INTERNSHIP REPORT

A report submitted in partial fulfilment of the requirements for the award of the degree of

at

“PUBLIC WORK DEPARTMENT” (PWD),KARAIKAL

for

BACHELOR OF TECHNOLOGY

In

CIVIL ENGINEERING

By

MUTHUKUMARAN.B

Roll No : CE22B1022

(Duration : 3rd June 2024 to 28th June 2024)

“DEPARTMENT OF CIVIL ENGINEERING”

NATIONAL INSTITUTE OF TECHNOLOGY PUDUCHERRY

(An Institute of National Importance under Ministry of HRD, Govt of India)

Thiruvettakudy, Karaikal-609609

BONAFIDE CERTIFICATE

This is to certify that the internship report entitled **Summer internship Training Report** has been submitted by **MUTHUKUMARAN. B** bearing the register number **CE22B1022** He has successfully completed the internship at **Public Work Department (PWD), Karaikal** under the supervision of the undersigned Internship Coordinator & Head of the Department during the period from **03.06.2024** to **28.06.2024**.

The internship report is accepted as a partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in the Department of Civil Engineering at the National Institute of Technology Puducherry, Karaikal, during the academic year 2024-25.

Dr. Senthilkumar
Internship Co-Ordinator & Faculty Advisor
Assistant Professor
Department of Civil Engineering
NIT Puducherry
Karaikal -609609.

Dr. Sivakumar Ramalingam
Head of the Department
Assistant Professor
Department of Civil Engineering
NIT Puducherry
Karaikal -609609.

Internship viva-voce held on ________________

DECLARATION

GOVERNMENT OF PUDUCHERRY
IRRIGATION AND PUBLIC HEALTH DIVISION
PUBLIC WORKS DEPARTMENT, KARAIKAL
*****

CERTIFICATE dt. 03.07.2024

This is to certify that Thiru. **B. MUTHUKUMARAN (CE22B1022),** Department of Civil Engineering, National Institute of Technology Puducherry, Karaikal has undergone Internship/training for 11 days from **03.06.2024 to 14.06.2024** in the Irrigation and Public Health Division, Public Works Department, Karaikal.

During the training period he showed keen interest and gained sufficient knowledge in Augmentation of Water Supply Scheme and Distribution Grid, Irrigation Structures and Sewage Treatment Plant (11 MLD) in Puduthurai. He has completed the training successfully.

During the training period, his conduct and character were very good.

GOVERNMENT OF PUDUCHERRY PWD KARAIKAL O/o THE EXECUTIVE ENGINEER - I&PH

(J. MAHESH, B.E.)
EXECUTIVE ENGINEER – I&PH
PWD, KARAIKAL

To
Thiru. B. MUTHUKUMARAN,
B.Tech 2nd year, CE22B1022
Department of Civil Engineering,
National Institute of Technology Puducherry,
Karaikal - 609609

GOVERNMENT OF PUDUCHERRY
BUILDINGS AND ROADS DIVISION
PUBLIC WORKS DEPARTMENT

TOWHOM SOEVER IT MAY CONCERN

This is to Certify that **Mr. B. MUTHUKUMARAN** **II Year, B. TECH. Civil Engineering** Department of **National Institute of Technology, Puducherry, Karaikal**, had undergone In-plant Training on the Project for "Improvements to the Kamaraj Salai from CRC Bus Depot to Ammalchathiram, including Jawaharlal Nehru street, Dr. Ambedkar Salai and Lemaire road in Karaikal (SIDBI) " **from 17.06.2024 to 28.06.2024**.

During the Training period he had gained sufficient knowledge and completed the Training satisfactorily.

Government of Puducherry
PWD (B&R) KARAIKAL

(R. CHIDAMBARANATHAN)
EXECUTIVE ENGINEER (B&R)
P.W.D. KARAIKAL.

Place : Karaikal
Date : 10-07-2024

ACKNOWLEDGEMENTS

I am grateful to my internship coordinator **Dr. Senthilkumar** for their unwavering support, insightful feedback, and expert guidance throughout the project. Their expertise and encouragement have been instrumental in the successful completion of this work.

I am grateful to **Dr. Makarand Madhao Ghangrekar, Director**, NIT Puducherry, for providing a conducive environment for learning and research. I extend my heartfelt thanks to **Dr. Sundaravarathan S,** Registrar, NIT Puducherry, for the administrative support throughout the project. I would like to express my gratitude to the Dean, Academics of NIT Puducherry, for the valuable insights, encouragement, and support during this project.

A special word of thanks goes to **Dr. Sivakumar Ramalingam**, the Head of the Department of Civil Engineering for his continuous guidance, mentorship, and encouragement. I would also like to acknowledge the faculty members, mentors, and colleagues who provided valuable suggestions, feedback, and assistance during the course of this project. Their contributions have greatly enriched the project.

It gives us a great pleasure to have an opportunity to acknowledge and to express gratitude to those who were associated with me during my training at Public Work Department (PWD), Karaikal and I am very grateful Mr. **J.MAHESH(EE)(I&PH).**

Mr .**R.CHIDAMBARANATHAN(EE)(B&R) .** for providing me with an opportunity to undergo training under his able guidance. Last, but not the least, I would also like to acknowledge the support of my college friends, who pursued their training with me. I express my sincere thanks and gratitude to PWD, Karaikal authorities for allowing me to undergo the training in this prestigious organisation. I will always remain indebted to them for their constant interest and excellent guidance in my training work, moreover for providing me with an opportunity to work and gain experience.

ABSTRACT

This report details my internship experience at the Public Works Department (PWD) in Karaikal from June 3 to June 28, 2024. The internship provided comprehensive training in civil engineering practices, with a focus on construction and water management. My activities included working on Sewage Treatment Plant (STP) projects, where I contributed to raft and isolated foundation construction, RCC wall work, and the installation of mechanical systems. I also engaged in water quality testing in the laboratory and observed water treatment processes at a Water Treatment Plant (WTP). In the second phase, I was involved in the construction of culverts and a 2-meter high retaining wall, emphasizing the importance of drainage infrastructure. Key observations included the critical role of precise construction practices in ensuring structural integrity and effective water management. This internship enhanced my practical skills and understanding of civil engineering, providing valuable experience in both construction and water treatment processes.

ABOUT PWD(Public Work Department)-karaikal:

Public Works Department, the premier technical organization in the Union Territory of Pondicherry, is in-charge of Planning, Designing, Construction and Maintenance of Buildings, Irrigation, Flood Control, Water Supply and Public Health Engineering in all the four regions namely, Pondicherry, Karaikal, Mahe and Yanam. The Department is also responsible for maintaining essential services like Water Supply, Sewerage, Management of Water Resources etc. Puducherry, Public Works Department has carried out number of landmark constructions in the infrastructure development, including, Bridges, Irrigation structures, Water supply and Sanitary installations etc. in the Union Territory of Puducherry. Presently, this department has taken up many major works in the regions of Puducherry, Karaikal, Mahe and Yanam.

Public Works Department, the premier technical organization in the Union Territory of Pondicherry, is in-charge of Planning, Designing, Construction and Maintenance of Buildings, Roads, Bridges, National Highways, Irrigation, Flood Control, Water Supply and Public Health Engineering the Department is also responsible for maintaining essential services like Water Supply, Sewerage, Management of Water Resources etc. I have undergone in-plant training in three departments such as **Public health sub-division, Buildings and road sub-division** and **Medium irrigation sub-division** at **Public Work Department, Karaikal** on June 03.06.2024T to 28.06.2024 (21) days.

सत्यमेव जयते

Public Works Department

Government of Puducherry (India)

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LIST OF SYMBOLS AND ABREVATION

1.STP - Sewage treatment plant

2.WTP - Water treatment plant

3.MLD - Million lakhs of litter per day

4.BOD - Biochemical oxygen demand

5.COD - Chemical oxygen demand

1 INTRODUCTION

1.1 Overview of the Internship

During my 21-day internship at the Public Works Department (PWD) in Karaikal, I gained hands-on experience in various civil engineering projects and water quality testing. My primary focus areas included:

1. **Sewage Treatment Plant (STP) Construction:**

I participated in the construction of a Sewage Treatment Plant, observing and assisting in the planning and execution of structural works. This experience provided me with insights into the complex processes involved in wastewater treatment and the importance of sustainable infrastructure in urban planning.

2. **Culvert Construction:**

I was involved in the construction of culverts, essential for managing water flow in roadways and preventing flooding. I gained practical knowledge in the design and implementation of culvert systems, including material selection and construction techniques.

3. **Retaining Wall Construction for Drainage (2m height):**

My internship included the construction of a 2-meter high retaining wall designed for drainage purposes. This project helped me understand the importance of retaining structures in preventing soil erosion and managing water flow, particularly in areas prone to heavy rainfall.

4. **Water Treatment Plant Visit and Water Quality Testing:**

I visited a Water Treatment Plant and learned about the various stages of water purification. Additionally, I performed water quality tests in the laboratory, including tests for alkalinity, hardness, chloride, and calcium. These tests are crucial for ensuring the safety and quality of drinking water, and this experience enhanced my understanding of environmental engineering practices.

Overall, this internship provided me with valuable practical experience in civil engineering and water treatment processes, which will be instrumental in my future career as a civil engineer. I am grateful for the opportunity to apply my academic knowledge to real-world projects and to work alongside experienced professionals in the field.

1.2 Objectives and Scope

During my 21-day internship at the Public Works Department (PWD) in Karaikal, my primary objectives were to gain practical experience in civil engineering by participating in the construction of infrastructure projects such as a Sewage Treatment Plant (STP), culverts, and a 2-meter high retaining wall. I aimed to understand construction techniques, materials, and site management, as well as to learn about water treatment processes by visiting a Water Treatment Plant. Additionally, I performed laboratory tests for water quality, focusing on alkalinity, hardness, chloride, and calcium, to understand their importance in public health. The scope of my internship included active involvement in construction projects, conducting water quality tests, and documenting my findings, while also collaborating with professionals to enhance my knowledge and skills in civil engineering and water management.

TRAINING SCHEDULE

2.1 Detailed Timeline of the Training Period

Training Schedule Internship Period: June 3, 2024 – June 28, 2024,

Location: Public Works Department (PWD), Karaikal.

Phase 1: June 3 – June 14, 2024

Field: Irrigation & Public Health Department

June 3, 2024 (Day 1):
Orientation and Introduction to STP Plant Construction:

- Overview of the internship program and objectives.
- Introduction to the Sewage Treatment Plant (STP) project, including site layout, key components, and overall purpose in wastewater management.
- Safety protocols, site regulations, and environmental considerations.
- Initial observations of site preparation activities.

June 4 – June 5, 2024 (Days 2-3):
Raft Foundation Construction for STP:

Assisted in the construction of the raft foundation, including:

- Excavation and preparation of the site for the foundation.
- Placement of reinforcement steel bars according to design specifications.
- Pouring and leveling of concrete for the raft foundation.
- Learned about the importance of raft foundations in distributing the load of the STP structure evenly across the ground to prevent settlement and ensure stability.

June 6, 2024 (Day 4):
Isolated Foundation Construction:

Participated in the construction of isolated foundations for columns and load-bearing walls, including:

- Excavation for footings and ensuring proper depth and width.
- Installation of steel reinforcement to support vertical loads.
- Pouring concrete into the footings and ensuring proper curing.
- Discussed with engineers the design criteria for isolated foundations and their role in supporting individual structural elements.

June 7 – June 8, 2024 (Days 5-6):
RCC Wall Construction:

Involved in constructing Reinforced Cement Concrete (RCC) walls, including:

- Setting up formwork for wall construction.
- Placing steel reinforcement bars within the formwork.
- Pouring concrete and ensuring proper compaction and leveling.
- Observed the curing process to ensure the strength and durability of the walls.
- Gained insights into the role of RCC walls in providing structural strength and their importance in the overall design of the STP.

June 9, 2024 (Day 7):
Continued STP Plant Construction Activities

- Continued involvement in RCC wall construction and other structural elements of the STP.
- Observed and assisted in the installation of mechanical components such as pumps, aerators, and pipelines.
- Participated in site meetings to discuss daily progress, challenges, and solutions with the project team.

June 10, 2024 (Day 8):
Water Treatment Plant (WTP) Visit – Introduction

- Visited the Water Treatment Plant (WTP) to understand its role in providing safe drinking water.
- Guided tour of the facility, covering key processes such as coagulation, sedimentation, filtration, and disinfection.
- Discussions with plant operators about operational challenges and maintenance requirements.

June 11, 2024 (Day 9):
Water Treatment Plant (WTP) Visit – Detailed Study

- Detailed observation of each stage of the water treatment process.
- Assisted in monitoring and recording water quality parameters, including turbidity, pH, and chlorine levels.
- Learned about regulatory standards and compliance in water treatment.

June 12 – June 14, 2024 (Days 10-12):
Water Testing Laboratory – Testing and Analysis

- Conducted laboratory tests on water samples to measure alkalinity, hardness, chloride, and calcium levels.
- Assisted in calibrating laboratory equipment, preparing chemical reagents, and documenting test results.
- Analysed results to understand their impact on water quality and public health.

Phase 2: June 17 – June 28, 2024

Field: Buildings and Road Division

June 17 – June 19, 2024 (Days 13-15):
Culvert Construction

- Introduction to the culvert construction project, including scope, design specifications, and site conditions.
- Assisted in the layout and excavation for the culvert installation.
- Participated in the preparation of the foundation, including leveling and compacting the base soil.

- Observed the installation of precast concrete culvert sections, focusing on jointing and sealing techniques.
- Engaged in backfilling around the culvert to ensure stability and proper drainage.

June 20 – June 21, 2024 (Days 16-17):
Culvert Construction – Finalization

- Final stages of culvert construction, including finishing work and quality checks.
- Assisted in conducting inspections to ensure proper alignment and structural integrity.
- Documented the construction process and discussed maintenance requirements with engineers.

June 24 – June 28, 2024 (Days 18-22):
Retaining Wall Construction (2m height for drainage purposes)

Involved in the construction of a 2-meter high retaining wall, including:

- Excavation and preparation of the site for the retaining wall.
- Placement of reinforcement bars and formwork.
- Pouring and levelling of concrete for the retaining wall.
- Installation of drainage pipes and backfilling behind the retaining wall.

Conducted quality checks and final inspections to ensure the wall's structural stability and effectiveness in managing drainage.

2.2 Summary

The internship at the Public Works Department in Karaikal from June 3 to June 28, 2024, provided hands-on experience in various construction projects. The program included raft foundation construction, isolated foundations, RCC wall construction, water treatment plant visits, culvert construction, and constructing a 2-meter high retaining wall. The internship also involved conducting water quality tests and conducting laboratory tests.

WORK UNDERTAKEN / OBSERVATIONS

3.1 General Introduction

During my internship at the Public Works Department (PWD) in Karaikal from June 3 to June 28, 2024, 21 days .I engaged in diverse civil engineering tasks. I participated in foundational work for Sewage Treatment Plants (STPs), including raft and isolated foundations, RCC wall construction, and mechanical system installation. I also conducted water quality tests and visited a Water Treatment Plant (WTP) to understand treatment processes. In the second phase, I worked on culvert and 2-meter high retaining wall construction, focusing on drainage infrastructure. These activities provided practical experience and insights into construction accuracy and water management.

3.2 Description of Daily Tasks and Responsibilities

During my 21-day civil engineering internship, I supported construction activities and performed essential technical tasks. I assisted with site familiarization, followed safety protocols, and helped in the construction of raft and isolated foundations for the STP, focusing on site preparation, reinforcement placement, and concrete pouring. I also contributed to RCC wall construction and worked on the installation of culverts and a retaining wall, including site surveying, levelling, and ensuring proper alignment. Additionally, I conducted water quality tests for alkalinity, hardness, chloride, and calcium to ensure the suitability of water for construction. In the final days, I participated in site inspections and compiled a comprehensive report, blending hands-on work with technical analysis to ensure project success and deepen my understanding of civil engineering.

3.3 Key Observations and Insights Gained

During my internship, I learned the importance of precise site preparation and reinforcement placement for foundation stability, as well as the need for proper concrete curing to ensure durability. I also gained insight into the critical role of water quality testing in preventing structural issues and the necessity of accurate site surveying and soil compaction for effective drainage solutions. These experiences highlighted the importance of detail-oriented work and technical accuracy in civil engineering projects.

3.4 STP(sewage treatment plant) construction at 11MLD in Karaikal:

Site details:

- Area of STP Facilities: 5400 Sq.M
- Area of Green Belt: 1590Sq.M
- Total STP Area: 6600 Sq.M
- Total Area Available: 17000 Sq. M

Construction works progress:

- SBR – 1(sequence batching reactor)
- SBR – 2 (sequence batching reactor)
- Sludge sump and plant drain sum
- Raft foundation construction
- RCC wall construction

SBR-1 & SBR-2:

- Raft foundation construction:
- Dimension of raft – length=20m & width = 10m, depth = 300mm
- Clear cover = 50mm
- Bottom bar 24mm dia , top bar16mm dia
- Concrete grade M30
- SBC for soil shall be taken not more than 12 t/sqm. as per soil report at 2.0 m. depth.
- Net safe bearing capacity is 9.0sq.m
- Backfilling is 2m.
- Three different sizes of coloumn present in this foundation that is C1 , C2 , C3 and

Plant drain and sludge sump:

- Raft foundation construction:
- Raft foundation reinforcement casting bottom bar Dia is 24mm and top bar Dia is 16mm dimension of raft foundation length is 10m and width is 10m, depth is 300mm.and M25 concrete used in this foundation.
- 11 different types of column was present here that is C1, C2,C3,and C4.

Site Preparation: The initial phase involved surveying and marking the construction area, followed by the excavation process to the required depth. The excavation was carried out systematically to ensure a level base and adequate space for the foundation.

Reinforcement Placement: After excavation, a grid of steel reinforcement bars (rebar) was laid out according to the structural design. The bars were tied securely at intersections using steel wire to maintain their position during the concrete pour.

Concrete Pouring: The concrete mix was poured into the foundation, encapsulating the rebar. The process was carefully monitored to ensure the even distribution of concrete and to avoid voids or air pockets that could weaken the structure.

Curing Process: Post-pouring, the concrete was allowed to cure under controlled conditions. Proper curing is critical to achieving the desired strength and durability of the foundation

Figure 3.1 Raft foundation construction and curing

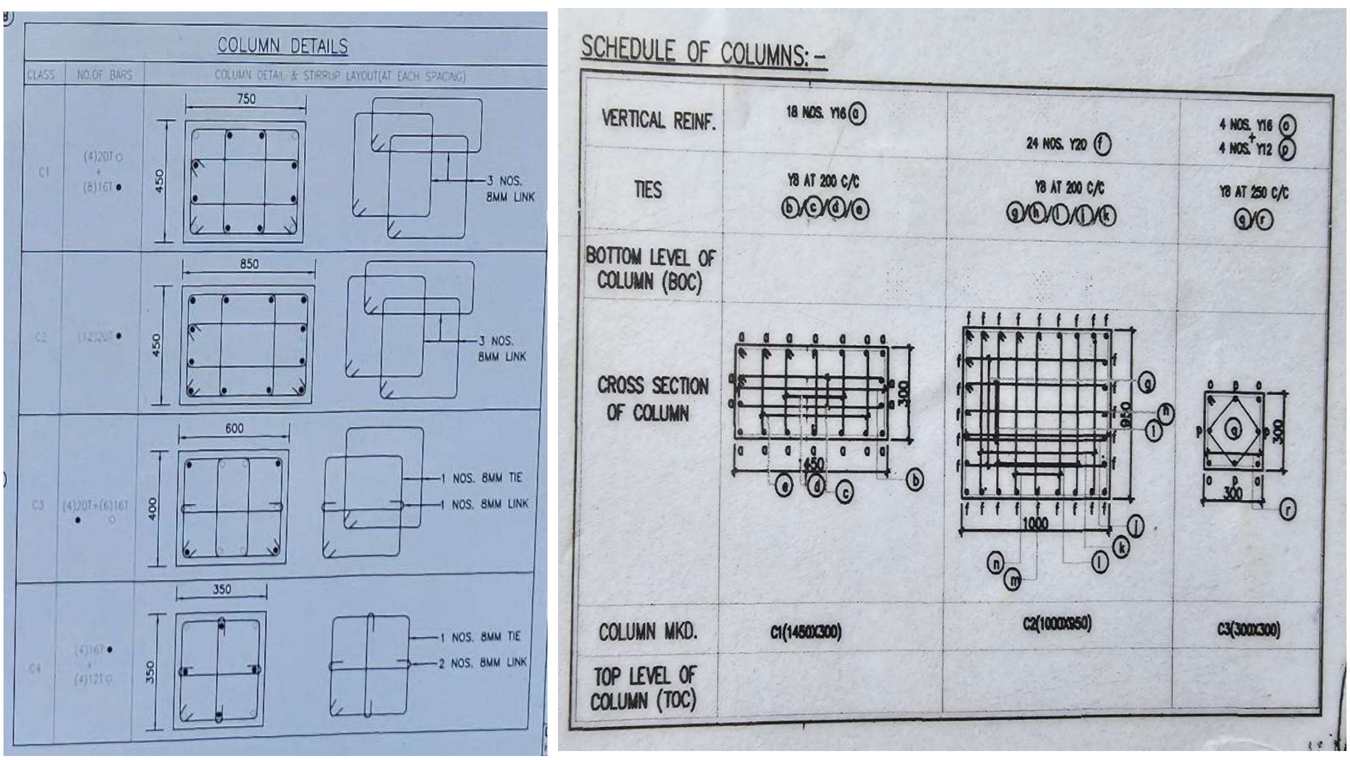


Figure 3.2 column detailing

3.4.1 Sewage treatment technologies:

<u>Moving Bed Bio Reactor (MBBR)/ Fixed Aerated Bioreactor:</u>

The Moving Bed Bio Reactor (MBBR) offers cost-effective waste water treatment solutions for industrial and municipal markets. It reduces pollution load and meets less stringent discharge regulations. The MBBR system uses an activated sludge aeration system, collecting sludge on recycled plastic carriers for optimal contact with water, air, and bacteria. It significantly increases plant capacity and efficiency.

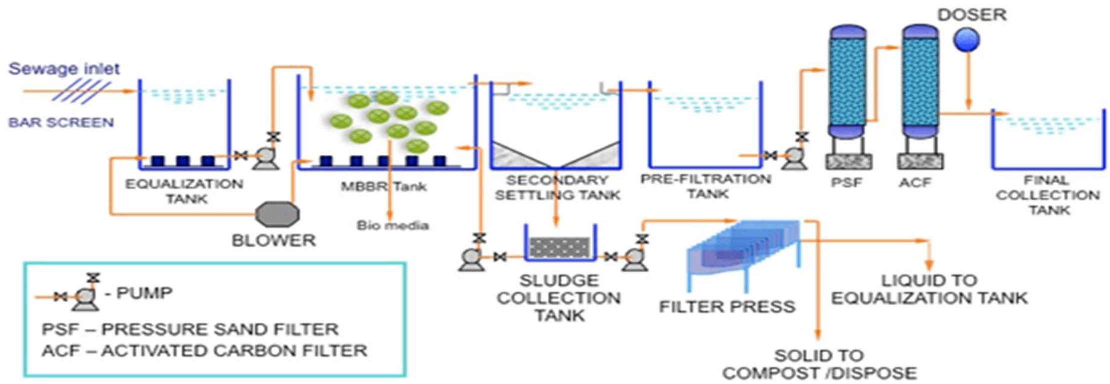


Figure 3.3 MBBR technology process

Sequencing batch reactor(SBR):

Sequencing batch reactors (SBR) are activated sludge processes used to treat wastewater in batches. Oxygen is injected into the mixture to reduce organic matter, reducing biochemical oxygen demand (BOD) and chemical oxygen demand (COD). The treated effluent can be discharged to surface waters or used on land.

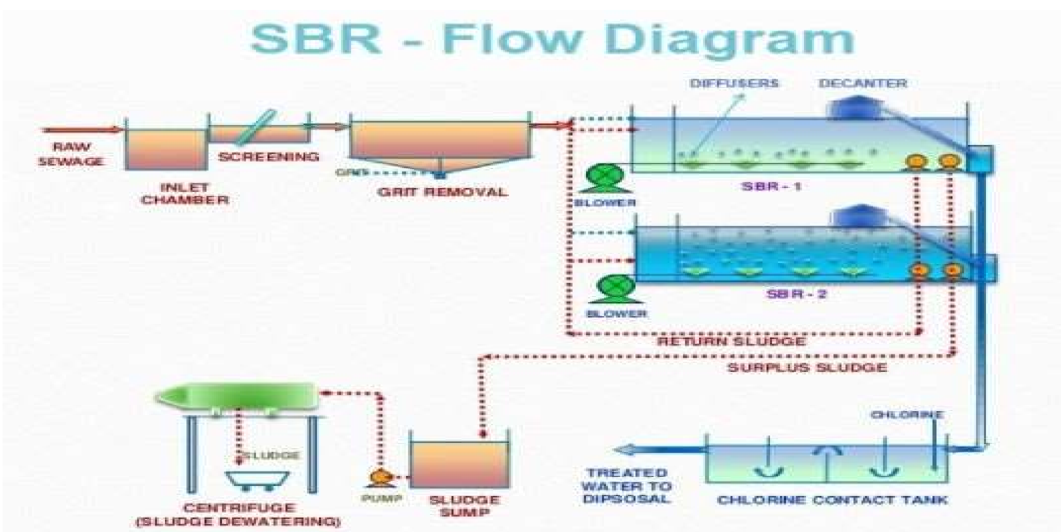


Figure 3.4 SBR technology process

This STP under the SBR technology.

3.4.2 Process of sewage treatment plant:

There are 3 stages of treatment process:

- Preliminary treatment
- Secondary treatment
- Tertiary treatment

Preliminary treatment:

The preliminary treatment stage consists of inlet chamber, fine screen channel and grit chamber.The description of each units are as mentioned below:

Inlet chamber:

The inlet chamber is mainly used to dampen the turbulence of raw influent and also for its smooth transition flow to the Fine screen channel.

Design Criteria

Flow	:	Peak Flow
No. of Units	:	1 Working
Retention Time	:	30 seconds for peak flow.

Fine screen channel:

The bar screen is a vertical bar device used to prevent solid particles larger than 6mm from entering the Sewage Treatment Plant (STP). It consists of a combination of Mechanical and Manual Fine Screens, with the Mechanical screen removing non-biodegradable objects.

Design Criteria

Mechanical Fine Screen

Type of screen	:	Step Type Bar Screen
No. of Units	:	1 No. (Working)
Velocity	:	0.6 to 1.2 m/sec
Angle of inclination	:	45 Degrees
Bar Spacing	:	6 mm
Bar Thickness	:	3 mm

Manual Fine Screen

Type of screen	:	Bar Type Screen
No. of Units	:	1 No. (Standby)
Velocity	:	0.6 to 1.2 m/sec
Angle of inclination	:	45 Degrees
Bar Spacing	:	10 mm
Bar Thickness	:	10 mm

Mechanical grit chamber (detritor tank)

Grit, a byproduct of wastewater treatment, can cause equipment wear and clog pipes. The system removes grit through chambers, collection tank, scraper mechanism, and organic return pump, then re-enters the wastewater stream.

Design Criteria:

Type	:	Detritor (Mechanical Grit Chamber)
No. of Units	:	1 Working.
Components	:	Detritor Mechanism, Classifier & Organic Return Pump.
Surface Loading Rate	:	960 $m^3/m^2/d$

Skimming tanks

A skimming tank is a chamber so arranged that the floating matter like oil, fat, grease etc., rise and remain on the surface of the wastewater until removed, while the liquid flows out continuously under partitions.

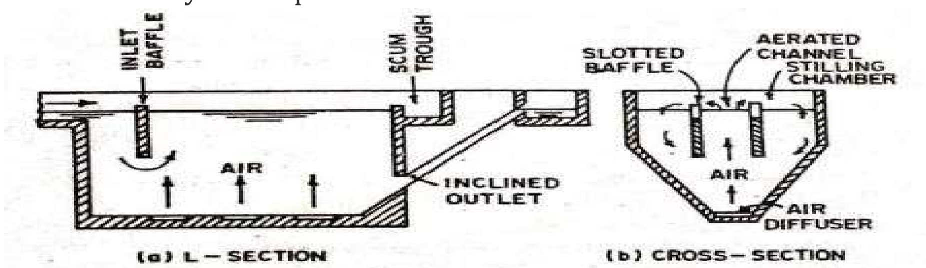


Figure 3.5 skimming tank cross section

Secondary treatment

The flow from the Parshall Flume shall be taken into the Biological Treatment unit viz. Sequential Batch Reactor (SBR) by means of an SBR inlet channel. The SBR interconnecting channel shall house 2 No's of motorized gates for isolation of flow into each of the SBR basin.

Sequence batch reactor(SBR)

- C-Tech is a 4th generation Cyclic Activated Sludge process technology that uses variable volume treatment, a biological Selector, and oxygen intake rate control in a fed-batch reactor mode. It maintains anoxic-mix conditions and recycles treated effluent and activated sludge using a Return Activated Sludge Pump. The system is flexible, allowing adjustments for sludge age, operating liquor solids concentration, total cycle duration, and dissolved oxygen profile.

➢ The biological operation is divided into cyclic modes, lasting 3.0 hours, involving fill-aeration, settling, and decantation, saving up to 30-40% space and eliminating the need for a secondary clarifier system.

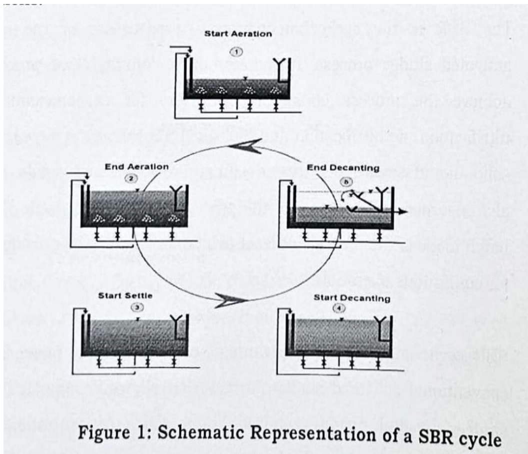


Figure 1: Schematic Representation of a SBR cycle

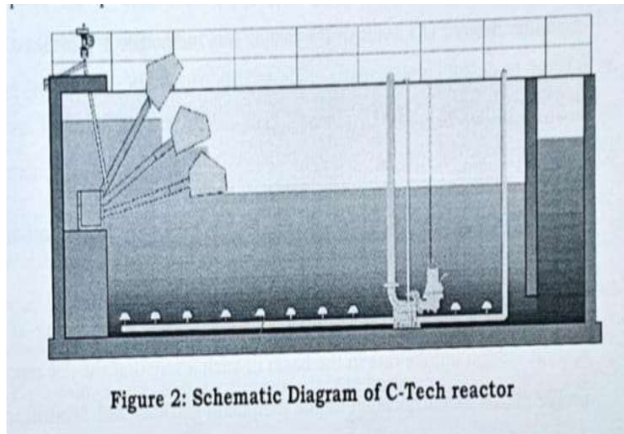


Figure 2: Schematic Diagram of C-Tech reactor

Figure 3.6 schematic representation of a SBR cycle and diagram of C-tech reactor

<u>Tertiary treatment:</u>

Disinfection(UV SYSTEM):

The UV system is a safe, environmentally friendly solution for disinfecting waste water in large plants, treating various wastewater types and allowing unlimited flow quantities, making it an ideal choice for efficient sewage effluent treatment.

<u>Design Criteria</u>

Design flow	: 1047 m3/hr
Type	: UV SYSTEM
No. of Units	: 2 nos
Design UV transmittance (1 cm)	60 %

3.4.3 Design basis:

The Sewage Treatment Plant shall be designed to treat the raw sewage in a single stage fully automatic Plant based on Cyclic Activated Sludge Technology.

RAW SEWAGE & TREATED SEWAGE CHARACTERISTICS

SL NO	PARAMETER	UNIT	RAW SEWAGE	TREATED SEWAGE
1	Average Flow	MLD m^3/hr	12.00 500.0	
2	Peak Factor		2.25	
3	Peak Flow	MLD m^3/hr	27.00 1125	
4	PH	mg/l	6.5 - 7.5	6.5 - 7.5
5	BOD $_5$ @ 20° C	mg/l	250	≤ 10
6	COD	mg/l	450	≤ 50
7	TSS	mg/l	375	≤ 10
8	TKN	mg/l	45	--
9	TN Total Nitrogen.	mg/l	--	≤ 10
10	TP Phosphorous.	mg/l	7	≤ 1

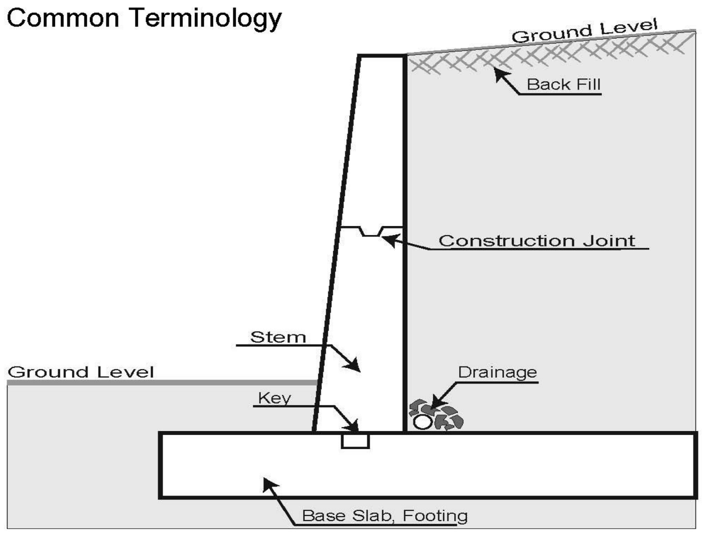
3.5 Retaining wall construction;

Drain work :

In this estimate Provision has been made for construction of 'U' drain in the end of "ROW" on both side of road in which Earth work excavation, quarry dust and PCC 1:4:8 in the foundation, PCC 1:3:6 for drain wall and precast slab in RCC 1:2:4 on the top of the drain. The space between BT edge and drain which underneath for service lines will be provided with base course PCC 1:4:8 150mm thickness and top surface will be finished with PCC 1:2:4 - 75mm thickness. In this estimate provision also has been made for construction of retaining wall in the Kamarajar Salai East side where ever required from Packirisamy pillai street junction to Singaravelar salai for which provisions have been made for Earth work excavation quarry dust PCC 1:4:8 RCC 1:2:4 Retaining wall with required reinforcement.

Cantilever retaining wall:

Cantilever walls are reinforced concrete retaining structures built with an L-shaped or inverted T-shaped foundation. They have a stem and base slab, transferring vertical stress to prevent toppling. The T-shaped foundation benefits from soil weight, providing stability. Cantilever walls are suitable for retained heights up to 5m but require space behind the wall, making them unsuitable for supporting existing slopes.



. **Formwork Installation**: Formwork was erected to shape the wall and hold the concrete in place during pouring. The formwork was carefully aligned and secured to prevent any movement or deformation.

Reinforcement Placement: Additional layers of reinforcement were placed within the formwork for the wall itself. These layers were critical for resisting the bending and shear forces that the wall would experience due to soil pressure.

Concrete Pouring and Layering: Concrete was poured into the formwork in layers, with each layer properly compacted to remove air pockets and ensure a dense, solid structure. The construction was carried out in stages to maintain stability and allow for adequate curing time between layers.

Curing: After the concrete was poured, it was allowed to cure. This process was crucial to achieving the necessary strength and durability of the wall. Curing involved maintaining adequate moisture levels and temperature conditions for an extended period, typically seven to 14 days.

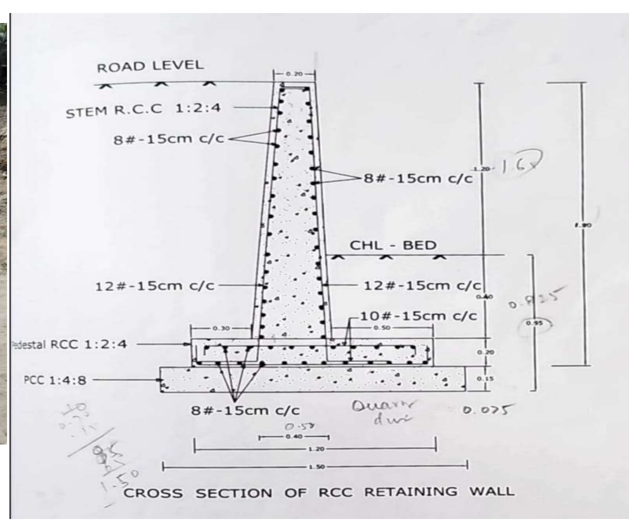


Figure 3.7 retaining wall construction and cross section

3.6 Culvert construction;

Scope and design: 1m this estimate Provision has been made for the reconstruction of existing old damaged brick masonry abutment / RCC slab type culvert with new IRC single cell 1.20m x 170m RCC box culvert for Pallivoikal and 2.0m x2.0m span IRC single cell box culvert for Olakudiyan channel. Necessary provisions for dismantling and removal of the of old damaged culvert structure, Earth work excavation, foundation concrete with PCC M15 mix are included in this estimate. The Base slab, Side walls and deck slab and approach slabs of the proposed culverts will be constructed in RCC M30 mix . Provision for wearing coat in M30 mix concrete, steel reinforcement for the RCC items, Plastering and Painting to the exposed surfaces are properly included. Provisions are included for the temporary traffic diversion arrangements.

Figure 3.8 culvert construction

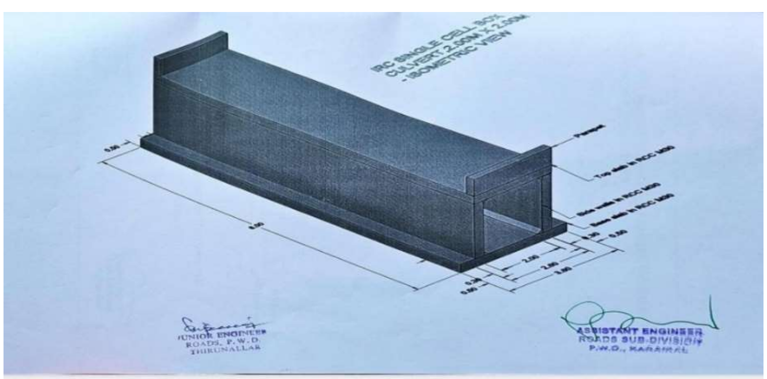


Figure 3.9 3Dimensional culvert cross section

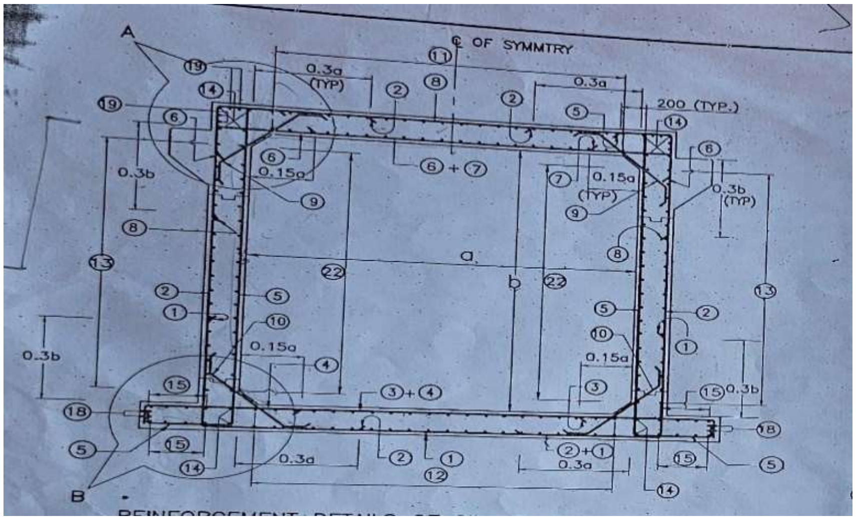


Figure 3.10 reinforcement details for culvert construction

3.6.1 Culvert Types

The types of culverts that are generally used in construction are as follows:-

Pipe Culvert (Single or Multiple):

Pipe culverts, rounded culverts, are widely used and can be single or multiple in number, ranging from 1 metre to 6 metres, made of concrete, steel, or other materials.

Pipe Arch Culvert (Single or Multiple):

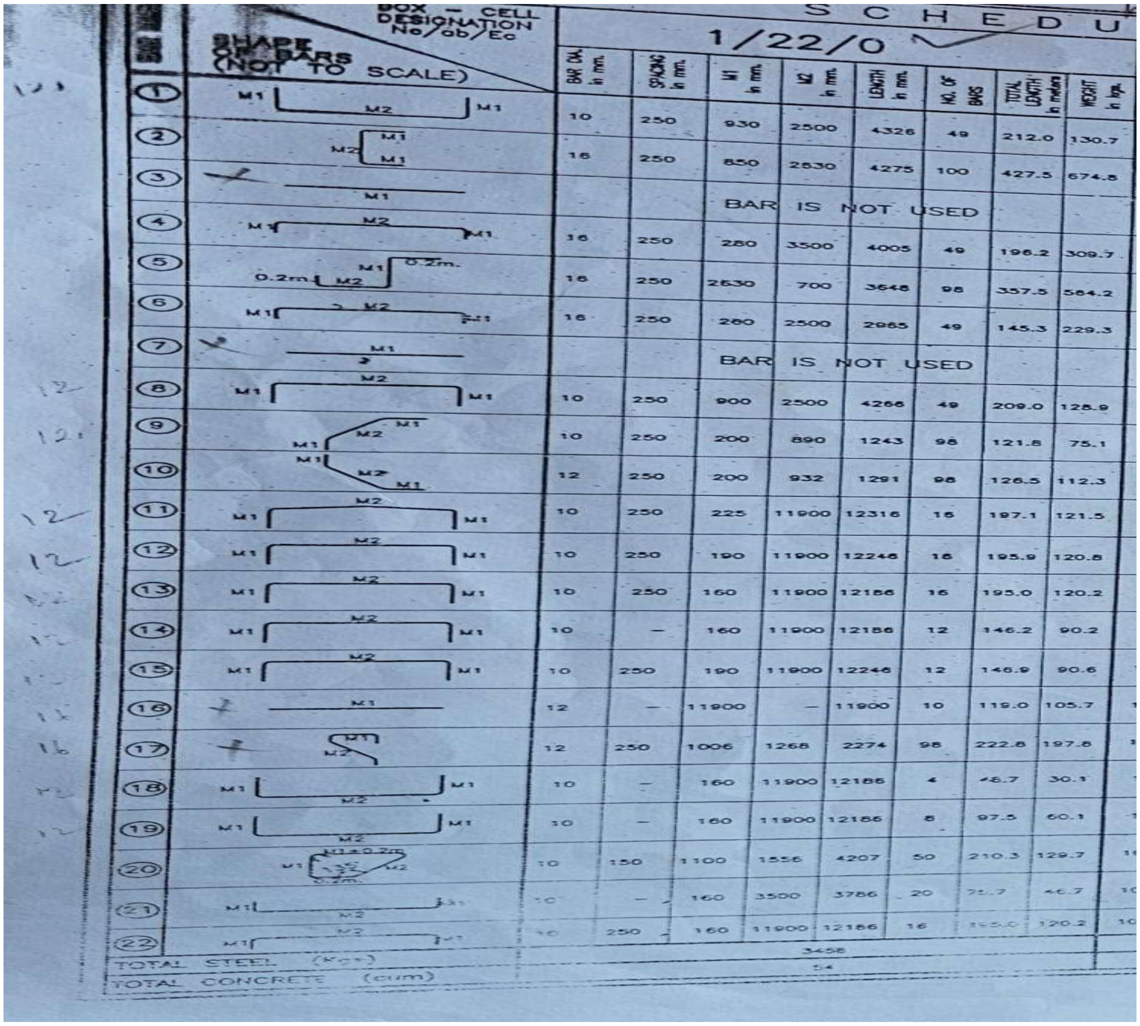
Pipe arch culverts, resembling half circle culverts, can handle stable water flows, allowing easy transport of fish or sewage. Available in various sizes and with a beautiful appearance.

Box Culvert (Single or Multiple):

Box culverts, rectangular concrete structures with reinforcement, remove rainwater but are ineffective during dry seasons. They also serve as passageways for animals, but not suitable for higher velocities due to sharp corners.

Arch Culvert:

Arch culverts are similar to pipe arch culverts, but an artificial floor is provided beneath the arch in this case. It is commonly used in narrow passages. The artificial floor is constructed of concrete, as is the arch. Steel arch culverts are also available, but they are quite costly.



Bar No.	Shape of bars (not to scale) / Box-cell designation No/ob/Ec	Bar dia. in mm.	Spacing in mm.	M1 in mm.	M2 in mm.	Length in mm.	No. of bars	Total length in meters	Weight in kgs.
1	M1 M2 M1	10	250	930	2500	4326	49	212.0	130.7
2	M2 M1 M1	16	250	850	2630	4275	100	427.5	674.8
3	M1	BAR IS NOT USED							
4	M1 M2 M1	16	250	280	3500	4005	49	196.2	309.7
5	0.2m M2 M1 0.2m.	16	250	2630	700	3648	98	357.5	564.2
6	M1 M2 M1	16	250	280	2500	2965	49	145.3	229.3
7	M1	BAR IS NOT USED							
8	M1 M2 M1	10	250	900	2500	4266	49	209.0	128.9
9	M1 M2 M1	10	250	200	890	1243	98	121.8	75.1
10	M1 M2 M1	12	250	200	932	1291	98	126.5	112.3
11	M1 M2 M1	10	250	225	11900	12316	16	197.1	121.5
12	M1 M2 M1	10	250	190	11900	12246	16	195.9	120.8
13	M1 M2 M1	10	250	160	11900	12186	16	195.0	120.2
14	M1 M2 M1	10	—	160	11900	12186	12	146.2	90.2
15	M1 M2 M1	10	250	190	11900	12246	12	146.9	90.6
16	M1	12	—	11900	—	11900	10	119.0	105.7
17	M1 M2	12	250	1006	1268	2274	98	222.8	197.8
18	M1 M2 M1	10	—	160	11900	12186	4	48.7	30.1
19	M1 M2 M1	10	—	160	11900	12186	8	97.5	60.1
20	M1+0.2m M1 135° M2 0.2m.	10	150	1100	1556	4207	50	210.3	129.7
21	M1 M2 M1	10	—	160	3500	3786	20	[illegible]	46.7
22	M1 M2 M1	10	250	160	11900	12186	16	[illegible]	120.2
Total steel (Kgs)		3458							
Total concrete (cum)		54							

Figure 3.11 BBS for culvert construction

3.7 Form work:

The construction of concrete structures begins with foundations and floors, followed by columns or walls. Foundation shuttering ensures uniformity, strength, and reduces cracks, leaks, and defects. It also enables the creation of complex shapes and designs not possible with other methods.

Material checking:

- Span and Jacky should be undamaged and not visible bent.
- If beam span and depth is higher we have to use Jacky in closer spacing minimum 1m once.

- Place the Jacky unsettled region solid surface.

De-shuttering:

- For[column ,beams ,walls] for(16-24hrs)
- Bottom shuttering (slab and beam) span length up to 6m -14days
- Span length over 6m-21days.


Figure 3.12 form work

3.8 WTP(water treatment plant) --- visit:

5MLD capacity:

<u>BENEFITED AREAS</u>

Central zone	2.50MLD
South zone	1.50MLD
Melaoduthurai village	0.50MLD
Puduthurai village	0.50MLD
Total ➡	5.00MLD

_**Process Observation:** Observed various stages of water treatment, including coagulation, flocculation, sedimentation, filtration, and disinfection. Each stage was explained in detail, emphasizing its role in the overall treatment process.

Chemical Dosing: Learned about the chemical dosing process used to facilitate coagulation and disinfection, and observed the control mechanisms in place to ensure proper dosing.

components of the schemes:

- Intake well
- Aerator
- Receiving chamber/clarifier
- Clarifloculator
- Pressure filter
- Chlorinator
- Distribution unit

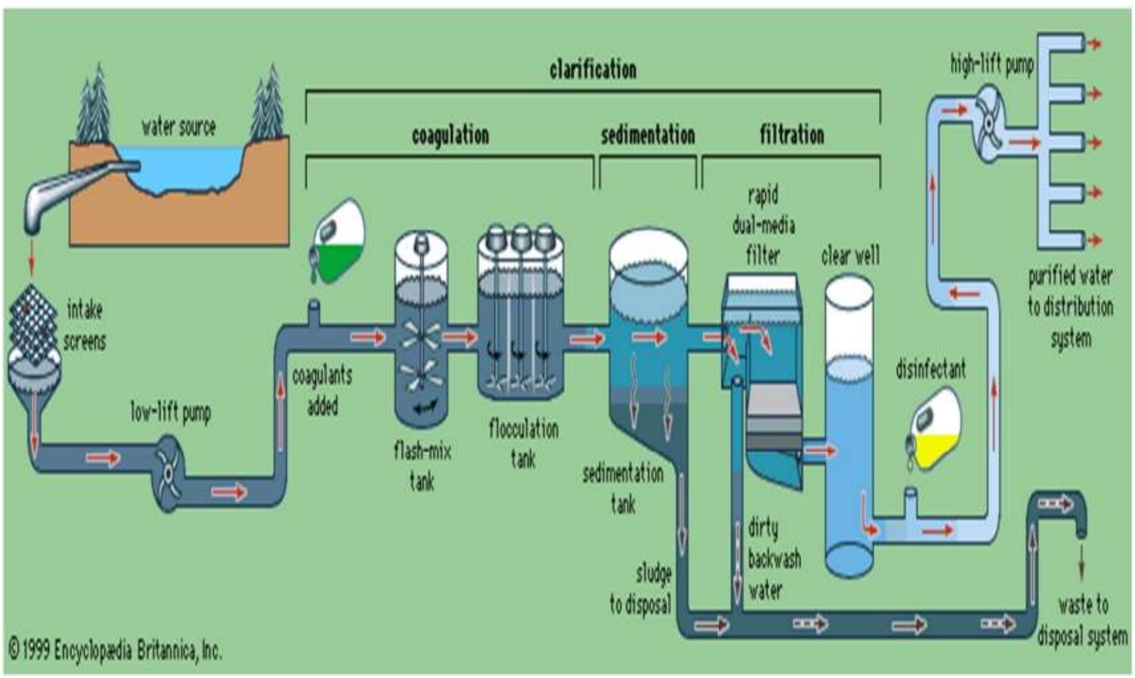


Figure 3.13 WTP process layout

3.8.1 Process of water treatment plant:

1. Collection of Water Sources

Water treatment plants collect water from diverse sources like rivers, reservoirs, or underground aquifers, varying in quality and location, requiring specific treatment methods for safety.

2. Screening and Intake

Water is collected, screened for debris, and then separated using coarse and fine screens. Coarse screens remove larger materials, while fine screens catch smaller particles like algae and plankton.

3. Aeration and Pre-Chlorination

The water undergoes aeration in a treatment plant to remove dissolved gases, reduce corrosiveness, and eliminate undesirable tastes and odors. Pre-chlorination is used to address algae growth, while chlorination kills algae and oxidizes compounds.

4. Coagulation and Flocculation

The water undergoes aeration and pre-chlorination before undergoing coagulation and flocculation. A coagulant, like aluminum sulfate or ferric chloride, neutralizes the negative charge of suspended particles, causing them to clump together and form larger aggregates called flocs. This process, achieved through gentle stirring, facilitates their removal in subsequent steps.

5. Sedimentation

After flocculation, water enters sedimentation basins, where flocs settle due to increased weight. This process, known as sedimentation or clarification, separates heavier particles from water, removing sludge for disposal and allowing clarified water to move forward in treatment.

6. Filtration

Water is purified through filtration, which involves passing it through media like sand, gravel, anthracite, and activated carbon to remove suspended particles, microorganisms, and impurities. Various filters, including rapid gravity sand filters and multi-media filters, are used for optimal purification.

7. Disinfection

Water undergoes filtration and disinfection to eliminate pathogenic microorganisms. Common disinfectants include chlorine, chlorine dioxide, or chloramines, which kill bacteria and viruses. Fluoride is added to support dental health by preventing tooth decay.

9. UV Sterilization and Ozone Treatment

Water treatment plants often use ultraviolet (UV) sterilization or ozone treatment as alternative disinfection methods. UV light damages microorganisms' genetic material, making them unreplicable, while ozone, an oxidizing agent, kills them through chemical reactions. These advanced techniques ensure water safety by providing additional protection.

10. Distribution of Treated Water

Once the water has undergone the necessary treatment processes, it is ready for distribution to homes, businesses, and other end-users. Treated water is pumped into a network of pipes that transport it to its final destination, accordingly.

Figure 3.14 WTP site visit

3.8.2 characteristics of water

- Physical characteristics
- Chemical characteristics
- Biological characteristics

Physical characteristics:

<u>Colour:</u>

- Pure H_2o – colour less
- Impure H_20 – color appearance

<u>Taste and odour:</u>

- Pure H_2o – taste less, odourless
- Impure H_20 – taste, odour present

Turbidity:

- Pure H_2o – clear do not absorb light
- Impure H_20 – turbidity appear

Chemical characteristics:

PH

Drinking H_2o = 6.5 to 8.5

Hardness

Hardness = ca, mg salt

Temporary hardness = bicarbonate of ca , mg

Permanent hardness = chloride and sulphate of ca , mg.

Alkalinity:

- Acts as a stabilizer for PH
- Effect the toxicity of many substances in H_2o.

Arsenic :

- Naturally present at high levels in ground water.
- Highly toxic in inorganic form.

Fluoride:

- Helps to protect tooth decay
- All H_2O contains some fluorides.

Biological characteristics

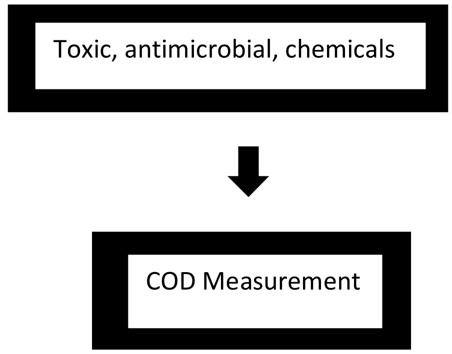
Biological oxygen demand(BOD):

- Represents amount of O_2 required by living organisms.
- When bio-degradable organic matter is added in H_2o , microorganism utilizer dissolved o_2 to oxidize organic matter.

High level of BOD “water pollution”

Chemical oxygen demand(COD):

Amount of O_2 needed for Oxidation of Organic matter present in H_2O by strong chemical oxidizing agente such as $K_2cr_2O_7$.



3.9 Summary

During my 21-day internship, I worked on STP plant and drainage construction projects. Key tasks included assisting with foundation construction, RCC wall setup, and the installation of culverts and retaining walls. I conducted water quality tests, which emphasized the importance of meeting standards for construction materials. My observations highlighted the critical need for accurate site preparation, proper concrete curing, and effective water quality management to ensure structural stability and project success.

SPECIFIC ASSIGNMENTS / PROJECTS HANDLED

4.1 General Overview

During my internship, I focused on key tasks such as using an autolevel to ensure precise leveling for culvert construction, which was crucial for proper alignment and stability. I also measured the deck slab thickness to confirm it met design specifications, ensuring structural integrity. Additionally, I conducted water quality tests for alkalinity, hardness, chloride, and calcium to verify that the water met construction standards, ensuring it would not compromise the materials.

4.2 Water tests are performed below:

- Chloride Test - Potassium chromate is a indicator
  $AgNo_3$ Silver nitrate in burette
  Brown colour will occur

- Alkalinity Test – Sulphuric acid 0.02 normality in burette
  Methyl orange is a indicator
  Dark orange will occur

- Hardness Test – EDTA in burette
  Buffer (2ml) + Erchrome black T-pinch is a indicator
  Wine red to blue colour

- Calcium Test – NaOH – Burette
  Nuroxide – 1 pinch (indicator)
  Wine red to blue colour

Figure 4.1 water testing laboratory

4.3 Culvert Top slab alignment checking using auto level

Preparation and Setup:

- Equipment: I used an auto level for precise elevation measurements, a staff rod for reading elevations, and a measuring tape to verify slab thickness.
- Auto Level Setup: The auto level was mounted on a tripod positioned to cover the entire slab area. I carefully adjusted the leveling screws to ensure the instrument was perfectly horizontal, using a bubble level as a guide. This step was crucial for accurate elevation readings.
- Benchmark Reference: A known benchmark with a fixed elevation was identified, and an initial reading was taken to establish a reference point for all subsequent measurements.

Alignment Check:

- Elevation Readings: I placed the staff rod at key locations on the top slab, including the edges, centre, and corners. From the auto level, I took elevation readings at each of these points, comparing them to the expected elevations based on the design plans.
- Deviation Analysis: I analysed the readings to identify any misalignment or unevenness. If the elevations varied from the design specifications, those areas were marked for further inspection and potential correction.

Thickness Measurement:

- Direct Measurement: I measured the slab thickness at multiple points using a measuring tape. Special attention was given to ensure that the thickness was uniformly 350mm, as specified in the design. This step involved measuring from the bottom of the slab to the top surface, ensuring consistent thickness across all sections.
- Comparison to Specifications: Each measurement was compared against the design requirements. Variations beyond the allowable tolerance were noted for corrective action.

Documentation and Reporting:

- Data Recording: All elevation readings and thickness measurements were meticulously recorded. Any deviations from the design specifications were highlighted.
- Reporting: The findings were compiled into a report, detailing the alignment and thickness checks. Recommendations for corrections were provided where deviations were identified, ensuring the slab met the structural integrity requirements of the project.

Figure 4.2 Alignment checking using auto level

4.4 Checked Column Alignment Using Starter Mold:

- **Inspection of Starter Mold Setup:** Verified that the starter Mold was correctly positioned according to the design specifications before proceeding with column construction.
- **Measurement Accuracy:** Ensured that the Mold was aligned with the design drawings, using measuring tools to check dimensions and angles for accuracy.
- **Column Placement:** Monitored the placement of columns within the Mold, ensuring proper alignment with the starter Mold to maintain structural integrity and correct positioning.
- **Adjustment and Corrections:** Made necessary adjustments to the Mold to correct any misalignments, ensuring that the columns would be constructed as per the intended design.
- **Verification of Verticality:** Used levelling instruments to confirm that the columns were vertical and aligned correctly, essential for load distribution and overall structural stability

Figure 4.3 starter marking

4.5 Outcomes & Summary

The outcomes of my internship tasks were significant in ensuring the success and quality of the construction projects. Precise leveling for culvert construction was achieved using an autolevel, which ensured proper alignment and stability of the structures, preventing issues related to misalignment and uneven settlement. The measurement of deck slab thickness confirmed that it met the design specifications, thereby ensuring the slab's structural integrity and load-bearing capacity. Additionally, the water quality tests for alkalinity, hardness, chloride, and calcium verified that the water used in construction met the required standards, ensuring it would not compromise the materials or overall project quality. These tasks collectively highlighted the importance of meticulous attention to detail and adherence to engineering standards in civil engineering practices.

LEARNING ACHIEVED

5.1 General Introduction

The overall internship provided a valuable opportunity to apply and expand my civil engineering knowledge in a practical setting. It allowed me to engage in various aspects of construction projects, including site levelling, deck slab measurement, and water quality testing. Through hands-on tasks and real-world problem-solving, I gained a deeper understanding of the technical and procedural aspects of civil engineering. This experience highlighted the importance of precision, quality control, and adherence to engineering standards. It also enhanced my problem-solving skills and professional development, bridging the gap between academic theory and practical application.

5.2 Skills and Knowledge Acquired

The internship provided me with essential skills for a civil engineering career, including precise site levelling, measuring deck slab thickness, conducting water quality tests, and hands-on experience with construction processes like foundation work, RCC walls, culverts, and retaining walls. It improved my understanding of project coordination, problem-solving skills, and quality control practices. The internship also bridging the gap between theoretical learning and real-world application, enhancing my technical knowledge of engineering standards and material properties.

5.3 Practical Application and Relevance to Civil Engineering

This internship taught practical skills in civil engineering, such as site leveling, deck slab thickness measurement, and water quality tests. Accurate site preparation is crucial for ensuring structural stability and preventing issues like uneven settlement. Adherence to design specifications is essential for structural integrity and load-bearing capacity. Water quality tests highlight the impact of factors like alkalinity, hardness, chloride, and calcium on materials, allowing informed decisions to avoid long-term issues. The internship underscored the importance of accuracy, quality control, and adherence to engineering standards in civil engineering.

5.4 Summary

The internship highlighted the importance of accurate site preparation, precise structural measurements, and thorough material testing in civil engineering. It highlighted the need for alignment, stability, and structural integrity in construction. The internship also highlighted the importance of water quality tests for durability and safety. These experiences demonstrated the need for meticulous attention to detail and adherence to engineering standards for successful civil engineering projects.

CHALLENGES ENCOUNTERED

6.1 General Introduction

During the internship, I encountered several challenges that tested my problem-solving skills and adaptability. These challenges ranged from technical difficulties in accurate measurements to logistical issues on construction sites. Addressing these challenges required a combination of theoretical knowledge and practical experience, offering valuable learning opportunities. Navigating these obstacles not only enhanced my technical abilities but also provided insights into the complexities of managing real-world engineering project.

6.2 Difficulties Faced During Training

I faced challenges in precise site levelling, verifying deck slab thickness, and conducting water quality tests. These tasks required meticulous attention and adjustment, requiring careful attention to varying site conditions and ensuring accuracy despite potential contamination or equipment issues. These challenges required a balance of theoretical knowledge and practical application, enhancing my understanding of real-world engineering projects.

6.3 Solutions and Strategies Employed

During my internship, I used various strategies to overcome challenges. I followed calibration procedures for accurate site levelling, used calibrated equipment for deck slab thickness measurements, and followed standard procedures for water quality testing. Regular checks and cross-referencing ensured precision and structural integrity. These strategies helped me complete tasks successfully and minimize contamination risks.

6.4 Summary

During the internship, I faced challenges in site levelling, verifying deck slab thickness, and conducting water quality tests. These involved varying conditions, discrepancies due to inconsistent methods, and potential contamination or equipment issues.

CONCLUSION & SUMMARY

7.1 Summary

The intern gained practical experience in STP plant construction and PWD activities. The first phase involved working on a Sewage Treatment Plant, including raft foundation, isolated foundation, and RCC wall construction. The second phase involved PWD's Buildings and Road Division in Karaikal, constructing culverts and a retaining wall for drainage. This internship enhanced skills in construction and water management, providing insights into project workflows and site management.

7.2 Recap of the Training Experience

The internship from June 3 to June 28, 2024, provided hands-on experience in civil engineering through two phases. The first phase focused on STP plant construction and water testing, involving excavation, reinforcement layout, and concrete pouring. The second phase focused on retaining wall construction and culvert construction, emphasizing proper formwork alignment and reinforcement for structural stability. The internship provided a comprehensive understanding of civil engineering practices, construction techniques, and maintaining high standards throughout construction work.

7.3 Key Takeaways and Overall Impact

The internship emphasized the importance of precision and accuracy in construction tasks, such as excavation depth, reinforcement placement, and formwork setup. It highlighted the role of reinforcement, water quality, drainage systems, and coordination in preventing structural damage. The internship also highlighted the need for effective communication and safety protocols in construction projects. The experience deepened the professional development of the intern, enhancing technical skills, problem-solving abilities, and appreciation for the complexities of construction work.

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