER UNIT

DEFECT	CAUSE	ACTION
Pressure build-up in the vessel	Valve partially closed.	Check and adjust valve accordingly.
Increased flow rate	Valve excessively opened.	Check and throttle accordingly.
Flow rate too less	Choking in valve or suction of pump or cavitations in the pump	Check and rectify the same
	Low inlet pressure	Check the inlet pump and rectify the same
	Distribution collecting system choked	Check and rectify the same
	Bed could have been chocked due to suspended particles.	Backwash the system properly.
Pressure drop across the bed increasing day by day	Valves may be damaged	Check and rectify the same
	Collecting system choked	Check and clean the same.
	Pressure gauge defective	Check and rectify/ replace.
Sand/Carbon media escaping during backwash	Excessive backwash flow rate	Check and reduce the same
	Faulty collecting system	Examine the same for breakage
	Valve damaged	Check and replace

LIST OF CHEMICALS WITH PURPOSE - STP

S. NO	LOCATION	PRODUCT NAME	PURPOSE
1.	STP (Aeration tank)	Bio-Culture	To develop Micro-Organism / Maintenance of Biomass
2.	STP (Aeration tank)	Urea	Maintenance of Biomass as per C: N: P ratio
3.	STP (Aeration tank)	MOP (Muriate - Of - Potash)	Maintenance of Biomass as per C: N: P ratio
4.	STP (Filter feed tank)	SODIUM HYPO CHLORITE (Hypo)	Disinfectant

CHEMICAL ADDITION & DOSAGE DETAILS:

UREA Calculation: (As per C_{100} :N_5 :P_1 ratio)

350 ppm BOD (Raw sewage) X 500 KLD (STP Capacity) / 1000
= 140 kgs (BOD load)
= 140 / 20 (percentage of nitrogen in CNP ratio)
= 7
= 7 / 0.4 (Urea available at 40%, so 40/100 = 0.4)
= 17.5 kgs / day
= 17.5 x 31 days
= 542.5 kgs / month reqd.

DAP / MOP Calculation: (As per C_{100} :N_5 :P_1 ratio)

350 ppm BOD (Raw sewage) X 500 KLD (STP Capacity) / 1000
= 140 kgs (BOD load)
= 140 / 100 (percentage of Phosphorous in CNP ratio)
= 1.4
= 1.4 / 0.3 (MOP available at 30%, so 30/100 = 0.3)

= 4.6 kgs / day
= 4.6 x 31 days
= 144.6 kgs / month reqd.

The 'MLSS' (SSV_{30}) growth is strictly based on the following conditions:

- ❖ Design flow rate is to be maintained. i.e. raw sewage will be pumped from collection sump to aeration tank @ flow rate of not more than 20 KL/Hr.
- ❖ Air should be provided in the aeration tank constant & continuously (24 hrs)
- ❖ Addition of Bio-culture along with Urea & MOP is to be added regularly in the aeration tank to maintain sufficient biomass in the aeration tank.
- ❖ Recirculation of Bio-mass (Activated Sludge) from settling tank to aeration tank should be done continuously (24 hrs x 7 days).

- The clarified water contains bacterial contamination. By dosing sodium hypo chlorite, this possibility is eliminated. We suggest that **'HYPO'** (Sodium hypo chlorite) dosing in STP is very important before filtration. Chlorine will kill bacteria present in water it also oxidizes the organic substances and for that reason is a good reagent for preventing reproduction of micro organism in water. To maintain Free Residual Chlorine (FRC) level < 1ppm (0.2 - 0.5 ppm).

Dosage calculation:

(Feed) Flow rate/hr x plant running hrs x ppm of chlorine / 1000

= 20 m3/hr x 20 hrs x 100 ppm of 6% chlorine (Actual dosing - 6 ppm) / 1000

= 40 kgs required per day (If Plant operating for 20 hrs)

Mixing procedure:

- 40 kgs Hypo is dissolved in 100 lts of Raw water and adjust the flow rate 6 LPH for 20 hrs
- Dosage Location: PSF & ACF - on line dosing

Note:

To start chemical dosing, ensure that there is adequate solution level of hypochlorite in the tank, the suction/delivery tubing is Connected and the suction tubing is dipped into the solution. Then switch on the pump & adjust the dosing, rate (10% w/v sodium hypo.) To desire value by means of the Stroke-frequency knobs provided in the pump.

Solution preparation: Flush the tank thoroughly with filter water and drain down. Fill the tank up to desired level in the tank for Preparation of 10% w/v solution. Pour out the desired quantity of dosing chemicals.

PREVENTIVE MAINTENANCE SCHEDULE

SEWAGE TREATMENT PLANT:

Air Blower	**Frequency**
Oil & Grease change	-250 Hrs
Filter cleaning	-monthly once
NRV & Delivery valve cleaning	-monthly once
Delivery line cleaning	-Once in a year
Belt & Alignment checking	-monthly once

Raw Sewage Transfer Pump

Impeller Cleaning	-when struck (or) monthly once
Foot valve Cleaning	-when struck (or) monthly once
Rope change	-when leakage
NRV & suction, Delivery	
Delivery valve checking	-monthly once
Bearing Grease change	-monthly once
Alignment checking	-monthly once

Pressure Sand Filter (PSF)

Media change	-Once in a year

Activated carbon filter (ACF)

Media change -Once in a year

Mono Block Pumps

Impeller Cleaning -monthly once

Dosing Pump

NRV, suction & Delivery set cleaning -monthly once

CLEANING FREQUENCY:

Collection sump - once in a year / Whenever sludge level is high

Aeration tank - once in a year / whenever required

Settling tank - six months once

Clarified water tank - six months once

Treated water tank - six months once

Filter Feed Pump

Impeller cleaning - monthly once
NRV cleaning - monthly once

- List of Critical Spares

S. NO	NAME OF SPARE	SPECIFICATION	MAKE	QTY REQUIRED
1.	Pressure gauges	0 - 6kg with bush adaptor	Warrie / H-guru	6 Nos
2.	Air blower oil	320 or 120 oil	Castrol / Eq.	20 liters
3.	Air blower filter	Suitable for capacity of 500 cum	Kay / Eq.	8 Nos
4.	Gland rope for pumps	-	-	10 boxes
5.	Gaskets for filters	Dia 600mm, 6 mm Thickness	-	12 Nos
6.	Bearings, Oil seal, Mechanical seal, star bush, etc for pumps and motors	-	SKF / Eq.	Each 12 Nos
7.	Foot valve	PP/PVC	-	12 Nos
8.	NRV, injection valve, foot valve, hose for dosing pumps	-	Focus Eng	1 Lot
9.	Grease	-	-	2 kgs
10.	Bolt nut with washers	1/2", 3/4", 1”, 1 ½”, 2” etc	-	1 Lot

MATERIAL SAFETY DATA SHEET (MSDS)

1 Product and Company identification:

Brand Name : MICROBION WWTP (Bio-culture)

Manufacturer/Supplier: Global Recruiters & Envirobio Advance Technologies, Chennai – 100.
Information Department: Global Recruiters & Envirobio Advance Technologies, Chennai – 100.
Emergency Information: Tel: 8344311777

2 Composition/ Information on ingredients:

Non-hazardous, mixed naturally occuring non-altered microbes, enzymes, on bran/talc base

3 Hazards identification:
Non- classified

4 First Aid Measures:

Eye: Wash immediately with copious amount of water and obtain medical attention
Skin: Not applicable for normal use. Wash accidental spillage from skin.
ingestion: remove material from mouth .goggle with water .if large amount swallowed or symptoms develop obtain medical attention.

Inhalation: Remove from source of exposure. seek medical attention if breathing is difficult or allergic reaction or irritation develops.
Equipment at work place: work gloves, safety glasses.

5 Fire fighting measures:

Flammability: Not flammable.
Suitable extinguishers: Any can be used.
Extinguishers not to be used: None.
Explosive hazards: None known.
Special protective equipments: Not required .
Hazardous combustion products: Irritant fumes may be given off when heated to decomposition.

6 Accidental release measures:
Protection of personnel: protective clothing , gloves,safety glasses required.
Spillage Clean-up: Observe local legislation.. Wash residues and small spillages away to drain with water. sweep or vaccum spilled material ,being careful not to create dust.

7 Handling and storage

Handling: No special precautions required. avoid direct skin contact.. no special disposal methods,
Storage: Store in the original, closed containers under dry conditions. Avoid extremes of temperature.

8 Exposure controls and personal protection:

Protection for skin may be necessary for prolonged or repeated contact.

9 Physical and Chemical properties:

Appearance: Granular powder, buff to brown/white colour, musty odour
Solubility in Water: forms slurry
pH as 1%solution: Neutral
Boiling point ^{0} c: Not applicable
Flash point ^{0}c : Not applicable
Specific gravity (H_2O=1): 0.4-0.5

10 Stability and reactivity

Stable, no dangerous reactions known.

11 Toxicological information

Eye: Can cause irritation
Skin: unlikely to be irritant to skin in normal use.
Ingestion: Unlikely to be harmful unless excessive amount swallowed
Inhalation: Can cause irritation.

12 Ecological information:

This product is not known to pose any threat to the environment.

13 Disposal considerations:

Contents: Observe current rules of local authority
Empty containers: Observe current rules of local authority.

14 Transport information:

Non-dangerous material.

15 Regulatory information:

Classified as non-dangerous

16 Other information:

The information in this document is based on our best present knowledge. However, it does not constitute a guarantee for any specific product features and does not establish a legally binding contract.

Department issuing material safety data sheet:
Global Recruiters & Envirobio Advance Technologies, Chennai – 100. **Tel: 8344311777**

MATERIAL SAFETY DATA SHEET

SECTION 1 MATERIAL IDENTIFICATION				
Material Name			**Organic Micro Nutrient (MN-2900)**	
Description			Micro nutrient for Sewage & effluent treatment	
1.1 SECTION 2 INGREDIENTS			% of active content	**1.1.1 HAZARD DATA**
Mixture of Organic Nitrogen, Organic phosphorous, Organic Potash			90 ± 2	Not applicable
1.2 SECTION 3 PHYSICAL DATA			Specific Gravity	Not Applicable
1.3 Boiling Point: Not applicable			Melting Point	Not applicable
1.4 Vapour Pressure : Not applicable			Evaporation rate	Not applicable
1.5 Vapour Density : Not applicable			Volatiles	Low
1.6 Appearance: Mud color lumps and Solid particles			pH (5% solution)	Not Applicable
1.7 Solubility in water : soluble			Molecular weight	Not applicable
1.8 SECTION 4 FIRE & EXPLOSION DATA			**1.8.1 LOWER**	**1.8.2 UPPER**
1.9 Flash Point & Method	1.10 Auto-ignition Temperature	1.11 Flammability Limits in Air	**1.12 Not applicable**	Not applicable
1.13 Not applicable	**1.14 Not applicable**	**1.15 Not applicable**	**1.16 -**	-
EXTINGUISHING DATA : Dry chemical, carbon dioxide, foam, water or water spray. Non combustible. Use a smothering technique to extinguish fire and any media suitable for extinguishing surrounding fire.				
SPECIAL FIRE FIGHTING PROCEDURES : Normal fire fighting equipment should be used when surrounded with fire.				
SECTION 5 REACTIVITY DATA				
Chemical Incompatibilities : MN-2900 is a stable material in weather tight, closed containers at room temperature under normal storage conditions. It does not undergo any reaction.				
SECTION 6 HEALTH HAZARD INFORMATION				
Summary of Risks : Eye contact may cause irritation.				
Primary Entry : Ingestion.				

Target Organs : Not applicable
Acute Effects : Nil
Chronic effects : Nil
1.16.1.1 FIRST AID
Eye Contact : Flush thoroughly with running water for 15 minutes. Get medical help.
Skin Contact : No effect
Inhalation : No effect
Ingestion : Rinse mouth with water. Give victim 2-3 glasses of water to drink to dilute the material.
SECTION 7 SPILL LEAK & DISPOSAL PROCEDURES
Spill Leak : No effect
Disposal : Safe as landfill
SECTION 8 SPECIAL PROTECTION INFORMATION
Goggles : Wear goggles.
Gloves : Wear rubber gloves, boots, apron and other protective clothing suitable for use conditions to prevent contact with skin.
Respirator : Approved respirator for emergencies or when concentrations of dust are unknown.
Ventilation : Provide general or local (hood) exhaust ventilation sufficient to minimize employee exposure where use conditions generate airborne dust or decomposition products.
Contact lenses pose a special hazard; soft lenses absorb irritants, and all lenses concentrate them.
Special consideration : Nil
SECTION 9 SPECIAL PRECAUTIONS & COMMENTS
Storage Segregation : Store in weather tight containers in a cool, dry, ventilated area away from oxidizing agents, acids, and sources of heat. Protect containers from physical damage.
Other Precautions : Avoid contact with eyes, Do not ingest it. Wash hands thoroughly after handling this material and before eating. Use good housekeeping techniques and follow good personal hygiene practices. Do not handle with bare hands. Eating, drinking and smoking should be prohibited in area of its use of handling.

KEEP OUT OF REACH OF CHILDREN

PRODUCT DESCRIPTION

MN-2900 contains mixture of organic micronutrients like Nitrogen, Phosphorous and Potash. It will aid for the robust growth of biomass in aerobic and anaerobic Sewage & Effluent treatment systems. It will offset any variation in the organic load in the Sewage & Effluent treatment plants.

ADVANTAGES

- **Enhanced BOD and COD removal**
- **Builds up Biomass level.**
- **Reduction in imbalance in the FM ratio.**
- **No need for Urea and MOP/DAP addition.**
- **Helps to reduce foaming**
- **Easy to handle**
- **Eco friendly natural product**
- **Reduces Cow-dung addition**
- **Can be used for cultivation**

PRODUCT SPECIFICATION

- **Form : Granules and Lumps**
- **Colour : Muddy Color**
- **Contents : Organic micro nutrients**
- **Storage : Store sealed in a dry area and do not allow product to become wet prior to use.**

For further details contact:

Global Recruiters & Envirobio Advance Technologies
No. 4B, Thulukkanathamman Koil 11th Street,
Pallikaranai,
Chennai - 600 100. Mobile: 83443 11777

Material safety Data Sheet

1 Product and Company identification:

Brand Name : sodium hypochlorite
Manufacturer/Supplier: Global Recruiters & Envirobio Advance Technologies, Chennai – 100.
Information Department: Global Recruiters & Envirobio Advance Technologies, Chennai – 100.
Emergency Information: Tel: 8344311777

2 Composition/ Information on ingredients:

Name	Range	Hazard
Water Etc	>90%	irritant, harmful
Sodium hypochlorite.	6-8%	

3 Hazards identification:
Non- classified

4 First Aid Measures:

Eye: Wash immediately with copious amount of water and obtain medical attention
Skin: Not applicable for normal use. Wash accidental spillage from skin.
Ingestion: Remove material from mouth. Drink 1 or 2 glasses of water (or Milk). If large amount swallowed or symptoms develop obtain medical attention.

Inhalation: Remove from source of exposure.
Equipment at work place: No special equipment required.

5 Fire fighting measures:

Flammability: Not flammable.
Suitable extinguishers: Any can be used.
Extinguishers not to be used: None.
Explosive hazards: None known.
Special protective equipments: Breathing apparatus shoule be worn when tackling fires involving this product.
Hazardous combustion products: Toxic and irritant fumes may be given off when heated to decomposition.

6 Accidental release measures:
Protection of personnel: Not required.
Spillage Clean-up: Observe local legislation.. Wash residues and small spillages away to drain with water.

7 Handling and storage

Handling: No special precautions required
Storage: Store in the original, closed containers under dry conditions. Avoid extremes of temperature.

8 Exposure controls and personal protection:

Protection for skin may be necessary for prolonged or repeated contact.

9 Physical and Chemical properties:

Appearance: Pale yellow liquid
Solubility in Water: Miscible
PH: 7.5 – 8.5
Boiling point ^{0}c: Not applicable
Flash point ^{0}c : Not applicable
Density: 1.1 +/- 0.05 kgs/l

10 Stability and reactivity

Non Stable, no dangerous reactions known.

11 Toxicological information

Eye: Can cause irritation
Skin: unlikely to be irritant to skin in normal use.
Ingestion: Unlikely to be harmful unless excessive amount swallowed
Inhalation: Can cause irritation.

12 Ecological information:

This product is not known to pose any threat to the environment.

13 Disposal considerations:

Contents: Observe current rules of local authority
Empty containers: Observe current rules of local authority.

14 Transport information:

Non-dangerous material.

15 Regulatory information:

Classified as non-dangerous

16 Other information:

The information in this document is based on our best present knowledge. However, it does not constitute a guarantee for any specific product features and does not establish a legally binding contract.

Department issuing material safety data sheet:
Global Recruiters & Envirobio Advance Technologies, Chennai – 100. **Tel: 8344311777**

ANALYSIS:

DETERMINATION OF P^H VALUE

(Method-POTENTIOMETRIC)

MATERIALS REQUIRED:

1) P^H meter,
2) 100mL Beakers,
3) Glass rods,
4) Buffer solution - (P^H 4&7)

PROCEDURE:

Standardisation of P^H meter:

- Switch on the instrument and allow it to warm for 10minutes.Keep the P^H selector switches on P^H zero position.
- Set the temperature compenstion control to the solution temperature.
- Adjust the zero adjustment knob so, that the pointer in the meter reads exactly zero, when the electrodes immersed in distilled water.
- Lift the electrode from distilled water, wipe with filter paper and dip them in standard buffer solution of known P^H 4.00 &7.00.
- Changes the function switch to particular P^H range and adjust the standardisation knob until the pointer reads the correct P^H value of the buffer solution.Do not disturb the zero knob adjustment.
- Wash the electrodes with distilled water and wipe with filter or tissue paper.
- Dip the electrode in the sample solution and keep the temperature Knob @ 25°C
- Switch in check position and mode switch in P^H position, if the reading should be P^H 4.00.
- Adjust the temperature knob to the temperature of the sample.
- Know the reading will be the P^H of the sample solution within P^H $\bar{}$0.01
- accuracy.

ESTIMATION OF OIL AND GREASE

(Method- Partition Gravimetric Method)

REAGENTS REQUIRED:

1) Petroleum ether.
2) Magnesium sulphate.
3) 6N Hydrochloric acid.

PROCEDURE:

- Take 100mL of sample (well mixed) in a separating funnel.

- Add dilute HCl (6N) to dissolve the precipitate and adjust the P^H upto 2.00 in the sample.
- Rinse the separating funnel with 30mL of petroleum ether.
- Gently shake the funnel with its contents for one minute.
- Release the gas, three to four times.
- Then allowing it to separate (20-30minutes)
- After 20 minutes, the aqueous layer forms.
- Then, release the separating funnel cap and drain (Draw off) the sample before aqueous layer into a conical flask.
- Then separating aqueous layer filter through a filter paper (No.41 filter paper, add pinch of magnesium sulphate in it) into a dry and weighed wide neck flask.
- Wash the filter paper 2 or 3 times with small portion of petroleum ether and evaporate even the last traces in a current of warm air.
- Keep wide neck flask on water bath for 15 minutes then kept it in oven for one hour at 105ºC.
- Cool it in desicator, and then weigh final weight.

Calculation:

$$\textbf{Oil \& Grease} = F_W - I_W \times 10^6/V \text{ ppm}$$

Where,

F_W = Final weight of wide neck flask.

I_W = Initial weight of wide neck flask. V = Sample taken (separating funnel).

ESTIMATION OF TOTAL DISSOLVED SOLIDS (TDS)

(Method – Calulation from Ts Munus Ss)

PROCEDURE:

- Dry an evaporating dish at 105ºC for one hour, cool and store in a desicator and weigh.
- Pipette out 100mL of sample and filter the sample through No.41 filter paper.
- Transfer filtered water sample into a tared evaporating dish and evaporate to dryness on a hot plate then in an oven at 105ºC for one hour.
- Cool it in a desiccators and weigh.

Calculation:

$$\textbf{Total Dissolved Solids} = A - B \times 10^6/V \text{ ppm}$$

Where,

A = Weight of dish + residue (mg)

B = Weight of dish (mg).

V = Volume of sample taken (mL).

(*Or*)

Another method:

Calculation:

Total Dissolved Solids = Total solids – Total suspended solids (ppm)

ESTIMATION OF TOTAL DISSOLVED SOLIDS (TDS)

(Method – Calulation from Ts Munus Ss)

PROCEDURE:

- Dry an evaporating dish at 105ºC for one hour, cool and store in a desicator and weigh.
- Pipette out 100mL of sample and filter the sample through No.41 filter paper.
- Transfer filtered water sample into a tared evaporating dish and evaporate to dryness on a hot plate then in an oven at 105ºC for one hour.
- Cool it in a desicator and weigh.

Calculation:

$$\text{Total Dissolved Solids} = A - B \times 10^6 / V \text{ ppm}$$

Where,

A = Weight of dish + residue (mg)

B = Weight of dish (mg).

V = Volume of sample taken (mL).

(*Or*)

Another method:

Calculation:

Total Dissolved Solids = Total solids – Total suspended solids (ppm)

ESTIMATION OF TOTAL SUSPENDED SOLIDS

(Method- Gravimetric After Filtration)

PROCEDURE:

- Weigh No.41 fiter paper before use.
- Filter a suitable volume of the sample through the filter paper.
- Carefully remove the filter paper, dry at 105 ºC for one hour.Then cool it in a desicator, and weigh.

Calculation:

$$\text{Total Suspended Solids} = A - B \times 10^6 / V \text{ ppm}$$

Where,

A= Weight of filterpaper and suspened solids (mg).

B = Initial weight of filter paper (mg).

V= Volume of sample taken (mL).

BIO CHEMICAL OXYGEN DEMAND (BOD)

(Method-BOTTLE INCUBATION FOR 3 DAYS @27ºC)

REAGENTS REQUIRED:

1) **Manganese sulphate solution**:

   Dissolve 480g manganese sulphate in 1 litre distilled water filter and dilute it.

2) **Alkali-iodide-azide reagent**:

   Dissolve 500g NaoH and 135g NaI or (700g koH and 150g kI)in distilled water and dilute to 1litre.Add l0g sodium azide dissolved in 40ml distilled water.

3) **Starch indicator**:

   Dissolve 2g laboratory grade soluble starch and 0.2g salicylic acid for a preservative in 100ml hot distilled water.

4) **Standard sodium thiosulphate titrant:(0.025N**

   Dissolve 6.205g sodium thiosulphate in distilled water .Add 1.5ml 6N NaoH or 0.4g solid NaoH and dilute to 1000ml.standardise with bi-iodate solution.

5) **Standard potassium bi-iodate solution.(0.0126N)**

   Dissolve 812.4mg of Potassiun bi-iodate in distilled water and dilute to 1000mL.

   Standardisation:

Take 100mL distilled water in an Erlenmeyer flask.Dissolve approximately 2g of KI.Add 1mL of 6N H_2SO_4 or a few drops of conc. H_2SO_4 and 20mL of bi-iodate solution. Dilute to 200mL and titrate liberated iodine with thiosulphate titrant to a pale straw colour.Add a few drops of starch indicator, continue titration until dissappearance of blue colour calculate molrity (M) of thiosulpate.

Calculation:

Molarity of Thio Sulphate=20x0.0126/V

Where,

V = mL of thiosulpate used.

PROCEDURE:

(BOD - Measuring the oxygen consumed by bacteriel and chemical action in a closed sample of water maintained at 27ºC for three days).

- Take 999 ml of dis
- . Water adds 1mL of given sample and mix it well.
- Fill it two B.O.D bottles upto the rim thightly stopper these and make sure that there are no air bubbles inside the bottles.
- Place one bottle in an incubater at 27ºC for 3 days.Determine the B.O.D of the dilutted sample using one of the bottles immediately.
- Remove the stopper bottles and add 1mL of $MnSO_4$ followed by 1mL of alkali iodide azide reagent. Hold the pippete tip just below the liquid surface touching the side of bottles.
- Wash the pipete before returning to the reagent bottles.
- Stopper carefully to exclude air bubbles mix by inverting the bottles a few times.
- Then add 10mL conc.Sulphuric acid, re-stopper and mix by inverting several time untill dissolution is completed.
- Titrate 100mL with standard Sodium.thiosulphate as for standardisation procedure discribed above.

Calculation:

$$\textbf{B.O.D}\ (mg/l) = \frac{(A-B) \times 0.025 \times 8 \times 1000}{V}$$

Where,

A= mL of titrant used for diluted water sample before incubation.

B = mL of titrant used for diluted water sample after three days of incubation.

V = mL of sample taken.

DISSOLVED OXYGEN

(Method- Vinkler Azide Modification Titrimetric)

REAGENTS REQUIRED:

1) **Manganese sulphate solution**:

   Dissolve 480g manganese sulphate in 1 litre distilled water filter and dilute it.

2) **Alkali-iodide-azide reagent**

   Dissolve 500g NaoH and 135g NaI or (700g koH and 150g kI)in distilled water and dilute to 1litre.Add l0g sodium azide dissolved in 40ml distilled water.

3) **Starch indicator**

   Dissolve 2g laboratory grade soluble starch and 0.2g salicylic acid for a preservative in 100ml hot distilled water.

4) **Standard sodium thiosulphate titrant:(0.025N**)

   Dissolve 6.205g sodium thiosulphate in distilled water .Add 1.5ml 6N NaoH or 0.4g solid NaoH and dilute to 1000ml.standardise with bi-iodate solution.

5) **Standard potassium bi-iodate solution.(0.0126N)**

   Dissolve 812.4mg of Potassiun bi-iodate in distilled water and dilute to 1000mL.

   Standardization:

   Take 100mL distilled water in an Erlenmeyer flask.Dissolve approximately 2g of KI.Add 1mL of 6N H_2SO_4 or a few drops of conc. H_2SO_4 and 20mL of bi-iodate solution. Dilute to 200mL and titrate liberated iodine with thiosulphate titrant to a pale straw colour.Add a few drops of starch indicator, continue titration to until dissappearance of blue colour calculate molrity (M) of thiosulpate.

PROCEDURE:

- Add below the liquid surface in the sample bottle in quick successions.1mL manganous sulphate and 1mL alkaline iodide azide reagents added then 2mL conc H_2SO_4 added.
- Stopper the bottle and mix by inversion.
- Remove 100mL of the sample, place in a 500mL conical flask and titrate with standard 0.025N sodium thiosulphate.
- Add 1 to 2mL starch indicator when the colour changes to pale yellow and complete the titration to the first disappearance of the blue colour.

Calculation:

D.O (mg/l) = B x N x 8 x 1000/ A

Where,

B = mL of sodium thiosulphate.

N = Normality of sodiu thiosulphate.

A = Corrected sample aliquot = 200x300/295, if a 300mL bottle is used for sampling.

ESTIMATION OF CHEMICAL OXYGEN DEMAND

(METHOD-OPEN REFLUX)

REAGENTS REQUIRED:

1) **Mercuric sulphate crystals**.
2) **Preparation of sulphuric acid-silver sulphate reagent:**
   Dissolve 10.1g of Silver sulphate (Ag_2SO_4) in 1000mL Sulphuric acid.
3) **Potassiumdichromate(0.25N):**
   Dissolve 12.258g of Potassiumdichromate (previously dried at 105ºC for 2 hours) in distilled water and make upto 1000mL in a volumetric flask
4) **Std.Ferrous Ammonium Sulphate(0.25N FAS):**
   Dissolve 98g of Ferrous Ammonium Sulphate in distilled water then add 20mL conc. Sulphuric acid.Cool and make upto 1000mL in a volumetric flask.Standardise it against 0.25N Potassiumdichromate.
5) **Standardisation procedure:**
   Pipette out 10mL of 0.25N potassium dichromate solution in to a 250ml conical flask.Dilute to 100mL, add 30mL of conc.Sulphuric acid, and cool to room temperature. Add 2 to 5 drops of Ferroin indicator and titrate with ferrous ammoniumsulphate solution.The end is the colour change from blue green to reddish brown.
6) **Ferroin indicator**:
   Dissolve 1.485g of 1, 10- Phenanthoroline mono hydrade together with 0.695g of ferrous sulphate and dilute to 100mL of distilled water.

PROCEDURE:

(If the given sample contain suspended solids is more filtered with ordinary filter paper and than take sample)

- Pipette out 1ml sample in to a 300mL round bottom flask and add 19mL of distilled water. Then add 0.4g of Mercuric sulphate.
- Add 5mL of Sulphuric acid with Silver sulphate carefully with gentle mixing then add 25mL of Sulphuric acid with Silver sulphate again.
- Mix and cool it well.
- Then add 10mL of standardised Potassiumdichromate solution. (If the sample change green colour add another portion of Potassiumdichromate solution.)
- Attach a reflux condenser,Reflux the mixture for 2 hrs @ 80°C with a small bunsen flame.Cool the flask and rinse the inside of the condenser with a 80mL of distilled water allowing the washing to run into the flask.
- Then add 2 to 3 drops of ferroin indicator and titrate with standardised ferrous ammonium sulphate.
- The end is the sharp change of colour from blue green to reddish brown.
- Simultaneously perform blank using distilled water in place of sample.
- From the titre, values calculate the C.O.D.

Calculation:

Molarity of FAS:

$$\text{Molarity of FAS} = V \times N/A$$

Where,

V=Volume of $K_2Cr_2O_7$ used.

N=Normality of $K_2Cr_2O_7$ used.

A=mL of FAS used.

Calculation for COD:

$$B\text{-}A \times 8 \times 1000 \times M/V$$

Where,

V = Volume of sample used.

N = Normality of FAS used.

B = Blank value for FAS.

A = Sample value for FAS.

M = Molarity of FAS used.

ADEQUACY REPORT - STP 500 KLD

CHAPTER – I

LIST OF UNITS IN STP- 500 KLD

S. No	Description	Dimensions	Capacity	MOC	Qty
1.	Bar Screen chamber	1.0 x 1.0 x 1.0 m (H),	1 KL	RCC	1 No
2.	Collection Sump	8.0 x 5.0 x 4.0 m (H)	150 KL	RCC	1 No.
3.	Aeration Tank	8.0 x 8.0 x 3.8 m (H),	240 KL	RCC	1 No.
4.	Settling Tank	6.5 x 6.5 x 3.8 m (H), Hopper Bottom - 1m	120 KL	RCC	1 No.
5.	Clarified Water Tank	6.9 x 3.5 x 3.8 mm(H),	80 KL	RCC	1 No.
6.	Pressure Sand Filter	Dia 1500mm x 2000 mm (H)	20 KL/HR	MSEP	1 No.
7.	Activated Carbon Filter	Dia 1300mm x 2500 mm (H)	20 KL/HR	MSEP	1 No.
8.	Sludge Drying Beds	2.5 x 2.5 x 1m (H)	18.75 KL	RCC	3 Nos

LIST OF MAJOR EQUIPMENTS IN STP- 500 KLD

S. No	Description	Capacity	Make	Qty
1.	Raw Sewage Pumps	20 cu.m/hr	Crompton	2 Nos.
2.	Air Blowers with motor	500 cu.m/hr	Kay International	2 Nos.
3.	Air Blower motor	15 HP	Kirloskar	2 Nos.
4.	Recycle pumps	10 cu.m/hr	Kirloskar	2 Nos.
5.	Filter Feed pumps	40 cu.m/hr	Crompton	2 Nos.
6.	Hypo Dosing pump	0-6LPH	Focus Eng	2 Nos.

6.	Screw pumps with motor	1 cu.m/hr	Kirloskar	2 Nos
7.	Filter press	10 plates, 18" x 18"	Recessed type	1 No.
8.	Racker arm motor	Stirrer	Kirloskar	1 No.

CHAPTER – II

DESIGN OF STP – 500 KLD

1. BAR SCREEN CHAMBER

Size of the unit (B.S) : 1.0 x 1.0 x 1.0 m (H),

Adequately designed.

2. COLLECTION SUMP

Size of the unit : 8.0 x 5.0 x 4 m (H)
Holding capacity required : 5 hours (Min.)
Volume required : 100 m3
Detention time provided : 71/2 hours
Volume provided : 150 m3

Adequately designed.

3. RAW SEWAGE PUMPS

Required flow rate : 20 cu.m / hr max
Flow rate provided : 20 cum/hr
Total developed head : 12 m
Sufficient to handle

Adequately designed.

4. AERATION TANK

(A). Size of the unit : 8.0 x 8.0 x 3.8 m (H),

Detention time required : min. 8 hours
Volume required : 160 m3
Detention time provided : 12 hours
Volume provided : 240 m3

Adequately designed

(B). Size of the unit : 8.0 x 8.0 x 3.8 m (H),
Inlet BOD5 : 350 mg/lit
MLSS considered : 3000 mg/lit
F/M ratio considered : $\frac{\text{Flow rate/day x BOD kg/day}}{\text{Aeration Vol. x MLSS}}$
: 0.5
Aeration tank volume required : 100 m3
Aeration tank volume provided : 240 m3

Adequately designed.

5. TWIN LOBE AIR BLOWERS

Air Volume : $\frac{\text{COD x Cu.m/day}}{1000}$
: 800 x 500/1000
: 320 kgs/day
: 13.33 kgs/hr
13.33/0.23 (oxygen availability in air) : 57.97
57.97/1.12 (specific gravity of air) : 51.76
51.76/0.15 (15% for diffuser) : 345 Cu.m/hr
Air volume required for Aeration tank : 345 Cu.m/hr
Air volume required for Collection tank : 150 m3 x 0.9 = 135 Cu.m/hr
Total air volume required : 480 cu.m/hr
Air volume Provided : 500 Cu.m/hr

Adequately designed.

6. SETTLING TANK

Detention time required : 4 hours
Volume required : 80 m3
Detention time provided : 6 hours
Volume provided : 120 m3
Tank Size : 6.5 x 6.5 x 3.8 m (H), Hopper-1m

Adequately designed.

7. SLUDGE RECYCLE PUMPS

Capacity : 10 cu.m/hr
Sludge flow rate : less than 5 kl / hr
Sufficient to handle.

Adequately designed.

8. CLARIFIED WATER TANK

Detention time required : 4 hours
Volume required : 80 m3
Detention time provided : 4 hours
Volume provided : 80 m3
Tank Size : 6.9 x 3.5 x 3.8 mm(H), LD-3.6m

Adequately designed.

9. FILTER FEED PUMPS

Required flow rate : 24 m3/m2/hr
: 3.14 x 1.5 x 1.3 / 4 x 24
(Flow rate = Area x Velocity)
: 36.7 cum/hr
Required Flow rate : 36.7 cu.m/hr
Flow rate provided : 40 cum/hr
Total developed head : 25 m

Adequately designed.

10. PRESSURE SAND FILTER

Filtration rate provided : 15 m3/m2/hr
Filter size required : Dia 1300mm x 1800 mm (H)
Filter size provided : Dia 1500mm x 2000 mm (H)

Adequately designed.

11. ACTIVATED CARBON FILTER

Filtration rate provided : 20 m3/m2/hr
Filter size required : Dia 1127mm x 2000 mm (H)
Filter size provided : Dia 1300mm x 2500 mm (H)

Adequately designed.

12. SLUDGE DRYING BEDS:

Biological sludge :(BOD x Plant Capacity/1000) x 0.2
= (350 x 500/1000) x 0.2
= 35 kg/day
Sludge volume = 35/ 0.02
= 1750/1000
= 1.75 m^3
Total sludge volume = 1.75 m^3/day
Drying time = 7 days
= 1.75 m^3 x 7 days
= 12.25 m^3
Sludge application depth = 0.5 m
= 12.25 m^3/0.5 m
= 24.5 m2

SDB area required (Total) = 19.6 m^2
SDB area Provided (Existing) = 18.7m^2
SDB size Provided : 2.5m (L) x 2.5m (W) x 1.0m (H) - 3 Nos

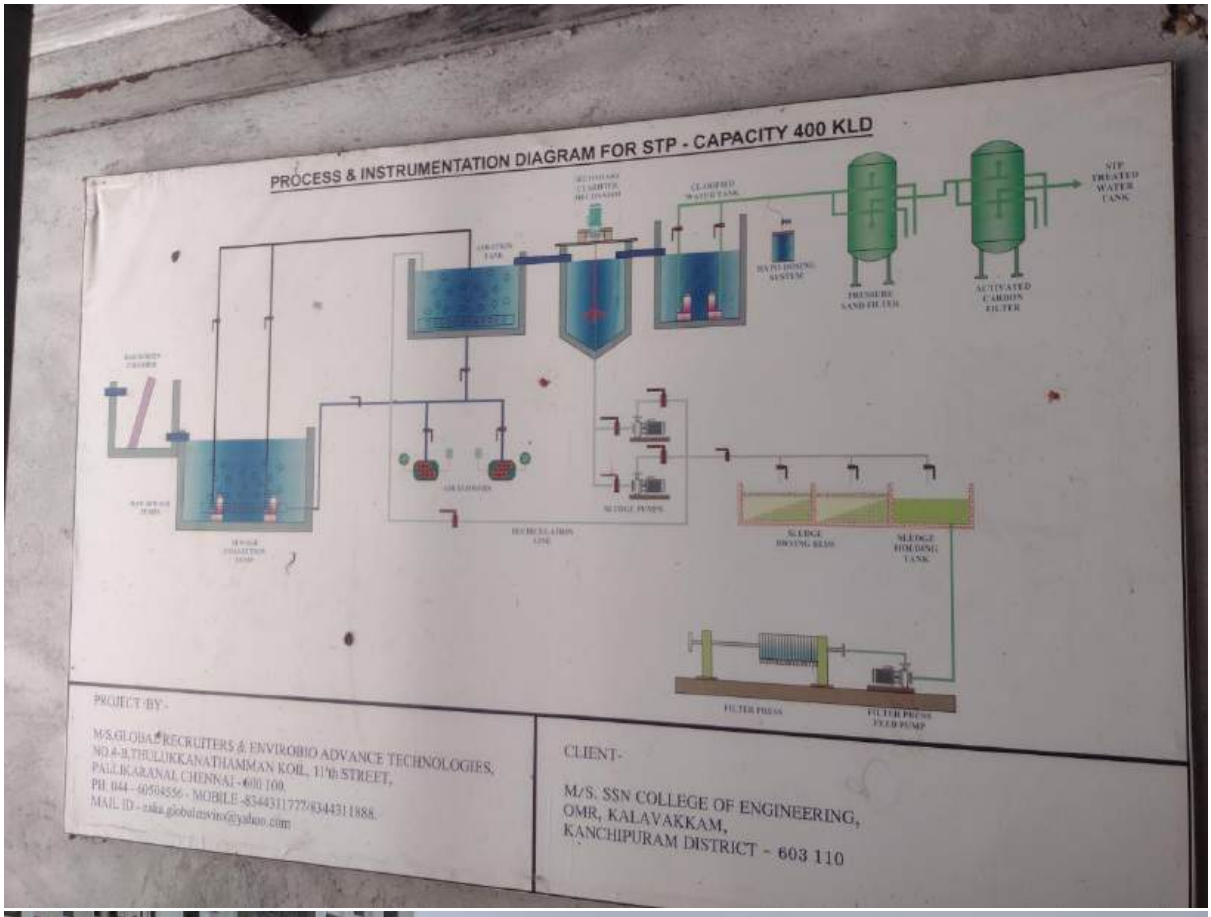
Adequately designed.

PROCESS AND INSTRUMENTATION DIAGRAM

GENERAL LAYOUT

HYDRAULIC FLOW DIAGRAM

ELECTRICAL CONTROL PANEL DIAGRAM


PROCESS & INSTRUMENTATION DIAGRAM FOR STP - CAPACITY 400 KLD
PROJECT BY -
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SRI SIVASUBRAMANIYA NADAR COLLEGE OF ENGINEERING

(An Autonomous Institution)
Kalavakkam – 603 110

OPERATIONS

3.4 Ratio of water recovered returned to total water withdrawal

Submitted to

The Sustainability Tracking, Assessment & Rating System (STARS)

3.4 Ratio of water recovered returned to total water withdrawal

Narrative outlining the methodologies used to estimate or model the annual volume of water recovered and/or returned on-site

The Campus having the disposition to be a green community that keeps sustainability as its core ideology will ensure that every major water consumption is accounted for through water metering. Towards its affinity to lower water consumption in every possible way, water consumption metering shall be a day-to-day activity right from the initial stage of the project.

Hence, the SSN facility has a metering facility to monitor water consumption. The water meters for monitoring the consumption have been installed at Borewell consumption, Treated wastewater consumption and Well water consumption.

- Estimated volume of rainwater harvested on-site for storage and use: 48,491.59 KLD
- Estimated volume of water recovered on-site for reuse: 395 KLD
- Estimated volume of water collected and returned through on-site green infrastructure: 395 KLD
- URL to water consumption data, conservation plans, or efficiency improvement efforts/reports

https://www.ssn.edu.in/wp-content/uploads/2024/02/7.1.4_Water-conservation.pdf