

# KERALA WATER AUTHORITY



## DETAILED PROJECT REPORT

### SEWERAGE SYSTEM TO KASARAGOD MUNICIPALITY PHASE 1 - CONSTRUCTION OF 4MLD CAPACITY SEWAGE TREATMENT PLANT AT PACHAKKADU THURUTHU AND LAYING SEWERAGE NETWORK



**KERALA WATER AUTHORITY**  
**PPD & SEWERAGE VERTICAL**  
**KOZHIKODE**

## CONTENTS

<b>LIST OF TABLES.....</b>	<b>iv</b>
<b>LIST OF FIGURES.....</b>	<b>v</b>
<b>APPENDIX .....</b>	<b>v</b>
<b>PROJECT AT A GLANCE.....</b>	<b>vi</b>
<b>ABSTRACT OF ESTIMATE.....</b>	<b>vii</b>
<b>EXECUTIVE SUMMARY .....</b>	<b>viii</b>
<b>Chapter 1 INTRODUCTION .....</b>	<b>1</b>
1.1 BACKGROUND .....	1
1.2 SCOPE OF THE REPORT.....	1
1.3 PROJECT AREA.....	1
1.4 POPULATION PATTERN.....	3
1.5 SOCIO-ECONOMIC PROFILE.....	3
1.6 GEOGRAPHICAL FEATURES .....	3
1.7 RAINFALL & TEMPERATURE.....	3
1.8 LAND USE .....	3
1.9 SOIL TYPE .....	4
<b>Chapter 2 PROJECT RATIONALE AND METHODOLOGY .....</b>	<b>5</b>
2.1 SANITATION – VISION, STATUS AND GOALS .....	5
2.2 NEED FOR SEWERAGE SCHEME .....	6
2.3 PRESENT SEWERAGE SYSTEM- OVERVIEW .....	8
2.4 WATER SUPPLY FACILITIES .....	8
2.4.1 PRESENT SYSTEM.....	8
2.4.2 ONGOING AND PROPOSED WATER SUPPLY SYSTEM.....	8
2.4.3 GROUND WATER SOURCES.....	9
2.5 METHODOLOGY FOR PREPARATION OF SEWERAGE MASTER PLAN .....	9
2.6 FIELD INVESTIGATIONS.....	9
2.6.1 SURVEY WORK.....	9
2.6.2 SOCIAL SURVEY.....	10
<b>Chapter 3 DESIGN CRITERIA .....</b>	<b>11</b>
3.1 SEWAGE COLLECTION & CONVEYANCE SYSTEM .....	11
3.2 ESTIMATION OF QUANTITY OF SEWAGE.....	11
3.2.1 INFILTRATION AND LEAKAGE. ....	12
3.2.2 ESTIMATION OF INDUSTRIAL SEWAGE.....	12
3.3 DESIGN PERIOD .....	12
3.4 VARIATION IN RATE OF FLOW .....	13
3.5 HYDRAULIC DESIGN OF SEWERS .....	13

3.5.1	DEPTH OF FLOW .....	14
3.5.2	HYDRAULIC FORMULAE FOR DESIGN OF SEWERS .....	14
3.5.3	PER CAPITA SEWAGE FLOW .....	14
3.5.4	MINIMUM VELOCITY OF FLOW .....	14
3.5.5	RECOMMENDED SLOPES FOR MINIMUM VELOCITY .....	14
3.5.6	EROSION AND MAXIMUM VELOCITY OF FLOW .....	15
3.5.7	SEWER TRANSITIONS.....	15
3.5.8	MINIMUM PIPE DIAMETER .....	15
3.6	MATERIAL OF CONSTRUCTION FOR GRAVITY SEWERS.....	16
3.6.1	BENEFITS OF PE PIPES FOR SEWERS .....	18
3.7	MANHOLES .....	19
3.7.1	GENERAL .....	19
3.7.2	TYPE OF MANHOLES .....	19
3.7.3	MATERIAL OF CONSTRUCTION FOR MANHOLE .....	20
<b>Chapter 4</b>	<b>PROPOSED SEWERAGE SYSTEM .....</b>	<b>22</b>
4.1	POPULATION PROJECTION .....	22
4.2	COLLECTION SYSTEM .....	24
4.3	SEWERAGE NETWORK AND MANHOLES .....	24
4.3.1	DETAILS OF SEWER NETWORK .....	26
4.3.2	MANHOLES.....	26
4.4	PUMPING STATION AND RISING MAIN.....	27
4.4.1	GENERAL .....	27
4.5	LIFTING STATION /PUMPING STATION.....	27
4.5.1	DETAILS OF PUMPING STATIONS .....	27
4.5.2	DETAILS OF LIFTING STATIONS.....	28
4.5.3	PUMPING MAINS AND LIFTING MAINS .....	28
4.6	PUMP AND OPERATION CONTROL .....	29
4.6.1	DETAILS OF PUMP SETS.....	29
4.7	LAYING OF SEWER NETWORK.....	30
4.7.1	EXCAVATION AND LAYING .....	30
4.8	GANTRY .....	31
4.9	ARRANGEMENTS FOR POWER SUPPLY .....	31
<b>Chapter 5</b>	<b>PROPOSED SEWERAGE TREATMENT PLANT.....</b>	<b>32</b>
5.1	GENERAL .....	32
5.2	CHARECTERISTICS OF SEWAGE .....	32
5.2.1	INFLUENT CHARACTERISTICS .....	32
5.2.2	EFFLUENT CHARACTERISTICS .....	33
5.3	CAPACITY CALCULATION OF STP.....	33
5.4	UNIT OPERATIONS IN TREATMENT OF SEWAGE.....	34
5.5	THEPROPOSED PFD PROCESS FLOW DIAGRAM OF PROPOSED STP .....	35
5.6	SELECTION OF TECHNOLOGY FOR THE PROPOSED STP .....	36
5.6.1	FEATURES OF MBBR.....	36
5.6.2	NITRIFICATION .....	39
5.6.3	DENITRIFICATION.....	39
5.6.4	PHOSPHOROUS REMOVAL .....	40
5.6.5	A2O PROCESS.....	40

5.7	PROPOSED TREATMENT UNITS .....	40
5.7.1	RECEIVING CHAMBER .....	40
5.7.2	SCREEN CHANNEL .....	40
5.7.3	GRIT SEPARATOR .....	40
5.7.4	APPROACH CHANNEL FOR PARSHALL FLUME .....	41
5.7.5	EQUALISATION TANK .....	41
5.7.6	MIXING EQUIPMENT .....	41
5.7.7	PUMPSETS TO MBBR .....	41
5.7.8	MOVING BED BIO REACTOR (MBBR) .....	41
5.7.9	AIR BLOWERS .....	41
5.7.10	SECONDARY CLARIFIER .....	42
5.7.11	SLUDGE SUMP .....	42
5.7.12	THICKENER FEED PUMP .....	42
5.7.13	CENTRIFUGE FEED PUMP .....	42
5.7.14	SLUDGE CENTRIFUGE .....	42
5.7.15	PRESSURE SAND FILTER (PSF) .....	42
5.7.16	ACTIVATED CARBON FILTER (ACF) .....	43
5.7.17	TREATED WATER TANK .....	44
5.7.18	CHLORINE CONTACT TANK .....	44
5.7.19	EFFLUENT CHANNEL .....	44
5.7.20	OUTFALL .....	44
5.8	DETAILED DESIGN .....	44
5.9	POWER REQUIREMENT .....	44
5.10	OTHER FACILITIES .....	45
5.11	PLANS FOR RE-USE OF RECYCLED SEWAGE .....	45
5.12	MAINTENANCE OF AN ECO - FRIENDLY SYSTEM .....	45
5.13	PRELIMINARY STRUCTURAL DESIGN OF COMPONENTS .....	46
5.14	SEPTAGE .....	46
5.14.1	SEPTAGE MANAGEMENT .....	46
5.14.2	TRANSPORTATION OF SEPTAGE .....	47
5.14.3	SEPTAGE CO-TREATMENT PROPOSED .....	49
5.15	LAND REQUIRED FOR STP AND WELLS .....	49
5.16	SMART MANAGEMENT AND ONLINE MONITORING USING INTERNET OF THINGS (IoT) .....	50
5.17	ODOUR CONTROL METHODS .....	51
5.18	PREVENTION OF ODOUR .....	51
<b>Chapter 6</b>	<b>COST ESTIMATE, OPERATION AND MAINTENANCE CHARGES .....</b>	<b>54</b>
6.1	DETAILED ESTIMATE .....	54
6.1.1	GENERAL .....	54
6.1.2	DETAILED ESTIMATE OF COMPONENTS .....	54
6.2	PROPOSED SEWERAGE SYSTEM O&M .....	54
6.3	SEWER NETWORK MAINTENANCE .....	54
6.4	TYPES OF MAINTENANCE .....	55
6.4.1	STEPS TO BE TAKEN FOR OPERATION AND MAINTENANCE OF THE SEWERAGE NETWORK DETAILED IN THIS SECTION ARE AIMED AT .....	55
6.4.2	INSTITUTIONAL STRUCTURE .....	55
6.4.3	PREVENTIVE MAINTENANCE .....	56
6.4.4	BREAK DOWN MAINTENANCE .....	56

6.4.5	PERFORMANCE LEVEL TO BE ACHIEVED .....	56
6.5	PROPOSED SEWERAGE SYSTEM O&M.....	56
6.6	SAFTEY PRACTICES .....	57
6.7	O &M CHARGES .....	57
<b>Chapter 7</b>	<b>IMPLIMENTATION OF THE PROJECT .....</b>	<b>58</b>
7.1	IMPLEMENTING AGENCY .....	58
7.2	STEPS TO TAKEN WHILE TENDERING.....	58
7.3	INTEGRATION WITH OTHERPROJECTS .....	58
7.4	SUPPORT ACTIVITIES .....	58
7.5	IMPLIMENTATION SCHEDULE .....	59
7.6	ENVIRONMENTAL IMPACT MANAGEMENT .....	59
<b>Chapter 8</b>	<b>CONCLUSION AND RECOMMENDATION .....</b>	<b>60</b>

## LIST OF TABLES

Table 1.1	Population Pattern .....	3
Table 1.2	Land use Pattern .....	4
Table 2.1	Water Tank details.....	8
Table 3.1	Design Period of Sewerage Components.....	12
Table 3.2	Peak Factor.....	13
Table 3.3	Recommended slope.....	15
Table 3.4	Pipe material Comparison.....	16
Table 3.5	Recommended Size of manholes .....	19
Table 4.1	Population Projection.....	22
Table 4.2	Zone Boundary .....	23
Table 4.3	STP Capacity Calculation .....	23
Table 4.4	Lifting stations.....	25
Table 4.5	Network details.....	26
Table 4.6	Excavation Details .....	26
Table 4.7	Details of Manholes.....	26
Table 4.8	Pumping station detail .....	27
Table 4.9	Lifting station details .....	28
Table 4.10	Pumping mains and Lifting mains.....	28
Table 4.11	Details of pump sets.....	29
Table 5.1	Influent Characteristics .....	32
Table 5.2	Effluent Characteristics.....	33
Table 5.3	Unit Operations .....	34
Table 5.4	Land details .....	49
Table 5.5	Control of odour by chemical addition .....	53
Table 7.1	Implementation Schedule.....	59

## LIST OF FIGURES

Figure 1.1 Project Area .....	2
Figure 1.2 RIVER BASIN MAPS .....	4
Figure 2.1 Wastewater.....	7
Figure 2.2 DGPS Survey .....	10
Figure 4.1 Network Sketch.....	25
Figure 5.1 Process Flow Diagram.....	35
Figure 5.2 MBBR Carrier media in a MBBR tank .....	37
Figure 5.3 Pressure Sand Filter.....	43
Figure 5.4 Activated Carbon Filter .....	44
Figure 5.5 Truck-mounted vacuum tankers.....	47
Figure 5.6 Tractor-mounted tankers.....	48
Figure 5.7 STP-Location .....	50

## APPENDIX

<b>APPENDIX -I</b>	-	Design of STP
<b>APPENDIX -II</b>	-	Drawings
<b>APPENDIX -III</b>	-	Design of Wet Wells & Lifting Stations
<b>APPENDIX -IV</b>	-	Design of Pump set
<b>APPENDIX -V</b>	-	Flex Table - Conduits
<b>APPENDIX -VI</b>	-	Flex Table – Manhole
<b>APPENDIX -VII</b>	-	Power Calculation
<b>APPENDIX -VIII</b>	-	Detailed Estimate

### ACKNOWLEDGEMENT

We wish to express our sincere gratitude to the Additional Chief Secretary (WRD) Sri. T K Jose IAS, Chairman KWA, Sri. Venkatesapathy S. IAS, Managing Director, KWA, Sri. Sreekumar G. Technical Member, KWA, Smt. C K Preethimol, Chief Engineer, PPD-WASCON & Sewerage Works, for the valuable guidance and support.

We express our gratefulness to all the PPD Regional Office Kozhikode/Kasaragod staff for their valuable support, especially to Sri. Abdul Rahman.T, Sri.Aslam.A.P, Sri.Vinod.K.A, Smt. Divyamol S.B, surveyors of PPD/Sewerage camp office Kasaragod, for their dedication and hard work.

We express our gratitude to the authorities of Kasaragod municipality for their support, without which this endeavour would not have been possible. We extend our sincere gratitude to M/S Crowned Eagle Survey & Development Pvt.Ltd. for timely completing the DGPS survey work. We trust that the project will become a reality as per the timeline shown, and it would be beneficial to reduce the pollution load on the Chandragiri River and improve people's living standards in Kasaragod municipality.

Sri. Sreelal B,  
Assistant Engineer  
**Assistant Engineer**  
**PPD CAMP OFFICE**  
Kerala Water Authority  
Kasaragod - 671 123

Sri. Jobi Joseph,  
Assistant Executive  
**ASSISTANT EXECUTIVE ENGINEER**  
Regional Office  
Project Planning and Development  
Kerala Water Authority

Smt. Sreekala L.B,  
Executive Engineer

**EXECUTIVE ENGINEER**  
Regional Office  
Kerala Water Authority  
Kozhikode


Smt. Indulekha P.P.  
Superintending Engineer


**SUPERINTENDING ENGINEER**  
Regional Office  
Project Planning and Development  
Kerala Water Authority  
Kozhikode

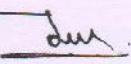
**CHIEF ENGINEER**  
Sewerage, PPD & WASCON  
Kerala Water Authority  
Thiruvananthapuram -33

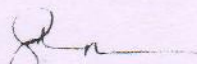
## PROJECT AT A GLANCE

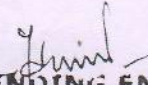
Sl. No.	Item	Description
1	Name of the Project	Sewerage System to Kasaragod Municipality -Phase 1- Construction of 4 MLD capacity Sewage Treatment Plant and Laying Sewerage Network to Pachakkad Thuruth zone of Kasaragod Municipality
2	Name of District	Kasaragod
3	Name of Municipality	Kasaragod
4	Project area covered(km2)	6.09
5	Population Benefitted (in year 2054)	29931
6	STP Capacity	4MLD
7	Total Network Length	21014 m
8	Number of Wells	1
9	Number of Pumping Stations	11
10	Number of Manholes	1046
11	Number of Connections	3000
12	O&M cost for 10 Years including 18% GST (including electricity charges)	367416297
13	Electricity charge for one year	15752050
14	Amount required for Land acquisition	20000000
15	Total cost including 10years O&M cost	1060000000
16	Implementation agency	Kerala Water Authority
17	Period of execution	2 Years

  
**CHIEF ENGINEER**  
 Sewerage, PPD & WASCON  
 Kerala Water Authority  
 Thiruvananthapuram -33

  
**Assistant Engineer**  
 PPD CAMP OFFICE  
 Kerala Water Authority  
 Kasaragod - 671 100

  
**ASST. EXECUTIVE ENGINEER**  
 Regional Office  
 Project Planning and Development  
 Kerala Water Authority

  
**Executive Engineer**  
 PPD Regional Office  
 Kerala Water Authority

  
**SUPERINTENDING ENGINEER**  
 Regional Office  
 Project Planning and Development



## ABSTRACT OF ESTIMATE

SL NO	HEADING DESCRIPTION	AMOUNT IN RS.
1	Cost of STP	90008501.17
2	Cost of ELECTRO MECHANICAL ITEMS	55024024.08
3	Cost of NETWORK (Including sewer connection charges)	361567461.04
4	O&M charges for 10 years (STP + Network)	311369743.25
5	Centage @10% (1+2+3+4)	81796972.95
6	GST @18% (1+2+3+4)	147234551.32
7	DPR PREPERATION CHARGES @2.5% (1+2+3)	12664999.66
8	Unforeseen items (including LS round off)	333746.53
9	Grand Total	1060000000.00
	Rupees One Hundred and Six Crore	

*Sreedal B*  
**Sreedal B**  
 Assistant Engineer  
 PPD CAMP OFFICE  
 Kerala Water Authority  
 Kasaragod - 671 123

*Jobi Joseph*  
**JOBI JOSEPH**  
 ASST. EXECUTIVE ENGINEER  
 Regional Office  
 Project Planning and Development  
 Kerala Water Authority  
 K.

*Plm*  
**Executive Engineer**  
 PPD Regional Office  
 Kerala Water Authority  
 Kozhikode-20

*Shan*  
**SUPERINTENDING ENGINEER**  
 Regional Office  
 Project Planning and Development  
 Kerala Water Authority  
 Kozhikode

*(Signature)*  
**CHIEF ENGINEER**  
 Sewerage, PPD & WASCON  
 Kerala Water Authority  
 Thiruvananthapuram -33

## EXECUTIVE SUMMARY

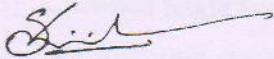
Environmental protection has been widely accepted as a vital aspect of sustainable development. Proper sewage and septage management are a crucial parameter in achieving this. Though considerable achievement has been marked by the state in the drinking water sector, the development in sewerage sector is lagging much behind. Unplanned urbanisation and poor sewage management has resulted in large scale pollution of water resources. This has become a complex challenge to the environment as well as to the public health. Realizing the threat, the government, in recent years, has made much deliberations and initiatives to address the situation. Moreover, the Honourable National Green Tribunal (NGT) has given mandate to implement sewerage system in whole of the state in a time bound manner.

The local bodies, who have been constitutionally entrusted with the responsibility of environmental protection, have only limited infrastructure and expertise to tackle the situation. Hence Kerala Water Authority, being a state wide establishment with qualified and experienced personnel in Public Health Engineering, has been considered by the government to take up the responsibility. As per the Kerala Water Supply and Sewerage Act, 1986 KWA has the function of rendering services in collection and disposal of waste water. KWA, as a knowledge partner, service provider and central agency for coordinating the activities related to the planning and implementation of sewerage systems for LSGIs can contribute in scientific and systematic way. To meet the growing demand for waste water management, KWA established a Sewerage Vertical Wing, led by the Chief Engineer, PPD & WASCON. The former Sewerage Circle office in Kochi, which had a Superintending Engineer, one Executive Engineer, and two Assistant Executive Engineers, has now been merged with this. In addition to their existing responsibilities, the PPD Wing's three circle offices in Thiruvananthapuram, Kochi, and Kozhikode have been designated as Sewage Circle offices. This wing is responsible for the investigation, planning, design, and DER preparation of sewerage projects.

This Detailed Engineering Report envisions the establishment of sewerage facilities to the Kasaragod Municipality's Zone-1 Pachakkad Thuruthu is designed to meet the sewerage demand up to the year 2053, using 2023 as the base year and a design period of 30 years. Kasaragod Municipality is divided into two main sewer zones based on topography, population, railway line, and other factors. A septage zone is also proposed in areas where the population density is less than 1500/km<sup>2</sup>. Furthermore, septage treatment is proposed in

densely populated areas where there is no road network. The ultimate sewage load for this Zone is 4 MLD including non-domestic demand and infiltration.

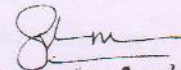
The scheme covers 6.09 km<sup>2</sup> area in Kasaragod Municipality's Pachakkad zone with the design population of 29931. Co-Treatment is proposed along with the Sewage Treatment Plant for Zone-1 covering septage area of this zones. This proposal includes 4 MLD STP with MBBR technology at Pachakkad Thuruthu in Kasaragod Municipality, a sewer network of 21.01 km, 1046 manholes, one pumping station at Kargil Road and 11 lifting stations. Manholes at 30 m intervals and at all intersections are proposed to facilitate maintenance operations. Total Estimated cost of the project including 10-year O&M cost is 106 crores



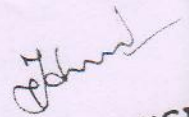
**Sreeal B**  
Assistant Engineer  
PPD CAMP OFFICE  
Kerala Water Authority  
Kasaragod - 671 123



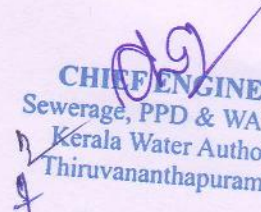
**JOBI JOSEPH**  
ASST. EXECUTIVE ENGINEER  
Regional Office  
Project Planning and Development  
Kerala Water Authority  
Kl



**Executive Engineer**  
PPD Regional Office  
Kerala Water Authority  
Kozhikode



**SUPERINTENDING ENGINEER**  
Regional Office  
Project Planning and Development  
Kerala Water Authority  
Kozhikode



**CHIEF ENGINEER**  
Sewerage, PPD & WASCON  
Kerala Water Authority  
Thiruvananthapuram -33

# **Chapter 1 INTRODUCTION**

## **1.1 BACKGROUND**

Provision of drinking water and sanitation facilities has always been a key priority in our country as it is directly related with the health of the community and the responsibility for providing these services lies with the public domain. With unplanned urbanization the sewage management and pollution of water resources has become a complex challenge to the environment as well as to the public health. Even though Kerala State has achieved significant results in terms of improved water supply coverage through Kerala Water Authority, the sanitation sector could not cope up with the water supply sector. Immediate removal of sewage from its source of generation followed by proper treatment and safe disposal into environment in an eco-friendly manner or reuse is highly necessary to protect the public health and environment.

## **1.2 SCOPE OF THE REPORT**

The scope of this work consists of planning and design of a comprehensive sewerage scheme for Pachakkad zone of Kasaragod Municipality of Kasaragod district in Kerala State. The project proposes a well-planned sewerage pipe line network for the core area of Municipality, pumping stations, and sewerage treatment plant with MBBR technology so as to ensure the quality of effluent as per KSPCB standards. Septage management facility will be provided for the area where laying sewerage network is not feasible.

## **1.3 PROJECT AREA**

The Kasaragod Municipality is located 50 km south of the major port city Manglore and 364 km north of the major port city Kochi, between Kasaragod and Kanhangad, on National Highway 66. The historical place Bekal fort, built by Sivappa Nayak in 1650 is near Kasaragod Municipality. Kasaragod is well connected to major towns like Vidyanagar, Uppala, Uduma, Kanhangad etc. Municipality is Located on the East, West South bank of Chandragiri River, which acts like a boundary Kasaragod Municipality.

Kasaragod Municipality is well connected with road and rail. NH 66 passes through Municipality. Kasaragod Railway station is situated in the boarder of city. The nearest airport is Manglore international airport situated at a distance of about 60 km from municipal area. The latitude for Kasaragod, Kerala, India is: 12.501041 and the longitude is: 74.993304. Kasaragod Municipality is in Kasaragod Taluk of Kasaragod district and there are 44 Divisions in Kasaragod Municipality. The Municipality is under Kasaragod Parliament Constituency and Kasaragod Assembly Constituency.

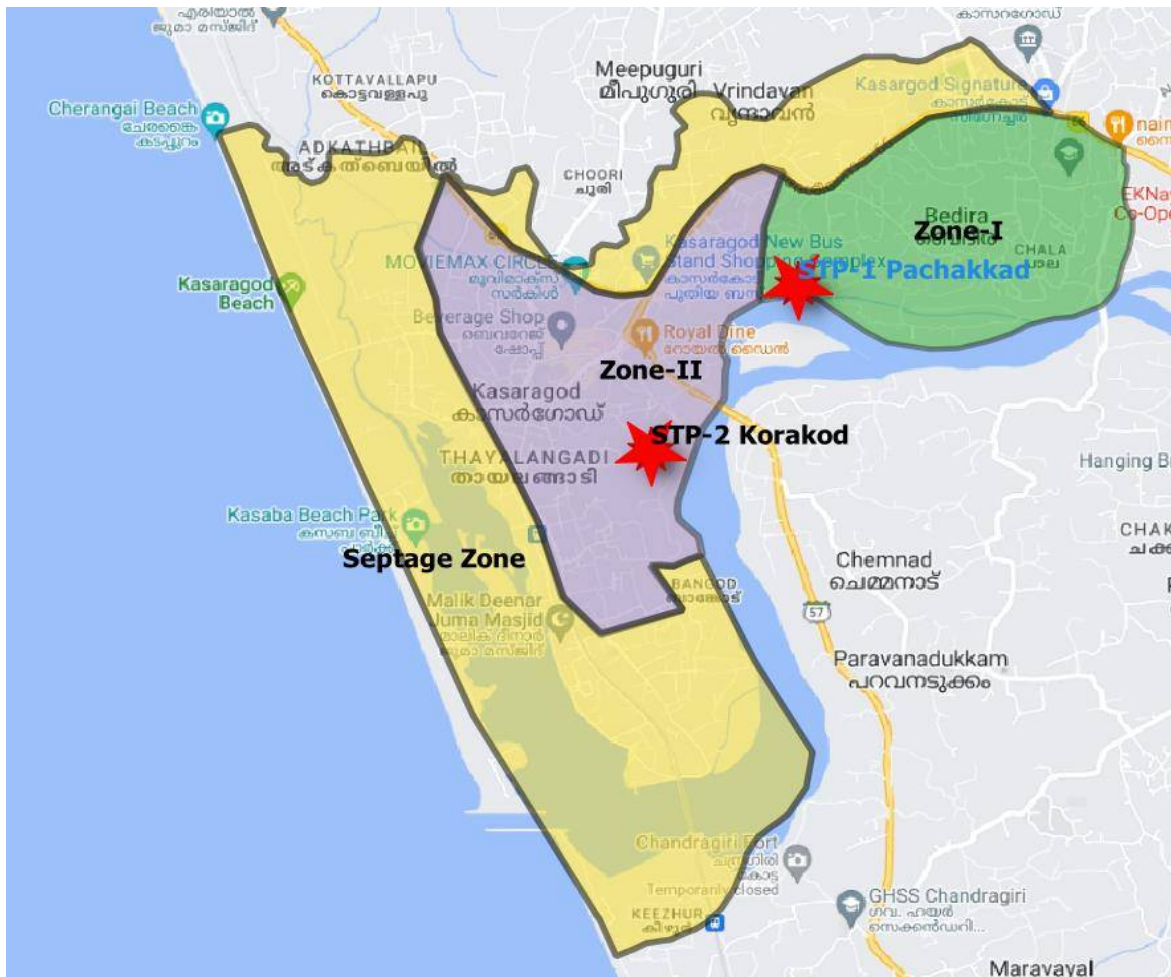
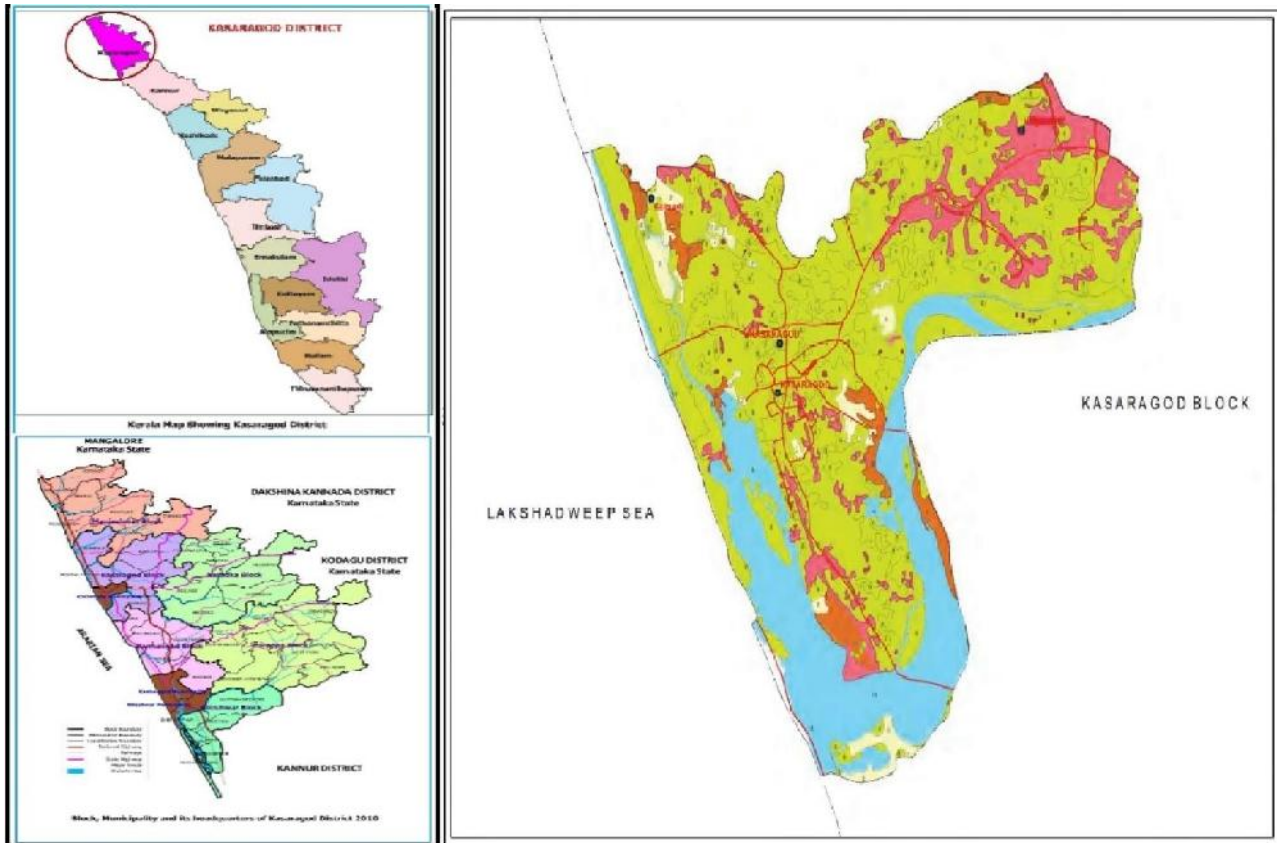


Figure 1.1 Project Area

#### **1.4 POPULATION PATTERN**

The Kasaragod Municipality has population of 54172 of which 26319 are males while 27853 are females as per report released by Census India 2011. Density of population is 3200/sq.km

Table 1.1 Population Pattern

<b>Population as per 2011 census</b>	<b>No. of households</b>	<b>Male</b>	<b>Female</b>	<b>Transgender</b>	<b>SC/ST</b>
54172	10202	26319	27853	0	1711

#### **1.5 SOCIO-ECONOMIC PROFILE**

Kasaragod Municipality is located on the estuary. The number of business establishments is increasing year by year as lots of construction activities are going on in Municipality. Literacy rate of Kasaragod is 94.76%, which is higher than Kerala average of 94.00%. A good number of people are engaged in business, agriculture and employed in private establishments. A minority of the population are employed in Government offices, the main agriculture product being Cashew, Paddy, Pepper and Arecanut. Small section of people in the coastal area is employed in fishing. The important public offices in Municipality are located in the Civil Station Building, Vidyanagar.

#### **1.6 GEOGRAPHICAL FEATURES**

Kasaragod Municipality covers area of 16.69km/sq and the boundaries are

South - Chandragiri River and Chemmanad Panchayath

North - Mogral-Puthur and Madhur Panchayath

East - Chengala Panchayath

West - Arabian Sea

#### **1.7 RAINFALL & TEMPERATURE**

Kasaragod Municipality has a mean annual temperature 28°C. The mean annual rainfall is 3350mm. The south west monsoon occurs between May and October. There is an average 160 rainy days in a year. Excessive rain fall causes frequent floods in rivers and canals causing submerges in low level areas.

#### **1.8 LAND USE**

The current land use pattern indicates that 34.5% of the land is for residential use which comprises houses in individual plot scattered all over the city. Commercial area is comparatively less and comprises small establishment.

Table 1.2 Land use Pattern

SI No	Land use	Percentage
1	Residential	34.5
2	Transport	2
3	Agriculture	41.69
4	Water bodies	17
5	commercial	1
6	Common land	1.89
7	others	1.92

### 1.9 SOIL TYPE

Four distinct soil types are dominant in the area. Geologically crystalline rocks of Archaean Age occupy the entire district except along the coast. A narrow strip of tertiary and recent sedimentary rocks is seen along the coast. Charnockites and gneisses are the crystalline rocks. The crystalline rocks are extensively laterites. The laterites by virtue of porous nature form potential aquifers and store groundwater. Lateritic soil is the most predominant soil in highland area.

### DRAINAGE AND DRAINAGE PATTERN

The river Chandragiri is passes through the southern boundary of Kasaragod Municipality. The Chandragiri River originates from the northern slopes of the Greater Talacauvery National Park in the Western Ghats and empties to Arabian Sea at Thalangara. The river has a total length of 105km.

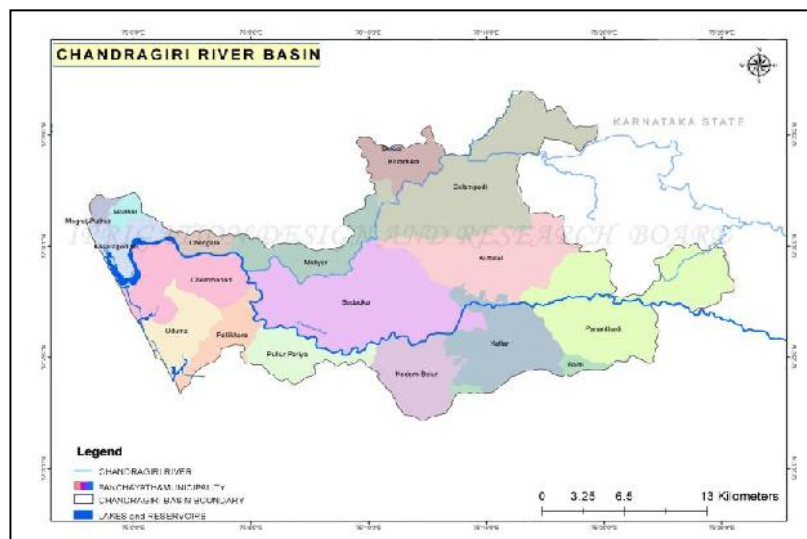


Figure 1.2 RIVER BASIN MAPS

## **Chapter 2 PROJECT RATIONALE AND METHODOLOGY**

### **2.1 SANITATION – VISION, STATUS AND GOALS**

To address the situation of inadequate sanitation facilities to the urban population, the Government of India has formally approved the National Urban Sanitation Policy in 2008 which envisions the creation of totally sanitized cities and towns. The policy articulates awareness generation and behaviour change, open defecation free cities in which all urban dwellers have access to safe sanitation, integrated city-wide sanitation planning and sanitary and safe disposal of urban wastes.

The vision of the policy is that the municipality shall be totally sanitized, healthy and liveable and ensure and sustain good public health and environmental outcomes for all the citizens with a special focus on hygienic and affordable sanitation. The policy articulates the following goals-

1. Awareness Generation and Behavioural Change
2. Open Defecation Free Cities
3. Integrated City-Wide Sanitation
4. Sanitary and Safe Disposal
5. Proper Operation and Maintenance of all Sanitary Installations

Wastewater disposal and treatment is a major problem in cities in Kerala. The wastewater from toilets has been disposed through septic tanks and soak pits and grey form of wastewater from kitchen and bathrooms is directly discharged into the sludge drains without any treatment. As per Census 2011, 45.45% of the urban households have “no drainage”. There are 14.32% of the households connected to centralized sewerage system. About 97.43% of the households in the urban areas of Kerala state have a toilet within their residential premises. Almost 56.69% of them are connected to septic tanks, 21.87% to pit latrines while households having connection to the centralized sewer system are about 14.32%. There are both technical and institutional dimensions to the problem of septic tanks in the state of Kerala. The septic tanks design does not comply with the national guidelines with reference to planning, design and construction. Local masons are unaware of the existing design and construction guidelines to construct and design the septic tanks. There are multiple agencies involved in operation and maintenance of water and sanitation services in Kerala. Septage management is viewed as private provision with limited role of urban local bodies. Another set of reasons cited for urgency in taking up septage management is the occupational hazards for emptying the septic tanks. The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013 has expanded the definition of workers engaged in such sanitation works by including the practice of septic tank emptying and manual handling of such faecal sludge. The revised Manual Scavenging Act will require states to gear up the Municipal bodies in discharging their responsibilities effectively. In the absence of efficient waste water treatment systems and solid waste management systems, untreated domestic and industrial wastes, and agriculture-runoff flow into the rivers polluting the rivers in Kerala. There has been widespread bacteriological



contamination of faecal origin in ground and surface water which relate to proximity of increasing numbers of leach pit latrines, leakages from septic tanks, washing, bathing and other domestic activities. Hence the goals for setting a sewerage strategy for a district will involve multi-faceted approach to cover every habitation and other institutions and establishments. This will render adequate results in both short term and long-term development plans. If a plan has been chalked out which can provide a systematic and flexible implementation mode, stage by stage implementation and better control over the system can be achieved. A district level plan document for sewerage prepared by KWA will create a backbone for the subsequent formation of detailed engineering reports for ULBs.

National Green Tribunal (NGT) while considering various OAs related to pollution of river trenches, pollution of coastal regions, pollution of ground water and restoration of water bodies in various States and UTs has ordered that all States and UTs shall ensure that various measures are taken to prevent the pollution of river stretches, water bodies and coastal areas on priority basis and within specified time limits. One of the directions is to ensure 100% treatment of sewage at least to the extent of in-situ remediation. Following this, being the agency for ensuring sewerage services in the State, Kerala Water Authority (KWA) has created a separate Vertical with in it exclusively for preparation of DPR sewerage works across the State. The newly formed Sewerage Vertical of KWA has prepared Preliminary Engineering Report for establishing a sewerage network/ septage management across the State.

As per order no GO(Rt) No.352/2021/P&EA dated 16/8/2021 Administrative Sanction has been accorded for conducting DGPS levelling survey work for 28 Urban Local Bodies and DPR preparation of 4 corporations in Kerala and Kasaragod Municipality is one among them. PPD and Sewerage Vertical Circle, Kozhikode is assigned with the task of preparation of DPR for sewerage scheme for Kasaragod Municipality.

## **2.2 NEED FOR SEWERAGE SCHEME**

The sewerage project in respect of which considerable public and social resources are being used, form a basic infrastructure for the country and an indisputable indicator of civilization and development. The works cover a number of substantial social needs and aim to improve the quality of life and to protect public health and the environment. Some of the benefits and advantages of the sewerage system are as follows:

### **(a) Upgrading the quality of life**

The quality of life and the hygienic conditions in the areas where the system operates have already improved. The operation of the sewerage system has relieved these areas to a great extent from previous problems that were caused by the continuous emptying of cesspools. In the past, hotels and blocks of apartments were required to empty and maintain septic tanks and soak ways. The sewerage system provides a healthier and more appropriate way to manage liquid wastes.

### **(b) Preserving the natural environment**

Previously, all sewage waste was discharged in septic tanks and cesspits, resulting in the pollution of the ground water of the areas where such waste was discharged. Polluted waters then ended in the sea and caused various risks and other environmental problems. With the

operation of the sewerage system no more pollution of ground water is affected and the discharge of sewage waste has significantly been reduced moreover, the wastewater treatment plant produces by-products such as treated biosolids and methane. Treated sludge is used as a soil-improving substance mainly for tree cultivations whilst methane is being used for electricity generation, covering part of the power, required to operate the plant.

**c) Saving and processing waters**

Water is a substantial natural resource for our country and it should be managed in the best possible manner. The tertiary treated effluent at the wastewater treatment plant is reused for agricultural and other purposes. On completion of the project, the amount of water to be saved is expected to exceed 1.45 million cubic metres per year.

**(d) Economic development and tourism**

The most significant advantage of the system is maintaining sustainable development, the protection of the environment and improvement of the quality of life in our town, with a further impact on the development of tourism and the economy in general.

**(e) Standard of living**

As a result of the above, the sewerage system contributes to further development and increase of the standard of living of the town of Kasaragod inhabitants. Considering all the above advantages, there is no doubt that if we all cooperate, ourselves and our children will enjoy a better quality of life in the years to come and that we will secure a better environment



Figure 2.1 Wastewater

## 2.3 PRESENT SEWERAGE SYSTEM- OVERVIEW

Like all other Municipalities in Kerala, Kasaragod Municipality is also not having a sewerage system. All the residential building, commercial buildings, institutional establishments are having their own septic tanks for collecting sewage from latrines and grey water is either collected in leach pits or directly disposed to drainage system and nearby canals. Most of septic tanks are unscientifically constructed and do not have the facility for treating the effluent resulting in contamination of surroundings and the ground water. Even though Hospitals and other institutions are having their own independent facilities, in most cases partly treated effluent is discharged to nearby drains or water bodies. Most of dwellings have their own wells as drinking water source and proximity to the septic tanks leads pollution in well water also. Coliform bacteria are detected in 70% of wells in Kerala and emphasising the need for a well-planned sewerage system.

## 2.4 WATER SUPPLY FACILITIES

### 2.4.1 PRESENT SYSTEM

At present there is only one water supply system within the municipality area, that is WSS to Kasaragod, this scheme is very old and not functioning satisfactory due to many reasons such as quality problem, inadequacy of source, frequent leak in pipe lines, break down with old pump sets, etc. The distribution system laid very long back as a part of WSS to Kasaragod.

### 2.4.2 ONGOING AND PROPOSED WATER SUPPLY SYSTEM

The ongoing project is KIIFB- Special Investment Package-WSS to Kasaragod Municipality and Chemmanad Panchayath Phase-1, with 55 MLD capacity is intended to provide adequate drinking water to the entire population of Kasaragod and five adjoining panchayats. It is proposed to draw raw water from the intake well at Bavikkara to STP, which is 1.1km away from the well. The treated water is then transmitted to the Service Reservoirs. For Kasaragod municipality 2 OHSR/GLSR are constructed at Vidyanagar and 1 OHSR/GLSR at Pulikkunnu. After commissioning the ongoing scheme will be compiled with the existing scheme WSS to Kasaragod.

The distribution system of Kasaragod Municipality will be fulfilled by the upcoming JJM- Urban scheme.

Table 2.1 Water Tank details

Tank Location	Capacity (LL)	Type
Bavikkara Hills	11 LL	OHSR(new)
Vidyanagar	5 LL	OHSR(new)
Vidyanagar	21 LL	OHSR(new)
Pulikkunnu	8 LL	OHSR(new)
Vidyanagar	2.5 LL (2nos)	OHSR(Existing)
Pulikkunnu	1.8 LL	OHSR(Existing)

### **2.4.3 GROUND WATER SOURCES**

Most of the people depends ground water source, open wells and shallow tube wells for their drinking water needs. Studies have revealed that

- Almost all samples were contaminated with Total Coli forms
- Level of bacteriological contamination is very high during monsoon
- Elevated areas had comparatively lesser level of contamination
- Contamination was higher in the vicinity of onsite sanitation structures especially in open wells situated within 10-15 m from latrines
- In a number of cases cause of contamination is of human origin

### **2.5 METHODOLOGY FOR PREPARATION OF SEWERAGE MASTER PLAN**

The following tasks have been performed during the planning of the proposed Sewerage System:

- Data Collection and Field Visits
- Review of adequacy of existing sewerage system
- field levelling survey using DGPS
- Social survey
- Population Projection and Sewage Flow Estimation
- Design of Sewage Collection System
- STP site identification, assessing area requirement
- Phasing of construction of STP
- Capital cost and O & M costs

### **2.6 FIELD INVESTIGATIONS**

General Field investigations like topographic survey, geotechnical investigation to be conducted to ascertain the topography of the area, the soil classifications and to ascertain its characteristics for designing the type of treatment, which forms the basis for proceeding further in designing the sewerage system.

#### **2.6.1 SURVEY WORK**

Topographical Survey Topographical survey forms a very important component in formulating the sewerage project. A detailed topographical survey has been performed covering the area using DGPS and Total Station.



Figure 2.2 DGPS Survey

Topographical survey of the project area was conducted using DGPS and Total station. Ground Levels have been taken along the roads at suitable intervals along straight portions and at all junctions of alignment. Important features and obligatory points like junctions such as culverts, major drains, and public utilities, cross roads, railway line have been captured. Using the topographical survey data and detailed base map showing the features like roads, land marks, public buildings, parks etc. has been developed.

### **2.6.2 SOCIAL SURVEY**

Social Survey was carried out for locating each building for arriving the sewer load in manholes. Identifying and arriving possible shock loads from institutions such as, flats, and other establishments are very important for avoiding overflows in manholes. Identifying the buildings which are not feasible to be connected to network, for arriving septage load /separate pumping arrangements is also carried out in social survey. Moreover, the areas likely to be developed in future are to be identified for arriving sewer load to be incorporated in design.

## **Chapter 3 DESIGN CRITERIA**

### **3.1 SEWAGE COLLECTION & CONVEYANCE SYSTEM**

The sewerage system or storm water carriage system can be separate system or combined system or partially separate system depending on domestic sewage and rain water are drained through two separate set of pipes or through single set of piping. However, the combined system is not quite suitable in tropical Indian conditions as;

- i) Heavy and concentrated rainfall occurs during the monsoon period and thus there is a large variation in the quantity of sewage during different months of the year,
- ii) Dry weather flow is generally a very small proportion of the total flow and hence Sewers are likely to get silted up due to low velocity of flow in lean periods,
- iii) Capital funds are limited,
- iv) Treatment costs and pumping costs are significantly reduced in separate system due to reduction in quantity.
- v) If the system is oversized, external flushing to attain the areas where the self-cleansing velocity is not attained which will increase the O&M cost. It affects system efficiency.

#### **The pipes for collection can have;**

- i) Zonal pattern in which entire city is divided into suitable zones and a separate interceptor is provided for each zone,
- ii) Radial pattern in which sewers are laid radially outwards from the center of the city to dispose sewage at multiple points,
- iii) Interceptor pattern in which sewers are intercepted by large size sewers laid along the natural watercourses or,
- iv) Fan pattern in which the STP is located at a certain point and the entire sewage flow is directed towards this point.

### **3.2 ESTIMATION OF QUANTITY OF SEWAGE**

Separate drainage system is proposed for rain water as such only dry weather flow will pass through sewers. The connection of roof, backyard and foundation drains to the sanitary sewers should be avoided and hence shall not be considered for estimation of sanitary sewage. The prevalent sewerage systems in India do receive rain water even if separate system for rain water exists but sewers are designed for 30 years and have spare capacity in early phases of implementation and considering that by end of 30 years sewerage system will become water tight to rain water, it is appropriate to design system assuming no rain water penetration in sewers. The quantity of domestic sewage can be best estimated by quantity of water supply consumption minus evaporation plus sewage flow from personal water sources which are other than those of community water supply and this water reaching to sewers. Another important factor in Indian cities is generally less connectivity of sewage to the sewerage system as many people continue to use on site sanitation i.e., septic tanks and soak pits etc. particularly in colonies where sewerage system

is laid after a long gap of construction of houses which is a general phenomenon in Indian cities. In actual practice about 70-80% of the water supplied is reaching to sewers. As such 80% of quantity of water supply can be taken as sewage generation.

### 3.2.1 INFILTRATION AND LEAKAGE.

Some quantity of ground water or subsoil water may infiltrate into sewers through defective joints, broken pipes etc. This is significant when water table is high and head of ground water is more than the head of sewage in sewers. Some quantity of sewage may leak out from defective joints and defective pipes when head of sewage is more in sewers than head of ground water outside. Infiltration and leakage mainly depend on quality of construction and water table levels. Infiltration can be considered 5000-50000 litres per day per hectare or 500-5000 litres per day per km length of sewers or 250-500 litres per day per manhole for sewers laid below ground water level.

### 3.2.2 ESTIMATION OF INDUSTRIAL SEWAGE

The quantity of industrial sewage will vary with type and size of industry, the manufacturing processes involved, degree of water reuse and onsite treatment methods that are used, if any. However, in general the quantity of industrial sewage may be taken 80 to 90 % of quantity of water supplied through public water supply system. Some industries develop their own source of water supply and may discharge their liquid waste into sewers. This should be estimated separately for large industries. It may, however, be stated that industrial sewage should be treated to the standards prescribed by the Pollution Control Boards before being discharged into sewers.

### 3.3 DESIGN PERIOD

Sewerage projects are normally designed to meet the requirements over a period of 30 years after their completion. However, the period of 30 years may be modified in respect of certain components of the project depending on their useful life or the facility for carrying out extensions when required and rate of interest, so that expenditure far ahead of its utilization is avoided. As such design period for various main components has been taken as indicated in Table below.

Table 3.1 Design Period of Sewerage Components

SL NO.	Design Component	Design Period	Remarks
1	Land Acquisition for STP, SPS, sewers etc.	30 Years	Land acquisition in future difficult
2	Sewer network (laterals, Trunk mains, Outfall etc.)	30 Years	Replacement difficult and costly
3	Pumping mains	30 Years	Cost may be economical
4	Pumping Stations- Civil Work	30 Years	Life of civil structure is 30 years

5	Pumping Machinery	15 Years	Life of pumping machinery is 15 years
6	Sewage Treatment Plants	30 Years	The construction shall be modular in phased manner as actual population less than design population and in Indian cities initially flows are much less due to connectivity problems
7	Effluent disposal and utilization	30 Years	Provision of design capacities in the initial stages itself is economical

### 3.4 VARIATION IN RATE OF FLOW

The rate of flow of sewage varies from season to season (seasonal or monthly variation), from day to day (daily variation) and from hour to hour (hourly variation). For design of sewers maximum or peak flow rates are adopted. The value of peak factor (ratio of maximum flow to average flow) depends on the contributing population and the values recommended in the Manual on Sewerage and Sewage Treatment prepared by CPHEEO are given in Table below.

Table 3.2 Peak Factor

SL NO.	Contributing Population	Peak Factor
1	Up to 20,000	3.00
2	20,000 – 50,000	2.50
3	50,000 – 7,50,000	2.25
4	Above 7,50,000	2.00

The variation between maximum and average rates of flow is large for domestic and lateral sewers because they receive the flow directly from the source. This variation gradually diminishes as the flow reaches the branch or sub main sewers and the main sewers. Minimum rate of flow: The minimum rate of flow may vary from 0.5 to 0.33 of the average flow.

### 3.5 HYDRAULIC DESIGN OF SEWERS

The design for sewage collection system presumes flow to be steady and uniform. The unsteady and non-uniform sewage flow characteristics are accounted in the design by proper sizing of manhole. The sewage is mostly liquid containing about 0.1% of solid matter and hence follows same laws of flow as water. However the difference in design for water supply network and sewer network is, i) In order to avoid clogging of sewers due to settlement of heavier particles of solids, sewers are to be laid at such gradient that self-cleansing velocity is achieved at all values of discharge and that the inner surface of the sewers should be capable of resisting the wear and tear due to abrasive action of solid



particles and ii) sewage flows under gravity as open channel flow and as such sewers are laid at continuous downward gradient.

### **3.5.1 DEPTH OF FLOW**

The sewers shall not run full as otherwise the pressure will rise above or fall below the atmospheric pressure and condition of open channel flow will cease to exist. Moreover, from consideration of ventilation, sewers should not be designed to run full. In case of circular sewers, the Manning's formula reveals that:

The velocity at 0.8 depth of flow is 1.14 times the velocity at full depth of flow.

The discharge at 0.8 depth of flow is 0.98 times the discharge at full depth of flow.

Accordingly, the maximum depth of flow in design shall be limited to 0.80 of the diameters at ultimate peak flow.

### **3.5.2 HYDRAULIC FORMULAE FOR DESIGN OF SEWERS**

Manning's formula has been used for design of sewers in case of gravity flow. For pressure flow (Pumping Mains), the Hazen-William's formula has been used. Sewer Network design has been done with the help of Manning's Formulae i.e.

Velocity  $V = [(1/n) \times (R^2/3 \cdot S^{1/2})]$  (in m/s)

For Circular Sections

$V = (1/n) (3.968 \times 10^{-3} D^{2/3} S^{1/2})$   $Q = (1/n) (3.118 \times 10^{-6} D^8/3 S^{1/2})$

Where, Q = discharge in lps; S = slope of hydraulic gradient; D = internal dia of pipe line in mm; R = hydraulic radius in m; n = Manning's Coefficient of roughness

### **3.5.3 PER CAPITA SEWAGE FLOW**

The rate of water supply has been adopted 150 LPCD at consumer end throughout the whole design period as water supply schemes are designed with per capita supply of 150lcd in Kerala. 80 percent of the water supply has been considered as sewage flow into the sewerage system

### **3.5.4 MINIMUM VELOCITY OF FLOW**

A minimum velocity of 0.6 m/s for present peak flow and 0.8 m/s at design peak flow is recommended for sanitary sewers. Thus, the sewers are designed on the assumption that although silting might occur at minimum flow, it would be flushed out during peak flows.

### **3.5.5 RECOMMENDED SLOPES FOR MINIMUM VELOCITY**

For sewers running partially full, for a given flow and slope, velocity is little influenced by pipe diameter. As such for present peak flows up to 30 lps, the slopes given in Table below may be adopted which would ensure minimum velocity of 0.6 m/s in the early years.

Table 3.3 Recommended slope

SL NO.	Present Peak Flow in LPS	Slope per 1000
1	2	6.0
2	3	4.0
3	5	3.1
4	10	2.0
5	15	1.3
6	20	1.2
7	30	1.0

### 3.5.6 EROSION AND MAXIMUM VELOCITY OF FLOW

Erosion of sewers is caused by sand and other gritty material in the sewer and also by excessive velocity. Non-scouring or limiting velocities in sewers of different materials are given in CPHEEO manual. Accordingly maximum velocity for cement concrete pipes is 2.5- 3.00 m/s.

### 3.5.7 SEWER TRANSITIONS

Sewers shall be designed to ensure that the energy gradient is a continuous smooth line, thus transitions from larger to smaller diameters shall not be made. The crowns of sewers shall be kept continuous. In no case, the hydraulic flow line in the large sewers shall be higher than the incoming sewer. To avoid backing up, the crown of outgoing sewer shall not be higher than the crown of incoming sewer

### 3.5.8 MINIMUM PIPE DIAMETER

Minimum pipe diameter recommended in CPHEEO manual is 150 mm except that in hilly areas, where extreme slopes are prevalent, 100 mm can be used. Some states and ULBs have started adopting minimum diameter as 200 mm or even 250 mm. The logic is Maintenance of sewer system is generally not good and 150 mm dia sewer will block frequently and remain un-attended for some time, Quality of construction in smaller size RCC main such as 150 mm is not good, The sewerage system is not totally closed one and undesired waste such as solid waste and drains finds way in sewerage, making smaller size sewer lines more prone to frequent blocking, The cost of pipe line element is only about 15 percent of total project cost and increase in pipe size from minimum of 150 mm to minimum of 200 mm size will increase cost of project by 2 percent whereas flow capacity increases by more than 80 percent.

The minimum diameter may be adopted as 200 mm for cities having present / base year population of over 1 lakh. However, depending on growth potential in certain areas even 150 mm diameter can also be considered. However, in towns having present / base year population of less than 1 lakh, the minimum diameter of 200mm shall be adopted.

The house sewer connection pipe to public sewer shall be (a) minimum 100 mm or higher based on the number of houses / flats connected and (b) subject to the receiving public sewer being of higher diameter. In this project 200 mm diameter have been suggested as

minimum diameter in design of sewerage network.

### 3.6 MATERIAL OF CONSTRUCTION FOR GRAVITY SEWERS

Brickwork is used for large diameters as sewers can be constructed in any shape. However now it is not common. Concrete pipes are commonly used now as can be manufactured to any reasonable strength and laying is easy and jointing is leak proof. However, these pipes are subject to corrosion where acid discharges are carried or where velocities are not sufficient to prevent septic conditions or where the soil is highly acidic or contains excessive sulphates. Only high alumina cement concrete should be used when it is exposed to corrosive sewage or industrial wastes. Salt glazed stoneware pipes are mostly manufactured in sizes 80-1000 mm but sizes greater than 380 mm are generally not used due to economic considerations. The length of these pipes is 60 cm, 75 cm and 90 cm. These pipes are good for corrosion resistance and erosion resistance. However due to less length, more joints, difficulty in jointing, requirement of special bedding and less compressive strength of pipes manufactured in India; use of these pipes is reducing in India.

Table 3.4 Pipe material Comparison

SL. NO.	EVALUATION CRITERIA	RCC PIPES	DI PIPES	PE PIPES	DWC PE PIPES
1	Type of Joint	Available in both collar and S&S joints.	Tyton joint With rubber gasket	Butt fusion welding process.	Simple push fit joints with Elastomeric sealing Ring for on line system or with extracouplers.
2	Weight	Heavy	Lighter than R.C.C.	Light	Very Light in Comparison of Other Solid Wall Pipes.
3	Corrosion resistance	To prevent corrosion sulphate resistant cement concrete to be used for pipe manufacture.	Protective layers are Required to protect corrosion	Highly corrosion resistant	Highly corrosion resistant

4	Remarks on Cost	NP2 is Cheapest among all materials	Costlier than other pipes but cheaper than PE pipes.	Smaller diameter pipes are cheaper and higher diameter pipes are costlier.	Uses minimal material for equal strength, therefore cost cheaper from other pipes.
5	Infiltration	Infiltration is less	Infiltration is very less	Infiltration is very less	Infiltration is very less
6	Workability	due to heavy weight handling to be done with care	Good	Light weight for easy handling.	They are user friendly, very fast and inexpensive in installation
7	Jointing	Jointing is easy in S&S pipes with Rubber ring joints.	Jointing is easy in S&S pipes with Rubber ring joints.	Jointing is expensive	Joining time is 2-5 minutes per joint
8	Maintenance	Almost nil if proper velocity is maintained.	Minimum	Pipe may get damaged due to rodding	Maintenance is low because of non adherence of sewer elements.
9	Previous Experience/ Performance	In use for long period and performance is Good	It is durable pipe. Performance is yet to be proven	Recent use started in India. It is durable.	They are maintenance free and therefore, once installed, will lie underground for years.
10	Trenchless compatibility	Micro tunneling	Micro tunneling	HDD & Micro tunneling	Not suitable for Trenchless

AC pipes cannot stand high superimposed loads, subject to corrosion from acids in sewage and high sulphate soils, require special bedding and weak against erosion where high velocities are encountered; as such use of AC pipe is not prevalent. Cast iron, DI and steel pipes are not used due to high cost. UPVC pipes are manufactured in sizes 75, 90, 110, 140-, 160, 250, 290- and 315-mm outer dia. uPVC pipes are smooth, light, easy to joint and have leak proof joint. Rates are also low. These days these pipes are used for making connection from house to sewer but not prevalent in street sewers.

GRP pipes are widely used in other countries where corrosion resistant pipes are required at reasonable rates. When using concrete or reinforced concrete, high density sulphur resistant

cement should be used. These pipes are made of slag cement that contains fewer calcareous (CaOH<sub>2</sub>) particles than pipes made of Portland cement. These particles react with the sulphuric acid (created by bacterial dissipation of hydrogen sulphide) in sewers, causing the aforementioned crown corrosion. If this particular cement is not used, lifetime of concrete sewers cannot be expected more than 30 years. A comparative study of characteristics of various pipe options for gravity sewers is presented in table above.

### **3.6.1 BENEFITS OF PE PIPES FOR SEWERS**

When compared to other common wastewater piping system materials, such as PVC, ductile iron, or concrete, PE pipe offers significant benefits. Some of these include:

- **Chemical Resistance.** Hydrogen sulphide gas (H<sub>2</sub>S) corrosion is a serious threat to conventional sewer lines, like concrete and ductile iron, greatly reducing their service life. WL Plastics PE pipe is not attacked, corroded or degraded by H<sub>2</sub>S, ensuring a service life of 100 years.
- **Anti-corrosive properties.** PE piping systems are immune to the harmful effects of corrosion and tuberculation, common factors that reduces the operational life of concrete and ductile iron wastewater systems. PE also resists other corrosive or harmful agents, including scaling and organics such as fungi, bacteria, and other microbial contaminants.
- **Leak-free.** PE pipe is joined together via heat fusion, creating a welded, leak- free joint unlike conventional bell and spigot joints. These leak-free joints prevent infiltration and exfiltration making it a truly sanitary piping system.
- **Durability.** PE pipe is resistant to fatigue from water hammer and surge events in sewer force mains. PE pipe is also abrasion resistant, ensuring that flowing water and slurries won't damage the pipe throughout its service life.
- **Lightweight.** PE pipes are much lighter in weight compared with ductile iron or concrete alternatives, which makes transportation and installation significantly easier and safer.
- **Cost-effectiveness.** PE pipe is cost competitive with other sewer pipe options. PE pipe is faster, easier, and safer to install due to longer cut lengths and more linear footage per truck, which significantly reduce the overall project costs. With low maintenance costs and long service life, PE pipe is the ideal solution for wastewater systems.

However, PE pipes are slightly costlier compare to RCC pipe but as of now most of sewer pipes are laid through Trenchless technology method and because of this, plastic pipes like PE/ uPVC are most suitable and easy to use for trenchless as well as open cut trench method for pipe laying. The use of PE pipes are more economical and to be considered for smaller diameter pipes up to 110mm where they are available on coils thereby avoiding joints. Hence lesser number of joints thereby reducing leaks and the rates of pipes are reasonable. As a general pipe policy decision, the use of PE pipe shall be preferred up to 200mm & occasionally upto 350mm (source- KWA pipe policy, page 19).

Therefore, considering the above benefits of PE pipe over RCC pipes, PE pipes are recommended to use for maximum stretch of network. The pipe policy of KWA also favours adoption of PE pipes. However, RCC pipe (PE lined) has been recommended for

higher diameter pipe (i.e., above 700 mm) as PE pipes for higher diameter pipes are not easily available and very costly for large diameter and generally not manufactured.

### 3.7 MANHOLES

#### 3.7.1 GENERAL

A manhole is an opening constructed on the alignment of a sewer for facilitating a person to access the sewer for the purpose of inspection, testing, cleaning and removal of obstructions from the sewer line. Manholes will be located at:

- Change of direction
  - Change of slope
  - Change of pipe diameter
  - Change of material
  - Ginning of each line at points of branches
- Manhole Sizes

Table 3.5 Recommended Size of manholes

Sl.No.	Depth of Manhole(m)	Diameter of Manhole(m)
1	Above 0.9m and up to 2.5m	1.2m(TYPE-I)
2	Above 2.50m and up to 6.5m	1.5 m(TYPE-II)

#### 3.7.2 TYPE OF MANHOLES

##### 3.7.2.1 3.7.2.1 STRAIGHT – THROUGH MANHOLES

The simplest type of manhole is that built on a straight run of sewer with no side junctions. Where there is change in the size of sewer, the soffit or crown level of the two sewers should be the same, except where special conditions require otherwise.

##### 3.7.2.2 3.7.2.1 JUNCTION MANHOLES

A manhole is provided at every junction of two or more sewers, and the curved portions of the inverts of tributary sewers have been formed within the manhole. The gradient of the smaller sewer may be steepened from the previous manhole sufficiently to reduce the difference of invert level at the point of junction to a convenient amount.

##### 3.7.2.3 3.7.2.3 DROP MANHOLES

As per CPHEEO manual, drop manhole is to be provided when a sewer connects with another sewer, where the difference in level between water lines (peak flow levels) of main line and the invert level of branch line is more than 600mm or a drop of more than 600mm is required to be given in the same line and it is uneconomical or impractical to arrange the connection within 600mm.

The drop pipe may be either outside the manhole shaft and encased in concrete or supported on brackets inside the shaft. If the drop pipe is outside the shaft, a continuation of the sewer should be built through the shaft wall to form a rodding and inspection eye, which should be

provided with a half blank flange. If the drop pipe inside the shaft, it should be in cast iron/ductile iron and it would be advantageous to provide adequate means for rodding and water cushion of 150mm depth should also be provided. The drop pipe should terminate at its lower end with a plan or duck-foot bend turned so as to discharge its flow at 45 degrees or less to the direction of the flow in the main sewer and the pipe, unless of cast iron, should be surrounded with 150mm concrete.

#### **3.7.2.4 3.7.2.4 FLUSHING MANHOLES**

Where it is not possible to obtain self-cleansing velocities due to flatness of the gradient especially at the starting point of branch sewers which receive very little flow, it is essential that some form of flushing device to be incorporated in the system. Flushing can be very conveniently accomplished using a fire hydrant or tanker and hose pipe.

The upper reaches of lateral sewers, the discharges shall be partially full even at the ultimate design flow conditions, because of necessity of adopting the prescribed minimum size of sewer. In such situations, flushing arrangements have to be provided in the initial years.

### **3.7.3 MATERIAL OF CONSTRUCTION FOR MANHOLE**

#### **3.7.3.1 BRICK MASONRY MANHOLES**

Bricks used for construction of manholes shall conform to the relevant Indian Standards. They shall be sound, hard and homogeneous in texture, well burnt in kiln without being vitrified, table moulded, deep red, cherry or copper coloured, of regular shape and size and shall have sharp and square and parallel faces. The bricks shall be free from pores, chips, flaws or humps of any kind. Bricks containing unground particles and/or which absorb water more than 1/6 th of their weight when soaked in water for twenty-four hours shall be rejected. Over burnt or under burnt bricks shall be liable to rejection. The bricks shall give a clear ringing sound when struck and shall have a minimum crushing strength of 35 Kg/sq.cm unless otherwise noted in drawings.

The class and quality requirements of bricks shall be as laid down in IS: 1077. The size of the brick shall be 23.0 x 11.5 x 7.5 or unless otherwise specified. Mortar for brick masonry shall be prepared as per IS: 2250. Manholes shall be constructed in brick masonry with cement mortar (1:4), 20 mm thick inside plaster with plasticized water proofing material consisting of 12 mm thick backing coat in CM 1:3 and 8 mm thick finishing coat in CM 1:1 and 15 mm thick outside plaster in CM 1:3. Whenever a pipe enters or leaves a manhole, bricks on edge must be cut to a proper form and laid around the upper end of the pipe so as to form an arch. All around the pipes, there shall be a joint of cement mortar (1:2) 13 mm thick between it and the bricks. The manhole base has been kept as 150mm for manholes upto 1m depth, and 200mm for manholes from 1 to 2 m depth and 300 mm for greater depths. In all cases, the thickness shall be counter checked for uplift conditions based on maximum ground water elevations at the site on the soil side by considering empty manhole conditions.

The thickness of walls shall be typically one brick up to 1.5 m deep manholes, one and a half brick for depths greater than 1.5 m. The actual thickness in any case shall be verified on the basis of engineering design in difficult soil conditions

### **3.7.3.2 RCC MANHOLES**

The idea of RCC manholes is essentially to quicken the work of construction in the roads by adopting precast sections assembled at site. Thus, the issues related to their construction are more of design itself and quality control in casting. In general, plain and reinforced concrete work for manholes shall be carried out in accordance with the specification given in CPHEEO manual otherwise specified in this specification. Wherever good quality of brick and workmanship of the construction cannot be ensured, it is advisable to go in for RCC manholes. The provisions of IS: 456 and IS3370 Part I, II and IV shall inter alia apply to the design. The entire structure shall at all times be designed to the condition where the ground water is at ground level itself and the inside is empty and there is no superimposed load on the manhole and not considering the skin friction of the manhole side wall with the soil. Now the newly available precast RCC chambers shall be conveniently used for the manholes upto 6.0m or more depth. This will make the construction very easy and faster. So the same are proposed for Kasaragod scheme.

### **3.7.3.3 PE MANHOLES**

Polyethylene manholes remain leak-free because there is no chemical attack. The toughness of polyethylene eliminates the chance of cracking during installation. There is no infiltration of external ground water, reducing the amount of treatment required. There is no exfiltration of sewage to the environment. PE manholes are available with ladders installed. Ladder design has been inspected and meets all OSHA dimensional requirements.



## Chapter 4 PROPOSED SEWERAGE SYSTEM

### 4.1 POPULATION PROJECTION

Population of the city normally depends on factors such as birth and death rates, migration, industrial development, general environmental conditions etc. Usually, the population forecast of a city is made on the basis of methods of population forecast as provided for in section 1.5 of the CPHEO manual for sewerage and sewerage treatment. The latest available census records are that of 2011. As far as Kerala is concerned it is quite different from other states on education, health, life expectancy etc. The demographic pattern of the state therefore is quite different and need to take into account all the developmental parameters so as to avoid undue over designs.

The anticipation of future growth in any community in terms of population or commercial and industrial expansion forms the basis for preparation of plan for providing the amenities including installation of sewers in the area to be served. The anticipated population, its density and its waste production is generally estimated for a specified planning period. The recommended planning period is 30 years.

Decadal growth of 8.58% is adopted for population projection, as the district average for the decade from 2001 to 2011 is 8.58%

Decimal increase	8.58%
Current Year	2022
Execution Period	2 Year
Design Year	2054
Design Period	30 Years

Based on topography, population etc municipality is divided into two sewer zones as below. Population for the zone 1 and 2 has been worked out and provided as per the projection the designed population is as follows

Table 4.1 Population Projection

Sl No	Name	Area	2011	2021	2024	2039	2054
1	Kasaragod	Municipality	54172	58820	60215	67965	75715
2	zone 1	Pachakkad Thuruthu Area	12205	13252	13567	15314	17060
3	zone 2	KorakodVayal	12668	13755	14082	15895	17707

Table 4.2 Zone Boundary

Zone	West	East	south	North
Zone- 1	Pachakkad Vayal	Nayanmarmoola	Chandragiri River	Vidyanagar, NH-66
Zone 2	Railway line	Chandragiri River	Chandragiri River	NH-66

Based on the population density a seepage zone is also proposed to area where population density is below 3200/km<sup>2</sup>. In addition, in the high density populated areas but where there is no road network, seepage treatment is proposed.

Table 4.3 STP Capacity Calculation

Design Period	30 <b>years</b>
Decadal increase in Population	8.58%
Sewerage return ratio	80%
Septage return ratio	10%

	Population	Projected Population			
Year	2011	2021	2024	2039	2054
Kasaragod Municipality	54172	58820	60215	67965	75715
Network area of Zone-1	12205	13252	13567	15314	17060
Septage area of Zone-1	9208	9998	10236	11554	12871

Year	Non-Domestic Demand	Non-Domestic Water Demand (MLD)				Sewerage Flow (MLD)			
		2021	2024	2039	2054	2021	2024	2039	2054
Kasaragod Municipality	20%	1.76	1.81	2.04	2.27	8.46	8.67	9.78	10.9
Network area of Zone-1	20%	0.4	0.41	0.46	0.51	1.91	1.96	2.21	2.46
Septage area of Zone-1	20%	0.3	0.31	0.35	0.39	0.18	0.19	0.21	0.23

Total sewage flow (Dry weather flow)	2.46	MLD
Total septage load	0.23	MLD
Maximum infiltration limited to 5000 Ltr/km/day	0.105	MLD
Number of persons giving un authorised connection	1 in 50	
Number of households in 2021	2650	
Number of households in 2054	3412	
Number of houses giving unauthorised connection	69	
Unauthorised water entering the sewer	0.380	MLD
Capacity of Sewage Treatment plant Say	4	MLD

Zone 1 coverage area of 6.09 km<sup>2</sup>. This is the residential and commercial area of Kasaragod Municipality and is thickly populated. The total length of sewer network comes to 21010 m. The proposed location of treatment plant is near Pachakkad Thuruthu. 1 number of Pumping stations are proposed near Kargil road (Thuruthu side). The capacity of the plant is 4 MLD. Co- Treatment is proposed along with the Sewage Treatment Plant for Zone-1. The capacity of Plant is arrived adding the part septage load in Kasaragod Municipality.

#### 4.2 COLLECTION SYSTEM

The collection system has been designed for ultimate year peak flow. The cumulative flows and the cumulative contributory population are discussed zone wise in the succeeding sections. The design diameter and slope have been finalized based on the minimum flow velocity of 0.60 m/s (present peak flow) with maximum velocity of 3.00 m/sec.

Design calculations are shown in Annexure attached. The sewerage system network has been so planned to limit lifting and pumping stations. The Maximum depth of the sewer lines are kept at 5.18 m from the existing ground level.

#### 4.3 SEWERAGE NETWORK AND MANHOLES

Design & estimates of the sewer collection system has prepared so as to limit the depth of excavation and to accommodate changes in location of STP. It is proposed to have single collection system and STP for whole Zone.

This Zone-1 will have 11 lifting stations and 1 No of pumping station. The collected volume in the lifting station is pumped to the appropriate manhole to enhance the gravity flow. The corresponding manhole ID's of each Lifting stations are listed below.

Table 4.4 Lifting stations

Sl. No.	Lifting Station	Manhole ID
1	LS-1	111
2	LS-2	45
3	LS-3	795
4	LS-4	764
5	LS-5	628
6	LS-6	158
7	LS-7	544
8	LS-8	541
9	LS-9	495
10	LS-10	99
11	LS-11	318

The sewage collected in the wet well PH1 is directly pumped to the proposed plant at Pachakkad Thuruthu.

Based on the analysis of the topography of the city area and its surroundings, the existing and future land use of the area, the existing status of water courses, the proposal for network, manholes have been arrived.



Figure 4.1 Network Sketch

### 4.3.1 DETAILS OF SEWER NETWORK

Abstract of sewer network is furnished below

Table 4.5 Network details

SI NO	Diameter in mm	Pipe Material	Length in metres
1	225	PE PE100	18067.60
2	250	PE PE100	1169.70
3	280	PE PE100	731.50
4	315	PE PE100	792.70
5	355	PE PE100	119.90
6	400	PE PE100	126.90
7	450	PE PE100	6.10
	<b>Total</b>		<b>21014.4</b>

Upto 3 meter depth of sewer line open cutting is proposed and above 3 m depth pipe laying through HDD method is proposed.

Table 4.6 Excavation Details

Diameter (mm)	Open Cut in metres	HDD in metres	Total
225	16893.10	1174.50	18067.6
250	372.70	191.80	564.50
280	302.60	227.10	529.70
315	428.70	75.90	504.60
355	53.10	-	-
400	30.0	-	-
450	6.10	-	-

### 4.3.2 MANHOLES

Total number of manholes comes to 1046

Table 4.7 Details of Manholes

Manhole depth in Meters	No of manholes
Up to 1.5	724
1.5 to 2.5	174
2.5 to 3.5	110
3.5 to 4.5	33

4.5 to 5.5	5
<b>Total</b>	<b>1046</b>

#### 4.4 PUMPING STATION AND RISING MAIN

##### 4.4.1 GENERAL

Pumping or force mains deliver wastewater discharged from a pumping station to its destination, which may be a treatment plant or the final disposal point.

##### 4.5 LIFTING STATION /PUMPING STATION

Pump stations are normally required in a sewage collection system to lift the sewage against a gradient or to limit the depth of cutting of the pertinent sewer line. A simplified form of the pump station, called a Lift Station, is also employed for the same purpose. The primary difference between a pump station and a lift station is that the Pump Station shall handle greater flows with arrangements for removal of floating material and grit prior to pumping through a force main. Lift Stations will have only an enlarged manhole as a wet well with pumps installed and a small control room adjacent to it, for lifting the sewage to ground level.

Lift stations are generally used to restrict the depth of cutting and discharging normally to the manhole in a downstream trunk sewer. No screens and grit wells are provided in lift stations.

Pumping and lifting stations shall use submersible pumps, such stations have a single well, circular or rectangular, in which pumps are installed. Superstructure requirement is minimum. The pump stations have been designed considering easy removal and reinstallation of the pumps without disturbing the connecting delivery pipe work.

Hydraulic Criteria:

According to the existing ground level contour from the topographic survey, the number of pumping stations has been finalized. Lift stations are generally proposed where depth of cutting exceeds 5.5 m. The location of pumping stations is at lower points of the network, but away from public and flood areas. Overflow is not allowed

##### 4.5.1 DETAILS OF PUMPING STATIONS

Table 4.8 Pumping station detail

Sl No	Wet well No	Peak Flow in LPS	Detention Period in Minutes	Storage Capacity m <sup>3</sup>	SWD in Metres	Diameter in metres	Total Depth in metres
1	PH - STP	84.72	10	50.84	3	5	4.38

#### 4.5.2 DETAILS OF LIFTING STATIONS

Table 4.9 Lifting station details

Sl No	LS No	Peak Flow in LPS	Detention Period in Minutes	Storage Capacity (m <sup>3</sup> )	SWD in Metres	Diameter in metres	Total Depth in metres
1	LS-1	0.567	10	0.34	0.75	2	4.97
2	LS-2	12.23	10	7.34	2.5	2	3.71
3	LS-3	13.364	10	8.02	1.45	3	5.96
4	LS-4	1.62	10	0.97	0.75	2	7.05
5	LS-5	26.405	10	15.84	0.85	5	5.94
6	LS-6	1.134	10	0.68	0.75	2	5.24
7	LS-7	1.944	10	1.17	0.75	2	6.41
8	LS-8	5.751	10	3.45	1.3	2	5.99
9	LS-9	11.421	10	6.85	1.15	3	5.98
10	LS-10	16.848	10	10.11	1.50	3	5.25
11	LS-11	10.611	10	6.37	2.25	2	3.44

#### 4.5.3 PUMPING MAINS AND LIFTING MAINS

Table 4.10 Pumping mains and Lifting mains

SI NO	Name	Length in metres	Diameter in mm	Material	Route
1	LS-1	10	100	DI	LS-1 to MH ID-111
2	LS-2	242	150	DI	LS-1 to MH ID-45
3	LS-3	10	100	DI	LS-1 to MH ID-795
4	LS-4	10	100	DI	LS-1 to MH ID-764
5	LS-5	10	200	DI	LS-1 to MH ID-628
6	LS-6	10	100	DI	LS-1 to MH ID-158
7	LS-7	10	100	DI	LS-1 to MH ID-544
8	LS-8	10	100	DI	LS-1 to MH ID-541
9	LS-9	10	150	DI	LS-1 to MH ID-495
10	LS-10	10	150	DI	LS-1 to MH ID-99

11	LS-11	150	150	DI	LS-1 to MH ID-318
12	PH1-STP Receiving chamber	2000	300	DI	Kargil road to Pachakkad road
13	Septage well to Receiving chamber	30	100	DI	Well to Receiving Chamber

#### 4.6 PUMP AND OPERATION CONTROL

Fluid level activated switches will be provided to start and to stop the pumps depending upon the quantity of sewage available in the pump house. This will ensure that the pumps will not run dry. A sluice valve will be provided on the suction side and a sluice valve and a non- return valve will be provided on the delivery side. Flow meter (digital type) will be provided to measure the quantity of sewage flowing out of the pumping station. It will be an integrating type indicating instantaneous flow and the cumulative flow.

##### 4.6.1 DETAILS OF PUMP SETS

Table 4.11 Details of pump sets

Sl NO	Lifting Station/Pumping Station	Number of Pump sets	HP	Type of Pump	Remarks
1	LS-1	2	0.50	Submersible	
2	LS-2	2	1.50	Submersible	
3	LS-3	2	2	Submersible	
4	LS-4	2	0.5	Submersible	
5	LS-5	2	4	Submersible	
6	LS-6	2	0.5	Submersible	
7	LS-7	2	0.5	Submersible	
8	LS-8	2	1	Submersible	
9	LS-9	2	2	Submersible	
10	LS-10	2	2	Submersible	
11	LS-11	2	3	Submersible	
12	PH1-STP	2	50	Submersible	
13	Septage Well	2	1.5	Submersible	



## **4.7 LAYING OF SEWER NETWORK**

In the following sections, important matters in connection with the laying of sewer network and making the system efficient is illustrated in detail.

### **4.7.1 EXCAVATION AND LAYING**

1. On all excavation work, safety precautions for the protection of life and property are essential and measures to avoid too great inconveniences to the public care desirable. Such measures and precautions include the erection and maintenance of signs (to forewarn public), barricades, bridges and detours; placing and maintenance of lights both for illumination and as danger signals; provision of watchmen to exclude unauthorized persons, particularly children from tress passing on the work.
2. Computation of the safe load carrying capacity of the pipe when installed and bedded in the manner to be specified using a suitable factor of safety and making certain the design supporting strength thus obtained is greater than the maximum load to be applied.
3. Sewers may be laid in trenches or under embankment in areas which may be temporarily or permanently submerged in water. The fill load in such cases will be reduced and will correspond to the buoyant weight of the fill material. However, effect of submergence could be ignored which provides an additional factor of safety, but it may be necessary to check whether a pipe is subject to flotation. Under submergence, the minimum height of the fill material that will be required to prevent flotation ignoring the frictional forces in the fill can be determined. Wherever sufficient height of fill material is not available, anti-flotation blocks should be provided.
4. All rigid pipes may be tested for strength in the laboratory by the three-edge bearing test (ultimate load).
5. Width of the trench specified for a particular job should be minimum in consonance with the requirements of adequate working space to allow access to all parts and joints of pipe.
6. The Field Engineer should keep in touch with the Design Engineer throughout the duration of the Project and any deviation from the design assumptions due to the exigencies of work, should be immediately investigated and corrective measures taken in time.
7. All pipes used on the work should be tested as per the IS specifications and test certificates of the manufacturers should be furnished for every consignment brought to the site.
8. Whenever shoring is used, the pulling out of planks on completion of work, should be carried out in stages and this should be properly supervised to ensure that the space occupied by the planks is properly back filled.

9. Proper back filling methods both as regards to selection of materials, methods of placing and proper compaction should be in general agreement with the design assumptions.
10. In quicksand conditions, it is necessary to anchor the sewer to the ground and hold it at the grade as laid in the face of soil sink age.
11. The type of bedding (granular, concrete cradle, full concrete encasement etc.) would depend on the soil strata and depth at which sewer is laid.
12. It is understood that the line (horizontal alignment) and grade layout of a sewer line as per design must be carried out meticulously. The horizontal layout determines the location as well as direction of the sewer line, while slope (grade) of the line provides the necessary hydraulic carrying capacity of the sewerage system.
13. The location of the trench is generally laid out first as an offset line running parallel to the proposed sewer centre line. This offset line is demarcated by wooden stakes driven into the ground surface at intervals of say, 15 m. The offset line, as is clear, is quite away from the sewer centre line with a view not to allow it being disturbed during construction; however, it must be proximate enough so that the transfer of measurements to the actual trench can readily be done.

#### **4.8 GANTRY**

Gantry of adequate capacity having floor control pendant will be provided for handling heavy parts of equipment's, valves etc. during erection and maintenance of pumping stations. Proper opening to lift the heavy equipment will be provided at motor floor slab in pumping station.

#### **4.9 ARRANGEMENTS FOR POWER SUPPLY**

KSEB will supply power at 11/22KV HT supply or 440 V LT supply for the operation of pumps in the pumping stations and for operation of equipment in the STP. In respect of HT supply, suitable transformers would be provided to step down the voltages to 440V. In case the Horse Power of pump set is less than 75HP, 440V LT supply will be availed. Each pumping station shall have Motor control centre for start-stop and other controls for protection and safety of motors and other auxiliary equipment. Capacitors of suitable capacity would be provided to improve the power factor to so that power consumption can be brought down.

## Chapter 5 PROPOSED SEWERAGE TREATMENT PLANT

### 5.1 GENERAL

The constituents of concern found in wastewater are removed by physical, chemical, and biological methods. The individual methods usually are classified as physical unit operations, chemical unit processes, and biological unit processes. Treatment methods in which the application of physical forces predominate are known as physical unit operations. Examples of physical unit operations include screening, mixing, sedimentation, gas transfer, filtration and adsorption. Treatment methods in which the removal or conversion of constituents is brought about by the addition of chemicals or other chemical reactions are known as chemical unit processes. Examples of chemical unit processes include disinfection, oxidation and precipitation. Treatment methods in which the removal of constituents is brought about by biological activity are known as biological unit processes. Biological treatment is used primarily to remove the biodegradable organic constituents and nutrients in waste water. From practical observations, the rates at which physical, chemical and biological reactions and conversions occur are important, as they will affect the size of the treatment facilities that must be provided. The rate at which reactions and conversions occur, and the degree of their completion, is generally a function of the constituents involved, the temperature, and the type of reactor. The fundamental basis for the analysis of the physical, chemical and biological unit operations and processes used for wastewater treatment is the material mass balance principle in which an accounting of the mass is made before and after reactions and conversions have taken place.

### 5.2 CHARACTERISTICS OF SEWAGE

#### 5.2.1 INFLUENT CHARACTERISTICS

Table 5.1 Influent Characteristics

Parameters	Units	Value
Biochemical Oxygen Demand (BOD <sub>5</sub> )	mg/l	250
Chemical Oxygen Demand (COD)	mg/l	400
pH	Units	6.00-7.00
Total Suspended Solids (TSS)	mg/l	400
Total Dissolved Solids (TDS)	mg/l	800
Total Organic Nitrogen (Kjeldhal)	mg/l	>35<55
Oil and Grease	mg/l	>1<10

## 5.2.2 EFFLUENT CHARACTERISTICS

Table 5.2 Effluent Characteristics

Parameters	Units	Value
BiochemicalOxygenDemand(BOD5)	mg/l	<10
ChemicalOxygenDemand(COD)	mg/l	<50
pH	Units	6.5– 7.5
TotalSuspendedSolids(TSS)	mg/l	<10
TotalDissolvedSolids(TDS)	mg/l	100

## 5.3 CAPACITY CALCULATION OF STP

The details of forecasting of population and demand for zone1 is shown below

Last census Population 2011	12205 Persons
Population for sewerage zone-2011	12205
Decennial increase	8.58 %
Current year	2022
Design period	30 Years
Execution period	2 Years
Projected population 2054	17060Persons
Per capita water supply	150 LPCD
Waste water generated	80% of water supply
Quantity of waste water generated	2.05 MLD
Groundwater Infiltration for pipeline & Manholes	5000L/km/day
Total Ground water infiltration	5000x 21= 0.105MLD
Number of persons per house	5Persons
Average roof area	55m <sup>2</sup>
Rainfall intensity	100mm/day
Number of households in 2054	3412 Nos
Waste water generated accounted for Rain water	0.3795 MLD
Non domestic demand	0.41 MLD
Total sewerage load	2.944
Septage load for co-treatment	0.23MLD

Total

3.174 MLD

Say

**4 MLD**

#### 5.4 UNIT OPERATIONS IN TREATMENT OF SEWAGE

Table 5.3 Unit Operations

Sl No.	Unit	Function	Unit Operations /Phases
1	Primary	Removal of rags, floating matter, grit, oil and grease etc.	Screening Grit removal Oil and grease trap
2	Secondary	Removal of Bio degradable organic matter and suspended solids  Also include nutrient removal (Nitrate and Phosphate) in advanced technologies	Aerobic suspended growth (Aerobic and anaerobic) Lagoon Nitrate and phosphate removal Chemical oxidation Suspended growth Nitrification/De-nitrification Air stripping Ion exchange Chemical treatment Biological nutrient removal
3	Tertiary	Polishing the effluent for reuse application	Pathogen removal Chlorine compounds O <sub>3</sub> , UV Radiation Membrane filtration Filtration variation Carbon Adsorption Iron exchange

## 5.5 THE PROPOSED PFD PROCESS FLOW DIAGRAM OF PROPOSED STP

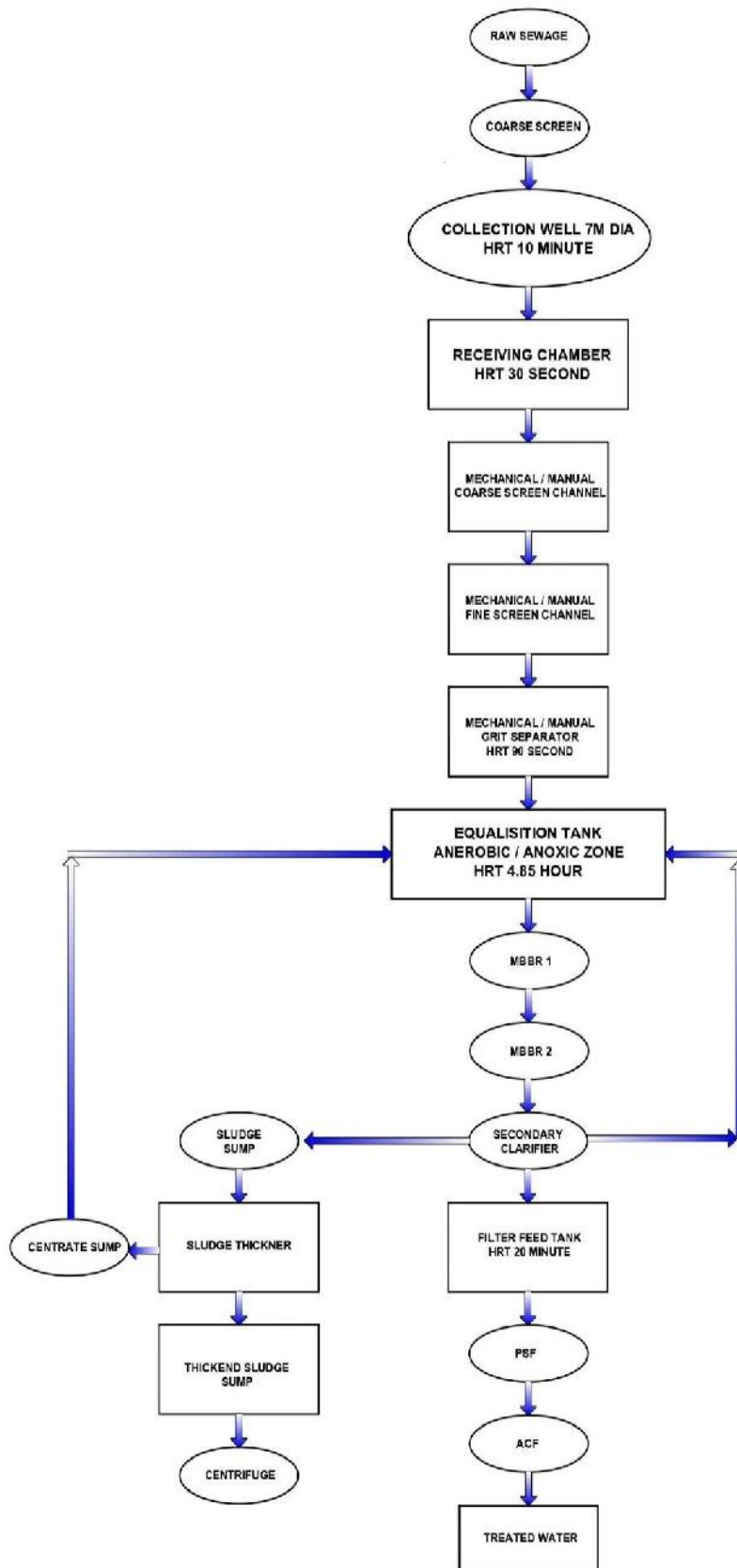


Figure 5.1 Process Flow Diagram

## **5.6 SELECTION OF TECHNOLOGY FOR THE PROPOSED STP**

MBBR Technology is opted for secondary treatment in this project for following reasons.

1. MBBR has been in existence for a long time, also in India is approved technology.
2. Minimum foot print
3. Better Stabilized sludge
4. Better Effluent Quality
5. Less sophisticated
6. Spare parts available
7. Lower life cycle cost
8. Nil odour nuisance and other environmental hazards

### **5.6.1 FEATURES OF MBBR**

Biochemical oxygen demand (BOD) is an indirect measure of the concentration of biodegradable organic matter in water or wastewater. Organic matter (as measured by BOD) is one of the major constituents removed from wastewater in domestic wastewater treatment plants. The reason for being concerned about organic matter in water is its effect on dissolved oxygen in the receiving stream. Dissolved oxygen in water is essential for much of aquatic life, so organic contaminants that affect dissolved oxygen level in water are of concern.

The two major reactions that take place in the organic carbon cycle are biological oxidation of waste organic matter and photosynthesis, which is the process by which green plants produce organic matter from carbon dioxide and water in reactions that are catalysed by sunlight and the chlorophyll in the green plants. Through the biological oxidation process, aerobic microorganisms utilize oxygen in breaking down organic matter to carbon dioxide and water together with small amounts of other end products.

The process takes place as aerobic microorganisms utilize the waste organic matter as their food (energy) source. The process uses oxygen, so if it is taking place in a water body, dissolved oxygen is consumed. A large quantity of organic matter in the water will result in multiplication of microorganisms and rapid removal of dissolved oxygen, leading to oxygen depletion below the level needed by aquatic life. This is also the process that takes place in biological oxidation processes in wastewater treatment plants for removal of organic matter from the incoming wastewater.

The MBBR process for wastewater treatment was invented and initially developed by Professor Hallvard Ødegaard in the late 1980s at the Norwegian University of Science and Technology. Use of this wastewater treatment process has spread rapidly.

The MBBR process is an attached growth biological wastewater treatment process. That is, the microorganisms that carry out the treatment are attached to a solid medium, as in trickling filter or RBC systems. By contrast, in a suspended growth biological wastewater treatment process, like the activated sludge process, the microorganisms that carry out the treatment are kept suspended in the mixed liquor in the aeration tank. In the conventional

attached growth biological treatment processes, like trickling filter or RBC systems the microorganisms are attached to a medium that is fixed in place and the wastewater being treated flows past the surfaces of the medium with their attached biological growth. which are described in more detail in the next section. The MBBR treatment processes typically take place in a tank like an activated sludge aeration tank. In contrast, an MBBR process utilizes small plastic carrier media, which are kept suspended by a diffused air aeration system for an aerobic process or by a mechanical mixing system for an anoxic or anaerobic process. A sieve is typically used at the tank exit to keep the carrier media in the tank.

MBBR processes use plastic media support carriers like those shown in Figure 11. As shown in Figure, the carrier is typically designed to have a high surface area per unit volume, so that there is a lot of surface area on which the microorganisms attach and grow. Two properties of the carrier are needed for the process design calculations are the specific surface area in  $m^2 / m^3$  and the void ratio. The specific surface area of MBBR carriers is typically in the range from 350 to 1200  $m^2 / m^3$  and the void ratio typically ranges from 60% to 90%. Design values for these carrier properties should be obtained from the carrier manufacturer or vendor (Harlan H. Bengtson).

The MBBR waste water treatment process is quite flexible and can be used in several different ways:

1. Single stage BOD removal
2. Two stage BOD removal
3. Two stage BOD removal and Nitrification
4. Single stage tertiary Nitrification
5. Pre-Anoxic De nitrification
6. Post-Anoxic De nitrification (Harlan H. Bengtson).

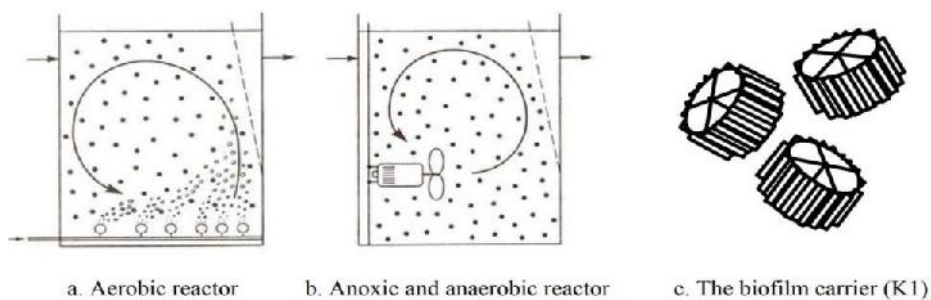


Figure 5.2 MBBR Carrier media in a MBBR tank



The idea behind the development of the moving bed biofilm process was to adopt the best from both the activated sludge process and the biofilter processes without including the worst. Contrary to most biofilm reactors, the moving bed biofilm reactor utilises the whole tank volume for biomass growth, as does also the activated sludge reactor. Contrary to the activated sludge reactor, it does not need any sludge recycle, as also the case in other biofilm reactors. This is achieved by having the biomass grow on carriers that move freely in the water volume of the reactor, kept within the reactor by a sieve arrangement at the reactor outlet. Since no sludge recirculation takes place, only the surplus biomass must be separated – a considerable advantage over activated sludge process. The reactor may be used for both aerobic, anoxic or anaerobic processes (H. Ødegaard).

The key design parameter for sizing the MBBR tank is the surface area loading rate (SALR), typically with units of  $\text{g/m}^2/\text{day}$ , that is  $\text{g/day}$  of BOD coming into the MBBR tank per  $\text{m}^2$  of carrier surface area. Using design values for wastewater flow rate and BOD concentration entering the MBBR tank, the loading rate in  $\text{g BOD/day}$  can be calculated. Then dividing BOD loading rate in  $\text{g/day}$  by the SALR in  $\text{g/m}^2/\text{day}$  gives the required carrier surface area in  $\text{m}^2$ . The carrier fill %, carrier specific surface area, and carrier % void space can then be used to calculate the required carrier volume, tank volume and the volume of liquid in the reactor (Harlan H. Bengtson).

As an improvement over the attached growth systems, the concept of trapping the microbes into the attached biomass concentration and long solids retention time in a biological reactor can limit the waste sludge production for a given reduction of BOD. This is due to the higher biomass concentration in the reactor due to the immobilized biomass and hence the Food/Microorganism ratio Nitrification going beyond the extended aeration. It is stated that during aeration, the synthesis and accumulation of readily biodegradable storage compounds are observed and these can be used for denitrification under starvation conditions.

Enhancing active biomass concentration, prolonging the life of immobilized carrier and improving the stability of immobilized microorganism play important roles in the process efficiency. The construction, operation, preventing clogging and reducing renewal costs are challenges in the commercial engineering of this technology. However, the fact remains that there are commercially operating STPs built with this technology in our country using various patented media of the respective vendors and with their own design criteria. As such, this technology holds the potential of reducing the footprint of the STP especially in land locked high density urban centres and thus merits its relative consideration.

The requirements for reactor media are high specific surface area, high percent void space, resistance to abrasion or disintegration during placement, insolubility in sewage and resistance to spalling and flaking. The inbuilt configuration must permit hydraulic self-cleaning of the media itself and thereby safeguarding the need to take the reactor out of service to attend for cleaning the clogged media.

Netting to hold back media is an important requirement and is usually provided near the top outlet of the treated sewage in the form of spread-out netting across the entire plan area or a netted cowl around the off take of the outlet pipe. Care is needed periodically to renew these.

### 5.6.2 NITRIFICATION

Biological nitrification/de nitrification is a two step process. The first step is nitrification, which is conversion of ammonia to nitrate through the action of nitrifying bacteria. The second step is nitrate conversion (de nitrification), which is carried out by facultative heterotrophic bacteria under anoxic conditions.

There are two groups of chemoautotrophic bacteria that can be associated with the process of nitrification. One group (Nitrosomonas) derives its energy through the oxidation of ammonium to nitrite, whereas the other group (Nitrobacter) obtains energy through the oxidation of nitrite to nitrate. Both the groups, collectively called Nitrifiers, obtain carbon required, from inorganic carbon forms.

Combined system is favoured method of operation as it is less sensitive to load variations - owing to larger sized aeration tank - generally produces a smaller volume of surplus sludge owing to higher values of  $q_c$  adopted, and better sludge settle ability.

Care should be taken to ensure that the oxygenation capacity of aeration tank is sufficient to meet oxygen uptake due to carbonaceous demand and nitrification. Recycling of sludge must be rapid enough to prevent de nitrification (and rising sludge) owing to anoxic conditions in the settling tank. This is rising sludge happens, the tertiary filters will chock very fast and will result reduction in plant capacity.

In separate system, the first tank can be smaller in size since a higher F/M ratio (Food to Microorganism Ratio) can be used, but this makes the system somewhat more sensitive to load variations and also tends to produce more sludge for disposal. An additional settling tank is also necessary between the two aeration tanks to keep the sludge separate. A principal advantage of this system is its higher efficiency of nitrification and its better performance when toxic substances are feared to be in the inflow.

### 5.6.3 DENITRIFICATION

The biological reduction of nitrate ( $\text{NO}_3$ ) to nitrogen gas ( $\text{N}_2$ ) by facultative heterotrophic bacteria is called De nitrification. "Heterotrophic" bacteria need a carbon source as food to live. "Facultative" bacteria can get their oxygen by taking dissolved oxygen out of the water or by taking it off of nitrate molecules.

De nitrification occurs when oxygen levels are depleted and nitrate becomes the primary oxygen source for microorganisms. The process is performed under anoxic conditions, when the dissolved oxygen concentration is less than 0.5 mg/L, ideally less than 0.2. When bacteria break apart nitrate ( $\text{NO}_3^-$ ) to gain the oxygen ( $\text{O}_2$ ), the nitrate is reduced to nitrous oxide ( $\text{N}_2\text{O}$ ), and, in turn, nitrogen gas ( $\text{N}_2$ ). Since nitrogen gas has low water solubility, it escapes into the atmosphere as gas bubbles.

Free nitrogen is the major component of air; thus, its release does not cause any environmental concern.

#### **5.6.4 PHOSPHOROUS REMOVAL**

The consciousness to restrict the phosphorous in the treated sewage before Discharge into the environment to curtail eutrophication is being recognised. The phosphorous can be removed by a process called as the luxury uptake. There are at least six different variations of these processes which have all been developed in advanced countries and every situation will need a separate evaluation and validation.

An alternative process is to introduce a chemical precipitation either in the secondary clarifier or as a separate tertiary stage where phosphorous is precipitated by coagulating with Ferric or Aluminium salts. There is also another technology of high Lime followed by acidification or carbonation whereby in addition to phosphorous removal, colour, heavy metals, fluorides, silica and magnesium can also be simultaneously removed. It is necessary to conduct lab studies to establish the efficiency and the type of chemicals.

#### **5.6.5 A2O PROCESS**

The combined removal of carbon, nitrogen and phosphorus can be achieved by several biological treatment processes. Two common biological treatment processes are the A2O and Barden-pho processes. The A2O process is a modification of A/O phosphorus removal process is to include an anoxic stage for de nitrification. Influent and return activated sludge flow into the anaerobic tank while nitrified liquor is recycled with a circulating pump from the aerobic (nitrification) tank to the anoxic (de nitrification) tank. Ammonia nitrogen is oxidized to nitrite or nitrate in the aerobic tank, and then nitrite or nitrate is denitrified to nitrogen gas in the anoxic tank.

### **5.7 PROPOSED TREATMENT UNITS**

#### **5.7.1 RECEIVINGCHAMBER**

The sewage received in the collection well located at the plant premises is pumped to the receiving chamber. The average quantity of flow in to the receiving chamber is assumed to be 33.88 Ltr/s whereas peak flow is taken as 84.72 Ltr/s. Dimension of receiving chamber is 2.25×1.0×1.0m with a free board of 0.5m.

#### **5.7.2 SCREENCHANNEL**

After receiving chamber, sewage passes through screening chambers provided. The principal role of the fine screening is to remove floating materials from the sewage that could damage subsequent process equipment, eliminate materials that may inhibit the beneficial reuse of bio solids and reduce overall treatment process effectiveness. Screened materials are mechanically removed by the scrappers. In case of emergency, the screen chamber can be by passed to the manual screen chamber so that the treatment is continuously ensured.

#### **5.7.3 GRITSEPARATOR**

The grit chamber is used to remove grit, consisting of sand, gravel, cinder, or other heavy solids materials that have specific gravity much higher than those of the organic solids in waste water. Grit chambers are provided to protect moving mechanical equipment from abrasion and abnormal wear; avoid deposition in pipelines, channels, and conduits; and to reduce frequency of digester cleaning. Two numbers of grit chambers are provided in the

plant (one stand by) with a dimension of 3.3x3.3 x2.50m.

#### **5.7.4 APPROACH CHANNEL FOR PARSHALL FLUME**

A Parshall flume is a fixed, hydraulic structure that is placed in a flow stream to determine the flow of water. The flume accelerates flow by both a contraction of the parallel sidewalls and a drop in the floor elevation in the throat. It is used to measure volumetric flow rate in industrial discharges, municipal sewer lines, and influent/effluent flows in waste water treatment plants.

#### **5.7.5 EQUALISATION TANK**

Flow equalization is used to minimize the variability of water and waste water flow rates and composition. Each unit operation in a treatment train is designed for specific waste water characteristics. Improved efficiency and control are possible when all unit operations are carried out at uniform flow conditions. The equalization tanks are provided (i) to balance fluctuating flows or concentrations, (ii) to assist self-neutralization, or (iii) to even out the effect of a periodic "slug" discharge from a batch process. The design is done to have a hydraulic retention time of 4.85 hours. A square tank with length and breadth 14.6m is proposed with a depth of 4.50m. Equalization tank is divided into Anaerobic and Anoxic areas with the help of baffle wall for de nitrification

#### **5.7.6 MIXING EQUIPMENT**

Mixers are often employed in equalization basins to achieve homogeneity in and to aerate the waste water. Various types of mixers are available. The classification of mixers depends on the flow pattern the mixers produce.

#### **5.7.7 PUMPSETS TO MBBR**

Horizontal Centrifugal, level controlled, submersible, detachable non clog submersible pump sets (2W+1SB) shall be used to lift sewage to the MBBR chamber of the STP from Equalization Tank.

#### **5.7.8 MOVING BED BIO REACTOR (MBBR)**

Moving Bed Biofilm Bioreactor (MBBR) process uses the whole tank volume for biomass growth. It uses simple floating media, which are carriers for attached growth of bio films. Bio film carrier movement is caused by the agitation of air bubbles. This compact treatment system is effective in removal of BOD as well as nitrogen and phosphorus while facilitating effective solids separation. Design of their reactor is based on the actual wastewater characteristics and local conditions. MBBR units are placed in series based on the load entering each reactor. Two square MBBR tank is designed with sides 15.2m with a depth of 4.50m.

#### **5.7.9 AIR BLOWERS**

Aeration is the most critical component of a treatment system using the Moving Bed Bio Reactor. A well-designed aeration system has a direct impact on the level of sewage treatment it achieves. An ample and evenly distributed oxygen supply in an aeration system is the key to rapid, economically-liable, and effective waste water treatment. Two numbers (1W+1S) of air blowers of 175 HP with a discharge of 5528 cum/hr are provided.

### **5.7.10 SECONDARY CLARIFIER**

Clarifiers are settling tanks built with mechanical means for continuous removal of solids being deposited by sedimentation. A clarifier is generally used to remove solid particulates or suspended solids from liquid for clarification and (or) thickening. Secondary Clarifier is a circular basin in which effluent from the MBBR process is held for a period of time during which the heavier biomass (microorganisms) settles to the bottom as “activated sludge”. There is no need for sludge recirculation in MBBR due to its high MLSS values. So secondary settling tanks are just used for removing excess settleable solids present in the effluent comes out from MBBR tanks. One number of secondary clarifiers with 15.70m diameter and 3.3m depth is provided with a retention period of 3.10 hrs.

### **5.7.11 SLUDGE SUMP**

Total sludge generated in the secondary clarifier is calculated as 914.46kg/day. Sludge sump is designed to have a hydraulic retention time of 2hrs. One number of sludge sump having circular shape with diameter 2.2m and depth 2.35 m is provided.

### **5.7.12 THICKENER FEED PUMP**

The major function of sludge thickener feed pump is to transfer the sludge from sludge sump to sludge thickener. Two numbers (1W+1SB) of non-clog, submersible pumps are provided with a discharge of 17.93 cum/hr

### **5.7.13 SLUDGE THICKENER**

Sludge thickening normally refers to the process of reducing the free water content of sludge or Thickening is a procedure used to increase the solids content of sludge by removing a portion of the liquid fraction.

### **5.7.13 CENTRIFUGE FEED PUMP**

The major function of Centrifuge feed pump is to transfer the sludge from thickened sludge sump to Centrifuge. Two numbers (1W+1SB) of non-clog, submersible pumps are provided with a discharge of 5.49cum/hr

### **5.7.14 SLUDGE CENTRIFUGE**

Centrifugal thickening and dewatering of sewage sludge are a high-speed process that uses the force from rapid rotation of a cylindrical bowl to separate wastewater solids from liquid. The centrifugal force in the decanters is utilized to separate the solids from the water. The use of organic flocculants, the poly electrolytes, made it possible to coagulate the fines sludge particles to relatively large sludge floc in the centrifugal field so that reliable separation of solids and water could take place.

### **5.7.15 PRESSURE SAND FILTER (PSF)**

The treated water which is collected in the filter feed tank shall be pumped into the Pressure Sand Filter using the Filter Feed Pumps. They are the most popular method for removal of turbidity from water. The Pressure Sand Filter consists of a multiple layer of sand with a variety in size and specific gravity. These Filters are designed to remove turbidity and suspended particles present in the feed water with minimum pressure drop. Raw water flows down wards through the filter bed and as the suspended matter, which is treated by addition

of a coagulant like alum or poly electrolyte, is retained on the sand surface and between the sand grains immediately below the surface. There is steady rise in the loss of head over a period of time and the flow reduces once the pressure drop across the filter is excessive. The filter is then taken out of service and cleaning of the filter media is effected by flow reversal also called as backwash. To assist in cleaning the bed, the backwash operation is sometimes preceded by air scouring by way of agitation through the under-drain system. The air scouring agitates the sand with a scrubbing action, which loosens the intercepted particles.



Figure 5.3 Pressure Sand Filter

Pressure sand filter is designed to have a dimension of 2.4m $\varnothing$  and 2.5m height. The work pressure is 3.5bar and it can be increased up to a maximum of 3.50 bar. Materials used in pressure sand filter are sand and anthracite (Dual media).

#### 5.7.16 ACTIVATED CARBON FILTER (ACF)

Filtered wastewater from Pressure sand filter is then passed through the Activated Carbon Filter. They are generally employed in the process of removing organic compound sand/or extracting free chlorine from water, thereby making the water suitable for discharge.

Activated carbon is commonly used for removing organic constituents and residual disinfectants in water supplies. This not only improves taste and minimizes health hazards; it protects other water treatment units such as reverse osmosis membranes and ion exchange resins from possible damage due to oxidation or organic fouling. Activated carbon is a favored water treatment technique because of its multifunctional nature and the fact that it adds nothing detrimental to the treated water. Most activated carbons are made from raw materials such as nut shells, wood, coal and petroleum.

Carbon filtering is a method of filtering that uses a bed of activated carbon to remove contaminant sand impurities, using chemical adsorption. Each particle/granule of carbon provide salaried surface area /pore structure, all owing contaminants the maximum possible exposure to the active sites within the filter media.

The dimension of Activated Carbon Filter is 2.6m $\varnothing$ x2.5m height.



Figure 5.4 Activated Carbon Filter

### 5.7.17 TREATED WATER TANK

The treated water is finally fed in to the treated water tank having a capacity of 176.40 m<sup>3</sup>. Treated water from Activated Carbon filter is pumped in to the treated water tank of dimension 9.8x6x3.35m. Hydraulic retention time of 60 minutes is given in the treated water tank.

### 5.7.18 CHLORINE CONTACT TANK

No separate Chlorine contact tank is proposed. Treated water tank is proposed as chlorine contact tank itself.

### 5.7.19 EFFLUENT CHANNEL

Effluent Conveyance System called as Effluent Channel Is provided to carry treated effluent from STP to the sea.

### 5.7.20 OUTFALL

The disinfected clear effluent shall be let out to the sea through a RCC covered channel of adequate slope.

## 5.8 DETAILED DESIGN

Detailed design of the Sewage Treatment Plant with MBBR Technology is provided in the annexure

## 5.9 POWER REQUIREMENT

The total running power requirement is 163HP/136KW and the installed capacity is 350HP/260KW. The single largest motor capacity is 175HP (Air blower). An Indoor type transformer and a Generator is proposed with the following capacities.

- a. Transformer : 250KVA
- b. Generator : 250KVA

## **5.10 OTHER FACILITIES**

Following provisions are also included in the proposal

5.7.15 Comfort room cum office in the laboratory

5.7.16 Internal Roads

5.7.17 Storm Water Drain

5.7.18 Providing Lawns

5.7.19 Planting trees

5.7.20 Bye-passing Arrangements

5.7.21 Walk ways for all major elevated units

5.7.22 Walkways /ground pavements

5.7.23 Water Supply and sanitation arrangements

5.7.24 Laboratory

## **5.11 PLANS FOR RE-USE OF RECYCLED SEWAGE**

In the planning and implementation of water reclamation and reuse, the reclaimed water application will usually govern the waste water treatment needed to protect public health and the environment, and the degree of reliability required for the treatment processes and operation (Metcalf and Eddy). The major waste water reuse categories are as follows:

- a] agricultural irrigation, crop irrigation and commercial nurseries
- b] Landscape irrigation
- c] industrial recycling and reuse
- d] groundwater recharge, groundwater replenishment and saltwater intrusion control
- e] recreational/environmental uses
- f] Non potable urban reuse

## **5.12 MAINTENANCE OF AN ECO - FRIENDLY SYSTEM**

Since the treated water contains plant nutrients also, it will be beneficial for the environment when discharged as soil infiltration. Care has also been taken to properly treat the sludge produced during the operation. It has also been decided to impart a green environment to the STP units with special methods of growing plants at the exterior of plant components and space between units. Maximum utilization of space has been taken at the planning and design stage itself and using the natural treatment properties of the soil, such decentralized systems provide good opportunities to use the natural environment. They can help reduce the level of difficulty and cost to treat pollutants, such as nutrients, and keeping them from entering lakes, rivers, and streams. The soil acts as a natural filter and provides final treatment by removing harmful bacteria, viruses, and nutrients.



### **5.13 PRELIMINARY STRUCTURAL DESIGN OF COMPONENTS**

For the various units of the STP structural analysis and design have been performed in accordance with the stipulations of all relevant Indian Standard Codes of practice. For the reinforced concrete elements, special attention has been given to arrive at the preliminary dimensions to satisfy norms and conditions for the water retaining structures. For the metallic structures like pressure filter units, similar approach has been adopted. Since the units are constantly in contact with aggressive environment like sewage, non-corrosive coating for reinforcing steel and water proofing application for the inner side of reinforced concrete structures are recommended. These provisions are already given in the detailed estimates. During the execution stage, a detailed structural analysis of the components can be performed. However, the dimensions are expected to fall within the limits of the values obtained from the preliminary analysis. In the case of foundations, simple raft and beam-slab type raft is adopted for safety considerations. Since the soil nature is observed to be satisfactory to withstand medium loading conditions, deep foundations are not suggested. Soil analysis reports available for the locality has been examined to arrive at a decision. However, during the execution stage, detailed soil investigations can be performed. Cover for the reinforced concrete elements is to be given in accordance with the exposure conditions given in the IS 456 Code of practice.

### **5.14 SEPTAGE**

Septage or septic tank waste refers to the partially treated matter stored in and pumped out of a septic tank. In other words, fecal sludge from septic tanks is known as Septage, but fecal sludge and Septage are interchangeably used in India. Septage is a by-product of pretreatment of household wastewater in a septic tank where it accumulates overtime. It is generally pumped out of a septic tank or onsite sanitation system using a vacuum tanker. Septage is the liquid and solid material that is pumped from a septic tank, cesspool, or other such onsite treatment facilities after it has accumulated over a period of time.

#### **5.14.1 SEPTAGE MANAGEMENT**

Sanitation often focuses only on the provisioning of physical infrastructure toilets or latrines in order to increase the ‘coverage of toilets’, or to look at the epitome of sanitation: ODF cities. But in order to provide tangible and sustainable sanitation, there is a need to focus on the entire ‘sanitation chain’. In simple terms, a sanitation chain is an outline for understanding how fecal waste flows through each system. It sets out interlinked steps vital to manage septage and effluent from generation to disposal or end use, thereby summarizing the city-level outcomes and current status of the same.



from generation to disposal or end use, thereby summarizing the city-level outcomes and current status of the same.

#### **5.14.2 TRANSPORTATION OF SEPTAGE**

Transportation is a very vital stage in the sanitation value chain and so are safety measures involved in it. Vehicles that carry Septage act as mobile sewer networks for OSS. Ideally, an ultimate discharge point of collected Septage is an STP or Septage treatment plant. The two main types of vehicles used in India are:

1. Truck-mounted vacuum tankers: These trucks have vacuum pumps with sizes based on lift elevation, pumping distance, volume of sludge to be removed, and volume of the tank. Their capacity varies between 3,000–10,000liters.

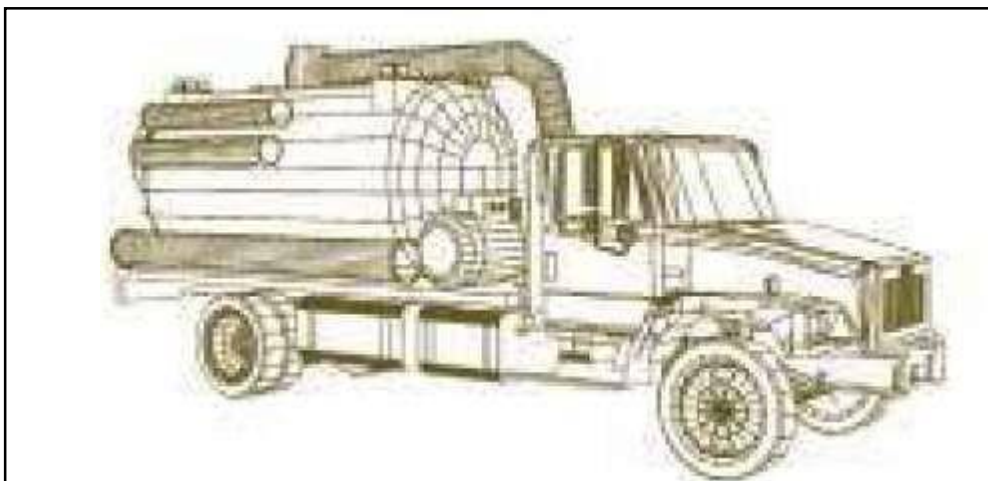


Figure 5.5 Truck-mounted vacuum tankers

2. Tractor-mounted tankers: These vehicles are locally made across India, but their

capacity is similar to that of vacuum trucks. The motor, the tank and the tractor are assembled according to the complimenting capacity of each module.

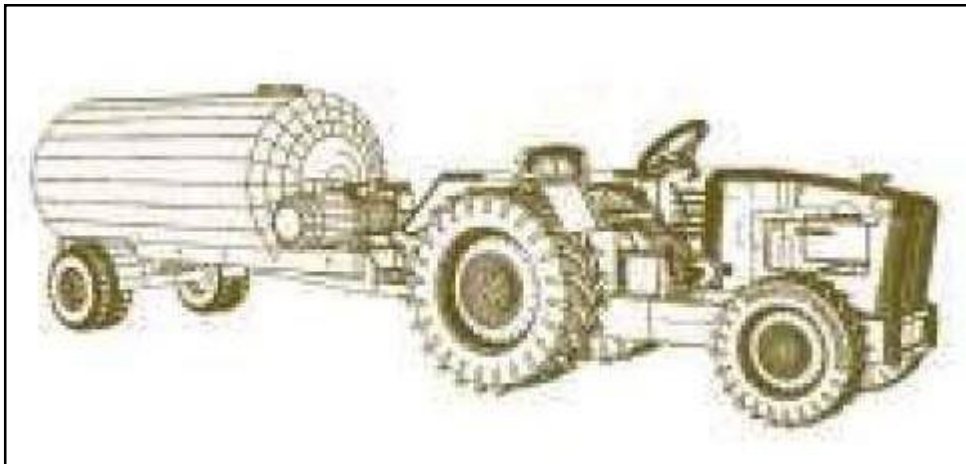


Figure 5.6 Tractor-mounted tankers

Septage transportation is one of the most important components of Septage management. There is need for evolving a standard method of collection, handling and transportation of Septage. Desludging trucks act as a “mobile sewer network” for onsite sanitation systems. They collect the Septage at the household level and transport it to treatment or disposal sites, thereby complimenting the functions of underground sewer network. It may be assumed that one vehicle having a capacity of 2,000 liters shall clean 3 to 10 septic tanks per day. This is based on the frequency of cleaning of septic tanks (once in 2 – 3 years) and also the distance from the location of septic tanks to the Septage treatment facility. The vehicles are available in different capacities from 2,000 up to 12,000 liters. It is to be noted that the requirement of machines also varies depending upon the capacity of vehicles, road width etc. In case of bigger cities having sufficient width of roads, vehicles having larger capacities may be adopted. Adequate provision for standby machines for cleaning of septic tanks may also be made. Small scale vacuum trucks called Vacutug (from 200 up to 2,000 Liters capacity) also are recommended for use in areas inaccessible to large desludging vehicles. The Vacutug is mounted on wheels and can be attached to a small vehicle. It can be manufactured locally to offer flexibility and mobility without losing the capacity to collect a substantial volume of fecal sludge within one operation.

For the purpose of planning sewerage/septage management systems for this proposal the project area is broadly categorized into two: areas with higher population density and areas with lower population density. Networked sewerage system with STPs is proposed for the first category where the density is generally more than 1500 per square kilometre. Furthermore, septage treatment is proposed in densely populated areas where there is no road network. Septage load from this zone of Kasaragod Municipality is proposed to be transported to the 4 MLD STP with MBBR technology at Pachakkad thuruth in Kasaragod Municipality where Co-treatment facility will be provided.

### 5.14.3 SEPTAGE CO-TREATMENT PROPOSED

Septage collected from the septage Zone is proposed to be treated in the Sewage Treatment Plant. Capacity of septage load is considered while designing the Sewage Treatment Plant. A septage collecting tank of size 6mX3mX3m is proposed to collect the septage received by trucks. The septage is diluted with effluent from secondary clarifier and proposed to pump to receiving chamber of Sewage Treatment Plant.

### 5.15 LAND REQUIRED FOR STP AND WELLS

The details of land required for Sewage Treatment Plant, pumping stations and lifting stations are detailed below. Procurement of land is the sole responsibility of Municipal Authority.

Table 5.4 Land details

Sl No	Components	Area required in cents	Remarks
1	Sewage Treatment Plant	200	RS No.190, Lat Lon 12.50680472, 75.00334791 Kasaragod Village
2	STP Link Road	150	RS No.190, 12.50680472, 75.00334791 Kasaragod Village
3	Wet well and Pump house, PH 1	10	at Kargil road, Lat Long 12.50545864, 75.00952635
4	Lifting Station, LS-1	1	12.50818761, 75.00236584
5	Lifting Station, LS-2	1.50	12.50685019, 75.00264583
6	Lifting Station, LS-3	1.5	12.50706660, 75.00505806
7	Lifting Station, LS-4	1	12.50828077, 75.00813033
8	Lifting Station, LS-5	5	12.50453832, 75.00816842
9	Lifting Station, LS-6	1	12.51298394, 75.02092178
10	Lifting Station, LS-7	1	12.51102358, 75.02065833

11	Lifting Station, LS-8	1	12.51160655, 75.02193661
12	Lifting Station, LS-9	1.5	12.51004973, 75.02203200
13	Lifting Station, LS-10	2	12.50421400, 75.01384953
14	Lifting Station, LS-11	1.5	12.51428011, 75.01500084



Figure 5.7 STP-Location

### 5.16 SMART MANAGEMENT AND ONLINE MONITORING USING INTERNET OF THINGS (IoT)

Advancement in the field of digital technology has enabled the wastewater treatment system operators and managers to control and enhance the performance of various components of the system. Internet of things (IoT) consists of a network of physical objects using various sensors as end points to enable monitoring from a remote station.

For the sewerage treatment plant, a network of various sensors can capture the variations of values of parameters like temperature, dissolved oxygen, chemical composition, TDS etc. at different control points of the system. The continuous data obtained through IoT is used by a customized algorithm for synthesis to impart a decision-making procedure. A centralised information processing system (CIPS) can be formed for this task. In addition to this smart water flow meters can also be coupled to this digital environment. IoT in waste water management can also be used to calculate residual chemicals after the treatment. This

data can be further used to calculate the efficiency of the treatment process and ensure that water quality standards are met before it is discharged in a water body.

By using real-time data gathered through different embedded sensors, performance characteristics of machines can be monitored that further increase the productivity of equipment and boost maintenance tasks. In the present study for the hospital, provision for implementing a IoT based control of the units have been suggested.

### **5.17 ODOUR CONTROL METHODS**

Odours are a complex combination of a wide variety of compounds; however, there are certain compounds and groups of compounds that contribute specifically to sewage odours, and significantly determine the selection of the control technology. These include the following: Hydrogen sulphide, and Ammonia.

Odour control is a complex and time-consuming challenge, often requiring a combination of methods for treating odorous gases and for removing or reducing the potential causes of the odours. If an odour problem is severe enough to affect the community, an emergency response and solution to the problem must be carried out quickly. The approach for selecting an odour control method or technology includes the following steps:

- A. Identify the odour source and character is tics through sampling and analysis.
- B. List and assign priorities to controlling a specific odour problem, recognizing considerations such as cost, plant location, future upgrading of various sewage processes, severity of the odour problem, and the nature of the affected area.
- C. Select one or more odour control method or technology for implementation to meet the objectives of steps “a” and “b”, taking into consideration the advantages and disadvantages of each.
- D. Monitor odour emissions from the treated air for process adjustments and for feedback to evaluate the solution’s effectiveness.

Hydrogen sulphide ( $H_2S$ ) is the most common odorous gas found in sewage collection and treatment systems and results from the reduction of sulphate by bacteria under anaerobic conditions. Its characteristic rotten-egg odour is well known. The gas is corrosive, toxic and soluble in sewage. Hydrogen sulphide is considered a broad-spectrum poison, meaning it can poison several different systems in the body.

### **5.18 PREVENTION OF ODOUR**

Hydrogen sulphide production can be controlled by maintaining conditions that prevent the build-up of sulphides in the sewage. The presence of oxygen at concentrations of more than 1.0 mg/L in the sewage prevents sulphide build-up because sulphide produced by anaerobic bacteria is aerobically oxidized. Maintaining anaerobic environment inhibits the anaerobic degradation process, which contributes to the generation of hydrogen sulphide. A checklist is given below:

- Prevent corrosion in the collection well of the facility by blowing air through the facility

- Avoid storing screenings and grit generated in the grit chamber for a long time. Dispose of screening sand grit at appropriate Intervals
- Retention time of sludge in the sludge treatment facilities should be appropriate (Do not retain sludge for a long time)
- Maintain sewage at neutral pH range because most of the sulphide is present at a pH value of less than 7.

Following is a short checklist of operational considerations for controlling odours of primary treatment facilities:(May also apply in other facilities)

- Remove scum routinely, with increased frequency during warm weather.
- Remove sludge before it can bubble or float.
- Wash weirs and other points where floatable and slime collect. Some facilities use submerged pipes with holes rather than effluent troughs. The submerged pipes do not splash the primary effluent, thereby reducing the release of hydrogen sulphide.
- Washdown all spills and grease coatings.
- When draining a tank, immediately flush it completely. If sludge does not drain quickly, spray lime, calcium hypochlorite, or potassium permanganate on the sludge surface to reduce odours. Because even a clean tank can produce odours, flushing the tank with a chlorine solution or keeping the tank floor covered with allow concentration of chlorine solution will reduce odours.
- If the sewage is septic, add chemicals in the collection system or at the plant, as appropriate, to reduce sulphides.
- If tanks are covered for odour control, keep plates and access hatches in place.
- Routinely check any odour scrubbers or deodorizers for plugging, adequate supply of chemicals, proper pressures for demisting, and/or effectiveness of carbon.
- The splashing of primary sewage into weir troughs and effluent channels can result in the release of hydrogen sulphide. If possible, try to minimize the splashing of primary sewage into the channel or weirs. If it cannot be accomplished operationally, then installing submerged sewer pipes may be necessary. This will require tank modifications to verify the plant hydraulics and provide proper control to avoid fluctuations in the tank levels.
- Minimize the stripping of hydrogen sulphide from the sewage when using channel air diffuser systems. Adoption of the following regular practices will not only increase removal efficiency but will provide better working conditions for the operator:
- Regularly remove accumulations from the inlet baffles and outlet weirs with a hose or a broom with stiff bristles. Only experience will determine the necessary frequency.

- Clean scum removal equipment regularly; otherwise, obnoxious odours and an unsightly appearance will result.
- Keep cover plates in place except when operations or maintenance require the removal.
- Immediately flush and remove all sewage and sludge spills. Avoid hosing down motors and enclosed control devices.
- Establish a house keeping schedule for the primary treatment area, including galleries, stairwells, control rooms, and related buildings, and assign responsibility for each item to a specific employee.
- Repaint surfaces as necessary for surface protection and appearance.

#### CONTROL OF ODOUR BY CHEMICAL ADDITION

Chemical addition can control odours in STP by preventing anaerobic conditions or controlling the release of odorous substances.

Table 5.5 Control of odour by chemical addition

Chemical	Effective against
	<b>Oxidizers</b>
<b>Ozone</b>	Atmospheric hydrogen sulphide only
<b>Hydrogenperoxide</b>	Hydrogensulphide, also acts as oxygen source
<b>Chlorine</b>	Hydrogensulphide and other reduced sulphur compounds
<b>Sodium and calciumhypochlorite</b>	Hydrogensulphide and other reduced sulphur compounds
<b>Potassiumpermanganate</b>	Hydrogensulphide and other reduced sulphur compounds



## **Chapter 6 COST ESTIMATE, OPERATION AND MAINTENANCE CHARGES**

### **6.1 DETAILED ESTIMATE**

#### **6.1.1 GENERAL**

The detailed estimate for the STP components and Network components is prepared in accordance with the Delhi Schedule of Rates (DSR) 2018 provisions after applying District Cost Index. For certain items, market rates are adopted. The estimate prepared in Kerala Water Authority Price software.

#### **6.1.2 DETAILED ESTIMATE OF COMPONENTS**

The detailed estimates have been divided into components as Raw sewage well, Receiving Chamber, Screen Chamber, Grit chamber, Equalization Tank, Aeration/MBBR Tank, Secondary Settling Tank, Filter Feed Tank, Treated Water tank, Sludge sump, Sludge Thickener, Thickened sludge Centrifuge Structure, Centrate sump, Chlorinator room, Air blower room, Administrative Building, Well and pump house, Sewer network, Control room, etc, Mechanical works, Electrical installations and instrumentation, Operation and maintenance. The total estimate amount comes to Rs. 86 Cores including O&M for 10 years. Detailed estimate is enclosed as annexure.

### **6.2 PROPOSED SEWERAGE SYSTEM O&M**

On completion of the construction, the system should be commissioned in phases. Trial commissioning and operation of all the components of the project shall be carried out in phases and any defects found during the period shall be attended immediately. The following components require regular supervision, operation and maintenance.

1. Sewerage Network.
2. Pumping Stations.
3. Sewage Treatment Plants.

For the efficient operation and maintenance of sewerage system, proper planning, staff/labour, tools & equipment and spares are required. For estimating the O&M cost for the Sewerage system, the cost is broadly categorized into

1. Establishment Charges
2. O&M for Network maintenance cost
3. O&M for STP

### **6.3 SEWER NETWORK MAINTENANCE**

For the purpose of maintenance, the jet rodding machine will be used along with other components for maintenance of the collection system. It can either be procured or can be hired. The staff shall be properly trained to operate the jet rodding machine.

All the new connections shall be given under the supervision of O&M staff. No unauthorized connection shall be given to the sewerage system. Sewer inspections and maintenance should be planned. The whole sewerage system should be marked on a plan and divided into sections and areas.

Quality maintenance shall be the most important step in smooth functioning of the proposed sewers. This includes the optimum use of labour , equipment and material to keep the system in good condition.

#### **6.4 TYPES OF MAINTENANCE**

There are two types of maintenance of an underground sewerage system - preventive and emergency. It is necessary that preventive or routine maintenance are carried out to prevent any breakdown of the system and to avoid emergency operations to deal with clogged sewer lines or over flowing manholes or backing up of sewage into a house or structural failure of the system. Preventive maintenance is more economical and provides for reliability in operations of the sewer facilities. Emergency repairs, which would be very rare if proper maintenance is carried out will also have to be provided for proper inspection and preventive maintenance is a necessity.

The organization required for the maintenance of the sewerage system will vary with the size and type of the sewerage system and the relative age of the system. The larger the municipality, the larger and more complex will be its maintenance organization. The size of the organization will vary from a couple of employees to several hundred regular employees. The primary effort of the staff is to maintain sewers free flowing and unobstructed.

##### **6.4.1 STEPS TO BE TAKEN FOR OPERATION AND MAINTENANCE OF THE SEWERAGE NETWORK DETAILED IN THIS SECTION ARE AIMED AT**

- Regular maintenance of the system for proper functioning
- Preventing any breakdown of the system
- Emergency operations to deal with clogged sewer lines or overflowing manholes
- Preventing back flow of sewage into residence sand
- Preventing structural failure of the system.

##### **6.4.2 INSTITUTIONAL STRUCTURE**

Operation and maintenance of the proposed scheme shall be carried out through the maintenance wing of KWA.

The following list gives the duties that are to be performed for proper sewer maintenance:

- Inspection of sewers, sewer appurtenance sand Sewage Treatment Plant.
- Cleaning of sewers and sewer appurtenances.
- Checking manhole conditions for deposition of silt etc.
- Replacing broken manhole covers.
- Raising the manhole cover for the construction of culverts, resurfacing etc.
- Approval of sewer connection applications and executing connections
- Maintaining records of sewers and STP including:
  - Daily operation and maintenance report
  - Complaints register
  - Stock of equipment
  - Disposal of silt, garbage removed after cleanings ewer, manholes and treatment

plants.

- Removal of debris, brick bats etc. After any repair work.
- Identifying locations where regular maintenance is needed (problem areas) in sewers and STP.
- Ensuring work is carried out correctly and safely with due regards to health and safety regulations.
- Adopting preventive maintenance within the sub division as a whole, conducting periodic staff meeting and record of the proceedings.

#### **6.4.3 PREVENTIVE MAINTENANCE**

In order to maintain the sewer system in satisfactory manner, desilting of manholes and sewers is to be done by any of the following methods suitable for the purpose.

- a) By manually by ball passing method
- b) By drag bucket machine
- c) By jet rodding machine

#### **6.4.4 BREAK DOWN MAINTENANCE**

The work of each sewer maintenance gang would consist of the following:

- 1) The house sewer obstruction and main sewer obstruction or any other related complaints to be attended with high priority.
- 2) There were line leaks/complaints are to be attended with high priority.
- 3) Any silt or mud removed during sewer cleaning operation shall be removed from the roads within 24 hours to approved location.

It shall be the responsibility of the O&M division to arrange for traffic control and to obtain permission from concerned agencies for traffic diversion etc for purpose of maintenance. All necessary precautions shall be taken. After the maintenance works are completed roads, cables, utilities etc shall be restored to the original condition.

#### **6.4.5 PERFORMANCE LEVEL TO BE ACHIEVED**

- a) Collection system shall be maintained without over flows from manholes/sewers on to streets or into storm water drains.
- b) Silt and trash removed from sewers during removal of block ages/routine cleaning of sewers shall be disposed off hygienically within 24hours.
- c) Preventive maintenance shall be carried out as per approved schedule.
- d) Duration of break down maintenance shall not exceed the specified norms.
- e) All safety precautions shall be taken in sewer maintenance`

#### **6.5 PROPOSED SEWERAGE SYSTEM O&M**

On completion of the construction, the system should be commissioned in phases. Trial commissioning and operation of all the components of the project shall be carried out in phases and any defects found during the period shall be attended immediately. The

following components require regular supervision, operation and maintenance.

- Sewerage Network.
- Pumping Stations.
- Sewage Treatment Plants.

## **6.6 SAFETY PRACTICES**

Sewer cleaning is an occupation that has an overall accident frequency rate that is relatively higher than any other industry. The employer has the responsibility of providing the worker with a safe place to work. Nevertheless, the worker has the overall responsibility and must ensure that it is a safe place to work. This can only be done by constantly thinking of safety and working safely. The worker has the responsibility of protecting not only himself, but also all other plant personnel or visitors by establishing safety procedures for the plant and then ensuring they are followed. He must train himself to analyse jobs, work areas and procedures from a safety stand point and learn to recognize potentiality hazardous actions or conditions. When he recognizes a hazard, he must take immediate steps to eliminate it through corrective action. If correction is not possible, guard against the hazard by proper use of warning signs and devices / by establishing and maintaining safety procedures. As an individual, the supervisor can be held liable for injuries or property damage, which results from an accident caused by his negligence.

## **6.7 O &M CHARGES**

O&M charges for 10 years (STP + Network) excluding centage and GST	Rs. 311369743.25
--	------------------

## **Chapter 7 IMPLIMENTATION OF THE PROJECT**

### **7.1 IMPLEMENTING AGENCY**

Kerala Water Authority is the responsible agency in Government sector in the water supply sector and sewerage Sector for implementation of Major Projects under various funding agencies AMRUTH, NABARD, Rebuild Kerala, ADB assistance, and also STATE PLAN Works. Being high value projects Implementation of sewerage projects also requires an agency with expertise and having sufficient human resources. Implementation can be done through concerned Project Divisions of KWA.

### **7.2 STEPS TO TAKEN WHILE TENDERING.**

Conditions should be incorporated in the NIT that detailed field survey and design of network shall be carried out for ascertaining the levels due to road developments if any and in order to accommodate the fact that sewer network design based on gravity flow and accurate levels with Total Station equipment along both sides of road and centre of road is required. Due to limitation of fund and time DGPS survey along one side of the road is only taken in the present proposal. Additional changes required for satisfactory completion of work additional sewer lines required with additional manholes, lifting stations required due to future developments in the scheme area shall also be included in the scope of work while implementing the project. Better and advanced technology for treatment to be considered for STP while implementing the project. Soil investigation of STP site, well sites not carried out as the land proposed are private lands. Hence detailed soil investigation is to be carried out and type of foundation of the structures to be changed accordingly.

### **7.3 INTEGRATION WITH OTHERPROJECTS**

Planning and design of sewerage schemes can be combined with other water projects. This is since most of these projects are inter-related and environment sensitive. Hence the location of an STP, collection wells and coverage of sewerage networks in an area depends upon the water supply system existing in that area, proximity of irrigation canals, water bodies and flood routing structures if any. Planning shall also be done for integrating with road development projects in the scheme area so as to execute all road reformation works after laying sewerage system.

### **7.4 SUPPORT ACTIVITIES**

It has been observed that in many cases of the implementation of the sewerage projects, public protests are experienced by the implementing agencies and authorities. This is because of the unawareness of the local people about the treatment process, disposal of sludge and re-use of treated sewage etc. In this regard, it is essential to educate the consumers to make them aware of the waste management process thereby encouraging them to come up with sewerage connections. The state government is promoting the waste management concept in all the possible ways. More support is needed from the Local Self Government Departments, Suchitwa Mission Kerala, Haritha Keralam Mission Kerala and all the other departments by organizing programmers for motivation public through seminars and awareness classes.

## 7.5 IMPLIMENTATION SCHEDULE

Proposed implementation Schedule is provided above. The project is proposed to complete within a period of two years.

Table 7.1 Implementation Schedule

	2022						2023					
	1 2	3 4	5 6	7 8	9 10	11 12	1 2	3 4	5 6	7 8	9 10	11 12
1 Appraisal of the report												
2 Sanction of the project												
3 Tendering, and awarding work												
4 Civil works												
5 Mechanical works												
6 Electrical and instrumentation works												
7 Sewer network and allied works												
8 Trial and commissioning												

## 7.6 ENVIRONMENTAL IMPACT MANAGEMENT

The project area is not falling under environmental sensitive zones. There are no natural reserve forests or parks or the presence of coastal belt. During the construction phase, the emissions from movement of vehicles used for project activity may affect the air quality due to the particulate matter generated during loading, transporting, unloading of materials during construction. Movement of heavy vehicles and concrete mixer would generate considerable noise in the surrounding environment. Hence a proper traffic managements plan is recommended during the construction activities. Sludge generated in the STP must be properly disposed off by transforming it into fertilizer products or bricks for low impact construction activities. Recycled water generated from the STP is to be used as per the guidelines already given. Regarding the positive impacts, it is to be noted that water quality of the rivers and streams will be greatly improved along with the general environment. The large quantity of recycled water will be useful for multiple purposes including agriculture.

## **Chapter 8 CONCLUSION AND RECOMMENDATION**

- The responsibility of providing sewerage systems rest with local bodies which can be facilitated by Kerala Water Authority. KWA has recently set up a Sewerage Vertical with four sewerage circles towards this. The idea and vision behind it are to visualize and materialize complete sewerage schemes for the State as it is vital for a safe environment. Moreover, there are directions from the Honourable National Green Tribunal (NGT) for ensuring the installation of Effluent Treatment Plants (ETPs), Common Effluent Treatment Plants (CETPs), Sewage Treatment Plants (STPs) and other pollution control measures. Hon. NGT has also directed to take necessary action to abate discharge of pollution into rivers (OA No. 673 of 2018).
- This proposal includes 4 MLD STP with MBBR technology at Pachakkad thuruth in Kasaragod Municipality, a sewer network of 21.01 km, 1046 manholes, one pumping station at Kargil road and 11 lifting stations. Manholes at 30 m intervals and at all intersections are proposed to facilitate maintenance operations. Septage load from entire Kasaragod Municipality is proposed to be transported to the 4 MLD STP where Co-treatment facility will be provided.
- The cost estimate of the project is excluding land cost. The fund for land has to be provided by the local bodies /Government, according to the source of funding for the scheme.
- If sufficient funds and lands are made available, the projects can be taken up by KWA and can be completed in 2 years. For efficient control of operation and maintenance a monitoring cell at institutional level is to be formed.
- For better performance of the system testing of influent samples, effluent samples after treatment from each unit is to be tested at regular intervals and modifications if any shall be made at the initial stage itself so as to ensure efficiency of individual units and effluent standards as per design.
- Better and advanced technology for treatment can be considered for STP while implementing the project.

## APPENDIX -I

DESIGN OF STP WITH MOVING BED BIOFILM-REACTOR (MBBR)						
Average flow	4	MLD				
Design flow	4.174	MLD	4173913	LPD	4174	m <sup>3</sup> /day
Working hours	23		4174	KLD	173.91	m <sup>3</sup> /hour
Assumed peak factor	2.5					
Peak design flow	9.39	MLD	9391304	LPD	9391	m <sup>3</sup> /day
					391.30	m <sup>3</sup> /hour
<b>Raw Sewage Characteristics</b>						
Average sewage flow entering the STP	173.91	m <sup>3</sup> /hour				
Peak flow entering the STP	391.30	m <sup>3</sup> /hour				
COD	400	mg/l				
Primary ST/ET effluent BOD	250	mg/l				
Thickener overflow return as fraction of plant flow	0.15					
Thickener overflow return	0.626	MLD				
Thickener overflow return BOD	500	mg/l				
Centrate from sludge dewatering as fraction of plant flow	0.006					
Centrate from sludge dewatering return	0.02504	MLD				
Centrate from sludge dewatering return BOD	380	mg/l				
Influent BOD to aeration tank	283.1	mg/l				
TSS	400	mg/l				
Total Nitrogen (As N)	40	mg/l				
Total Phosphorous (As P)	7	mg/l				
Faecal Coliform	30000000	mpn/100 ml				
E Coliform	40000000	mpn/100 ml				
Chlorides as Cl	125	mg/l				
pH	6					
<b>Treated Sewage Characteristics (after filtration)</b>						
COD	50	mg/l				
BOD	10	mg/l				
TSS	10	mg/l				
Total Nitrogen (As N)	9	mg/l				
Total Phosphorous (As P)	1	mg/l				
E Coliform	1000	mpn/100 ml				
pH	7					
<b>Receiving Chamber</b>						
Average quantity of flow	173.91	m <sup>3</sup> /hour				
Peak flow	391.30	m <sup>3</sup> /hour				
	0.109	m <sup>3</sup> /sec				
Average Retention Time for peak flow	30	sec	offset to wall	0.3	m	
Volume of the inlet chamber	3.26	m <sup>3</sup>	free board	0.5	m	
Assumed depth of flow	1.5	m	total height	1	m	
Area required for inlet chamber	2.17	m <sup>2</sup>	wall thickness	0.25	m	
Length of the tank	2.25	m	slab thickness	0.3	m	
Breadth of the tank	0.97	fix	1	m	area in m <sup>2</sup>	7.035
<b>Mechanical Coarse Screen Channel</b>						
Peak design flow	0.109	m <sup>3</sup> /sec				
Number of screen	1					
Peak flow rate per screen	0.109	m <sup>3</sup> /sec				
Velocity at peak flow	0.8	m/sec	assumed			
Velocity through clean bar screen	0.86	m/sec				
Length of channel U/S	1	m				
Width of channel provided	0.8	m				
Depth of flow	0.17	m				
Area required for screen	0.136	sqm				
Headloss through bar screen	0.01	m	assuming head loss coefficient = 0.7			
Assumed depth of flow after inserting bar screen	0.2	m	0.18	(control value)		
Width of channel required	0.68	m	fix	1	m	
Clear bar spacing	20	mm	(20 to 50 mm)			
Bar thickness	10	mm	(5 to 15 mm)			
Number of bars	25					
Clear bar spacing obtained	31	mm	OK			
Inside width of screen (openings)	0.75	m				



Full height of channel	1	m	fb	0.5		
Angle of inclination	70	degree	1.22	rad		
Actual velocity at peak flow	0.82	(between 0.60 m/sec and 0.90 m/sec)				
Length of channel required D/S	2.74	m	fix	2.75	m	3.75
<b>Manual Coarse Screen Channel</b>						
Peak design flow	0.1087	m <sup>3</sup> /sec				
Number of screen	1					
Peak flow rate per screen	0.109	m <sup>3</sup> /sec				
Velocity at peak flow	0.8	m/sec	assumed			
Velocity through clean bar screen	0.90	m/sec				
Length of channel U/S	1	m	wall thickness	0.25	m	
Width of channel provided	0.8	m	offset to wall	0.25	m	
Depth of flow	0.17	m	slab thickness	0.30	m	
Area required for screen	0.136	sqm				
Headloss through bar screen	0.01	m	assuming head loss coefficient = 0.7			
Assumed depth of flow after inserting bar screen	0.2	m	0.18	(control value)		
Width of channel required	0.68	m	fix	1	m	
Clear bar spacing	20	mm	(20 to 50 mm)			
Bar thickness	10	mm	(5 to 15 mm)			
Number of bars	25					
Clear bar spacing obtained	31	mm	OK			
Inside width of screen (openings)	0.75	m			area in m <sup>2</sup>	7.5
Full height of channel	1	m	fb	0.3		
Angle of inclination	70	degree	1.22	rad		
Actual velocity at peak flow	0.80	(between 0.60 m/sec and 0.90 m/sec)				
Length of channel required D/S	2.74	m	fix	2.75	m	
<b>Mechanical Fine Screen Channel</b>						
Peak design flow	0.109	m <sup>3</sup> /sec				
Number of screen	1					
Peak flow rate per screen	0.109	m <sup>3</sup> /sec				
Velocity at peak flow	0.8	m/sec	assumed			
Velocity through clean bar screen	1.10	m/sec				
Length of channel U/S	1.75	m	wall thickness	0.25	m	
Width of channel provided	0.6	m	offset to wall	0.25	m	
Depth of flow	0.23	m	slab thickness	0.30	m	
Area required for screen	0.14	sqm				
Headloss through bar screen	0.04	m	assuming head loss coefficient = 0.7			
Assumed depth of flow after inserting bar screen	0.25	m	0.27	(control value)		
Width of channel required	0.54	m	fix	1	m	
Clear bar spacing	6	mm	(up to 6 mm)			
Bar thickness	10	mm	(5 to 15 mm)			
Number of bars	63					
Clear bar spacing obtained	6.0	mm				
Inside width of screen (openings)	0.37	m				
Full height of channel	1	m	fb	0.5		
Angle of inclination	45	degree	0.79	rad		
Actual velocity at peak flow	1.10	(between 0.60 m/sec and 1.20 m/sec)				
Length of channel required D/S	1.00	m	fix	1	m	2.75
<b>Daily screening quantity</b>						
Daily sewage quantity	4174	m <sup>3</sup> /day				
Rate of screening quantity	0.015	m <sup>3</sup> /1000 m <sup>3</sup>				
Daily screening quantity	0.0626	m <sup>3</sup> /day				
<b>Grit Separator Chamber</b>						
Number of grit units	1	SB	1			
Peak flow	0.1087	m <sup>3</sup> /sec				
Flow in one unit	0.1087	m <sup>3</sup> /sec				
Grit particle size	0.2	mm				
HRT	90	sec	(45 to 90 sec, typical 60)			
Volume of grit chamber	9.78	m <sup>3</sup>				
SOR	900	m <sup>3</sup> /m <sup>2</sup> /day	(empirical, from observations)			
	0.010	m <sup>3</sup> /m <sup>2</sup> /sec				
Area required	10.43	m <sup>2</sup>	wall thickness	0.25	m	
SWD	2.00	m	slab thickness	0.30	m	

Side of square channel	3.23	m	offset to wall	0.3	m	
Fix length	3.3	m	freeboard	0.5	m	
Fix width	3.3	m	area given	10.89	m <sup>2</sup>	OK
Shape factor	0.85		volume given	21.78	m <sup>3</sup>	OK
Specific gravity of liquid	2.65					
Kinematic viscosity	1.003E-06	m <sup>2</sup> /sec				
V <sub>p</sub> in m/sec	0.036		let $N_r < 1$ , apply Stoke's law to get terminal velocity $v_p$			
N <sub>r</sub>	6		apply Newton's equation			
assumed velocity in m/sec	0.0146					
N <sub>r</sub>	2				area in m <sup>2</sup>	19.36
drag coefficient Cd	11.95					
v <sub>p</sub> in m/sec	0.019					
Critical displacement velocity, V <sub>c</sub>	0.0190	m/sec		R <sub>t</sub>	1.65	
Horizontal velocity of flow, V <sub>h</sub>	0.0165	m/sec	OK	R <sub>v</sub>	1.15	
<b>Equalisation Tank</b>						
Number of units	1					
Average design flow	173.91	m <sup>3</sup> /hour				
Volume of tank required	843.00	m <sup>3</sup>	from detailed analysis			
HRT	4.85	hours	free board	0.50	m	
SWD	3.5	m	offset to wall	0.45	m	
Area required for each tank	240.86	m <sup>2</sup>	wall thickness	0.3	m	
Diameter of circular tank	17.51	m	fix	18	m	
Side if square tank	15.52	m	fix length	16	m	
Thickness of foundation slab	0.45	m	fix breadth	16	m	
Actual capacity provided	890.6	m <sup>3</sup>	circular	OK		
	896.00	m <sup>3</sup>	rectangular	OK	area in m <sup>2</sup>	306.25
<b>Sewage pump- for pumping to MBBR tank</b>						
Number of pumping system	1	SB		1		
Type of pump set	fugal sewage transfer-non clog					
Average flow	4173.91	m <sup>3</sup> /day				
Peak design flow	9391.30	m <sup>3</sup> /day				
Flow capacity of each pump	173.91	m <sup>3</sup> /hour				
Peak factor	1.20					
Discharge	57.97	LPS	0.0580	m <sup>3</sup> /sec		
Head required	12	m				
Efficiency	50%					
Power required	18.55	HP	fix	19	HP	
Energy	318.29	kwh				
<b>Moving Bed Bio-Reactor (MBBR)-Single Stage</b>						
Number of tanks proposed	1					
Average design flow/tank	4173.91	m <sup>3</sup> /day				
Number of streams	1					
BOD of incoming sewage	283.11	mg/l				
TSS of incoming sewage	400	mg/l				
BOD expected after treatment	10	mg/l				
BOD to be removed	273.11	mg/l				
BOD removal % expected	96.47					
BOD loading rate/volume	4	kg/m <sup>3</sup> /day	4-7 kg/m <sup>3</sup> /day as per M&E			
Actual BOD loading rate	1181.69	kg/day				
Quantity of BOD to be removed per day	1139.95	kg/day				
Volume of reactor required	295.42	m <sup>3</sup>				
Surface area loading rate (SALR) for BOD removal	7.50	g/m <sup>2</sup> /day				
Required carrier surface area	157559.20	m <sup>2</sup>				
Specific surface area of carrier	450.00	m <sup>2</sup> /m <sup>3</sup>				
Required carrier volume	350.13	m <sup>3</sup>				
Volume of media required	40%					
	118.17	m <sup>3</sup>	depth of base	0.9	m	
Volume of tank required-BOD loading rate/volume method	413.59	m <sup>3</sup>	slab thickness	0.35	m	
Volume of tank required- SALR method	875.33	m <sup>3</sup>	offset to wall	0.45	m	
Volume of each tank	875.33	m <sup>3</sup>	total height	3.50	m	
SWD	4	m	wall thickness	0.30	m	

Area of each tank	218.83	m <sup>2</sup>	fix dia	17.2	m	
Diameter of circular tank	16.69	m	length	15	m	
Side of square tank	14.79	m	breadth	15	m	
Actual capacity provided-circular	929.41	m <sup>3</sup>	OK			
Actual capacity provided-rectangular	900.00	m <sup>3</sup>	OK			
Fix capacity	924.16	m <sup>3</sup>				
Actual volume of media obtained	369.66	m <sup>3</sup>				
Actual carrier surface area	166348.80	m <sup>2</sup>				
Volume of liquid in the tank	776.29	m <sup>3</sup>				
Hydraulic Retention Time at design average flow	4.46	hours	267.8	minutes		
Hydraulic Retention Time at peak flow	1.98	hours	119.0	minutes		
SARR for the given SALR	6.94	g/m <sup>2</sup> /day			area in m <sup>2</sup>	272.25
Estimated BOD removal rate	1154.04	kg/day				
Actual BOD removal rate %	97.66	BOD of effluent	6.62	mg/l	ok	
<b>Moving Bed Bio-Reactor (MBBR)-Single Stage Nitrification</b>						
Number of tanks proposed	1					
Average design flow/tank	4173.91	m <sup>3</sup> /day				
Number of streams	1					
BOD of incoming sewage	10.00	mg/l				
NH <sub>4</sub> -N of incoming sewage	40.00	mg/l				
Alkalinity as CaCO <sub>3</sub>	140.00	mg/l				
Target effluent NH <sub>3</sub> -N	3.30	mg/l	% removal	91.75		
DL level to be maintained in tank	2.00	mg/l				
Design minimum waste water temperature	20.00	° C				
SARR <sub>max</sub>	0.61		SARR temp coefft. Θ	1.058		
Minimum NH <sub>3</sub> -N at SARR <sub>max</sub>	0.50		SARR <sub>T</sub>	0.81	g/m <sup>2</sup> /day	
Design value of SALR	0.88	g/m <sup>2</sup> /day				
NH <sub>3</sub> -N loading rate	166.96	kg/day				
Required carrier surface area	189431.10	m <sup>2</sup> /day				
Specific surface area of carrier	600.00	m <sup>2</sup> /m <sup>3</sup>				
Required carrier volume	315.72	m <sup>3</sup> /day	depth of base	0.65	m	
Volume of media required	40%		slab thickness	0.35	m	
Volume of tank required- SALR method	789.30	m <sup>3</sup>	offset to wall	0.45	m	
Volume of each tank	789.30	m <sup>3</sup>	total height	3.50	m	
SWD	4	m	wall thickness	0.30	m	
Area of each tank	197.32	m <sup>2</sup>	fix dia	16	m	
Diameter of circular tank	15.85	m	fix length	15	m	
Side of square tank	14.05	m	fix breadth	15	m	
Actual capacity provided-circular	804.25	m <sup>3</sup>	OK			
Actual capacity provided-rectangular	900.00	m <sup>2</sup>	OK			
Fix capacity	804.25	m <sup>3</sup>				
Actual volume of media obtained	321.70	m <sup>3</sup>				
Actual carrier surface area	193020.00	m <sup>2</sup>			area in m <sup>2</sup>	272.25
Volume of liquid in the tank	675.57	m <sup>3</sup>				
Hydraulic Retention Time at design average flow	3.88	hours	233.07	minutes		
Hydraulic Retention Time at peak flow	1.73	hours	103.59	minutes		
Estimated NH <sub>3</sub> -N removal rate	156.08	kg/day				
NH <sub>3</sub> -N of effluent	2.60	mg/l				
BOD SALR	0.22	g/m <sup>2</sup> /day	<i>should be &lt; 0.5 to achieve good nitrification</i>			
Using the equivalent weight of CaCO <sub>3</sub> as 50, the equivalent weight of NaHCO <sub>3</sub> as 84, the alkalinity use for nitrification as 7.14 g CaCO <sub>3</sub> /g NH <sub>3</sub> -N and the target effluent alkalinity as 80 mg/L as CaCO <sub>3</sub> , give the calculated alkalinity requirement as 118.5 mg/L as CaCO <sub>3</sub> .						
Influent alkalinity	140.00	mg/l				
Target effluent alkalinity	80.00	mg/l				
Alkalinity used for Nitrification	7.14	g CaCO <sub>3</sub> /g NH <sub>3</sub> -N				
Alkalinity to be added	202.04	mg/l				
Rate of alkalinity addition needed as CaCO <sub>3</sub>	843.29	kg/day				
Equiv wt. of CaCO <sub>3</sub>	50.00	g/equivalent				
Equiv wt. of NaHCO <sub>3</sub>	84.00	g/equivalent				

Daily NaHCO <sub>3</sub> requirement	1416.73	kg/day NaHCO <sub>3</sub>			
<b>Blower air requirement</b>					
BOD loading/tank	1181.69	kg/day			
NH <sub>3</sub> -N loading rate/tank	166.96	kg/day			
Oxygen uptake ratio-BOD	<b>1.50</b>	kg of O <sub>2</sub> /kg of BOD			
Oxygen uptake ratio-NH <sub>3</sub> -N	<b>4.35</b>	kg of O <sub>2</sub> /kg of NH <sub>3</sub> -N			
Oxygen required for BOD loading	1772.54	kg/day			
Oxygen required for NH <sub>3</sub> -N loading	726.26	kg/day			
Percentage of O <sub>2</sub> in air	<b>21.00</b>				
Weight of air required-BOD loading	8440.67	kg/day			
Weight of air required-NH <sub>3</sub> -N loading	3458.39	kg/day			
Density of air	<b>1.225</b>	kg/m <sup>3</sup>			
Volume of air-BOD loading	6890.34	m <sup>3</sup> /day			
Volume of air-NH <sub>3</sub> -N loading	2823.17	m <sup>3</sup> /day			
Air transfer efficiency of diffuser	<b>0.100</b>				
Quantity of air required-BOD loading	68903.44	m <sup>3</sup> /day			
Quantity of air required-NH <sub>3</sub> -N loading	28231.72	m <sup>3</sup> /day			
Factor of safety	<b>1.10</b>				
Volume of air required-BOD loading	3158.07	m <sup>3</sup> /hour			
Volume of air required-NH <sub>3</sub> -N loading	1293.95	m <sup>3</sup> /hour			
Volume of equalisation tank	843.00	m <sup>3</sup>			
Normal inflow	0.048	m <sup>3</sup> /sec			
Air requirement for equalisation tank	<b>1.25</b>	m <sup>3</sup> /m <sup>3</sup> /hour			
Air requirement for sludge tank	<b>3.00</b>	m <sup>3</sup> /m <sup>3</sup> /hour			
Volume of ET	843.00	m <sup>3</sup>			
Volume of air required for ET	1053.75	m <sup>3</sup> /hour			
Volume of air required for ST	22.41	m <sup>3</sup>			
Total air required	5528.19	m <sup>3</sup> /hour			
Capacity of blower	5528.00	m <sup>3</sup> /hour			
Number of blowers working	<b>1.00</b>	SB	<b>1</b>		
Air required per blower	5528.00	m <sup>3</sup> /hour			
Pressure given	<b>0.60</b>	kg/cm <sup>2</sup>	5.89	m	
Volumetric efficiency	<b>70%</b>				
Power required for blower motor	173.36	HP	175.00	kw	
Fix power of blower motor	<b>175.00</b>	HP			
Energy/tank	3103.85	kwh			
<b>Alum solution tank</b>					
number of units	<b>1</b>				
dosage of alum	<b>50</b>	ppm			
requirement for 8 hours	69.570	kg			
volume of solution at 10% strength/unit	0.630	m <sup>3</sup>			
length of tank	<b>1</b>	m			
breadth of tank	<b>1</b>	m			
liquid depth	0.63	m			
total depth	<b>1</b>	m			
solution flow rate	0.0788	m <sup>3</sup> /hour			
<b>Lime solution tank</b>					
number of units	<b>1</b>				
dosage of lime	<b>35</b>	ppm			
requirement for 8 hours	48.7	kg			
volume of solution at 10% strength/unit	0.45	m <sup>3</sup>			
length of tank	<b>1</b>	m			
breadth of tank	<b>1</b>	m			
liquid depth	0.45	m			
total depth	<b>0.75</b>	m			
solution flow rate	0.05625	m <sup>3</sup> /hour			
<b>Secondary Clarifier</b>					
No. of Tanks	<b>1</b>				
Average Flow in each tank	4173.91	m <sup>3</sup> /day			
SOR	25.00	m <sup>3</sup> /m <sup>2</sup> /day			

SWD	2.80	m				
Solid conc. In settled sludge -%	0.8 to 0.9	%				
Withdrawal frequency - continuous						
Area Required for the Tank	166.96	m <sup>2</sup>				
Diametre Required for Secondary Settling Tank	14.58	m				
Assumed Detention Period	3.10	hrs				
Volume	539.13	m <sup>3</sup>		FB		0.5
Depth of the Clarifier assumed	2.80	m				
Area of the Clarifier	192.55	m <sup>2</sup>				
Provide Secondary Clarifier of Diametrer	15.70	m				
Surface Loading Rate	21.68	m <sup>3</sup> /m <sup>2</sup> /day		OK		
Check for Peak flow	48.77	m <sup>3</sup> /m <sup>2</sup> /day		OK		
<b>Sludge Sump</b>						
Number of units	1					
Average flow/tank	4173.91	m <sup>3</sup> /day				
TSS	400	mg/l				
BOD	283.11	mg/l				
Assumed TSS Sludge	30%					
Assumed BOD Sludge	35%					
Sludge generated-TSS	500.9	kg/day				
Sludge generated-BOD	413.6	kg/day				
Total sludge	914.46	kg/day				
% sludge with 1.02 specific gravity	10%					
Sludge volume per day/tank	89.65	m <sup>3</sup> /day				
	3.74	m <sup>3</sup> /hour				
Assumed HRT	2	hours	freeboard	0.35	m	
Volume of tank	7.47	m <sup>3</sup>	slab thickness	0.3	m	
Assumed SWD	2	m	offset to wall	0.3	m	
Area of the tank	3.74	m <sup>2</sup>	wall thickness	0.25	m	
Diameter of circular tank	2.18	m	fix	2.2	m	
Actual capacity provided	7.60	m <sup>3</sup>			area in m <sup>2</sup>	3.30
<b>Pump for Sludge transfer to Thickner</b>						
Number of pumps	1.00	W	1	SB		
Specific gravity of liquid	1.03					
Type of pump set	fugal sewage transfer-non clog					
Working hours	5.00	hours				
Discharge required	17.93	m <sup>3</sup> /hour	0.004981	m <sup>3</sup> /sec		
Required head	15.00	m				
Velocity in sludge transfer pipe adopted	0.70	m/sec				
Pipe diameter required	95.18	mm	fix	100	mm	
Efficiency	50%					
Power required	1.99	HP	fix	2.00	HP	
Energy	7.43	kwh				
<b>Sludge Thickener</b>						
Number of units	1					
Total sludge	914.46	kg/day				
Solids Loading Rate	40	kg/m <sup>2</sup> /day				
Thickening area required	22.86	m <sup>2</sup>				
Surface Loading Rate	12	m <sup>3</sup> /m <sup>2</sup> /day				
Thickening area required	7.47	m <sup>2</sup>	freeboard	0.35	m	
Maximum area	22.86	m <sup>2</sup>	slab thickness	0.35	m	
Area of distribution chamber	20%		offset to wall	0.35	m	
Total area required	27.43	m <sup>2</sup>	wall thickness	0.3	m	
Diameter of circular tank	5.91	m	fix	6.2	m	
Thickening area available	30.19	m <sup>2</sup>				
SWD	2.5	m				
Actual volume provided	75.48	m <sup>3</sup>				
Thickened sludge consistency	3%	of total sludge volume				
Thickened sludge volume	27.43	m <sup>3</sup> /day			area in m <sup>2</sup>	7.50
<b>Pump for Sludge transfer to Centrifuge</b>						
Type of pump set	Screw pump					
Number of pumps	1.00	W	1	SB		

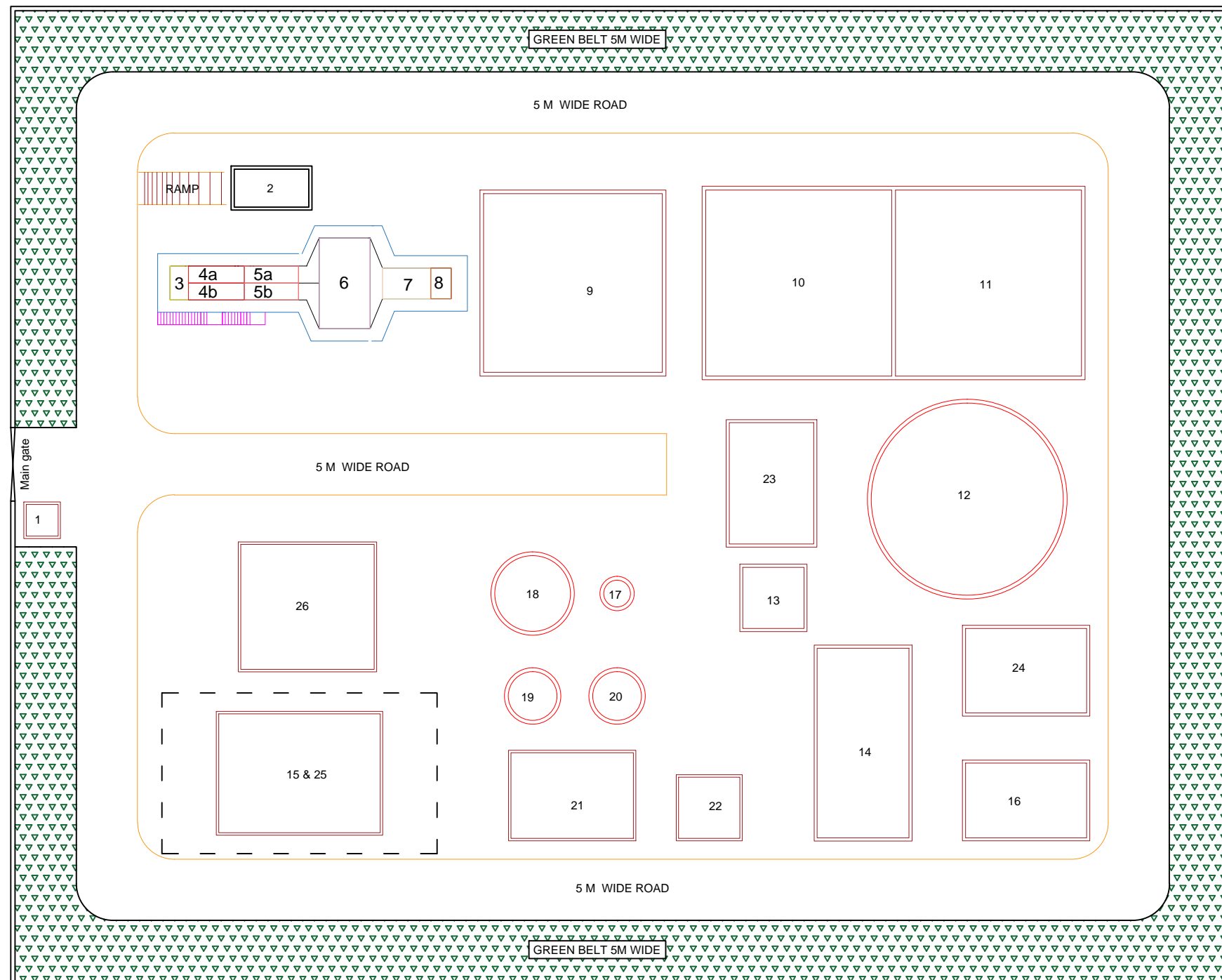
Volume of thickened sludge to be pumped	27.43	m <sup>3</sup> /day				
Working hours of centrifuge	5.00	hours				
Discharge required	5.49	m <sup>3</sup> /hour	1.5E-03	m <sup>3</sup> /sec		
Head required	15.00	m				
Efficiency	50%					
Power required	0.61	fix	1.00	HP		
Energy	2.274	kwh				
<b>Sludge Centrifuge and Dosing Tanks</b>						
Number of centrifuges	1	SB	1			
Capacity of centrifuge	0.25	m <sup>3</sup> /hour				
Poly electrolyte dosing for centrifuge & thickener	10%					
Sludge volume	914.46	kg/day				
Dose	2	kg/1000 kg				
Quantity of Poly Electrolyte	1.83	kg/day				
Concentration	0.1					
Volume of tanks @ 24 hour	1.83	m <sup>3</sup>				
	1828.92	litres				
Volume	76.21	litres/hour				
Volume required for 8 hours	0.61	m <sup>3</sup>				
Liquid depth of tank	1	m				
Area required	0.61	m <sup>2</sup>				
side of square tank	0.78	m	fix	0.8	area in m <sup>2</sup>	1.28
<b>Chlorine contact tank</b>						
HRT	30	minutes	offset to wall	0.3	m	
Average flow	173.91	m <sup>3</sup> /hour	wall thickness	0.25	m	
Volume of tank	86.96	m <sup>3</sup>	slab thickness	0.35	m	
Assumed liquid depth	2.5	m	freeboard	0.35	m	
Area of the tank	34.78	m <sup>2</sup>			area in m <sup>2</sup>	50.41
side of square tank	5.90	m	fix	6	m	
<b>Filter feed tank</b>						
HRT	20	minutes	offset to wall	0.3	m	
Average flow	173.91	m <sup>3</sup> /hour	wall thickness	0.25	m	
Volume of tank	57.97	m <sup>3</sup>	slab thickness	0.3	m	
Assumed liquid depth	2.5	m	freeboard	0.35	m	
Area of the tank	23.19	m <sup>2</sup>				
side of square tank	4.82	m	fix length	5	m	
			fix breadth	5	m	
Volume provided	62.50	OK			area in m <sup>2</sup>	37.21
<b>Pressure Sand Filter</b>						
Number of units	2					
Average flow/filter	2086.96	m <sup>3</sup> /day				
Filter operating hours	20	hours				
Operating flow/filter	104.35	m <sup>3</sup> /hour				
Filter Loading Rate	12	m <sup>3</sup> /m <sup>2</sup> /hour				
Area of the filter required	8.70	m <sup>2</sup>				
Area of each filter	8.70	sqm				
Diameter of filter required	3.33	m	fix	3.4	m	
Height of the filter	2.5	m	offset to wall	0.5	m	
Operating pressure	3.5	Bar				
Filter media	Sand				area in m <sup>2</sup>	38.72
<b>Activated Carbon Filter</b>						
Number of units	2					
Average flow/filter	2086.96	m <sup>3</sup> /day				
Filter operating hours	20	hours				
Operating flow/filter	104.35	m <sup>3</sup> /hour				
Filter Loading Rate	10	m <sup>3</sup> /m <sup>2</sup> /hour				
Area of the filter required	10.43	m <sup>2</sup>				
Area of each filter	10.43	sqm				
Diameter of filter required	3.64	m	fix	3.7	m	
Height of the filter	2.5	m	offset to wall	0.5	m	
Operating pressure	3.5	Bar				
Filter media	Activated Carbon				area in m <sup>2</sup>	44.18

<b>Pump for clarified water to PSF and ACF</b>						
Type of pump set	CF					
Number of pumps	<b>2.00</b>	W	<b>1</b>	SB		
Discharge of clarified water required/pum set	0.00	m <sup>3</sup> /hour				
Working hours of pumps	<b>20.00</b>	hours				
Discharge required/pump set	0.00	m <sup>3</sup> /hour	0.0E+00	m <sup>3</sup> /sec		
Head required	<b>40.00</b>	m				
Efficiency	<b>60%</b>					
Power required	0.00	fix	<b>30.00</b>	HP		
Energy	0.00	kwh				
<b>Treated Water Tank</b>						
HRT	<b>60</b>	minutes	offset to wall	<b>0.3</b>	m	
Average flow	173.91	m <sup>3</sup> /hour	wall thickness	<b>0.3</b>	m	
Volume of the tank	173.9	m <sup>3</sup>	slab thickness	<b>0.35</b>	m	
Assumed liquid depth	<b>3</b>	m	freeboard	<b>0.35</b>	m	
Area of the tank	57.97	m <sup>2</sup>				
Number of tanks	<b>1</b>		fix length	<b>9.8</b>	m	
Area of one tank	57.97	m <sup>2</sup>	fix breadth	<b>6</b>	m	
Side of square tank	7.61	m				
Volume provided	176.40	m <sup>3</sup>	OK			

NO	DESCRIPTION	Size
1	SECURITY ROOM	
2	SEPTAGE TANK	6.00x6.00x3.00
3	RECIVING CHAMBER & COLLECTION WELL	5.00
4 a	COARSE SCREEN CHANNEL-MECHANICAL	2.75 x 1
4 b	COARSE SCREEN CHANNEL-MANUAL	2.75 x 1
5 a	FINE SCREEN CHANNEL-MECHANICAL	2.75 x 1
5 b	FINESCREEN CHANNEL-MANUAL	2.75 x 1
6	GRIT CHAMBER	3.00x3.00x2.50
7	PARSHALL FLUME	3.00x2.00
8	DISTRIBUTION CHAMBER	2.00x2.00
9	EQUALISATION TANK	14.60x14.60x4.50

10	MBBR 1	15.20x15.20
11	MBBR 2	15.20x15.20
12	SECONDARY SETTING TANK	15.70 <del>15.70</del>
13	FILTER FEED TANK	5.0x5.0x2.85
14	PSF/ACF	
15	DG ROOM	
16	TREATED WATER TANK	5.0x5.0x2.85
17	SLUDGE SUMP	2.2 <del>2.2</del>
18	SLUDGE THICKNER	6.2 <del>6.2</del>
19	CENTRATE SUMP	4.0 <del>4.0</del>

20	THICKNED SLUDGE SUMP
21	CENTRIFUGE BUILDING
22	SLUDGE SHED
23	AIR BLOWER ROOM
24	CHLORINATION ROOM
25	TRANSFORMER YARD
26	ADMINISTRATIVE BUILDING



### GENERAL NOTES

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE

### PROJECT NAME

SEWERAGE SCHEME TO KASARAGOD  
MUNICIPALITY (PHASE-1) -  
CONSTRUCTION OF 4 MLD CAPACITY  
SEWAGE TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

### DRAWING TITLE

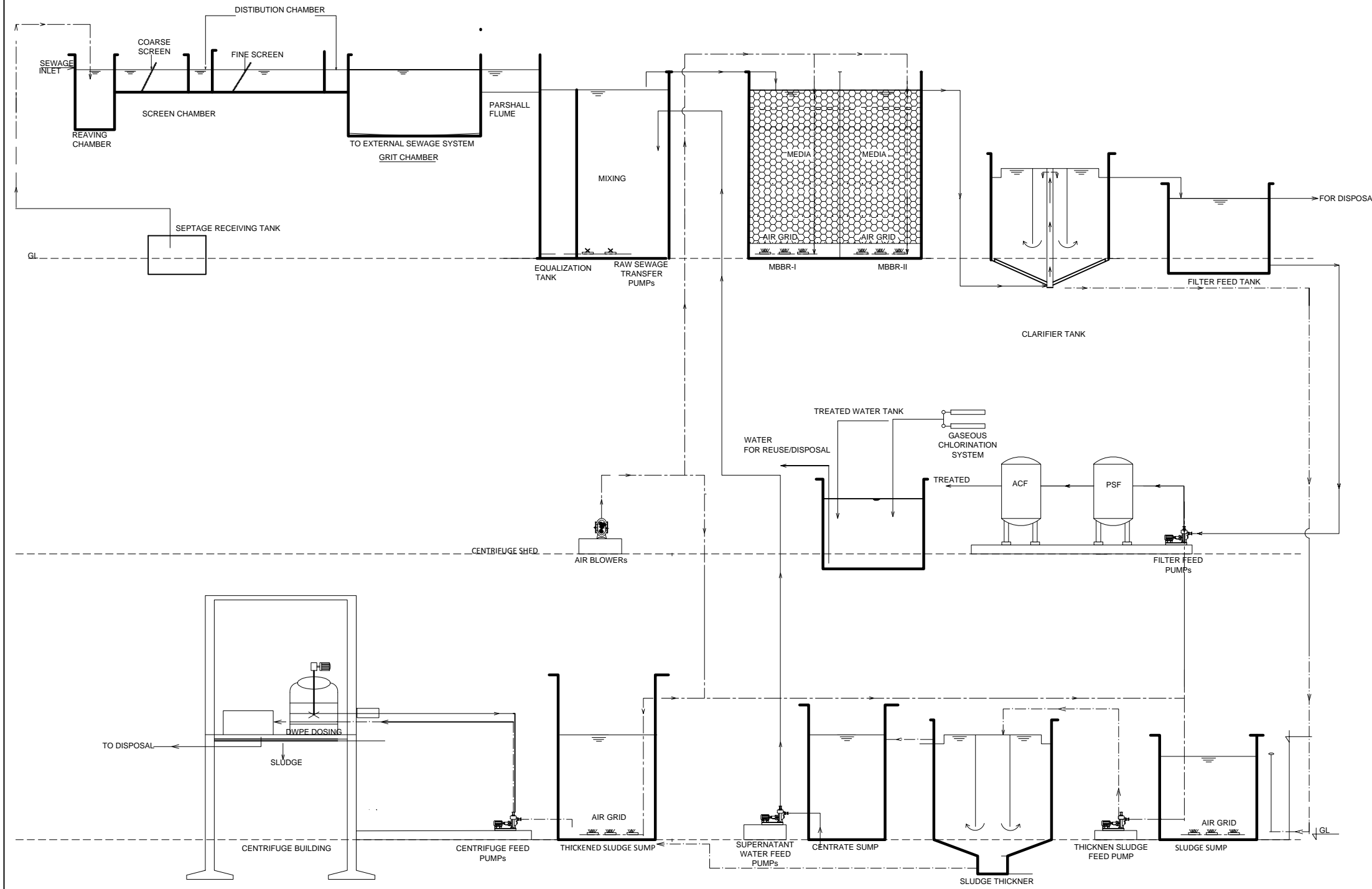
STP LAYOUT

DWG No :- KSD/PHASE -1 / 1

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----





**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-1) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

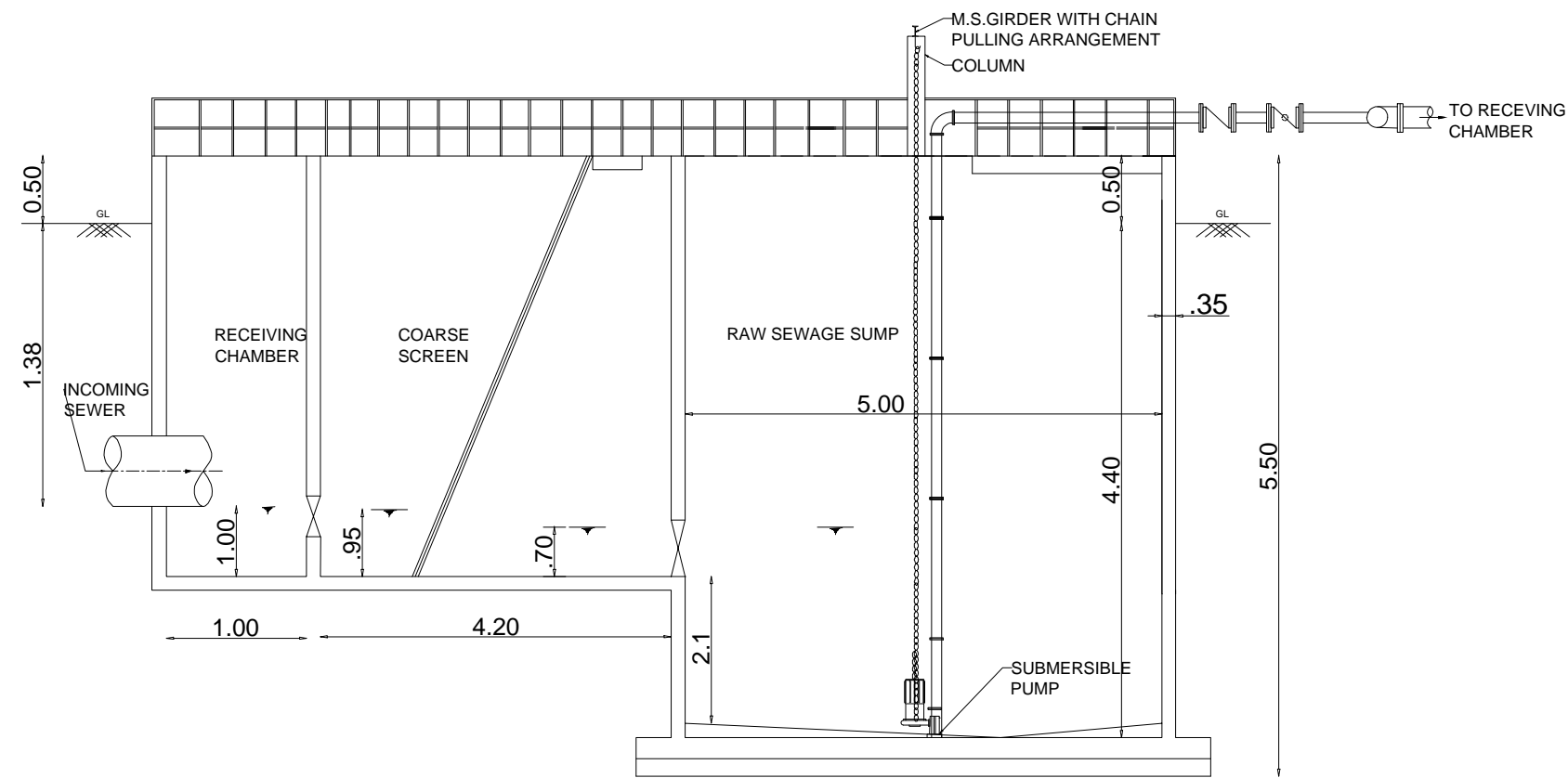
**DRAWING TITLE**

HYDRAULIC FLOW DIAGRAM

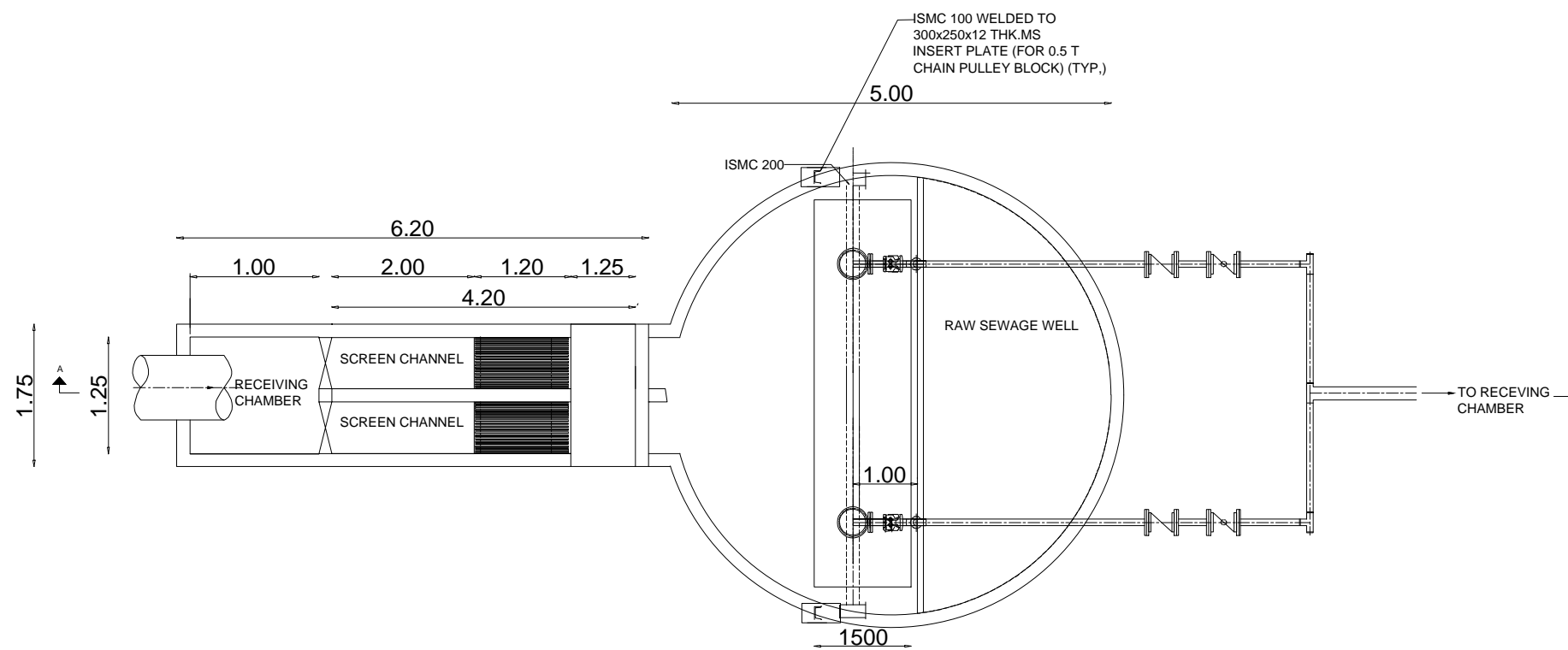
**DWG No :- KSD/PHASE -1 / 2**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



**SECTION  
: A-A**



**PLAN**

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO KASARAGOD MUNICIPALITY (PHASE-1) - CONSTRUCTION OF 4 MLD CAPACITY SEWAGE TREATMENT PLANT AT PACHAKADU THURUTHU AND LAYING SEWERAGE NET WORK

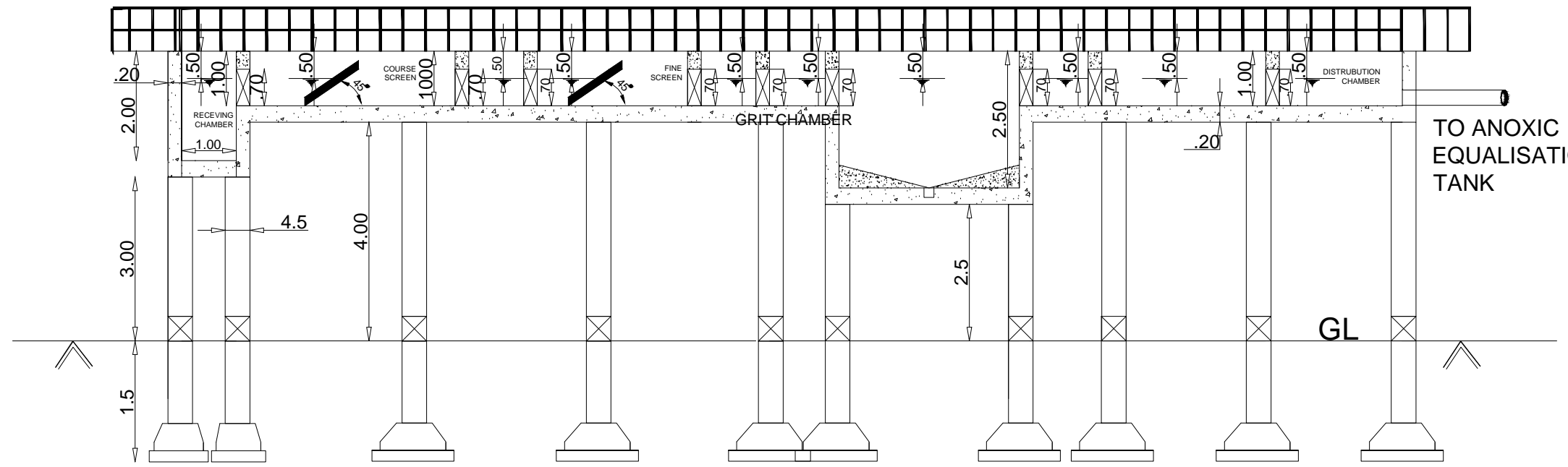
**DRAWING TITLE**

DETAILS OF RECEIVING CHAMBER  
SCREEN RAW SEWAGE WELL

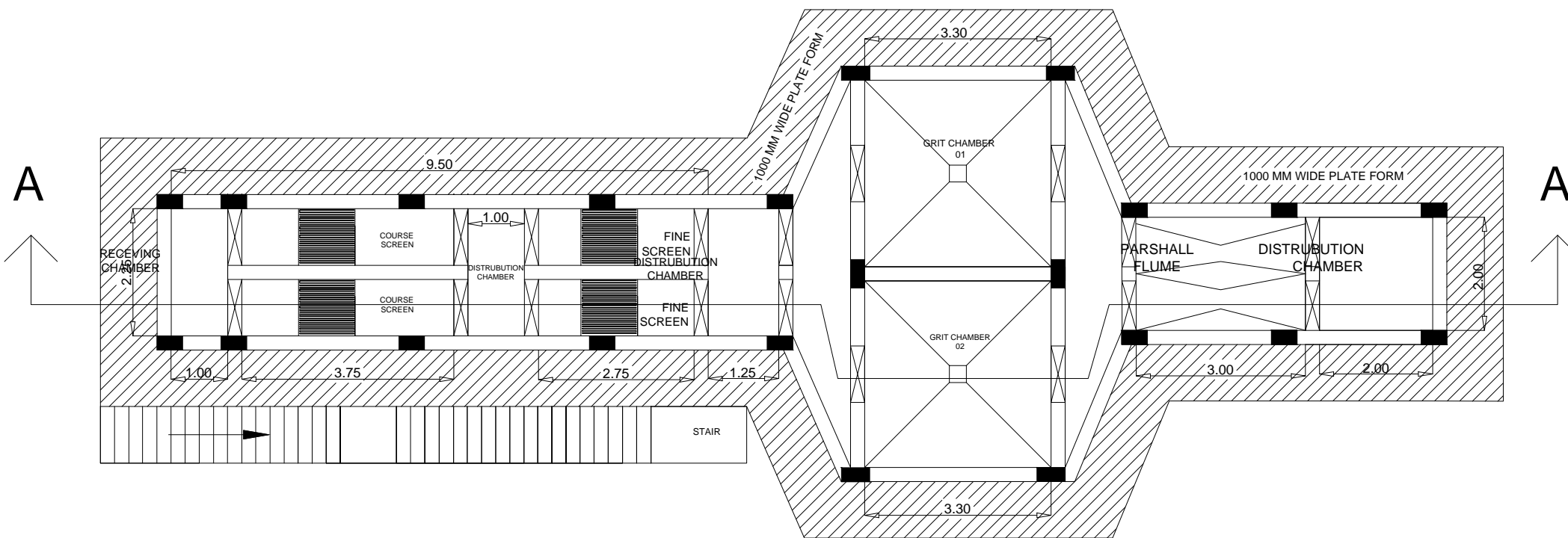
**DWG No :- KSD/PHASE -1 / 3**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



SECTION: A-A



PLAN

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-1) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

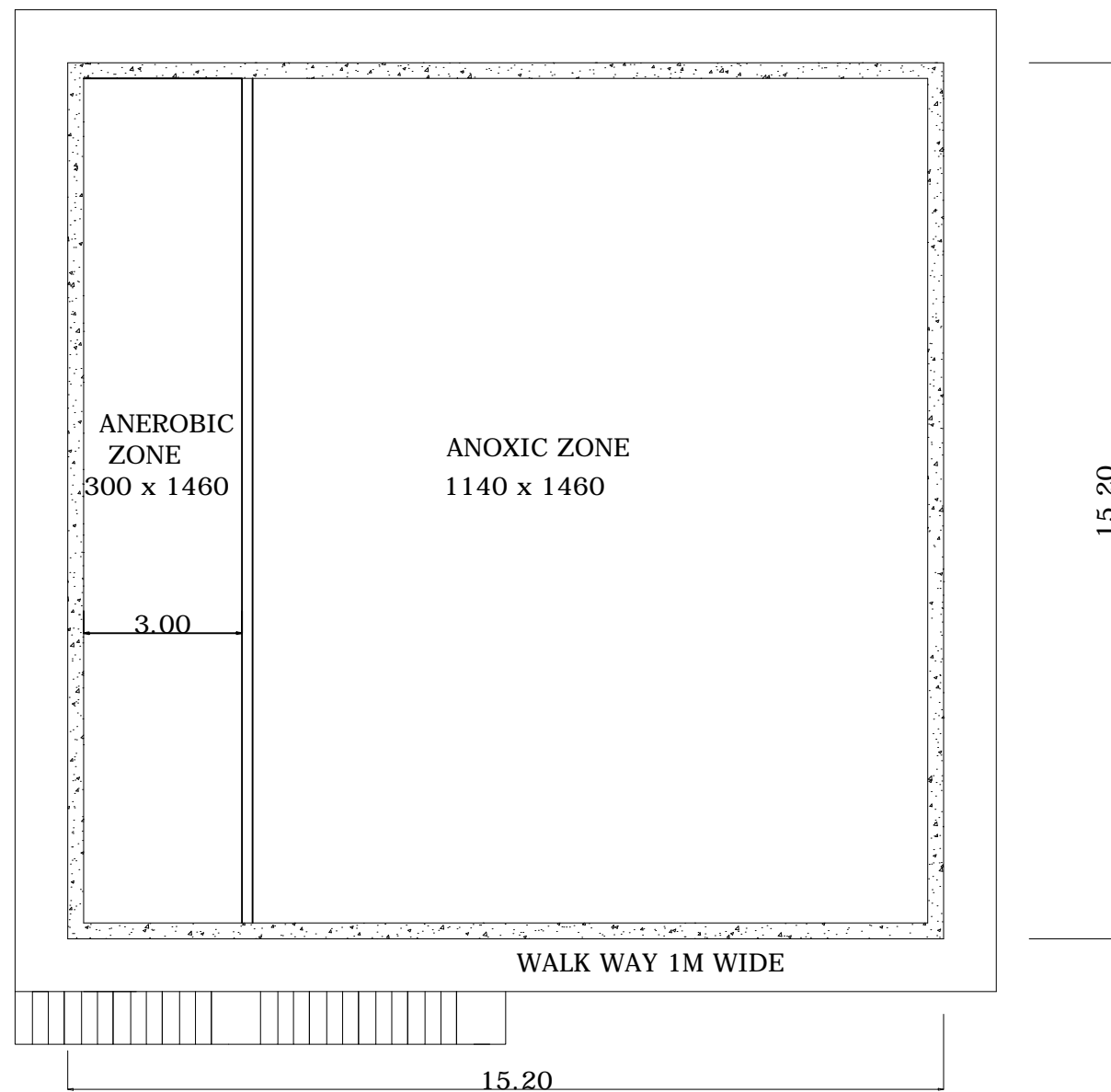
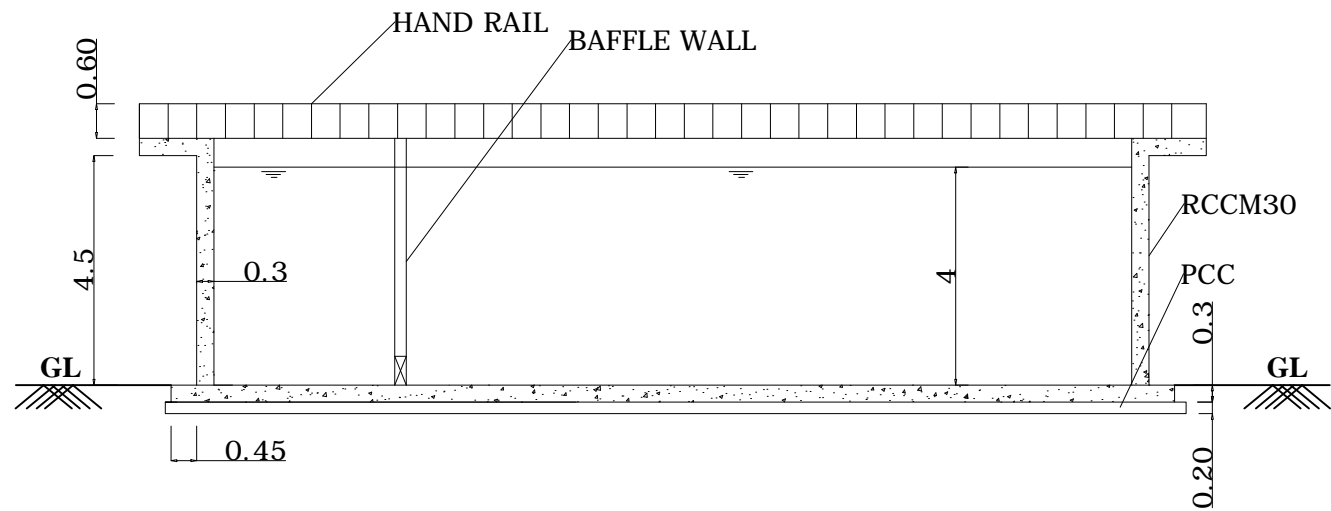
**DRAWING TITLE**

DETAILS COURS & FINE SCREEN, GRIT  
CHAMBER & DISTRIBUTION CHAMBER

**DWG No :- KSD/PHASE -1 / 4**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE, KERALA  
WATER AUTHORITY, KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO KASARAGOD  
MUNICIPALITY (PHASE-1) - CONSTRUCTION  
OF 4 MLD CAPACITY SEWAGE TREATMENT  
PLANT AT PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

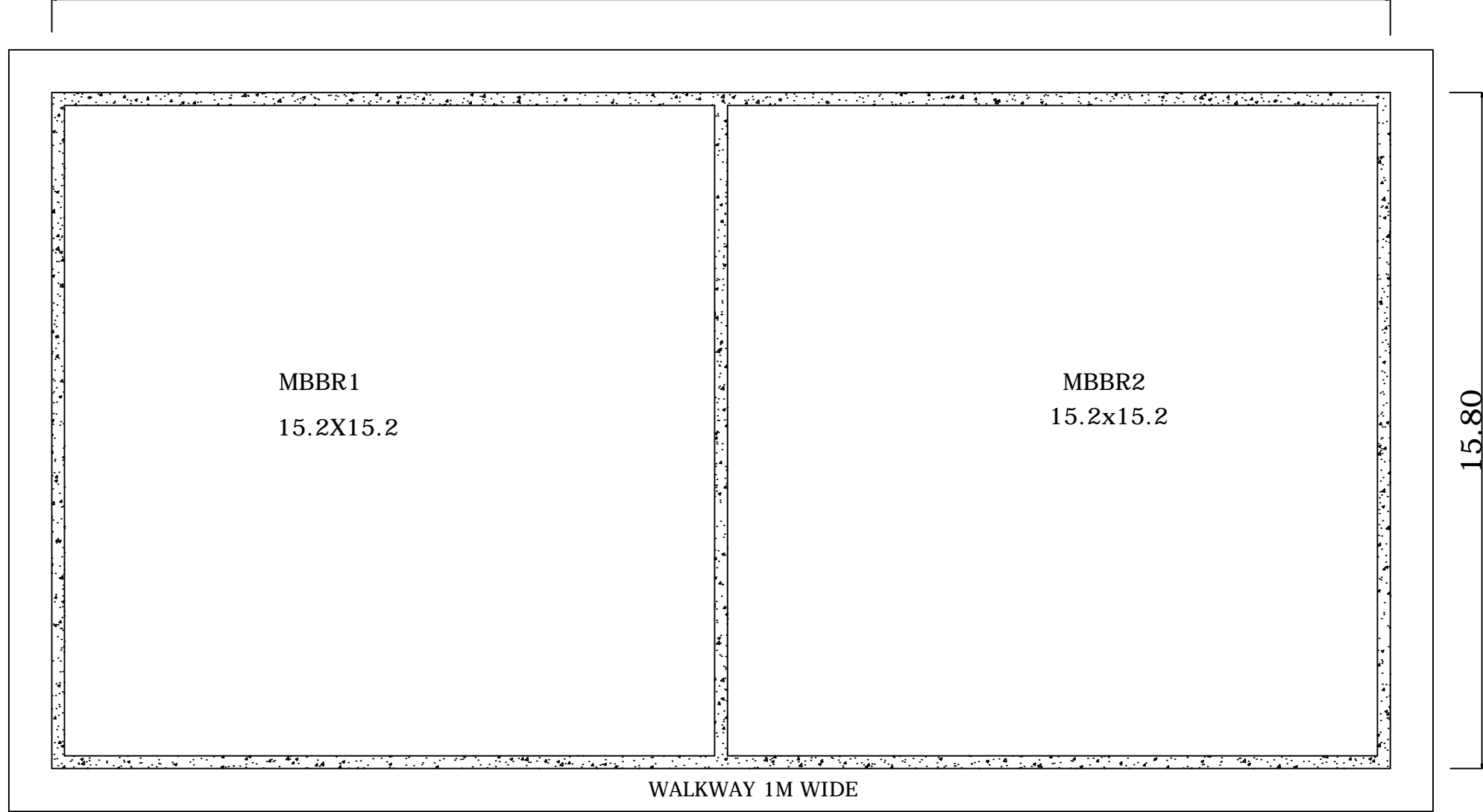
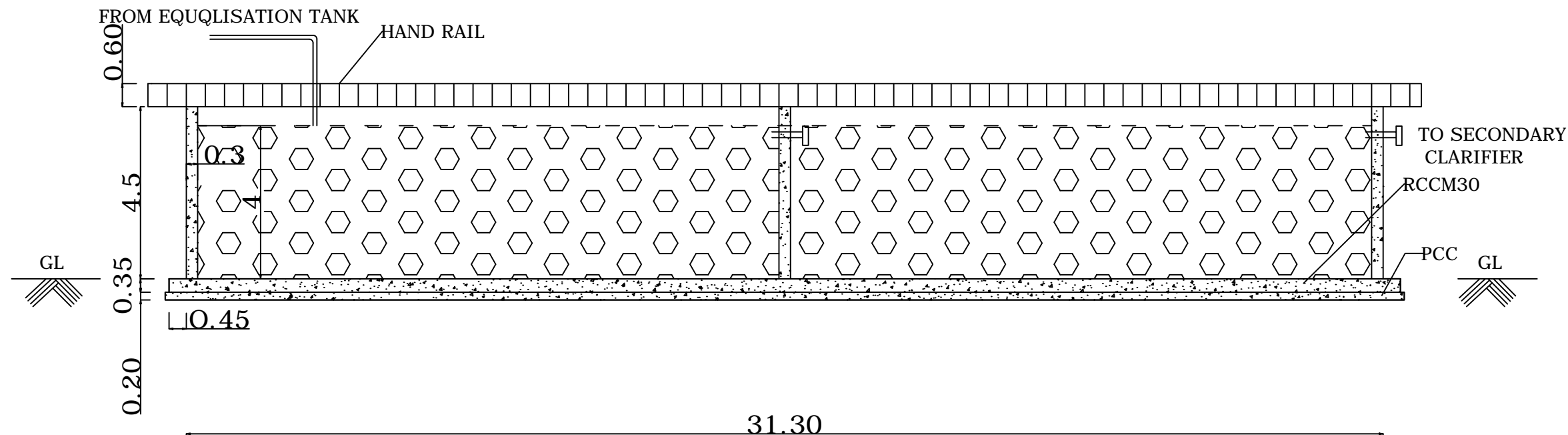
**DRAWING TITLE**

EQUALIZATION TANK

**DWG No :- KSD/PHASE -1 / 5**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE, KERALA  
WATER AUTHORITY, KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO KASARAGOD MUNICIPALITY (PHASE-1) - CONSTRUCTION OF 4 MLD CAPACITY SEWAGE TREATMENT PLANT AT PACHAKADU THURUTHU AND LAYING SEWERAGE NET WORK

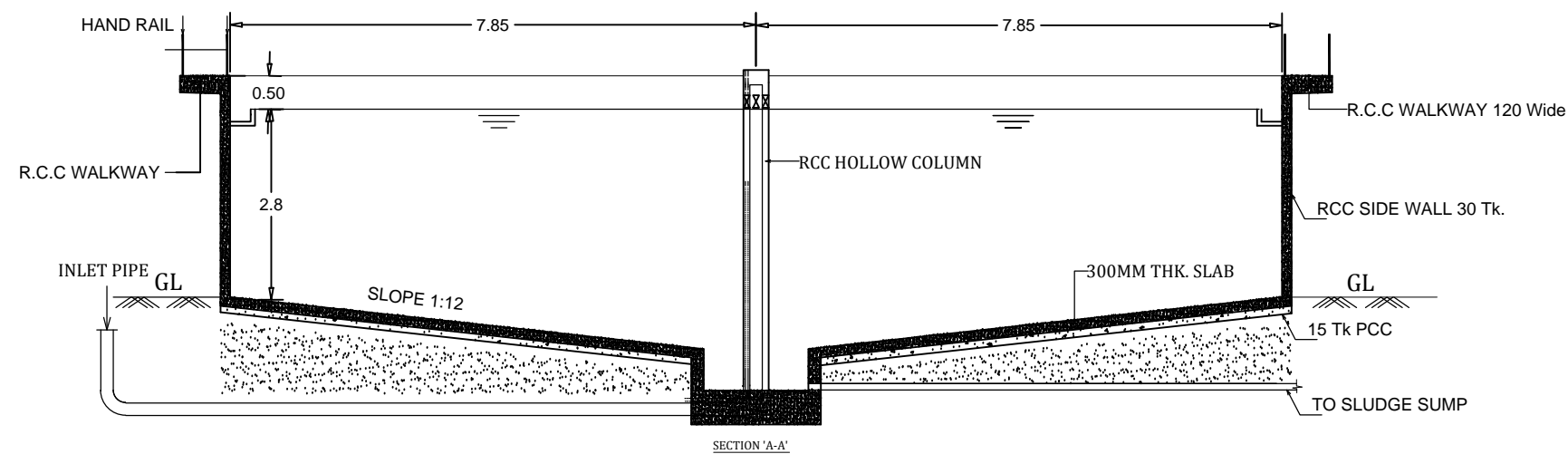
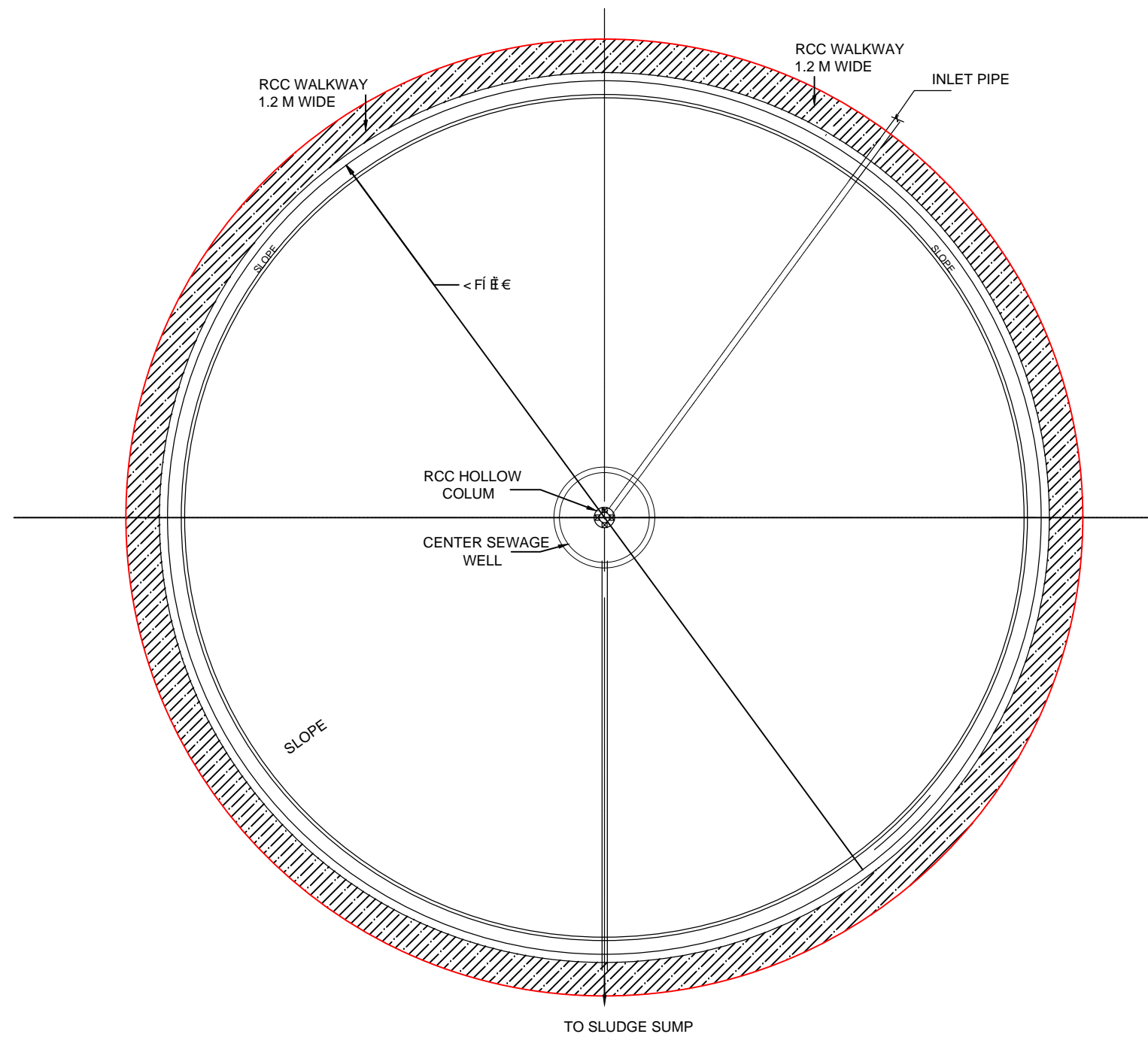
**DRAWING TITLE**

MBBR TANK 1&2

**DWG NO :- KSD/PHASE -1 / 6**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-1) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

**DRAWING TITLE**

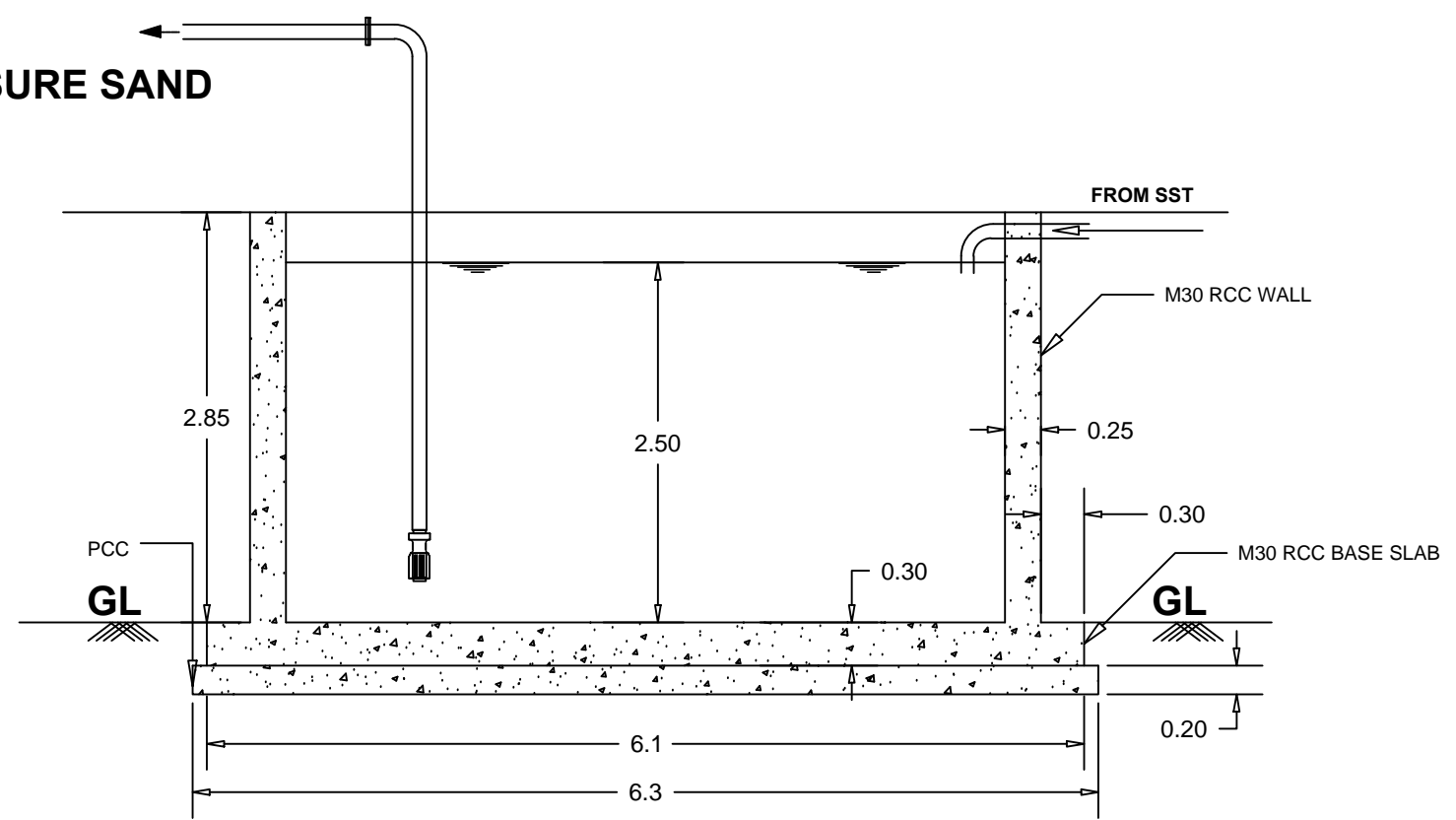
SECONDARY CLARIFIER TANK

**DWG NO :- KSD/PHASE -1 / 7**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----

**TO PRESSURE SAND FILTER**



**SECTION AA**



**PLAN**

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-1) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

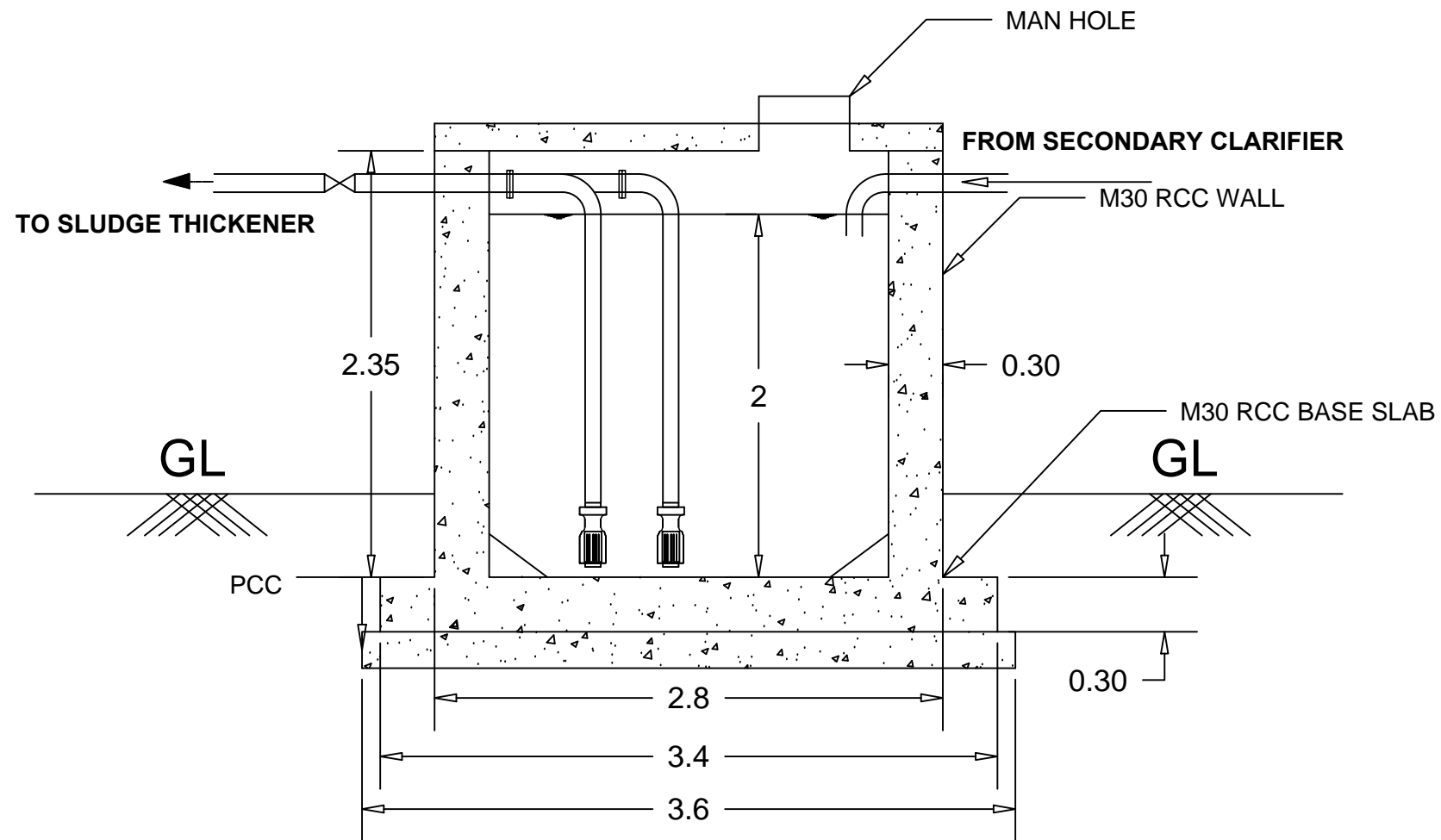
**DRAWING TITLE**

FILTER FEED TANK

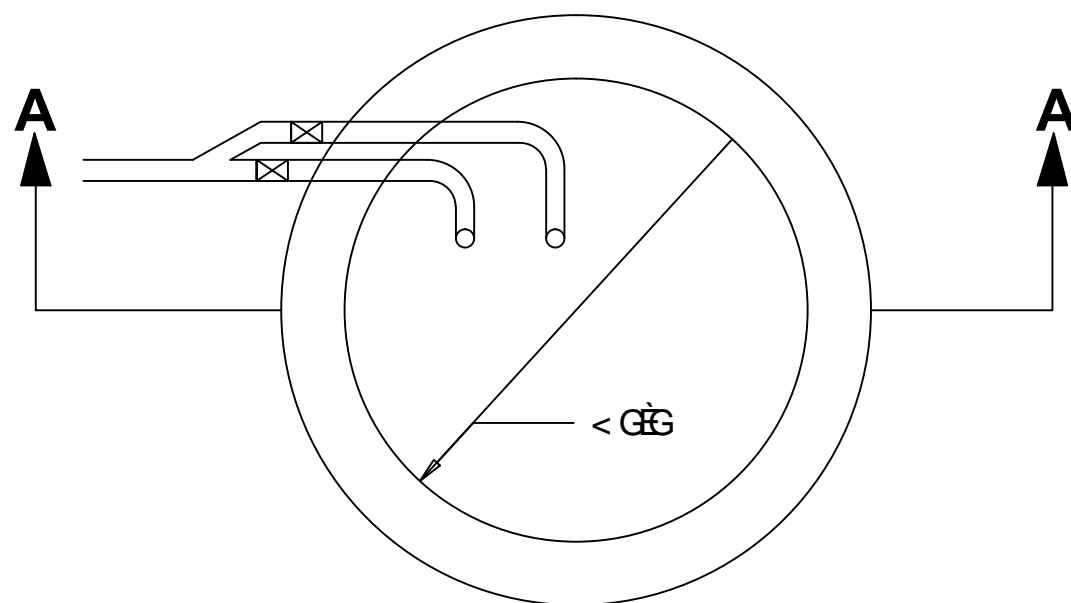
**DWG NO :- KSD/PHASE -1 / 8**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



**SECTION AA**



**PLAN**

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-1) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

**DRAWING TITLE**

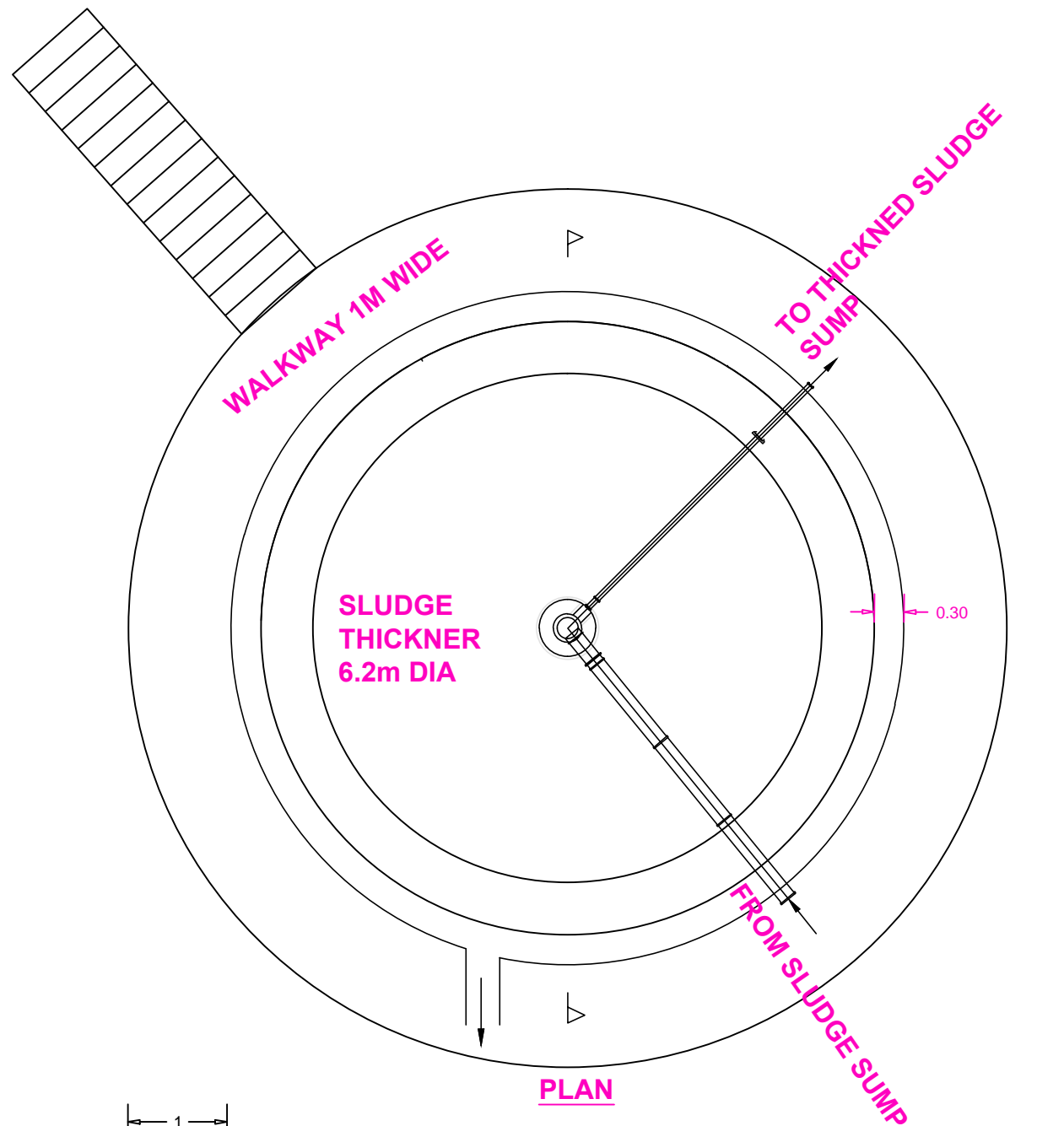
SLUDGE SUMP

**DWG NO :- KSD/PHASE -1 / 9**

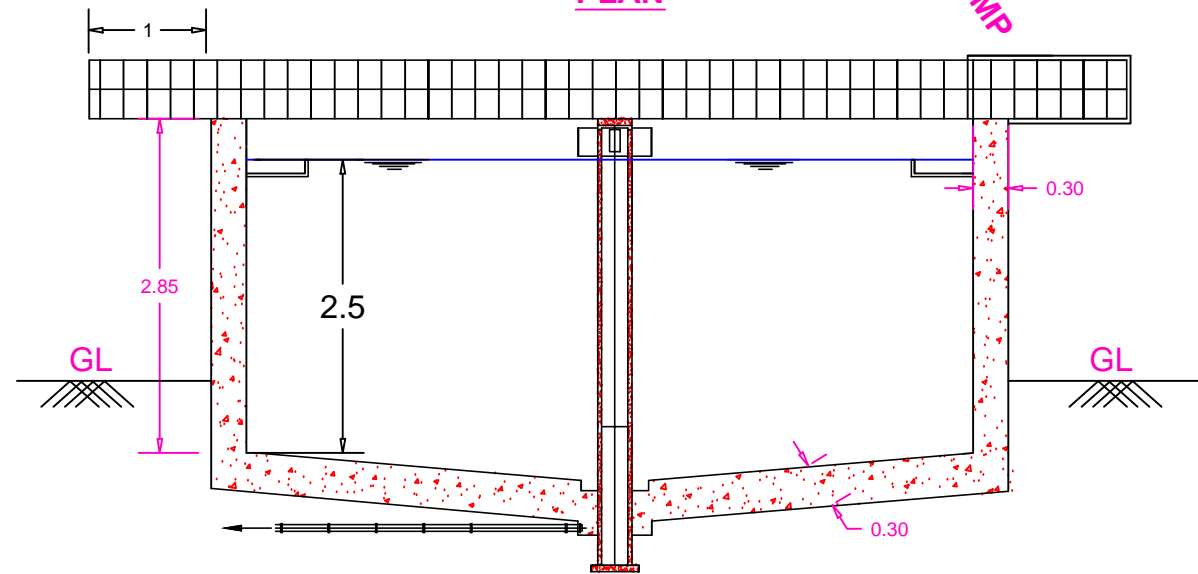
Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----





**PLAN**



**TO THICKENED  
SLUDGE SUMP**

**SECTION AA**

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Rivision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-1) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

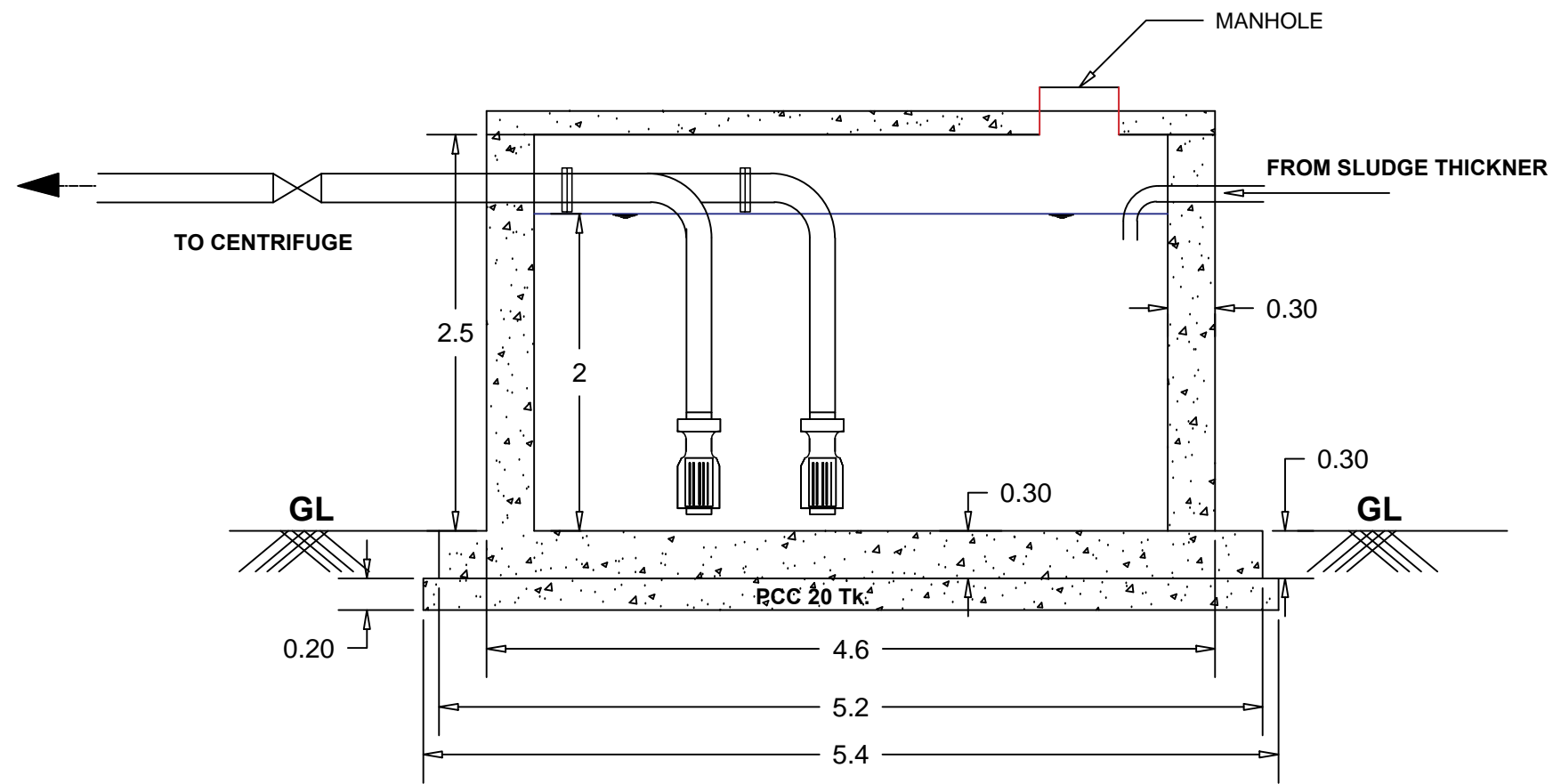
**DRAWING TITLE**

SLUDGE THICKNER

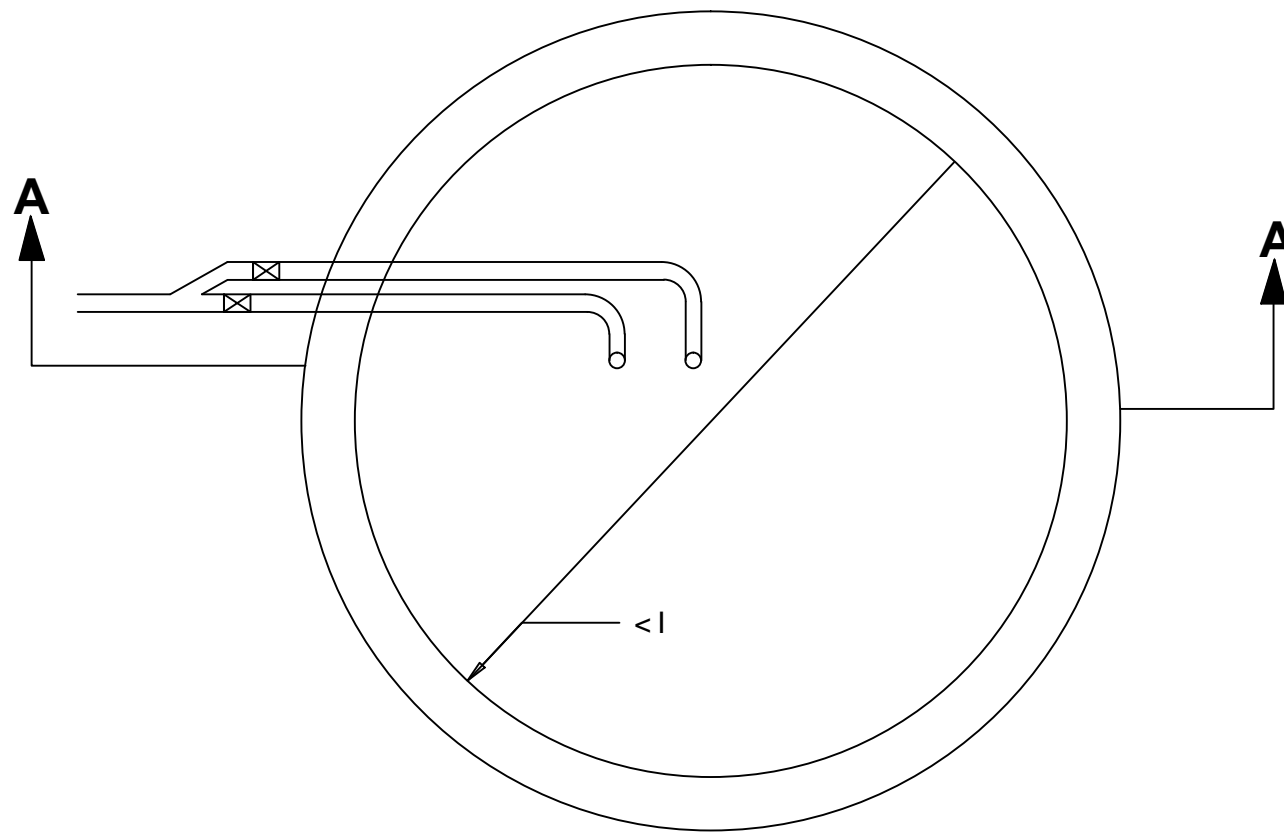
**DWG NO :- KSD/PHASE -1 / 10**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



**SECTION AA**



**PLAN**

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-1) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

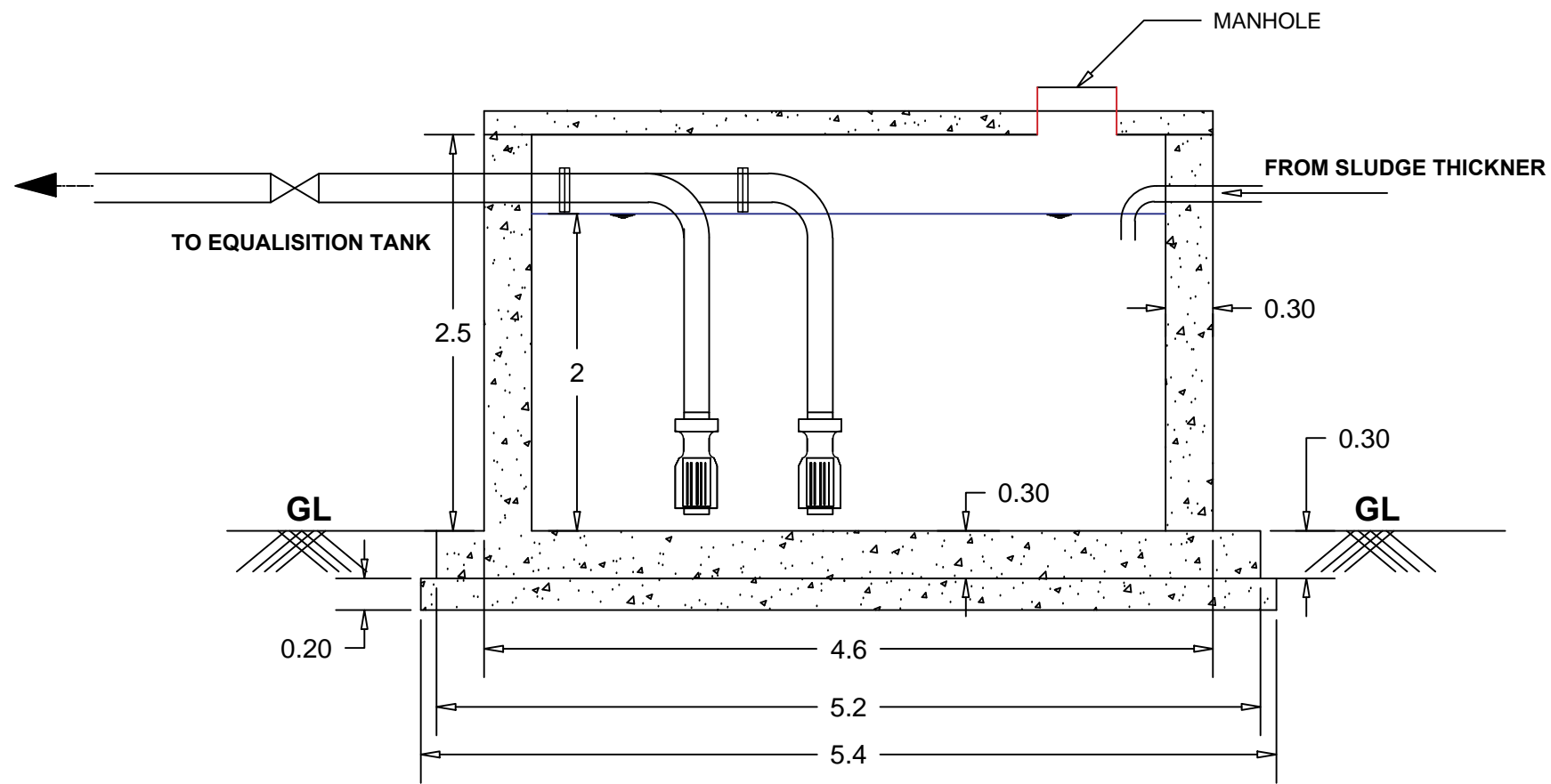
**DRAWING TITLE**

THICKNED SLUDGE SUMP

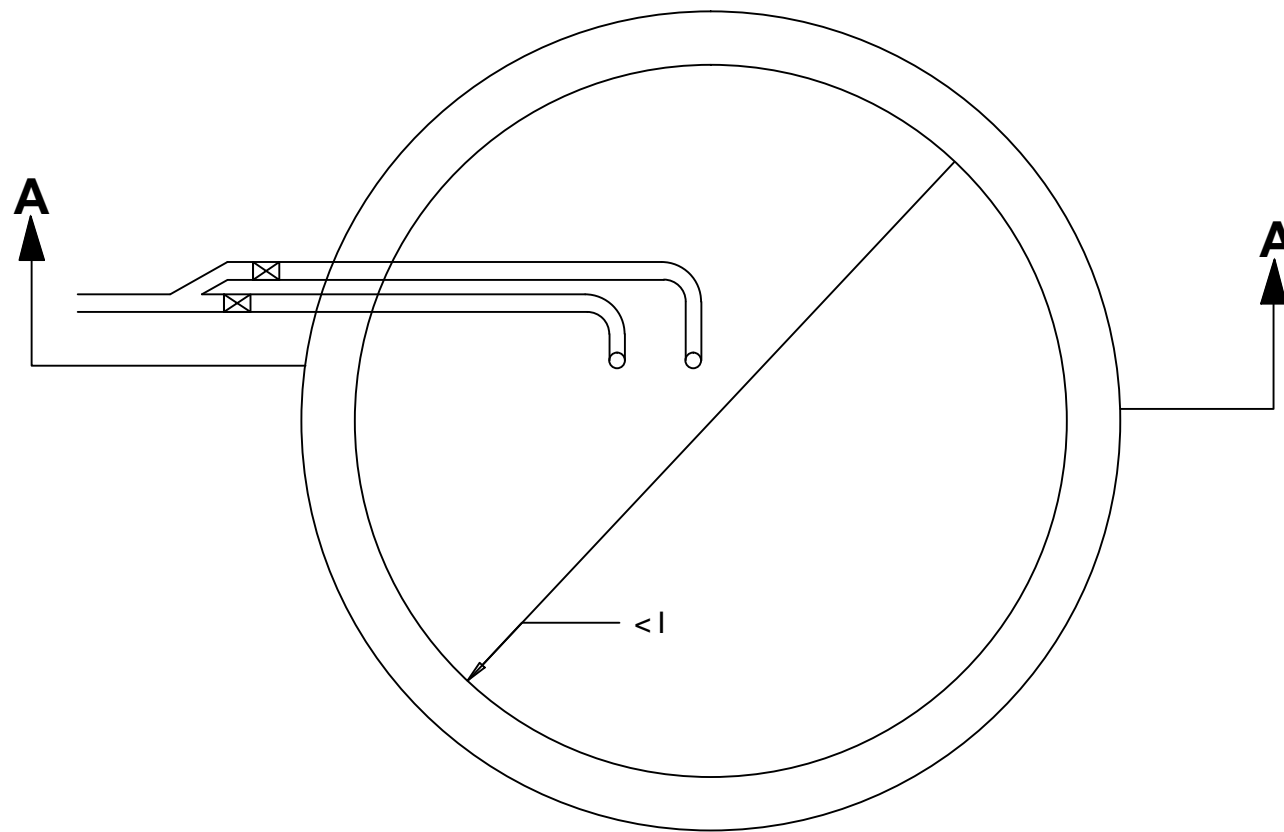
**DWG NO :- KSD/PHASE -1 / 11**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



**SECTION AA**



**PLAN**

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-1) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

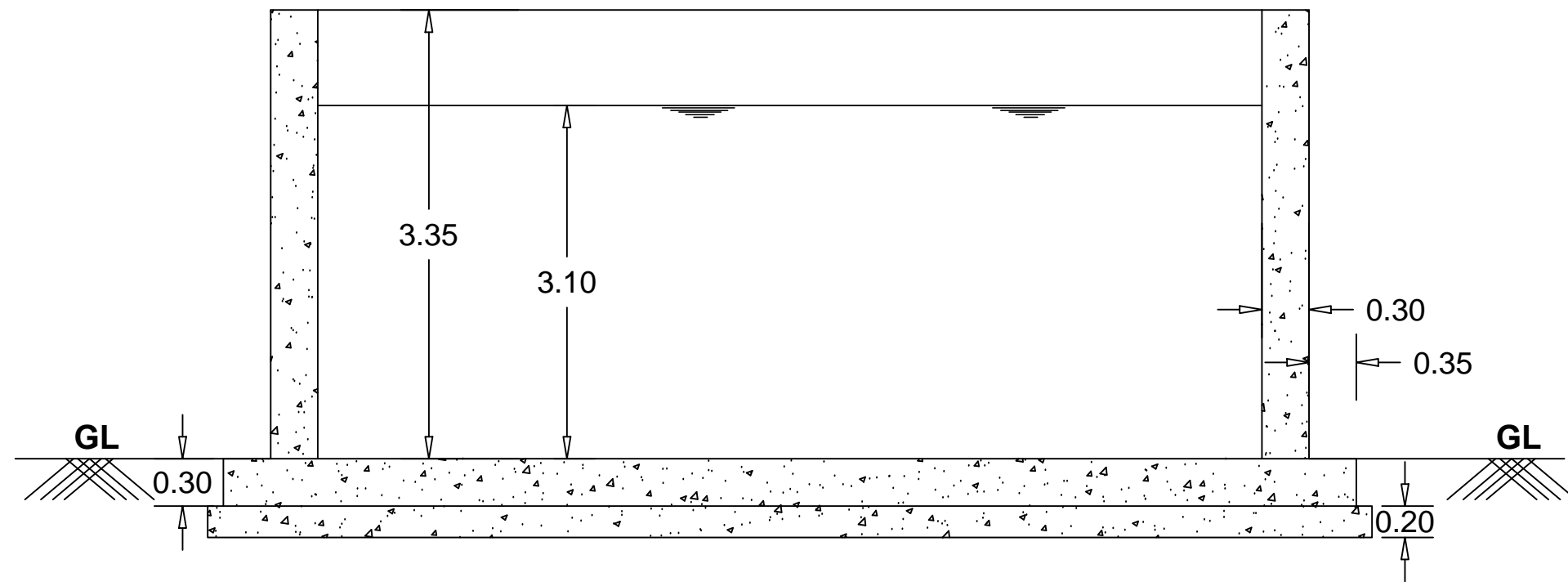
**DRAWING TITLE**

CENTRATE SUMP

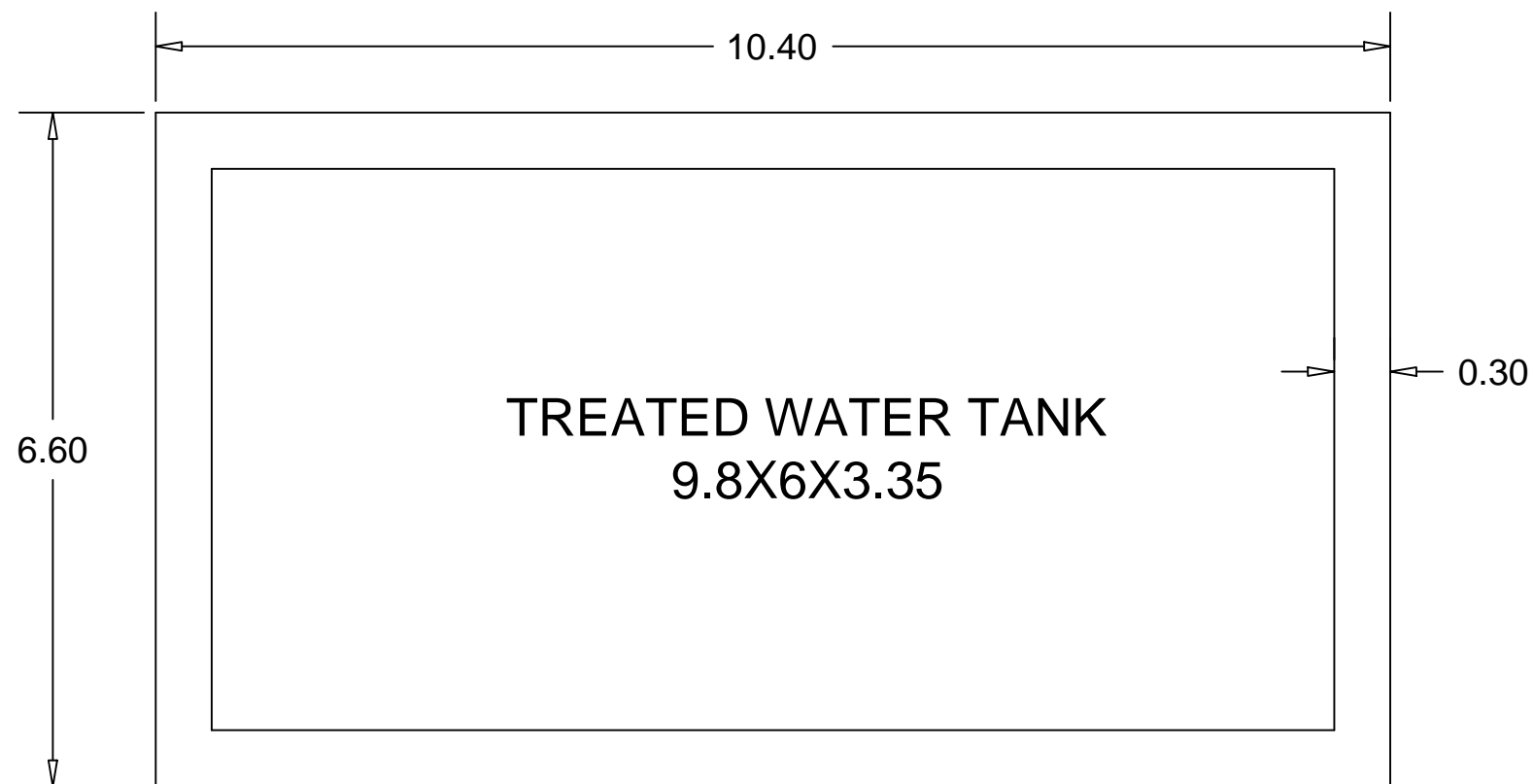
**DWG NO :- KSD/PHASE -1 / 12**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



SECTION



PLAN

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Rivision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-1) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

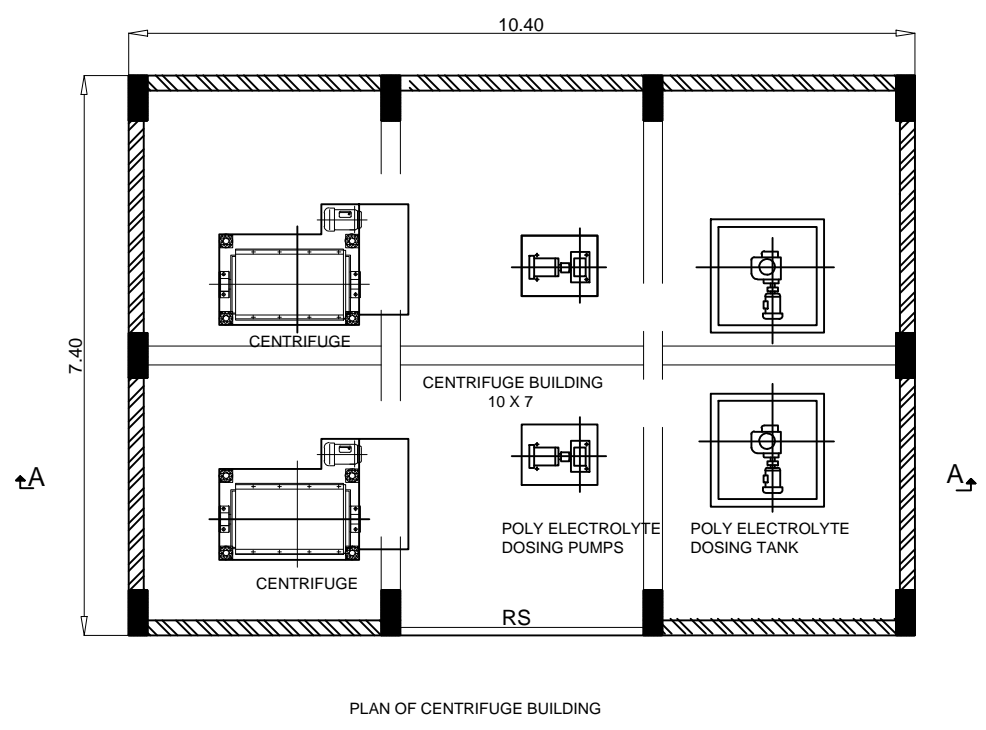
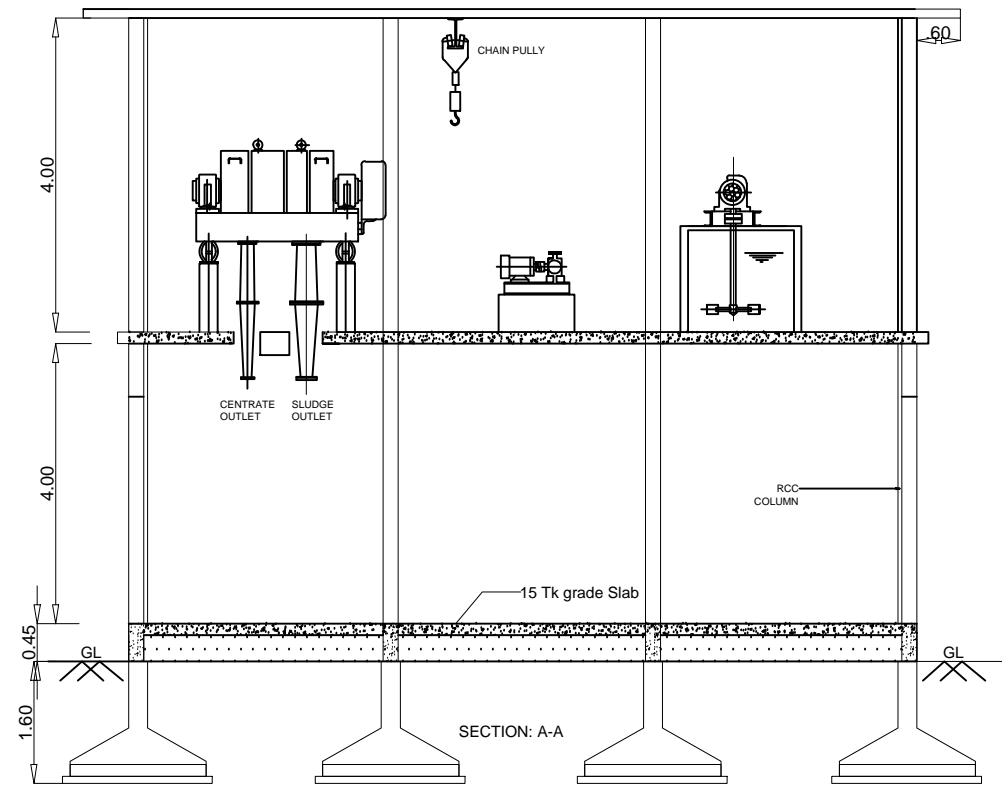
**DRAWING TITLE**

TREATED WATER TANK

**DWG NO :- KSD/PHASE -1 / 13**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-1) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

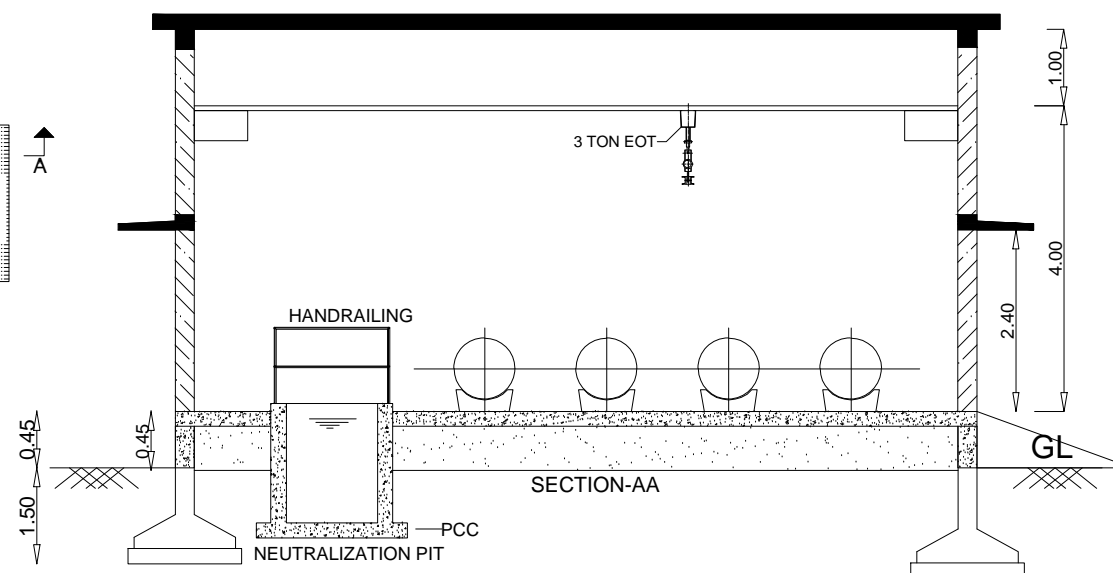
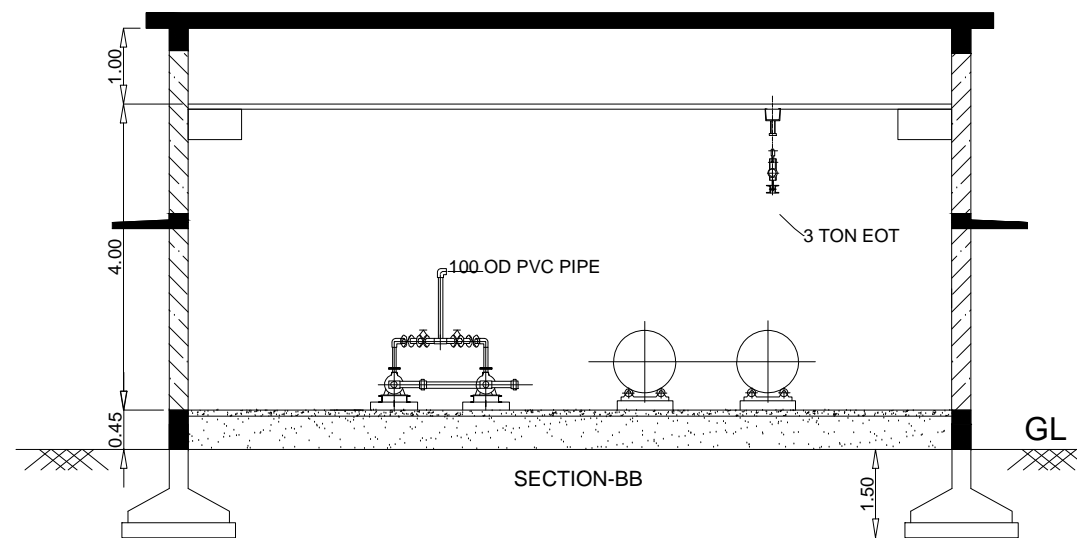
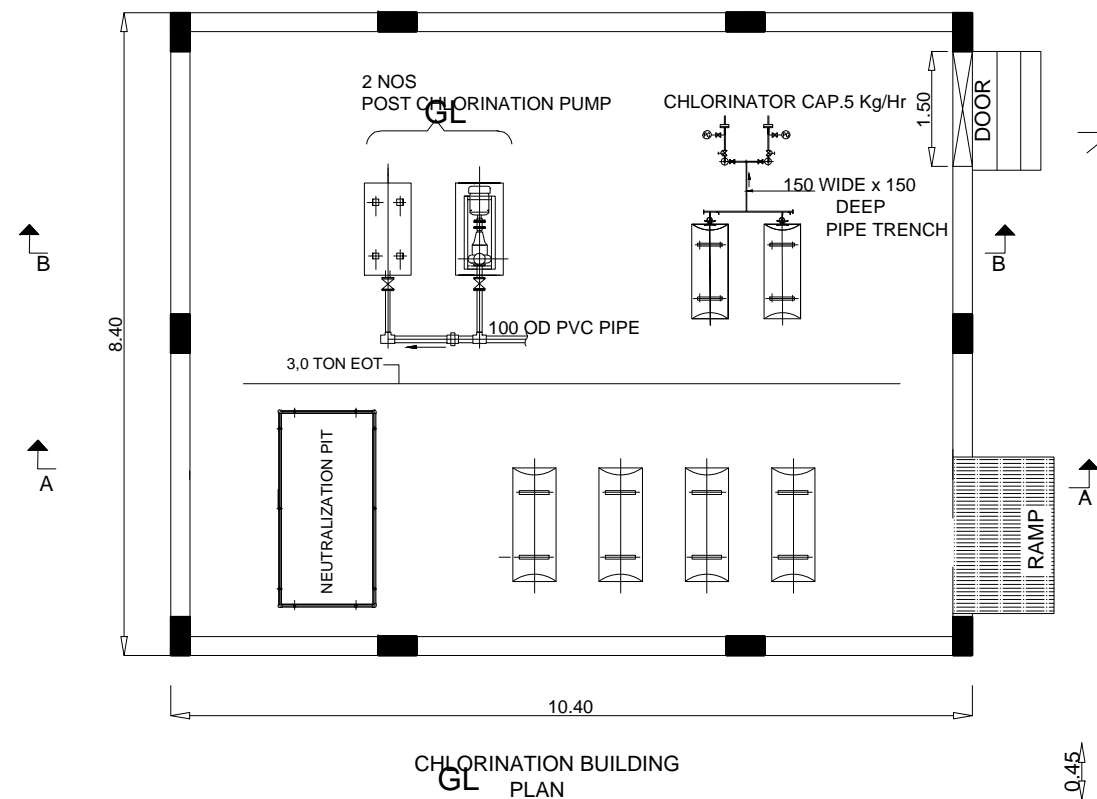
**DRAWING TITLE**

CENTRIFUGE BUILDING

**DWG NO :- KSD/PHASE -1 / 14**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-1) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

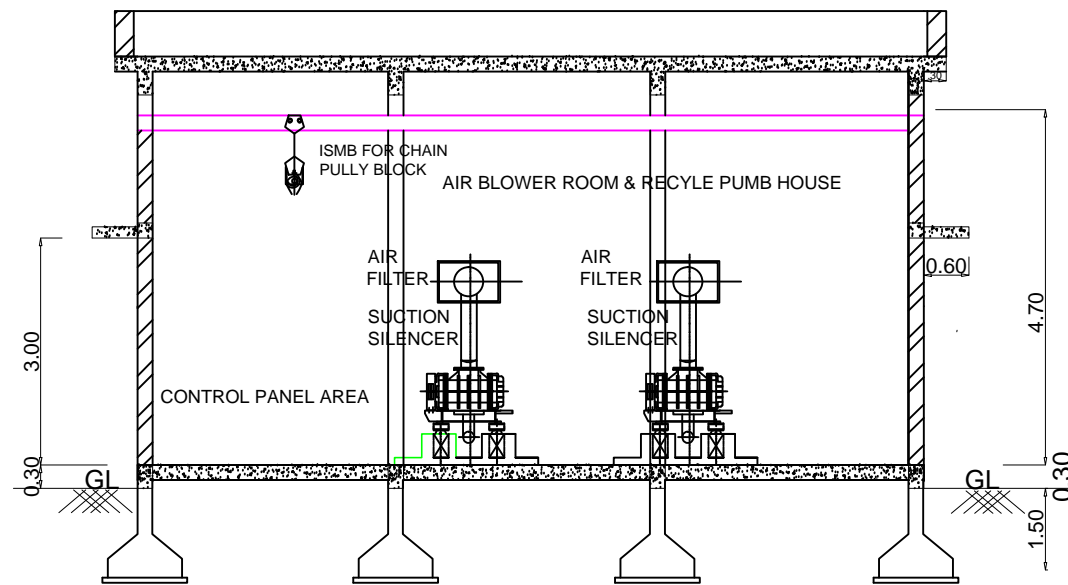
**DRAWING TITLE**

CHLORINATION ROOM

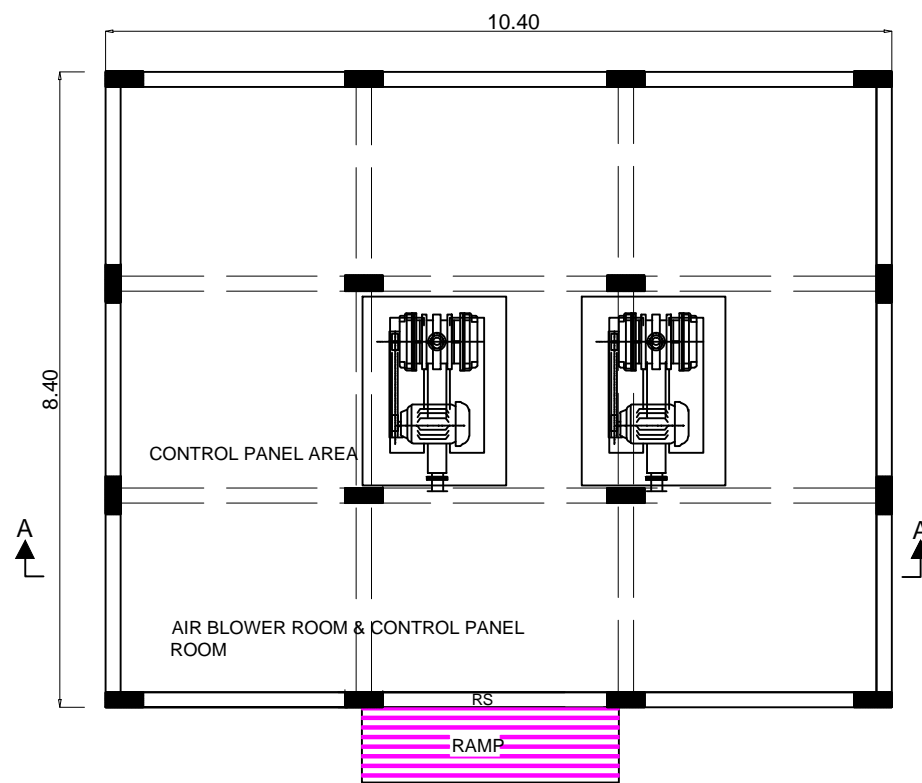
**DWG NO :- KSD/PHASE -1 / 15**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



SECTION A-A



PLAN

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-1) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

**DRAWING TITLE**

AIR BLOWER ROOM  
AND CONTROL PANEL ROOM

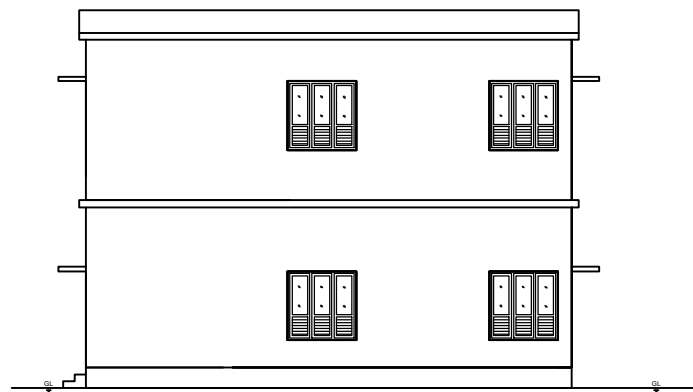
**DWG NO :- KSD/PHASE -1 / 16**

Not in scale

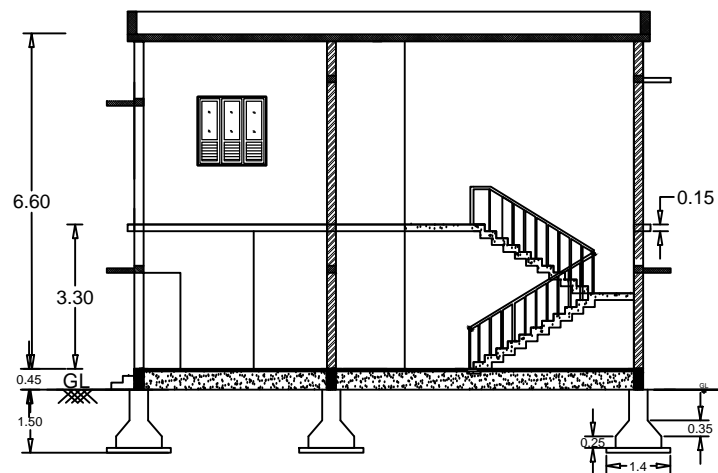
AE	AEE	EE	SE	CE
----	-----	----	----	----



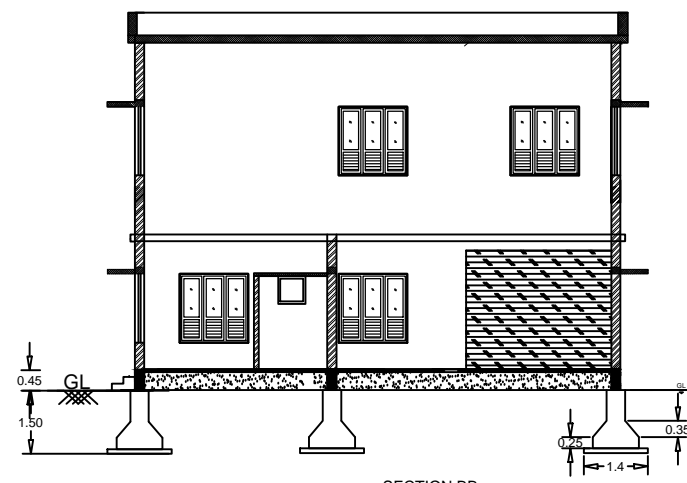
FRONT ELEVATION



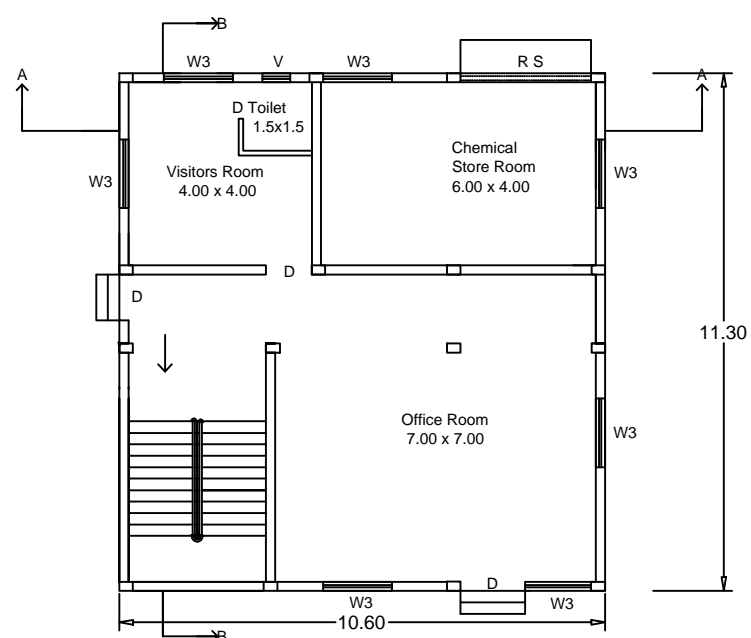
SIDE ELEVATION



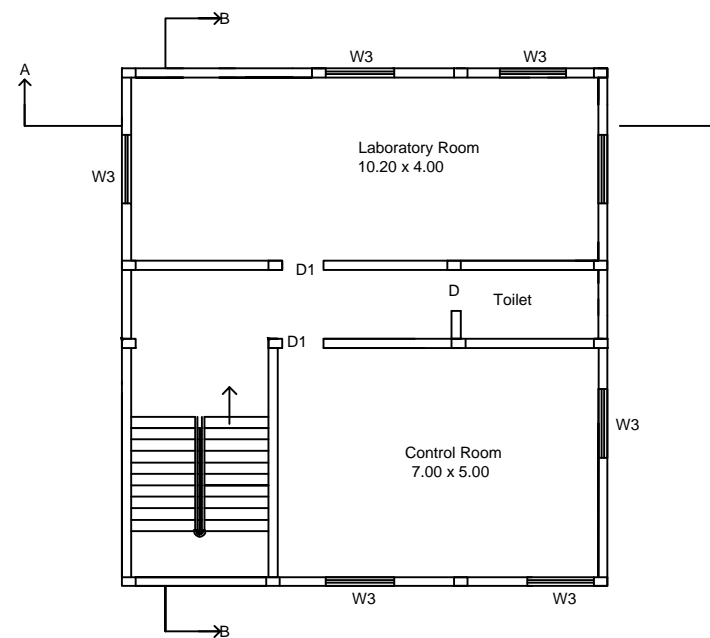
SECTION BB



SECTION BB



GROUND FLOOR PLAN



FIRST FLOOR PLAN

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-1) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

**DRAWING TITLE**

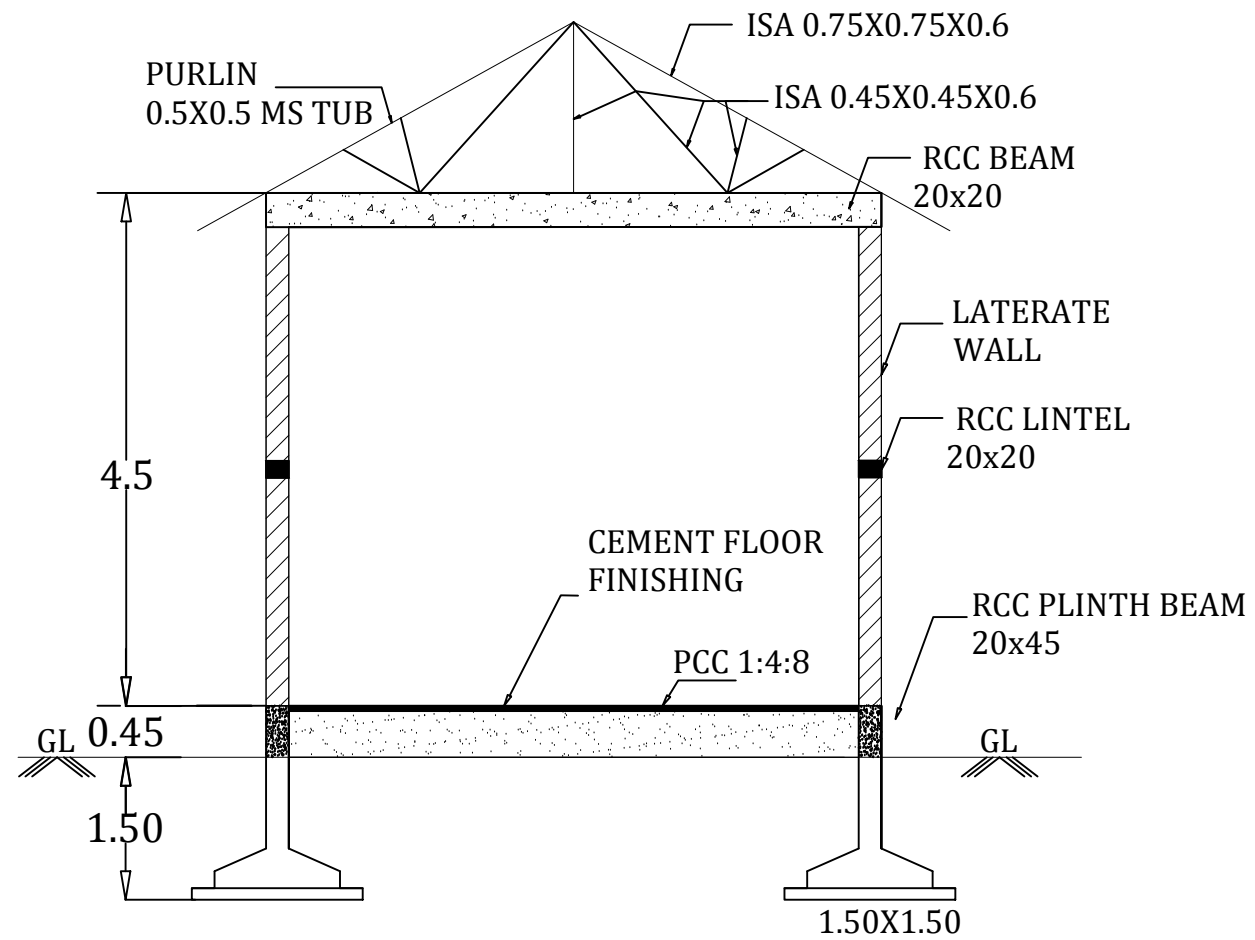
ADMINISTRATIVE BUILDING  
MCC AND LAB

**DWG NO :- KSD/PHASE -1 / 17**

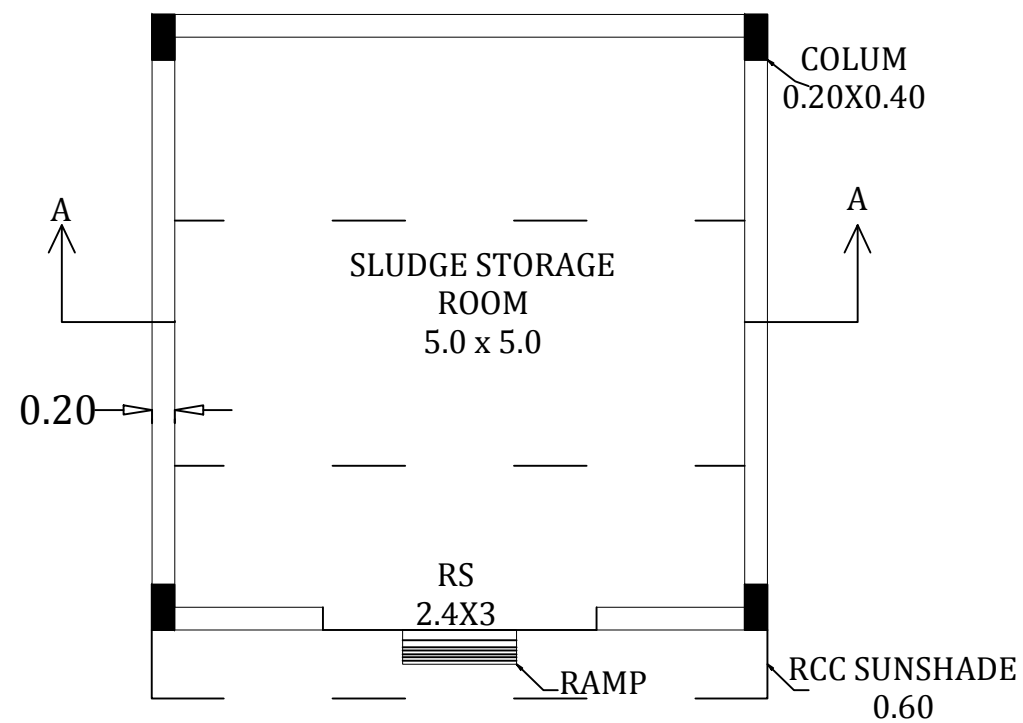
Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----





**SECTION**



**PLAN**

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-1) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

**DRAWING TITLE**

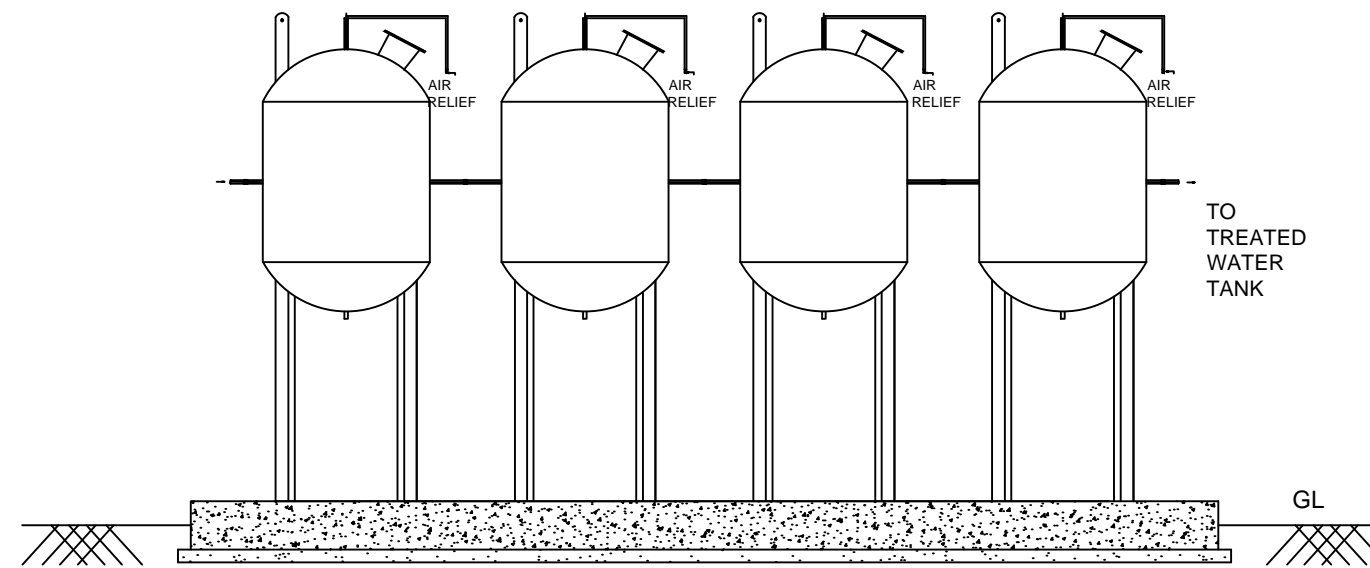
SLUDGE STORAGE ROOM

**DWG NO :- KSD/PHASE -1 / 18**

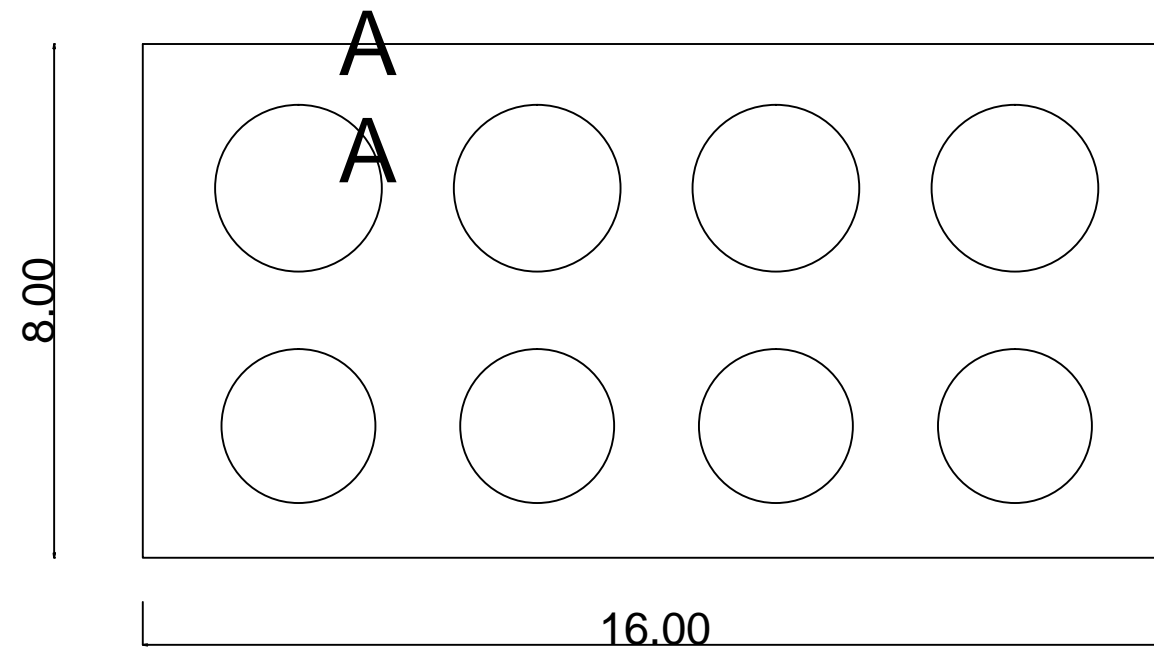
Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----

INLET  
FROM  
FILTER  
FEED  
PUMP



# SECTION



# PLAN

## GENERAL NOTES

ALL DIMENSIONS ARE IN METERS  
DIMENSIONS NOT IN SCALE  
FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



PPD & SEWERAGE CIRCLE  
KERALA WATER AUTHORITY  
KOZHIKODE

### PROJECT NAME

SEWERAGE SCHEME TO KASARAGOD  
MUNICIPALITY (PHASE-1) -  
CONSTRUCTION OF 4 MLD CAPACITY  
SEWAGE TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

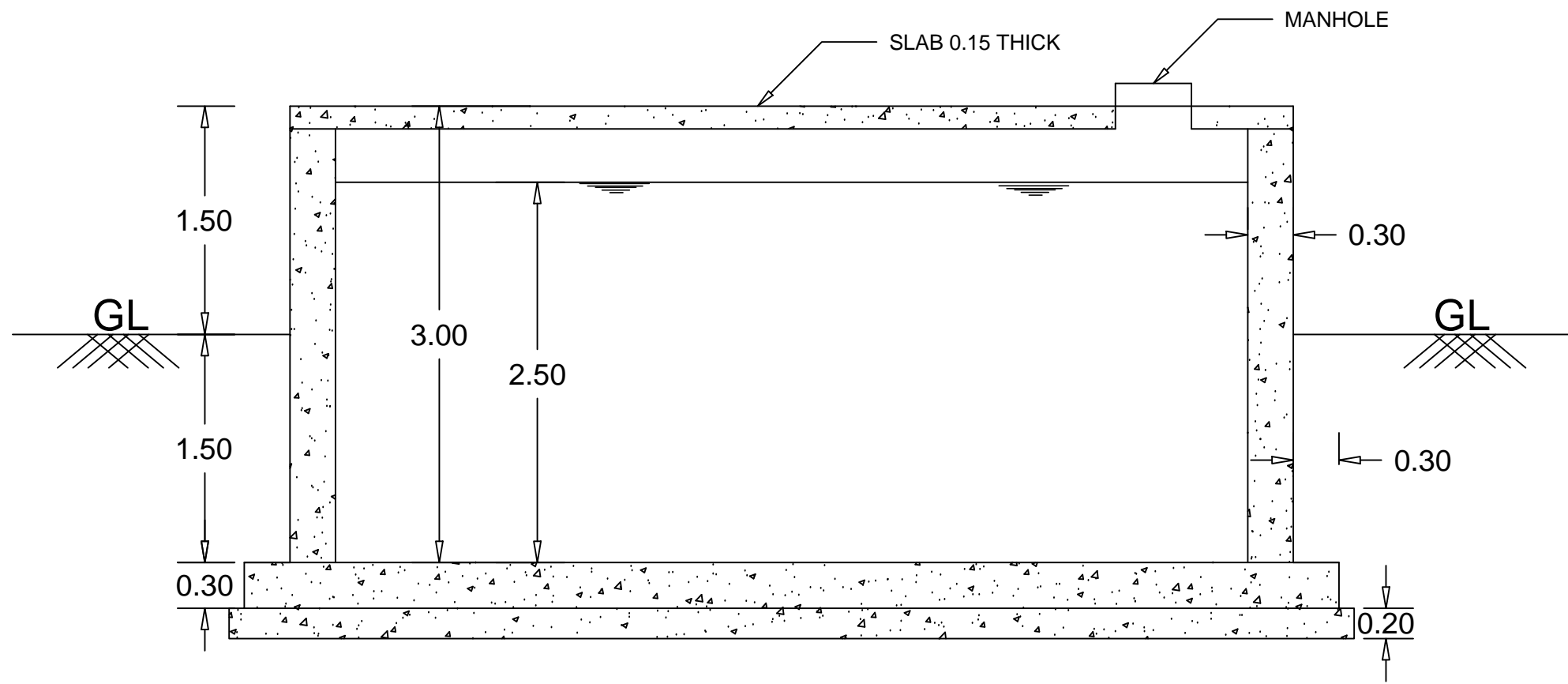
### DRAWING TITLE

PSFACF UNIT

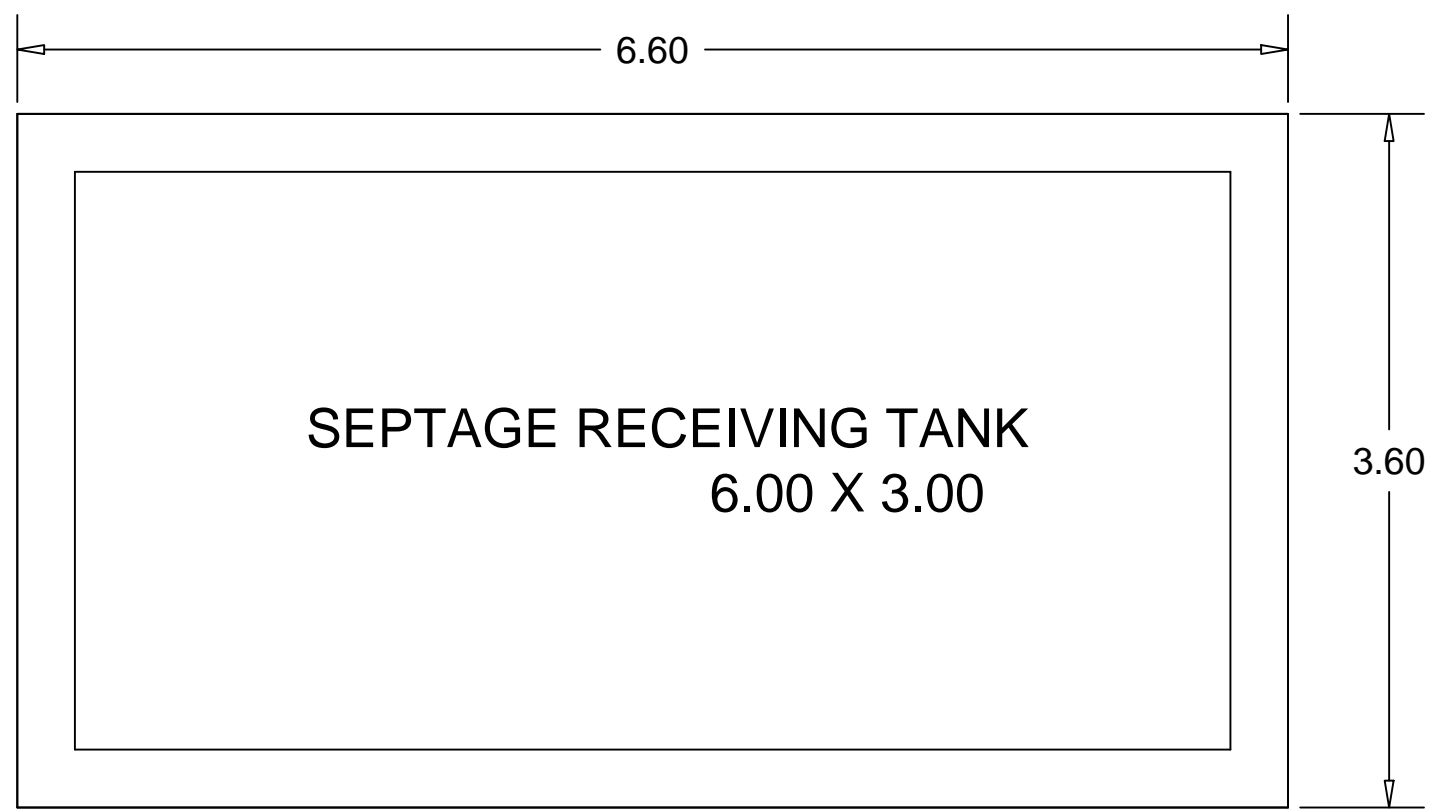
DWG NO :- KSD/PHASE -1 / 19

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



SECTION



PLAN

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-1) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

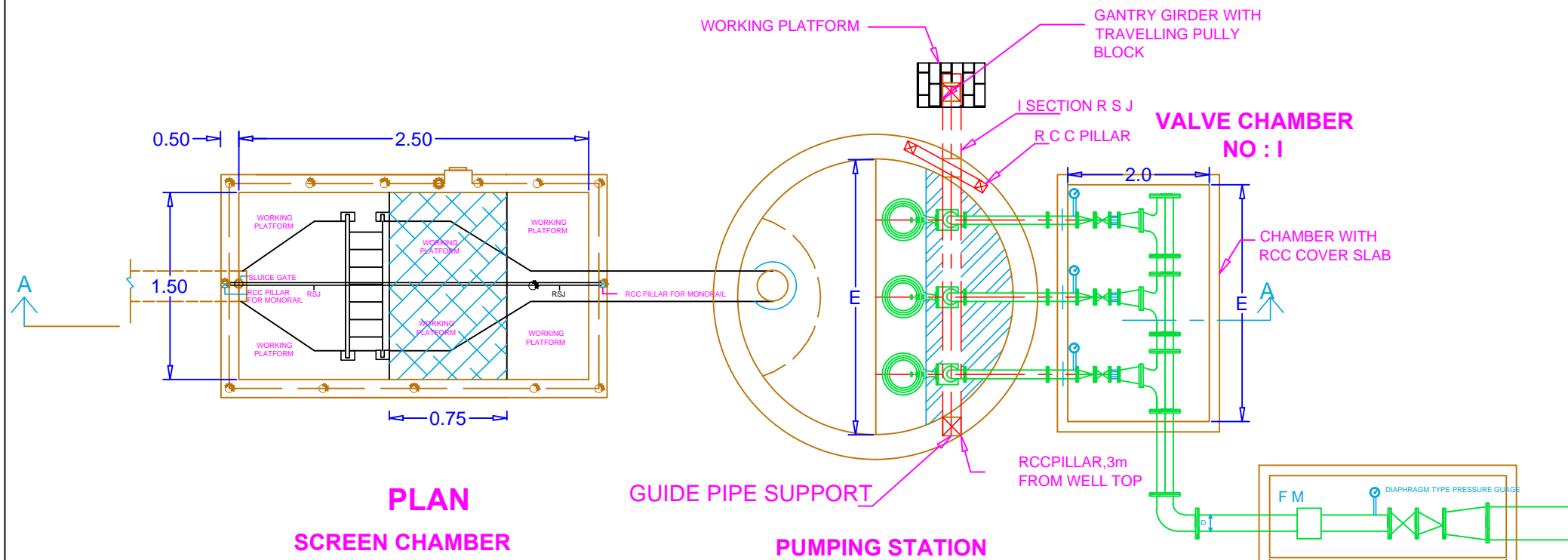
**DRAWING TITLE**

SEPTAGE RECEIVING TANK

**DWG NO :- KSD/PHASE -1 / 20**

Not in scale

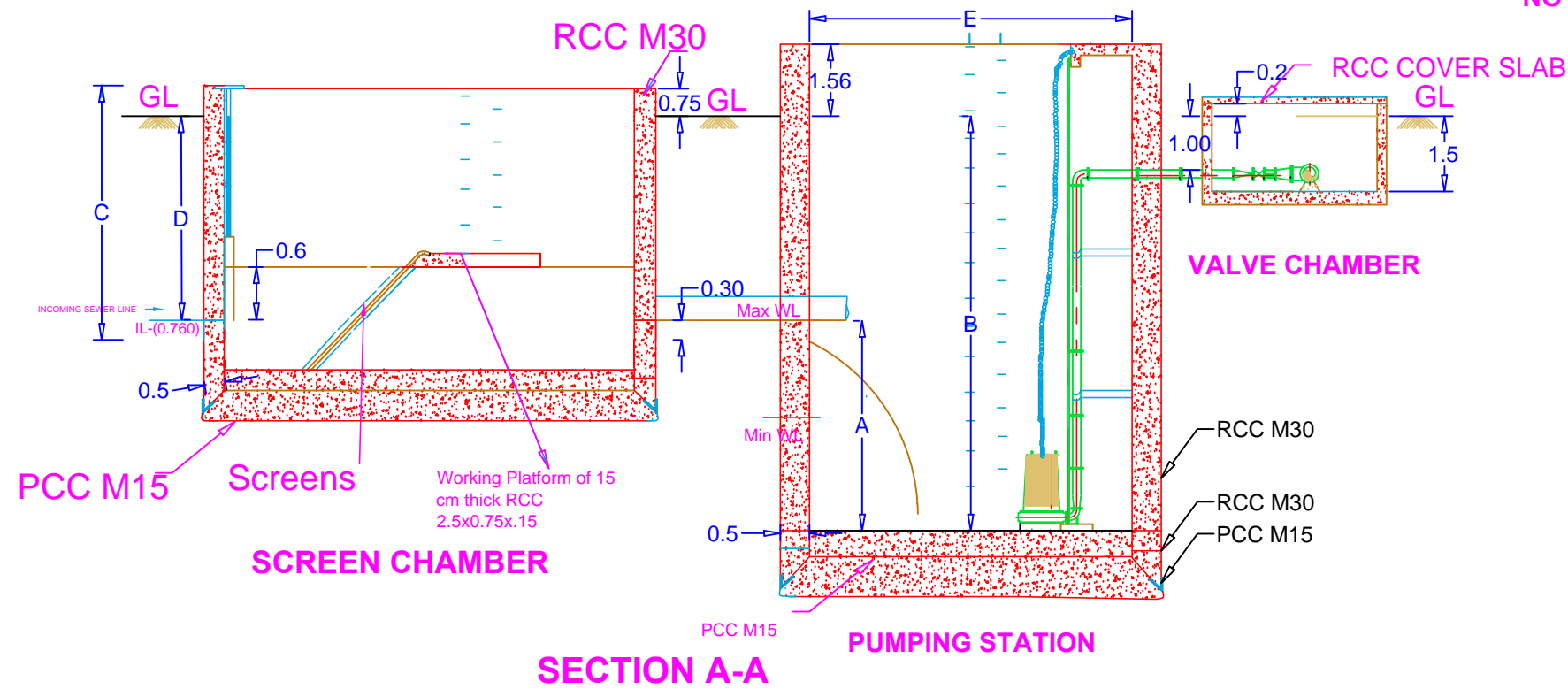
AE	AEE	EE	SE	CE
----	-----	----	----	----



**PLAN**  
**SCREEN CHAMBER**

**PUMPING STATION**

**VALVE CHAMBER NO : II**



**SCREEN CHAMBER**

**SECTION A-A**

**PUMPING STATION**

**VALVE CHAMBER**

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-1) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

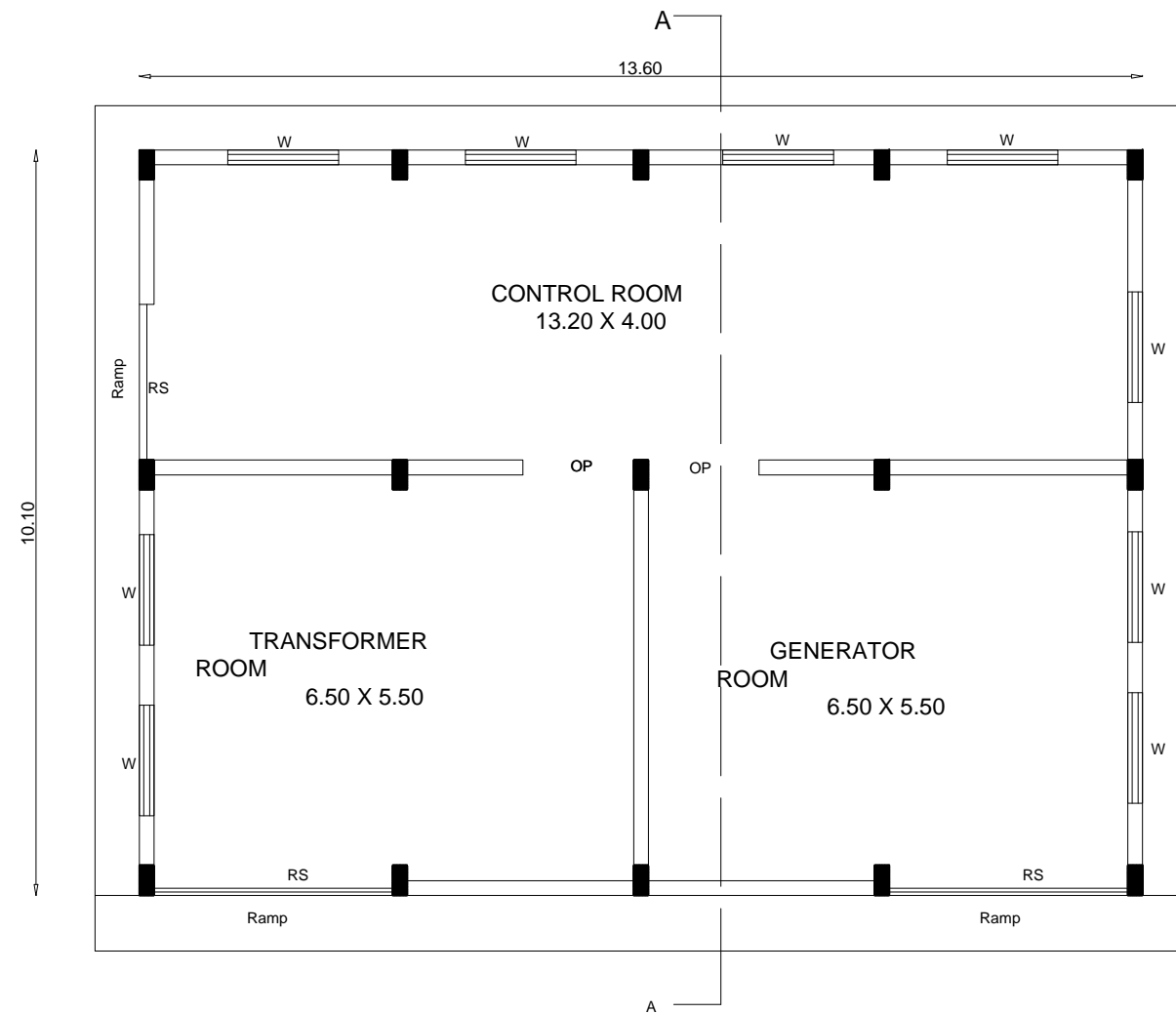
**DRAWING TITLE**

GENERAL ARRANGEMENT OF  
PUMPING STATION

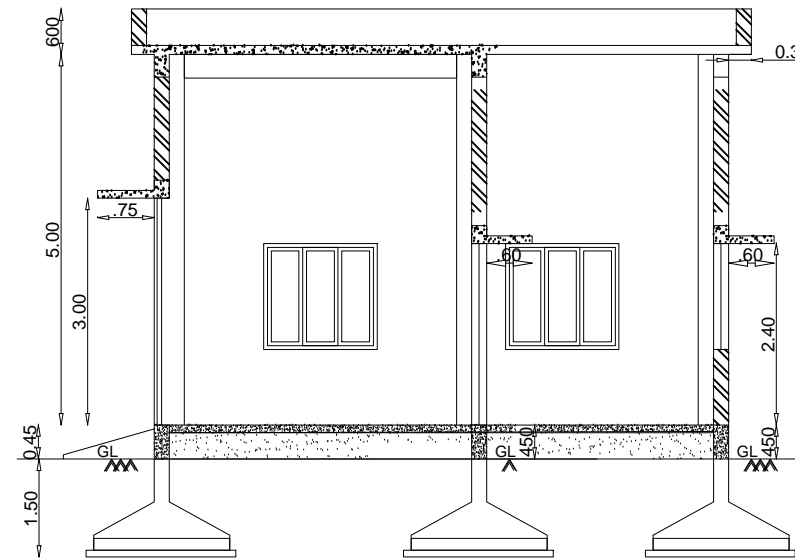
**DWG No :- KSD/PHASE -1 / 21**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



PLAN OF GENERATOR WITH DG ROOM



SECTION A A

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-1) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK

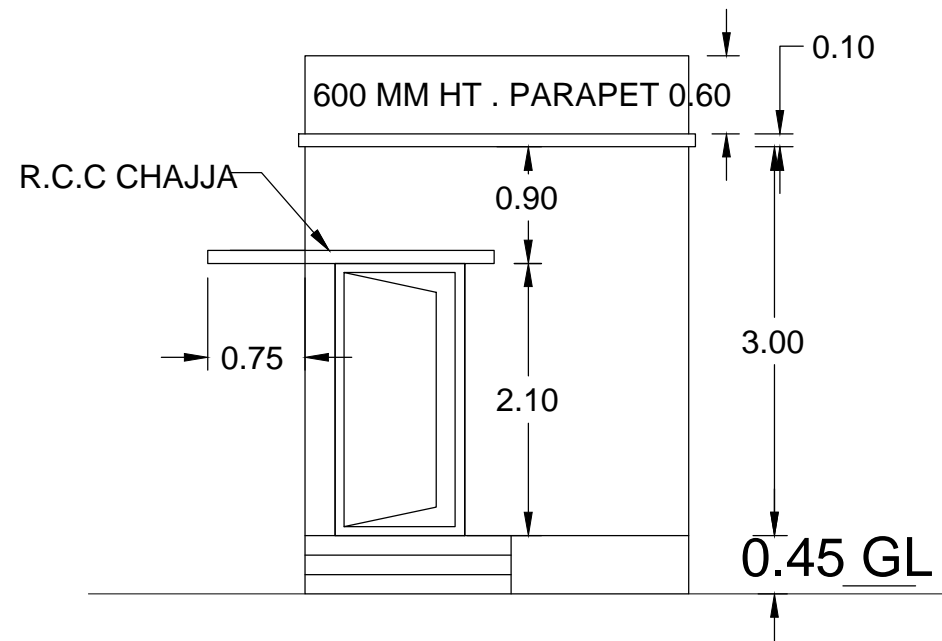
**DRAWING TITLE**

GENERATOR WITH CONTROL ROOM

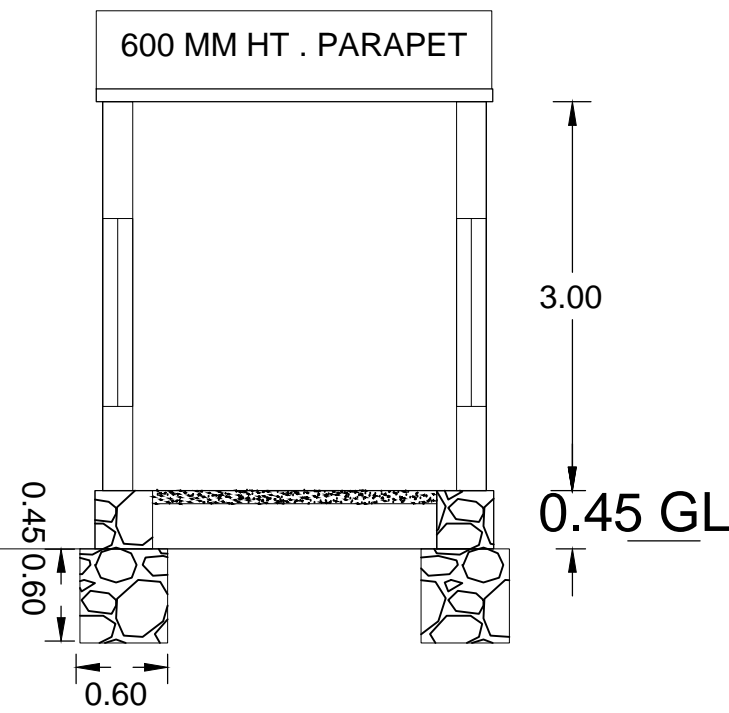
**DWG No :- KSD/PHASE -1 / 22**

Not in scale

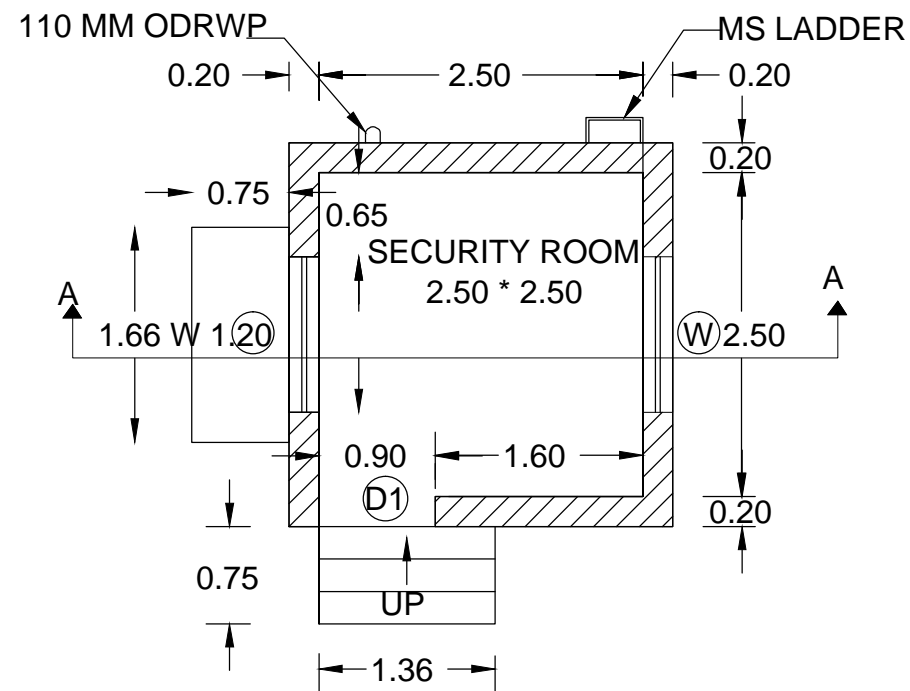
AE	AEE	EE	SE	CE
----	-----	----	----	----



**ELEVATION**



**SECTION**



**PLAN**

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Rivision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE**

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
(PHASE-2) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
KORAKODVAYAL AND LAYING  
SEWERAGE NET WORK

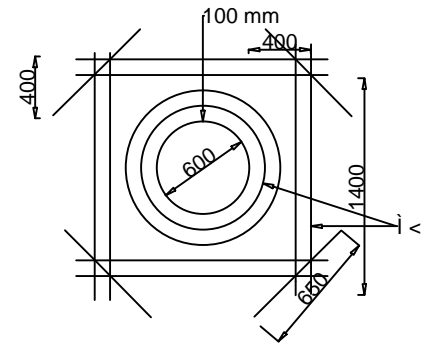
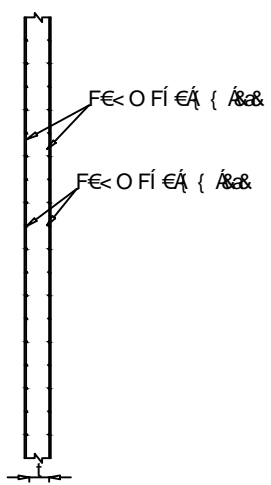
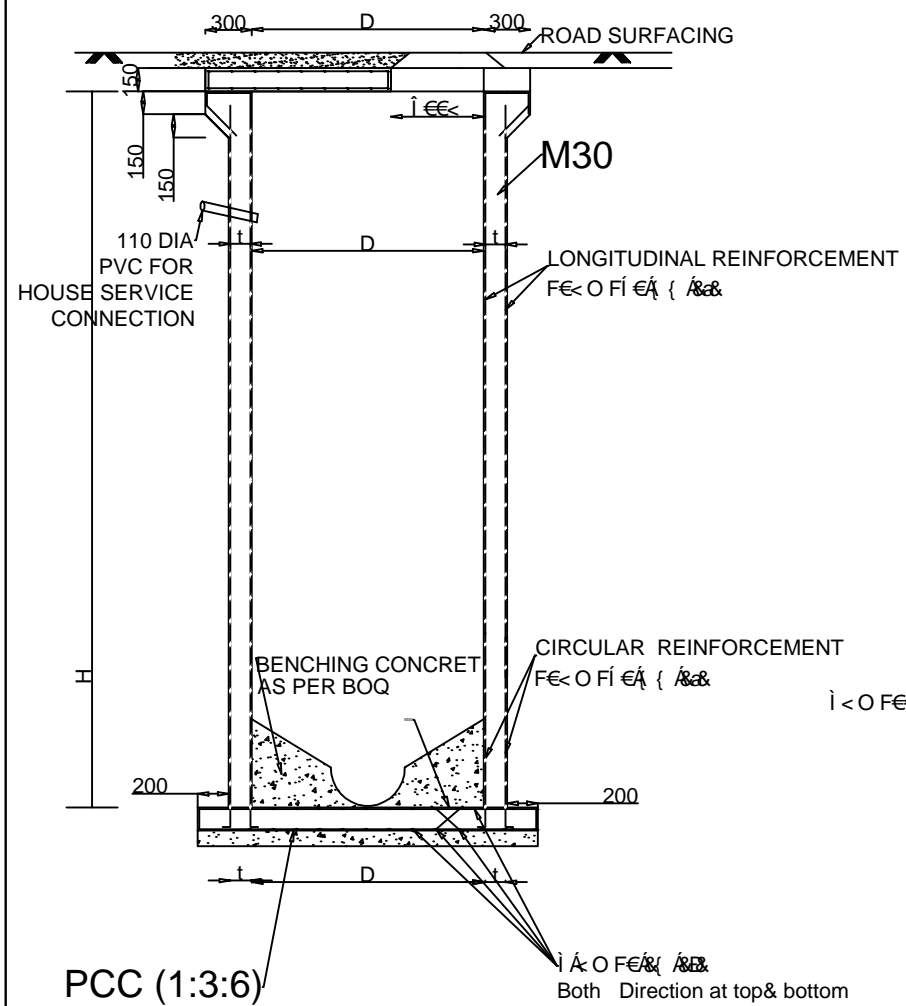
**DRAWING TITLE**

SECURITY ROOM

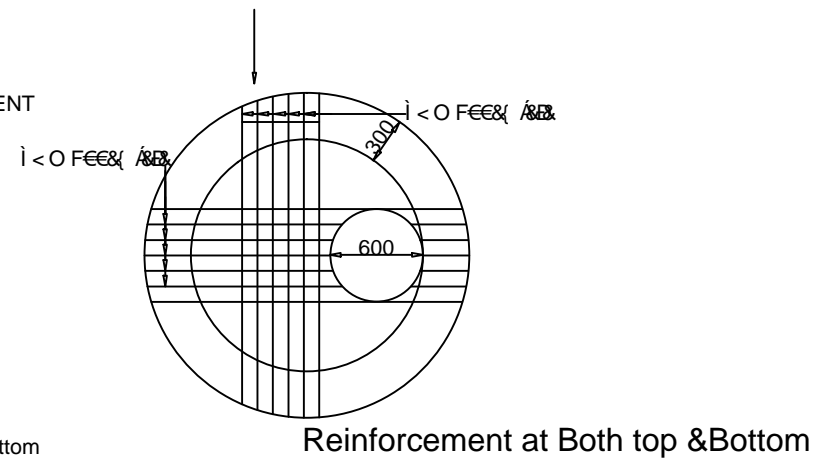
**DWG NO :- KSD/PHASE -1 / 23**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



ADDITIONAL REINFORCEMENT AROUND MANHOLE COVER OPENING ,INLET OPENING AND OUTLET OPENING



COVER SLAB

SECTION

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

DEPTH,H,(m)	DIA,D(m)	THICKNESS T(mm)
<1.5	1.2	150
1.5 to 2.5	1.2	150
2.5 to 6.0	1.5	200
6.0 to 7.5	1.8	250

No.	Revision/ Issue	Date



PPD & SEWERAGE CIRCLE,  
KERALA WATER AUTHORITY,  
KOZHIKODE

**PROJECT NAME**

SEWERAGE SCHEME TO KASARAGOD MUNICIPALITY (PHASE-1) - CONSTRUCTION OF 4 MLD CAPACITY SEWAGE TREATMENT PLANT AT PACHAKADU THURUTHU AND LAYING SEWERAGE NET WORK

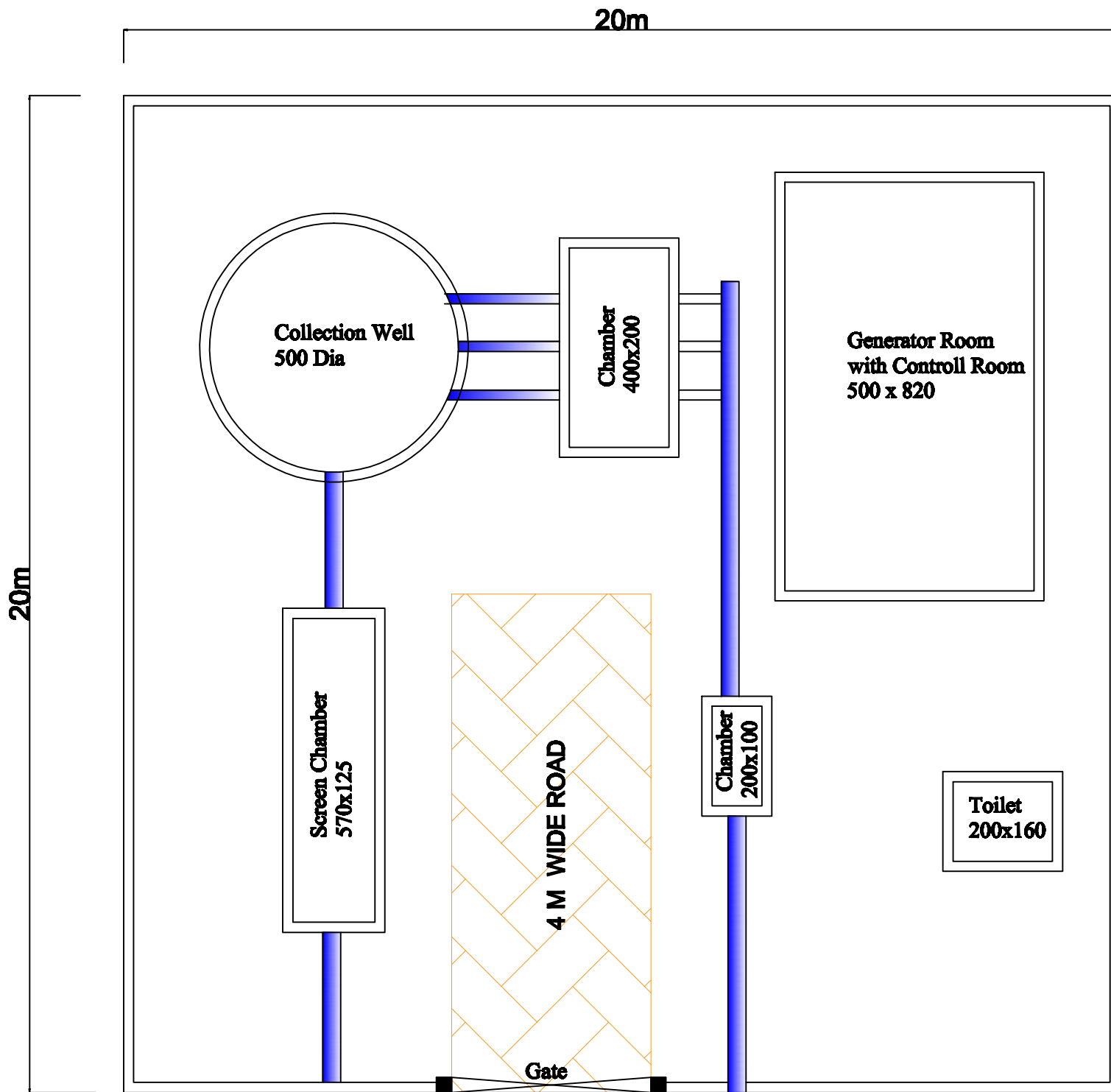
**DRAWING TITLE**

TYPICAL MANHOLE DETAILS

DWG No :- KSD/PHASE -1 / 24

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



**GENERAL NOTES**

ALL DIMENSIONS ARE IN METERS  
DIMENSIONS NOT IN SCALE  
FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



PPD & SEWERAGE CIRCLE  
KERALA WATER AUTHORITY  
KOZHIKODE

PROJECT NAME  
SEWERAGE SCHEME TO KASARAGOD  
MUNICIPALITY (PHASE-1) -  
CONSTRUCTION OF 4 MLD CAPACITY  
SEWAGE TREATMENT PLANT AT  
PACHAKADU THURUTHU AND  
LAYING SEWERAGE NET WORK -STP  
DESIGN

DRAWING TITLE  
  
COLLECTION WELL LAYOUT

DWG No :- KSD/PHASE -1 / 25

Not in scale

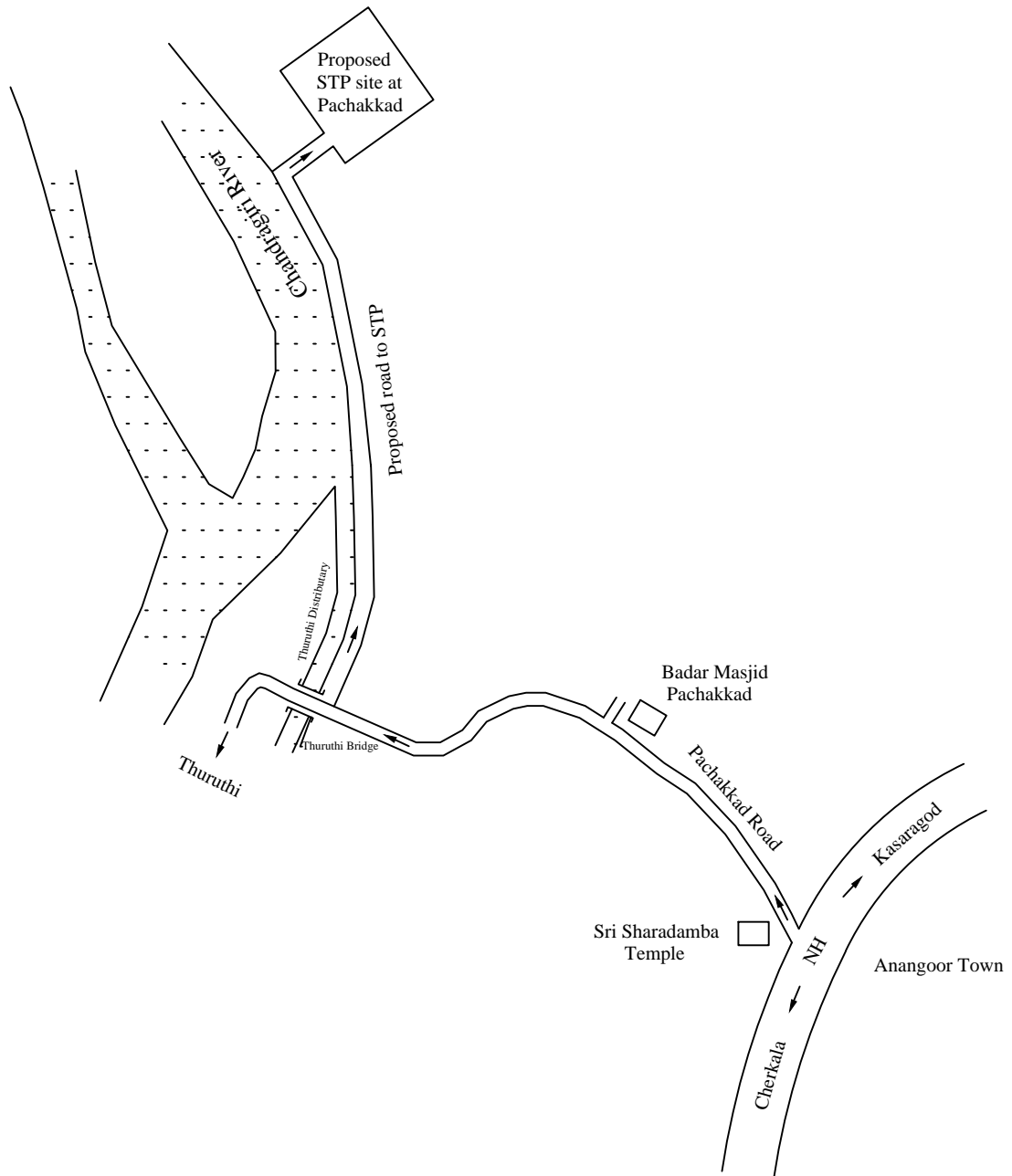
AE	AEE	EE	SE	CE
----	-----	----	----	----

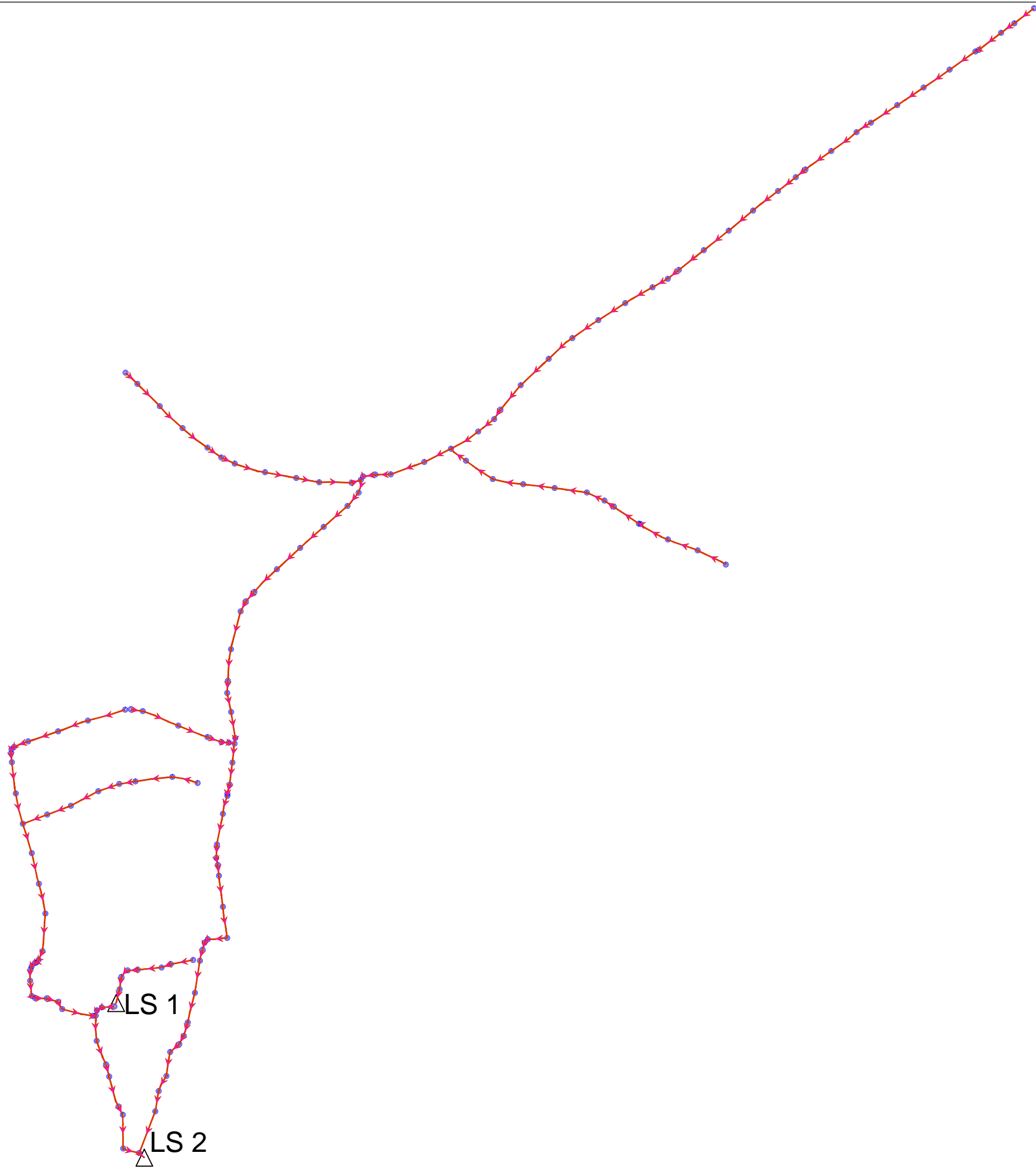


# LOCATION SKETCH

## STP AT PACHAKKAD

### KASARAGOD ZONE-1





**GENERAL NOTES**

ALL DIMENSIONS ARE IN METERS  
 DIMENSIONS NOT IN SCALE  
 FOR ESTIMATION PURPOSE ONLY


No.	Rivision/ Issue	Date
-----	-----------------	------



PPD & SEWERAGE CIRCLE  
 KERALA WATER AUTHORITY  
 KOZHIKODE

PROJECT NAME

SEWERAGE SCHEME TO KASARAGOD  
 MUNICIPALITY (PHASE-1) -  
 CONSTRUCTION OF 4 MLD CAPACITY  
 SEWAGE TREATMENT PLANT AT  
 PACHAKADU THURUTHU AND  
 LAYING SEWERAGE NET WORK -STP  
 DESIGN

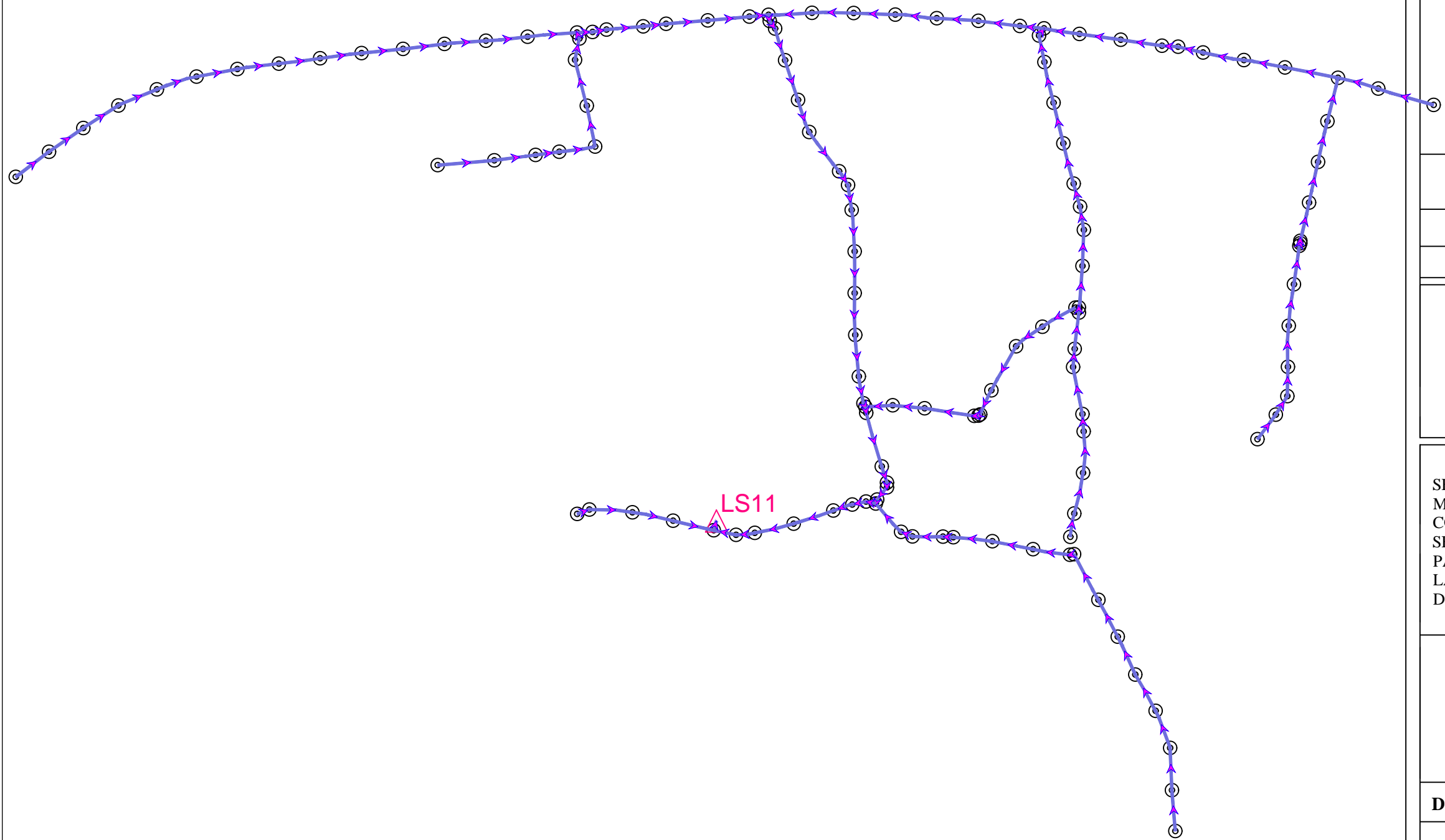
DRAWING TITLE

NET WORK LAYOUT - ZONE -1A

**DWG No :- KSD/PHASE -1 / 31**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



**GENERAL NOTES**

ALL DIMENSIONS ARE IN METERS  
 DIMENSIONS NOT IN SCALE  
 FOR ESTIMATION PURPOSE ONLY

No.	Revision/ Issue	Date



PPD & SEWERAGE CIRCLE  
 KERALA WATER AUTHORITY  
 KOZHIKODE

PROJECT NAME

SEWERAGE SCHEME TO KASARAGOD  
 MUNICIPALITY (PHASE-1) -  
 CONSTRUCTION OF 4 MLD CAPACITY  
 SEWAGE TREATMENT PLANT AT  
 PACHAKADU THURUTHU AND  
 LAYING SEWERAGE NET WORK -STP  
 DESIGN

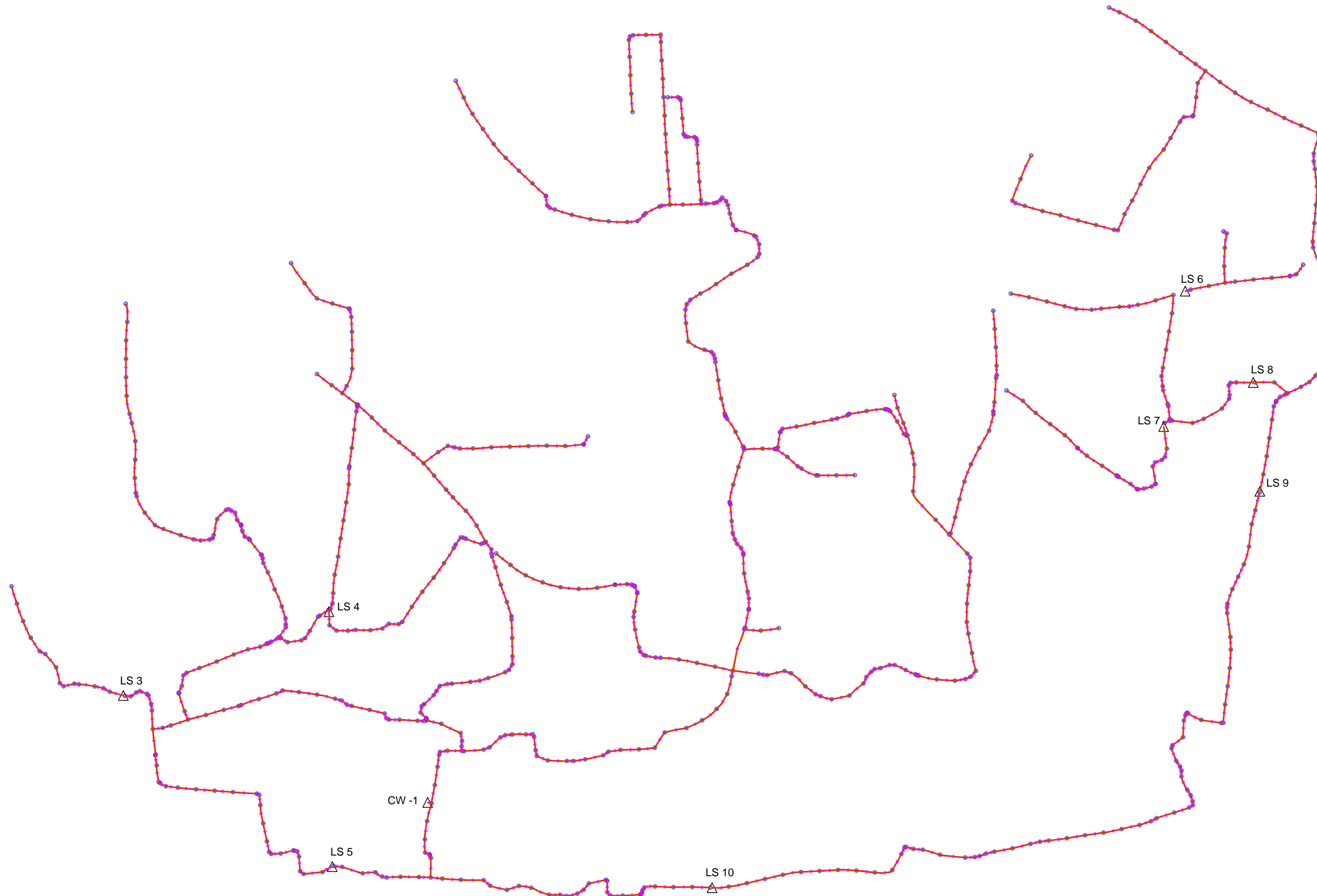
DRAWING TITLE

NET WORK LAYOUT - ZONE -1B

**DWG No :- KSD/PHASE -1 / 32**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----



**GENERAL NOTES**

ALL DIMENSIONS ARE IN METERS  
 DIMENSIONS NOT IN SCALE  
 FOR ESTIMATION PURPOSE ONLY


No.	Revision/ Issue	Date
-----	-----------------	------



PPD & SEWERAGE CIRCLE  
 KERALA WATER AUTHORITY  
 KOZHIKODE

**PROJECT NAME**

SEWERAGE SCHEME TO KASARAGOD MUNICIPALITY (PHASE-1) - CONSTRUCTION OF 4 MLD CAPACITY SEWAGE TREATMENT PLANT AT PACHAKADU THURUTHU AND LAYING SEWERAGE NET WORK -STP DESIGN

**DRAWING TITLE**

NET WORK LAYOUT - ZONE -1C

**DWG No :- KSD/PHASE -1 / 33**

Not in scale

AE	AEE	EE	SE	CE
----	-----	----	----	----

**APPENDIX III**  
**DESIGN OF WETWELLS AND LIFTING STATIONS**

Sl no.	Name of wetwel	Peak flowLPS	Detention Period in min.	Storage capacity m <sup>3</sup>	SWD (m)	Area m <sup>2</sup>	Size (Internal Dia)	Depth up to invert of pipe (m)	Total Depth (m)
1	LS1	0.567	10.00	0.34	0.75	0.45	0.76	4.217	4.97
							say 2 m dia		
2	LS2	12.230	10.00	7.34	2.50	2.94	1.94	1.212	3.71
		12.230					say 2 m dia		
3	LS3	13.364	10.00	8.02	1.45	5.53	2.65	4.507	5.96
		13.364					say 3 m dia		
4	LS4	1.620	10.00	0.97	0.75	1.30	1.29	6.3	7.05
		1.620					say 2 m dia		
5	LS5	26.405	10.00	15.84	0.85	18.64	4.87	5.088	5.94
		26.405					say 5 m dia		
6	LS6	1.134	10.00	0.68	0.75	0.91	1.08	4.492	5.24
		1.134					say 2 m dia		
7	LS7	1.944	10.00	1.17	0.75	1.56	1.41	5.657	6.41
		1.944					say 2 m dia		
8	LS 8	5.751	10.00	3.45	1.30	2.65	1.84	4.686	5.99
		5.751					say 2 m dia		
9	LS 9	11.421	10.00	6.85	1.15	5.96	2.76	4.834	5.98
		11.421					say 3 m dia		
10	LS 10	16.848	10.00	10.11	1.50	6.74	2.93	3.746	5.25
		16.848					say 3 m dia		
11	LS 11	10.611	10.00	6.37	2.25	2.83	1.90	1.19	3.44
		10.611					say 2 m dia		
12	PH 1	84.725	10.00	50.84	3.00	16.95	4.65	1.378	4.38
		84.725					say 5 m dia		





APPENDIX : V  
SEWERAGE NETWORK DESIGN TO KASARAGOD MUNICIPALITY ZONE -1 CONDUIT TABLE

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
180	p686	n887	42.26	n888	42.19	15.4	0.455	HDPE	43.45	43.38	225
181	p687	n888	42.19	n889	41.83	30	1.2	HDPE	43.38	43.02	225
182	p690	n889	41.83	n893	41.51	30	1.067	HDPE	43.02	42.7	225
183	p692	n893	41.51	n895	41.27	30	0.8	HDPE	42.7	42.46	225
184	p694	n898	40.9	n899	40.62	30	0.933	HDPE	42.09	41.81	225
185	p696	n899	40.62	n901	40.33	30	0.967	HDPE	41.81	41.52	225
186	p698	n5046	39.97	n904	39.46	30.7	1.663	HDPE	41.16	40.65	225
187	p700	n906	39.16	n907	39.2	11.7	0.34	HDPE	40.45	40.39	225
188	p703	n912	42.65	n913	41.88	19.1	4.04	HDPE	43.84	43.07	225
189	p704	n913	41.88	n3492	40.57	30.6	4.287	HDPE	43.07	41.76	225
190	p705	n915	39.92	n5047	39.34	33.8	1.714	HDPE	41.11	40.53	225
191	p706	n917	43.05	n918	44.08	30	3.436	HDPE	44.24	45.27	225
192	p707	n918	44.08	n920	45.1	36.3	2.808	HDPE	45.27	46.29	225
193	p708	n920	45.1	n921	45.82	30	2.401	HDPE	46.29	47.01	225
194	p709	n921	45.82	n922	46.36	30	1.801	HDPE	47.01	47.55	225
195	p710	n923	46.73	n924	47.31	30	1.934	HDPE	47.92	48.5	225
196	p711	n925	47.93	n926	48.44	30	1.7	HDPE	49.12	49.63	225
197	p712	n927	48.86	n928	49.28	30	1.4	HDPE	50.05	50.47	225
198	p713	n928	49.28	n929	49.79	30	1.7	HDPE	50.47	50.98	225
199	p714	n929	49.79	n930	50.2	21.4	1.914	HDPE	50.98	51.39	225
200	p715	n931	50.45	n932	51.16	30	2.367	HDPE	51.64	52.35	225
201	p716	n932	51.16	n933	51.85	30	2.301	HDPE	52.35	53.04	225
202	p717	n933	51.85	n934	52.33	16.3	2.939	HDPE	53.04	53.52	225
203	p718	n934	52.33	n935	53.21	30	2.934	HDPE	53.52	54.4	225
204	p719	n935	53.21	n936	54.34	30	3.769	HDPE	54.4	55.53	225
205	p720	n936	54.34	n937	55.67	30	4.438	HDPE	55.53	56.86	225
206	p721	n938	58.93	n939	59.72	15.5	5.084	HDPE	60.12	60.91	225
207	p2454	n3180	39.147	n3181	38.93	12.5	1.736	HDPE	40.56	40.12	225
208	p2455	n3181	38.93	n3182	38.875	16.4	0.34	HDPE	40.12	40.27	225
209	p2456	n3183	38.773	n3184	38.671	30	0.34	HDPE	40.26	40.45	225
210	p2457	n3185	38.569	n3186	38.467	30	0.34	HDPE	41.15	41.79	225
211	p2458	n5559	38.389	n3188	38.263	37	0.34	HDPE	41.88	40.98	225
212	p2459	n3188	38.263	n3189	38.161	30	0.34	HDPE	40.98	40.22	225
213	p2460	n3190	37.7	n3191	36	24.9	6.816	HDPE	38.89	37.19	225
214	p2462	n3194	37.52	n3195	40.72	29.8	10.731	HDPE	38.71	41.91	225
215	p2463	n3195	40.72	n5562	41.632	36.3	2.508	HDPE	41.91	43.44	225
216	p2464	n5564	41.3	n3198	39.63	36.9	4.528	HDPE	42.49	40.82	225
217	p2465	n3198	39.63	n3199	39.528	30	0.34	HDPE	40.82	41.99	225
218	p2466	n3199	39.528	n3200	39.426	30	0.34	HDPE	41.99	42.72	225
219	p2467	n3200	39.426	n3201	39.377	14.4	0.34	HDPE	42.72	42.32	225
220	p2468	n3202	39.325	n3203	37.924	29.9	4.684	HDPE	41.33	39.6	225
221	p2469	n3203	37.924	n3204	32.91	29.5	17	HDPE	39.6	34.1	225
222	p2470	n5568	30.47	n3206	30.752	29.4	0.958	HDPE	31.66	33.05	225
223	p2471	n3207	30.876	n3209	30.996	35.2	0.34	HDPE	33.52	33.27	225
224	p2472	n3209	30.996	n3210	31.08	24.8	0.34	HDPE	33.27	32.27	225
226	p2475	n3212	34.05	n3213	32.26	21.1	8.495	HDPE	35.24	33.45	225
227	p2476	n3213	32.26	n3211	31.41	8.8	9.645	HDPE	33.45	32.6	225
228	p2477	n3204	30.305	n3214	28.33	29	6.806	HDPE	34.1	29.52	225
229	p2478	n3214	28.33	n3215	25.66	29.9	8.939	HDPE	29.52	26.85	225
230	p2479	n3215	25.66	n3216	22.6	28.9	10.592	HDPE	26.85	23.79	225
231	p2480	n3216	19.311	n5582	13.23	35.8	17	HDPE	23.79	14.42	225
232	p2481	n5577	8.66	n3219	7.16	11.2	13.429	HDPE	9.85	8.35	225
233	p2482	n3220	6.942	n3221	6.915	7.9	0.34	HDPE	11.07	11.61	225



ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
234	p2483	n3221	6.915	n3223	6.813	29.8	0.34	HDPE	11.61	11.73	225
235	p2484	n3224	6.804	n3225	6.723	24	0.34	HDPE	11.76	11.08	225
236	p2485	n3225	6.723	n3227	6.641	24	0.34	HDPE	11.08	10.07	225
237	p2486	n3228	6.601	n3229	4.91	29.8	5.668	HDPE	9.26	6.1	225
238	p2487	n3230	3.5	n3232	1.6	31.9	5.951	HDPE	4.69	2.79	225
239	p2489	n3232	1.6	MH-3	1.06	15.8	3.418	HDPE	2.79	2.25	225
240	p2490	n3224	9.214	n3234	9.231	5.1	0.34	HDPE	11.76	11.67	225
242	p2492	n3237	6.262	n3238	6.291	8.6	0.34	HDPE	9.85	9.13	225
243	p2493	n3238	6.291	n3239	6.324	9.5	0.34	HDPE	9.13	8.39	225
244	p2494	n3240	6.4	n3241	6.52	9.3	1.294	HDPE	7.59	7.71	225
245	p2496	n3244	1.99	n3246	2.24	16.1	1.557	HDPE	3.18	3.43	225
246	p2497	n3246	2.24	n3247	2.63	23.1	1.686	HDPE	3.43	3.82	225
247	p2498	n3247	2.63	n3249	2.86	11.5	2.009	HDPE	3.82	4.05	225
248	p2499	n3249	2.86	n3250	2.93	8.9	0.784	HDPE	4.05	4.12	225
249	p2500	n3250	2.93	n3251	3.3	13.2	2.809	HDPE	4.12	4.49	225
250	p2501	n3251	3.3	n3252	4.44	28.9	3.942	HDPE	4.49	5.63	225
251	p2502	n3252	4.44	n3243	8.36	30.8	12.736	HDPE	5.63	9.55	225
252	p2504	n3243	8.36	n3255	9.82	10.9	13.37	HDPE	9.55	11.01	225
253	p2505	n3256	11.612	n3257	14.12	18.5	13.554	HDPE	12.84	15.31	225
254	p2506	n3258	31.16	n3259	29.26	17.4	10.913	HDPE	32.35	30.45	225
255	p2507	n3259	29.26	n3260	25.44	29.7	12.84	HDPE	30.45	26.63	225
256	p2508	n3261	21.06	n3262	17.11	29.7	13.282	HDPE	22.25	18.3	225
257	p2509	n3262	17.11	n3257	14.12	29.9	10.017	HDPE	18.3	15.31	225
258	p2675	n3492	40.57	n3493	40.86	18.4	1.579	HDPE	41.76	42.05	225
259	p2676	n3493	40.86	n3495	41.38	30.6	1.697	HDPE	42.05	42.57	225
260	p2677	n3495	41.38	n3496	42.27	29.3	3.033	HDPE	42.57	43.46	225
261	p2678	n3496	42.27	n3497	43.54	30	4.238	HDPE	43.46	44.73	225
262	p2679	n3497	43.54	n5489	44.79	30.8	4.06	HDPE	44.73	45.98	225
263	p2680	n3499	45.86	n3500	46.51	28.4	2.29	HDPE	47.05	47.7	225
264	p2688	n3501	46.57	n3512	47.09	30	1.733	HDPE	47.76	48.28	225
265	p2689	n3512	47.09	n3513	47.28	30	0.633	HDPE	48.28	48.47	225
266	p2690	n3513	47.28	n3514	47.91	30	2.101	HDPE	48.47	49.1	225
267	p4721	n895	41.27	n5045	41.12	16.1	0.931	HDPE	42.46	42.31	225
268	p4722	n5045	41.12	n898	40.9	13.9	1.584	HDPE	42.31	42.09	225
269	p4723	n901	40.33	n5046	39.97	22.2	1.62	HDPE	41.52	41.16	225
270	p4726	n904	39.46	n3180	39.147	9.2	3.419	HDPE	40.65	40.56	225
271	p4727	n3180	39.147	n906	39.16	4.1	0.34	HDPE	40.56	40.45	225
272	p4728	n907	39.2	n5047	39.34	14.6	0.957	HDPE	40.39	40.53	225
273	p4742	n917	43.05	n912	42.65	10.9	3.663	HDPE	44.24	43.84	225
274	p4743	n915	39.92	n3492	40.57	28.3	2.294	HDPE	41.11	41.76	225
275	p4757	n922	46.36	n923	46.73	30	1.233	HDPE	47.55	47.92	225
276	p4758	n924	47.31	n5058	47.67	16.4	2.195	HDPE	48.5	48.86	225
277	p4759	n5058	47.67	n925	47.93	13.6	1.913	HDPE	48.86	49.12	225
278	p4760	n926	48.44	n927	48.86	30	1.4	HDPE	49.63	50.05	225
279	p4761	n930	50.2	n931	50.45	11.7	2.142	HDPE	51.39	51.64	225
280	p4764	n937	55.67	n3722	57.13	30	4.873	HDPE	56.86	58.32	225
281	p4765	n3722	57.13	n5060	57.35	3.5	6.364	HDPE	58.32	58.54	225
282	p4766	n5060	57.35	n938	58.93	26.5	5.965	HDPE	58.54	60.12	225
283	p4767	n939	59.72	n940	60.61	23.5	3.792	HDPE	60.91	61.8	225
284	p5521	n5489	44.79	n5490	45.56	18.3	4.212	HDPE	45.98	46.75	225
285	p5522	n5490	45.56	n3499	45.86	10.9	2.757	HDPE	46.75	47.05	225
286	p5523	n3500	46.51	n3501	46.57	1.6	3.715	HDPE	47.7	47.76	225
287	p5620	n5556	22.55	n3261	21.06	10.3	14.48	HDPE	23.74	22.25	225
288	p5621	n5557	23.54	n5556	22.55	6.7	14.748	HDPE	24.73	23.74	225
289	p5622	n3260	25.44	n5557	23.54	12.7	14.996	HDPE	26.63	24.73	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
290	p5623	n3211	31.41	n3258	31.16	2.2	11.457	HDPE	32.6	32.35	225
291	p5625	n3190	37.7	n5558	38.122	18.4	2.286	HDPE	38.89	39.85	225
292	p5626	n5558	38.122	n3189	38.161	11.5	0.34	HDPE	39.85	40.22	225
293	p5628	n5559	38.389	n5560	38.425	10.8	0.34	HDPE	41.88	42.02	225
294	p5629	n3186	38.467	n5560	38.425	12.2	0.34	HDPE	41.79	42.02	225
295	p5630	n3185	38.569	n3184	38.671	30	0.34	HDPE	41.15	40.45	225
296	p5631	n3183	38.773	n3182	38.875	30	0.34	HDPE	40.26	40.27	225
297	p5632	n3193	35.79	n5561	36.14	7.1	4.928	HDPE	36.98	37.33	225
298	p5633	n3194	37.52	n5561	36.14	14	9.836	HDPE	38.71	37.33	225
299	p5635	n5562	41.632	n5563	41.67	11.3	0.34	HDPE	43.44	42.86	225
301	p5638	n3201	39.377	n5565	39.366	3.3	0.34	HDPE	42.32	41.96	225
302	p5639	n5565	39.366	n5566	39.354	3.6	0.34	HDPE	41.96	41.62	225
303	p5640	n5566	39.354	n3202	39.325	8.6	0.34	HDPE	41.62	41.33	225
304	p5641	n3204	30.305	n5567	30.389	24.7	0.34	HDPE	34.1	32.86	225
305	p5642	n5567	30.389	n5568	30.47	24	0.34	HDPE	32.86	31.66	225
306	p5644	n3206	30.752	n5569	30.824	21.1	0.34	HDPE	33.05	33.71	225
307	p5645	n5569	30.824	n3207	30.876	15.4	0.34	HDPE	33.71	33.52	225
308	p5648	MH-1	1.81	n3244	1.99	19.3	0.931	HDPE	3	3.18	225
309	p5652	n3255	9.82	n5572	10.87	6.8	15.425	HDPE	11.01	12.06	225
310	p5653	n3256	11.612	n5572	10.87	4.4	17	HDPE	12.84	12.06	225
311	p5654	n3242	7.65	n3241	6.52	21.7	5.212	HDPE	8.84	7.71	225
312	p5655	n3240	6.4	n3239	6.324	22.6	0.34	HDPE	7.59	8.39	225
313	p5656	n3237	6.262	n3236	6.222	11.8	0.34	HDPE	9.85	10.08	225
314	p5657	n3235	9.29	n5573	9.25	11.9	0.34	HDPE	10.48	11.58	225
315	p5658	n5573	9.25	n3234	9.231	5.5	0.34	HDPE	11.58	11.67	225
316	p5659	n3223	6.813	n3224	6.804	2.6	0.34	HDPE	11.73	11.76	225
317	p5661	n3227	6.641	n3228	6.601	11.9	0.34	HDPE	10.07	9.26	225
318	p5662	n3229	4.91	n3230	3.5	8.8	16.092	HDPE	6.1	4.69	225
319	p5664	n3220	6.942	n5574	6.981	11.5	0.34	HDPE	11.07	9.46	225
320	p5665	n5574	6.981	n5575	7.018	10.9	0.34	HDPE	9.46	8.4	225
321	p5666	n5576	7.03	n5575	7.018	3.7	0.34	HDPE	8.22	8.4	225
322	p5667	n5576	7.03	n3219	7.16	14.6	0.892	HDPE	8.22	8.35	225
323	p5669	n5577	8.66	n5578	9.153	2.9	17	HDPE	9.85	10.53	225
324	p5670	n5578	9.34	n5579	9.96	4.1	15.192	HDPE	10.53	11.15	225
325	p5671	n5579	9.96	n5580	10.225	1.6	17	HDPE	11.15	11.42	225
326	p5672	n5580	10.225	n5581	10.73	3.4	14.959	HDPE	11.42	11.92	225
327	p5673	n5581	10.73	n5582	12.261	9	17	HDPE	11.92	14.42	225
334	CO-2	MH-1	1.81	MH-3	1.06	42.4	1.769	HDPE	3	2.25	225
336	p2474(1)	n3191	36	MH-2	35.554	5.4	8.291	HDPE	37.19	36.744	225
337	p2474(2)	MH-2	35.554	n3212	34.05	18.1	8.291	HDPE	36.744	35.24	225
338	CO-4	MH-2	35.554	n3193	35.79	5.4	4.363	HDPE	36.744	36.98	225
341	CO-6	MH-3	1.06	LS 2	1.038	6.6	0.34	HDPE	2.25	2.25	225
383	p2491(2)	LS 1	6.176	n3236	6.222	13.6	0.34	HDPE	10.393	10.08	225
162	p722	n940	60.61	n941	60.18	30	1.435	HDPE	61.8	61.42	225
163	p723	n942	59.04	n943	58.14	30	3	HDPE	60.47	59.33	225
164	p724	n943	58.14	n944	57.26	30	2.934	HDPE	59.33	58.45	225
165	p725	n944	57.26	n945	56.51	30	2.501	HDPE	58.45	57.7	225
166	p726	n945	56.51	n946	55.75	30	2.534	HDPE	57.7	56.94	225
167	p727	n946	55.75	n947	55.06	30	2.301	HDPE	56.94	56.25	225
168	p728	n947	55.06	n948	54.35	30	2.367	HDPE	56.25	55.54	225
169	p729	n948	54.35	n949	53.6	30	2.501	HDPE	55.54	54.79	225
170	p730	n950	52.82	n951	51.94	30	2.934	HDPE	54.01	53.13	225
171	p731	n951	51.94	n952	51.22	30	2.401	HDPE	53.13	52.41	225
172	p732	n952	51.22	n953	50.62	30	2.001	HDPE	52.41	51.81	225
173	p733	n953	50.62	n5079	49.87	35.7	2.099	HDPE	51.81	51.06	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
174	p734	n955	48.2	n1120	48.11	26.6	0.34	HDPE	50.71	50.35	225
175	p735	n957	48.05	n958	47.95	30	0.34	HDPE	50.01	49.9	225
176	p736	n958	47.95	n959	47.85	30	0.34	HDPE	49.9	49.69	225
177	p737	n5103	48.47	n961	48.77	31.2	0.96	HDPE	49.66	49.96	225
178	p738	n961	48.77	n962	49.17	30	1.333	HDPE	49.96	50.36	225
179	p739	n962	49.17	n963	49.65	30	1.6	HDPE	50.36	50.84	225
180	p740	n963	49.65	n964	50.13	30	1.6	HDPE	50.84	51.32	225
181	p741	n964	50.13	n965	50.59	30	1.533	HDPE	51.32	51.78	225
182	p742	n965	50.59	n966	50.97	30	1.278	HDPE	51.78	52.2	225
183	p743	n967	51.03	n968	51.72	25.8	2.66	HDPE	52.49	52.91	225
184	p744	n968	51.72	n969	52.34	30	2.067	HDPE	52.91	53.53	225
185	p745	n970	53.17	n971	53.52	11.7	3	HDPE	54.36	54.76	225
186	p746	n972	54.3	n973	55.2	30	3	HDPE	55.49	56.67	225
187	p747	n973	55.48	n974	56.38	30	3	HDPE	56.67	58.12	225
188	p748	n974	56.93	n976	58.1	38.8	3	HDPE	58.12	59.87	225
189	p749	n976	58.68	n977	59.45	30	2.568	HDPE	59.87	60.64	225
190	p750	n977	59.45	n5115	59.88	41.6	1.033	HDPE	60.64	61.07	225
191	p2871	n5386	38.59	n3750	37.66	31.1	3	HDPE	41.51	38.85	225
192	p2872	n3750	36.04	n3751	35.14	29.9	3	HDPE	38.85	36.33	225
193	p2873	n3751	35.14	n3752	34.34	30	2.668	HDPE	36.33	35.53	225
194	p2874	n3753	34.7	n3754	35.11	13.6	3	HDPE	35.89	36.64	225
195	p2875	n3754	35.45	n3755	36.31	28.8	3	HDPE	36.64	38.38	225
196	p2993	n5082	48.34	n3919	48.46	34.1	0.34	HDPE	50.82	50.59	225
197	p2994	n3919	48.46	n3920	48.56	30	0.34	HDPE	50.59	49.75	225
198	p3039	n3971	52.96	n3974	52.06	40.9	3	HDPE	55.43	53.25	225
199	p3040	n3974	51.56	n3975	50.66	30	3	HDPE	53.25	51.85	225
200	p3041	n3975	50.24	n3976	49.73	17.1	3	HDPE	51.85	50.92	225
201	p3042	n3976	49.34	n3920	48.56	26.1	3	HDPE	50.92	49.75	225
202	p3048	n3982	47.76	n3983	47.56	23.8	0.858	HDPE	49.15	48.75	225
203	p3049	n3983	47.56	n3984	47.29	30	0.9	HDPE	48.75	48.48	225
204	p3050	n3984	47.29	n3985	47.13	24.4	0.654	HDPE	48.48	48.32	225
205	p3051	n3985	47.13	n3987	46.43	35.5	2.334	HDPE	48.32	47.62	225
206	p3056	n3987	46.13	n3995	45.78	11.7	3	HDPE	47.62	46.97	225
207	p3057	n3996	43.16	n3997	42.26	29.9	3	HDPE	45.45	43.45	225
208	p3058	n3997	42.26	n3998	41.97	30	0.967	HDPE	43.45	43.16	225
209	p3059	n3998	41.97	n3999	41.87	30	0.34	HDPE	43.16	43.45	225
210	p3060	n3999	41.87	n4000	41.77	30	0.34	HDPE	43.45	44	225
211	p3061	n4000	41.77	n4001	41.7	19.7	0.34	HDPE	44	44.15	225
212	p3062	n5176	41.67	n4003	40.52	40.2	2.882	HDPE	44.14	42.45	225
213	p3063	n4004	39.55	n4005	39.21	11.3	3	HDPE	41.17	40.4	225
214	p3068	n3755	37.19	n4012	38.09	30	3	HDPE	38.38	39.58	225
215	p3069	n4012	38.39	n4006	38.79	14.4	2.782	HDPE	39.58	39.98	225
216	p3070	n4013	51.05	n4014	51.12	19.4	0.34	HDPE	52.28	52.31	225
217	p3071	n4014	51.12	n4015	51.4	30	0.933	HDPE	52.31	52.59	225
218	p3072	n4016	51.67	n4017	52.04	30	1.233	HDPE	52.86	53.23	225
219	p3073	n4018	52.29	n4019	52.38	26	0.34	HDPE	53.79	54.36	225
220	p3074	n4019	52.38	n4020	52.48	30	0.34	HDPE	54.36	55.06	225
221	p3075	n4021	42.96	n5175	43.55	19.7	3	HDPE	44.15	44.77	225
222	p3076	n4023	44.52	n5174	45.6	36	3	HDPE	45.71	48.72	225
223	p3077	n4025	48.42	n4026	49	19.2	3	HDPE	49.61	51.25	225
224	p3078	n4026	50.06	n4028	51.15	36.3	3	HDPE	51.25	53.15	225
225	p3079	n4028	51.96	n4029	52.67	23.6	3	HDPE	53.15	54	225
226	p3080	n4029	52.81	n4030	53.63	27.5	3	HDPE	54	54.96	225
227	p3081	n4031	52.5	n4032	52.58	26.3	0.34	HDPE	55.12	55.4	225
228	p3082	n4033	52.79	n4034	52.89	30	0.34	HDPE	55.67	55.29	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
229	p3083	n4034	52.89	n4035	52.99	30	0.34	HDPE	55.29	54.74	225
230	p3084	n4035	52.99	n4036	53.05	17	0.34	HDPE	54.74	54.24	225
231	p3086	n4038	39.06	n4039	39.88	27.3	3	HDPE	40.25	41.33	225
232	p3087	n4040	40.65	n4041	41.31	22	3	HDPE	41.84	44.38	225
233	p3090	n4044	43.94	n4045	44.79	28.1	3	HDPE	45.13	47.89	225
234	p3091	n4045	46.7	n4046	47.6	29.8	3	HDPE	47.89	51.03	225
235	p3092	n4046	49.84	n4047	50.65	26.8	3	HDPE	51.03	53.76	225
236	p3095	n4037	51.6	n4052	51.7	37.2	0.34	HDPE	53.89	53.03	225
237	p3096	n4052	51.7	n4053	51.8	30	0.34	HDPE	53.03	52.99	225
238	p3097	n4053	51.8	n4054	52.7	30	3	HDPE	52.99	53.95	225
239	p3098	n4054	52.76	n4055	53.66	29.9	3	HDPE	53.95	56.12	225
240	p3099	n4055	54.93	n4218	55.7	28.6	2.697	HDPE	56.12	56.89	225
242	p3139	n976	58.68	n4111	59.38	32.2	2.172	HDPE	59.87	60.57	225
243	p3140	n4111	59.38	n4112	60.28	30	3	HDPE	60.57	61.94	225
244	p3141	n4112	60.75	n4113	61.65	29.9	3	HDPE	61.94	63.72	225
245	p3142	n4113	61.65	n4114	62.49	28.2	2.983	HDPE	63.72	64.87	225
246	p3146	n4119	62.5	n4120	62.6	27.9	0.34	HDPE	65.06	63.89	225
247	p3147	n4120	62.6	n4121	62.7	30	0.34	HDPE	63.89	63.89	225
248	p3148	n4121	62.7	n4122	63.01	29.5	1.05	HDPE	63.89	64.2	225
249	p3150	n4122	63.01	n4124	63.25	21.2	1.132	HDPE	64.2	64.44	225
250	p3154	n4125	63.93	n4129	64.59	22.1	2.989	HDPE	65.12	65.78	225
251	p4768	n941	60.18	n942	59.28	30	3	HDPE	61.42	60.47	225
252	p4797	n949	53.6	n950	52.82	30	2.601	HDPE	54.79	54.01	225
253	p4799	n5079	48.27	n5080	48.24	11.1	0.34	HDPE	51.06	50.95	225
254	p4800	n5080	48.24	n955	48.2	10.1	0.34	HDPE	50.95	50.71	225
255	p4801	n5079	48.27	n5081	48.29	4.6	0.34	HDPE	51.06	50.8	225
256	p4802	n5081	48.29	n5082	48.34	15.6	0.34	HDPE	50.8	50.82	225
257	p4816	n1120	48.11	n957	48.05	16.6	0.34	HDPE	50.35	50.01	225
258	p4851	n972	54.12	n971	53.57	18.3	3	HDPE	55.49	54.76	225
259	p4852	n970	53.17	n969	52.34	30	2.768	HDPE	54.36	53.53	225
260	p4853	n967	51.03	n4013	51.05	6.3	0.34	HDPE	52.49	52.28	225
261	p4854	n967	51.03	n966	50.97	17.4	0.34	HDPE	52.49	52.2	225
262	p4855	n959	47.85	n5103	47.8	13.9	0.34	HDPE	49.69	49.66	225
263	p4857	n5103	47.8	n5104	47.79	4.6	0.34	HDPE	49.66	49.34	225
264	p4858	n5104	47.79	n3982	47.76	6.8	0.34	HDPE	49.34	49.15	225
265	p4912	n4125	63.72	n4124	63.25	15.6	3	HDPE	65.12	64.44	225
266	p4913	n4119	62.5	n5130	62.5	2	0.34	HDPE	65.06	64.85	225
267	p4914	n4114	62.49	n5130	62.5	1.7	0.34	HDPE	64.87	64.85	225
268	p4972	n4015	51.4	n4016	51.67	30	0.9	HDPE	52.59	52.86	225
269	p4973	n4017	52.04	n5168	52.23	17	1.143	HDPE	53.23	53.51	225
270	p4974	n5168	52.23	n4018	52.29	17	0.34	HDPE	53.51	53.79	225
271	p4977	n4020	52.48	n4031	52.5	3.7	0.34	HDPE	55.06	55.12	225
272	p4978	n4032	52.58	n5170	52.63	13.1	0.34	HDPE	55.4	55.54	225
273	p4980	n5170	52.63	n5172	52.75	34.4	0.34	HDPE	55.54	55.8	225
274	p4981	n5172	52.75	n4033	52.79	12.5	0.34	HDPE	55.8	55.67	225
275	p4983	n4025	48.12	n5173	48.08	1.4	3	HDPE	49.61	49.27	225
276	p4984	n5173	47.62	n5174	47.53	3.1	3	HDPE	49.27	48.72	225
277	p4986	n4023	44.27	n5175	43.58	23.1	3	HDPE	45.71	44.77	225
278	p4988	n4001	41.7	n4021	41.69	3	0.34	HDPE	44.15	44.15	225
279	p4989	n4021	41.69	n5176	41.67	4.3	0.34	HDPE	44.15	44.14	225
280	p4991	n4003	40.52	n5177	40.15	12.2	3	HDPE	42.45	41.34	225
281	p4992	n5177	40.08	n4004	39.98	3.4	3	HDPE	41.34	41.17	225
282	p4993	n4005	39.15	n4038	39.06	3	3	HDPE	40.4	40.25	225
283	p4994	n4006	38.79	n5178	38.99	10.1	1.976	HDPE	39.98	40.18	225
284	p4995	n5178	38.99	n4038	39.06	7.1	0.983	HDPE	40.18	40.25	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
285	p4997	n4039	40.14	n4040	40.38	8.7	3	HDPE	41.33	41.84	225
286	p4998	n4041	43.19	n4044	43.42	7.5	3	HDPE	44.38	45.13	225
287	p5002	n4047	51.59	n4037	51.6	3	0.34	HDPE	53.76	53.89	225
288	p5005	n5183	56.28	n4218	55.7	30.5	1.904	HDPE	57.47	56.89	225
289	p5336	n3748	40.6	n5386	40.32	9.3	3	HDPE	42.48	41.51	225
290	p5338	n3752	34.34	n3753	34.7	16.4	2.198	HDPE	35.53	35.89	225
291	p5375	n3995	44.81	n3996	44.26	18.2	3	HDPE	46.97	45.45	225
293	CO-2	n5183	56.28	n4058	56.58	29.5	1.017	HDPE	57.47	57.77	225
295	CO-4	n3752	34.34	LS11	34.31	7	0.431	HDPE	35.53	35.5	225
801	p751	n979	59.53	n980	58.69	30	2.801	HDPE	60.72	59.88	225
802	p752	n980	58.69	n981	57.71	30	3.269	HDPE	59.88	58.9	225
803	p753	n981	57.71	n982	56.77	30	3.134	HDPE	58.9	57.96	225
804	p754	n982	56.77	n983	55.91	30	2.868	HDPE	57.96	57.1	225
805	p755	n983	55.91	n984	55.09	30	2.734	HDPE	57.1	56.28	225
806	p756	n985	54.5	n986	53.31	30	3.969	HDPE	55.69	54.5	225
807	p757	n986	53.31	n987	52.29	30	3.402	HDPE	54.5	53.48	225
808	p758	n987	52.29	n988	51.79	30	1.667	HDPE	53.48	52.98	225
809	p759	n988	51.79	n989	51.62	29.9	0.569	HDPE	52.98	52.81	225
810	p760	n990	51.518	n991	51.416	30	0.34	HDPE	52.92	53.06	225
811	p761	n991	51.416	n992	51.314	30	0.34	HDPE	53.06	53.12	225
812	p2511	n3263	13.1	n3264	8.96	29.7	13.935	HDPE	14.29	10.15	225
813	p2512	n3264	8.96	n3265	6.76	29.9	7.358	HDPE	10.15	7.95	225
814	p2513	n3265	6.76	n3266	5.4	30	4.538	HDPE	7.95	6.59	225
815	p2514	n3267	4.49	n3269	4.11	28	1.357	HDPE	5.68	5.3	225
816	p2515	n3269	4.11	n5554	3.92	26.3	0.724	HDPE	5.3	5.11	225
817	p2516	n3271	3.72	n3272	3.632	25.9	0.34	HDPE	4.91	5.77	225
818	p2517	n3272	3.632	n3273	3.584	14.3	0.34	HDPE	5.77	6	225
819	p2518	n3274	6.92	n3275	6.882	11.3	0.34	HDPE	8.86	9.09	225
820	p2519	n3276	3.18	n3277	2.54	10.9	5.877	HDPE	4.37	3.73	225
821	p2520	n3277	2.54	n3278	0.67	30	6.235	HDPE	3.73	3.47	225
822	p2521	n3278	0.67	n5251	0.539	41.8	0.313	HDPE	3.47	3.7	280
823	p2522	n3280	0.535	n3281	0.482	16.9	0.313	HDPE	3.65	3.71	280
824	p2523	n3281	0.482	n3282	0.398	26.9	0.313	HDPE	3.71	3.49	280
825	p2524	n3283	0.388	n3284	0.355	10.6	0.313	HDPE	3.43	3.29	280
826	p2525	n3285	0.294	n3286	0.2	30	0.313	HDPE	3.05	2.85	280
827	p2526	n3286	0.2	n3287	0.106	30	0.313	HDPE	2.85	2.92	280
828	p2527	n3287	0.106	n3288	0.012	30	0.313	HDPE	2.92	2.99	280
829	p2528	n3288	0.012	n5250	-0.109	38.6	0.313	HDPE	2.99	2.95	280
830	p2529	n3290	-0.124	n3291	-0.176	16.7	0.313	HDPE	2.94	2.91	280
831	p2530	n3291	-0.176	n3292	-0.27	30	0.313	HDPE	2.91	2.83	280
832	p2531	n3292	-0.27	n3293	-0.364	30	0.313	HDPE	2.83	2.64	280
833	p2532	n3294	-0.418	n3295	-0.433	4.8	0.313	HDPE	2.59	2.65	280
835	p2534	n5239	1.374	n3299	1.288	34.9	0.249	HDPE	2.64	2.61	315
836	p2535	n3299	1.288	n3301	1.236	20.6	0.249	HDPE	2.61	2.51	315
837	p2536	n3301	1.236	n3302	1.204	13.2	0.249	HDPE	2.51	2.73	315
838	p2537	n3302	1.204	n3303	1.185	7.4	0.249	HDPE	2.73	2.7	315
839	p2538	n3303	1.185	n3304	1.129	22.6	0.249	HDPE	2.7	2.73	315
840	p2539	n3304	1.129	n3305	1.054	30	0.249	HDPE	2.73	2.53	315
841	p2540	n3306	0.002	n3307	0.067	19.2	0.34	HDPE	2.53	2.62	250
842	p2541	n3307	0.067	n3308	0.169	30	0.34	HDPE	2.62	2.82	250
843	p2542	n3308	0.169	n3310	0.296	37.1	0.34	HDPE	2.82	2.88	250
844	p2543	n3310	0.296	n3311	0.344	14.2	0.34	HDPE	2.88	2.89	250
845	p2544	n3311	0.344	n3313	0.439	27.9	0.34	HDPE	2.89	2.94	250
846	p2546	n3315	0.508	n3316	0.577	20.3	0.34	HDPE	2.84	2.74	250
847	p2547	n3316	0.577	n5235	0.683	31.2	0.34	HDPE	2.74	2.58	250

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
848	p2548	n3318	0.842	n3319	0.883	12.2	0.34	HDPE	2.44	2.63	250
849	p2549	n3320	1.034	n3322	1.096	18.3	0.34	HDPE	2.65	2.71	250
850	p2550	n3322	1.096	n3323	1.121	7.3	0.34	HDPE	2.71	2.75	250
851	p2551	n3323	1.121	n3324	1.189	20.2	0.34	HDPE	2.75	2.78	250
852	p2553	n3327	1.334	n3328	1.393	17.5	0.34	HDPE	2.79	2.9	250
853	p2554	n3328	1.393	n3329	1.495	30	0.34	HDPE	2.9	2.97	250
856	p2557	n3332	-0.752	n3333	-0.65	30	0.34	HDPE	2.82	2.7	250
857	p2558	n3334	-0.548	n3335	-0.446	30	0.34	HDPE	2.73	2.75	250
858	p2559	n3336	-0.242	n3337	-0.14	30	0.34	HDPE	2.76	2.81	250
859	p2560	n3337	-0.14	n3338	-0.038	30	0.34	HDPE	2.81	2.75	250
860	p2561	n3338	-0.038	n3339	0.064	30	0.34	HDPE	2.75	2.72	250
861	p2562	n3339	0.064	n3340	0.166	30	0.34	HDPE	2.72	2.47	250
862	p2563	n3340	0.166	n3342	0.268	30	0.34	HDPE	2.47	2.39	250
863	p2565	n3342	0.268	n3343	0.309	12.1	0.34	HDPE	2.39	4.44	250
864	p2566	n915	39.92	n3344	38.44	30	4.94	HDPE	41.11	39.63	225
865	p2567	n3344	38.44	n3345	37.34	30	3.67	HDPE	39.63	38.53	225
866	p2568	n3345	37.34	n3346	36.61	30	2.434	HDPE	38.53	37.8	225
867	p2569	n3346	36.61	n3347	35.93	30	2.267	HDPE	37.8	37.12	225
868	p2570	n3347	35.93	n3348	35.47	30	1.533	HDPE	37.12	36.66	225
869	p2571	n3348	35.47	n3349	34.8	30	2.234	HDPE	36.66	35.99	225
870	p2572	n3349	34.8	n3350	34.43	15.4	2.401	HDPE	35.99	35.62	225
871	p2579	n3350	34.43	n3359	33.02	30	4.706	HDPE	35.62	34.21	225
872	p2580	n3359	33.02	n3360	31.05	29.9	6.584	HDPE	34.21	32.24	225
873	p2581	n3360	31.05	n3361	30.69	30	1.2	HDPE	32.24	31.88	225
874	p2582	n3362	30.31	n3363	28.61	29.9	5.678	HDPE	31.5	29.8	225
875	p2583	n3363	28.61	n3364	26	26.2	9.947	HDPE	29.8	27.19	225
876	p2586	n3364	26	n3367	24.3	15.1	11.236	HDPE	27.19	25.49	225
877	p2587	n3367	24.3	n3368	20.02	29.7	14.416	HDPE	25.49	21.21	225
878	p2589	n3368	19.354	n3371	16.07	21.9	15	HDPE	21.21	17.26	225
879	p2590	n3372	9.68	n3373	7.55	26.6	7.998	HDPE	10.87	8.74	225
880	p2593	n3373	7.55	n3376	5.73	20.9	8.712	HDPE	8.74	6.92	225
881	p2594	n3377	4.08	n3378	3.62	30	1.533	HDPE	5.27	4.81	225
882	p2596	n3381	3.24	n3382	3.05	30	0.633	HDPE	4.43	4.24	225
883	p2597	n3382	3.05	n3383	2.82	30	0.767	HDPE	4.24	4.01	225
884	p2598	n3384	1.969	n3385	1.87	24.4	0.406	HDPE	3.18	3.06	225
885	p2599	n3385	1.87	n3386	1.768	30	0.34	HDPE	3.06	3	225
886	p2600	n3386	1.768	n3387	1.666	30	0.34	HDPE	3	2.97	225
887	p2601	n3388	1.462	n3389	1.36	30	0.34	HDPE	2.73	2.86	225
888	p2602	n3389	1.36	n3390	0.872	14.6	3.345	HDPE	2.86	2.97	225
889	p2603	n3278	0.67	n3391	0.725	16.2	0.34	HDPE	3.47	2.84	225
890	p2604	n3392	0.772	n3390	0.872	29.5	0.34	HDPE	2.88	2.97	225
891	p2605	n3390	0.872	n3393	0.974	30	0.34	HDPE	2.97	2.47	225
892	p2606	n3393	0.974	n3394	1.076	30	0.34	HDPE	2.47	2.52	225
893	p2607	n3395	1.178	n3396	1.28	30	0.34	HDPE	2.48	2.47	225
894	p2608	n3396	1.28	n3397	1.39	30	0.367	HDPE	2.47	2.58	225
895	p2609	n3397	1.39	n3398	1.54	11.1	1.355	HDPE	2.58	2.73	225
896	p2613	n3398	1.54	n3403	1.644	26.5	0.392	HDPE	2.73	2.9	225
897	p2614	n3403	1.644	n3404	1.746	30	0.34	HDPE	2.9	3.11	225
898	p2615	n3404	1.746	n3405	1.848	30	0.34	HDPE	3.11	3.28	225
899	p2617	n3408	1.95	n3409	2.08	30	0.433	HDPE	3.14	3.27	225
900	p2618	n3409	2.08	n3410	2.31	24.8	0.927	HDPE	3.27	3.5	225
901	p2621	n3410	2.31	n3413	2.86	8.3	6.621	HDPE	3.5	4.05	225
902	p2622	n3414	4.09	n3415	7.89	29.7	12.777	HDPE	5.28	9.08	225
903	p2623	n3416	13.94	n3417	17.111	21.1	15	HDPE	15.13	19.17	225
904	p2624	n3418	22.84	n3419	24.4	30	5.207	HDPE	24.03	25.59	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
905	p2625	n3420	25.37	n3421	26.06	29	2.376	HDPE	26.56	27.25	225
906	p2626	n3422	28.05	n3423	30.48	29.9	8.127	HDPE	29.24	31.67	225
907	p2627	n3423	30.48	n3424	32.1	30	5.407	HDPE	31.67	33.29	225
908	p2628	n3425	35.32	n3426	39.59	29.7	14.382	HDPE	36.51	40.78	225
909	p2629	n3426	39.59	n3427	43.119	29.8	11.844	HDPE	40.78	44.33	225
910	p2630	n3427	43.119	n3428	43.18	18.1	0.34	HDPE	44.33	45.46	225
911	p2631	n3429	7.36	n3430	9.15	26.3	6.816	HDPE	8.55	10.34	225
912	p2632	n3431	12.64	n3432	14.44	29.9	6.01	HDPE	13.83	15.63	225
913	p2633	n3432	14.44	n3433	16.81	29.9	7.926	HDPE	15.63	18	225
914	p2634	n3433	16.81	n3434	20.01	29.8	10.727	HDPE	18	21.2	225
915	p2635	n3434	20.01	n3435	23.26	29.8	10.899	HDPE	21.2	24.45	225
916	p2636	n3435	23.26	n3436	27.64	29.7	14.762	HDPE	24.45	28.83	225
917	p2637	n3436	27.64	n3437	32.089	29.7	15	HDPE	28.83	33.33	225
918	p2638	n3437	32.089	n3438	35.54	25.9	13.35	HDPE	33.33	36.73	225
919	p2639	n3439	36.02	n3440	39.63	29.8	12.122	HDPE	37.21	40.82	225
920	p2640	n3440	39.63	n3441	43.01	29.8	11.338	HDPE	40.82	44.2	225
921	p2641	n3441	43.01	n3442	45.4	29.9	7.993	HDPE	44.2	46.59	225
922	p2642	LS 4	5.55	n3444	5.625	22.1	0.34	HDPE	11.85	9.68	225
923	p2643	n3445	12.74	n3446	15.07	29.2	7.977	HDPE	13.93	16.26	225
924	p2644	n3446	15.07	n3447	19.31	29.7	14.276	HDPE	16.26	20.5	225
925	p2645	n3447	19.31	n3448	23.729	29.5	15	HDPE	20.5	26.16	225
926	p2646	n3448	24.97	n3449	29.329	29.1	15	HDPE	26.16	33.58	225
927	p2647	n3449	32.39	n3450	36.767	29.2	15	HDPE	33.58	40.56	225
928	p2648	n3451	43.73	n3452	44.68	26	3.648	HDPE	44.92	45.87	225
929	p2649	n3453	10.22	n3454	10.138	24.1	0.34	HDPE	11.41	12.13	225
930	p2650	n3454	10.138	n5471	6.549	34.8	10.318	HDPE	12.13	7.98	225
931	p2651	n3457	3.68	n3458	2.57	7.7	14.406	HDPE	4.87	3.76	225
932	p2653	n3306	0.002	n3460	-0.055	31.7	0.179	HDPE	2.53	2.3	400
933	p2654	n3461	-0.079	n3462	-0.118	21.6	0.179	HDPE	2.25	2	400
934	p2655	n3462	-0.118	n3463	-0.171	30	0.179	HDPE	2	1.42	400
935	p2656	n3463	-0.171	n3464	-0.388	30	0.722	HDPE	1.42	0.99	400
936	p2658	n3465	-0.06	n3466	0.074	30	0.444	HDPE	1.24	1.85	355
937	p2659	n3466	0.074	n3467	0.115	19.5	0.209	HDPE	1.85	2.1	355
938	p2660	n3468	0.151	n3458	0.199	23.1	0.209	HDPE	2.55	3.76	355
939	p2661	n3469	0.209	n5390	0.289	32.2	0.25	HDPE	3.58	2.36	315
940	p2662	n3471	0.423	n3472	0.479	22.6	0.249	HDPE	2.19	2.15	315
941	p2663	n3473	0.519	n3474	0.573	21.6	0.249	HDPE	2.15	2.12	315
942	p2664	n5397	0.644	n3476	0.767	31.1	0.394	HDPE	1.91	2.06	315
943	p2665	n3477	0.874	n3478	1.106	29.6	0.783	HDPE	2.14	2.45	315
944	p2666	n3479	1.182	n3480	1.257	30	0.249	HDPE	2.55	2.69	315
945	p2667	n3480	1.257	n3481	1.321	25.9	0.249	HDPE	2.69	2.77	315
946	p2668	n3481	1.321	n3483	1.394	29.6	0.249	HDPE	2.77	2.66	315
947	p2669	n3483	1.394	n3486	1.514	36.1	0.332	HDPE	2.66	2.78	315
948	p2670	n3486	1.514	n3487	1.704	28.4	0.668	HDPE	2.78	2.97	315
949	p2671	n3487	1.704	n3488	1.944	30	0.8	HDPE	2.97	3.21	315
950	p2672	n3488	1.944	n3489	2.342	30	1.327	HDPE	3.21	3.69	315
951	p2673	n3489	2.342	n3490	2.417	30	0.249	HDPE	3.69	5.31	315
952	p2674	n3490	2.417	n3491	2.441	9.5	0.249	HDPE	5.31	5.87	315
953	p2692	n3515	47.82	n3516	47.2	30	2.067	HDPE	49.01	48.39	225
954	p2693	n3516	47.2	n3517	44.422	21.7	12.779	HDPE	48.39	47.97	225
955	p2694	n3517	44.422	n3518	44.32	30	0.34	HDPE	47.97	47.12	225
956	p2695	n3519	44.313	n3520	44.211	30	0.34	HDPE	47.09	46.89	225
957	p2696	n3520	44.211	n3521	44.109	30	0.34	HDPE	46.89	46.92	225
958	p2697	n3521	44.109	n3522	44.007	30	0.34	HDPE	46.92	47.27	225
959	p2698	n3522	44.007	n3523	43.905	30	0.34	HDPE	47.27	47.63	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
960	p2699	n3523	43.905	n3524	43.829	22.3	0.34	HDPE	47.63	47.62	225
961	p2700	n3524	43.829	n3525	44.014	30	0.618	HDPE	47.62	47	225
962	p2701	n3526	44.218	n3527	44.32	30	0.34	HDPE	46.07	46.77	225
963	p2702	n3527	44.32	n3528	44.422	30	0.34	HDPE	46.77	46.84	225
964	p2703	n3528	44.422	n3529	44.524	30	0.34	HDPE	46.84	46.82	225
965	p2704	n3529	44.524	n3530	44.626	30	0.34	HDPE	46.82	46.91	225
966	p2705	n3530	44.626	n3531	44.728	30	0.34	HDPE	46.91	47.25	225
967	p2706	n3531	44.728	n3532	44.83	30	0.34	HDPE	47.25	46.98	225
968	p2707	n3524	43.829	n3533	43.739	26.6	0.34	HDPE	47.62	47.17	225
969	p2708	n3533	43.739	n3534	43.637	30	0.34	HDPE	47.17	46.93	225
970	p2715	n3534	43.637	n3542	43.579	16.9	0.34	HDPE	46.93	46.96	225
971	p2716	n3542	43.579	n3543	43.477	30	0.34	HDPE	46.96	47.13	225
972	p2717	n3543	43.477	n3544	43.375	30	0.34	HDPE	47.13	46.9	225
973	p2718	n3544	43.375	n3545	43.273	30	0.34	HDPE	46.9	45.95	225
974	p2719	n3545	43.273	n3546	43.221	15.5	0.34	HDPE	45.95	45.84	225
975	p2721	n3547	46.52	n3548	45.22	30	4.338	HDPE	47.71	46.41	225
976	p2722	n3548	45.22	n3549	43.09	29.9	7.119	HDPE	46.41	44.28	225
977	p2723	n3549	43.09	n3550	40.11	29.8	9.983	HDPE	44.28	41.3	225
978	p2724	n3550	40.11	n3551	38.66	30	4.841	HDPE	41.3	39.85	225
979	p2725	n3551	38.66	n3552	38.38	30	0.933	HDPE	39.85	39.57	225
980	p2726	n3552	38.38	n3553	36.7	29.9	5.611	HDPE	39.57	37.89	225
981	p2727	n3553	36.7	n3554	33.91	29.1	9.584	HDPE	37.89	35.1	225
982	p2728	n3555	29.01	n3556	25.095	29.7	13.156	HDPE	30.2	26.41	225
983	p2729	n3556	25.095	n3557	23.77	8.8	15	HDPE	26.41	24.96	225
984	p2730	n3557	23.261	n3558	20.15	20.7	15	HDPE	24.96	21.34	225
985	p2731	n3558	19.935	n3559	15.49	29.6	15	HDPE	21.34	16.68	225
986	p2737	n3566	10.11	n3567	7.42	29.9	9.003	HDPE	11.3	8.61	225
987	p2738	n3567	7.42	n3568	6.26	30	3.872	HDPE	8.61	7.45	225
988	p2739	n3568	6.26	n3569	6.158	30	0.34	HDPE	7.45	7.63	225
989	p2740	n3569	6.158	n3491	2.441	29.5	12.598	HDPE	7.63	5.87	225
990	p2748	n3517	44.422	n3582	44.468	13.5	0.34	HDPE	47.97	48	225
991	p2749	n3582	44.468	n3583	44.57	30	0.34	HDPE	48	48.41	225
992	p2758	n3583	44.57	n3593	44.672	30	0.34	HDPE	48.41	48.94	225
993	p2759	n3593	44.672	n3594	44.774	30	0.34	HDPE	48.94	48.65	225
994	p2760	n3594	44.774	n3595	44.856	24.1	0.34	HDPE	48.65	47.76	225
995	p2761	n3595	44.856	n3597	44.899	12.7	0.34	HDPE	47.76	46.77	225
996	p2767	n3605	44.904	n3606	45.001	28.4	0.34	HDPE	46.65	46.31	225
997	p2768	n3606	45.001	n3607	45.09	26.3	0.34	HDPE	46.31	46.28	225
998	p2769	n3607	45.09	n3609	46.27	32.1	3.677	HDPE	46.28	47.46	225
999	p2770	n3609	46.27	n5460	48.32	39.3	5.211	HDPE	47.46	49.51	225
1000	p2825	n3491	2.441	n3684	2.66	70	0.313	HDPE	5.87	4.06	280
1001	p2826	n3684	2.66	n3685	5.28	27	9.698	HDPE	4.06	6.47	225
1002	p2827	n3685	5.28	n3686	9.72	29.6	15	HDPE	6.47	11.32	225
1003	p2828	n3687	2.67	n3688	2.762	29.4	0.313	HDPE	4.07	4.24	280
1004	p2829	n3689	2.856	n3690	2.95	30	0.313	HDPE	4.29	4.33	280
1005	p2830	n3690	2.95	n3691	3.044	30	0.313	HDPE	4.33	4.45	280
1006	p2831	n3692	3.113	n3693	3.138	8	0.313	HDPE	4.49	4.57	280
1007	p2832	n3694	3.232	n3695	3.316	26.8	0.313	HDPE	4.66	4.73	280
1008	p2833	n3696	3.329	n3697	3.42	29	0.313	HDPE	4.69	4.74	280
1009	p2834	n3697	3.42	n3698	3.514	30	0.313	HDPE	4.74	4.75	280
1010	p2835	n3698	3.514	n3699	3.947	30	1.444	HDPE	4.75	5.34	250
1011	p2836	n3700	3.966	n3701	4.056	26.6	0.34	HDPE	5.36	5.43	250
1012	p2837	n3701	4.056	n3702	4.141	25	0.34	HDPE	5.43	5.52	250
1013	p2838	n3703	4.193	n3704	4.279	25.4	0.34	HDPE	5.42	5.49	250
1014	p2839	n3704	4.279	n3705	4.53	30	0.837	HDPE	5.49	5.72	225



ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
1015	p2840	n3705	4.53	n3706	4.77	30	0.8	HDPE	5.72	5.96	225
1016	p2841	n3707	6.01	n3708	9.63	29.6	12.23	HDPE	7.2	10.82	225
1017	p2842	n3709	12.58	n3710	15.42	22.1	12.874	HDPE	13.77	16.61	225
1018	p2843	n3711	20.3	n3712	22.16	29.9	6.212	HDPE	21.49	23.35	225
1019	p2844	n3712	22.16	n3713	24.28	29.9	7.086	HDPE	23.35	25.47	225
1020	p2845	n3713	24.28	n3714	28.22	29.7	13.248	HDPE	25.47	29.41	225
1021	p2846	n3714	28.22	n3715	31.04	20.7	13.61	HDPE	29.41	32.23	225
1022	p2847	n3716	35.58	n3717	39.03	29.8	11.577	HDPE	36.77	40.22	225
1023	p2848	n3718	40.13	n3719	41.43	18.8	6.93	HDPE	41.32	42.62	225
1024	p2849	n3720	42.98	n3721	43.61	8.6	7.298	HDPE	44.17	44.8	225
1025	p2851	n3724	56.398	n3725	56.296	30	0.34	HDPE	57.8	58.19	225
1026	p2852	n3725	56.296	n3726	56.194	30	0.34	HDPE	58.19	58.33	225
1027	p2853	n3726	56.194	n3727	56.092	30	0.34	HDPE	58.33	57.44	225
1028	p2854	n3727	56.092	n3728	55.59	30	1.674	HDPE	57.44	56.78	225
1029	p2855	n3728	55.59	n3729	54.84	30	2.501	HDPE	56.78	56.03	225
1030	p2856	n3729	54.84	n3730	54	30	2.801	HDPE	56.03	55.19	225
1031	p2857	n3730	54	n3731	53.03	30	3.237	HDPE	55.19	54.22	225
1032	p2858	n3732	53	n3733	51.54	15.2	9.599	HDPE	54.19	52.73	225
1033	p2859	n3734	51.271	n3735	51.172	29	0.34	HDPE	52.75	53.72	225
1034	p2860	n3735	51.172	n3736	51.067	31	0.34	HDPE	53.72	54.47	225
1035	p2861	n3736	51.067	n3737	50.965	30	0.34	HDPE	54.47	54.16	225
1036	p2862	n3737	50.965	n3738	50.863	30	0.34	HDPE	54.16	53.49	225
1037	p2863	n3738	50.863	n3739	50.807	16.5	0.34	HDPE	53.49	53.23	225
1038	p2864	n3739	50.807	n3740	50.761	13.5	0.34	HDPE	53.23	53.36	225
1039	p2865	n3741	50.743	n3742	50.659	24.8	0.34	HDPE	53.48	53.02	225
1040	p2866	n3743	50.644	n3744	50.6	13.2	0.34	HDPE	52.95	52.63	225
1041	p2867	n3744	50.6	n3745	50.16	20.9	2.102	HDPE	52.63	51.35	225
1042	p2868	n3745	50.16	n3746	46.969	29.9	10.69	HDPE	51.35	48.42	225
1043	p2869	n3746	46.969	n3747	46.42	7.9	6.95	HDPE	48.42	47.61	225
1044	p2887	n3769	0.411	n3770	0.51	29.2	0.34	HDPE	2.2	2.19	250
1045	p2888	n3771	0.77	n3772	0.816	13.6	0.34	HDPE	2.09	2.1	250
1046	p2889	n3772	0.816	n3773	0.918	30	0.34	HDPE	2.1	2.15	250
1047	p2890	n3773	0.918	n3774	1.02	30	0.34	HDPE	2.15	2.32	250
1048	p2891	n3775	1.074	n3776	1.122	14.1	0.34	HDPE	2.37	2.47	225
1049	p2892	n3776	1.122	n3777	1.224	30	0.34	HDPE	2.47	2.61	225
1050	p2893	n3777	1.224	n3778	1.326	30	0.34	HDPE	2.61	2.61	225
1051	p2894	n3779	1.428	n3780	1.53	30	0.34	HDPE	2.68	2.72	225
1052	p2895	n3780	1.53	n3781	1.66	30	0.433	HDPE	2.72	2.85	225
1053	p2896	n3781	1.66	n3782	1.83	19.3	0.879	HDPE	2.85	3.02	225
1054	p2897	n3782	1.83	n3783	2.11	10.7	2.627	HDPE	3.02	3.3	225
1055	p2898	n3783	2.11	n3784	2.239	30	0.43	HDPE	3.3	3.49	225
1056	p2899	n3784	2.239	n3785	2.326	25.5	0.34	HDPE	3.49	3.6	225
1057	p2900	n3786	2.7	n3787	3.328	23.7	2.653	HDPE	3.89	4.61	225
1058	p2901	n5204	6.85	n3789	10.045	21.3	15	HDPE	8.04	12.29	225
1059	p2902	n3789	11.1	n5203	14.84	27.3	13.685	HDPE	12.29	16.03	225
1060	p2913	n3804	17.187	n3805	15.99	23.8	5.032	HDPE	18.79	17.18	225
1061	p2926	n3823	34.263	n3824	34.162	29.7	0.34	HDPE	35.55	35.87	225
1062	p2927	n3824	34.162	n3825	33.62	30	1.807	HDPE	35.87	34.81	225
1063	p2929	n3491	2.441	n5329	6.67	42.1	10.052	HDPE	5.87	7.86	225
1064	p2931	n3828	8.762	n3830	12.7	28.7	13.718	HDPE	10.03	13.89	225
1065	p2932	n5331	14.445	n3832	17.68	31.4	10.301	HDPE	15.79	18.87	225
1066	p2933	n3832	17.68	n3833	19.98	20.9	10.989	HDPE	18.87	21.17	225
1067	p2934	n3834	21.45	n3835	24.23	18.5	15	HDPE	22.64	25.47	225
1068	p2935	n3835	24.23	n3837	28.29	29.6	13.718	HDPE	25.47	29.48	225
1069	p2936	n3837	28.29	n3839	30.69	30.1	7.968	HDPE	29.48	31.88	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
1070	p2937	n3839	30.69	n3841	31.11	11.5	3.643	HDPE	31.88	32.3	225
1071	p2938	n3841	31.11	n3842	31.39	11.7	2.387	HDPE	32.3	32.58	225
1072	p2956	n3868	32.19	n3869	32.63	19.5	2.254	HDPE	33.38	33.82	225
1073	p2957	n3869	32.63	n3870	33.29	17.3	3.819	HDPE	33.82	34.48	225
1074	p2963	n3822	35.11	n3879	38.84	29.8	12.529	HDPE	36.3	40.03	225
1075	p2964	n3879	38.84	n3881	43.23	32	13.719	HDPE	40.03	44.42	225
1076	p2975	n3897	50.59	n3898	49.59	60	1.668	HDPE	51.78	50.78	225
1077	p2976	n3898	49.59	n5336	47.63	32.7	6.005	HDPE	50.78	48.82	225
1078	p2978	n5336	44.173	n5337	44.028	42.4	0.34	HDPE	48.82	47.88	225
1079	p2979	n3903	43.924	n3904	43.847	22.8	0.34	HDPE	47.26	47	225
1080	p2980	n3904	43.847	n3905	43.745	30	0.34	HDPE	47	46.71	225
1081	p2981	n3905	43.745	n3906	43.643	30	0.34	HDPE	46.71	45.85	225
1082	p2982	n3906	43.643	n3881	43.23	19.1	2.163	HDPE	45.85	44.42	225
1083	p3008	n3744	50.6	n3939	53.19	25.3	10.232	HDPE	52.63	54.38	225
1084	p3009	n3939	53.19	n3940	53.511	30	1.07	HDPE	54.38	55.58	225
1085	p3010	n3940	53.511	n3941	53.613	30	0.34	HDPE	55.58	57.16	225
1086	p3011	n3941	53.613	n3942	53.715	30	0.34	HDPE	57.16	58.28	225
1087	p3012	n3942	53.715	n3943	53.817	29.9	0.34	HDPE	58.28	56.7	225
1088	p3013	n3943	53.817	n3944	53.918	30	0.34	HDPE	56.7	55.26	225
1089	p3014	n3944	53.918	n3945	54.02	30	0.34	HDPE	55.26	55.21	225
1090	p3015	n3945	54.02	n3946	54.628	30	2.027	HDPE	55.21	55.85	225
1091	p3016	n3946	54.628	n3947	54.73	30	0.34	HDPE	55.85	55.92	225
1092	p3017	n3947	54.73	n3948	54.83	12	0.835	HDPE	55.92	56.02	225
1093	p3018	n3949	59.49	n3950	57.46	29.9	6.787	HDPE	60.68	58.65	225
1094	p3019	n3950	57.46	n3951	57.358	30	0.34	HDPE	58.65	59.15	225
1095	p3020	n3951	57.358	n3952	57.257	30	0.34	HDPE	59.15	60.94	225
1096	p3021	n3952	57.257	n3953	57.163	27.5	0.34	HDPE	60.94	61.62	225
1097	p3022	n3954	57.125	n3955	56.67	21.1	2.155	HDPE	60.46	57.86	225
1098	p3023	n3955	56.67	n3948	54.83	23.9	7.702	HDPE	57.86	56.02	225
1099	p3024	n3746	46.969	n3956	46.99	6.2	0.34	HDPE	48.42	48.18	225
1100	p3025	n3956	46.99	n3957	47.44	30	1.5	HDPE	48.18	48.63	225
1101	p3026	n3957	47.44	n3958	48.7	30	4.204	HDPE	48.63	49.89	225
1102	p3027	n3958	48.7	n3959	50.07	30	4.571	HDPE	49.89	51.26	225
1103	p3028	n3960	52.98	n3961	53.199	25.8	0.847	HDPE	54.17	54.65	225
1104	p3029	n3961	53.199	n3962	53.299	29.5	0.34	HDPE	54.65	54.6	225
1106	p3100	n4057	56.27	n4058	56.168	29.5	0.34	HDPE	57.46	57.77	225
1107	p3101	n4058	56.168	n4059	56.066	30	0.34	HDPE	57.77	58.16	225
1108	p3102	n4059	56.066	n4060	55.964	30	0.34	HDPE	58.16	57.98	225
1109	p3103	n4061	55.896	n4062	53.02	39.3	7.316	HDPE	57.75	54.21	225
1110	p3104	n4063	50.24	n4064	47.68	27.2	9.415	HDPE	51.43	48.87	225
1111	p3105	n4064	47.68	n4066	45.95	32.2	5.376	HDPE	48.87	47.14	225
1112	p3106	n4066	45.95	n4067	44.58	30	4.571	HDPE	47.14	45.77	225
1113	p3107	n4067	44.58	n4068	44.478	30	0.34	HDPE	45.77	46.2	225
1114	p3108	n4068	44.478	n4069	44.376	30	0.34	HDPE	46.2	47.03	225
1115	p3109	n4069	44.376	n4070	44.274	30	0.34	HDPE	47.03	47.46	225
1116	p3110	n4070	44.274	n4071	44.183	26.9	0.34	HDPE	47.46	48.52	225
1117	p3111	n3897	50.59	n5364	51.22	43.4	1.452	HDPE	51.78	52.41	225
1118	p3112	n4074	52.29	n4075	54.36	29.9	6.916	HDPE	53.48	55.55	225
1119	p3113	n4076	54.05	n4077	53.63	22.9	1.832	HDPE	55.24	54.82	225
1120	p3114	n4077	53.63	n4078	52.18	20.2	7.175	HDPE	54.82	53.37	225
1121	p3115	n4079	50.84	n4080	46.47	29.7	14.724	HDPE	52.03	47.66	225
1122	p3116	n4080	45.271	n4081	40.93	28.9	15	HDPE	47.66	42.12	225
1123	p3117	n4082	31.488	n4083	27.12	29.1	15	HDPE	35.53	28.31	225
1124	p3118	n4083	25.168	n4084	20.77	29.3	15	HDPE	28.31	21.96	225
1125	p3119	n4084	19.65	n4085	16.18	23.1	15	HDPE	21.96	17.37	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
1126	p3120	n4085	15.605	n4086	14.67	6.2	15	HDPE	17.37	15.86	225
1127	p3121	n4087	12.863	n4088	9.14	24.8	15	HDPE	15.69	10.33	225
1128	p3122	n3699	3.947	n4089	5.73	29.9	5.956	HDPE	5.34	6.92	225
1129	p3123	n4089	5.73	n4090	8.63	19.3	15	HDPE	6.92	11.1	225
1130	p3124	n4091	8.74	n4092	10.01	21.3	5.968	HDPE	9.93	11.2	225
1131	p3125	n4093	12.24	n4094	15.85	26.7	13.516	HDPE	13.43	17.04	225
1132	p3126	n4095	16.06	n4096	18.98	29.8	9.786	HDPE	17.25	20.17	225
1133	p3127	n4075	54.36	n4097	55.59	20.9	5.888	HDPE	55.55	56.78	225
1134	p3155	n4129	64.59	n4131	64.41	41.9	0.43	HDPE	65.78	65.6	225
1135	p3156	n4131	64.41	n5128	63.48	37.6	2.472	HDPE	65.6	64.67	225
1136	p3157	n4133	63.28	n4134	62.67	30	2.034	HDPE	64.47	63.86	225
1137	p3158	n4134	62.67	n4135	61.87	30	2.668	HDPE	63.86	63.06	225
1138	p3159	n4135	61.87	n4136	60.68	30	3.969	HDPE	63.06	61.87	225
1139	p3160	n4136	60.68	n4137	59.34	30	4.471	HDPE	61.87	60.53	225
1140	p3161	n4137	59.34	n4138	57.82	30	5.073	HDPE	60.53	59.01	225
1141	p3162	n4138	57.82	n4139	57.44	6.5	5.829	HDPE	59.01	58.63	225
1142	p3163	n4139	57.44	n5126	56.56	28.5	3.089	HDPE	58.63	57.75	225
1143	p3164	n4141	56.475	n4142	56.373	30	0.34	HDPE	57.98	58.38	225
1144	p3165	n4142	56.373	n4143	56.271	30	0.34	HDPE	58.38	58.24	225
1145	p3166	n4143	56.271	n5125	56.141	38.3	0.34	HDPE	58.24	57.34	225
1146	p3167	n4145	56.04	n4146	55.9	30	0.467	HDPE	57.23	57.09	225
1147	p3168	n4146	55.9	n4147	55.85	10.7	0.468	HDPE	57.09	57.04	225
1148	p3169	n985	54.5	n4149	54.69	23.2	0.82	HDPE	55.69	55.88	225
1149	p3170	n4149	54.69	n4150	54.85	23.3	0.686	HDPE	55.88	56.04	225
1150	p3171	n4150	54.85	n4151	55.26	30	1.367	HDPE	56.04	56.45	225
1151	p3181	n4165	51.298	n5117	51.196	30.2	0.34	HDPE	53	53.26	225
1152	p3182	n4167	51.11	n4168	51.013	28.5	0.34	HDPE	53.42	53.52	225
1153	p3183	n4168	51.013	n4169	50.911	30	0.34	HDPE	53.52	53.36	225
1154	p3184	n4169	50.911	n4170	50.809	30	0.34	HDPE	53.36	52.92	225
1155	p3185	n4170	50.809	n4171	50.707	30	0.34	HDPE	52.92	52.4	225
1156	p3186	n4172	17.31	n4173	19.34	29.9	6.782	HDPE	18.5	20.53	225
1157	p3187	n4173	19.34	n4174	21.54	29.9	7.353	HDPE	20.53	22.73	225
1158	p3188	n4174	21.54	n4175	23.63	29.9	6.983	HDPE	22.73	24.82	225
1159	p3189	n4175	23.63	n4176	25.8	29.9	7.253	HDPE	24.82	26.99	225
1160	p3190	n5195	27.2	n4178	30.1	39.4	7.364	HDPE	28.39	31.29	225
1161	p3191	n4178	30.1	n4179	30.72	9.7	6.369	HDPE	31.29	31.91	225
1162	p3192	n4180	31.06	n4181	32.41	24.9	5.426	HDPE	32.25	33.6	225
1163	p3196	n4181	32.41	n4185	33.87	22.2	6.568	HDPE	33.6	35.06	225
1164	p3201	n4185	33.87	n4192	35.33	22.3	6.55	HDPE	35.06	36.52	225
1165	p3202	n4192	35.33	n4193	35.494	30	0.548	HDPE	36.52	37.94	225
1166	p3203	n4193	35.494	n4195	35.62	36.8	0.34	HDPE	37.94	38.81	225
1167	p3204	n4195	35.62	n4196	35.698	23.2	0.34	HDPE	38.81	38.3	225
1168	p3207	n4196	35.698	n4200	35.8	30	0.34	HDPE	38.3	36.99	225
1170	p3209	n4201	32.194	n4202	32.296	30	0.34	HDPE	36.16	34.95	225
1171	p3210	n4202	32.296	n4203	32.398	30	0.34	HDPE	34.95	33.81	225
1172	p3211	n4203	32.398	n4204	32.5	30	0.34	HDPE	33.81	33.69	225
1173	p3212	n4205	34.327	n4206	35.97	23.9	6.882	HDPE	35.62	37.16	225
1174	p3213	n4207	37.14	n4208	38.1	14.2	6.784	HDPE	38.33	39.29	225
1175	p3214	n4208	38.1	n4209	39.73	30	5.441	HDPE	39.29	40.92	225
1176	p3215	n5136	40.89	n4211	42.84	31.3	6.22	HDPE	42.08	44.03	225
1177	p3216	n4212	44.12	n4213	45.51	17.4	7.975	HDPE	45.31	46.7	225
1178	p3217	n4213	45.51	n4214	47.12	30	5.374	HDPE	46.7	48.31	225
1179	p3218	n4215	48.51	n4216	49.12	8.9	6.867	HDPE	49.7	50.31	225
1180	p3219	n5132	50.675	n4216	49.12	34.3	4.526	HDPE	52.19	50.31	225
1181	p3221	n4219	53.81	n4220	53.4	30	1.367	HDPE	55	54.59	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
1182	p3222	n4220	53.4	n4221	53.27	30	0.433	HDPE	54.59	54.46	225
1183	p3223	n4221	53.27	n4222	51.45	29.9	6.081	HDPE	54.46	52.64	225
1184	p3224	n4223	48.89	n5164	48.73	30	0.534	HDPE	50.08	49.92	225
1185	p3225	n4225	48.18	n4226	46.13	29.9	6.854	HDPE	49.37	47.32	225
1186	p3226	n4226	46.13	n4227	43.08	29.8	10.221	HDPE	47.32	44.27	225
1188	p3228	n4228	37.277	n4229	37.379	29.9	0.34	HDPE	40.6	38.78	225
1189	p3229	n4229	37.379	n4230	37.47	26.9	0.34	HDPE	38.78	38.66	225
1190	p3230	n4230	37.47	n4232	37.74	16.6	1.627	HDPE	38.66	38.93	225
1191	p3231	n4232	37.74	n4233	39.62	29.9	6.283	HDPE	38.93	40.81	225
1192	p3232	n4233	39.62	n4234	42.85	29.8	10.828	HDPE	40.81	44.04	225
1193	p3233	n4234	42.85	n4235	45.69	29.5	9.64	HDPE	44.04	46.88	225
1194	p3234	n4236	47.12	n4237	49.73	19.1	13.694	HDPE	48.31	50.92	225
1195	p3236	n4238	40.409	n4239	39.22	23.6	5.039	HDPE	41.65	40.41	225
1196	p3237	n4239	39.22	n4240	38.23	30	3.302	HDPE	40.41	39.42	225
1197	p3238	n4240	38.23	n4230	37.47	26.9	2.82	HDPE	39.42	38.66	225
1198	p3241	n4227	43.08	n4245	41.62	30	4.875	HDPE	44.27	42.81	225
1199	p3242	n4245	41.62	n4246	40.25	30	4.571	HDPE	42.81	41.44	225
1200	p3243	n4246	40.25	n4247	39.21	30	3.469	HDPE	41.44	40.4	225
1201	p3244	n4247	39.21	n4248	38.48	30	2.434	HDPE	40.4	39.67	225
1202	p3245	n4249	33.29	n4250	32.55	19.4	3.809	HDPE	34.48	33.74	225
1203	p3246	n4250	32.55	n4252	31.26	33.9	3.802	HDPE	33.74	32.45	225
1204	p3247	n4252	31.26	n4253	31.193	19.8	0.34	HDPE	32.45	32.89	225
1205	p3248	n4254	31.102	n4255	31.07	9.5	0.34	HDPE	34.58	34.94	225
1207	p3250	n4256	34.53	n4258	34.421	32.2	0.34	HDPE	35.72	36.68	225
1208	p3252	n4259	34.68	n4260	34.71	8.8	0.34	HDPE	36.02	35.9	225
1209	p3253	LS 7	29.823	n4262	29.946	36.2	0.34	HDPE	35.48	33.77	225
1210	p3254	n4263	30.083	n4264	30.18	28.6	0.34	HDPE	32.02	31.37	225
1211	p3256	n4267	53.68	n4269	51.38	31.4	7.358	HDPE	54.87	52.57	225
1212	p3257	n4269	51.38	n4270	49.25	28.6	7.455	HDPE	52.57	50.44	225
1213	p3258	n4270	49.25	n4271	47.2	29.9	6.849	HDPE	50.44	48.39	225
1214	p3259	n4271	47.2	n4272	45.26	29.9	6.48	HDPE	48.39	46.45	225
1215	p3260	n4272	45.26	n4273	42.911	28.9	8.137	HDPE	46.45	44.13	225
1216	p3261	n5257	42.8	n4275	41.38	19.3	7.35	HDPE	43.99	42.57	225
1217	p3262	n4275	41.38	n4276	38.46	29.9	9.779	HDPE	42.57	39.65	225
1218	p3263	n4276	38.46	n4277	35.48	28.1	10.601	HDPE	39.65	36.67	225
1219	p3264	n4278	35.32	n4279	35.07	2.8	8.812	HDPE	36.51	36.26	225
1220	p3265	n4279	35.07	n4280	32.68	22.1	10.805	HDPE	36.26	33.87	225
1221	p3305	n3335	-0.446	n4340	-0.344	30	0.34	HDPE	2.75	2.73	250
1222	p3306	n3770	0.51	n5216	0.651	41.4	0.34	HDPE	2.19	2.2	250
1223	p4882	n5115	59.88	n979	59.53	18.4	1.906	HDPE	61.07	60.72	225
1224	p4883	n984	55.09	n985	54.5	19.3	3.062	HDPE	56.28	55.69	225
1225	p4885	n989	51.62	n990	51.518	30.2	0.34	HDPE	52.81	52.92	225
1226	p4886	n4165	51.298	n992	51.314	4.6	0.34	HDPE	53	53.12	225
1227	p4888	n5117	51.196	n5118	51.153	12.6	0.34	HDPE	53.26	53.26	225
1228	p4889	n5118	51.153	n4167	51.11	12.7	0.34	HDPE	53.26	53.42	225
1229	p4898	n4147	55.85	n5122	55.3	13.9	3.954	HDPE	57.04	56.49	225
1230	p4899	n5122	55.3	n4151	55.26	2	1.971	HDPE	56.49	56.45	225
1231	p4903	n4145	56.04	n5125	56.141	21.7	0.465	HDPE	57.23	57.34	225
1232	p4905	n4141	56.475	n5126	56.56	25	0.34	HDPE	57.98	57.75	225
1233	p4907	n4133	63.28	n5127	63.457	15.7	1.131	HDPE	64.47	64.66	225
1234	p4908	n5127	63.457	n5128	63.48	6.7	0.34	HDPE	64.66	64.67	225
1235	p4917	n4171	50.707	n5132	50.675	9.4	0.34	HDPE	52.4	52.19	225
1236	p4919	n4236	47.12	n5133	45.74	10.7	12.933	HDPE	48.31	46.93	225
1237	p4920	n4235	45.69	n5133	45.74	0.4	12.503	HDPE	46.88	46.93	225
1238	p4922	n4238	40.409	n5134	40.43	6.4	0.34	HDPE	41.65	41.62	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
1239	p4923	n4215	48.51	n4214	47.12	21.1	6.603	HDPE	49.7	48.31	225
1240	p4924	n4212	44.12	n4211	42.84	19.2	6.684	HDPE	45.31	44.03	225
1241	p4927	n5136	40.89	n4209	39.73	21.9	5.304	HDPE	42.08	40.92	225
1242	p4928	n4207	37.14	n4206	35.97	15.8	7.419	HDPE	38.33	37.16	225
1243	p4930	n4205	34.327	n5137	34.17	4.6	3.395	HDPE	35.62	35.36	225
1244	p4931	n5137	34.17	n5138	33.65	8.9	5.827	HDPE	35.36	34.84	225
1245	p4932	n5138	33.65	n5139	33.16	9.3	5.262	HDPE	34.84	34.35	225
1246	p4933	n5139	33.16	n5140	33.08	1.6	4.981	HDPE	34.35	34.27	225
1247	p4934	n5140	33.08	n5141	32.68	8.2	4.897	HDPE	34.27	33.87	225
1248	p4935	n5141	32.68	n4204	32.5	21.8	0.825	HDPE	33.87	33.69	225
1249	p4944	n4254	31.102	n5148	31.12	5.2	0.34	HDPE	34.58	33.97	225
1250	p4945	n5148	31.12	n5149	31.172	15.5	0.34	HDPE	33.97	33	225
1251	p4946	n5149	31.172	n4253	31.193	6.1	0.34	HDPE	33	32.89	225
1252	p4949	n4249	33.29	n5151	34.5	33.5	3.612	HDPE	34.48	35.69	225
1253	p4950	n4259	34.68	n5151	34.5	4.4	4.103	HDPE	36.02	35.69	225
1254	p4951	n4259	34.68	n5152	34.91	3	7.577	HDPE	36.02	36.1	225
1255	p4952	n5152	34.91	n5153	35.85	20.2	4.647	HDPE	36.1	37.04	225
1256	p4953	n5153	35.85	n5154	36.03	4.4	4.048	HDPE	37.04	37.22	225
1257	p4954	n5154	36.03	n5155	36.98	23.2	4.104	HDPE	37.22	38.17	225
1258	p4955	n5156	37.3	n5155	36.98	6.8	4.691	HDPE	38.49	38.17	225
1259	p4956	n5156	37.3	n5157	38.05	16.1	4.658	HDPE	38.49	39.24	225
1260	p4957	n5157	38.05	n4248	38.48	13.9	3.098	HDPE	39.24	39.67	225
1262	p4960	n4262	29.946	n5160	29.993	13.7	0.34	HDPE	33.77	33.29	225
1263	p4962	n5161	30.018	n5160	29.993	7.4	0.34	HDPE	32.91	33.29	225
1264	p4963	n5161	30.018	n5162	30.057	11.6	0.34	HDPE	32.91	32.58	225
1265	p4964	n4263	30.083	n5162	30.057	7.5	0.34	HDPE	32.02	32.58	225
1266	p4965	n4225	48.18	n5163	48.6	14	3	HDPE	49.37	49.79	225
1267	p4966	n5163	48.6	n5164	48.73	16	0.813	HDPE	49.79	49.92	225
1268	p4968	n4223	48.89	n5165	49.09	15.6	1.28	HDPE	50.08	50.28	225
1269	p4969	n5165	49.09	n5167	50.05	25.2	3.816	HDPE	50.28	51.24	225
1270	p4971	n5167	50.05	n4222	51.45	19.1	7.311	HDPE	51.24	52.64	225
1271	p5018	n4180	31.06	n4179	30.72	5.6	6.087	HDPE	32.25	31.91	225
1272	p5026	n5195	27.2	n4176	25.8	20.5	6.839	HDPE	28.39	26.99	225
1273	p5034	n3804	17.187	n5201	17.299	32.9	0.34	HDPE	18.79	18.49	225
1274	p5035	n5201	17.299	n4172	17.31	3.3	0.34	HDPE	18.49	18.5	225
1275	p5037	n3805	15.99	n3806	15.83	2.1	7.692	HDPE	17.18	17.02	225
1276	p5038	n3806	15.83	n5202	15.6	3.8	6.081	HDPE	17.02	16.79	225
1277	p5039	n5202	15.6	n5203	14.84	10	7.637	HDPE	16.79	16.03	225
1278	p5042	n5204	6.85	n5205	6.13	5.4	13.282	HDPE	8.04	7.32	225
1279	p5043	n5205	6.13	n5207	3.95	21.6	10.093	HDPE	7.32	5.14	225
1280	p5045	n5207	3.95	n5208	3.58	11.5	3.212	HDPE	5.14	4.77	225
1281	p5046	n5208	3.58	n5209	3.36	6.8	3.226	HDPE	4.77	4.55	225
1282	p5047	n5209	3.36	n3787	3.328	9.4	0.34	HDPE	4.55	4.61	225
1283	p5048	n3786	2.7	n5210	2.46	10.2	2.348	HDPE	3.89	3.65	225
1284	p5049	n5210	2.46	n5211	2.4	10.8	0.553	HDPE	3.65	3.59	225
1285	p5050	n5211	2.4	n5212	2.35	6.3	0.792	HDPE	3.59	3.54	225
1286	p5051	n5212	2.35	n3785	2.326	7.1	0.34	HDPE	3.54	3.6	225
1287	p5052	n3779	1.428	n3778	1.326	30	0.34	HDPE	2.68	2.61	225
1288	p5053	n3775	1.074	n3774	1.02	15.9	0.34	HDPE	2.37	2.32	225
1289	p5054	n3771	0.77	n5213	0.732	11.3	0.34	HDPE	2.09	2.07	250
1290	p5055	n5213	0.732	n5215	0.704	8.2	0.34	HDPE	2.07	2.05	250
1291	p5057	n5215	0.704	n5216	0.651	15.6	0.34	HDPE	2.05	2.2	250
1292	p5060	n5218	0.36	n3769	0.411	14.9	0.34	HDPE	2.25	2.2	250
1293	p5061	n5219	0.318	n5218	0.36	12.6	0.34	HDPE	2.4	2.25	250
1294	p5062	n3343	0.309	n5219	0.318	2.6	0.34	HDPE	4.44	2.4	250

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
1295	p5068	n3336	-0.242	n4340	-0.344	30	0.34	HDPE	2.76	2.73	250
1296	p5069	n3334	-0.548	n3333	-0.65	30	0.34	HDPE	2.73	2.7	250
1297	p5070	n5223	1.599	n3329	1.495	30.4	0.34	HDPE	3.03	2.97	250
1298	p5071	n3327	1.334	n5224	1.316	5	0.34	HDPE	2.79	2.62	250
1299	p5072	n5224	1.316	n5225	1.301	4.6	0.34	HDPE	2.62	2.79	250
1300	p5073	n5225	1.301	n5226	1.291	2.8	0.34	HDPE	2.79	2.75	250
1301	p5077	n5226	1.291	n5229	1.285	1.9	0.34	HDPE	2.75	2.7	250
1302	p5078	n5229	1.285	n3324	1.189	28.1	0.34	HDPE	2.7	2.78	250
1303	p5080	n3320	1.034	n5230	1.023	3	0.34	HDPE	2.65	2.76	250
1304	p5082	n5230	1.023	n5232	0.928	27.9	0.34	HDPE	2.76	2.79	250
1305	p5083	n5232	0.928	n3319	0.883	13.3	0.34	HDPE	2.79	2.63	250
1306	p5084	n3318	0.842	n5233	0.783	17.2	0.34	HDPE	2.44	2.54	250
1307	p5085	n5233	0.783	n5234	0.744	11.5	0.34	HDPE	2.54	2.6	250
1308	p5086	n5234	0.744	n5235	0.683	17.9	0.34	HDPE	2.6	2.58	250
1309	p5088	n3315	0.508	n3313	0.439	20.5	0.34	HDPE	2.84	2.94	250
1310	p5091	n3305	1.054	n3306	0.002	19	5.537	HDPE	2.53	2.53	315
1311	p5093	n3460	-0.055	n5237	-0.064	5.2	0.179	HDPE	2.3	2.29	400
1312	p5094	n5237	-0.064	n5238	-0.065	0.8	0.179	HDPE	2.29	2.29	400
1313	p5095	n3461	-0.079	n5238	-0.065	7.6	0.179	HDPE	2.25	2.29	400
1314	p5098	n5239	1.374	n5240	3.34	14.1	13.923	HDPE	2.64	4.53	225
1315	p5100	n3296	-0.741	n5241	-0.664	31.1	0.249	HDPE	2.52	2.39	315
1316	p5101	n5241	-0.664	n5242	-0.646	7.1	0.249	HDPE	2.39	2.44	315
1317	p5103	n5242	-0.646	n5244	-0.587	23.9	0.249	HDPE	2.44	1.63	315
1318	p5104	n5244	-0.587	n5245	-0.564	9.2	0.249	HDPE	1.63	2.44	315
1319	p5105	n5245	-0.564	n5246	-0.551	5.1	0.249	HDPE	2.44	2.81	315
1320	p5106	n5246	-0.551	n5247	-0.549	1.1	0.249	HDPE	2.81	2.89	315
1321	p5107	n5247	-0.549	n5248	-0.481	21.5	0.313	HDPE	2.89	2.53	280
1322	p5109	n5248	-0.481	n3295	-0.433	15.3	0.313	HDPE	2.53	2.65	280
1323	p5110	n3294	-0.418	n3293	-0.364	17.3	0.313	HDPE	2.59	2.64	280
1324	p5111	n3290	-0.124	n5250	-0.109	4.7	0.313	HDPE	2.94	2.95	280
1325	p5113	n3285	0.294	n3284	0.355	19.4	0.313	HDPE	3.05	3.29	280
1326	p5114	n3283	0.388	n3282	0.398	3.1	0.313	HDPE	3.43	3.49	280
1327	p5115	n3280	0.535	n5251	0.539	1.3	0.313	HDPE	3.65	3.7	280
1328	p5117	n4060	55.964	n4265	55.912	15.3	0.34	HDPE	57.98	57.76	225
1329	p5118	n4265	55.912	n4061	55.896	4.9	0.34	HDPE	57.76	57.75	225
1330	p5119	n4062	53.02	n5252	51.031	14.9	13.367	HDPE	54.21	52.35	225
1331	p5120	n5252	51.031	n4063	50.24	5.3	15	HDPE	52.35	51.43	225
1332	p5128	n4273	42.911	n5257	42.8	0.7	15	HDPE	44.13	43.99	225
1333	p5132	n4280	32.68	n5260	31.7	13.1	7.47	HDPE	33.87	32.89	225
1334	p5133	n5260	31.7	n5261	31.56	1.9	7.411	HDPE	32.89	32.75	225
1335	p5136	n5261	31.56	n5263	31.07	9.7	5.067	HDPE	32.75	32.26	225
1336	p5137	n5263	31.07	n5264	30.37	12.9	5.418	HDPE	32.26	31.56	225
1337	p5138	n5264	30.37	n5265	30.18	7.8	2.44	HDPE	31.56	31.37	225
1338	p5139	n4264	30.18	n5265	30.18	0.1	0.34	HDPE	31.37	31.37	225
1339	p5211	n3822	35.11	n5313	34.4	12.1	5.868	HDPE	36.3	35.59	225
1340	p5213	n5313	34.4	n5314	34.32	10	0.804	HDPE	35.59	35.51	225
1341	p5214	n5314	34.32	n3823	34.263	17	0.34	HDPE	35.51	35.55	225
1342	p5216	n3870	33.29	n5316	33.4	3.3	3.309	HDPE	34.48	34.59	225
1343	p5217	n5316	33.4	n3825	33.62	2.9	7.703	HDPE	34.59	34.81	225
1344	p5225	n3842	31.39	n5320	31.64	7	3.563	HDPE	32.58	32.83	225
1345	p5226	n5320	31.64	n5321	31.86	9.9	2.223	HDPE	32.83	33.05	225
1346	p5227	n5321	31.86	n5323	31.94	15.1	0.531	HDPE	33.05	33.13	225
1347	p5229	n5323	31.94	n3868	32.19	8.5	2.944	HDPE	33.13	33.38	225
1348	p5238	n3834	21.301	n3833	19.98	8.8	15	HDPE	22.64	21.17	225
1349	p5240	n5329	6.67	n5330	7.72	7.4	14.153	HDPE	7.86	8.91	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
1350	p5241	n5330	7.72	n3828	8.762	6.9	15	HDPE	8.91	10.03	225
1351	p5242	n3830	12.7	n5331	14.445	11.6	15	HDPE	13.89	15.79	225
1352	p5254	n4071	44.183	n5336	44.173	3.1	0.34	HDPE	48.52	48.82	225
1353	p5256	n5337	44.028	n5338	43.999	8.5	0.34	HDPE	47.88	47.82	225
1354	p5257	n5338	43.999	n3903	43.924	22.1	0.34	HDPE	47.82	47.26	225
1355	p5260	n4278	35.32	n4277	35.48	1.7	9.249	HDPE	36.51	36.67	225
1356	p5262	n3684	2.66	n3687	2.67	3.1	0.313	HDPE	4.06	4.07	280
1357	p5263	n3688	2.762	n5340	2.768	1.9	0.313	HDPE	4.24	4.23	280
1358	p5264	n5340	2.768	n5341	2.82	16.5	0.313	HDPE	4.23	4.26	280
1359	p5265	n3689	2.856	n5341	2.82	11.6	0.313	HDPE	4.29	4.26	280
1360	p5266	n3691	3.044	n5342	3.054	3.1	0.313	HDPE	4.45	4.46	280
1361	p5267	n5343	3.083	n5342	3.054	9.3	0.313	HDPE	4.54	4.46	280
1362	p5268	n3692	3.113	n5343	3.083	9.7	0.313	HDPE	4.49	4.54	280
1363	p5269	n3693	3.138	n5344	3.171	10.6	0.313	HDPE	4.57	4.6	280
1365	p5271	n3695	3.316	n5346	3.326	3.2	0.313	HDPE	4.73	4.7	280
1366	p5272	n3696	3.329	n5346	3.326	1	0.313	HDPE	4.69	4.7	280
1367	p5273	n3703	4.193	n5347	4.159	4.2	0.793	HDPE	5.42	5.37	250
1368	p5274	n5347	4.159	n5348	4.158	0.3	0.34	HDPE	5.37	5.38	250
1369	p5275	n5348	4.158	n3702	4.141	5	0.34	HDPE	5.38	5.52	250
1370	p5276	n3700	3.966	n5349	3.955	3.1	0.34	HDPE	5.36	5.41	250
1371	p5277	n5349	3.955	n3699	3.947	2.4	0.34	HDPE	5.41	5.34	250
1372	p5278	n4091	8.74	n4090	8.63	3.5	3.124	HDPE	9.93	11.1	225
1373	p5279	n4091	8.74	n4088	9.14	3.8	10.585	HDPE	9.93	10.33	225
1374	p5280	n4087	14.5	n4086	14.619	0.8	15	HDPE	15.69	15.86	225
1375	p5281	n4092	10.01	n5350	11.32	23	5.708	HDPE	11.2	12.51	225
1376	p5282	n5350	11.32	n4093	12.24	6.9	13.234	HDPE	12.51	13.43	225
1377	p5283	n4094	15.85	n4095	16.06	3	6.908	HDPE	17.04	17.25	225
1378	p5284	n4096	18.98	n5351	23.15	29.7	14.036	HDPE	20.17	24.34	225
1379	p5285	n4082	34.34	n5352	35.695	9	15	HDPE	35.53	37.78	225
1380	p5286	n5352	36.59	n5353	39.089	16.7	15	HDPE	37.78	41.45	225
1381	p5287	n5353	40.26	n5354	40.798	3.6	15	HDPE	41.45	42.04	225
1382	p5288	n5354	40.85	n4081	40.929	0.5	15	HDPE	42.04	42.12	225
1383	p5289	n4079	50.84	n5355	51.3	3.1	14.887	HDPE	52.03	52.49	225
1384	p5290	n5355	51.3	n5356	51.7	3.2	12.492	HDPE	52.49	52.89	225
1385	p5291	n5356	51.7	n4078	52.18	3.3	14.35	HDPE	52.89	53.37	225
1386	p5304	n5364	51.22	n4074	52.29	19.3	5.556	HDPE	52.41	53.48	225
1387	p5305	n4076	54.05	n5365	54.23	5	3.623	HDPE	55.24	55.42	225
1388	p5307	n4097	55.59	n5366	56.71	26.7	4.198	HDPE	56.78	57.9	225
1389	p5309	n5366	56.71	n5368	56.89	21.3	0.845	HDPE	57.9	58.08	225
1390	p5311	n3706	4.77	n5369	4.83	6.1	0.982	HDPE	5.96	6.02	225
1391	p5312	n5369	4.83	n5370	4.97	6.6	2.119	HDPE	6.02	6.16	225
1392	p5313	n5370	4.97	n5371	5.05	5.4	1.478	HDPE	6.16	6.24	225
1393	p5314	n5371	5.05	n3707	6.01	11.8	8.108	HDPE	6.24	7.2	225
1394	p5315	n3708	9.63	n3709	12.58	30	9.824	HDPE	10.82	13.77	225
1395	p5316	n3710	15.42	n5372	16.786	9.1	15	HDPE	16.61	18.09	225
1396	p5317	n5372	16.9	n5373	18.26	9.4	14.457	HDPE	18.09	19.45	225
1397	p5318	n5373	18.26	n3711	20.3	18.9	10.788	HDPE	19.45	21.49	225
1398	p5324	n3715	31.04	n5378	31.986	6.3	15	HDPE	32.23	33.29	225
1399	p5325	n5378	32.1	n5379	34.4	15.4	14.906	HDPE	33.29	35.59	225
1400	p5326	n5379	34.4	n5380	35.34	13.4	7.01	HDPE	35.59	36.53	225
1401	p5327	n5380	35.34	n3716	35.58	3.6	6.583	HDPE	36.53	36.77	225
1402	p5328	n3717	39.03	n5381	39.21	1.4	12.544	HDPE	40.22	40.4	225
1403	p5329	n3718	40.13	n5381	39.21	9.7	9.476	HDPE	41.32	40.4	225
1404	p5330	n3719	41.43	n5382	42.32	14.1	6.312	HDPE	42.62	43.51	225
1405	p5331	n3720	42.98	n5382	42.32	7.2	9.188	HDPE	44.17	43.51	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
1406	p5332	n3747	46.42	n5383	45.3	12.9	8.702	HDPE	47.61	46.49	225
1407	p5333	n5383	45.3	n5384	44.9	4.7	8.487	HDPE	46.49	46.09	225
1408	p5334	n5384	44.9	n5385	44.13	6.9	11.111	HDPE	46.09	45.32	225
1409	p5335	n5385	44.13	n3721	43.61	5.4	9.709	HDPE	45.32	44.8	225
1410	p5342	n3467	0.115	n5389	0.125	5.1	0.209	HDPE	2.1	2.39	355
1411	p5343	n5389	0.125	n3468	0.151	12.2	0.209	HDPE	2.39	2.55	355
1412	p5344	n3458	0.199	n3469	0.209	3.9	0.251	HDPE	3.76	3.58	315
1413	p5346	n5390	0.289	n5391	0.315	10.4	0.249	HDPE	2.36	2.11	315
1414	p5347	n5391	0.315	n5392	0.374	23.5	0.249	HDPE	2.11	2	315
1415	p5348	n5392	0.374	n5393	0.395	8.7	0.249	HDPE	2	2.1	315
1416	p5349	n5393	0.395	n3471	0.423	11.2	0.249	HDPE	2.1	2.19	315
1417	p5350	n3472	0.479	n5395	0.506	10.9	0.249	HDPE	2.15	2.26	315
1418	p5352	n5395	0.506	n3473	0.519	4.9	0.249	HDPE	2.26	2.15	315
1419	p5353	n3474	0.573	n5396	0.597	9.7	0.249	HDPE	2.12	2.12	315
1420	p5354	n5396	0.597	n5397	0.644	19.2	0.249	HDPE	2.12	1.91	315
1421	p5356	n3476	0.767	n5398	0.794	11.1	0.249	HDPE	2.06	2.06	315
1422	p5357	n5398	0.794	n3477	0.874	18.9	0.422	HDPE	2.06	2.14	315
1423	p5358	n3478	1.106	n5399	1.133	10.7	0.249	HDPE	2.45	2.5	315
1424	p5359	n5399	1.133	n3479	1.182	19.7	0.249	HDPE	2.5	2.55	315
1425	p5391	n3953	57.163	n5416	57.143	5.9	0.34	HDPE	61.62	61.08	225
1426	p5392	n5416	57.143	n3954	57.125	5.3	0.34	HDPE	61.08	60.46	225
1427	p5393	n3963	53.53	n5417	53.31	4.3	5.129	HDPE	54.72	54.5	225
1428	p5394	n5417	53.31	n3962	53.299	3.2	0.34	HDPE	54.5	54.6	225
1429	p5395	n3960	52.98	n5418	52.47	4.1	12.304	HDPE	54.17	53.66	225
1431	p5397	n5420	52.04	n5421	51.01	11.6	8.841	HDPE	53.23	52.2	225
1432	p5398	n5421	51.01	n5422	50.61	4	10.109	HDPE	52.2	51.8	225
1433	p5399	n5422	50.61	n5423	50.36	4.2	5.937	HDPE	51.8	51.55	225
1434	p5400	n5423	50.36	n3959	50.07	6.3	4.606	HDPE	51.55	51.26	225
1435	p5401	n3743	50.644	n3742	50.659	4.3	0.34	HDPE	52.95	53.02	225
1436	p5402	n3741	50.743	n3740	50.761	5.2	0.34	HDPE	53.48	53.36	225
1437	p5403	n3734	51.271	n5424	51.3	8.7	0.34	HDPE	52.75	52.49	225
1438	p5404	n3733	51.54	n5424	51.3	5.8	4.139	HDPE	52.73	52.49	225
1439	p5405	n3731	53.03	n3732	53	0.2	12.516	HDPE	54.22	54.19	225
1440	p5406	n3723	56.5	n3724	56.398	30	0.34	HDPE	57.69	57.8	225
1441	p5409	n3566	10.11	n5426	10.98	8.4	10.393	HDPE	11.3	12.17	225
1442	p5410	n5426	10.98	n5427	12.75	15.6	11.353	HDPE	12.17	13.94	225
1443	p5411	n5427	12.75	n3565	13.26	4.1	12.421	HDPE	13.94	14.45	225
1444	p5412	n3565	13.26	n5428	14.4	7.9	14.379	HDPE	14.45	15.59	225
1445	p5413	n3559	15.485	n5428	14.4	7.2	15	HDPE	16.68	15.59	225
1446	p5420	n3555	29.01	n5434	29.3	1.9	15	HDPE	30.2	30.49	225
1447	p5421	n5434	29.3	n5435	30.53	11	11.185	HDPE	30.49	31.72	225
1448	p5422	n3573	30.7	n5435	30.53	2.2	7.703	HDPE	31.89	31.72	225
1449	p5423	n3554	33.91	n5436	33.83	0.8	10.655	HDPE	35.1	35.02	225
1450	p5424	n5436	33.83	n5437	31.97	19	9.789	HDPE	35.02	33.16	225
1451	p5425	n5437	31.97	n5438	31.04	7.5	12.43	HDPE	33.16	32.23	225
1452	p5426	n5438	31.04	n3573	30.7	3.4	10.14	HDPE	32.23	31.89	225
1453	p5473	n3605	44.904	n3597	44.899	1.6	0.34	HDPE	46.65	46.77	225
1454	p5482	n3525	44.014	n5465	44.079	18.9	0.34	HDPE	47	46.19	225
1455	p5483	n5465	44.079	n5466	44.116	11.1	0.34	HDPE	46.19	45.88	225
1456	p5484	n5466	44.116	n5467	44.146	8.8	0.34	HDPE	45.88	45.63	225
1457	p5485	n5467	44.146	n3526	44.218	21.2	0.34	HDPE	45.63	46.07	225
1458	p5486	n5468	44.88	n5469	44.831	14.5	0.34	HDPE	46.07	46.98	225
1459	p5487	n3532	44.83	n5469	44.831	0.2	0.34	HDPE	46.98	46.98	225
1460	p5488	n3457	3.68	n5470	4.63	8.7	10.873	HDPE	4.87	5.82	225
1461	p5489	n5470	4.63	n5471	6.549	12.8	15	HDPE	5.82	7.98	225



ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
1462	p5493	n3405	1.848	n5472	1.886	11.2	0.34	HDPE	3.28	3.36	225
1463	p5494	n5472	1.886	n5473	1.925	11.4	0.34	HDPE	3.36	3.21	225
1464	p5495	n5473	1.925	n3408	1.95	7.4	0.34	HDPE	3.21	3.14	225
1465	p5498	n3413	2.86	n5475	2.89	4.9	0.612	HDPE	4.05	4.08	225
1466	p5499	n5475	2.89	n3414	4.09	16.7	7.173	HDPE	4.08	5.28	225
1467	p5500	n3415	7.89	n5476	9.479	10.6	15	HDPE	9.08	10.96	225
1468	p5502	n3453	10.22	n5477	10.42	2.5	8.061	HDPE	11.41	11.61	225
1469	p5503	n5477	10.42	n5478	10.54	1.5	7.762	HDPE	11.61	11.73	225
1470	p5504	n5478	10.54	n5479	11.55	12.5	8.093	HDPE	11.73	12.74	225
1471	p5505	n5479	11.55	n5480	13.02	10.7	13.725	HDPE	12.74	14.21	225
1472	p5506	n5480	13.02	n3416	13.776	5	15	HDPE	14.21	15.13	225
1473	p5507	n3417	17.98	n5481	19.234	8.4	15	HDPE	19.17	20.6	225
1474	p5508	n5481	19.41	n5482	20.906	10	15	HDPE	20.6	22.31	225
1475	p5509	n5482	20.906	n5483	22.5	12.3	12.998	HDPE	22.31	23.69	225
1476	p5510	n5483	22.5	n3418	22.84	7.5	4.514	HDPE	23.69	24.03	225
1477	p5511	n3419	24.4	n5484	25.321	15.3	5.995	HDPE	25.59	26.53	225
1478	p5512	n5484	25.321	n3420	25.37	14.6	0.34	HDPE	26.53	26.56	225
1479	p5513	n3421	26.06	n5485	26.43	7.2	5.104	HDPE	27.25	27.62	225
1480	p5514	n5485	26.43	n5486	27.04	10.8	5.669	HDPE	27.62	28.23	225
1481	p5515	n3422	28.05	n5486	27.04	12.9	7.848	HDPE	29.24	28.23	225
1482	p5516	n3424	32.1	n5487	32.39	5.7	5.116	HDPE	33.29	33.58	225
1483	p5517	n3425	35.32	n5487	32.39	24.1	12.133	HDPE	36.51	33.58	225
1484	p5518	n3428	43.18	n5488	43.197	5	0.34	HDPE	45.46	45.55	225
1485	p5519	n5488	43.197	n3546	43.221	6.9	0.34	HDPE	45.55	45.84	225
1486	p5528	n3518	44.32	n3519	44.313	2.2	0.34	HDPE	47.12	47.09	225
1487	p5530	n5492	45.87	n3442	45.4	7.7	6.063	HDPE	47.06	46.59	225
1488	p5531	n3439	36.02	n3438	35.54	3.9	12.317	HDPE	37.21	36.73	225
1489	p5535	n3452	44.68	n5494	44.76	4.9	1.645	HDPE	45.87	45.95	225
1490	p5536	n3451	43.73	n5495	43.44	4.4	6.557	HDPE	44.92	44.63	225
1491	p5537	n5495	43.44	n5496	42.9	4.6	11.731	HDPE	44.63	44.09	225
1492	p5538	n5496	42.9	n5497	40.8	14.1	14.873	HDPE	44.09	41.99	225
1493	p5539	n5497	40.345	n3450	39.37	6.5	15	HDPE	41.99	40.56	225
1494	p5540	n3391	0.725	n3392	0.772	13.7	0.34	HDPE	2.84	2.88	225
1495	p5541	n3394	1.076	n5498	1.161	25	0.34	HDPE	2.52	2.49	225
1496	p5542	n5498	1.161	n3395	1.178	5	0.34	HDPE	2.49	2.48	225
1497	p5543	n3388	1.462	n5499	1.468	1.7	0.34	HDPE	2.73	2.73	225
1498	p5544	n5499	1.468	n5500	1.509	12.1	0.34	HDPE	2.73	2.74	225
1499	p5545	n5500	1.509	n5501	1.568	17.3	0.34	HDPE	2.74	3	225
1500	p5546	n5501	1.568	n5502	1.591	6.6	0.34	HDPE	3	3.01	225
1501	p5547	n5502	1.591	n3387	1.666	22.3	0.34	HDPE	3.01	2.97	225
1502	p5548	n3384	1.969	n5503	2.038	20.3	0.34	HDPE	3.18	3.31	225
1503	p5549	n5503	2.038	n5504	2.08	12.2	0.34	HDPE	3.31	3.4	225
1504	p5550	n5504	2.08	n5505	2.081	0.2	0.34	HDPE	3.4	3.46	225
1505	p5551	n5505	2.081	n5506	2.09	2.8	0.34	HDPE	3.46	3.28	225
1506	p5553	n5506	2.09	n5507	2.21	4.7	2.573	HDPE	3.28	3.4	225
1507	p5554	n5507	2.21	n5508	2.29	11.6	0.692	HDPE	3.4	3.48	225
1508	p5555	n5508	2.29	n5509	2.38	3.9	2.265	HDPE	3.48	3.57	225
1509	p5556	n5509	2.38	n5510	2.39	3.2	0.34	HDPE	3.57	3.58	225
1510	p5557	n5510	2.39	n5511	3.58	12.6	9.437	HDPE	3.58	4.77	225
1511	p5558	n5511	3.58	n5512	5.89	22.6	10.203	HDPE	4.77	7.08	225
1512	p5559	n5512	5.89	n5513	6.68	7.3	10.846	HDPE	7.08	7.87	225
1513	p5560	n5513	6.68	n3429	7.36	14.1	4.833	HDPE	7.87	8.55	225
1514	p5561	n3430	9.15	n5514	9.48	3.7	9.004	HDPE	10.34	10.67	225
1515	p5562	n5514	9.48	n5515	10.97	16.6	8.992	HDPE	10.67	12.16	225
1517	p5564	n5515	10.97	n5516	11.19	4.1	5.322	HDPE	12.16	12.38	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
1518	p5565	n5516	11.19	n5517	11.7	9.2	5.53	HDPE	12.38	12.89	225
1519	p5566	n5517	11.7	n3431	12.64	16.6	5.663	HDPE	12.89	13.83	225
1520	p5567	n3444	5.625	n5518	5.674	14.2	0.34	HDPE	9.68	7.54	225
1521	p5568	n5518	5.674	n5519	5.738	18.8	0.34	HDPE	7.54	6.96	225
1522	p5569	n5519	5.738	n5520	5.78	12.5	0.34	HDPE	6.96	6.97	225
1523	p5570	n5520	5.78	n5521	6.34	23.7	2.363	HDPE	6.97	7.53	225
1524	p5571	n5521	6.34	n5522	8.81	19.8	12.494	HDPE	7.53	10	225
1525	p5572	n5522	8.81	n5523	10.756	13	15	HDPE	10	11.97	225
1526	p5573	n5523	10.756	n5524	12.32	16.1	9.693	HDPE	11.97	13.51	225
1527	p5574	n3445	12.74	n5524	12.32	6.8	6.195	HDPE	13.93	13.51	225
1528	p5575	n5509	2.38	n5525	2.67	18.6	1.562	HDPE	3.57	3.89	225
1529	p5576	n5525	2.67	n5526	2.687	4.9	0.34	HDPE	3.89	3.89	225
1530	p5577	n5526	2.687	n5527	2.72	9.9	0.34	HDPE	3.89	3.91	225
1531	p5578	n3383	2.82	n5527	2.72	20.1	0.498	HDPE	4.01	3.91	225
1532	p5579	n3381	3.24	n5528	3.43	16.8	1.132	HDPE	4.43	4.62	225
1533	p5580	n5528	3.43	n5529	3.54	7.7	1.422	HDPE	4.62	4.73	225
1534	p5581	n5529	3.54	n3379	3.6	5.5	1.094	HDPE	4.73	4.79	225
1535	p5582	n3378	3.62	n3379	3.6	1.1	1.797	HDPE	4.81	4.79	225
1536	p5583	n3377	4.08	n5530	4.1	3	0.661	HDPE	5.27	5.29	225
1537	p5584	n5531	4.22	n5530	4.1	7.3	1.639	HDPE	5.41	5.29	225
1538	p5585	n5531	4.22	n5532	4.46	10.3	2.321	HDPE	5.41	5.65	225
1539	p5586	n5532	4.46	n5533	4.62	9.3	1.719	HDPE	5.65	5.81	225
1540	p5587	n5534	4.63	n5533	4.62	0.5	1.895	HDPE	5.82	5.81	225
1541	p5588	n5535	4.72	n5534	4.63	10.1	0.891	HDPE	5.91	5.82	225
1542	p5589	n5535	4.72	n5536	5.11	12.1	3.213	HDPE	5.91	6.3	225
1543	p5590	n5536	5.11	n5537	5.25	7.2	1.937	HDPE	6.3	6.44	225
1544	p5591	n5538	5.34	n5537	5.25	4.9	1.849	HDPE	6.53	6.44	225
1545	p5592	n3376	5.73	n5538	5.34	4.1	9.418	HDPE	6.92	6.53	225
1546	p5594	n3372	9.68	n5540	10.34	5.6	11.86	HDPE	10.87	11.53	225
1547	p5595	n5540	10.34	n5541	11.199	5.7	15	HDPE	11.53	12.5	225
1548	p5596	n5541	11.31	n5542	13.433	14.1	15	HDPE	12.5	15.07	225
1549	p5597	n5542	13.88	n3371	15.646	11.8	15	HDPE	15.07	17.26	225
1550	p5601	n3362	30.31	n5545	30.44	5.8	2.239	HDPE	31.5	31.63	225
1551	p5602	n5545	30.44	n3361	30.69	24.2	1.033	HDPE	31.63	31.88	225
1552	p5606	n3276	3.18	n5547	5.283	14	15	HDPE	4.37	6.5	225
1553	p5607	n5547	5.31	n5548	5.91	4.1	14.709	HDPE	6.5	7.1	225
1554	p5608	n5548	5.91	n5549	6.86	12.1	7.814	HDPE	7.1	8.47	225
1555	p5609	n5549	6.86	n3275	6.882	6.4	0.34	HDPE	8.47	9.09	225
1556	p5610	n3274	6.92	n5550	6.95	8.9	0.34	HDPE	8.86	8.14	225
1558	p5612	n5551	3.544	n3273	3.584	11.8	0.34	HDPE	6.52	6	225
1559	p5613	n3271	3.72	n5552	3.832	7.6	1.467	HDPE	4.91	5.37	225
1560	p5614	n5552	3.832	n5553	3.893	17.8	0.34	HDPE	5.37	5.13	225
1561	p5615	n5553	3.893	n5554	3.92	8	0.34	HDPE	5.13	5.11	225
1562	p5618	n5555	4.76	n3267	4.49	10.5	2.571	HDPE	5.95	5.68	225
1563	p5619	n3266	5.4	n5555	4.76	25.8	2.482	HDPE	6.59	5.95	225
1568	CO-2	n4258	34.421	n4205	34.327	27.7	0.34	HDPE	36.68	35.62	225
1569	CO-4	n3465	-0.06	n3464	-0.388	30	1.095	HDPE	1.24	0.99	355
1571	CO-6	n3464	-0.388	C W -1	-0.478	6.1	1.464	HDPE	0.99	0.9	450
1573	CO-8	n3963	53.53	MH-1	53.909	16.1	2.351	HDPE	54.72	55.099	225
1574	CO-10	n3694	3.232	n5344	3.171	19.4	0.313	HDPE	4.66	4.6	280
1575	CO-12	n5418	52.47	n5420	52.04	3.8	11.435	HDPE	53.66	53.23	225
1576	CO-14	n5223	1.599	n3331	1.699	29.6	0.34	HDPE	3.03	2.91	250
1590	p3227(2)	LS 6	37.246	n4228	37.277	9.2	0.34	HDPE	41.738	40.6	225
1605	p3249(1)	n4255	31.07	LS 8	30.976	27.7	0.34	HDPE	34.94	35.662	225
1613	p3208(2)	LS 9	32.099	n4201	32.194	27.9	0.34	HDPE	36.933	36.16	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculated) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
1617	p2556(2)	LS 10	-0.845	n3332	-0.752	27.1	0.34	HDPE	2.901	2.82	250
1625	p5611(2)	LS 3	3.465	n5551	3.544	23	0.34	HDPE	7.972	6.52	225
1631	p2533(1)	n3296	-0.741	LS 5	-0.787	18.1	0.249	HDPE	2.52	4.301	315

## APPENDIX : VI - FLEX TABLE - MANHOLES

## SEWERAGE NETWORK DESIGN KASARAGOD MUNICIPALITY ZONE-1 MANHOLE TABLE

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
30	n887	43.45	43.45	42.26	0	0.081	42.269	42.269	1.19
31	n888	43.38	43.38	42.19	0.081	0.162	42.201	42.201	1.19
32	n889	43.02	43.02	41.83	0.162	0.243	41.843	41.843	1.19
33	n893	42.7	42.7	41.51	0.243	0.324	41.525	41.525	1.19
34	n895	42.46	42.46	41.27	0.324	0.405	41.287	41.287	1.19
35	n898	42.09	42.09	40.9	0.486	0.567	40.92	40.92	1.19
36	n899	41.81	41.81	40.62	0.567	0.648	40.641	40.641	1.19
37	n901	41.52	41.52	40.33	0.648	0.729	40.353	40.353	1.19
38	n904	40.65	40.65	39.46	0.81	0.891	39.485	39.485	1.19
39	n906	40.45	40.45	39.16	3.564	3.645	39.218	39.218	1.29
40	n907	40.39	40.39	39.2	3.483	3.564	39.258	39.258	1.19
41	n912	43.84	43.84	42.65	2.106	2.187	42.69	42.69	1.19
42	n913	43.07	43.07	41.88	2.187	2.268	41.92	41.92	1.19
43	n915	41.11	41.11	39.92	3.321	3.402	39.97	39.97	1.19
44	n917	44.24	44.24	43.05	2.025	2.106	43.089	43.089	1.19
45	n918	45.27	45.27	44.08	1.944	2.025	44.118	44.118	1.19
46	n920	46.29	46.29	45.1	1.863	1.944	45.137	45.137	1.19
47	n921	47.01	47.01	45.82	1.782	1.863	45.856	45.856	1.19
48	n922	47.55	47.55	46.36	1.701	1.782	46.396	46.396	1.19
49	n923	47.92	47.92	46.73	1.62	1.701	46.765	46.765	1.19
50	n924	48.5	48.5	47.31	1.539	1.62	47.344	47.344	1.19
51	n925	49.12	49.12	47.93	1.377	1.458	47.962	47.962	1.19
52	n926	49.63	49.63	48.44	1.296	1.377	48.471	48.471	1.19
53	n927	50.05	50.05	48.86	1.215	1.296	48.89	48.89	1.19
54	n928	50.47	50.47	49.28	1.134	1.215	49.309	49.309	1.19
55	n929	50.98	50.98	49.79	1.053	1.134	49.818	49.818	1.19
56	n930	51.39	51.39	50.2	0.972	1.053	50.227	50.227	1.19
57	n931	51.64	51.64	50.45	0.891	0.972	50.476	50.476	1.19
58	n932	52.35	52.35	51.16	0.81	0.891	51.185	51.185	1.19
59	n933	53.04	53.04	51.85	0.729	0.81	51.874	51.874	1.19
60	n934	53.52	53.52	52.33	0.648	0.729	52.353	52.353	1.19
61	n935	54.4	54.4	53.21	0.567	0.648	53.231	53.231	1.19
62	n936	55.53	55.53	54.34	0.486	0.567	54.36	54.36	1.19
63	n937	56.86	56.86	55.67	0.405	0.486	55.689	55.689	1.19
64	n938	60.12	60.12	58.93	0.162	0.243	58.943	58.943	1.19
65	n939	60.91	60.91	59.72	0.081	0.162	59.731	59.731	1.19
66	n940	61.8	61.8	60.61	0	0.081	60.618	60.618	1.19
67	n3180	40.56	40.56	39.147	4.536	4.617	39.204	39.204	1.41
68	n3181	40.12	40.12	38.93	4.617	4.698	38.996	38.996	1.19
69	n3182	40.27	40.27	38.875	4.698	4.779	38.941	38.941	1.4
70	n3183	40.26	40.26	38.773	4.779	4.86	38.84	38.84	1.49
71	n3184	40.45	40.45	38.671	4.86	4.941	38.739	38.739	1.78
72	n3185	41.15	41.15	38.569	4.941	5.022	38.637	38.637	2.58
73	n3186	41.79	41.79	38.467	5.022	5.103	38.536	38.536	3.32
74	n3188	40.98	40.98	38.263	5.265	5.346	38.334	38.334	2.72
75	n3189	40.22	40.22	38.161	5.346	5.427	38.232	38.232	2.06
76	n3190	38.89	38.89	37.7	5.508	5.589	37.764	37.764	1.19
77	n3191	37.19	37.19	36	5.589	5.67	36.064	36.064	1.19
78	n3193	36.98	36.98	35.79	0.405	0.486	35.809	35.809	1.19
79	n3194	38.71	38.71	37.52	0.243	0.324	37.535	37.535	1.19

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
80	n3195	41.91	41.91	40.72	0.162	0.243	40.733	40.733	1.19
81	n3198	40.82	40.82	39.63	0.081	0.162	39.643	39.643	1.19
82	n3199	41.99	41.99	39.528	0.162	0.243	39.544	39.544	2.46
83	n3200	42.72	42.72	39.426	0.243	0.324	39.444	39.444	3.29
84	n3201	42.32	42.32	39.377	0.324	0.405	39.397	39.397	2.94
85	n3202	41.33	41.33	39.325	0.567	0.648	39.346	39.346	2.01
86	n3203	39.6	39.6	37.924	0.648	0.729	37.946	37.946	1.68
87	n3204	34.1	34.1	30.305	1.296	1.377	30.336	30.336	3.8
88	n3206	33.05	33.05	30.752	0.324	0.405	30.769	30.769	2.3
89	n3207	33.52	33.52	30.876	0.162	0.243	30.892	30.892	2.64
90	n3209	33.27	33.27	30.996	0.081	0.162	31.009	31.009	2.27
91	n3210	32.27	32.27	31.08	0	0.081	31.09	31.09	1.19
92	n3211	32.6	32.6	31.41	6.399	6.48	31.479	31.479	1.19
93	n3212	35.24	35.24	34.05	6.237	6.318	34.118	34.118	1.19
94	n3213	33.45	33.45	32.26	6.318	6.399	32.328	32.328	1.19
95	n3214	29.52	29.52	28.33	1.377	1.458	28.362	28.362	1.19
96	n3215	26.85	26.85	25.66	1.458	1.539	25.693	25.693	1.19
97	n3216	23.79	23.79	19.311	1.539	1.62	19.345	19.345	4.48
98	n3219	8.35	8.35	7.16	2.106	2.187	7.2	7.2	1.19
99	n3220	11.07	11.07	6.942	2.43	2.511	6.989	6.989	4.13
100	n3221	11.61	11.61	6.915	2.511	2.592	6.963	6.963	4.7
101	n3223	11.73	11.73	6.813	2.592	2.673	6.866	6.866	4.92
102	n3224	11.76	11.76	6.804	3.483	3.564	6.862	6.862	4.96
103	n3225	11.08	11.08	6.723	3.564	3.645	6.781	6.781	4.36
104	n3227	10.07	10.07	6.641	3.645	3.726	6.7	6.7	3.43
105	n3228	9.26	9.26	6.601	3.726	3.807	6.653	6.653	2.66
106	n3229	6.1	6.1	4.91	3.807	3.888	4.963	4.963	1.19
107	n3230	4.69	4.69	3.5	3.888	3.969	3.553	3.553	1.19
108	n3232	2.79	2.79	1.6	3.969	4.05	1.654	1.654	1.19
110	n3234	11.67	11.67	9.231	0.729	0.81	9.259	9.259	2.44
111	n3235	10.48	10.48	9.29	0	0.648	9.315	9.315	1.19
112	n3236	10.08	10.08	6.222	0.486	0.567	6.245	6.245	3.86
113	n3237	9.85	9.85	6.262	0.405	0.486	6.283	6.283	3.59
114	n3238	9.13	9.13	6.291	0.324	0.405	6.311	6.311	2.84
115	n3239	8.39	8.39	6.324	0.243	0.324	6.341	6.341	2.07
116	n3240	7.59	7.59	6.4	0.162	0.243	6.416	6.416	1.19
117	n3241	7.71	7.71	6.52	0.081	0.162	6.531	6.531	1.19
118	n3242	8.84	8.84	7.65	0	0.081	7.658	7.658	1.19
119	n3243	9.55	9.55	8.36	7.371	7.452	8.434	8.434	1.19
120	n3244	3.18	3.18	1.99	7.938	8.019	2.067	2.067	1.19
121	n3246	3.43	3.43	2.24	7.857	7.938	2.316	2.316	1.19
122	n3247	3.82	3.82	2.63	7.776	7.857	2.706	2.706	1.19
123	n3249	4.05	4.05	2.86	7.695	7.776	2.936	2.936	1.19
124	n3250	4.12	4.12	2.93	7.614	7.695	3.005	3.005	1.19
125	n3251	4.49	4.49	3.3	7.533	7.614	3.375	3.375	1.19
126	n3252	5.63	5.63	4.44	7.452	7.533	4.514	4.514	1.19
127	n3255	11.01	11.01	9.82	7.29	7.371	9.894	9.894	1.19
128	n3256	12.84	12.84	11.612	7.128	7.209	11.684	11.684	1.23
129	n3257	15.31	15.31	14.12	7.047	7.128	14.192	14.192	1.19
130	n3258	32.35	32.35	31.16	6.48	6.561	31.229	31.229	1.19
131	n3259	30.45	30.45	29.26	6.561	6.642	29.33	29.33	1.19
132	n3260	26.63	26.63	25.44	6.642	6.723	25.51	25.51	1.19
133	n3261	22.25	22.25	21.06	6.885	6.966	21.131	21.131	1.19

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
134	n3262	18.3	18.3	17.11	6.966	7.047	17.182	17.182	1.19
135	n3492	41.76	41.76	40.57	3.24	3.321	40.619	40.619	1.19
136	n3493	42.05	42.05	40.86	0.891	0.972	40.886	40.886	1.19
137	n3495	42.57	42.57	41.38	0.81	0.891	41.405	41.405	1.19
138	n3496	43.46	43.46	42.27	0.729	0.81	42.294	42.294	1.19
139	n3497	44.73	44.73	43.54	0.648	0.729	43.563	43.563	1.19
140	n3499	47.05	47.05	45.86	0.405	0.486	45.879	45.879	1.19
141	n3500	47.7	47.7	46.51	0.324	0.405	46.527	46.527	1.19
142	n3501	47.76	47.76	46.57	0.243	0.324	46.585	46.585	1.19
143	n3512	48.28	48.28	47.09	0.162	0.243	47.103	47.103	1.19
144	n3513	48.47	48.47	47.28	0.081	0.162	47.291	47.291	1.19
145	n3514	49.1	49.1	47.91	0	0.081	47.918	47.918	1.19
146	n3722	58.32	58.32	57.13	0.324	0.405	57.147	57.147	1.19
147	n5045	42.31	42.31	41.12	0.405	0.486	41.139	41.139	1.19
148	n5046	41.16	41.16	39.97	0.729	0.81	39.994	39.994	1.19
149	n5047	40.53	40.53	39.34	3.402	3.483	39.39	39.39	1.19
150	n5058	48.86	48.86	47.67	1.458	1.539	47.703	47.703	1.19
151	n5060	58.54	58.54	57.35	0.243	0.324	57.365	57.365	1.19
152	n5489	45.98	45.98	44.79	0.567	0.648	44.811	44.811	1.19
153	n5490	46.75	46.75	45.56	0.486	0.567	45.58	45.58	1.19
154	n5556	23.74	23.74	22.55	6.804	6.885	22.621	22.621	1.19
155	n5557	24.73	24.73	23.54	6.723	6.804	23.611	23.611	1.19
156	n5558	39.85	39.85	38.122	5.427	5.508	38.185	38.185	1.73
157	n5559	41.88	41.88	38.389	5.184	5.265	38.459	38.459	3.49
158	n5560	42.02	42.02	38.425	5.103	5.184	38.495	38.495	3.59
159	n5561	37.33	37.33	36.14	0.324	0.405	36.157	36.157	1.19
160	n5562	43.44	43.44	41.632	0.081	0.162	41.642	41.642	1.81
161	n5563	42.86	42.86	41.67	0	0.081	41.68	41.68	1.19
162	n5564	42.49	42.49	41.3	0	0.081	41.308	41.308	1.19
163	n5565	41.96	41.96	39.366	0.405	0.486	39.388	39.388	2.59
164	n5566	41.62	41.62	39.354	0.486	0.567	39.377	39.377	2.27
165	n5567	32.86	32.86	30.389	0.486	0.567	30.412	30.412	2.47
166	n5568	31.66	31.66	30.47	0.405	0.486	30.492	30.492	1.19
167	n5569	33.71	33.71	30.824	0.243	0.324	30.842	30.842	2.89
169	n5572	12.06	12.06	10.87	7.209	7.29	10.943	10.943	1.19
170	n5573	11.58	11.58	9.25	0.648	0.729	9.276	9.276	2.33
171	n5574	9.46	9.46	6.981	2.349	2.43	7.028	7.028	2.48
172	n5575	8.4	8.4	7.018	2.268	2.349	7.064	7.064	1.38
173	n5576	8.22	8.22	7.03	2.187	2.268	7.076	7.076	1.19
174	n5577	9.85	9.85	8.66	2.025	2.106	8.699	8.699	1.19
175	n5578	10.53	10.53	9.153	1.944	2.025	9.19	9.19	1.38
176	n5579	11.15	11.15	9.96	1.863	1.944	9.997	9.997	1.19
177	n5580	11.42	11.42	10.225	1.782	1.863	10.261	10.261	1.2
178	n5581	11.92	11.92	10.73	1.701	1.782	10.766	10.766	1.19
179	n5582	14.42	14.42	12.261	1.62	1.701	12.295	12.295	2.16
333	MH-1	3	3	1.81	8.019	8.1	1.887	1.887	1.19
335	MH-2	36.744	36.744	35.554	6.156	6.237	35.622	35.622	1.19
339	MH-3	2.25	2.25	1.06	12.15	12.231	1.173	1.173	1.19
30	n940	61.8	61.8	60.61	0	0.081	60.62	60.62	1.19
31	n941	61.42	61.42	60.18	0.081	0.162	60.19	60.19	1.24
32	n942	60.47	60.47	59.04	0.162	0.243	59.05	59.05	1.43
33	n943	59.33	59.33	58.14	0.243	0.324	58.16	58.16	1.19
34	n944	58.45	58.45	57.26	0.324	0.405	57.28	57.28	1.19

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
35	n945	57.7	57.7	56.51	0.405	0.486	56.53	56.53	1.19
36	n946	56.94	56.94	55.75	0.486	0.567	55.77	55.77	1.19
37	n947	56.25	56.25	55.06	0.567	0.648	55.08	55.08	1.19
38	n948	55.54	55.54	54.35	0.648	0.729	54.37	54.37	1.19
39	n949	54.79	54.79	53.6	0.729	0.81	53.62	53.62	1.19
40	n950	54.01	54.01	52.82	0.81	0.891	52.85	52.85	1.19
41	n951	53.13	53.13	51.94	0.891	0.972	51.97	51.97	1.19
42	n952	52.41	52.41	51.22	0.972	1.053	51.25	51.25	1.19
43	n953	51.81	51.81	50.62	1.053	1.134	50.65	50.65	1.19
44	n955	50.71	50.71	48.2	1.944	2.025	48.24	48.24	2.51
45	n957	50.01	50.01	48.05	2.106	2.187	48.1	48.1	1.96
46	n958	49.9	49.9	47.95	2.187	2.268	48	48	1.95
47	n959	49.69	49.69	47.85	2.268	2.349	47.9	47.9	1.84
48	n961	49.96	49.96	48.77	3.645	3.726	48.82	48.82	1.19
49	n962	50.36	50.36	49.17	3.564	3.645	49.22	49.22	1.19
50	n963	50.84	50.84	49.65	3.483	3.564	49.7	49.7	1.19
51	n964	51.32	51.32	50.13	3.402	3.483	50.18	50.18	1.19
52	n965	51.78	51.78	50.59	3.321	3.402	50.64	50.64	1.19
53	n966	52.2	52.2	50.97	3.24	3.321	51.02	51.02	1.23
54	n967	52.49	52.49	51.03	3.159	3.24	51.09	51.09	1.46
55	n968	52.91	52.91	51.72	1.701	1.782	51.76	51.76	1.19
56	n969	53.53	53.53	52.34	1.62	1.701	52.37	52.37	1.19
57	n970	54.36	54.36	53.17	1.539	1.62	53.2	53.2	1.19
58	n971	54.76	54.76	53.52	1.458	1.539	53.55	53.55	1.24
59	n972	55.49	55.49	54.12	1.377	1.458	54.15	54.15	1.37
60	n973	56.67	56.67	55.2	1.296	1.377	55.23	55.23	1.47
61	n974	58.12	58.12	56.38	1.215	1.296	56.41	56.41	1.74
62	n976	59.87	59.87	58.1	1.134	1.215	58.12	58.12	1.77
63	n977	60.64	60.64	59.45	0.081	0.162	59.46	59.46	1.19
64	n1120	50.35	50.35	48.11	2.025	2.106	48.15	48.15	2.24
65	n3748	42.48	42.48	40.6	0	0.081	40.61	40.61	1.88
66	n3750	38.85	38.85	36.04	0.162	0.243	36.05	36.05	2.81
67	n3751	36.33	36.33	35.14	0.243	0.324	35.16	35.16	1.19
68	n3752	35.53	35.53	34.34	10.53	10.611	34.44	34.44	1.19
69	n3753	35.89	35.89	34.7	10.125	10.206	34.79	34.79	1.19
70	n3754	36.64	36.64	35.11	10.044	10.125	35.19	35.19	1.53
71	n3755	38.38	38.38	36.31	9.963	10.044	36.4	36.4	2.07
72	n3919	50.59	50.59	48.46	0.405	0.486	48.48	48.48	2.13
73	n3920	49.75	49.75	48.56	0.324	0.405	48.58	48.58	1.19
74	n3971	55.43	55.43	52.96	0	0.081	52.97	52.97	2.47
75	n3974	53.25	53.25	51.56	0.081	0.162	51.57	51.57	1.69
76	n3975	51.85	51.85	50.24	0.162	0.243	50.26	50.26	1.61
77	n3976	50.92	50.92	49.34	0.243	0.324	49.36	49.36	1.58
78	n3982	49.15	49.15	47.76	6.237	6.318	47.83	47.83	1.39
79	n3983	48.75	48.75	47.56	6.318	6.399	47.63	47.63	1.19
80	n3984	48.48	48.48	47.29	6.399	6.48	47.36	47.36	1.19
81	n3985	48.32	48.32	47.13	6.48	6.561	47.2	47.2	1.19
82	n3987	47.62	47.62	46.13	6.561	6.642	46.2	46.2	1.49
83	n3995	46.97	46.97	44.81	6.642	6.723	44.88	44.88	2.16
84	n3996	45.45	45.45	43.16	6.723	6.804	43.23	43.23	2.29
85	n3997	43.45	43.45	42.26	6.804	6.885	42.33	42.33	1.19
86	n3998	43.16	43.16	41.97	6.885	6.966	42.05	42.05	1.19
87	n3999	43.45	43.45	41.87	6.966	7.047	41.95	41.95	1.58

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
88	n4000	44	44	41.77	7.047	7.128	41.85	41.85	2.23
89	n4001	44.15	44.15	41.7	7.128	7.209	41.78	41.78	2.45
90	n4003	42.45	42.45	40.52	8.1	8.181	40.59	40.59	1.93
91	n4004	41.17	41.17	39.55	8.262	8.343	39.63	39.63	1.62
92	n4005	40.4	40.4	39.15	8.343	8.424	39.23	39.23	1.25
93	n4006	39.98	39.98	38.79	9.801	9.882	38.88	38.88	1.19
94	n4012	39.58	39.58	38.09	9.882	9.963	38.18	38.18	1.49
95	n4013	52.28	52.28	51.05	1.296	1.377	51.09	51.09	1.23
96	n4014	52.31	52.31	51.12	1.215	1.296	51.15	51.15	1.19
97	n4015	52.59	52.59	51.4	1.134	1.215	51.43	51.43	1.19
98	n4016	52.86	52.86	51.67	1.053	1.134	51.7	51.7	1.19
99	n4017	53.23	53.23	52.04	0.972	1.053	52.07	52.07	1.19
100	n4018	53.79	53.79	52.29	0.81	0.891	52.32	52.32	1.5
101	n4019	54.36	54.36	52.38	0.729	0.81	52.41	52.41	1.98
102	n4020	55.06	55.06	52.48	0.648	0.729	52.51	52.51	2.58
103	n4021	44.15	44.15	41.69	7.938	8.019	41.78	41.78	2.46
104	n4023	45.71	45.71	44.27	0.567	0.648	44.29	44.29	1.44
105	n4025	49.61	49.61	48.12	0.324	0.405	48.14	48.14	1.49
106	n4026	51.25	51.25	49	0.243	0.324	49.01	49.01	2.25
107	n4028	53.15	53.15	51.15	0.162	0.243	51.16	51.16	2
108	n4029	54	54	52.67	0.081	0.162	52.68	52.68	1.33
109	n4030	54.96	54.96	53.63	0	0.081	53.64	53.64	1.33
110	n4031	55.12	55.12	52.5	0.567	0.648	52.52	52.52	2.62
111	n4032	55.4	55.4	52.58	0.486	0.567	52.61	52.61	2.82
112	n4033	55.67	55.67	52.79	0.243	0.324	52.81	52.81	2.88
113	n4034	55.29	55.29	52.89	0.162	0.243	52.91	52.91	2.4
114	n4035	54.74	54.74	52.99	0.081	0.162	53.01	53.01	1.75
115	n4036	54.24	54.24	53.05	0	0.081	53.06	53.06	1.19
116	n4037	53.89	53.89	51.6	0.567	0.648	51.62	51.62	2.29
117	n4038	40.25	40.25	39.06	9.639	9.72	39.14	39.14	1.19
118	n4039	41.33	41.33	39.88	1.134	1.215	39.91	39.91	1.45
119	n4040	41.84	41.84	40.38	1.053	1.134	40.4	40.4	1.46
120	n4041	44.38	44.38	41.31	0.972	1.053	41.34	41.34	3.07
121	n4044	45.13	45.13	43.42	0.891	0.972	43.44	43.44	1.71
122	n4045	47.89	47.89	44.79	0.81	0.891	44.81	44.81	3.1
123	n4046	51.03	51.03	47.6	0.729	0.81	47.62	47.62	3.43
124	n4047	53.76	53.76	50.65	0.648	0.729	50.67	50.67	3.11
125	n4052	53.03	53.03	51.7	0.486	0.567	51.72	51.72	1.33
126	n4053	52.99	52.99	51.8	0.405	0.486	51.82	51.82	1.19
127	n4054	53.95	53.95	52.7	0.324	0.405	52.72	52.72	1.25
128	n4055	56.12	56.12	53.66	0.243	0.324	53.67	53.67	2.46
130	n4058	57.77	57.77	56.58	0	0.081	56.59	56.59	1.19
131	n4111	60.57	60.57	59.38	0.891	0.972	59.41	59.41	1.19
132	n4112	61.94	61.94	60.28	0.81	0.891	60.3	60.3	1.66
133	n4113	63.72	63.72	61.65	0.729	0.81	61.67	61.67	2.07
134	n4114	64.87	64.87	62.49	0.648	0.729	62.51	62.51	2.38
135	n4119	65.06	65.06	62.5	0.486	0.567	62.53	62.53	2.56
136	n4120	63.89	63.89	62.6	0.405	0.486	62.62	62.62	1.29
137	n4121	63.89	63.89	62.7	0.324	0.405	62.72	62.72	1.19
138	n4122	64.2	64.2	63.01	0.243	0.324	63.03	63.03	1.19
139	n4124	64.44	64.44	63.25	0.162	0.243	63.26	63.26	1.19
140	n4125	65.12	65.12	63.72	0.081	0.162	63.73	63.73	1.4
141	n4129	65.78	65.78	64.59	0	0.081	64.6	64.6	1.19



ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
142	n4218	56.89	56.89	55.7	0.162	0.243	55.71	55.71	1.19
143	n5079	51.06	51.06	48.27	1.782	1.863	48.31	48.31	2.79
144	n5080	50.95	50.95	48.24	1.863	1.944	48.28	48.28	2.71
145	n5081	50.8	50.8	48.29	0.567	0.648	48.32	48.32	2.51
146	n5082	50.82	50.82	48.34	0.486	0.567	48.37	48.37	2.48
147	n5103	49.66	49.66	47.8	6.075	6.156	47.88	47.88	1.86
148	n5104	49.34	49.34	47.79	6.156	6.237	47.86	47.86	1.55
149	n5115	61.07	61.07	59.88	0	0.081	59.89	59.89	1.19
150	n5130	64.85	64.85	62.5	0.567	0.648	62.52	62.52	2.35
151	n5168	53.51	53.51	52.23	0.891	0.972	52.26	52.26	1.28
152	n5170	55.54	55.54	52.63	0.405	0.486	52.65	52.65	2.91
153	n5172	55.8	55.8	52.75	0.324	0.405	52.77	52.77	3.05
154	n5173	49.27	49.27	47.62	0.405	0.486	47.64	47.64	1.65
155	n5174	48.72	48.72	45.6	0.486	0.567	45.62	45.62	3.12
156	n5175	44.77	44.77	43.55	0.648	0.729	43.57	43.57	1.22
157	n5176	44.14	44.14	41.67	8.019	8.1	41.75	41.75	2.47
158	n5177	41.34	41.34	40.08	8.181	8.262	40.16	40.16	1.26
159	n5178	40.18	40.18	38.99	9.72	9.801	39.08	39.08	1.19
160	n5183	57.47	57.47	56.28	0.081	0.162	56.29	56.29	1.19
161	n5386	41.51	41.51	38.59	0.081	0.162	38.6	38.6	2.92
30	n915	41.11	41.11	39.92	0	0.081	39.928	39.928	1.19
31	n979	60.72	60.72	59.53	0.081	0.162	59.541	59.541	1.19
32	n980	59.88	59.88	58.69	0.162	0.243	58.703	58.703	1.19
33	n981	58.9	58.9	57.71	0.243	0.324	57.725	57.725	1.19
34	n982	57.96	57.96	56.77	0.324	0.405	56.787	56.787	1.19
35	n983	57.1	57.1	55.91	0.405	0.486	55.929	55.929	1.19
36	n984	56.28	56.28	55.09	0.486	0.567	55.11	55.11	1.19
37	n985	55.69	55.69	54.5	2.43	2.511	54.542	54.542	1.19
38	n986	54.5	54.5	53.31	2.511	2.592	53.353	53.353	1.19
39	n987	53.48	53.48	52.29	2.592	2.673	52.334	52.334	1.19
40	n988	52.98	52.98	51.79	2.673	2.754	51.834	51.834	1.19
41	n989	52.81	52.81	51.62	2.754	2.835	51.671	51.671	1.19
42	n990	52.92	52.92	51.518	2.835	2.916	51.569	51.569	1.4
43	n991	53.06	53.06	51.416	2.916	2.997	51.468	51.468	1.64
44	n992	53.12	53.12	51.314	2.997	3.078	51.367	51.367	1.81
45	n3263	14.29	14.29	13.1	0	12.311	13.196	13.196	1.19
46	n3264	10.15	10.15	8.96	12.311	12.392	9.056	9.056	1.19
47	n3265	7.95	7.95	6.76	12.392	12.473	6.857	6.857	1.19
48	n3266	6.59	6.59	5.4	12.473	12.554	5.497	5.497	1.19
49	n3267	5.68	5.68	4.49	12.635	12.716	4.588	4.588	1.19
50	n3269	5.3	5.3	4.11	12.716	12.797	4.208	4.208	1.19
51	n3271	4.91	4.91	3.72	13.04	13.121	3.841	3.841	1.19
52	n3272	5.77	5.77	3.632	13.121	13.202	3.753	3.753	2.14
53	n3273	6	6	3.584	13.202	13.283	3.705	3.705	2.42
54	n3274	8.86	8.86	6.92	13.445	13.526	7.042	7.042	1.94
55	n3275	9.09	9.09	6.882	13.526	13.607	7.001	7.001	2.21
56	n3276	4.37	4.37	3.18	13.85	13.931	3.283	3.283	1.19
57	n3277	3.73	3.73	2.54	13.931	14.012	2.643	2.643	1.19
58	n3278	3.47	3.47	0.67	24.299	24.38	0.828	0.828	2.8
59	n3280	3.65	3.65	0.535	24.461	24.542	0.694	0.694	3.12
60	n3281	3.71	3.71	0.482	24.542	24.623	0.641	0.641	3.23
61	n3282	3.49	3.49	0.398	24.623	24.704	0.557	0.557	3.09
62	n3283	3.43	3.43	0.388	24.704	24.785	0.548	0.548	3.04

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
63	n3284	3.29	3.29	0.355	24.785	24.866	0.515	0.515	2.94
64	n3285	3.05	3.05	0.294	24.866	24.947	0.454	0.454	2.76
65	n3286	2.85	2.85	0.2	24.947	25.028	0.361	0.361	2.65
66	n3287	2.92	2.92	0.106	25.028	25.109	0.267	0.267	2.81
67	n3288	2.99	2.99	0.012	25.109	25.19	0.174	0.174	2.98
68	n3290	2.94	2.94	-0.124	25.271	25.352	0.039	0.039	3.06
69	n3291	2.91	2.91	-0.176	25.352	25.433	-0.013	-0.013	3.09
70	n3292	2.83	2.83	-0.27	25.433	25.514	-0.107	-0.107	3.1
71	n3293	2.64	2.64	-0.364	25.514	25.595	-0.2	-0.2	3
72	n3294	2.59	2.59	-0.418	25.595	25.676	-0.254	-0.254	3.01
73	n3295	2.65	2.65	-0.433	25.676	25.757	-0.269	-0.269	3.08
74	n3296	2.52	2.52	-0.741	26.324	26.405	-0.581	-0.581	3.26
75	n3299	2.61	2.61	1.288	26.567	26.648	1.452	1.452	1.32
76	n3301	2.51	2.51	1.236	26.648	26.729	1.402	1.402	1.27
77	n3302	2.73	2.73	1.204	26.729	26.81	1.369	1.369	1.53
78	n3303	2.7	2.7	1.185	26.81	26.891	1.351	1.351	1.51
79	n3304	2.73	2.73	1.129	26.891	26.972	1.294	1.294	1.6
80	n3305	2.53	2.53	1.054	26.972	27.053	1.185	1.185	1.48
81	n3306	2.53	2.53	0.002	46.088	46.169	0.223	0.223	2.53
82	n3307	2.62	2.62	0.067	18.954	19.035	0.261	0.261	2.55
83	n3308	2.82	2.82	0.169	18.873	18.954	0.321	0.321	2.65
84	n3310	2.88	2.88	0.296	18.792	18.873	0.437	0.437	2.58
85	n3311	2.89	2.89	0.344	18.711	18.792	0.485	0.485	2.55
86	n3313	2.94	2.94	0.439	18.63	18.711	0.579	0.579	2.5
87	n3315	2.84	2.84	0.508	18.549	18.63	0.649	0.649	2.33
88	n3316	2.74	2.74	0.577	18.468	18.549	0.717	0.717	2.16
89	n3318	2.44	2.44	0.842	18.144	18.225	0.98	0.98	1.6
90	n3319	2.63	2.63	0.883	18.063	18.144	1.021	1.021	1.75
91	n3320	2.65	2.65	1.034	17.82	17.901	1.17	1.17	1.62
92	n3322	2.71	2.71	1.096	17.739	17.82	1.232	1.232	1.61
93	n3323	2.75	2.75	1.121	17.658	17.739	1.256	1.256	1.63
94	n3324	2.78	2.78	1.189	17.577	17.658	1.324	1.324	1.59
95	n3327	2.79	2.79	1.334	17.172	17.253	1.467	1.467	1.46
96	n3328	2.9	2.9	1.393	17.091	17.172	1.526	1.526	1.51
97	n3329	2.97	2.97	1.495	17.01	17.091	1.627	1.627	1.47
99	n3331	2.91	2.91	1.699	0	16.929	1.831	1.831	1.21
100	n3332	2.82	2.82	-0.752	16.767	16.848	-0.622	-0.622	3.57
101	n3333	2.7	2.7	-0.65	16.686	16.767	-0.52	-0.52	3.35
102	n3334	2.73	2.73	-0.548	16.605	16.686	-0.418	-0.418	3.28
103	n3335	2.75	2.75	-0.446	16.524	16.605	-0.317	-0.317	3.2
104	n3336	2.76	2.76	-0.242	16.362	16.443	-0.114	-0.114	3
105	n3337	2.81	2.81	-0.14	16.281	16.362	-0.012	-0.012	2.95
106	n3338	2.75	2.75	-0.038	16.2	16.281	0.089	0.089	2.79
107	n3339	2.72	2.72	0.064	16.119	16.2	0.191	0.191	2.66
108	n3340	2.47	2.47	0.166	16.038	16.119	0.293	0.293	2.3
109	n3342	2.39	2.39	0.268	15.957	16.038	0.394	0.394	2.12
110	n3343	4.44	4.44	0.309	15.876	15.957	0.435	0.435	4.13
111	n3344	39.63	39.63	38.44	0.081	0.162	38.451	38.451	1.19
112	n3345	38.53	38.53	37.34	0.162	0.243	37.353	37.353	1.19
113	n3346	37.8	37.8	36.61	0.243	0.324	36.625	36.625	1.19
114	n3347	37.12	37.12	35.93	0.324	0.405	35.947	35.947	1.19
115	n3348	36.66	36.66	35.47	0.405	0.486	35.489	35.489	1.19
116	n3349	35.99	35.99	34.8	0.486	0.567	34.82	34.82	1.19

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
117	n3350	35.62	35.62	34.43	0.567	0.648	34.451	34.451	1.19
118	n3359	34.21	34.21	33.02	0.648	0.729	33.043	33.043	1.19
119	n3360	32.24	32.24	31.05	0.729	0.81	31.074	31.074	1.19
120	n3361	31.88	31.88	30.69	0.81	0.891	30.715	30.715	1.19
121	n3362	31.5	31.5	30.31	0.972	1.053	30.337	30.337	1.19
122	n3363	29.8	29.8	28.61	1.053	1.134	28.638	28.638	1.19
123	n3364	27.19	27.19	26	1.134	1.215	26.029	26.029	1.19
124	n3367	25.49	25.49	24.3	1.215	1.296	24.33	24.33	1.19
125	n3368	21.21	21.21	19.354	1.296	1.377	19.385	19.385	1.86
126	n3371	17.26	17.26	15.646	1.377	1.458	15.678	15.678	1.61
127	n3372	10.87	10.87	9.68	1.701	1.782	9.716	9.716	1.19
128	n3373	8.74	8.74	7.55	1.782	1.863	7.586	7.586	1.19
129	n3376	6.92	6.92	5.73	1.863	1.944	5.767	5.767	1.19
130	n3377	5.27	5.27	4.08	2.673	2.754	4.124	4.124	1.19
131	n3378	4.81	4.81	3.62	2.754	2.835	3.665	3.665	1.19
132	n3379	4.79	4.79	3.6	2.835	2.916	3.646	3.646	1.19
133	n3381	4.43	4.43	3.24	3.078	3.159	3.288	3.288	1.19
134	n3382	4.24	4.24	3.05	3.159	3.24	3.098	3.098	1.19
135	n3383	4.01	4.01	2.82	3.24	3.321	2.87	2.87	1.19
136	n3384	3.18	3.18	1.969	7.614	7.695	2.052	2.052	1.21
137	n3385	3.06	3.06	1.87	7.695	7.776	1.957	1.957	1.19
138	n3386	3	3	1.768	7.776	7.857	1.856	1.856	1.23
139	n3387	2.97	2.97	1.666	7.857	7.938	1.754	1.754	1.3
140	n3388	2.73	2.73	1.462	8.262	8.343	1.553	1.553	1.27
141	n3389	2.86	2.86	1.36	8.343	8.424	1.439	1.439	1.5
142	n3390	2.97	2.97	0.872	10.044	10.125	0.974	0.974	2.1
143	n3391	2.84	2.84	0.725	10.206	10.287	0.846	0.846	2.11
144	n3392	2.88	2.88	0.772	10.125	10.206	0.876	0.876	2.11
145	n3393	2.47	2.47	0.974	1.539	1.62	1.013	1.013	1.5
146	n3394	2.52	2.52	1.076	1.458	1.539	1.114	1.114	1.44
147	n3395	2.48	2.48	1.178	1.296	1.377	1.214	1.214	1.3
148	n3396	2.47	2.47	1.28	1.215	1.296	1.315	1.315	1.19
149	n3397	2.58	2.58	1.39	1.134	1.215	1.423	1.423	1.19
150	n3398	2.73	2.73	1.54	1.053	1.134	1.568	1.568	1.19
151	n3403	2.9	2.9	1.644	0.972	1.053	1.674	1.674	1.26
152	n3404	3.11	3.11	1.746	0.891	0.972	1.776	1.776	1.36
153	n3405	3.28	3.28	1.848	0.81	0.891	1.877	1.877	1.43
154	n3408	3.14	3.14	1.95	0.567	0.648	1.975	1.975	1.19
155	n3409	3.27	3.27	2.08	0.486	0.567	2.102	2.102	1.19
156	n3410	3.5	3.5	2.31	0.405	0.486	2.329	2.329	1.19
157	n3413	4.05	4.05	2.86	0.324	0.405	2.877	2.877	1.19
158	n3414	5.28	5.28	4.09	0.162	0.243	4.103	4.103	1.19
159	n3415	9.08	9.08	7.89	0.081	0.162	7.901	7.901	1.19
160	n3416	15.13	15.13	13.776	4.941	5.022	13.836	13.836	1.35
161	n3417	19.17	19.17	17.111	4.86	4.941	17.171	17.171	2.06
162	n3418	24.03	24.03	22.84	4.536	4.617	22.898	22.898	1.19
163	n3419	25.59	25.59	24.4	4.455	4.536	24.457	24.457	1.19
164	n3420	26.56	26.56	25.37	4.293	4.374	25.434	25.434	1.19
165	n3421	27.25	27.25	26.06	4.212	4.293	26.116	26.116	1.19
166	n3422	29.24	29.24	28.05	3.969	4.05	28.104	28.104	1.19
167	n3423	31.67	31.67	30.48	3.888	3.969	30.533	30.533	1.19
168	n3424	33.29	33.29	32.1	3.807	3.888	32.153	32.153	1.19
169	n3425	36.51	36.51	35.32	3.645	3.726	35.372	35.372	1.19

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
170	n3426	40.78	40.78	39.59	3.564	3.645	39.641	39.641	1.19
171	n3427	44.33	44.33	43.119	3.483	3.564	43.169	43.169	1.21
172	n3428	45.46	45.46	43.18	3.402	3.483	43.237	43.237	2.28
173	n3429	8.55	8.55	7.36	3.078	3.159	7.408	7.408	1.19
174	n3430	10.34	10.34	9.15	2.997	3.078	9.197	9.197	1.19
175	n3431	13.83	13.83	12.64	0.972	1.053	12.667	12.667	1.19
176	n3432	15.63	15.63	14.44	0.891	0.972	14.466	14.466	1.19
177	n3433	18	18	16.81	0.81	0.891	16.835	16.835	1.19
178	n3434	21.2	21.2	20.01	0.729	0.81	20.034	20.034	1.19
179	n3435	24.45	24.45	23.26	0.648	0.729	23.283	23.283	1.19
180	n3436	28.83	28.83	27.64	0.567	0.648	27.661	27.661	1.19
181	n3437	33.33	33.33	32.089	0.486	0.567	32.109	32.109	1.24
182	n3438	36.73	36.73	35.54	0.405	0.486	35.559	35.559	1.19
183	n3439	37.21	37.21	36.02	0.324	0.405	36.037	36.037	1.19
184	n3440	40.82	40.82	39.63	0.243	0.324	39.645	39.645	1.19
185	n3441	44.2	44.2	43.01	0.162	0.243	43.023	43.023	1.19
186	n3442	46.59	46.59	45.4	0.081	0.162	45.411	45.411	1.19
188	n3444	9.68	9.68	5.625	1.539	1.62	5.664	5.664	4.05
189	n3445	13.93	13.93	12.74	0.891	0.972	12.766	12.766	1.19
190	n3446	16.26	16.26	15.07	0.81	0.891	15.095	15.095	1.19
191	n3447	20.5	20.5	19.31	0.729	0.81	19.334	19.334	1.19
192	n3448	26.16	26.16	23.729	0.648	0.729	23.752	23.752	2.43
193	n3449	33.58	33.58	29.329	0.567	0.648	29.35	29.35	4.25
194	n3450	40.56	40.56	36.767	0.486	0.567	36.787	36.787	3.79
195	n3451	44.92	44.92	43.73	0.162	0.243	43.743	43.743	1.19
196	n3452	45.87	45.87	44.68	0.081	0.162	44.691	44.691	1.19
197	n3453	11.41	11.41	10.22	5.346	5.427	10.292	10.292	1.19
198	n3454	12.13	12.13	10.138	5.427	5.508	10.201	10.201	1.99
199	n3457	4.87	4.87	3.68	5.67	5.751	3.745	3.745	1.19
200	n3458	3.76	3.76	0.199	37.503	37.584	0.398	0.398	3.56
201	n3460	2.3	2.3	-0.055	46.169	46.25	0.165	0.165	2.35
202	n3461	2.25	2.25	-0.079	46.412	46.493	0.139	0.139	2.33
203	n3462	2	2	-0.118	46.493	46.574	0.096	0.096	2.12
204	n3463	1.42	1.42	-0.171	46.574	46.655	-0.01	-0.01	1.59
205	n3464	0.99	0.99	-0.388	84.644	84.725	-0.175	-0.175	1.38
206	n3465	1.24	1.24	-0.06	37.908	37.989	0.091	0.091	1.3
207	n3466	1.85	1.85	0.074	37.827	37.908	0.231	0.231	1.78
208	n3467	2.1	2.1	0.115	37.746	37.827	0.307	0.307	1.99
209	n3468	2.55	2.55	0.151	37.584	37.665	0.348	0.348	2.4
210	n3469	3.58	3.58	0.209	31.671	31.752	0.406	0.406	3.37
211	n3471	2.19	2.19	0.423	31.266	31.347	0.608	0.608	1.77
212	n3472	2.15	2.15	0.479	31.185	31.266	0.664	0.664	1.67
213	n3473	2.15	2.15	0.519	31.023	31.104	0.703	0.703	1.63
214	n3474	2.12	2.12	0.573	30.942	31.023	0.756	0.756	1.55
215	n3476	2.06	2.06	0.767	30.699	30.78	0.923	0.923	1.29
216	n3477	2.14	2.14	0.874	30.537	30.618	1.026	1.026	1.27
217	n3478	2.45	2.45	1.106	30.456	30.537	1.245	1.245	1.34
218	n3479	2.55	2.55	1.182	30.294	30.375	1.36	1.36	1.37
219	n3480	2.69	2.69	1.257	30.213	30.294	1.436	1.436	1.43
220	n3481	2.77	2.77	1.321	30.132	30.213	1.501	1.501	1.45
221	n3483	2.66	2.66	1.394	30.051	30.132	1.574	1.574	1.27
222	n3486	2.78	2.78	1.514	29.97	30.051	1.676	1.676	1.27
223	n3487	2.97	2.97	1.704	29.889	29.97	1.842	1.842	1.27

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
224	n3488	3.21	3.21	1.944	29.808	29.889	2.082	2.082	1.27
225	n3489	3.69	3.69	2.342	29.727	29.808	2.48	2.48	1.35
226	n3490	5.31	5.31	2.417	29.646	29.727	2.593	2.593	2.89
227	n3491	5.87	5.87	2.441	29.565	29.646	2.617	2.617	3.43
228	n3515	49.01	49.01	47.82	0	0.081	47.828	47.828	1.19
229	n3516	48.39	48.39	47.2	0.081	0.162	47.211	47.211	1.19
230	n3517	47.97	47.97	44.422	1.053	1.134	44.454	44.454	3.55
231	n3518	47.12	47.12	44.32	1.134	1.215	44.354	44.354	2.8
232	n3519	47.09	47.09	44.313	1.215	1.296	44.347	44.347	2.78
233	n3520	46.89	46.89	44.211	1.296	1.377	44.246	44.246	2.68
234	n3521	46.92	46.92	44.109	1.377	1.458	44.145	44.145	2.81
235	n3522	47.27	47.27	44.007	1.458	1.539	44.044	44.044	3.26
236	n3523	47.63	47.63	43.905	1.539	1.62	43.943	43.943	3.73
237	n3524	47.62	47.62	43.829	2.673	2.754	43.879	43.879	3.79
238	n3525	47	47	44.014	0.972	1.053	44.041	44.041	2.99
239	n3526	46.07	46.07	44.218	0.648	0.729	44.244	44.244	1.85
240	n3527	46.77	46.77	44.32	0.567	0.648	44.345	44.345	2.45
241	n3528	46.84	46.84	44.422	0.486	0.567	44.445	44.445	2.42
242	n3529	46.82	46.82	44.524	0.405	0.486	44.546	44.546	2.3
243	n3530	46.91	46.91	44.626	0.324	0.405	44.646	44.646	2.28
244	n3531	47.25	47.25	44.728	0.243	0.324	44.746	44.746	2.52
245	n3532	46.98	46.98	44.83	0.162	0.243	44.846	44.846	2.15
246	n3533	47.17	47.17	43.739	2.754	2.835	43.79	43.79	3.43
247	n3534	46.93	46.93	43.637	2.835	2.916	43.688	43.688	3.29
248	n3542	46.96	46.96	43.579	2.916	2.997	43.632	43.632	3.38
249	n3543	47.13	47.13	43.477	2.997	3.078	43.53	43.53	3.65
250	n3544	46.9	46.9	43.375	3.078	3.159	43.429	43.429	3.52
251	n3545	45.95	45.95	43.273	3.159	3.24	43.328	43.328	2.68
252	n3546	45.84	45.84	43.221	3.24	3.321	43.276	43.276	2.62
253	n3547	47.71	47.71	46.52	0	0.081	46.528	46.528	1.19
254	n3548	46.41	46.41	45.22	0.081	0.162	45.231	45.231	1.19
255	n3549	44.28	44.28	43.09	0.162	0.243	43.103	43.103	1.19
256	n3550	41.3	41.3	40.11	0.243	0.324	40.125	40.125	1.19
257	n3551	39.85	39.85	38.66	0.324	0.405	38.677	38.677	1.19
258	n3552	39.57	39.57	38.38	0.405	0.486	38.399	38.399	1.19
259	n3553	37.89	37.89	36.7	0.486	0.567	36.72	36.72	1.19
260	n3554	35.1	35.1	33.91	0.567	0.648	33.931	33.931	1.19
261	n3555	30.2	30.2	29.01	1.134	1.215	29.039	29.039	1.19
262	n3556	26.41	26.41	25.095	1.215	1.296	25.125	25.125	1.32
263	n3557	24.96	24.96	23.261	1.296	1.377	23.292	23.292	1.7
264	n3558	21.34	21.34	19.935	1.377	1.458	19.967	19.967	1.41
265	n3559	16.68	16.68	15.485	1.458	1.539	15.518	15.518	1.19
266	n3565	14.45	14.45	13.26	1.62	1.701	13.295	13.295	1.19
267	n3566	11.3	11.3	10.11	1.863	1.944	10.147	10.147	1.19
268	n3567	8.61	8.61	7.42	1.944	2.025	7.458	7.458	1.19
269	n3568	7.45	7.45	6.26	2.025	2.106	6.304	6.304	1.19
270	n3569	7.63	7.63	6.158	2.106	2.187	6.198	6.198	1.47
271	n3573	31.89	31.89	30.7	0.891	0.972	30.726	30.726	1.19
272	n3582	48	48	44.468	0.81	0.891	44.497	44.497	3.53
273	n3583	48.41	48.41	44.57	0.729	0.81	44.597	44.597	3.84
274	n3593	48.94	48.94	44.672	0.648	0.729	44.698	44.698	4.27
275	n3594	48.65	48.65	44.774	0.567	0.648	44.798	44.798	3.88
276	n3595	47.76	47.76	44.856	0.486	0.567	44.879	44.879	2.9

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
277	n3597	46.77	46.77	44.899	0.405	0.486	44.92	44.92	1.87
278	n3605	46.65	46.65	44.904	0.324	0.405	44.924	44.924	1.75
279	n3606	46.31	46.31	45.001	0.243	0.324	45.019	45.019	1.31
280	n3607	46.28	46.28	45.09	0.162	0.243	45.106	45.106	1.19
281	n3609	47.46	47.46	46.27	0.081	0.162	46.281	46.281	1.19
282	n3684	4.06	4.06	2.66	22.518	22.599	2.81	2.81	1.4
283	n3685	6.47	6.47	5.28	0.081	0.162	5.291	5.291	1.19
284	n3686	11.32	11.32	9.72	0	0.081	9.728	9.728	1.6
285	n3687	4.07	4.07	2.67	22.275	22.356	2.819	2.819	1.4
286	n3688	4.24	4.24	2.762	22.194	22.275	2.91	2.91	1.48
287	n3689	4.29	4.29	2.856	21.951	22.032	3.003	3.003	1.43
288	n3690	4.33	4.33	2.95	21.87	21.951	3.097	3.097	1.38
289	n3691	4.45	4.45	3.044	21.789	21.87	3.19	3.19	1.41
290	n3692	4.49	4.49	3.113	21.546	21.627	3.258	3.258	1.38
291	n3693	4.57	4.57	3.138	21.465	21.546	3.283	3.283	1.43
292	n3694	4.66	4.66	3.232	21.303	21.384	3.376	3.376	1.43
293	n3695	4.73	4.73	3.316	21.222	21.303	3.46	3.46	1.41
294	n3696	4.69	4.69	3.329	21.06	21.141	3.473	3.473	1.36
295	n3697	4.74	4.74	3.42	20.979	21.06	3.563	3.563	1.32
296	n3698	4.75	4.75	3.514	20.898	20.979	3.656	3.656	1.24
297	n3699	5.34	5.34	3.947	20.817	20.898	4.069	4.069	1.39
298	n3700	5.36	5.36	3.966	18.306	18.387	4.1	4.1	1.39
299	n3701	5.43	5.43	4.056	18.225	18.306	4.195	4.195	1.37
300	n3702	5.52	5.52	4.141	18.144	18.225	4.279	4.279	1.38
301	n3703	5.42	5.42	4.193	17.901	17.982	4.306	4.306	1.23
302	n3704	5.49	5.49	4.279	17.82	17.901	4.416	4.416	1.21
303	n3705	5.72	5.72	4.53	17.739	17.82	4.647	4.647	1.19
304	n3706	5.96	5.96	4.77	17.658	17.739	4.886	4.886	1.19
305	n3707	7.2	7.2	6.01	17.334	17.415	6.125	6.125	1.19
306	n3708	10.82	10.82	9.63	17.253	17.334	9.745	9.745	1.19
307	n3709	13.77	13.77	12.58	17.172	17.253	12.695	12.695	1.19
308	n3710	16.61	16.61	15.42	17.091	17.172	15.534	15.534	1.19
309	n3711	21.49	21.49	20.3	16.848	16.929	20.414	20.414	1.19
310	n3712	23.35	23.35	22.16	16.767	16.848	22.273	22.273	1.19
311	n3713	25.47	25.47	24.28	16.686	16.767	24.393	24.393	1.19
312	n3714	29.41	29.41	28.22	16.605	16.686	28.333	28.333	1.19
313	n3715	32.23	32.23	31.04	16.524	16.605	31.152	31.152	1.19
314	n3716	36.77	36.77	35.58	16.2	16.281	35.691	35.691	1.19
315	n3717	40.22	40.22	39.03	16.119	16.2	39.141	39.141	1.19
316	n3718	41.32	41.32	40.13	15.957	16.038	40.24	40.24	1.19
317	n3719	42.62	42.62	41.43	15.876	15.957	41.54	41.54	1.19
318	n3720	44.17	44.17	42.98	5.103	15.795	43.089	43.089	1.19
319	n3721	44.8	44.8	43.61	5.022	5.103	43.671	43.671	1.19
320	n3723	57.69	57.69	56.5	0	0.081	56.51	56.51	1.19
321	n3724	57.8	57.8	56.398	0.081	0.162	56.411	56.411	1.4
322	n3725	58.19	58.19	56.296	0.162	0.243	56.312	56.312	1.89
323	n3726	58.33	58.33	56.194	0.243	0.324	56.212	56.212	2.14
324	n3727	57.44	57.44	56.092	0.324	0.405	56.109	56.109	1.35
325	n3728	56.78	56.78	55.59	0.405	0.486	55.609	55.609	1.19
326	n3729	56.03	56.03	54.84	0.486	0.567	54.86	54.86	1.19
327	n3730	55.19	55.19	54	0.567	0.648	54.021	54.021	1.19
328	n3731	54.22	54.22	53.03	0.648	0.729	53.053	53.053	1.19
329	n3732	54.19	54.19	53	0.729	0.81	53.024	53.024	1.19

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
330	n3733	52.73	52.73	51.54	0.81	0.891	51.565	51.565	1.19
331	n3734	52.75	52.75	51.271	0.972	1.053	51.302	51.302	1.48
332	n3735	53.72	53.72	51.172	1.053	1.134	51.204	51.204	2.55
333	n3736	54.47	54.47	51.067	1.134	1.215	51.1	51.1	3.4
334	n3737	54.16	54.16	50.965	1.215	1.296	50.999	50.999	3.2
335	n3738	53.49	53.49	50.863	1.296	1.377	50.898	50.898	2.63
336	n3739	53.23	53.23	50.807	1.377	1.458	50.844	50.844	2.42
337	n3740	53.36	53.36	50.761	1.458	1.539	50.798	50.798	2.6
338	n3741	53.48	53.48	50.743	1.539	1.62	50.782	50.782	2.74
339	n3742	53.02	53.02	50.659	1.62	1.701	50.698	50.698	2.36
340	n3743	52.95	52.95	50.644	1.701	1.782	50.685	50.685	2.31
341	n3744	52.63	52.63	50.6	3.24	3.321	50.648	50.648	2.03
342	n3745	51.35	51.35	50.16	3.321	3.402	50.21	50.21	1.19
343	n3746	48.42	48.42	46.969	4.617	4.698	47.027	47.027	1.45
344	n3747	47.61	47.61	46.42	4.698	4.779	46.479	46.479	1.19
345	n3769	2.2	2.2	0.411	15.633	15.714	0.536	0.536	1.79
346	n3770	2.19	2.19	0.51	15.552	15.633	0.635	0.635	1.68
347	n3771	2.09	2.09	0.77	15.228	15.309	0.893	0.893	1.32
348	n3772	2.1	2.1	0.816	15.147	15.228	0.939	0.939	1.28
349	n3773	2.15	2.15	0.918	15.066	15.147	1.04	1.04	1.23
350	n3774	2.32	2.32	1.02	14.985	15.066	1.142	1.142	1.3
351	n3775	2.37	2.37	1.074	14.904	14.985	1.206	1.206	1.3
352	n3776	2.47	2.47	1.122	14.823	14.904	1.254	1.254	1.35
353	n3777	2.61	2.61	1.224	14.742	14.823	1.356	1.356	1.39
354	n3778	2.61	2.61	1.326	14.661	14.742	1.457	1.457	1.28
355	n3779	2.68	2.68	1.428	14.58	14.661	1.558	1.558	1.25
356	n3780	2.72	2.72	1.53	14.499	14.58	1.66	1.66	1.19
357	n3781	2.85	2.85	1.66	14.418	14.499	1.779	1.779	1.19
358	n3782	3.02	3.02	1.83	14.337	14.418	1.934	1.934	1.19
359	n3783	3.3	3.3	2.11	14.256	14.337	2.214	2.214	1.19
360	n3784	3.49	3.49	2.239	14.175	14.256	2.357	2.357	1.25
361	n3785	3.6	3.6	2.326	14.094	14.175	2.453	2.453	1.27
362	n3786	3.89	3.89	2.7	13.77	13.851	2.802	2.802	1.19
363	n3787	4.61	4.61	3.328	13.689	13.77	3.43	3.43	1.28
364	n3789	12.29	12.29	10.045	13.203	13.284	10.145	10.145	2.24
365	n3804	18.79	18.79	17.187	12.798	12.879	17.285	17.285	1.6
366	n3805	17.18	17.18	15.99	12.879	12.96	16.089	16.089	1.19
367	n3806	17.02	17.02	15.83	12.96	13.041	15.929	15.929	1.19
368	n3822	36.3	36.3	35.11	2.673	2.754	35.154	35.154	1.19
369	n3823	35.55	35.55	34.263	2.916	2.997	34.315	34.315	1.29
370	n3824	35.87	35.87	34.162	2.997	3.078	34.208	34.208	1.71
371	n3825	34.81	34.81	33.62	3.078	3.159	33.668	33.668	1.19
372	n3828	10.03	10.03	8.762	4.536	4.617	8.819	8.819	1.27
373	n3830	13.89	13.89	12.7	4.455	4.536	12.757	12.757	1.19
374	n3832	18.87	18.87	17.68	4.293	4.374	17.736	17.736	1.19
375	n3833	21.17	21.17	19.98	4.212	4.293	20.036	20.036	1.19
376	n3834	22.64	22.64	21.301	4.131	4.212	21.356	21.356	1.34
377	n3835	25.47	25.47	24.23	4.05	4.131	24.284	24.284	1.24
378	n3837	29.48	29.48	28.29	3.969	4.05	28.344	28.344	1.19
379	n3839	31.88	31.88	30.69	3.888	3.969	30.743	30.743	1.19
380	n3841	32.3	32.3	31.11	3.807	3.888	31.163	31.163	1.19
381	n3842	32.58	32.58	31.39	3.726	3.807	31.442	31.442	1.19
382	n3868	33.38	33.38	32.19	3.402	3.483	32.24	32.24	1.19

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
383	n3869	33.82	33.82	32.63	3.321	3.402	32.68	32.68	1.19
384	n3870	34.48	34.48	33.29	3.24	3.321	33.339	33.339	1.19
385	n3879	40.03	40.03	38.84	2.592	2.673	38.884	38.884	1.19
386	n3881	44.42	44.42	43.23	2.511	2.592	43.273	43.273	1.19
387	n3897	51.78	51.78	50.59	0.486	0.567	50.61	50.61	1.19
388	n3898	50.78	50.78	49.59	0.567	0.648	49.611	49.611	1.19
390	n3903	47.26	47.26	43.924	2.187	2.268	43.97	43.97	3.34
391	n3904	47	47	43.847	2.268	2.349	43.893	43.893	3.15
392	n3905	46.71	46.71	43.745	2.349	2.43	43.792	43.792	2.97
393	n3906	45.85	45.85	43.643	2.43	2.511	43.685	43.685	2.21
394	n3939	54.38	54.38	53.19	1.377	1.458	53.222	53.222	1.19
395	n3940	55.58	55.58	53.511	1.296	1.377	53.542	53.542	2.07
396	n3941	57.16	57.16	53.613	1.215	1.296	53.647	53.647	3.55
397	n3942	58.28	58.28	53.715	1.134	1.215	53.748	53.748	4.57
398	n3943	56.7	56.7	53.817	1.053	1.134	53.849	53.849	2.88
399	n3944	55.26	55.26	53.918	0.972	1.053	53.95	53.95	1.34
400	n3945	55.21	55.21	54.02	0.891	0.972	54.05	54.05	1.19
401	n3946	55.85	55.85	54.628	0.81	0.891	54.653	54.653	1.22
402	n3947	55.92	55.92	54.73	0.729	0.81	54.758	54.758	1.19
403	n3948	56.02	56.02	54.83	0.648	0.729	54.853	54.853	1.19
404	n3949	60.68	60.68	59.49	0	0.081	59.498	59.498	1.19
405	n3950	58.65	58.65	57.46	0.081	0.162	57.473	57.473	1.19
406	n3951	59.15	59.15	57.358	0.162	0.243	57.374	57.374	1.79
407	n3952	60.94	60.94	57.257	0.243	0.324	57.274	57.274	3.68
408	n3953	61.62	61.62	57.163	0.324	0.405	57.183	57.183	4.46
409	n3954	60.46	60.46	57.125	0.486	0.567	57.145	57.145	3.33
410	n3955	57.86	57.86	56.67	0.567	0.648	56.691	56.691	1.19
411	n3956	48.18	48.18	46.99	1.134	1.215	47.03	47.03	1.19
412	n3957	48.63	48.63	47.44	1.053	1.134	47.468	47.468	1.19
413	n3958	49.89	49.89	48.7	0.972	1.053	48.727	48.727	1.19
414	n3959	51.26	51.26	50.07	0.891	0.972	50.096	50.096	1.19
415	n3960	54.17	54.17	52.98	0.405	0.486	52.999	52.999	1.19
416	n3961	54.65	54.65	53.199	0.324	0.405	53.216	53.216	1.45
417	n3962	54.6	54.6	53.299	0.243	0.324	53.317	53.317	1.3
418	n3963	54.72	54.72	53.53	0.081	0.162	53.541	53.541	1.19
419	n4057	57.46	57.46	56.27	0	0.081	56.28	56.28	1.19
420	n4058	57.77	57.77	56.168	0.081	0.162	56.181	56.181	1.6
421	n4059	58.16	58.16	56.066	0.162	0.243	56.082	56.082	2.09
422	n4060	57.98	57.98	55.964	0.243	0.324	55.982	55.982	2.02
423	n4061	57.75	57.75	55.896	0.405	0.486	55.914	55.914	1.85
424	n4062	54.21	54.21	53.02	0.486	0.567	53.04	53.04	1.19
425	n4063	51.43	51.43	50.24	0.648	0.729	50.263	50.263	1.19
426	n4064	48.87	48.87	47.68	0.729	0.81	47.704	47.704	1.19
427	n4066	47.14	47.14	45.95	0.81	0.891	45.975	45.975	1.19
428	n4067	45.77	45.77	44.58	0.891	0.972	44.61	44.61	1.19
429	n4068	46.2	46.2	44.478	0.972	1.053	44.509	44.509	1.72
430	n4069	47.03	47.03	44.376	1.053	1.134	44.409	44.409	2.65
431	n4070	47.46	47.46	44.274	1.134	1.215	44.308	44.308	3.19
432	n4071	48.52	48.52	44.183	1.215	1.296	44.22	44.22	4.34
433	n4074	53.48	53.48	52.29	0.324	0.405	52.307	52.307	1.19
434	n4075	55.55	55.55	54.36	0.243	0.324	54.375	54.375	1.19
435	n4076	55.24	55.24	54.05	0.081	0.162	54.061	54.061	1.19
436	n4077	54.82	54.82	53.63	0.162	0.243	53.643	53.643	1.19



ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
437	n4078	53.37	53.37	52.18	0.243	0.324	52.195	52.195	1.19
438	n4079	52.03	52.03	50.84	0.486	0.567	50.86	50.86	1.19
439	n4080	47.66	47.66	45.271	0.567	0.648	45.292	45.292	2.39
440	n4081	42.12	42.12	40.929	0.648	0.729	40.951	40.951	1.19
441	n4082	35.53	35.53	31.488	0.972	1.053	31.515	31.515	4.04
442	n4083	28.31	28.31	25.168	1.053	1.134	25.196	25.196	3.14
443	n4084	21.96	21.96	19.65	1.134	1.215	19.679	19.679	2.31
444	n4085	17.37	17.37	15.605	1.215	1.296	15.635	15.635	1.76
445	n4086	15.86	15.86	14.619	1.296	1.377	14.65	14.65	1.24
446	n4087	15.69	15.69	12.863	1.377	1.458	12.895	12.895	2.83
447	n4088	10.33	10.33	9.14	1.458	1.539	9.173	9.173	1.19
448	n4089	6.92	6.92	5.73	2.268	2.349	5.771	5.771	1.19
449	n4090	11.1	11.1	8.63	2.187	2.268	8.67	8.67	2.47
450	n4091	9.93	9.93	8.74	2.106	2.187	8.78	8.78	1.19
451	n4092	11.2	11.2	10.01	0.486	0.567	10.03	10.03	1.19
452	n4093	13.43	13.43	12.24	0.324	0.405	12.257	12.257	1.19
453	n4094	17.04	17.04	15.85	0.243	0.324	15.865	15.865	1.19
454	n4095	17.25	17.25	16.06	0.162	0.243	16.073	16.073	1.19
455	n4096	20.17	20.17	18.98	0.081	0.162	18.991	18.991	1.19
456	n4097	56.78	56.78	55.59	0.162	0.243	55.603	55.603	1.19
457	n4129	65.78	65.78	64.59	0	0.081	64.599	64.599	1.19
458	n4131	65.6	65.6	64.41	0.081	0.162	64.421	64.421	1.19
459	n4133	64.47	64.47	63.28	0.324	0.405	63.297	63.297	1.19
460	n4134	63.86	63.86	62.67	0.405	0.486	62.689	62.689	1.19
461	n4135	63.06	63.06	61.87	0.486	0.567	61.89	61.89	1.19
462	n4136	61.87	61.87	60.68	0.567	0.648	60.701	60.701	1.19
463	n4137	60.53	60.53	59.34	0.648	0.729	59.363	59.363	1.19
464	n4138	59.01	59.01	57.82	0.729	0.81	57.844	57.844	1.19
465	n4139	58.63	58.63	57.44	0.81	0.891	57.465	57.465	1.19
466	n4141	57.98	57.98	56.475	0.972	1.053	56.507	56.507	1.5
467	n4142	58.38	58.38	56.373	1.053	1.134	56.406	56.406	2.01
468	n4143	58.24	58.24	56.271	1.134	1.215	56.305	56.305	1.97
469	n4145	57.23	57.23	56.04	1.296	1.377	56.073	56.073	1.19
470	n4146	57.09	57.09	55.9	1.377	1.458	55.934	55.934	1.19
471	n4147	57.04	57.04	55.85	1.458	1.539	55.883	55.883	1.19
472	n4149	55.88	55.88	54.69	1.782	1.863	54.726	54.726	1.19
473	n4150	56.04	56.04	54.85	1.701	1.782	54.886	54.886	1.19
474	n4151	56.45	56.45	55.26	1.62	1.701	55.295	55.295	1.19
475	n4165	53	53	51.298	3.078	3.159	51.352	51.352	1.7
476	n4167	53.42	53.42	51.11	3.321	3.402	51.166	51.166	2.31
477	n4168	53.52	53.52	51.013	3.402	3.483	51.069	51.069	2.51
478	n4169	53.36	53.36	50.911	3.483	3.564	50.968	50.968	2.45
479	n4170	52.92	52.92	50.809	3.564	3.645	50.867	50.867	2.11
480	n4171	52.4	52.4	50.707	3.645	3.726	50.765	50.765	1.69
481	n4172	18.5	18.5	17.31	12.636	12.717	17.428	17.428	1.19
482	n4173	20.53	20.53	19.34	12.555	12.636	19.437	19.437	1.19
483	n4174	22.73	22.73	21.54	12.474	12.555	21.637	21.637	1.19
484	n4175	24.82	24.82	23.63	12.393	12.474	23.727	23.727	1.19
485	n4176	26.99	26.99	25.8	12.312	12.393	25.896	25.896	1.19
486	n4178	31.29	31.29	30.1	12.15	12.231	30.196	30.196	1.19
487	n4179	31.91	31.91	30.72	12.069	12.15	30.815	30.815	1.19
488	n4180	32.25	32.25	31.06	11.988	12.069	31.155	31.155	1.19
489	n4181	33.6	33.6	32.41	11.907	11.988	32.505	32.505	1.19

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
490	n4185	35.06	35.06	33.87	11.826	11.907	33.964	33.964	1.19
491	n4192	36.52	36.52	35.33	11.745	11.826	35.424	35.424	1.19
492	n4193	37.94	37.94	35.494	11.664	11.745	35.591	35.591	2.45
493	n4195	38.81	38.81	35.62	11.583	11.664	35.731	35.731	3.19
494	n4196	38.3	38.3	35.698	11.502	11.583	35.809	35.809	2.6
495	n4200	36.99	36.99	35.8	0	11.502	35.911	35.911	1.19
496	n4201	36.16	36.16	32.194	11.34	11.421	32.304	32.304	3.97
497	n4202	34.95	34.95	32.296	11.259	11.34	32.406	32.406	2.65
498	n4203	33.81	33.81	32.398	11.178	11.259	32.507	32.507	1.41
499	n4204	33.69	33.69	32.5	11.097	11.178	32.609	32.609	1.19
500	n4205	35.62	35.62	34.327	10.611	10.692	34.416	34.416	1.29
501	n4206	37.16	37.16	35.97	4.617	4.698	36.028	36.028	1.19
502	n4207	38.33	38.33	37.14	4.536	4.617	37.198	37.198	1.19
503	n4208	39.29	39.29	38.1	4.455	4.536	38.157	38.157	1.19
504	n4209	40.92	40.92	39.73	4.374	4.455	39.787	39.787	1.19
505	n4211	44.03	44.03	42.84	4.212	4.293	42.896	42.896	1.19
506	n4212	45.31	45.31	44.12	4.131	4.212	44.175	44.175	1.19
507	n4213	46.7	46.7	45.51	4.05	4.131	45.565	45.565	1.19
508	n4214	48.31	48.31	47.12	3.969	4.05	47.174	47.174	1.19
509	n4215	49.7	49.7	48.51	3.888	3.969	48.563	48.563	1.19
510	n4216	50.31	50.31	49.12	3.807	3.888	49.173	49.173	1.19
511	n4219	55	55	53.81	0	0.081	53.818	53.818	1.19
512	n4220	54.59	54.59	53.4	0.081	0.162	53.412	53.412	1.19
513	n4221	54.46	54.46	53.27	0.162	0.243	53.283	53.283	1.19
514	n4222	52.64	52.64	51.45	0.243	0.324	51.465	51.465	1.19
515	n4223	50.08	50.08	48.89	0.486	0.567	48.911	48.911	1.19
516	n4225	49.37	49.37	48.18	0.729	0.81	48.204	48.204	1.19
517	n4226	47.32	47.32	46.13	0.81	0.891	46.155	46.155	1.19
518	n4227	44.27	44.27	43.08	0.891	2.106	43.119	43.119	1.19
519	n4228	40.6	40.6	37.277	1.053	1.134	37.309	37.309	3.32
520	n4229	38.78	38.78	37.379	0.972	1.053	37.41	37.41	1.4
521	n4230	38.66	38.66	37.47	0.891	0.972	37.5	37.5	1.19
522	n4232	38.93	38.93	37.74	0.486	0.567	37.76	37.76	1.19
523	n4233	40.81	40.81	39.62	0.405	0.486	39.639	39.639	1.19
524	n4234	44.04	44.04	42.85	0.324	0.405	42.867	42.867	1.19
525	n4235	46.88	46.88	45.69	0.243	0.324	45.705	45.705	1.19
526	n4236	48.31	48.31	47.12	0.081	0.162	47.131	47.131	1.19
527	n4237	50.92	50.92	49.73	0	0.081	49.738	49.738	1.19
528	n4238	41.65	41.65	40.409	0.081	0.162	40.419	40.419	1.24
529	n4239	40.41	40.41	39.22	0.162	0.243	39.233	39.233	1.19
530	n4240	39.42	39.42	38.23	0.243	0.324	38.245	38.245	1.19
531	n4245	42.81	42.81	41.62	2.106	2.187	41.66	41.66	1.19
532	n4246	41.44	41.44	40.25	2.187	2.268	40.29	40.29	1.19
533	n4247	40.4	40.4	39.21	2.268	2.349	39.251	39.251	1.19
534	n4248	39.67	39.67	38.48	2.349	2.43	38.522	38.522	1.19
535	n4249	34.48	34.48	33.29	5.103	5.184	33.351	33.351	1.19
536	n4250	33.74	33.74	32.55	5.184	5.265	32.612	32.612	1.19
537	n4252	32.45	32.45	31.26	5.265	5.346	31.331	31.331	1.19
538	n4253	32.89	32.89	31.193	5.346	5.427	31.265	31.265	1.7
539	n4254	34.58	34.58	31.102	5.589	5.67	31.175	31.175	3.48
540	n4255	34.94	34.94	31.07	5.67	5.751	31.144	31.144	3.87
541	n4256	35.72	35.72	34.53	0	5.832	34.605	34.605	1.19
542	n4258	36.68	36.68	34.421	5.832	5.913	34.496	34.496	2.26

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
543	n4259	36.02	36.02	34.68	4.941	5.022	34.74	34.74	1.34
544	n4260	35.9	35.9	34.71	0	2.025	34.753	34.753	1.19
545	n4262	33.77	33.77	29.946	1.863	1.944	29.988	29.988	3.82
546	n4263	32.02	32.02	30.083	1.539	1.62	30.121	30.121	1.94
547	n4264	31.37	31.37	30.18	1.458	1.539	30.217	30.217	1.19
548	n4265	57.76	57.76	55.912	0.324	0.405	55.932	55.932	1.85
550	n4267	54.87	54.87	53.68	0	0.081	53.688	53.688	1.19
551	n4269	52.57	52.57	51.38	0.081	0.162	51.391	51.391	1.19
552	n4270	50.44	50.44	49.25	0.162	0.243	49.263	49.263	1.19
553	n4271	48.39	48.39	47.2	0.243	0.324	47.215	47.215	1.19
554	n4272	46.45	46.45	45.26	0.324	0.405	45.277	45.277	1.19
555	n4273	44.13	44.13	42.911	0.405	0.486	42.929	42.929	1.22
556	n4275	42.57	42.57	41.38	0.567	0.648	41.401	41.401	1.19
557	n4276	39.65	39.65	38.46	0.648	0.729	38.483	38.483	1.19
558	n4277	36.67	36.67	35.48	0.729	0.81	35.504	35.504	1.19
559	n4278	36.51	36.51	35.32	0.81	0.891	35.345	35.345	1.19
560	n4279	36.26	36.26	35.07	0.891	0.972	35.096	35.096	1.19
561	n4280	33.87	33.87	32.68	0.972	1.053	32.707	32.707	1.19
562	n4340	2.73	2.73	-0.344	16.443	16.524	-0.215	-0.215	3.07
563	n5115	61.07	61.07	59.88	0	0.081	59.888	59.888	1.19
564	n5117	53.26	53.26	51.196	3.159	3.24	51.25	51.25	2.06
565	n5118	53.26	53.26	51.153	3.24	3.321	51.208	51.208	2.11
566	n5122	56.49	56.49	55.3	1.539	1.62	55.334	55.334	1.19
567	n5125	57.34	57.34	56.141	1.215	1.296	56.173	56.173	1.2
568	n5126	57.75	57.75	56.56	0.891	0.972	56.59	56.59	1.19
569	n5127	64.66	64.66	63.457	0.243	0.324	63.472	63.472	1.2
570	n5128	64.67	64.67	63.48	0.162	0.243	63.496	63.496	1.19
571	n5132	52.19	52.19	50.675	3.726	3.807	50.727	50.727	1.51
572	n5133	46.93	46.93	45.74	0.162	0.243	45.753	45.753	1.19
573	n5134	41.62	41.62	40.43	0	0.081	40.44	40.44	1.19
574	n5136	42.08	42.08	40.89	4.293	4.374	40.946	40.946	1.19
575	n5137	35.36	35.36	34.17	10.692	10.773	34.26	34.26	1.19
576	n5138	34.84	34.84	33.65	10.773	10.854	33.74	33.74	1.19
577	n5139	34.35	34.35	33.16	10.854	10.935	33.25	33.25	1.19
578	n5140	34.27	34.27	33.08	10.935	11.016	33.171	33.171	1.19
579	n5141	33.87	33.87	32.68	11.016	11.097	32.771	32.771	1.19
580	n5148	33.97	33.97	31.12	5.508	5.589	31.193	31.193	2.85
581	n5149	33	33	31.172	5.427	5.508	31.244	31.244	1.83
582	n5151	35.69	35.69	34.5	5.022	5.103	34.561	34.561	1.19
583	n5152	36.1	36.1	34.91	2.835	2.916	34.956	34.956	1.19
584	n5153	37.04	37.04	35.85	2.754	2.835	35.895	35.895	1.19
585	n5154	37.22	37.22	36.03	2.673	2.754	36.074	36.074	1.19
586	n5155	38.17	38.17	36.98	2.592	2.673	37.024	37.024	1.19
587	n5156	38.49	38.49	37.3	2.511	2.592	37.343	37.343	1.19
588	n5157	39.24	39.24	38.05	2.43	2.511	38.092	38.092	1.19
590	n5160	33.29	33.29	29.993	1.782	1.863	30.034	30.034	3.3
591	n5161	32.91	32.91	30.018	1.701	1.782	30.058	30.058	2.89
592	n5162	32.58	32.58	30.057	1.62	1.701	30.097	30.097	2.52
593	n5163	49.79	49.79	48.6	0.648	0.729	48.623	48.623	1.19
594	n5164	49.92	49.92	48.73	0.567	0.648	48.751	48.751	1.19
595	n5165	50.28	50.28	49.09	0.405	0.486	49.109	49.109	1.19
596	n5167	51.24	51.24	50.05	0.324	0.405	50.067	50.067	1.19
598	n5195	28.39	28.39	27.2	12.231	12.312	27.296	27.296	1.19

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
599	n5201	18.49	18.49	17.299	12.717	12.798	17.417	17.417	1.19
600	n5202	16.79	16.79	15.6	13.041	13.122	15.699	15.699	1.19
601	n5203	16.03	16.03	14.84	13.122	13.203	14.94	14.94	1.19
602	n5204	8.04	8.04	6.85	13.284	13.365	6.95	6.95	1.19
603	n5205	7.32	7.32	6.13	13.365	13.446	6.231	6.231	1.19
604	n5207	5.14	5.14	3.95	13.446	13.527	4.051	4.051	1.19
605	n5208	4.77	4.77	3.58	13.527	13.608	3.681	3.681	1.19
606	n5209	4.55	4.55	3.36	13.608	13.689	3.482	3.482	1.19
607	n5210	3.65	3.65	2.46	13.851	13.932	2.567	2.567	1.19
608	n5211	3.59	3.59	2.4	13.932	14.013	2.503	2.503	1.19
609	n5212	3.54	3.54	2.35	14.013	14.094	2.477	2.477	1.19
610	n5213	2.07	2.07	0.732	15.309	15.39	0.855	0.855	1.34
611	n5215	2.05	2.05	0.704	15.39	15.471	0.828	0.828	1.35
612	n5216	2.2	2.2	0.651	15.471	15.552	0.775	0.775	1.55
613	n5218	2.25	2.25	0.36	15.714	15.795	0.486	0.486	1.89
614	n5219	2.4	2.4	0.318	15.795	15.876	0.444	0.444	2.08
615	n5223	3.03	3.03	1.599	16.929	17.01	1.73	1.73	1.43
616	n5224	2.62	2.62	1.316	17.253	17.334	1.45	1.45	1.3
617	n5225	2.79	2.79	1.301	17.334	17.415	1.435	1.435	1.49
618	n5226	2.75	2.75	1.291	17.415	17.496	1.426	1.426	1.46
619	n5229	2.7	2.7	1.285	17.496	17.577	1.42	1.42	1.42
620	n5230	2.76	2.76	1.023	17.901	17.982	1.16	1.16	1.74
621	n5232	2.79	2.79	0.928	17.982	18.063	1.066	1.066	1.86
622	n5233	2.54	2.54	0.783	18.225	18.306	0.922	0.922	1.76
623	n5234	2.6	2.6	0.744	18.306	18.387	0.883	0.883	1.86
624	n5235	2.58	2.58	0.683	18.387	18.468	0.823	0.823	1.9
625	n5237	2.29	2.29	-0.064	46.25	46.331	0.155	0.155	2.35
626	n5238	2.29	2.29	-0.065	46.331	46.412	0.154	0.154	2.36
627	n5239	2.64	2.64	1.374	26.486	26.567	1.539	1.539	1.27
628	n5240	4.53	4.53	3.34	0	26.486	3.483	3.483	1.19
629	n5241	2.39	2.39	-0.664	26.243	26.324	-0.501	-0.501	3.05
630	n5242	2.44	2.44	-0.646	26.162	26.243	-0.483	-0.483	3.09
631	n5244	1.63	1.63	-0.587	26.081	26.162	-0.424	-0.424	2.22
632	n5245	2.44	2.44	-0.564	26	26.081	-0.402	-0.402	3
633	n5246	2.81	2.81	-0.551	25.919	26	-0.389	-0.389	3.36
634	n5247	2.89	2.89	-0.549	25.838	25.919	-0.387	-0.387	3.44
635	n5248	2.53	2.53	-0.481	25.757	25.838	-0.317	-0.317	3.01
636	n5250	2.95	2.95	-0.109	25.19	25.271	0.053	0.053	3.06
637	n5251	3.7	3.7	0.539	24.38	24.461	0.698	0.698	3.16
638	n5252	52.35	52.35	51.031	0.567	0.648	51.052	51.052	1.32
639	n5257	43.99	43.99	42.8	0.486	0.567	42.82	42.82	1.19
640	n5260	32.89	32.89	31.7	1.053	1.134	31.728	31.728	1.19
641	n5261	32.75	32.75	31.56	1.134	1.215	31.589	31.589	1.19
642	n5263	32.26	32.26	31.07	1.215	1.296	31.1	31.1	1.19
643	n5264	31.56	31.56	30.37	1.296	1.377	30.401	30.401	1.19
644	n5265	31.37	31.37	30.18	1.377	1.458	30.218	30.218	1.19
645	n5313	35.59	35.59	34.4	2.754	2.835	34.445	34.445	1.19
646	n5314	35.51	35.51	34.32	2.835	2.916	34.372	34.372	1.19
647	n5316	34.59	34.59	33.4	3.159	3.24	33.448	33.448	1.19
648	n5320	32.83	32.83	31.64	3.645	3.726	31.692	31.692	1.19
649	n5321	33.05	33.05	31.86	3.564	3.645	31.911	31.911	1.19
650	n5323	33.13	33.13	31.94	3.483	3.564	31.991	31.991	1.19
651	n5329	7.86	7.86	6.67	4.698	4.779	6.729	6.729	1.19

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
652	n5330	8.91	8.91	7.72	4.617	4.698	7.778	7.778	1.19
653	n5331	15.79	15.79	14.445	4.374	4.455	14.501	14.501	1.35
654	n5336	48.82	48.82	44.173	1.944	2.025	44.215	44.215	4.65
655	n5337	47.88	47.88	44.028	2.025	2.106	44.072	44.072	3.85
656	n5338	47.82	47.82	43.999	2.106	2.187	44.044	44.044	3.82
657	n5340	4.23	4.23	2.768	22.113	22.194	2.916	2.916	1.46
658	n5341	4.26	4.26	2.82	22.032	22.113	2.967	2.967	1.44
659	n5342	4.46	4.46	3.054	21.708	21.789	3.2	3.2	1.41
660	n5343	4.54	4.54	3.083	21.627	21.708	3.228	3.228	1.46
661	n5344	4.6	4.6	3.171	21.384	21.465	3.316	3.316	1.43
663	n5346	4.7	4.7	3.326	21.141	21.222	3.47	3.47	1.37
664	n5347	5.37	5.37	4.159	17.982	18.063	4.297	4.297	1.21
665	n5348	5.38	5.38	4.158	18.063	18.144	4.296	4.296	1.22
666	n5349	5.41	5.41	3.955	18.387	18.468	4.086	4.086	1.45
667	n5350	12.51	12.51	11.32	0.405	0.486	11.339	11.339	1.19
668	n5351	24.34	24.34	23.15	0	0.081	23.158	23.158	1.19
669	n5352	37.78	37.78	35.695	0.891	0.972	35.721	35.721	2.08
670	n5353	41.45	41.45	39.089	0.81	0.891	39.114	39.114	2.36
671	n5354	42.04	42.04	40.798	0.729	0.81	40.821	40.821	1.24
672	n5355	52.49	52.49	51.3	0.405	0.486	51.319	51.319	1.19
673	n5356	52.89	52.89	51.7	0.324	0.405	51.717	51.717	1.19
674	n5364	52.41	52.41	51.22	0.405	0.486	51.239	51.239	1.19
675	n5365	55.42	55.42	54.23	0	0.081	54.238	54.238	1.19
676	n5366	57.9	57.9	56.71	0.081	0.162	56.721	56.721	1.19
677	n5368	58.08	58.08	56.89	0	0.081	56.898	56.898	1.19
678	n5369	6.02	6.02	4.83	17.577	17.658	4.946	4.946	1.19
679	n5370	6.16	6.16	4.97	17.496	17.577	5.086	5.086	1.19
680	n5371	6.24	6.24	5.05	17.415	17.496	5.165	5.165	1.19
681	n5372	18.09	18.09	16.786	17.01	17.091	16.9	16.9	1.3
682	n5373	19.45	19.45	18.26	16.929	17.01	18.374	18.374	1.19
683	n5378	33.29	33.29	31.986	16.443	16.524	32.097	32.097	1.3
684	n5379	35.59	35.59	34.4	16.362	16.443	34.512	34.512	1.19
685	n5380	36.53	36.53	35.34	16.281	16.362	35.451	35.451	1.19
686	n5381	40.4	40.4	39.21	16.038	16.119	39.321	39.321	1.19
687	n5382	43.51	43.51	42.32	15.795	15.876	42.43	42.43	1.19
688	n5383	46.49	46.49	45.3	4.779	4.86	45.359	45.359	1.19
689	n5384	46.09	46.09	44.9	4.86	4.941	44.96	44.96	1.19
690	n5385	45.32	45.32	44.13	4.941	5.022	44.19	44.19	1.19
691	n5389	2.39	2.39	0.125	37.665	37.746	0.32	0.32	2.26
692	n5390	2.36	2.36	0.289	31.59	31.671	0.478	0.478	2.07
693	n5391	2.11	2.11	0.315	31.509	31.59	0.502	0.502	1.79
694	n5392	2	2	0.374	31.428	31.509	0.56	0.56	1.63
695	n5393	2.1	2.1	0.395	31.347	31.428	0.581	0.581	1.7
696	n5395	2.26	2.26	0.506	31.104	31.185	0.691	0.691	1.75
697	n5396	2.12	2.12	0.597	30.861	30.942	0.78	0.78	1.52
698	n5397	1.91	1.91	0.644	30.78	30.861	0.827	0.827	1.27
699	n5398	2.06	2.06	0.794	30.618	30.699	0.967	0.967	1.27
700	n5399	2.5	2.5	1.133	30.375	30.456	1.304	1.304	1.37
701	n5416	61.08	61.08	57.143	0.405	0.486	57.165	57.165	3.94
702	n5417	54.5	54.5	53.31	0.162	0.243	53.326	53.326	1.19
703	n5418	53.66	53.66	52.47	0.486	0.567	52.49	52.49	1.19
705	n5420	53.23	53.23	52.04	0.567	0.648	52.061	52.061	1.19
706	n5421	52.2	52.2	51.01	0.648	0.729	51.033	51.033	1.19

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
707	n5422	51.8	51.8	50.61	0.729	0.81	50.634	50.634	1.19
708	n5423	51.55	51.55	50.36	0.81	0.891	50.385	50.385	1.19
709	n5424	52.49	52.49	51.3	0.891	0.972	51.33	51.33	1.19
710	n5426	12.17	12.17	10.98	1.782	1.863	11.016	11.016	1.19
711	n5427	13.94	13.94	12.75	1.701	1.782	12.786	12.786	1.19
712	n5428	15.59	15.59	14.4	1.539	1.62	14.434	14.434	1.19
713	n5434	30.49	30.49	29.3	1.053	1.134	29.328	29.328	1.19
714	n5435	31.72	31.72	30.53	0.972	1.053	30.557	30.557	1.19
715	n5436	35.02	35.02	33.83	0.648	0.729	33.853	33.853	1.19
716	n5437	33.16	33.16	31.97	0.729	0.81	31.994	31.994	1.19
717	n5438	32.23	32.23	31.04	0.81	0.891	31.065	31.065	1.19
718	n5460	49.51	49.51	48.32	0	0.081	48.328	48.328	1.19
719	n5465	46.19	46.19	44.079	0.891	0.972	44.109	44.109	2.11
720	n5466	45.88	45.88	44.116	0.81	0.891	44.145	44.145	1.76
721	n5467	45.63	45.63	44.146	0.729	0.81	44.174	44.174	1.48
722	n5468	46.07	46.07	44.88	0	0.081	44.89	44.89	1.19
723	n5469	46.98	46.98	44.831	0.081	0.162	44.846	44.846	2.15
724	n5470	5.82	5.82	4.63	5.589	5.67	4.694	4.694	1.19
725	n5471	7.98	7.98	6.549	5.508	5.589	6.612	6.612	1.43
726	n5472	3.36	3.36	1.886	0.729	0.81	1.914	1.914	1.47
727	n5473	3.21	3.21	1.925	0.648	0.729	1.951	1.951	1.28
728	n5475	4.08	4.08	2.89	0.243	0.324	2.906	2.906	1.19
729	n5476	10.96	10.96	9.479	0	0.081	9.486	9.486	1.48
730	n5477	11.61	11.61	10.42	5.265	5.346	10.482	10.482	1.19
731	n5478	11.73	11.73	10.54	5.184	5.265	10.602	10.602	1.19
732	n5479	12.74	12.74	11.55	5.103	5.184	11.611	11.611	1.19
733	n5480	14.21	14.21	13.02	5.022	5.103	13.081	13.081	1.19
734	n5481	20.6	20.6	19.234	4.779	4.86	19.293	19.293	1.37
735	n5482	22.31	22.31	20.906	4.698	4.779	20.964	20.964	1.4
736	n5483	23.69	23.69	22.5	4.617	4.698	22.558	22.558	1.19
737	n5484	26.53	26.53	25.321	4.374	4.455	25.377	25.377	1.21
738	n5485	27.62	27.62	26.43	4.131	4.212	26.485	26.485	1.19
739	n5486	28.23	28.23	27.04	4.05	4.131	27.095	27.095	1.19
740	n5487	33.58	33.58	32.39	3.726	3.807	32.442	32.442	1.19
741	n5488	45.55	45.55	43.197	3.321	3.402	43.253	43.253	2.35
742	n5492	47.06	47.06	45.87	0	0.081	45.878	45.878	1.19
743	n5494	45.95	45.95	44.76	0	0.081	44.768	44.768	1.19
744	n5495	44.63	44.63	43.44	0.243	0.324	43.455	43.455	1.19
745	n5496	44.09	44.09	42.9	0.324	0.405	42.917	42.917	1.19
746	n5497	41.99	41.99	40.345	0.405	0.486	40.363	40.363	1.64
747	n5498	2.49	2.49	1.161	1.377	1.458	1.198	1.198	1.33
748	n5499	2.73	2.73	1.468	8.181	8.262	1.559	1.559	1.26
749	n5500	2.74	2.74	1.509	8.1	8.181	1.599	1.599	1.23
750	n5501	3	3	1.568	8.019	8.1	1.657	1.657	1.43
751	n5502	3.01	3.01	1.591	7.938	8.019	1.679	1.679	1.42
752	n5503	3.31	3.31	2.038	7.533	7.614	2.125	2.125	1.27
753	n5504	3.4	3.4	2.08	7.452	7.533	2.165	2.165	1.32
754	n5505	3.46	3.46	2.081	7.371	7.452	2.166	2.166	1.38
755	n5506	3.28	3.28	2.09	7.29	7.371	2.175	2.175	1.19
756	n5507	3.4	3.4	2.21	7.209	7.29	2.283	2.283	1.19
757	n5508	3.48	3.48	2.29	7.128	7.209	2.363	2.363	1.19
758	n5509	3.57	3.57	2.38	7.047	7.128	2.452	2.452	1.19
759	n5510	3.58	3.58	2.39	3.402	3.483	2.455	2.455	1.19

ID	Label	Elevation (Ground) (m)	Elevation (Rim) (m)	Elevation (Invert) (m)	Flow (Total In) (L/s)	Flow (Total Out) (L/s)	Hydraulic Grade Line (Out) (m)	Hydraulic Grade Line (In) (m)	Depth (Structure) (m)
760	n5511	4.77	4.77	3.58	3.321	3.402	3.63	3.63	1.19
761	n5512	7.08	7.08	5.89	3.24	3.321	5.939	5.939	1.19
762	n5513	7.87	7.87	6.68	3.159	3.24	6.728	6.728	1.19
763	n5514	10.67	10.67	9.48	2.916	2.997	9.526	9.526	1.19
764	n5515	12.16	12.16	10.97	1.215	2.916	11.016	11.016	1.19
765	n5516	12.38	12.38	11.19	1.134	1.215	11.219	11.219	1.19
766	n5517	12.89	12.89	11.7	1.053	1.134	11.728	11.728	1.19
767	n5518	7.54	7.54	5.674	1.458	1.539	5.711	5.711	1.87
768	n5519	6.96	6.96	5.738	1.377	1.458	5.774	5.774	1.22
769	n5520	6.97	6.97	5.78	1.296	1.377	5.816	5.816	1.19
770	n5521	7.53	7.53	6.34	1.215	1.296	6.37	6.37	1.19
771	n5522	10	10	8.81	1.134	1.215	8.839	8.839	1.19
772	n5523	11.97	11.97	10.756	1.053	1.134	10.784	10.784	1.21
773	n5524	13.51	13.51	12.32	0.972	1.053	12.347	12.347	1.19
774	n5525	3.89	3.89	2.67	3.483	3.564	2.72	2.72	1.22
775	n5526	3.89	3.89	2.687	3.402	3.483	2.743	2.743	1.2
776	n5527	3.91	3.91	2.72	3.321	3.402	2.776	2.776	1.19
777	n5528	4.62	4.62	3.43	2.997	3.078	3.477	3.477	1.19
778	n5529	4.73	4.73	3.54	2.916	2.997	3.586	3.586	1.19
779	n5530	5.29	5.29	4.1	2.592	2.673	4.144	4.144	1.19
780	n5531	5.41	5.41	4.22	2.511	2.592	4.263	4.263	1.19
781	n5532	5.65	5.65	4.46	2.43	2.511	4.502	4.502	1.19
782	n5533	5.81	5.81	4.62	2.349	2.43	4.662	4.662	1.19
783	n5534	5.82	5.82	4.63	2.268	2.349	4.671	4.671	1.19
784	n5535	5.91	5.91	4.72	2.187	2.268	4.76	4.76	1.19
785	n5536	6.3	6.3	5.11	2.106	2.187	5.15	5.15	1.19
786	n5537	6.44	6.44	5.25	2.025	2.106	5.289	5.289	1.19
787	n5538	6.53	6.53	5.34	1.944	2.025	5.378	5.378	1.19
788	n5540	11.53	11.53	10.34	1.62	1.701	10.375	10.375	1.19
789	n5541	12.5	12.5	11.199	1.539	1.62	11.232	11.232	1.3
790	n5542	15.07	15.07	13.433	1.458	1.539	13.466	13.466	1.64
791	n5545	31.63	31.63	30.44	0.891	0.972	30.466	30.466	1.19
792	n5547	6.5	6.5	5.283	13.769	13.85	5.385	5.385	1.22
793	n5548	7.1	7.1	5.91	13.688	13.769	6.012	6.012	1.19
794	n5549	8.47	8.47	6.86	13.607	13.688	6.961	6.961	1.61
795	n5550	8.14	8.14	6.95	0	13.445	7.073	7.073	1.19
796	n5551	6.52	6.52	3.544	13.283	13.364	3.665	3.665	2.98
797	n5552	5.37	5.37	3.832	12.959	13.04	3.931	3.931	1.54
798	n5553	5.13	5.13	3.893	12.878	12.959	4.012	4.012	1.24
799	n5554	5.11	5.11	3.92	12.797	12.878	4.039	4.039	1.19
800	n5555	5.95	5.95	4.76	12.554	12.635	4.857	4.857	1.19
1565	MH-1	55.099	55.099	53.909	0	0.081	53.916	53.916	1.19

## APPENDIX- VII-POWER CALCULATION

Sl no.	Name	Pumpset Capacity in HP	Pumpset Capacity in KW	No of Pumpset	No of Stand by	Working Time	Power Consumpti on/ day	Power Consumpti on/ year	Power cost @Rs7/unit	Remarks
<b>STP</b>										
1	Septage pump	1.5	1.119	2	1	24	26.856	9802.44	68617.08	
2	Air Blower	48	35.808	4	1	24	2578.176	941034.24	6587239.68	
3	Sludge Transfer to Thickner Pump	2	1.492	2	1	24	35.808	13069.92	91489.44	
4	Sludge Transfer to Centrifuge Pump	1	0.746	2	1	24	17.904	6534.96	45744.72	
5	Clarified water to ASF/PSF Pump	20	14.92	3	1	24	716.16	261398.4	1829788.8	
6	Mixer	3	2.238	2	1	24	53.712	19604.88	137234.16	
7	Clarifier to Sludge Sump Pump	2	1.492	2	1	24	35.808	13069.92	91489.44	
8	Centrate Sump to EQ Tank	2	1.492	2	1	24	35.808	13069.92	91489.44	
9	High Pressure Jet Pump	1	0.746	1	0	1	0.746	272.29	1906.03	
10	STP Ligting		20			24	480	175200	1226400	
<b>NET WORK</b>										
1	LS1	0.5	0.373	2	1	24	8.952	3267.48	22872.36	
2	LS2	4	2.984	2	1	24	71.616	26139.84	182978.88	
3	LS3	2	1.492	2	1	24	35.808	13069.92	91489.44	
4	LS4	0.5	0.373	2	1	24	8.952	3267.48	22872.36	
5	LS5	4	2.984	2	1	24	71.616	26139.84	182978.88	
6	LS6	0.5	0.373	2	1	24	8.952	3267.48	22872.36	
7	LS7	0.5	0.373	2	1	24	8.952	3267.48	22872.36	
8	LS8	1	0.746	2	1	24	17.904	6534.96	45744.72	
9	LS9	2	1.492	2	1	24	35.808	13069.92	91489.44	



SI no.	Name	Pumpset Capacity in HP	Pumpset Capacity in KW	No of Pumpset	No of Stand by	Working Time	Power Consumption/ day	Power Consumption/ year	Power cost @Rs7/unit	Remarks
10	LS10	2	1.492	2	1	24	35.808	13069.92	91489.44	
11	LS11	3	2.238	2	1	24	53.712	19604.88	137234.16	
12	PH-1	50	37.3	2	1	24	895.2	326748	2287236	
13	Ligting-Well and Lifting stations		12			24	288	105120	735840	
								<b>1840424.17</b>	<b>12882969.19</b>	

PRICE

EST NO:

General Abstract

**SEWERAGE SCHEME TO KASARAGOD MUNICIPALITY(PHASE-1) -  
CONSTRUCTION OF 4 MLD CAPACITY SEWAGE TREATMENT PLANT AT  
PACHAKADU THURUTHU AND LAYING SEWERAGE NET WORK**

(Dsor year: 2018)

SI No	Heading Description	Amount
1	Network Estimate Including O&M (Estimate No.2022/1797)	593741191.00
2	4MLD STP Estimate Including O&m(Estimate No.:2022/2012)	382829312.00
3	4 MLD STP Electro Mechanical Estimate(Estimate No.2022/2232)	70430751.00
	Total	<b>1047001254.00</b>
	Centage @	<b>0.0%</b>
	Centage Amount	<b>0.00</b>
	Provision for GST payments (in %) @	<b>0.0%</b>
	Amount reserved for GST payments	<b>0.00</b>
	Total & Centage	<b>1047001254.00</b>
	Lumpsum for round off	<b>0.00</b>
	<b>GRAND TOTAL Rs</b>	<b>1047001254.00</b>
	<b>Rounded Grand Total Rs 1,04,70,01,254</b>	
	<b>Rupees One Hundred Four Crore Seventy Lakh One Thousand Two Hundred and Fifty Four Only</b>	

Kerala Water Authority  
**PRICE**

## General Abstract

**SEWERAGE SCHEME TO KASARAGOD MUNICIPALITY (PHASE-1) -  
CONSTRUCTION OF 4 MLD CAPACITY SEWAGE TREATMENT PLANT AT  
PACHAKADU THURUTHU AND LAYING SEWERAGE NET WORK -STP DESIGN**

(Dsor year: 2018)

SI No	Heading Description	Amount
1	SEPTAGE TANK	1020823.21
2	INLET CHEMBER/SCREEN CHANEL/GRIT CHEMBER/PARSHALLFLUME	3791860.59
3	EQUALISATION TANK	6530115.52
4	MBBR 1 & 2	11768516.73
5	SECONDARY CLARIFIER	4595615.60
6	SLUDGE SUMP	307473.43
7	SLUDGE THICKNER	1244270.67
8	THICKENED SLUDGE SUMP	663367.94
9	FILTER FEED TANK	928561.45
10	TREATED WATER TANK	1949079.11
11	Centrate Sump	658423.19
12	Administrative/Laboratory/Chemical House / Control Room Building	5098073.01
13	Security Cabin	297948.09
14	Air Blower Building	2616139.55
15	Chlorination Building	2010961.80
16	Transformer Building	3152274.57
17	Centrifuge Building	3117537.57
18	PSF/ACF Foundation	730840.44
19	Sludge Shed	644439.80
20	STP Land Development and Approach Road and internal Service Roads	33918816.33
21	Storm Water Drains	1407474.00
22	Compound wall &Gate	2555888.58
23	Operation and Maintenance cost for STP and Allied works - 1st Year	6686478.06
24	Operation and Maintenance cost for STP and Allied works - 2nd Year to 10th year	84249623.56
25	Landscaping and Green belt formation around the STP compound	1000000.00
26	Electricity charges for 4 Mld STP	118140796.90
Total		<b>299085399.69</b>
Centage @		<b>10.0%</b>
Centage Amount		<b>29908539.97</b>
Provision for GST payments (in %) @		<b>18.0%</b>

Amount reserved for GST payments	<b>53835371.94</b>
Total & Centage	<b>382829311.61</b>
Lumpsum for round off	<b>0.00</b>
<b>GRAND TOTAL Rs</b>	<b>382829311.61</b>
<b>Rounded Grand Total Rs 38,28,29,312</b>	
<b>Rupees Thirty Eight Crore Twenty Eight Lakh Twenty Nine Thousand Three Hundred and Twelve Only</b>	



Kerala Water Authority

**PRICE**

## Detailed Estimate

**SEWERAGE SCHEME TO KASARAGOD MUNICIPALITY (PHASE-1) -  
CONSTRUCTION OF 4 MLD CAPACITY SEWAGE TREATMENT PLANT AT  
PACHAKADU THURUTHU AND LAYING SEWERAGE NET WORK -STP DESIGN**

(Dsr year: 2018)

Sl No	Description	No	L	B	D	CF	Quantity	Remark	
<b>1 SEPTAGE TANK (Cost Index:33.05 %)</b>									
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil								
		1	7.400	4.400	2.000		65.121		
		Total Quantity						65.121 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						65.121 cum	
		Say 65.121 cum @ Rs 210.02 / cum						<b>Rs 13676.71</b>	
2	4.1.5 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)								
		1	7.400	4.400	0.200		6.512		
		Total Quantity						6.512 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						6.512 cum	
		Say 6.512 cum @ Rs 7229.54 / cum						<b>Rs 47078.76</b>	
3	5.37.1 Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level								

	bottom	1	7.200	4.200	0.300		9.073	
	side upto GL	1	6.3*2+3.3* 2	0.300	1.500		8.640	
	Total Quantity						17.713 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						17.713 cum	
	Say 17.713 cum @ Rs 9700.81 / cum						<b>Rs 171830.45</b>	
4	<p>5.37.2 Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work above plinth level upto floor V level</p>							
	slab	1	6.600	3.600	0.1500		3.564	
	side upto slab	1	6.3*2+3.3* 2	0.300	1.500		8.640	
	Total Quantity						12.204 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						12.204 cum	
	Say 12.204 cum @ Rs 11321.96 / cum						<b>Rs 138173.20</b>	
5	<p>5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).</p>							
		1	34.234				34.234	
	Total Quantity						34.234 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						34.234 cum	
	Say 34.234 cum @ Rs 80.56 / cum						<b>Rs 2757.89</b>	
6	<p>4.12 Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .</p>							
		1	34.234	330.000			11297.221	
	Total Quantity						11297.221 kg	

	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						11297.221 kg	
	Say 11297.221 kg @ Rs 1.33 / kg						<b>Rs 15025.30</b>	
7	od327527/2021_2022 Extra for providing sulphate resistant cement for the structures above plinth level.							
	slab	1	6.600	3.600	0.1500		3.564	
	side upto slab	1	6.3*2+3.3* 2	0.300	1.500		8.640	
	Total Quantity						12.204 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						12.204 cum	
	Say 12.204 cum @ Rs 1965.60 / cum						<b>Rs 23988.18</b>	
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more							
	@120 kg/m3	1	34.234	120.000			4108.080	
	Total Quantity						4108.080 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						4108.080 kilogram	
	Say 4108.080 kilogram @ Rs 96.46 / kilogram						<b>Rs 396265.40</b>	
9	5.9.1 Centering and shuttering including strutting, etc. and removal of form for: Foundations, footings, bases of columns, etc for mass concrete							
		1	7.4*2+4.4* 2	0.300			7.080	
	Total Quantity						7.080 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						7.080 sqm	
	Say 7.080 sqm @ Rs 329.03 / sqm						<b>Rs 2329.53</b>	
10	5.9.2 Centering and shuttering including strutting, etc. and removal of form for: Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.							
	Inside	1	2*6+2*3	3.000			54.000	
	Out side	1	2*6.6+2*3. 6	3.000			61.200	
	Total Quantity						115.200 sqm	

		Total Deducted Quantity				0.000 sqm	
		Net Total Quantity				115.200 sqm	
		Say 115.200 sqm @ Rs 703.77 / sqm				<b>Rs 81074.30</b>	
11	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform						
	slab	1	6.000	3.000			18.000
		Total Quantity				18.000 sqm	
		Total Deducted Quantity				0.000 sqm	
		Net Total Quantity				18.000 sqm	
		Say 18.000 sqm @ Rs 800.50 / sqm				<b>Rs 14409.00</b>	
12	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)						
	Inside	1	2*6+2*3	3.000			54.000
	Out side	1	2*6.6+2*3. 6	1.500			30.600
	slab	1	6.600	3.600			23.760
		Total Quantity				108.360 sqm	
		Total Deducted Quantity				0.000 sqm	
		Net Total Quantity				108.360 sqm	
		Say 108.360 sqm @ Rs 393.69 / sqm				<b>Rs 42660.25</b>	
13	13.52.2 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On concrete work						
	Inside	1	2*6+2*3	3.000			54.000
	Out side	1	2*6.6+2*3. 6	1.500			30.600
	slab	1	6.600	3.600			23.760
		Total Quantity				108.360 sqm	
		Total Deducted Quantity				0.000 sqm	
		Net Total Quantity				108.360 sqm	
		Say 108.360 sqm @ Rs 218.73 / sqm				<b>Rs 23701.58</b>	
14	22.23.1 Providing and applying integral crystalline slurry of hydrophilic in nature forwaterproofing treatment to the RCC structures like retaining walls of the basement,water tanks, roof slabs, podiums, reservior, sewage						



	<p>&amp; water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For vertical surface two coats @0.70 kg per sqm</p>							
		2	6+3	3.000			54.000	
	Total Quantity						54.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						54.000 sqm	
	Say 54.000 sqm @ Rs 559.61 / sqm						<b>Rs 30218.94</b>	
15	<p>22.23.2          Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage &amp; water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For horizontal surface one coat @1.10 kg per sqm.</p>							
		1	6.000	3.000			18.000	
	Total Quantity						18.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						18.000 sqm	
	Say 18.000 sqm @ Rs 431.28 / sqm						<b>Rs 7763.04</b>	
16	<p>100.36.1          Filling water with 5000 litre tankers fitted in lorry and conveying water from a distance of 5 km (average) to the reservoir site and pumping the water into the reservoir of height not less than 3 m using 5 HP diesel engine pump set, hire for tanker lorry, tools and other appliances and cost of water etc. complete. "(Ref. No. 000, Technical Circular)"</p>							
		1	6.000	3.000	3.000		54.000	
	Total Quantity						54.000 Kilo litre	
	Total Deducted Quantity						0.000 Kilo litre	
	Net Total Quantity						54.000 Kilo litre	

SI No	Description	No	L	B	D	CF	Quantity	Remark
Say 54.000 Kilo litre @ Rs 182.79 / Kilo litre							<b>Rs 9870.66</b>	
<b>2INLET CHEMBER/SCREEN CHANEL/GRIT CHEMBER/PARSHALLFLUME (Cost Index:33.05 %)</b>								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	Reciving chamber footing	4	1.600	1.600	1.500		15.361	
	Reciving and Distribution chamber footing	6	1.900	1.900	1.500		32.491	
	Grit chamber Footing	6	2.200	2.200	1.500		43.561	
	Parshalflume and Distribution chamber	6	1.900	1.900	1.500		32.491	
	Staircase column footing	3	1.600	1.600	1.500		11.521	
Total Quantity							135.425 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							135.425 cum	
Say 135.425 cum @ Rs 210.02 / cum							<b>Rs 28441.96</b>	
2	4.1.5 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)							
	Reciving chamber footing	4	1.600	1.600	0.200		2.049	
	Reciving and Distribution chamber footing	6	1.900	1.900	0.200		4.332	
	Grit chamber Footing	6	2.200	2.200	0.200		5.809	
	Parshalflume and Distribution chamber	6	1.900	1.900	0.200		4.332	
	Staircase column footing	3	1.600	1.600	0.200		1.537	
Total Quantity							18.059 cum	
Total Deducted Quantity							0.000 cum	

		Net Total Quantity					18.059 cum	
		Say 18.059 cum @ Rs 7229.54 / cum					<b>Rs 130558.26</b>	
3	5.37.1 Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in-charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level							
	Receiving chamber footing Size 1.2 x 1.2 x 0.9 m	4	1.200	1.200	0.150		0.864	
		4	0.700	0.700	0.750		1.470	
	Receiving and Distribution chamber footing Size 1.5 x 1.5 x 0.9 m	6	1.500	1.500	0.150		2.025	
		6	0.900	0.900	0.750		3.646	
	Grit chamber Footing Size 1.8x1.8x0.9m	6	1.800	1.800	0.150		2.916	
		6	1.100	1.100	0.750		5.446	
	Parshall flume and Distribution chamber footing Size 1.5 x 1.5 x 0.9 m	6	1.500	0.150	0.150		0.203	
		6	0.900	0.900	0.750		3.646	
	Staircase column footing Size 1.2 x 1.2 x 0.9 m	3	1.200	1.200	0.150		0.648	
		3	0.700	0.700	0.750		1.103	
	Pedestal column-Receiving chamber	4	0.250	0.400	0.400		0.161	
	Pedestal column-Receiving and Distribution chamber	6	0.250	0.450	0.400		0.270	
	Pedestal column-staircase	3	0.200	0.400	0.400		0.097	

	Pedastral column-Gritchamber	6	0.250	0.500	0.400		0.301		
	Pedastral column-Parshalflume and Distribution chamber	6	0.250	0.450	0.400		0.270		
	Total Quantity						23.066 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						23.066 cum		
	Say 23.066 cum @ Rs 9700.81 / cum							<b>Rs 223758.88</b>	
4	<p>5.37.2            Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in-charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work above plinth level upto floor V level</p>								
	Plinth level beam	1	117.750	0.250	0.450		13.247		
	Receiving chamber column 250x400	4	0.250	0.400	2.550		1.020		
	Receiving and Distribution chamber column 250x450	6	0.250	0.450	3.000		2.026		
	Grit chamber Column 250x500	6	0.250	0.500	2.200		1.651		
	Parshalflume and Distribution chamber column 250x450	6	0.250	0.450	3.000		2.026		
	Staircase column 200x400	1	0.200	0.400	1.500		0.121		
	Staircase column 200x400	1	0.200	0.400	3.000		0.241		
	Staircase column 200x400	1	0.200	0.400	5.000		0.401		
	Receiving chamber base slab	1	2.250	1.000	0.200		0.450		

	Reciving chamber side wall	1	2.750	0.250	2.200		1.513		
		2	1.000	0.250	2.200		1.100		
		1	2.750	0.250	1.000		0.688		
	Coarse and fine screen chamber base slab	2	10.000	1.000	0.200		4.000		
	Coarse and fine screen chamber side wall	3	10.000	0.250	1.000		7.500		
	Grit chamber base slab -side portion	2	7.730		0.200		3.093		
	Grit chamber base slab -Centre portion	2	10.890		0.200		4.357		
	Grit Chamber sidewall	2	7.350	0.250	2.500		9.188		
		3	3.300	0.250	2.500		6.188		
	parshelfume and distribution chamber base slab	1	5.750	2.500	0.200		2.875		
	parshelfume and distribution chamber side wall	2	5.750	0.250	1.000		2.875		
	Allround verandha slab	1	61.120	1.000	0.150		9.168		
	verandha beam	15	1.000	0.250	0.400		1.500		
	Staircase -steps	18	1.000	0.300	0.150		0.810		
	Staircase -landing	1	1.000	1.000	0.150		0.150		
		1	1.700	1.000	0.150		0.255		
	Total Quantity						76.443 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						76.443 cum		
	Say 76.443 cum @ Rs 11321.96 / cum						<b>Rs 865484.59</b>		
5	4.12 Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .								
	Reciving chamber base slab	1	2.250	1.000	0.200	330.0	148.500		

	Reciving chamber side wall	1	2.750	0.250	2.200	330.0	499.126		
		2	1.000	0.250	2.200	330.0	363.001		
		1	2.750	0.250	1.000	330.0	226.875		
	Coarse and fine screen chamber base slab	2	10.000	1.000	0.200	330.0	1320.000		
	Coarse and fine screen chamber side wall	3	10.000	0.250	1.000	330.0	2475.000		
	Grit chamber base slab -side portion	2	7.730		0.200	330.0	1020.361		
	Grit chamber base slab -Centre portion	2	10.890		0.200	330.0	1437.481		
	Grit Chamber sidewall	2	7.350	0.250	2.500	330.0	3031.875		
		3	3.300	0.250	2.500	330.0	2041.875		
	parshelfume and distribution chamber base slab	1	5.750	2.500	0.200	330.0	948.750		
	parshelfume and distribution chamber side wall	2	5.750	0.250	1.000	330.0	948.750		
	Allround verandha slab	1	61.120	1.000	0.150	330.0	3025.440		
	Total Quantity						17487.034 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						17487.034 kg		
	Say 17487.034 kg @ Rs 1.33 / kg						<b>Rs 23257.76</b>		
6	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more								
	From item no 3 @120 kg/m3	1			23.066	120.0	2767.920		
	From item no 4 @120 kg/m3	1			76.503	120.0	9180.360		
	Total Quantity						11948.280 kilogram		
	Total Deducted Quantity						0.000 kilogram		
	Net Total Quantity						11948.280 kilogram		

		Say 11948.280 kilogram @ Rs 96.46 / kilogram					Rs 1152531.09	
7	od327527/2021_2022 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Reciving chamber base slab	1	2.250	1.000	0.200		0.450	
	Reciving chamber side wall	1	2.750	0.250	2.200		1.513	
		2	1.000	0.250	2.200		1.100	
		1	2.750	0.250	1.000		0.688	
	Coarse and fine screen chamber base slab	2	10.000	1.000	0.200		4.000	
	Coarse and fine screen chamber side wall	3	10.000	0.250	1.000		7.500	
	Grit chamber base slab -side portion	2	7.730		0.200		3.093	
	Grit chamber base slab -Centre portion	2	10.890		0.200		4.357	
	Grit Chamber sidewall	2	7.350	0.250	2.500		9.188	
		3	3.300	0.250	2.500		6.188	
	parshelfume and distribution chamber base slab	1	5.750	2.500	0.200		2.875	
	parshelfume and distribution chamber side wall	2	5.750	0.250	1.000		2.875	
	Allround verandha slab	1	61.120	1.000	0.150		9.168	
	Total Quantity						52.995 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						52.995 cum	
	Say 52.995 cum @ Rs 1965.60 / cum						Rs 104166.97	
8	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							

	Receiving chamber footing Size 1.2 x 1.2 x 0.9 m	4	4.800		0.150		2.880		
	Receiving and Distribution chamber footing Size 1.5 x 1.5 x 0.9 m	6	6.000		0.150		5.400		
	Grit chamber Footing Size 1.8x1.8x0.9m	6	7.200		0.150		6.480		
	Parshall flume and Distribution chamber footing Size 1.5 x 1.5 x 0.9 m	6	6.000		0.150		5.400		
	Staircase column footing Size 1.2 x 1.2 x 0.9 m	3	4.800		0.150		2.160		
	Pedestal column-Receiving chamber	4	1.300		0.400		2.080		
	Pedestal column-Receiving and Distribution chamber	6	1.400		0.400		3.360		
	Pedestal column-staircase	3	1.200		0.400		1.440		
	Pedestal column-Grit chamber	6	1.500		0.400		3.601		
	Pedestal column-Parshall flume and Distribution chamber	6	1.400		0.400		3.360		
	Total Quantity						36.161 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						36.161 sqm		
	Say 36.161 sqm @ Rs 329.03 / sqm						<b>Rs 11898.05</b>		
9	5.9.2 Centering and shuttering including strutting, etc. and removal of form for: Walls (any thickness) including attached pilasters, buttresses, plinth and string courses etc.								
	Receiving chamber side wall	2	2.750		2.200		12.101		
		4	1.000		2.200		8.800		
		2	2.750		1.000		5.500		



	Coarse and fine screen chamber side wall	6	10.000		1.000	60.000		
	Grit Chamber sidewall	2	7.350		2.500	36.750		
		2	6.850		2.500	34.250		
		3	3.300		2.500	24.750		
		3	3.600		2.500	27.000		
	parshelfume and distribution chamber side wall	4	5.750		1.000	23.000		
		2	2.500		1.000	5.000		
	Total Quantity						237.151 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						237.151 sqm	
	Say 237.151 sqm @ Rs 703.77 / sqm						<b>Rs 166899.76</b>	
10	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform							
	Reciving chamber base slab	1	2.250		1.000	2.250		
	Coarse and fine screen chamber base slab	2	10.000		1.000	20.000		
	Grit chamber base slab -side portion	2	7.730			15.460		
	Grit chamber base slab -Centre portion	2	10.890			21.780		
	parshelfume and distribution chamber base slab	1	5.750		2.500	14.375		
	Total Quantity						73.865 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						73.865 sqm	
	Say 73.865 sqm @ Rs 800.50 / sqm						<b>Rs 59128.93</b>	
11	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers							

	Allround verandha slab	1	61.120	1.150			70.288		
	verandha beam	15	1.000	0.250+0.4 *2			15.750		
	Staircase -steps	18	1.000	0.300*2+0 .15*2			16.200		
	Staircase -landing	1	1.000	1.000			1.000		
		1	1.700	1.000			1.700		
	Total Quantity						104.938 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						104.938 sqm		
	Say 104.938 sqm @ Rs 637.64 / sqm							<b>Rs 66912.67</b>	
12	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts								
	Plinth level beam	1	117.750	0.250+0.4 5*2			135.413		
	Reciving chamber column 250x400	4	0.250*2+0 .4*2		2.550		13.260		
	Reciving and Distribution chamber column 250x450	6	0.250*2+0 .45*2		3.000		25.200		
	Grit chamber Column 250x500	6	0.250*2+0 .5*2		2.200		19.800		
	Parshalflume and Distribution chamber column 250x450	6	0.250*2+0 .45*2		3.000		25.200		
	Staircase column 200x400	1	0.2*2+0.4 82		1.500		1.323		
	Staircase column 200x400	1	0.200*2+0 .4*2		3.000		3.601		
	Staircase column 200x400	1	0.200*2+0 .4*2		5.750		6.901		
	Total Quantity						230.698 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						230.698 sqm		
	Say 230.698 sqm @ Rs 847.46 / sqm							<b>Rs 195507.33</b>	

13	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)							
	Plinth level beam	1	117.750	1.400			164.850	
	Receiving chamber column 250x400	4	1.300		2.550		13.260	
	Receiving and Distribution chamber column 250x450	6	1.400		3.000		25.200	
	Grit chamber Column 250x500	6	1.500		2.200		19.800	
	Parshall flume and Distribution chamber column 250x450	6	1.400		3.000		25.200	
	Staircase column 200x400	1	1.200		1.500		1.800	
	Staircase column 200x400	1	1.200		3.000		3.600	
	Staircase column 200x400	1	1.200		5.000		6.000	
	Receiving chamber base slab- top and bottom	2	2.250	1.000			4.500	
	Receiving chamber side wall- inside and out side	2	2.750		2.200		12.101	
		4	1.000		2.200		8.800	
		2	2.750		1.000		5.500	
	Coarse and fine screen chamber base slab-top and bottom	4	10.000	1.000			40.000	
	Coarse and fine screen chamber side wall	6	10.000		1.000		60.000	
	Grit chamber base slab -side portion -top and bottom	4	7.730				30.920	
	Grit chamber base slab -Centre portion -top and bottom	4	10.890				43.560	

	Grit Chamber sidewall-inside and out side	4	7.350		2.500		73.500	
		6	3.300		2.500		49.500	
	parshelfume and distribution chamber base slab-top and bottom	2	5.750	2.500			28.750	
	parshelfume and distribution chamber side wall-inside and out side	4	5.750		1.000		23.000	
	Allround verandha slab-top and bottom	2	61.120	1.000	0.150		18.336	
	verandha -edge	1	61.200	0.150			9.180	
	verandha beam	15	1.000	1.050			15.750	
	Staircase -steps	18	1.000	0.900			16.200	
	Staircase -waist slab bottom	1	15.000	1.000			15.000	
	Staircase -landing -top only	1	1.000	1.000			1.000	
		1	1.700	1.000			1.700	
						Total Quantity	717.007 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	717.007 sqm	
						Say 717.007 sqm @ Rs 393.69 / sqm	<b>Rs 282278.49</b>	
14	13.52.2 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On concrete work							
	Qty same as item no-13	1	717.007				717.007	
						Total Quantity	717.007 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	717.007 sqm	
						Say 717.007 sqm @ Rs 218.73 / sqm	<b>Rs 156830.94</b>	
15	22.23.1 Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the							

	RCC structures like retaining walls of the basement,water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 partsintegral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 partsintegral crystalline slurry : 1 part water) for horizontal surfaces and applying thesame from negative (internal) side with the help of synthetic fiber brush. The materialshall meet the requirements as specified in ACI-212-3R-2010 i.e by reducingpermeability of concrete by more than 90% compared with control concrete as perDIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystallineslurry shall be capable of self-healing of cracks up to a width of 0.50mm. The workshall be carried out all complete as per specification and the direction of the engineerin-charge. The product performance shall carry guarantee for 10 years against anyleakage.For vertical surface two coats @0.70 kg per sqm						
	Receiving chamber side wall- inside and out side	2	2.750		2.200		12.101
		4	1.000		2.200		8.800
		2	2.750		1.000		5.500
	Coarse and fine screen chamber side wall	6	10.000		1.000		60.000
	Grit Chamber sidewall-inside and out side	4	7.350		2.500		73.500
		6	3.300		2.500		49.500
	parshelfume and distribution chamber side wall-inside and out side	4	5.750		1.000		23.000
		Total Quantity					232.401 sqm
		Total Deducted Quantity					0.000 sqm
		Net Total Quantity					232.401 sqm
		Say 232.401 sqm @ Rs 559.61 / sqm					<b>Rs 130053.92</b>
16	<p>22.23.2</p> <p>Providing and applying integral crystalline slurry of hydrophilic in nature forwaterproofing treatment to the RCC structures like retaining walls of the basement,water tanks, roof slabs, podiums, reservoir, sewage &amp; water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 partsintegral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 partsintegral crystalline slurry : 1 part water) for horizontal surfaces and applying thesame from negative (internal) side with the help of synthetic fiber brush. The materialshall meet the requirements as specified in ACI-212-3R-2010 i.e by reducingpermeability of concrete by more than 90% compared with control concrete as perDIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystallineslurry shall be capable of self-healing of cracks up to a width of 0.50mm. The workshall be carried out all complete as per specification and the direction of the engineerin-charge. The product performance shall carry guarantee</p>						

	for 10 years against any leakage. For horizontal surface one coat @ 1.10 kg per sqm.							
	Receiving chamber base slab- top and bottom	2	2.250	1.000			4.500	
	Coarse and fine screen chamber base slab-top and bottom	4	10.000	1.000			40.000	
	Grit chamber base slab -side portion -top and bottom	4	7.730				30.920	
	Grit chamber base slab -Centre portion -top and bottom	4	10.890				43.560	
	parshelfume and distribution chamber base slab-top and bottom	2	5.750	2.500			28.750	
	Total Quantity						147.730 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						147.730 sqm	
	Say 147.730 sqm @ Rs 431.28 / sqm						<b>Rs 63712.99</b>	
17	50.10.1 Steel work in built up G I tubular ( round, square or rectangular hollow tubes etc.) trusses etc., including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete							
	All round verandha	1	700.000				700.000	
	Total Quantity						700.000 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						700.000 kg	
	Say 700.000 kg @ Rs 186.34 / kg						<b>Rs 130438.00</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>3EQUALISATION TANK (Cost Index:33.05 %)</b>								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed. All kinds of soil							
		1	16.200	16.200	0.500		131.220	

							Total Quantity	131.220 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	131.220 cum
							Say 131.220 cum @ Rs 210.02 / cum	<b>Rs 27558.82</b>
2	4.1.5	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)						
		1	16.200	16.200	0.200		52.488	
							Total Quantity	52.488 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	52.488 cum
							Say 52.488 cum @ Rs 7229.54 / cum	<b>Rs 379464.10</b>
3	5.37.1	Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level						
		1	16.100	16.100	0.300		77.763	
							Total Quantity	77.763 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	77.763 cum
							Say 77.763 cum @ Rs 9700.81 / cum	<b>Rs 754364.09</b>
4	5.37.2	Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work above plinth level upto floor V level						

	c/c	1	4.000*14. 9	4.500	0.300		80.460	
	Baffle wall	1	14.600	4.000	0.100		5.840	
	Walkway	1	64.800	1.000	0.100		6.480	
	cantilever beams	8	1.000	0.250	0.250		0.500	
	Stair-step	29	1.000	0.50*0.30* 0.15			0.653	
	Stair - Landing	11	1.000	1.000	0.120		1.320	
	Stair- Waist	11	6.300	1.000	0.120		8.316	
	Walkway to MBBR	11	2.000	1.200	0.120		3.168	
						Total Quantity	106.737 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	106.737 cum	
						Say 106.737 cum @ Rs 11321.96 / cum	<b>Rs 1208472.04</b>	
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Qty Vide Item No:3	1	77.630				77.630	
	Qty Vide Item No:4	1	106.740				106.740	
						Total Quantity	184.370 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	184.370 cum	
						Say 184.370 cum @ Rs 80.56 / cum	<b>Rs 14852.85</b>	
6	4.12 Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .							
	Qty Vide Item No:3	1	77.630	330.000			25617.900	
	Qty Vide Item No:4	1	106.740	330.000			35224.200	
						Total Quantity	60842.100 kg	
						Total Deducted Quantity	0.000 kg	
						Net Total Quantity	60842.100 kg	
						Say 60842.100 kg @ Rs 1.33 / kg	<b>Rs 80919.99</b>	
7	od327527/2021_2022 Extra for providing sulphate resistant cement for the structures above plinth level.							



	Qty Vide Item No:3	1	77.630				77.630		
	Qty Vide Item No:4	1	106.740				106.740		
	Total Quantity						184.370 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						184.370 cum		
	Say 184.370 cum @ Rs 1965.60 / cum						<b>Rs 362397.67</b>		
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more								
	Qty Vide Item No:3 @ 120 kg/m3	1	77.630	120.000			9315.600		
	Qty Vide Item No:4 @ 120 kg/m3	1	106.740	120.000			12808.800		
	Total Quantity						22124.400 kilogram		
	Total Deducted Quantity						0.000 kilogram		
	Net Total Quantity						22124.400 kilogram		
	Say 22124.400 kilogram @ Rs 96.46 / kilogram						<b>Rs 2134119.62</b>		
9	od327530/2021_2022 Extra for providing epoxy coating for reinforcement bars.								
	Qty Vide Item No:3 @ 120 kg/m3	1	77.630	120.000			9315.600		
	Qty Vide Item No:4 @ 120 kg/m3	1	106.740	120.000			12808.800		
	Total Quantity						22124.400 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						22124.400 kg		
	Say 22124.400 kg @ Rs 2.32 / kg						<b>Rs 51328.61</b>		
10	5.9.1 Centering and shuttering including strutting, etc. and removal of form for: Foundations, footings, bases of columns, etc for mass concrete								
		1	64.400	0.300			19.320		
	Total Quantity						19.320 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						19.320 sqm		
	Say 19.320 sqm @ Rs 329.03 / sqm						<b>Rs 6356.86</b>		
11	5.9.2								

	Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, buttersesses, plinth and string courses etc.						
	Inside	4	14.600	4.500			262.800
	Outside	4	15.200	4.500			273.600
	Baffle	2	14.600	4.000			116.800
	Total Quantity						653.200 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						653.200 sqm
	Say 653.200 sqm @ Rs 703.77 / sqm						<b>Rs 459702.56</b>
12	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform						
	Walkway	1	64.800	1.000			64.800
	Stair- Landing	1	1.000	1.000			1.000
	Stair- Waist	1	6.300	1.000			6.300
	Stair- Step	29	1.000	0.150			4.350
	Walkway to MBBR	1	2.000	1.200			2.400
	Total Quantity						78.850 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						78.850 sqm
	Say 78.850 sqm @ Rs 800.50 / sqm						<b>Rs 63119.42</b>
13	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers						
		8	1.000	0.750			6.000
	Total Quantity						6.000 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						6.000 sqm
	Say 6.000 sqm @ Rs 637.64 / sqm						<b>Rs 3825.84</b>
14	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)						
	Qty vide Item No:10	1	1.000	19.320			19.320
	Qty vide Item No:11	1	1.000	653.200			653.200
	Qty vide Item No:12	1	1.000	78.850			78.850
	Qty vide Item No:13	1	1.000	6.000			6.000

							Total Quantity	757.370 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	757.370 sqm
							Say 757.370 sqm @ Rs 393.69 / sqm	<b>Rs 298169.00</b>
15	13.52.2	Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On concrete work						
	Tank	1	60.800	4.500				273.600
	Walkway	1	64.800	1.000				64.800
	Beams	8	1.000	0.750				6.000
							Total Quantity	344.400 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	344.400 sqm
							Say 344.400 sqm @ Rs 218.73 / sqm	<b>Rs 75330.61</b>
16	22.23.1	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e. by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For vertical surface two coats @ 0.70 kg per sqm						
	Tank	4	14.600	4.500				262.800
	Baffle	2	14.600	4.000				116.800
							Total Quantity	379.600 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	379.600 sqm
							Say 379.600 sqm @ Rs 559.61 / sqm	<b>Rs 212427.96</b>
17	22.23.2	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline						

	slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For horizontal surface one coat @ 1.10 kg per sqm.								
		1	14.600	14.600				213.160	
	Total Quantity							213.160 sqm	
	Total Deducted Quantity							0.000 sqm	
	Net Total Quantity							213.160 sqm	
	Say 213.160 sqm @ Rs 431.28 / sqm							<b>Rs 91931.64</b>	
18	100.36.1 Filling water with 5000 litre tankers fitted in lorry and conveying water from a distance of 5 km (average) to the reservoir site and pumping the water into the reservoir of height not less than 3 m using 5 HP diesel engine pump set , hire for tanker lorry, tools and other appliances and cost of water etc. complete. "(Ref. No. 000, Technical Circular)"								
		1	14.600	14.600	4.500			959.220	
	Total Quantity							959.220 Kilo litre	
	Total Deducted Quantity							0.000 Kilo litre	
	Net Total Quantity							959.220 Kilo litre	
	Say 959.220 Kilo litre @ Rs 182.79 / Kilo litre							<b>Rs 175335.82</b>	
19	50.10.1 Steel work in built up G I tubular ( round, square or rectangular hollow tubes etc.) trusses etc., including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete								
		1	700.000					700.000	
	Total Quantity							700.000 kg	
	Total Deducted Quantity							0.000 kg	
	Net Total Quantity							700.000 kg	
	Say 700.000 kg @ Rs 186.34 / kg							<b>Rs 130438.00</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
<b>4MBBR 1 &amp; 2 (Cost Index:33.05 %)</b>									
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed. All kinds of soil								

		1	32.300	16.800	0.550		298.452		
	Total Quantity						298.452 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						298.452 cum		
	Say 298.452 cum @ Rs 210.02 / cum							<b>Rs 62680.89</b>	
2	4.1.5 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)								
		1	32.300	16.800	0.200		108.528		
	Total Quantity						108.528 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						108.528 cum		
	Say 108.528 cum @ Rs 7229.54 / cum							<b>Rs 784607.52</b>	
3	5.37.1 Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level								
		1	32.200	16.700	0.350		188.209		
	Total Quantity						188.209 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						188.209 cum		
	Say 188.209 cum @ Rs 9700.81 / cum							<b>Rs 1825779.75</b>	
4	5.37.2 Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work above plinth level upto floor V level								

	Long Wall	2	31.300	4.500	0.300		84.510		
	Short Wall	3	15.200	4.500	0.300		61.560		
	Walkway	1	98.200	1.000	0.100		9.820		
	Cantilever beams	10	1.000	0.250	0.250		0.625		
	Total Quantity						156.515 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						156.515 cum		
	Say 156.515 cum @ Rs 11321.96 / cum							<b>Rs 1772056.57</b>	
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).								
	Qty vide item 3	1	188.029				188.029		
	Qty vide item 4	1	156.515				156.515		
	Total Quantity						344.544 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						344.544 cum		
	Say 344.544 cum @ Rs 80.56 / cum							<b>Rs 27756.46</b>	
6	4.12 Kerala Water Authority Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .								
	Qty vide item 3	1	188.029		330.000		62049.570		
	Qty vide item 4	1	156.515		330.000		51649.950		
	Total Quantity						113699.520 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						113699.520 kg		
	Say 113699.520 kg @ Rs 1.33 / kg							<b>Rs 151220.36</b>	
7	od327527/2021_2022 Extra for providing sulphate resistant cement for the structures above plinth level.								
	Qty vide item 3	1	188.029				188.029		
	Qty vide item 4	1	156.515				156.515		
	Total Quantity						344.544 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						344.544 cum		
	Say 344.544 cum @ Rs 1965.60 / cum							<b>Rs 677235.69</b>	

8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more						
	@120kg/m3	1	344.540	120.000			41344.800
	Total Quantity						41344.800 kilogram
	Total Deducted Quantity						0.000 kilogram
	Net Total Quantity						41344.800 kilogram
	Say 41344.800 kilogram @ Rs 96.46 / kilogram						<b>Rs 3988119.41</b>
9	od327530/2021_2022 Extra for providing epoxy coating for reinforcement bars.						
	@120kg/m3	1	344.540	120.000			41344.800
	Total Quantity						41344.800 kg
	Total Deducted Quantity						0.000 kg
	Net Total Quantity						41344.800 kg
	Say 41344.800 kg @ Rs 2.32 / kg						<b>Rs 95919.94</b>
10	5.9.1 Centering and shuttering including strutting, etc. and removal of form for: Foundations, footings, bases of columns, etc for mass concrete						
			32.2*2+16 .7*2	0.350			34.231
	Total Quantity						34.231 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						34.231 sqm
	Say 34.231 sqm @ Rs 329.03 / sqm						<b>Rs 11263.03</b>
11	5.9.2 Centering and shuttering including strutting, etc. and removal of form for: Walls (any thickness) including attached pilasters, buttersesses, plinth and string courses etc.						
	Inside	2*4	15.200	4.500			547.200
	Outside	1	94.200	4.500			423.901
	Total Quantity						971.101 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						971.101 sqm
	Say 971.101 sqm @ Rs 703.77 / sqm						<b>Rs 683431.75</b>
12	5.9.3 Centering and shuttering including strutting, etc. and removal of form for: Suspended floors, roofs, landings, balconies and access platform						

	Walkway	1	98.200				98.200	
	Total Quantity						98.200 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						98.200 sqm	
	Say 98.200 sqm @ Rs 800.50 / sqm						<b>Rs 78609.10</b>	
13	5.9.5 Centering and shuttering including strutting, etc. and removal of form for: Lintels, beams, plinth beams, girders bressumers and cantilevers							
	Cantilever beam	10	1.000	0.750			7.500	
	Total Quantity						7.500 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						7.500 sqm	
	Say 7.500 sqm @ Rs 637.64 / sqm						<b>Rs 4782.30</b>	
14	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)							
	Item No:10	1	34.210				34.210	
	Item No:11	1	971.101				971.101	
	Item No:12	1	98.200				98.200	
	Item No:13	1	7.500				7.500	
	Total Quantity						1111.011 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1111.011 sqm	
	Say 1111.011 sqm @ Rs 393.69 / sqm						<b>Rs 437393.92</b>	
15	13.52.2 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On concrete work							
	Tank	1	94.200	4.500			423.901	
	Walkway	1	98.200	1.000			98.200	
	Beams	3	1.000	0.250			0.750	
	Total Quantity						522.851 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						522.851 sqm	
	Say 522.851 sqm @ Rs 218.73 / sqm						<b>Rs 114363.20</b>	
16	22.23.1							



	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For vertical surface two coats @0.70 kg per sqm		8	15.200	4.500		547.200	
		Total Quantity					547.200 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					547.200 sqm	
		Say 547.200 sqm @ Rs 559.61 / sqm					<b>Rs 306218.59</b>	
17	22.23.2 Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For horizontal surface one coat @1.10 kg per sqm.		2	15.200	15.200		462.080	
		Total Quantity					462.080 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					462.080 sqm	
		Say 462.080 sqm @ Rs 431.28 / sqm					<b>Rs 199285.86</b>	
18	100.36.1 Filling water with 5000 litre tankers fitted in lorry and conveying water from a distance of 5 km (average) to the reservoir site and pumping the water into the reservoir of height not less than 3 m using 5 HP diesel engine pump set , hire for tanker lorry, tools and other appliances and cost of water etc. complete. "(Ref. No. 000, Technical Circular)"		2	15.200	15.200	4.500	2079.361	
		Total Quantity					2079.361 Kilo litre	

							Total Deducted Quantity	0.000 Kilo litre
							Net Total Quantity	2079.361 Kilo litre
							Say 2079.361 Kilo litre @ Rs 182.79 / Kilo litre	<b>Rs 380086.40</b>
19	50.10.1	Steel work in built up G I tubular ( round, square or rectangular hollow tubes etc.) trusses etc., including cutting, hoisting,fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete						
		1	900.000				900.000	
							Total Quantity	900.000 kg
							Total Deducted Quantity	0.000 kg
							Net Total Quantity	900.000 kg
							Say 900.000 kg @ Rs 186.34 / kg	<b>Rs 167706.00</b>
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>5SECONDARY CLARIFIER (Cost Index:33.05 %)</b>								
1	2.6.1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil						
		1	3.14/4	16.3*16.3	0.800		166.854	
							Total Quantity	166.854 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	166.854 cum
							Say 166.854 cum @ Rs 210.02 / cum	<b>Rs 35042.68</b>
2	4.1.5	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)						
		1	3.14/4	16.3*16.3	0.200		41.714	
							Total Quantity	41.714 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	41.714 cum
							Say 41.714 cum @ Rs 7229.54 / cum	<b>Rs 301573.03</b>
3	5.37.1	Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured						

	as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level						
	1	3.14/4	16.3*16.3	0.300	1.15	71.956	
	Total Quantity					71.956 cum	
	Total Deducted Quantity					0.000 cum	
	Net Total Quantity					71.956 cum	
	Say 71.956 cum @ Rs 9700.81 / cum					<b>Rs 698031.48</b>	
4	5.37.2 Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work above plinth level upto floor V level						
	Wall	3.14	16.000	0.300	3.300	49.738	
	chamber	3.14	15.200	0.500	0.100	2.387	
		3.14	14.700	0.300	0.100	1.385	
	Walkway	3.14	16.700	1.000	0.100	5.244	
	Cantilever beam	8	1.000	0.250	0.250	0.500	
	Total Quantity					59.254 cum	
	Total Deducted Quantity					0.000 cum	
	Net Total Quantity					59.254 cum	
	Say 59.254 cum @ Rs 11321.96 / cum					<b>Rs 670871.42</b>	
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).						
	Qty Vide Item No:3	1	71.956			71.956	
	Qty Vide Item No:4	1	59.254			59.254	
	Total Quantity					131.210 cum	
	Total Deducted Quantity					0.000 cum	

	Net Total Quantity						131.210 cum	
	Say 131.210 cum @ Rs 80.56 / cum						<b>Rs 10570.28</b>	
6	4.12 Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .							
	Qty Vide Item No:3	1	71.956		330.000		23745.480	
	Qty Vide Item No:4	1	59.254		330.000		19553.820	
	Total Quantity						43299.300 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						43299.300 kg	
	Say 43299.300 kg @ Rs 1.33 / kg						<b>Rs 57588.07</b>	
7	od327527/2021_2022 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Qty Vide Item No:3	1	71.956				71.956	
	Qty Vide Item No:4	1	59.254				59.254	
	Total Quantity						131.210 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						131.210 cum	
	Say 131.210 cum @ Rs 1965.60 / cum						<b>Rs 257906.38</b>	
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more							
	Qty Vide Item No:3 @ 120kg/m <sup>3</sup>	1	71.956	120.000			8634.721	
	Qty Vide Item No:4 @ 120kg/m <sup>3</sup>	1	59.254	120.000			7110.480	
	Total Quantity						15745.201 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						15745.201 kilogram	
	Say 15745.201 kilogram @ Rs 96.46 / kilogram						<b>Rs 1518782.09</b>	
9	od327530/2021_2022 Extra for providing epoxy coating for reinforcement bars.							
	Qty Vide Item No:3 @ 120kg/m <sup>3</sup>	1	71.956	120.000			8634.721	
	Qty Vide Item No:4 @ 120kg/m <sup>3</sup>	1	59.254	120.000			7110.480	

		Total Quantity						15745.201 kg
		Total Deducted Quantity						0.000 kg
		Net Total Quantity						15745.201 kg
		Say 15745.201 kg @ Rs 2.32 / kg						<b>Rs 36528.87</b>
10	5.9.1	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete						
		3.14	16.300	0.200			10.237	
		Total Quantity						10.237 sqm
		Total Deducted Quantity						0.000 sqm
		Net Total Quantity						10.237 sqm
		Say 10.237 sqm @ Rs 329.03 / sqm						<b>Rs 3368.28</b>
11	5.9.2	Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, buttersesses, plinth and string courses etc.						
	Wall Inside&outside	3.14*2	16.000		3.300		331.584	
		3.14*4	14.700		0.300		55.390	
		Total Quantity						386.974 sqm
		Total Deducted Quantity						0.000 sqm
		Net Total Quantity						386.974 sqm
		Say 386.974 sqm @ Rs 703.77 / sqm						<b>Rs 272340.69</b>
12	5.9.3	Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform						
	chamber	3.14	15.200	0.500			23.864	
	Walkway	3.14	16.700	1.000			52.438	
		Total Quantity						76.302 sqm
		Total Deducted Quantity						0.000 sqm
		Net Total Quantity						76.302 sqm
		Say 76.302 sqm @ Rs 800.50 / sqm						<b>Rs 61079.75</b>
13	5.9.5	Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers						
		8	1.000	0.750			6.000	
		Total Quantity						6.000 sqm

		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					6.000 sqm	
		Say 6.000 sqm @ Rs 637.64 / sqm					<b>Rs 3825.84</b>	
14	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)							
	Qty Vide Item No:10	1	10.237			10.237		
	Qty Vide Item No:11	1	386.974			386.974		
	Qty Vide Item No:12	1	76.302			76.302		
	Qty Vide Item No:13	1	6.000			6.000		
		Total Quantity					479.513 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					479.513 sqm	
		Say 479.513 sqm @ Rs 393.69 / sqm					<b>Rs 188779.47</b>	
15	13.52.2 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On concrete work							
	Outer wall	1	3.140	16.000	3.300	165.792		
	Walkway	1	3.140	16.700	1.000	52.438		
	Beams	8	1.000	0.750		6.000		
		Total Quantity					224.230 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					224.230 sqm	
		Say 224.230 sqm @ Rs 218.73 / sqm					<b>Rs 49045.83</b>	
16	22.23.1 Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For vertical surface two coats @ 0.70 kg per sqm							
		3.14/4	15.700	15.700		1.15	222.519	

		Total Quantity					222.519 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					222.519 sqm	
		Say 222.519 sqm @ Rs 559.61 / sqm					<b>Rs 124523.86</b>	
17	22.23.2	<p>Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage &amp; water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e. by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer-in-charge. The product performance shall carry guarantee for 10 years against any leakage. For horizontal surface one coat @ 1.10 kg per sqm.</p>						
		3.14	15.700	3.300			162.684	
		Total Quantity					162.684 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					162.684 sqm	
		Say 162.684 sqm @ Rs 431.28 / sqm					<b>Rs 70162.36</b>	
18	100.36.1	<p>Filling water with 5000 litre tankers fitted in lorry and conveying water from a distance of 5 km (average) to the reservoir site and pumping the water into the reservoir of height not less than 3 m using 5 HP diesel engine pump set, hire for tanker lorry, tools and other appliances and cost of water etc. complete. "(Ref. No. 000, Technical Circular)"</p>						
		3.14/4	15.700	15.700	3.500		677.232	
		Total Quantity					677.232 Kilo litre	
		Total Deducted Quantity					0.000 Kilo litre	
		Net Total Quantity					677.232 Kilo litre	
		Say 677.232 Kilo litre @ Rs 182.79 / Kilo litre					<b>Rs 123791.24</b>	
19	50.10.1	<p>Steel work in built up G I tubular (round, square or rectangular hollow tubes etc.) trusses etc., including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete</p>						
		1	600.000				600.000	
		Total Quantity					600.000 kg	
		Total Deducted Quantity					0.000 kg	

SI No	Description	No	L	B	D	CF	Quantity	Remark
Net Total Quantity							600.000 kg	
Say 600.000 kg @ Rs 186.34 / kg							<b>Rs 111804.00</b>	
<b>6SLUDGE SUMP (Cost Index:33.05 %)</b>								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	1.800	1.800	0.400	3.14	4.070	
Total Quantity							4.070 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							4.070 cum	
Say 4.070 cum @ Rs 210.02 / cum							<b>Rs 854.78</b>	
2	4.1.5 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)							
		3.14	1.800	1.800	0.100		1.018	
Total Quantity							1.018 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							1.018 cum	
Say 1.018 cum @ Rs 7229.54 / cum							<b>Rs 7359.67</b>	
3	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	@120kg/m3	1	9.439	120.000			1132.680	
Total Quantity							1132.680 kilogram	
Total Deducted Quantity							0.000 kilogram	
Net Total Quantity							1132.680 kilogram	
Say 1132.680 kilogram @ Rs 96.46 / kilogram							<b>Rs 109258.31</b>	
4	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
		1	9.439				9.439	
Total Quantity							9.439 cum	



		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					9.439 cum	
		Say 9.439 cum @ Rs 80.56 / cum					<b>Rs 760.41</b>	
5	5.37.1	Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level						
		3.14	1.700	1.700	0.300		2.723	
		Total Quantity					2.723 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					2.723 cum	
		Say 2.723 cum @ Rs 9700.81 / cum					<b>Rs 26415.31</b>	
6	5.37.2	Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work above plinth level upto floor V level						
		3.14	2.500	0.300	2.350		5.535	
	COVER SLAB	3.14	1.400	1.400	0.200		1.231	
	Manhole	1	0.500	0.500	0.200		-0.050	
		Total Quantity					6.766 cum	
		Total Deducted Quantity					-0.050 cum	
		Net Total Quantity					6.716 cum	
		Say 6.716 cum @ Rs 11321.96 / cum					<b>Rs 76038.28</b>	
7	4.12	Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .						
		1	9.439		330.000		3114.870	

						Total Quantity	3114.870 kg	
						Total Deducted Quantity	0.000 kg	
						Net Total Quantity	3114.870 kg	
						Say 3114.870 kg @ Rs 1.33 / kg	<b>Rs 4142.78</b>	
8	od327530/2021_2022 Extra for providing epoxy coating for reinforcement bars.							
	@120kg/m3	1	9.439	120.000			1132.680	
						Total Quantity	1132.680 kg	
						Total Deducted Quantity	0.000 kg	
						Net Total Quantity	1132.680 kg	
						Say 1132.680 kg @ Rs 2.32 / kg	<b>Rs 2627.82</b>	
9	od327527/2021_2022 Extra for providing sulphate resistant cement for the structures above plinth level.							
		1	9.439				9.439	
						Total Quantity	9.439 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	9.439 cum	
						Say 9.439 cum @ Rs 1965.60 / cum	<b>Rs 18553.30</b>	
10	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
	FOOTING	1	3.140*3.4		0.300		3.203	
						Total Quantity	3.203 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	3.203 sqm	
						Say 3.203 sqm @ Rs 329.03 / sqm	<b>Rs 1053.88</b>	
11	5.9.2 Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.							
	INSIDE	1	3.14*2.2		2.350		16.234	
	OUTSIDE	1	3.14*2.8		2.350		20.662	
						Total Quantity	36.896 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	36.896 sqm	
						Say 36.896 sqm @ Rs 703.77 / sqm	<b>Rs 25966.30</b>	

12	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform							
	Cover slab	3.14/4	2.200	2.200			3.800	
		Total Quantity					3.800 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					3.800 sqm	
		Say 3.800 sqm @ Rs 800.50 / sqm					<b>Rs 3041.90</b>	
13	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)							
	OUT SIDE	1	3.14*2.8		2.350		20.662	
	INSIDE	1	3.14*2.2		2.350		16.234	
		Total Quantity					36.896 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					36.896 sqm	
		Say 36.896 sqm @ Rs 393.69 / sqm					<b>Rs 14525.59</b>	
14	13.52.2 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On concrete work							
		3.14	2.800	2.350			20.662	
		Total Quantity					20.662 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					20.662 sqm	
		Say 20.662 sqm @ Rs 218.73 / sqm					<b>Rs 4519.40</b>	
15	22.23.1 Providing and applying integral crystalline slurry of hydrophilic in nature forwaterproofing treatment to the RCC structures like retaining walls of the basement,water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 partsintegral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 partsintegral crystalline slurry : 1 part water) for horizontal surfaces and applying thesame from negative (internal) side with the help of synthetic fiber brush. The materialshall meet the requirements as specified in ACI-212-3R-2010 i.e by reducingpermeability of concrete by more than 90% compared with control concrete as perDIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystallineslurry shall be capable of self-healing of cracks up to a width of 0.50mm. The workshall be carried out all complete as per specification and the direction of the engineerin-charge. The product performance shall carry guarantee for 10 years against anyleakage.For vertical surface two coats @0.70 kg per sqm							
		3.14	2.200		2.350		16.234	

							Total Quantity	16.234 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	16.234 sqm
							Say 16.234 sqm @ Rs 559.61 / sqm	<b>Rs 9084.71</b>
16	22.23.2	<p>Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage &amp; water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e. by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For horizontal surface one coat @ 1.10 kg per sqm.</p>						
		3.14/4	2.200	2.200				3.800
							Total Quantity	3.800 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	3.800 sqm
							Say 3.800 sqm @ Rs 431.28 / sqm	<b>Rs 1638.86</b>
17	100.36.1	<p>Filling water with 5000 litre tankers fitted in lorry and conveying water from a distance of 5 km (average) to the reservoir site and pumping the water into the reservoir of height not less than 3 m using 5 HP diesel engine pump set, hire for tanker lorry, tools and other appliances and cost of water etc. complete. "(Ref. No. 000, Technical Circular)"</p>						
		3.14/4	2.200	2.200	2.350			8.929
							Total Quantity	8.929 Kilo litre
							Total Deducted Quantity	0.000 Kilo litre
							Net Total Quantity	8.929 Kilo litre
							Say 8.929 Kilo litre @ Rs 182.79 / Kilo litre	<b>Rs 1632.13</b>
Sl No	Description	No	L	B	D	CF	Quantity	Remark
<b>7 SLUDGE THICKNER (Cost Index: 33.05 %)</b>								
1	2.6.1	<p>Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed. All kinds of soil</p>						
		1	3.14/4	6.8*6.8	0.500		18.150	

							Total Quantity	18.150 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	18.150 cum
							Say 18.150 cum @ Rs 210.02 / cum	<b>Rs 3811.86</b>
2	4.1.5	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)						
		1	3.14/4	6.8*6.8	0.100		3.630	
							Total Quantity	3.630 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	3.630 cum
							Say 3.630 cum @ Rs 7229.54 / cum	<b>Rs 26243.23</b>
3	5.37.1	Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level						
		1	3.14/4	6.8*6.8	0.300	1.15	12.523	
							Total Quantity	12.523 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	12.523 cum
							Say 12.523 cum @ Rs 9700.81 / cum	<b>Rs 121483.24</b>
4	5.37.2	Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work above plinth level upto floor V level						
	Wall	3.14	6.500	0.300	2.850		17.451	

	chamber	3.14	5.700	0.500	0.100		0.895		
		3.14	5.200	0.300	0.100		0.490		
	Walkway	3.14	7.800	1.000	0.100		2.450		
	Cantilever beam	4	1.000	0.250	0.250		0.250		
	Step	19	0.50*.3*.1 5	1.000			0.428		
	Step Waist	1	5.600	1.000	0.120		0.672		
		Total Quantity					22.636 cum		
		Total Deducted Quantity					0.000 cum		
		Net Total Quantity					22.636 cum		
		Say 22.636 cum @ Rs 11321.96 / cum					<b>Rs 256283.89</b>		
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).								
	Qty Vide Item No: 3	1	12.523				12.523		
	Qty Vide Item No: 4	1	22.636				22.636		
		Total Quantity					35.159 cum		
		Total Deducted Quantity					0.000 cum		
		Net Total Quantity					35.159 cum		
		Say 35.159 cum @ Rs 80.56 / cum					<b>Rs 2832.41</b>		
6	4.12 Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .								
	Qty Vide Item No: 3	1	12.523		330.000		4132.590		
	Qty Vide Item No: 4	1	22.636		330.000		7469.880		
		Total Quantity					11602.470 kg		
		Total Deducted Quantity					0.000 kg		
		Net Total Quantity					11602.470 kg		
		Say 11602.470 kg @ Rs 1.33 / kg					<b>Rs 15431.29</b>		
7	od327527/2021_2022 Extra for providing sulphate resistant cement for the structures above plinth level.								
	Qty Vide Item No: 3	1	12.523				12.523		
	Qty Vide Item No: 4	1	22.636				22.636		
		Total Quantity					35.159 cum		

		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					35.159 cum	
		Say 35.159 cum @ Rs 1965.60 / cum					<b>Rs 69108.53</b>	
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more							
	Qty Vide Item No: 3@120km/m3	1	12.523	120.000			1502.760	
	Qty Vide Item No: 4@120km/m3	1	22.636	120.000			2716.320	
		Total Quantity					4219.080 kilogram	
		Total Deducted Quantity					0.000 kilogram	
		Net Total Quantity					4219.080 kilogram	
		Say 4219.080 kilogram @ Rs 96.46 / kilogram					<b>Rs 406972.46</b>	
9	od327530/2021_2022 Extra for providing epoxy coating for reinforcement bars.							
	Qty Vide Item No: 3@120km/m3	1	12.523	120.000			1502.760	
	Qty Vide Item No: 4@120km/m3	1	22.636	120.000			2716.320	
		Total Quantity					4219.080 kg	
		Total Deducted Quantity					0.000 kg	
		Net Total Quantity					4219.080 kg	
		Say 4219.080 kg @ Rs 2.32 / kg					<b>Rs 9788.27</b>	
10	5.9.1 Centering and shuttering including strutting, etc. and removal of form for: Foundations, footings, bases of columns, etc for mass concrete							
		3.14	6.800	0.100			2.136	
		Total Quantity					2.136 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					2.136 sqm	
		Say 2.136 sqm @ Rs 329.03 / sqm					<b>Rs 702.81</b>	
11	5.9.2 Centering and shuttering including strutting, etc. and removal of form for: Walls (any thickness) including attached pilasters, buttersesses, plinth and string courses etc.							
	Wall Inside&outside	3.14*2	6.500		2.850		116.338	

		3.14*4	5.200		0.300		19.594	
	Total Quantity						135.932 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						135.932 sqm	
	Say 135.932 sqm @ Rs 703.77 / sqm						<b>Rs 95664.86</b>	
12	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform							
	chamber	3.14	5.700	0.500			8.949	
	Walkway	3.14	7.800	1.000			24.492	
	Stair -step	19	0.150	1.000			2.850	
	Stair Waist	1	5.600	1.000			5.600	
	Total Quantity						41.891 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						41.891 sqm	
	Say 41.891 sqm @ Rs 800.50 / sqm						<b>Rs 33533.75</b>	
13	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers							
		4	1.000	0.750			3.000	
	Total Quantity						3.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						3.000 sqm	
	Say 3.000 sqm @ Rs 637.64 / sqm						<b>Rs 1912.92</b>	
14	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)							
	Qty Vide Item No:10	1	2.136				2.136	
	Qty Vide Item No:11	1	135.932				135.932	
	Qty Vide Item No:12	1	41.891				41.891	
	Qty Vide Item No:13	1	3.000				3.000	
	Total Quantity						182.959 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						182.959 sqm	
	Say 182.959 sqm @ Rs 393.69 / sqm						<b>Rs 72029.13</b>	



15	13.52.2 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On concrete work								
	Outer wall	1	3.140	6.800	2.850		60.854		
	Walkway	1	3.140	7.800	1.000		24.492		
	Beams	4	1.000	0.750			3.000		
		Total Quantity						88.346 sqm	
		Total Deducted Quantity						0.000 sqm	
		Net Total Quantity						88.346 sqm	
		Say 88.346 sqm @ Rs 218.73 / sqm						<b>Rs 19323.92</b>	
16	22.23.1 Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For vertical surface two coats @ 0.70 kg per sqm								
		3.14	6.200	2.850			55.484		
		Total Quantity						55.484 sqm	
		Total Deducted Quantity						0.000 sqm	
		Net Total Quantity						55.484 sqm	
		Say 55.484 sqm @ Rs 559.61 / sqm						<b>Rs 31049.40</b>	
17	22.23.2 Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For horizontal surface one coat @ 1.10 kg per sqm.								

		3.14/4	6.200	6.200		1.15	34.702	
	Total Quantity						34.702 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						34.702 sqm	
	Say 34.702 sqm @ Rs 431.28 / sqm						<b>Rs 14966.28</b>	
18	100.36.1	Filling water with 5000 litre tankers fitted in lorry and conveying water from a distance of 5 km (average) to the reservoir site and pumping the water into the reservoir of height not less than 3 m using 5 HP diesel engine pump set , hire for tanker lorry, tools and other appliances and cost of water etc. complete. "(Ref. No. 000, Technical Circular)"						
		3.14/4	6.200*6.2		3.000		90.527	
	Total Quantity						90.527 Kilo litre	
	Total Deducted Quantity						0.000 Kilo litre	
	Net Total Quantity						90.527 Kilo litre	
	Say 90.527 Kilo litre @ Rs 182.79 / Kilo litre						<b>Rs 16547.43</b>	
19	50.10.1	Steel work in built up G I tubular ( round, square or rectangular hollow tubes etc.) trusses etc., including cutting, hoisting,fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete						
		1	250.000				250.000	
	Total Quantity						250.000 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						250.000 kg	
	Say 250.000 kg @ Rs 186.34 / kg						<b>Rs 46585.00</b>	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
<b>8THICKENED SLUDGE SUMP (Cost Index:33.05 %)</b>								
1	2.6.1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil						
		3.14/4	5.400	5.400	0.500		11.446	
	Total Quantity						11.446 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						11.446 cum	
	Say 11.446 cum @ Rs 210.02 / cum						<b>Rs 2403.89</b>	

2	4.1.5 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)		3.14/4	5.400	5.400	0.200		4.579	
		Total Quantity						4.579 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						4.579 cum	
		Say 4.579 cum @ Rs 7229.54 / cum						<b>Rs 33104.06</b>	
3	5.37.1 Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level		3.14/4	5.400	5.400	0.300		6.868	
		Total Quantity						6.868 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						6.868 cum	
		Say 6.868 cum @ Rs 9700.81 / cum						<b>Rs 66625.16</b>	
4	5.37.2 Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work above plinth level upto floor V level								
	Cover slab		3.14/4	4.600	4.600	0.120		1.994	
	Side wall		3.14	4.300	0.300	2.500		10.127	
	Manhole		1	0.500	0.500	0.120		-0.030	
		Total Quantity						12.121 cum	
		Total Deducted Quantity						-0.030 cum	

		Net Total Quantity					12.091 cum	
		Say 12.091 cum @ Rs 11321.96 / cum					<b>Rs 136893.82</b>	
5	5.34.1	Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).						
		1	18.959				18.959	
		Total Quantity					18.959 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					18.959 cum	
		Say 18.959 cum @ Rs 80.56 / cum					<b>Rs 1527.34</b>	
6	4.12	Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .						
		1	18.959		330.000		6256.470	
		Total Quantity					6256.470 kg	
		Total Deducted Quantity					0.000 kg	
		Net Total Quantity					6256.470 kg	
		Say 6256.470 kg @ Rs 1.33 / kg					<b>Rs 8321.11</b>	
7	od327527/2021_2022	Extra for providing sulphate resistant cement for the structures above plinth level.						
		1	18.959				18.959	
		Total Quantity					18.959 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					18.959 cum	
		Say 18.959 cum @ Rs 1965.60 / cum					<b>Rs 37265.81</b>	
8	5.22.6	Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more						
	@120kg/m3	1	18.959	120.000			2275.080	
		Total Quantity					2275.080 kilogram	
		Total Deducted Quantity					0.000 kilogram	
		Net Total Quantity					2275.080 kilogram	
		Say 2275.080 kilogram @ Rs 96.46 / kilogram					<b>Rs 219454.22</b>	
9	od327530/2021_2022	Extra for providing epoxy coating for reinforcement bars.						

	@120kg/m3	1	8.844	120.000			1061.280	
	Total Quantity						1061.280 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						1061.280 kg	
	Say 1061.280 kg @ Rs 2.32 / kg						<b>Rs 2462.17</b>	
10	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
		3.14	5.400		0.200		3.392	
	Total Quantity						3.392 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						3.392 sqm	
	Say 3.392 sqm @ Rs 329.03 / sqm						<b>Rs 1116.07</b>	
11	5.9.2 Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.							
		2*3.14	4.300		2.500		67.510	
	Base Slab side	13.14	5.200		0.300		20.499	
	Kerala Water Authority Total Quantity						88.009 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						88.009 sqm	
	Say 88.009 sqm @ Rs 703.77 / sqm						<b>Rs 61938.09</b>	
12	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform							
		3.14/4	4.000	4.000			12.560	
	Manhole	1	0.500	0.500			-0.250	
	Total Quantity						12.560 sqm	
	Total Deducted Quantity						-0.250 sqm	
	Net Total Quantity						12.310 sqm	
	Say 12.310 sqm @ Rs 800.50 / sqm						<b>Rs 9854.16</b>	
13	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)							
	Qty Vide Item No:10	1	3.392				3.392	
	Qty Vide Item No:11	1	88.009				88.009	

	Qty Vide Item No:12	1	12.310				12.310	
	Base top	3.14	2.000	2.000			12.560	
	Total Quantity						116.271 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						116.271 sqm	
	Say 116.271 sqm @ Rs 393.69 / sqm						<b>Rs 45774.73</b>	
14	13.52.2 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On concrete work							
		3.14	4.600		2.500		36.110	
	Total Quantity						36.110 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						36.110 sqm	
	Say 36.110 sqm @ Rs 218.73 / sqm						<b>Rs 7898.34</b>	
15	22.23.1 Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e. by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For vertical surface two coats @ 0.70 kg per sqm							
		3.14	4.000		2.500		31.401	
	Total Quantity						31.401 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						31.401 sqm	
	Say 31.401 sqm @ Rs 559.61 / sqm						<b>Rs 17572.31</b>	
16	22.23.2 Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010							

	i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For horizontal surface one coat @ 1.10 kg per sqm.								
		3.14/4	4.000	4.000				12.560	
	Total Quantity							12.560 sqm	
	Total Deducted Quantity							0.000 sqm	
	Net Total Quantity							12.560 sqm	
	Say 12.560 sqm @ Rs 431.28 / sqm							<b>Rs 5416.88</b>	
17	100.36.1 Filling water with 5000 litre tankers fitted in lorry and conveying water from a distance of 5 km (average) to the reservoir site and pumping the water into the reservoir of height not less than 3 m using 5 HP diesel engine pump set, hire for tanker lorry, tools and other appliances and cost of water etc. complete. "(Ref. No. 000, Technical Circular)"								
		3.14/4	4.000	4.000	2.500			31.401	
	Total Quantity							31.401 Kilo litre	
	Total Deducted Quantity							0.000 Kilo litre	
	Net Total Quantity							31.401 Kilo litre	
	Say 31.401 Kilo litre @ Rs 182.79 / Kilo litre							<b>Rs 5739.79</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
<b>9 FILTER FEED TANK (Cost Index: 33.05 %)</b>									
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed. All kinds of soil								
		1	6.300	6.300	0.500		19.845		
	Total Quantity							19.845 cum	
	Total Deducted Quantity							0.000 cum	
	Net Total Quantity							19.845 cum	
	Say 19.845 cum @ Rs 210.02 / cum							<b>Rs 4167.85</b>	
2	4.1.5 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)								
		1	6.300	6.300	0.200		7.938		

		Total Quantity					7.938 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					7.938 cum	
		Say 7.938 cum @ Rs 7229.54 / cum					<b>Rs 57388.09</b>	
3	5.37.1	Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level						
		1	6.100	6.100	0.300		11.163	
		Total Quantity					11.163 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					11.163 cum	
		Say 11.163 cum @ Rs 9700.81 / cum					<b>Rs 108290.14</b>	
4	5.37.2	Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work above plinth level upto floor V level						
	Long Wall	2	5.500	0.250	2.850		7.838	
	Short Wall	2	5.000	0.250	2.850		7.125	
		Total Quantity					14.963 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					14.963 cum	
		Say 14.963 cum @ Rs 11321.96 / cum					<b>Rs 169410.49</b>	
5	5.34.1	Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).						



		1	26.126				26.126	
	Total Quantity						26.126 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						26.126 cum	
	Say 26.126 cum @ Rs 80.56 / cum						<b>Rs 2104.71</b>	
6	4.12 Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .							
		1	26.126		330.000		8621.580	
	Total Quantity						8621.580 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						8621.580 kg	
	Say 8621.580 kg @ Rs 1.33 / kg						<b>Rs 11466.70</b>	
7	od327527/2021_2022 Extra for providing sulphate resistant cement for the structures above plinth level.							
		1	26.126				26.126	
	Total Quantity						26.126 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						26.126 cum	
	Say 26.126 cum @ Rs 1965.60 / cum						<b>Rs 51353.27</b>	
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	@120kg/m3	1	26.126	120.000			3135.121	
	Total Quantity						3135.121 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						3135.121 kilogram	
	Say 3135.121 kilogram @ Rs 96.46 / kilogram						<b>Rs 302413.77</b>	
9	od327530/2021_2022 Extra for providing epoxy coating for reinforcement bars.							
	@120kg/m3	1	26.126	120.000			3135.121	
	Total Quantity						3135.121 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						3135.121 kg	
	Say 3135.121 kg @ Rs 2.32 / kg						<b>Rs 7273.48</b>	

10	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete						
	PCC	4	6.300	0.200			5.040
	Base	4	6.100	0.300			7.320
	Total Quantity						12.360 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						12.360 sqm
	Say 12.360 sqm @ Rs 329.03 / sqm						<b>Rs 4066.81</b>
11	5.9.2 Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.						
	c/c	4*2	5.250	2.850			119.700
	Total Quantity						119.700 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						119.700 sqm
	Say 119.700 sqm @ Rs 703.77 / sqm						<b>Rs 84241.27</b>
12	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)						
	c/c	4*2	5.250	2.850			119.700
	Bottom	1	5.000	5.000			25.000
	Total Quantity						144.700 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						144.700 sqm
	Say 144.700 sqm @ Rs 393.69 / sqm						<b>Rs 56966.94</b>
13	13.52.2 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On concrete work						
		4	5.500	2.850			62.700
	Total Quantity						62.700 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						62.700 sqm
	Say 62.700 sqm @ Rs 218.73 / sqm						<b>Rs 13714.37</b>
14	22.23.1 Providing and applying integral crystalline slurry of hydrophilic in nature forwaterproofing treatment to the						

	RCC structures like retaining walls of the basement,water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 partsintegral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 partsintegral crystalline slurry : 1 part water) for horizontal surfaces and applying thesame from negative (internal) side with the help of synthetic fiber brush. The materialshall meet the requirements as specified in ACI-212-3R-2010 i.e by reducingpermeability of concrete by more than 90% compared with control concrete as perDIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystallineslurry shall be capable of self-healing of cracks up to a width of 0.50mm. The workshall be carried out all complete as per specification and the direction of the engineerin-charge. The product performance shall carry guarantee for 10 years against anyleakage.For vertical surface two coats @0.70 kg per sqm							
		4	5.000	2.850			57.000	
	Total Quantity						57.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						57.000 sqm	
	Say 57.000 sqm @ Rs 559.61 / sqm						<b>Rs 31897.77</b>	
15	22.23.2 Providing and applying integral crystalline slurry of hydrophilic in nature forwaterproofing treatment to the RCC structures like retaining walls of the basement,water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 partsintegral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 partsintegral crystalline slurry : 1 part water) for horizontal surfaces and applying thesame from negative (internal) side with the help of synthetic fiber brush. The materialshall meet the requirements as specified in ACI-212-3R-2010 i.e by reducingpermeability of concrete by more than 90% compared with control concrete as perDIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystallineslurry shall be capable of self-healing of cracks up to a width of 0.50mm. The workshall be carried out all complete as per specification and the direction of the engineerin-charge. The product performance shall carry guarantee for 10 years against anyleakage.For horizontal surface one coat @1.10 kg per sqm.							
		1	5.000	5.000			25.000	
	Total Quantity						25.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						25.000 sqm	
	Say 25.000 sqm @ Rs 431.28 / sqm						<b>Rs 10782.00</b>	
16	100.36.1 Filling water with 5000 litre tankers fitted in lorry and conveying water from a distance of 5 km (average) to the reservoir site and pumping the water into the reservoir of height not less than 3 m using 5 HP diesel engine pump set , hire for tanker lorry, tools and other appliances and cost of water etc. complete. "(Ref. No. 000, Technical Circular)"							
		1	5.000	5.000	2.850		71.250	
	Total Quantity						71.250 Kilo litre	
	Total Deducted Quantity						0.000 Kilo litre	

SI No	Description	No	L	B	D	CF	Quantity	Remark
Net Total Quantity							71.250 Kilo litre	
Say 71.250 Kilo litre @ Rs 182.79 / Kilo litre								<b>Rs 13023.79</b>
<b>10TREATED WATER TANK (Cost Index:33.05 %)</b>								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	11.200	7.400	0.500		41.440	
Total Quantity							41.440 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							41.440 cum	
Say 41.440 cum @ Rs 210.02 / cum								<b>Rs 8703.23</b>
2	4.1.5 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)							
		1	11.200	7.400	0.200		16.576	
Total Quantity							16.576 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							16.576 cum	
Say 16.576 cum @ Rs 7229.54 / cum								<b>Rs 119836.86</b>
3	5.37.1 Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in-charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level							
		1	11.000	7.200	0.300		23.760	
Total Quantity							23.760 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							23.760 cum	
Say 23.760 cum @ Rs 9700.81 / cum								<b>Rs 230491.25</b>

4	5.37.2 Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work above plinth level upto floor V level								
	Long Wall	2	10.400	0.300	3.350		20.904		
	Short Wall	2	6.000	0.300	3.350		12.060		
	Total Quantity						32.964 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						32.964 cum		
	Say 32.964 cum @ Rs 11321.96 / cum						<b>Rs 373217.09</b>		
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).								
		1	56.724				56.724		
	Total Quantity						56.724 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						56.724 cum		
	Say 56.724 cum @ Rs 80.56 / cum						<b>Rs 4569.69</b>		
6	4.12 Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .								
		1	56.724		330.000		18718.920		
	Total Quantity						18718.920 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						18718.920 kg		
	Say 18718.920 kg @ Rs 1.33 / kg						<b>Rs 24896.16</b>		
7	od327527/2021_2022 Extra for providing sulphate resistant cement for the structures above plinth level.								
		1	56.724				56.724		
	Total Quantity						56.724 cum		

						Total Deducted Quantity	0.000 cum
						Net Total Quantity	56.724 cum
						Say 56.724 cum @ Rs 1965.60 / cum	<b>Rs 111496.69</b>
8	5.22.6	Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more					
	@120kg/m3	1	56.724	120.000			6806.880
						Total Quantity	6806.880 kilogram
						Total Deducted Quantity	0.000 kilogram
						Net Total Quantity	6806.880 kilogram
						Say 6806.880 kilogram @ Rs 96.46 / kilogram	<b>Rs 656591.64</b>
9	od327530/2021_2022	Extra for providing epoxy coating for reinforcement bars.					
	@120kg/m3	1	56.724	120.000			6806.880
						Total Quantity	6806.880 kg
						Total Deducted Quantity	0.000 kg
						Net Total Quantity	6806.880 kg
						Say 6806.880 kg @ Rs 2.32 / kg	<b>Rs 15791.96</b>
10	5.9.1	Centering and shuttering including strutting, etc. and removal of form for: Foundations, footings, bases of columns, etc for mass concrete					
	Long Wall	2	11.000	0.300			6.600
	Short Wall	2	7.200	0.300			4.320
						Total Quantity	10.920 sqm
						Total Deducted Quantity	0.000 sqm
						Net Total Quantity	10.920 sqm
						Say 10.920 sqm @ Rs 329.03 / sqm	<b>Rs 3593.01</b>
11	5.9.2	Centering and shuttering including strutting, etc. and removal of form for: Walls (any thickness) including attached pilasters, butresses, plinth and string courses etc.					
	Inside Wall	1	2*9.8+2*6		3.350		105.861
	Outside Wall	1	2*10.4+2*6.6		3.350		113.900
						Total Quantity	219.761 sqm
						Total Deducted Quantity	0.000 sqm

	Net Total Quantity						219.761 sqm	
	Say 219.761 sqm @ Rs 703.77 / sqm						<b>Rs 154661.20</b>	
12	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)							
	Long Wall	2	11.000	0.300			6.600	
	Short Wall	2	7.200	0.300			4.320	
	Offset top	1	35.400	0.350			12.390	
	Inside Wall	1	2*9.8+2*6		3.350		105.861	
	Outside Wall	1	2*10.4+2*6.6		3.350		113.900	
	Wall top	1	34.000		0.300		10.200	
	Total Quantity						253.271 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						253.271 sqm	
	Say 253.271 sqm @ Rs 393.69 / sqm						<b>Rs 99710.26</b>	
13	13.52.2 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On concrete work							
		1	2*10.4+2*6.6		3.350		113.900	
	Total Quantity						113.900 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						113.900 sqm	
	Say 113.900 sqm @ Rs 218.73 / sqm						<b>Rs 24913.35</b>	
14	22.23.1 Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For vertical surface two coats @ 0.70 kg per sqm							
		1	2*9.8+2*6		3.350		105.861	

							Total Quantity	105.861 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	105.861 sqm
							Say 105.861 sqm @ Rs 559.61 / sqm	<b>Rs 59240.87</b>
15	22.23.2	<p>Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage &amp; water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e. by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For horizontal surface one coat @ 1.10 kg per sqm.</p>						
		1	9.800	6.000				58.801
							Total Quantity	58.801 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	58.801 sqm
							Say 58.801 sqm @ Rs 431.28 / sqm	<b>Rs 25359.70</b>
16	100.36.1	<p>Filling water with 5000 litre tankers fitted in lorry and conveying water from a distance of 5 km (average) to the reservoir site and pumping the water into the reservoir of height not less than 3 m using 5 HP diesel engine pump set, hire for tanker lorry, tools and other appliances and cost of water etc. complete. "(Ref. No. 000, Technical Circular)"</p>						
		1	9.800	6.000	3.350			196.981
							Total Quantity	196.981 Kilo litre
							Total Deducted Quantity	0.000 Kilo litre
							Net Total Quantity	196.981 Kilo litre
							Say 196.981 Kilo litre @ Rs 182.79 / Kilo litre	<b>Rs 36006.16</b>
Sl No	Description	No	L	B	D	CF	Quantity	Remark
<b>11Centrate Sump (Cost Index:33.05 %)</b>								
1	2.6.1	<p>Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed. All kinds of soil</p>						
		3.14/4	5.400	5.400	0.500			11.446



		Total Quantity					11.446 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					11.446 cum	
		Say 11.446 cum @ Rs 210.02 / cum					<b>Rs 2403.89</b>	
2	4.1.5	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)						
		3.14/4	5.400	5.400	0.200		4.579	
		Total Quantity					4.579 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					4.579 cum	
		Say 4.579 cum @ Rs 7229.54 / cum					<b>Rs 33104.06</b>	
3	5.37.1	Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level						
		3.14/4	5.400	5.400	0.300		6.868	
		Total Quantity					6.868 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					6.868 cum	
		Say 6.868 cum @ Rs 9700.81 / cum					<b>Rs 66625.16</b>	
4	5.37.2	Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work above plinth level upto floor V level						
	Cover slab	3.14/4	4.600	4.600	0.120		1.994	

	Side wall	3.14	4.300	0.300	2.500		10.127		
	Manhole	1	0.500	0.500	0.120		-0.030		
		Total Quantity						12.121 cum	
		Total Deducted Quantity						-0.030 cum	
		Net Total Quantity						12.091 cum	
		Say 12.091 cum @ Rs 11321.96 / cum						<b>Rs 136893.82</b>	
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).								
		1	18.959				18.959		
		Total Quantity						18.959 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						18.959 cum	
		Say 18.959 cum @ Rs 80.56 / cum						<b>Rs 1527.34</b>	
6	4.12 Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .								
		1	18.959		330.000		6256.470		
		Total Quantity						6256.470 kg	
		Total Deducted Quantity						0.000 kg	
		Net Total Quantity						6256.470 kg	
		Say 6256.470 kg @ Rs 1.33 / kg						<b>Rs 8321.11</b>	
7	od327527/2021_2022 Extra for providing sulphate resistant cement for the structures above plinth level.								
		1	18.959				18.959		
		Total Quantity						18.959 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						18.959 cum	
		Say 18.959 cum @ Rs 1965.60 / cum						<b>Rs 37265.81</b>	
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more								
	@120kg/m3	1	18.959	120.000			2275.080		
		Total Quantity						2275.080 kilogram	

						Total Deducted Quantity	0.000 kilogram
						Net Total Quantity	2275.080 kilogram
						Say 2275.080 kilogram @ Rs 96.46 / kilogram	<b>Rs 219454.22</b>
9	od327530/2021_2022 Extra for providing epoxy coating for reinforcement bars.						
	@120kg/m3	1	8.844	120.000			1061.280
						Total Quantity	1061.280 kg
						Total Deducted Quantity	0.000 kg
						Net Total Quantity	1061.280 kg
						Say 1061.280 kg @ Rs 2.32 / kg	<b>Rs 2462.17</b>
10	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete						
		3.14	5.400		0.200		3.392
						Total Quantity	3.392 sqm
						Total Deducted Quantity	0.000 sqm
						Net Total Quantity	3.392 sqm
						Say 3.392 sqm @ Rs 329.03 / sqm	<b>Rs 1116.07</b>
11	5.9.2 Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, buttersses, plinth and string courses etc.						
		2*3.14	4.300		2.500		67.510
	Base Slab side	13.14	5.200		0.300		20.499
						Total Quantity	88.009 sqm
						Total Deducted Quantity	0.000 sqm
						Net Total Quantity	88.009 sqm
						Say 88.009 sqm @ Rs 703.77 / sqm	<b>Rs 61938.09</b>
12	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform						
		3.14/4	4.000	4.000			12.560
	Manhole	1	0.500	0.500			-0.250
						Total Quantity	12.560 sqm
						Total Deducted Quantity	-0.250 sqm
						Net Total Quantity	12.310 sqm

	Say 12.310 sqm @ Rs 800.50 / sqm							<b>Rs 9854.16</b>
13	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)							
	Qty Vide Item No:10	1	3.392				3.392	
	Qty Vide Item No:11	1	88.009				88.009	
	Qty Vide Item No:12	1	12.310				12.310	
	Total Quantity							103.711 sqm
	Total Deducted Quantity							0.000 sqm
	Net Total Quantity							103.711 sqm
	Say 103.711 sqm @ Rs 393.69 / sqm							<b>Rs 40829.98</b>
14	13.52.2 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On concrete work							
		3.14	4.600		2.500		36.110	
	Total Quantity							36.110 sqm
	Total Deducted Quantity							0.000 sqm
	Net Total Quantity							36.110 sqm
	Say 36.110 sqm @ Rs 218.73 / sqm							<b>Rs 7898.34</b>
15	22.23.1 Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For vertical surface two coats @ 0.70 kg per sqm							
		3.14	4.000		2.500		31.401	
	Total Quantity							31.401 sqm
	Total Deducted Quantity							0.000 sqm
	Net Total Quantity							31.401 sqm
	Say 31.401 sqm @ Rs 559.61 / sqm							<b>Rs 17572.31</b>
16	22.23.2 Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the							

	RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e. by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer-in-charge. The product performance shall carry guarantee for 10 years against any leakage. For horizontal surface one coat @ 1.10 kg per sqm.							
		3.14/4	4.000	4.000			12.560	
	Total Quantity						12.560 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						12.560 sqm	
	Say 12.560 sqm @ Rs 431.28 / sqm						<b>Rs 5416.88</b>	
17	100.36.1 Filling water with 5000 litre tankers fitted in lorry and conveying water from a distance of 5 km (average) to the reservoir site and pumping the water into the reservoir of height not less than 3 m using 5 HP diesel engine pump set, hire for tanker lorry, tools and other appliances and cost of water etc. complete. "(Ref. No. 000, Technical Circular)"							
		3.14/4	4.000	4.000	2.500		31.401	
	Total Quantity						31.401 Kilo litre	
	Total Deducted Quantity						0.000 Kilo litre	
	Net Total Quantity						31.401 Kilo litre	
	Say 31.401 Kilo litre @ Rs 182.79 / Kilo litre						<b>Rs 5739.79</b>	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
<b>12 Administrative/Laboratory/Chemical House / Control Room Building (Cost Index: 33.05 %)</b>								
1	2.8.1 Earth work in excavation by mechanical means (Hydraulic excavator) / manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. All kinds of soil							
	FOR FOOTING	16	1.500	1.500	1.500		54.000	
	FOR STEP	1	2.000	2.000	0.200		0.800	
	FOR RAMP	1	3.000	1.500	0.150		0.675	
	Total Quantity						55.475 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						55.475 cum	

	Say 55.475 cum @ Rs 291.38 / cum						<b>Rs 16164.31</b>	
2	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	FOR RAMP	1	3.000	1.500	0.150		0.675	
	Total Quantity						0.675 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.675 cum	
	Say 0.675 cum @ Rs 7841.17 / cum						<b>Rs 5292.79</b>	
3	4.1.8 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)							
	FOR FOOTING	16	1.500	1.500	0.100		3.600	
	FOR STEP	1	2.000	2.000	0.100		0.400	
	FOR RAMP	1	3.000	1.500	0.150		0.675	
	Total Quantity						4.675 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						4.675 cum	
	Say 4.675 cum @ Rs 6687.23 / cum						<b>Rs 31262.80</b>	
4	50.2.25.1 Filling with contractor's own earth ( excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m as per direction of site Engineer-in-charge							
	Office Room	1	7.000	5.000	0.500		17.500	
	stair	1	7.000	3.000	0.500		10.500	
	chemical room	1	6.000	4.000	0.500		12.000	
	visitors room	1	4.000	4.000	0.500		8.000	
	Ramp	1*0.50	2.000	1.500	0.600		0.900	
	Total Quantity						48.900 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						48.900 cum	
	Say 48.900 cum @ Rs 515.97 / cum						<b>Rs 25230.93</b>	
5	5.37.1 Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work,							

	using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level							
	FOR FIRST FOOTING	16	1.400	1.400	0.250		7.840	
	FOR SECOND FOOTING	16	0.167	3.920	0.350		3.666	
	COLUMN UP TO PLINTH BEAM	16	0.400	0.200	0.800		1.025	
	PLINTH BEAMS	3	11.100	0.200	0.450		2.998	
	„	4	10.400	0.200	0.450		3.744	
	„	1	3.200	0.200	0.450		0.289	
	FLOOR SLAB	1	11.300	10.600	0.100		11.979	
	Total Quantity						31.541 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						31.541 cum	
	Say 31.541 cum @ Rs 9700.81 / cum						<b>Rs 305973.25</b>	
6	<p>5.37.2          Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work above plinth level upto floor V level</p>							
	Column Above Plinth	16	0.400	0.200	3.250		4.161	
	SUN SHADE DOOR	2	2.000	1.200	0.080		0.384	
	SUN SHADE W3	7	1.900	0.600	0.080		0.639	
	SUN SHADE RS	1	3.400	1.200	0.080		0.327	
	SUN SHADE V	1	1.000	0.600	0.080		0.048	
	LINTELS	3	11.100	0.200	0.150		1.000	

„	3	10.400	0.200	0.150		0.936	
„	1	3.200	0.200	0.150		0.097	
BEAMS	6	3.100	0.200	0.450		1.675	
„	2	4.000	0.200	0.450		0.721	
„	2	3.200	0.200	0.450		0.577	
„	2	4.200	0.200	0.450		0.757	
„	4	5.500	0.200	0.450		1.981	
„	4	1.700	0.200	0.450		0.613	
„	4	4.200	0.200	0.450		1.513	
STAIR CASE WAIST SLAB	2	3.700	1.500	0.125		1.388	
LANDING	1	3.000	1.500	0.125		0.563	
STEPS	22*.50	1.500	0.300	0.150		0.743	
ROOF SLAB	1	11.300	10.600	0.125		14.973	
First Floor - COLUMN UP TO ROOF SLAB	16	0.400	0.200	3.250		4.161	
LINTELS	2	11.100	0.200	0.150		0.666	
„	4	10.400	0.200	0.150		1.248	
„	1	1.700	0.200	0.150		0.052	
SUN SHADE	8	2.000	0.600	0.080		0.768	
„	1	1.000	0.600	0.080		0.048	
Beams	6	3.100	0.200	0.450		1.675	
„	2	4.000	0.200	0.450		0.721	
„	2	3.200	0.200	0.450		0.577	
„	2	4.200	0.200	0.450		0.757	
„	4	5.500	0.200	0.450		1.981	
„	4	1.700	0.200	0.450		0.613	
„	4	4.200	0.200	0.450		1.513	
Roof slab	1	11.900	11.200	0.125		16.660	
Column	16	0.200	0.400	0.600		-0.768	
OPENING	1	1.500	0.200	0.150		-0.045	
					Total Quantity	64.536 cum	
					Total Deducted Quantity	-0.813 cum	



	Net Total Quantity							63.723 cum
	Say 63.723 cum @ Rs 11321.96 / cum							<b>Rs 721469.26</b>
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more							
	@ 100 Kg/ Cum of CC - Footing	1	31.541			100.0	3154.100	
	@ 100 Kg/ Cum of CC	1	63.723			100.0	6372.300	
	Total Quantity							9526.400 kilogram
	Total Deducted Quantity							0.000 kilogram
	Net Total Quantity							9526.400 kilogram
	Say 9526.400 kilogram @ Rs 96.46 / kilogram							<b>Rs 918916.54</b>
8	14.12 Providing and fixing 16 mm M.S. Fan clamps of standard shape and size in existing R.C.C. slab, including cutting chase, anchoring clamp to reinforcement bar, including cleaning, refilling, making good the chase with matching concrete, plastering and painting the exposed portion of the clamps complete.							
	Fixing on ceiling	6					6.000	
	Total Quantity							6.000 No
	Total Deducted Quantity							0.000 No
	Net Total Quantity							6.000 No
	Say 6.000 No @ Rs 491.02 / No							<b>Rs 2946.12</b>
9	5.9.1 Centering and shuttering including strutting, etc. and removal of form for: Foundations, footings, bases of columns, etc for mass concrete							
	FOR FIRST FOOTING	16*4	1.400			0.250	22.400	
	Total Quantity							22.400 sqm
	Total Deducted Quantity							0.000 sqm
	Net Total Quantity							22.400 sqm
	Say 22.400 sqm @ Rs 329.03 / sqm							<b>Rs 7370.27</b>
10	5.9.3 Centering and shuttering including strutting, etc. and removal of form for: Suspended floors, roofs, landings, balconies and access platform							
	GF Slab	1	11.300	10.600			119.780	
	Slab Edge	1	43.800			0.125	5.475	
	FF slab	1	11.900	11.200			133.280	

	Slab Edge	1	46.200		0.125		5.775	
	Total Quantity						264.310 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						264.310 sqm	
	Say 264.310 sqm @ Rs 800.50 / sqm						<b>Rs 211580.16</b>	
11	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers							
	SUN SHADE DOOR	2	2.000	1.200			4.800	
	SUN SHADE W3	7	1.900	0.600			7.980	
	SUN SHADE RS	1	3.400	1.200			4.080	
	SUN SHADE V	1	1.000	0.600			0.600	
	Shade side	24	0.600		0.100		1.440	
	LINTELS	3*2	11.100		0.150		9.990	
	„	3*2	10.400		0.150		9.360	
	„	1*2	3.200		0.150		0.960	
	Op. Bottom	1	0.600	0.200			0.120	
		7	1.500	0.200			2.101	
		1	3.000	0.200			0.601	
	BEAMS	6	3.100		1.100		20.461	
	„	2	4.000		1.100		8.800	
	„	2	3.200		1.100		7.041	
	„	2	4.200		1.100		9.241	
	„	4	5.500		1.100		24.201	
	„	4	1.700		1.100		7.480	
	„	4	4.200		1.100		18.481	
	STAIR CASE WAIST SLAB	2	3.700	1.500			11.101	
	Side	2	3.700		0.125		0.925	
	LANDING	1	3.000	1.500			4.500	
	Side	1	6.000		0.150		0.900	
	STEPS	22	1.500		0.150		4.950	
	Side	44*0.50	0.300	0.150			0.990	
	LINTELS	2*2	11.100		0.150		6.660	

	„	4*2	10.400		0.150		12.480	
	„	1*2	1.700		0.150		0.510	
	SUN SHADE	8	2.000	0.600			9.600	
	„	1	1.000	0.600			0.600	
	Edge	8*2	1.500		0.100		2.401	
		1*2	0.600		0.100		0.120	
	Beams	6	3.100		1.100		20.461	
	„	2	4.000		1.100		8.800	
	„	2	3.200		1.100		7.041	
	„	2	4.200		1.100		9.241	
	„	4	5.500		1.100		24.201	
	„	4	1.700		1.100		7.480	
	„	4	4.200		1.100		18.481	
	PLINTH BEAMS	3*2	11.100		0.450		29.970	
	„	4*2	10.400		0.450		37.441	
	„	1*2	3.200		0.450		2.881	
						Total Quantity	359.471 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	359.471 sqm	
						Say 359.471 sqm @ Rs 637.64 / sqm	<b>Rs 229213.09</b>	
12	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts							
	COLUMN UP TO PLINTH BEAM	16	1.200		0.800		15.360	
	GF Column	16	1.200		3.250		62.400	
	FF Columns	16	1.200	3.250			62.400	
						Total Quantity	140.160 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	140.160 sqm	
						Say 140.160 sqm @ Rs 847.46 / sqm	<b>Rs 118779.99</b>	
13	50.6.7.2 Laterate masonry with neatly dressed laterate stone of size 40x20x15cm or nearest size in cement mortar 1:6 for super structure above plinth level up to floor two level including all cost of materials, labour charges etc.							

	GF Walls	3	11.100	0.200	3.200		21.313	
	„	3	10.400	0.200	3.200		19.969	
	„	1	3.200	0.200	3.200		2.049	
	FF - Walls	2	11.100	0.200	3.200		14.209	
	„	4	10.400	0.200	3.200		26.625	
	„	1	7.000	0.200	3.200		4.480	
	Parapet	1	45.400	0.200	0.600		5.448	
	Doors	1	1.200	0.200	2.100		-0.504	
	„	4	1.000	0.200	2.100		-1.680	
	„	2	0.800	0.200	2.100		-0.672	
	W	15	1.500	0.200	1.500		-6.750	
	V	2	0.600	0.200	0.500		-0.120	
	Rolling Shutter	1	2.000	0.200	2.400		-0.960	
	Column	2*16	0.200	0.400	3.200		-8.192	
						Total Quantity	94.093 cum	
						Total Deducted Quantity	-18.878 cum	
						Net Total Quantity	75.215 cum	
						Say 75.215 cum @ Rs 7872.98 / cum	<b>Rs 592166.19</b>	
14	13.1.1 12 mm cement plaster of mix:1:4 ( 1 cement : 4 fine sand)							
	Building Outside-Long Wall	2	11.300		3.900		88.140	
	Short Wall	2	10.600		3.900		82.680	
	Building inside-Long Wall	4	10.900		3.300		143.880	
	Short Wall	4	10.000		3.300		132.000	
	Toilet out side	2	1.600		3.300		10.560	
	Toilet in side	2	1.500		3.300		9.900	
	Sun shade	7	2.100		0.700		10.290	
	„	2	2.200		1.300		5.721	
	„	1	1.200		0.700		0.840	
	Step top	1	1.500		1.500		2.250	
	„ Side	2	0.900		0.300		0.540	
	Ramp	2*0.50	0.300		1.500		0.450	

	FF - Outside wall	2	11.300		3.300		74.580	
	„	2	10.600		3.300		69.960	
	FF - inside	2	10.700		3.300		70.620	
	„	4	10.000		3.300		132.000	
	„	1	5.700		3.300		18.810	
	„	1	7.000		3.300		23.100	
	Toilet inside	2	1.500		3.300		9.900	
	Parapet wall	1	45.400		1.400		63.560	
	Door	1	1.200		2.100		-2.520	
	„	4	1.000		2.100		-8.400	
	„	8	0.800		2.100		-13.440	
	Window	15	1.500		1.500		-33.750	
	ventilator	2	0.600		0.500		-0.600	
	Rs	1*2	2.000		2.400		-9.600	
						Total Quantity	949.781 sqm	
						Total Deducted Quantity	-68.310 sqm	
						Net Total Quantity	881.471 sqm	
						Kerala Water Authority Say 881.471 sqm @ Rs 308.21 / sqm	<b>Rs 271678.18</b>	
15	13.16.1 6 mm cement plaster of mix:1:3 ( 1 cement : 3 fine sand)							
	GF- slab-Bottom	1	10.700		10.000		107.000	
	Beam Bottom	1	82.800		0.850		70.380	
	Sun shad Door	2	2.000		1.200		4.800	
	„ W	7	1.900		0.600		7.980	
	„ V	1	0.900		0.600		0.540	
	Sun shad edge	1	30.200		0.100		3.020	
	Stair Waist Slab	2	3.700		1.700		12.580	
	Landing	1	3.000		1.500		4.500	
	FF - Roof slab-Bottom	1	10.700		10.000		107.000	
	Beam Bottom	1	82.800		0.850		70.380	
	Shade , W	8	1.900		0.600		9.120	
	„ V	1	0.900		0.600		0.540	
	Roof Slab Edge	1	33.700		0.300		10.111	

	Shade Edge	1	30.200		0.100		3.020	
	Total Quantity						410.971 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						410.971 sqm	
	Say 410.971 sqm @ Rs 262.57 / sqm						<b>Rs 107908.66</b>	
16	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)							
	Roof top	1	11.900	11.200			133.280	
	Total Quantity						133.280 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						133.280 sqm	
	Say 133.280 sqm @ Rs 393.69 / sqm						<b>Rs 52471.00</b>	
17	11.41.2 Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS : 15622, of approved make, in all colours and shades, laid on 20 mm thick cement mortar 1:4(1 cement : 4 coarse sand), including grouting the joints with white cement and matching pigments etc., complete. Size of Tile 600 x 600 mm.							
	Office room	1	7.000	7.000			49.000	
	Skirting-office room	1	26.500	0.100			2.651	
	Vistors room	1	4.000	4.000			16.000	
	Skirting-	1	14.200	0.100			1.420	
	Chemical Room	1	6.000	4.000			24.000	
	Skirting-	1	20.000	0.100			2.000	
	Stair Case Room	1	3.000	7.000			21.000	
	Step	22	1.500	0.450			14.851	
	Landing	1	3.000	1.500			4.500	
	Controll Room	1	7.000	5.000			35.000	
	Laboratory Room	1	10.200	4.000			40.800	
	Passage	1	7.000	1.500			10.500	
	Total Quantity						221.722 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						221.722 sqm	
	Say 221.722 sqm @ Rs 1733.18 / sqm						<b>Rs 384284.14</b>	
18	11.37 Providing and laying Ceramic glazed floor tiles of size 300x300 mm (thickness to be specified by the							

	manufacturer), of 1st quality conforming to IS : 15622, of approved make, in colours such as White, Ivory, Grey, Fume Red Brown, laid on 20 mm thick cement mortar 1:4 (1 Cement : 4 Coarse sand), including pointing the joints with white cement and matching pigment etc., complete.						
	Passage	1	1.500	1.500			2.250
	„	1	3.000	1.500			4.500
	Total Quantity						6.750 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						6.750 sqm
	Say 6.750 sqm @ Rs 1070.59 / sqm						<b>Rs 7226.48</b>
19	11.38 Providing and laying Ceramic glazed floor tiles of size 300x300 mm (thickness to be specified by the manufacturer), of 1st quality conforming to IS : 15622, of approved make, in all colours, shades, except White, Ivory, Grey, Fume Red Brown, laid on 20 mm thick bed of cement mortar 1:4 ( 1 cement : 4 Coarse sand), including pointing the joints with white cement and matching pigments etc., complete.						
	Wall Tile	1	6.000	2.100			12.601
	„	1	9.000	2.100			18.901
	Door	2	0.800	2.100			-3.360
	Total Quantity						31.502 sqm
	Total Deducted Quantity						-3.360 sqm
	Net Total Quantity						28.142 sqm
	Say 28.142 sqm @ Rs 1151.22 / sqm						<b>Rs 32397.63</b>
20	10.6.1 Supplying and fixing rolling shutters of approved make, made of required size M.S. laths, interlocked together through their entire length and jointed together at the end by end locks, mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation complete, including the cost of providing and fixing necessary 27.5 cm long wire springs manufactured from high tensile steel wire of adequate strength conforming to IS: 4454 - part 1 and M.S. top cover of required thickness for rolling shutters.80x1.25 mm M.S. laths with 1.25 mm thick top cover						
	RS	1	2.000	2.400			4.800
	Total Quantity						4.800 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						4.800 sqm
	Say 4.800 sqm @ Rs 3400.56 / sqm						<b>Rs 16322.69</b>
21	10.7 Providing and fixing ball bearing for rolling shutters.						
	For Rs	1					1.000

		Total Quantity					1.000 Nos	
		Total Deducted Quantity					0.000 Nos	
		Net Total Quantity					1.000 Nos	
		Say 1.000 Nos @ Rs 484.97 / Nos					<b>Rs 484.97</b>	
22	10.3 Providing and fixing in position collapsible steel shutters with vertical channels 20x10x2 mm and braced with flat iron diagonals 20x5 mm size, with top and bottom rail of T-iron 40x40x6 mm, with 40 mm dia steel pulleys, complete with bolts, nuts,locking arrangement, stoppers, handles, including applying a priming coat of approved steel primer .							
		1	1.500		2.100		3.151	
		Total Quantity					3.151 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					3.151 sqm	
		Say 3.151 sqm @ Rs 10014.74 / sqm					<b>Rs 31556.45</b>	
23	13.43.1 Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface:Water thinnable cement primer							
	Building Outside-Long Wall	2	11.300		3.900		88.140	
	Short Wall	2	10.600		3.900		82.680	
	Building inside-Long Wall	4	10.900		3.300		143.880	
	Short Wall	4	10.000		3.300		132.000	
	Toilet out side	2	1.600		3.300		10.560	
	Toilet in side	2	1.500		3.300		9.900	
	Sun shade	7	2.100		0.700		10.290	
	„	2	2.200		1.300		5.721	
	„	1	1.200		0.700		0.840	
	Step top	1	1.500		1.500		2.250	
	„ Side	2	0.900		0.300		0.540	
	Ramp	2*0.50	0.300		1.500		0.450	
	FF - Outside wall	2	11.300		3.300		74.580	
	„	2	10.600		3.300		69.960	
	FF - inside	2	10.700		3.300		70.620	
	„	4	10.000		3.300		132.000	



	„	1	5.700		3.300		18.810	
	„	1	7.000		3.300		23.100	
	Toilet inside	2	1.500		3.300		9.900	
	Parapet wall	1	45.400		1.400		63.560	
	Door	1	1.200		2.100		-2.520	
	„	4	1.000		2.100		-8.400	
	„	8	0.800		2.100		-13.440	
	Window	15	1.500		1.500		-33.750	
	ventilator	2	0.600		0.500		-0.600	
	Rs	1*2	2.000		2.400		-9.600	
	GF- slab-Bottom	1	10.700		10.000		107.000	
	Beam Bottom	1	82.800		0.850		70.380	
	Sun shad Door	2	2.000		1.200		4.800	
	„ W	7	1.900		0.600		7.980	
	„ V	1	0.900		0.600		0.540	
	Sun shad edge	1	30.200		0.100		3.020	
	Stair Waist Slab	2	3.700		1.700		12.580	
	Landing	1	3.000		1.500		4.500	
	FF - Roof slab-Bottom	1	10.700		10.000		107.000	
	Beam Bottom	1	82.800		0.850		70.380	
	Shade , W	8	1.900		0.600		9.120	
	„ V	1	0.900		0.600		0.540	
	Roof Slab Edge	1	33.700		0.300		10.111	
	Shade Edge	1	30.200		0.100		3.020	
						Total Quantity	1360.752 sqm	
						Total Deducted Quantity	-68.310 sqm	
						Net Total Quantity	1292.442 sqm	
						Say 1292.442 sqm @ Rs 69.32 / sqm	<b>Rs 89592.08</b>	
24	13.60.1 Wall painting with acrylic emulsion paint of approved brand and manufacture to give an even shade:Two or more coats on new work							
	Building Outside-Long Wall	2	11.300		3.900		88.140	
	Short Wall	2	10.600		3.900		82.680	

Building inside-Long Wall	4	10.900		3.300		143.880	
Short Wall	4	10.000		3.300		132.000	
Toilet out side	2	1.600		3.300		10.560	
Toilet in side	2	1.500		3.300		9.900	
Sun shade	7	2.100		0.700		10.290	
„	2	2.200		1.300		5.721	
„	1	1.200		0.700		0.840	
Step top	1	1.500		1.500		2.250	
„ Side	2	0.900		0.300		0.540	
Ramp	2*0.50	0.300		1.500		0.450	
FF - Outside wall	2	11.300		3.300		74.580	
„	2	10.600		3.300		69.960	
FF - inside	2	10.700		3.300		70.620	
„	4	10.000		3.300		132.000	
„	1	5.700		3.300		18.810	
„	1	7.000		3.300		23.100	
Toilet inside	2	1.500		3.300		9.900	
Parapet wall	1	45.400		1.400		63.560	
Door	1	1.200		2.100		-2.520	
„	4	1.000		2.100		-8.400	
„	8	0.800		2.100		-13.440	
Window	15	1.500		1.500		-33.750	
ventilator	2	0.600		0.500		-0.600	
Rs	1*2	2.000		2.400		-9.600	
GF- slab-Bottom	1	10.700		10.000		107.000	
Beam Bottom	1	82.800		0.850		70.380	
Sun shad Door	2	2.000		1.200		4.800	
„ W	7	1.900		0.600		7.980	
„ V	1	0.900		0.600		0.540	
Sun shad edge	1	30.200		0.100		3.020	
Stair Waist Slab	2	3.700		1.700		12.580	
Landing	1	3.000		1.500		4.500	

	FF - Roof slab-Bottom	1	10.700		10.000		107.000		
	Beam Bottom	1	82.800		0.850		70.380		
	Shade , W	8	1.900		0.600		9.120		
	„ V	1	0.900		0.600		0.540		
	Roof Slab Edge	1	33.700		0.300		10.111		
	Shade Edge	1	30.200		0.100		3.020		
	Total Quantity						1360.752 sqm		
	Total Deducted Quantity						-68.310 sqm		
	Net Total Quantity						1292.442 sqm		
	Say 1292.442 sqm @ Rs 148.55 / sqm						<b>Rs 191992.26</b>		
25	13.61.1 Painting with synthetic enamel paint of approved brand and manufacture to give an even shade:Two or more coats on new work								
	Widow grill	15	1.500	1.500			33.750		
	Ventilator	2	0.600	0.500			0.600		
	Rolling shutter	1	2.000	2.400		2.5	12.000		
	CG	1	1.500	2.100			3.151		
	Total Quantity						49.501 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						49.501 sqm		
	Say 49.501 sqm @ Rs 140.37 / sqm						<b>Rs 6948.46</b>		
26	21.1.1.1 Providing and fixing aluminium work for doors, windows, ventilators and partitions with extruded built up standard tubular sections/ appropriate Z sections and other sections of approved make conforming to IS : 733 and IS: 1285, fixing with dash fasteners of required dia and size, including necessary filling up the gaps at junctions, i.e. at top, bottom and sides with required EPDM rubber/ neoprene gasket etc. Aluminium sections shall be smooth, rust free, straight, mitred and jointed mechanically wherever required including cleat angle, Aluminnium snap beading for glazing /paneling, C.P. brass/ stainless steel screws, all complete as per architectural drawings and the directions of Engineer-in-charge.(Glazing, paneling and dash fasteners to be paid for separately):For fixed portionAnodised aluminium (anodised transparent or dyed to required shade according to IS : 1868, Minimum anodic coating of grade AC 15)								
	For window frames	15	1.500	1.500		4.5	151.875		
	Ventilator	2	0.600	0.500		4.5	2.700		
	Doors	1	1.200	2.100		4.5	11.340		
	„	4	1.000	2.100			8.400		
	Total Quantity						174.315 kg		

						Total Deducted Quantity	0.000 kg	
						Net Total Quantity	174.315 kg	
						Say 174.315 kg @ Rs 489.69 / kg	<b>Rs 85360.31</b>	
27	21.1.2.1	For shutters of doors, windows & ventilators including providing and fixing hinges / pivots and making provision for fixing of fittings wherever required including the cost of EPDM rubber/ neoprene gasket required (Fittings shall be paid for separately)Anodised aluminium ( anodised transparent or dyed to required shade according to IS : 1868, Minimum anodic coating of grade AC 15)						
	For window Shutter	15*3	0.470	1.440		3.0	91.368	
	Ventilator	2	0.570	0.470		3.0	1.608	
	Doors	1	1.060	1.960		4.5	9.350	
	„	4	0.860	1.960			6.743	
						Total Quantity	109.069 kg	
						Total Deducted Quantity	0.000 kg	
						Net Total Quantity	109.069 kg	
						Say 109.069 kg @ Rs 593.00 / kg	<b>Rs 64677.92</b>	
28	21.3.1	Providing and fixing glazing in aluminium door, window, ventilator shutters and partitions etc. with EPDM rubber / neoprene gasket etc. complete as per the architectural drawings and the directions of Engineer - in -Charge. ( Cost of aluminium snap beading shall be paid in basic item):With float glass panes of 4.0 mm thickness						
	For window Shutter	15*3	0.460	1.430		3.0	88.804	
	Ventilator	2	0.560	0.460		3.0	1.546	
	Doors	1*2	0.980	0.900		4.5	7.938	
	„	4*2	0.780	0.900			5.617	
						Total Quantity	103.905 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	103.905 sqm	
						Say 103.905 sqm @ Rs 1154.61 / sqm	<b>Rs 119969.75</b>	
29	9.48.2	Providing and fixing M.S. Grills of required pattern in frames of windows etc. with M.S. flats, square or round bars etc. including priming coat with approved steel primer all complete.Fixed to openings/ wooden frames with rawl plugs screws etc						
	For window frames	15	1.500	1.500		20.0	675.000	
	Ventilator	2	0.600	0.500		20.0	12.000	
						Total Quantity	687.000 kg	

		Total Deducted Quantity				0.000 kg	
		Net Total Quantity				687.000 kg	
		Say 687.000 kg @ Rs 211.95 / kg				<b>Rs 145609.65</b>	
30	10.28	Providing and fixing stainless steel (Grade 304) railing made of Hollow tubes, channels, plates etc., including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete, i/c fixing the railing with necessary accessories & stainless steel dash fasteners, stainless steel bolts etc., of required size on the top of the floor or the side of waist slab with suitable arrangement as per approval of Engineer-in-charge, (for payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.)					
	Stair hand rail	1	22.000	0.800		14.0	246.401
	Ramp Hand rail	2	3.000	0.800		14.0	67.201
		Total Quantity				313.602 kg	
		Total Deducted Quantity				0.000 kg	
		Net Total Quantity				313.602 kg	
		Say 313.602 kg @ Rs 664.65 / kg				<b>Rs 208435.57</b>	
31	9.117.1	Providing and fixing factory made uPVC door frame made of uPVC extruded sections having an overall dimension as below (tolerance $\pm 1$ mm), with wall thickness 2.0mm ( $\pm 0.2$ mm), corners of the door frame to be jointed with galvanized brackets and stainless steel screws, joints mitred and plastic welded. The hinge side vertical of the frames reinforced by galvanized M.S. tube of size 19 x 19 mm and 1 mm ( $\pm 0.1$ mm) wall thickness and 3 nos. stainless steel hinges fixed to the frame complete as per manufacturer's specification and direction of Engineer-in-charge Extruded section profile size 48x40 mm					
	Toilet door frame	2	5.000				10.000
		Total Quantity				10.000 metre	
		Total Deducted Quantity				0.000 metre	
		Net Total Quantity				10.000 metre	
		Say 10.000 metre @ Rs 256.05 / metre				<b>Rs 2560.50</b>	
32	9.118.3	Providing and fixing to existing door frames 25 mm thick PVC flush door shutters made out of a one piece Multi chamber extruded PVC section of the size of 762 mm x 25 mm or less as per requirement with and average wall thickness of 1 mm ( $\pm 0.3$ mm). PVC foam end cap of size 23x10 mm area provided on both vertical edges to ensure the overall thickness of 25 mm. An M.S. tube having dimensions 19 mm x 19 mm and 1.0 mm ( $\pm 0.1$ mm) is inserted along the hinge side of the door. Core of the door shutter should be filled with High Density Polyurethane foam. The Top & Bottom edges of the shutter are covered with an end -cap of the size 25 mm x 11 mm. Door shutter shall be reinforced with special polymeric reinforcements as per manufacturer,s specification and direction of Engineer-in-charge to take up necessary hardware and fixtures. Stickers indicating the locations of hardware will be pasted at appropriate places.					

	Toilet door Shutter	2	0.750		2.000		3.000	
	Total Quantity						3.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						3.000 sqm	
	Say 3.000 sqm @ Rs 2982.65 / sqm						<b>Rs 8947.95</b>	
33	17.2.1 Providing and fixing white vitreous china pedestal type water closet (European type W.C. pan) with seat and lid, 10 litre low level white P.V.C. flushing cistern, including flush pipe, with manually controlled device (handle lever), conforming to IS : 7231, with all fittings and fixtures complete, including cutting and making good the walls and floors wherever required:W.C. pan with ISI marked white solid plastic seat and lid							
	For Toilet	2					2.000	
	Total Quantity						2.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						2.000 No	
	Say 2.000 No @ Rs 6076.66 / No						<b>Rs 12153.32</b>	
34	17.7.2 Providing and fixing wash basin with C.I. brackets, 15 mm C.P. brass pillar taps, 32 mm C.P. brass waste of standard pattern, including painting of fittings and brackets, cutting and making good the walls wherever require:White Vitreous China Wash basin size 630 x 450 mm with a single 15 mm C.P. brass pillar tap							
	For toilet	2					2.000	
	Out side	1					1.000	
	Total Quantity						3.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						3.000 No	
	Say 3.000 No @ Rs 3177.83 / No						<b>Rs 9533.49</b>	
35	18.9.2 Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings. This includes jointing of pipes & fittings with one step CPVC solvent cement, trenching , refilling & testing of joints complete as per direction of Engineer- in-Charge. External work20 mm nominal outer dia pipes							
		1	45.000				45.000	
	Total Quantity						45.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						45.000 metre	

		Say 45.000 metre @ Rs 293.04 / metre						<b>Rs 13186.80</b>
36	18.9.3	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings. This includes jointing of pipes & fittings with one step CPVC solvent cement, trenching , refilling & testing of joints complete as per direction of Engineer- in-Charge. External work25 mm nominal outer dia pipes						
		1	25.000				25.000	
		Total Quantity						25.000 metre
		Total Deducted Quantity						0.000 metre
		Net Total Quantity						25.000 metre
		Say 25.000 metre @ Rs 377.26 / metre						<b>Rs 9431.50</b>
37	18.9.4	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings. This includes jointing of pipes & fittings with one step CPVC solvent cement, trenching , refilling & testing of joints complete as per direction of Engineer- in-Charge. External work32 mm nominal outer dia pipes						
		1	50.000				50.000	
		Total Quantity						50.000 metre
		Total Deducted Quantity						0.000 metre
		Net Total Quantity						50.000 metre
		Say 50.000 metre @ Rs 477.85 / metre						<b>Rs 23892.50</b>
38	18.19.1.2	Providing and fixing gun metal non-return valve of approved quality (screwed end):25 mm nominal boreVertical						
		1					1.000	
		Total Quantity						1.000 No
		Total Deducted Quantity						0.000 No
		Net Total Quantity						1.000 No
		Say 1.000 No @ Rs 582.69 / No						<b>Rs 582.69</b>
39	18.49.1	Providing and fixing C.P brass bib cock of approved quality conforming to IS: 8931.15 mm nominal bore						
		2					2.000	
		Total Quantity						2.000 No
		Total Deducted Quantity						0.000 No
		Net Total Quantity						2.000 No
		Say 2.000 No @ Rs 483.90 / No						<b>Rs 967.80</b>

40	18.58.2.1 Providing and fixing PTMT grating of approved quality and colour.Rectangular type with openable circular lid150 mm nominal size square 100 mm diameter of the inner hinged round grating									
		2						2.000		
		Total Quantity						2.000 No		
		Total Deducted Quantity						0.000 No		
		Net Total Quantity						2.000 No		
		Say 2.000 No @ Rs 195.18 / No						<b>Rs 390.36</b>		
41	17.31 Providing and fixing 600x450 mm beveled edge mirror of superior glass (of approved quality) complete with 6 mm thick hard board ground fixed to wooden cleats with C.P. brass screws and washers complete.									
		2						2.000		
		Total Quantity						2.000 No		
		Total Deducted Quantity						0.000 No		
		Net Total Quantity						2.000 No		
		Say 2.000 No @ Rs 1482.11 / No						<b>Rs 2964.22</b>		
42	18.48 Providing and placing on terrace (at all floor levels) polyethylene water storage tank :ISI 12701 marked, with cover and suitable locking arrangement and making necessary holes for inlet, outlet and overflow pipes but without fittings and the base support for tank.									
	at roof	1	1000.000					1000.000		
		Total Quantity						1000.000 Litre		
		Total Deducted Quantity						0.000 Litre		
		Net Total Quantity						1000.000 Litre		
		Say 1000.000 Litre @ Rs 10.18 / Litre						<b>Rs 10180.00</b>		
SI No	Description	No	L	B	D	CF	Quantity	Remark		
<b>13Security Cabin (Cost Index:33.05 %)</b>										
1	2.8.1 Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.All kinds of soil									
	Foundation	2	3.150	0.600	0.700		2.646			
	„	2	1.950	0.600	0.700		1.638			
	Step	1	1.000	0.700	0.100		0.070			
		Total Quantity						4.354 cum		



		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					4.354 cum	
		Say 4.354 cum @ Rs 291.38 / cum					<b>Rs 1268.67</b>	
2	4.1.8 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)							
	Foundation	2	3.150	0.600	0.100		0.378	
	„	2	1.950	0.600	0.100		0.234	
	Step	1	1.000	0.700	0.100		0.070	
	Floor	1	2.500	2.500	0.080		0.500	
		Total Quantity					1.182 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					1.182 cum	
		Say 1.182 cum @ Rs 6687.23 / cum					<b>Rs 7904.31</b>	
3	7.1.1 Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with:Cement mortar 1:6 (1 cement : 6 coarse sand)							
	Foundation	2	3.150	0.600	0.600		2.268	
	„	2	1.950	0.600	0.600		1.404	
	Step	1	3.000	0.450	0.450		0.608	
	Floor	1	2.100	0.450	0.450		0.426	
		Total Quantity					4.706 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					4.706 cum	
		Say 4.706 cum @ Rs 7069.81 / cum					<b>Rs 33270.53</b>	
4	50.6.7.2 Laterate masonry with neatly dressed laterate stone of size 40x20x15cm or nearest size in cement mortar 1:6 for super structure above plinth level up to floor two level including all cost of materials, labour charges etc.							
	Wall	4	2.700	0.200	2.850		6.157	
	Parapet	4	3.200	0.200	0.300		0.769	
	Step	1	1.000	0.600	0.200		0.120	
	„	1	1.000	0.300	0.200		0.060	

	Door	1	1.000	0.200	2.100		-0.420	
	Window	2	1.500	0.200	1.500		-0.900	
	Total Quantity						7.106 cum	
	Total Deducted Quantity						-1.320 cum	
	Net Total Quantity						5.786 cum	
	Say 5.786 cum @ Rs 7872.98 / cum						<b>Rs 45553.06</b>	
5	<p>5.37.1          Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level</p>							
	Plinth Belt	4	2.750	0.250	0.150		0.413	
	Total Quantity						0.413 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.413 cum	
	Say 0.413 cum @ Rs 9700.81 / cum						<b>Rs 4006.43</b>	
6	<p>5.37.2          Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work above plinth level upto floor V level</p>							
	Lintel	4	2.700	0.200	0.150		0.324	
	Shade	1	2.900	0.600	0.100		0.175	
	„	2	1.900	0.600	0.100		0.228	
	Roof slab	1	3.500	3.500	0.120		1.470	
	Total Quantity						2.197 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.197 cum	

	Say 2.197 cum @ Rs 11321.96 / cum						<b>Rs 24874.35</b>	
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more							
	@80 Kg/ 1Cum of CC	1	2.197+.41 3			80.0	208.800	
	Total Quantity						208.800 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						208.800 kilogram	
	Say 208.800 kilogram @ Rs 96.46 / kilogram						<b>Rs 20140.85</b>	
8	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform							
	Lintel	4	2.500		0.150		1.500	
	„	4	2.900		0.150		1.740	
	Bottom	1	1.000	0.200			0.200	
	Bottom	2	1.500	0.200			0.601	
	p-Beam	4	2.500		0.150		1.500	
	„	4	3.000		0.150		1.800	
	Shade	2	2.100	0.600			2.520	
	„	1	3.100	0.600			1.860	
	Side	6	0.600	0.100			0.360	
	Total Quantity						12.081 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						12.081 sqm	
	Say 12.081 sqm @ Rs 800.50 / sqm						<b>Rs 9670.84</b>	
9	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers							
	Slab Bott.	1	2.500	2.500			6.250	
	Proj.	4	3.200	0.300			3.840	
	Edge	4	3.500	0.120			1.680	
	Total Quantity						11.770 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						11.770 sqm	

	Say 11.770 sqm @ Rs 637.64 / sqm						<b>Rs 7505.02</b>	
10	13.1.1 12 mm cement plaster of mix:1:4 ( 1 cement : 4 fine sand)							
	inside wall	4	2.500		3.000		30.000	
	out side	4	2.900		3.000		34.800	
	Basement	4	3.000		0.600		7.200	
	parapet	4	3.300		0.850		11.220	
	Door	1	1.000	2.100			-2.100	
	Window	2	1.500	1.500			-4.500	
	Total Quantity						83.220 sqm	
	Total Deducted Quantity						-6.600 sqm	
	Net Total Quantity						76.620 sqm	
	Say 76.620 sqm @ Rs 308.21 / sqm						<b>Rs 23615.05</b>	
11	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)							
	Roof top	3.1	3.100				9.611	
	Total Quantity						9.611 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						9.611 sqm	
	Say 9.611 sqm @ Rs 393.69 / sqm						<b>Rs 3783.75</b>	
12	13.16.1 6 mm cement plaster of mix:1:3 ( 1 cement : 3 fine sand)							
	Slab bott.	1	2.500	2.500			6.250	
	„ proj.	4	3.200	0.300			3.840	
	Slab edge	4	3.500	0.120			1.680	
	Shade	2*2	1.900	0.600			4.560	
	„	2	3.000	0.600			3.600	
	Shade edge	6	0.600	0.100			0.360	
	Total Quantity						20.290 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						20.290 sqm	
	Say 20.290 sqm @ Rs 262.57 / sqm						<b>Rs 5327.55</b>	
13	11.41.2 Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer)							

	with water absorption less than 0.08% and conforming to IS : 15622, of approved make, in all colours and shades, laid on 20 mm thick cement mortar 1:4(1 cement : 4 coarse sand), including grouting the joints with white cement and matching pigments etc., complete.Size of Tile 600 x 600 mm.						
	Floor	1	2.500	2.500			6.250
	Skirting	1	10.000	0.100			1.000
	Step	1	1.000	0.600			0.600
	,, side	2	0.600	0.200			0.240
	,,	2	0.300	0.200			0.120
	Rise	1	1.000	0.600			0.600
	Total Quantity						8.810 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						8.810 sqm
	Say 8.810 sqm @ Rs 1733.18 / sqm						<b>Rs 15269.32</b>
14	21.1.1.1 Providing and fixing aluminium work for doors, windows, ventilators and partitions with extruded built up standard tubular sections/ appropriate Z sections and other sections of approved make conforming to IS : 733 and IS: 1285, fixing with dash fasteners of required dia and size, including necessary filling up the gaps at junctions, i.e. at top, bottom and sides with required EPDM rubber/ neoprene gasket etc. Aluminium sections shall be smooth, rust free, straight, mitred and jointed mechanically wherever required including cleat angle, Aluminium snap beading for glazing /paneling, C.P. brass/ stainless steel screws, all complete as per architectural drawings and the directions of Engineer-in-charge.(Glazing, paneling and dash fasteners to be paid for separately):For fixed portionAnodised aluminium (anodised transparent or dyed to required shade according to IS : 1868, Minimum anodic coating of grade AC 15)						
	Door	1	1.000	2.100		4.5	9.451
	window	2	1.500	1.500		4.5	20.250
	Total Quantity						29.701 kg
	Total Deducted Quantity						0.000 kg
	Net Total Quantity						29.701 kg
	Say 29.701 kg @ Rs 489.69 / kg						<b>Rs 14544.28</b>
15	21.3.1 Providing and fixing glazing in aluminium door, window, ventilator shutters and partitions etc. with EPDM rubber / neoprene gasket etc. complete as per the architectural drawings and the directions of Engineer - in -Charge. ( Cost of aluminium snap beading shall be paid in basic item):With float glass panes of 4.0 mm thickness						
	Door	1*2	0.880	0.900			1.584
	window	2*2	0.920	1.430			5.263
	Total Quantity						6.847 sqm

		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					6.847 sqm	
		Say 6.847 sqm @ Rs 1154.61 / sqm					<b>Rs 7905.61</b>	
16	9.48.2 Providing and fixing M.S. Grills of required pattern in frames of windows etc. with M.S. flats, square or round bars etc. including priming coat with approved steel primer all complete.Fixed to openings/ wooden frames with rawl plugs screws etc							
	Window grill	2	1.500	1.500		20.0	90.000	
		Total Quantity					90.000 kg	
		Total Deducted Quantity					0.000 kg	
		Net Total Quantity					90.000 kg	
		Say 90.000 kg @ Rs 211.95 / kg					<b>Rs 19075.50</b>	
17	13.43.1 Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface:Water thinnable cement primer							
	inside wall	4	2.500		3.000		30.000	
	out side	4	2.900		3.000		34.800	
	Basement	4	3.000		0.600		7.200	
	parapet	4	3.300		0.850		11.220	
	Slab bott.	1	2.500	2.500			6.250	
	„ proj.	4	3.200	0.300			3.840	
	Slab edge	4	3.500	0.120			1.680	
	Shade	2*2	1.900	0.600			4.560	
	„	2	3.000	0.600			3.600	
	Shade edge	6	0.600	0.100			0.360	
		Total Quantity					103.510 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					103.510 sqm	
		Say 103.510 sqm @ Rs 69.32 / sqm					<b>Rs 7175.31</b>	
18	13.82.2 Wall painting with acrylic emulsion paint, having VOC (Volatile Organic Compound) content less than 50 grams/ litre, of approved brand and manufacture including applying additional coats wherever required, to achieve even shade and colour.Two coats							
	inside wall	4	2.500		3.000		30.000	
	out side	4	2.900		3.000		34.800	

	Basement	4	3.000		0.600		7.200		
	parapet	4	3.300		0.850		11.220		
	Slab bott.	1	2.500	2.500			6.250		
	„ proj.	4	3.200	0.300			3.840		
	Slab edge	4	3.500	0.120			1.680		
	Shade	2*2	1.900	0.600			4.560		
	„	2	3.000	0.600			3.600		
	Shade edge	6	0.600	0.100			0.360		
	Total Quantity						103.510 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						103.510 sqm		
	Say 103.510 sqm @ Rs 123.40 / sqm						<b>Rs 12773.13</b>		
19	13.62.1 Painting with synthetic enamel paint of approved brand and manufacture of required colour to give an even shade:Two or more coats on new work over an under coat of suitable shade with ordinary paint of approved brand and manufacture .								
	Window grill	2	1.500	1.500			4.500		
	Total Quantity						4.500 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						4.500 sqm		
	Say 4.500 sqm @ Rs 204.63 / sqm						<b>Rs 920.84</b>		
20	17.7.2 Providing and fixing wash basin with C.I. brackets, 15 mm C.P. brass pillar taps, 32 mm C.P. brass waste of standard pattern, including painting of fittings and brackets, cutting and making good the walls wherever require:White Vitreous China Wash basin size 630 x 450 mm with a single 15 mm C.P. brass pillar tap								
	on out side wall	1					1.000		
	Total Quantity						1.000 No		
	Total Deducted Quantity						0.000 No		
	Net Total Quantity						1.000 No		
	Say 1.000 No @ Rs 3177.83 / No						<b>Rs 3177.83</b>		
21	18.9.2 Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings. This includes jointing of pipes & fittings with one step CPVC solvent cement, trenching , refilling & testing of joints complete as per direction of Engineer- in-Charge. External work20 mm nominal outer dia pipes								

		1	25.000				25.000	
	Total Quantity						25.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						25.000 metre	
	Say 25.000 metre @ Rs 293.04 / metre						<b>Rs 7326.00</b>	
22	18.9.3 Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings. This includes jointing of pipes & fittings with one step CPVC solvent cement, trenching , refilling & testing of joints complete as per direction of Engineer- in-Charge. External work25 mm nominal outer dia pipes							
		1	25.000				25.000	
	Total Quantity						25.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						25.000 metre	
	Say 25.000 metre @ Rs 377.26 / metre						<b>Rs 9431.50</b>	
23	18.9.4 Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings. This includes jointing of pipes & fittings with one step CPVC solvent cement, trenching , refilling & testing of joints complete as per direction of Engineer- in-Charge. External work32 mm nominal outer dia pipes							
		1	25.000				25.000	
	Total Quantity						25.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						25.000 metre	
	Say 25.000 metre @ Rs 477.85 / metre						<b>Rs 11946.25</b>	
24	17.31 Providing and fixing 600x450 mm beveled edge mirror of superior glass (of approved quality) complete with 6 mm thick hard board ground fixed to wooden cleats with C.P. brass screws and washers complete.							
		1					1.000	
	Total Quantity						1.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						1.000 No	
	Say 1.000 No @ Rs 1482.11 / No						<b>Rs 1482.11</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>14Air Blower Building (Cost Index:33.05 %)</b>								



1	2.8.1 Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.All kinds of soil								
	Column	12	1.900	1.900	1.500		64.981		
		4	1.600	1.600	1.500		15.361		
	Ramp	1	2.500	2.000	0.150		0.750		
	Total Quantity						81.092 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						81.092 cum		
	Say 81.092 cum @ Rs 291.38 / cum							<b>Rs 23628.59</b>	
2	4.1.5 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)								
	Footing	12	1.900	1.900	0.100		4.332		
	„	4	1.600	1.600	0.100		1.025		
	Ramp	1	2.500	2.000	0.150		0.750		
	Kerala Water Authority Total Quantity						6.107 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						6.107 cum		
	Say 6.107 cum @ Rs 7229.54 / cum							<b>Rs 44150.80</b>	
3	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete								
	Footing - at corner	4*4	1.400		0.150		3.360		
	„ at intermediate	8*4	1.700		0.150		8.160		
	„ inside	4*4	1.700		0.150		4.080		
	Total Quantity						15.600 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						15.600 sqm		
	Say 15.600 sqm @ Rs 329.03 / sqm							<b>Rs 5132.87</b>	
4	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform								

	Roof slab	1	11.000	9.000			99.000	
	Edge	1	40.000		0.120		4.800	
	Total Quantity						103.800 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						103.800 sqm	
	Say 103.800 sqm @ Rs 800.50 / sqm						<b>Rs 83091.90</b>	
5	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers							
	Plinth beam - inside	1	35.800		0.500		17.900	
	„ outside	1	37.800		0.500		18.900	
	Beam side	4*2	8.200		0.500		32.800	
	„ Bottom	4	8.200	0.200			6.560	
	Beam side	4*2	10.200		0.500		40.800	
	„ side	4	10.200	0.200			8.160	
	Lintel	2	18.000		0.200		7.200	
	„	2	18.800		0.200		7.521	
	Shade	1	36.330	0.600			21.798	
	„	1	3.670	0.750			2.753	
	Shade side	8	0.600	0.100			0.480	
	Ramp	1	5.000	2.000			10.000	
	„	2	2.000	0.200			0.800	
	„	1	5.000	0.200			1.000	
	Total Quantity						176.672 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						176.672 sqm	
	Say 176.672 sqm @ Rs 637.64 / sqm						<b>Rs 112653.13</b>	
6	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts							
	Column Pedestal	16	1.400		0.500		11.200	
	column	16	1.400	5.200			116.480	
	Total Quantity						127.680 sqm	
	Total Deducted Quantity						0.000 sqm	

	Net Total Quantity						127.680 sqm	
	Say 127.680 sqm @ Rs 847.46 / sqm						<b>Rs 108203.69</b>	
7	<p>5.37.1          Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level</p>							
	Column footing	4	1.400	1.400	0.150		1.176	
	„ Sloped Portion	4	1.400	1.400	0.75/3		1.960	
	Column footing	8	1.700	1.700	0.150		3.468	
	„ Sloped Portion	8	1.700	1.700	0.75/3		5.780	
	Column footing	4	1.700	1.700	0.150		1.734	
	„ Sloped Portion	4	1.700	1.700	0.75/3		2.890	
	Column Pedestal	16	0.500	0.200	0.500		0.800	
	Plinth beam	1	37.800	0.200	0.500		3.780	
	Grade slab	1	10.400	8.400	0.200		17.473	
	Total Quantity						39.061 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						39.061 cum	
	Say 39.061 cum @ Rs 9700.81 / cum						<b>Rs 378923.34</b>	
8	<p>5.37.2          Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work above plinth level upto floor V level</p>							
	Lintel	1	37.600	0.200	0.200		1.505	
	Shade	1	3.670	0.750	0.100		0.276	
	Shade	1	36.330	0.600	0.100		2.180	

	Ramp	1	5.000	2.000	0.200		2.000		
	Column	16	0.200	0.500	5.200		8.320		
	Beam	4	8.200	0.200	0.500		3.280		
	„	4	10.200	0.200	0.500		4.080		
	Slab	1	11.000	9.000	0.120		11.880		
	Total Quantity						33.521 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						33.521 cum		
	Say 33.521 cum @ Rs 11321.96 / cum						<b>Rs 379523.42</b>		
9	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more								
	@ 100 Kg / 1 Cum of CC	1	39.061+33.52			100.0	7258.100		
	Total Quantity						7258.100 kilogram		
	Total Deducted Quantity						0.000 kilogram		
	Net Total Quantity						7258.100 kilogram		
	Say 7258.100 kilogram @ Rs 96.46 / kilogram						<b>Rs 700116.33</b>		
10	50.2.26.1 Kerala Water Authority Filling with contractor own earth (excluding rock) in open areas in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m as per direction of site Engineer-in-charge.								
	Basement Filling	1	10.000	8.000	0.500		40.000		
	Total Quantity						40.000 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						40.000 cum		
	Say 40.000 cum @ Rs 289.98 / cum						<b>Rs 11599.20</b>		
11	50.6.7.2 Laterate masonry with neatly dressed laterate stone of size 40x20x15cm or nearest size in cement mortar 1:6 for super structure above plinth level up to floor two level including all cost of materials, labour charges etc.								
	wall	6	2.670	0.200	4.500		14.418		
	„	6	2.330	0.200	4.500		12.582		
	Window	11	1.500	0.200	1.500		-4.950		
	Rs	1	2.000	0.200	2.400		-0.960		
	Total Quantity						27.000 cum		

	Total Deducted Quantity						-5.910 cum	
	Net Total Quantity						21.090 cum	
	Say 21.090 cum @ Rs 7872.98 / cum						<b>Rs 166041.15</b>	
12	13.1.1 12 mm cement plaster of mix:1:4 ( 1 cement : 4 fine sand)							
	Outside	2	10.400		5.200		108.161	
	„	2	8.400		5.200		87.361	
	Inside	1	36.000		5.200		187.201	
	Column	4	1.400		5.200		29.120	
	Opening side	1	6.800		0.230		1.564	
	Parapet	1	39.600		0.850		33.661	
	Shade Top	1	36.330		0.600		21.798	
	„	1	3.670		0.750		2.753	
	Window	11	1.500		1.500		-24.750	
	Rs	1*2	2.000		2.400		-9.600	
	Total Quantity						471.619 sqm	
	Total Deducted Quantity						-34.350 sqm	
	Net Total Quantity						437.269 sqm	
	Say 437.269 sqm @ Rs 308.21 / sqm						<b>Rs 134770.68</b>	
13	13.16.1 6 mm cement plaster of mix:1:3 ( 1 cement : 3 fine sand)							
	Ceiling	1	10.000	8.000			80.000	
	Beam side	2*2	10.000		0.500		20.000	
	„	2*2	8.000		0.500		16.000	
	Shade Bott.	1	36.330		0.600		21.798	
	„	1	3.670		0.750		2.753	
	Slab Proj.	2	8.400	0.300			5.040	
	„	2	11.000	0.300			6.600	
	Edge	1	40.000	0.120			4.800	
	Total Quantity						156.991 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						156.991 sqm	
	Say 156.991 sqm @ Rs 262.57 / sqm						<b>Rs 41221.13</b>	

14	13.43.1 Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface:Water thinnable cement primer						
	Outside	2	10.400		5.200		108.161
	„	2	8.400		5.200		87.361
	Inside	1	36.000		5.200		187.201
	Column	4	1.400		5.200		29.120
	Opening side	1	6.800		0.230		1.564
	Parapet	1	39.600		0.850		33.661
	Shade Top	1	36.330		0.600		21.798
	„	1	3.670		0.750		2.753
	Window	11	1.500		1.500		-24.750
	Rs	1*2	2.000		2.400		-9.600
	Ceiling	1	10.000	8.000			80.000
	Beam side	2*2	10.000		0.500		20.000
	„	2*2	8.000		0.500		16.000
	Shade Bott.	1	36.330		0.600		21.798
	„	1	3.670		0.750		2.753
	Slab Proj.	2	8.400	0.300			5.040
	„	2	11.000	0.300			6.600
	Edge	1	40.000	0.120			4.800
	Total Quantity						628.610 sqm
	Total Deducted Quantity						-34.350 sqm
	Net Total Quantity						594.260 sqm
	Say 594.260 sqm @ Rs 69.32 / sqm						<b>Rs 41194.10</b>
15	13.82.2 Wall painting with acrylic emulsion paint, having VOC (Volatile Organic Compound) content less than 50 grams/ litre, of approved brand and manufacture including applying additional coats wherever required, to achieve even shade and colour.Two coats						
	Outside	2	10.400		5.200		108.161
	„	2	8.400		5.200		87.361
	Inside	1	36.000		5.200		187.201
	Column	4	1.400		5.200		29.120
	Opening side	1	6.800		0.230		1.564

	Parapet	1	39.600		0.850		33.661	
	Shade Top	1	36.330		0.600		21.798	
	„	1	3.670		0.750		2.753	
	Window	11	1.500		1.500		-24.750	
	Rs	1*2	2.000		2.400		-9.600	
	Ceiling	1	10.000	8.000			80.000	
	Beam side	2*2	10.000		0.500		20.000	
	„	2*2	8.000		0.500		16.000	
	Shade Bott.	1	36.330		0.600		21.798	
	„	1	3.670		0.750		2.753	
	Slab Proj.	2	8.400	0.300			5.040	
	„	2	11.000	0.300			6.600	
	Edge	1	40.000	0.120			4.800	
						Total Quantity	628.610 sqm	
						Total Deducted Quantity	-34.350 sqm	
						Net Total Quantity	594.260 sqm	
						Say 594.260 sqm @ Rs 123.40 / sqm	<b>Rs 73331.68</b>	
16	11.41.2 Kerala Water Authority Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS : 15622, of approved make, in all colours and shades, laid on 20 mm thick cement mortar 1:4(1 cement : 4 coarse sand), including grouting the joints with white cement and matching pigments etc., complete. Size of Tile 600 x 600 mm.							
	Floor finishing	1	10.000	8.000			80.000	
	Skirting	1	36.000	0.100			3.600	
						Total Quantity	83.600 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	83.600 sqm	
						Say 83.600 sqm @ Rs 1733.18 / sqm	<b>Rs 144893.85</b>	
17	10.4 Providing and fixing 1 mm thick M.S. sheet sliding- shutters, with frame and diagonal braces of 40x40x6 mm angle iron, 3 mm M.S. gusset plates at the junction and corners, 25 mm dia pulley, 40x40x6 mm angle and T-iron guide at the top and bottom respectively, including applying a priming coat of approved steel primer.							
	Windows	11	1.500		1.500		24.750	
						Total Quantity	24.750 sqm	

							Total Deducted Quantity	0.000 sqm		
							Net Total Quantity	24.750 sqm		
							Say 24.750 sqm @ Rs 5765.99 / sqm	<b>Rs 142708.25</b>		
18	10.6.1	Supplying and fixing rolling shutters of approved make, made of required size M.S. laths, interlocked together through their entire length and jointed together at the end by end locks, mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation complete, including the cost of providing and fixing necessary 27.5 cm long wire springs manufactured from high tensile steel wire of adequate strength conforming to IS: 4454 - part 1 and M.S. top cover of required thickness for rolling shutters.80x1.25 mm M.S. laths with 1.25 mm thick top cover								
	Front Op.	1	2.000		2.400		4.800			
							Total Quantity	4.800 sqm		
							Total Deducted Quantity	0.000 sqm		
							Net Total Quantity	4.800 sqm		
							Say 4.800 sqm @ Rs 3400.56 / sqm	<b>Rs 16322.69</b>		
19	13.61.1	Painting with synthetic enamel paint of approved brand and manufacture to give an even shade:Two or more coats on new work								
	Windows	11	1.500		1.500	2.0	49.500			
	Rs	1	2.000		2.400	2.5	12.000			
							Total Quantity	61.500 sqm		
							Total Deducted Quantity	0.000 sqm		
							Net Total Quantity	61.500 sqm		
							Say 61.500 sqm @ Rs 140.37 / sqm	<b>Rs 8632.76</b>		
SI No	Description	No	L	B	D	CF	Quantity	Remark		
<b>15Chlorination Building (Cost Index:33.05 %)</b>										
1	2.8.1	Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.All kinds of soil								
	Column Footing	10	1.700	1.700	1.500		43.350			
	Ramp	1	3.000	3.000	0.150		1.350			
	Neutralization pit	1	3.100	3.100	1.800		17.298			
							Total Quantity	61.998 cum		
							Total Deducted Quantity	0.000 cum		



	Net Total Quantity						61.998 cum	
	Say 61.998 cum @ Rs 291.38 / cum						<b>Rs 18064.98</b>	
2	4.1.5 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)							
	Column Footing	10	1.700	1.700	0.100		2.890	
	Ramp	1	3.000	3.000	0.150		1.350	
	Neutralization pit	1	3.100	3.100	0.100		0.962	
	Flooring	1	10.000	8.000	0.100		8.000	
	Total Quantity						13.202 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						13.202 cum	
	Say 13.202 cum @ Rs 7229.54 / cum						<b>Rs 95444.39</b>	
3	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
	Footing	10*4	1.500	1.500	0.200		18.000	
	Total Quantity						18.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						18.000 sqm	
	Say 18.000 sqm @ Rs 329.03 / sqm						<b>Rs 5922.54</b>	
4	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform							
	Shade	1	36.330	0.600			21.798	
	„	1	3.670	0.750			2.753	
	Slab	1	11.000	9.000			99.000	
	Slab edge	1	40.000		0.120		4.800	
	Total Quantity						128.351 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						128.351 sqm	
	Say 128.351 sqm @ Rs 800.50 / sqm						<b>Rs 102744.98</b>	
5	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers							

	Plinth beam- outer	1	37.600		0.450		16.920	
	„	1	36.000		0.450		16.200	
	Ramp	2*0.5	3.000		0.450		1.350	
	Lintel	6*2	3.000		0.150		5.400	
	„	4*2	3.450		0.150		4.140	
	Beam	6*2	3.000		0.300		10.800	
	„	4*2	3.450		0.300		8.280	
	„	2*2	8.000		0.600		19.200	
	„	6*2	3.000		0.300		10.800	
	Tunner support	2*2	1.500		0.450		2.700	
	„	2*2	5.000		0.450		9.000	
						Total Quantity	104.790 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	104.790 sqm	
						Say 104.790 sqm @ Rs 637.64 / sqm	<b>Rs 66818.30</b>	
6	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts							
	Column Pedestal	10	1.400		0.700		9.800	
	Column above Plinth	10	1.400		5.000		70.000	
	Neutralization pit outer	4	2.900		1.700		19.720	
	„ inner	4	2.500		1.500		15.000	
						Total Quantity	114.520 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	114.520 sqm	
						Say 114.520 sqm @ Rs 847.46 / sqm	<b>Rs 97051.12</b>	
7	50.2.26.1 Filling with contractor own earth (excluding rock) in open areas in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m as per direction of site Engineer-in-charge.							
	Basement inside	1	10.000	8.000	0.400		32.000	
	Pit	1	2.900	2.900	0.400		-3.364	
						Total Quantity	32.000 cum	
						Total Deducted Quantity	-3.364 cum	

	Net Total Quantity						28.636 cum	
	Say 28.636 cum @ Rs 289.98 / cum						<b>Rs 8303.87</b>	
8	<p>5.37.1          Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level</p>							
	Footing	10	1.500	1.500	0.200		4.500	
	,, Sloped portion	10/3	1.500	1.500	0.500		3.750	
	Column Pedestal	10	0.200	0.500	0.700		0.700	
	Plinth beam	2	10.400	0.200	0.450		1.872	
	,,	2	8.000	0.200	0.450		1.441	
	Ramp	1/2	3.000	2.000	0.450		1.350	
	Naturalization pit	1	2.900	2.900	0.200		1.683	
	,, wall	4	2.700	0.200	1.500		3.240	
	Total Quantity						18.536 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						18.536 cum	
	Say 18.536 cum @ Rs 9700.81 / cum						<b>Rs 179814.21</b>	
9	<p>5.37.2          Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work above plinth level upto floor V level</p>							
	Column above plinth	10	0.200	0.500	4.900		4.900	
	Lintel	6	3.000	0.200	0.150		0.540	
	,,	4	3.450	0.200	0.150		0.415	
	Shade	1	36.330	0.600	0.100		2.180	

	„	1	3.670	0.750	0.100		0.276		
	Beam	6	3.000	0.200	0.300		1.080		
	„	4	3.450	0.200	0.300		0.829		
	„	2	8.000	0.200	0.600		1.920		
	„	6	3.000	0.200	0.300		1.080		
	Slab	1	11.000	9.000	0.120		11.880		
	Tunner support	2	1.500	0.300	0.450		0.405		
	„	2	5.000	0.300	0.450		1.350		
			Total Quantity					26.855 cum	
			Total Deducted Quantity					0.000 cum	
			Net Total Quantity					26.855 cum	
			Say 26.855 cum @ Rs 11321.96 / cum					<b>Rs 304051.24</b>	
10	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more								
	@100 Kg 1Cum of CC	1	26.855+18.536			100.0	4539.100		
			Total Quantity					4539.100 kilogram	
			Total Deducted Quantity					0.000 kilogram	
			Net Total Quantity					4539.100 kilogram	
			Say 4539.100 kilogram @ Rs 96.46 / kilogram					<b>Rs 437841.59</b>	
11	50.6.7.2 Laterate masonry with neatly dressed laterate stone of size 40x20x15cm or nearest size in cement mortar 1:6 for super structure above plinth level up to floor two level including all cost of materials, labour charges etc.								
	wall	6	3.000	0.200	4.500		16.201		
	„	4	3.450	0.200	4.500		12.421		
	Ramp side	2*1/2	3.000	0.200	0.450		0.271		
	Parapet	1	39.200	0.200	0.300		2.353		
	Window	3	1.500	0.200	1.500		-1.350		
	Opening	4	2.000	0.200	2.100		-3.360		
	Door	1	1.000	0.200	2.400		-0.480		
	Rs	1	3.000	0.200	3.000		-1.800		
			Total Quantity					31.246 cum	
			Total Deducted Quantity					-6.990 cum	

	Net Total Quantity						24.256 cum	
	Say 24.256 cum @ Rs 7872.98 / cum						<b>Rs 190967.00</b>	
12	13.1.1 12 mm cement plaster of mix:1:4 ( 1 cement : 4 fine sand)							
	Outer wall	1	37.600		5.000		188.000	
	inner wall	1	36.000		5.000		180.000	
	pit inside	1	2.500	2.500			6.250	
	„	4	2.500	1.500			15.000	
	Tunnr Stand	2	1.500	1.200			3.600	
	„	2	5.000	1.200			12.000	
	side	2*4	0.300	0.450			1.080	
	Parapet	1	39.200	0.850			33.320	
	Shade top	1	36.330	0.600			21.798	
	„	1	3.670	0.750			2.753	
	Edge	8	0.600	0.100			0.480	
	Window	3	1.500		1.500		-6.750	
	Door	1	1.000		2.400		-2.400	
	Rs	1*2	3.000		3.000		-18.000	
	Op	4*2	2.000		2.100		-33.600	
						Total Quantity	464.281 sqm	
						Total Deducted Quantity	-60.750 sqm	
						Net Total Quantity	403.531 sqm	
						Say 403.531 sqm @ Rs 308.21 / sqm	<b>Rs 124372.29</b>	
13	13.16.1 6 mm cement plaster of mix:1:3 ( 1 cement : 3 fine sand)							
	Shade	1	36.330	0.600			21.798	
	„	1	3.670	0.750			2.753	
	Ceiling	1	10.000	8.000			80.000	
	Beam	2*2	8.000	0.600			19.200	
	„	2*2	10.000	0.300			12.000	
	Slab Proj.	1	38.800	0.300			11.640	
	Slab Edge	1	40.000	0.120			4.800	
						Total Quantity	152.191 sqm	

		Total Deducted Quantity				0.000 sqm	
		Net Total Quantity				152.191 sqm	
		Say 152.191 sqm @ Rs 262.57 / sqm				<b>Rs 39960.79</b>	
14	<p>11.41.2 Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS : 15622, of approved make, in all colours and shades, laid on 20 mm thick cement mortar 1:4(1 cement : 4 coarse sand), including grouting the joints with white cement and matching pigments etc., complete.Size of Tile 600 x 600 mm.</p>						
	Flor finishing	1	10.000	8.000			80.000
	Skirting	1	36.000	0.100			3.600
		Total Quantity				83.600 sqm	
		Total Deducted Quantity				0.000 sqm	
		Net Total Quantity				83.600 sqm	
		Say 83.600 sqm @ Rs 1733.18 / sqm				<b>Rs 144893.85</b>	
15	<p>13.43.1 Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface:Water thinnable cement primer</p>						
	Outer wall	1	37.600		5.000		188.000
	inner wall	1	36.000		5.000		180.000
	pit inside	1	2.500	2.500			6.250
	„	4	2.500	1.500			15.000
	Tunnr Stand	2	1.500	1.200			3.600
	„	2	5.000	1.200			12.000
	side	2*4	0.300	0.450			1.080
	Parapet	1	39.200	0.850			33.320
	Shade top	1	36.330	0.600			21.798
	„	1	3.670	0.750			2.753
	Edge	8	0.600	0.100			0.480
	Window	3	1.500		1.500		-6.750
	Door	1	1.000		2.400		-2.400
	Rs	1*2	3.000		3.000		-18.000
	Op	4*2	2.000		2.100		-33.600
	Shade	1	36.330	0.600			21.798
	„	1	3.670	0.750			2.753
	Ceiling	1	10.000	8.000			80.000

	Beam	2*2	8.000	0.600			19.200		
	„	2*2	10.000	0.300			12.000		
	Slab Proj.	1	38.800	0.300			11.640		
	Slab Edge	1	40.000	0.120			4.800		
	Total Quantity						616.472 sqm		
	Total Deducted Quantity						-60.750 sqm		
	Net Total Quantity						555.722 sqm		
	Say 555.722 sqm @ Rs 69.32 / sqm							<b>Rs 38522.65</b>	
16	13.82.2 Wall painting with acrylic emulsion paint, having VOC (Volatile Organic Compound) content less than 50 grams/ litre, of approved brand and manufacture including applying additional coats wherever required, to achieve even shade and colour. Two coats								
	Outer wall	1	37.600		5.000		188.000		
	inner wall	1	36.000		5.000		180.000		
	pit inside	1	2.500	2.500			6.250		
	„	4	2.500	1.500			15.000		
	Tunnr Stand	2	1.500	1.200			3.600		
	„	2	5.000	1.200			12.000		
	side	2*4	0.300	0.450			1.080		
	Parapet	1	39.200	0.850			33.320		
	Shade top	1	36.330	0.600			21.798		
	„	1	3.670	0.750			2.753		
	Edge	8	0.600	0.100			0.480		
	Window	3	1.500		1.500		-6.750		
	Door	1	1.000		2.400		-2.400		
	Rs	1*2	3.000		3.000		-18.000		
	Op	4*2	2.000		2.100		-33.600		
	Shade	1	36.330	0.600			21.798		
	„	1	3.670	0.750			2.753		
	Ceiling	1	10.000	8.000			80.000		
	Beam	2*2	8.000	0.600			19.200		
	„	2*2	10.000	0.300			12.000		
	Slab Proj.	1	38.800	0.300			11.640		
	Slab Edge	1	40.000	0.120			4.800		

						Total Quantity	616.472 sqm
						Total Deducted Quantity	-60.750 sqm
						Net Total Quantity	555.722 sqm
						Say 555.722 sqm @ Rs 123.40 / sqm	<b>Rs 68576.09</b>
17	10.4	Providing and fixing 1 mm thick M.S. sheet sliding- shutters, with frame and diagonal braces of 40x40x6 mm angle iron, 3 mm M.S. gusset plates at the junction and corners, 25 mm dia pulley, 40x40x6 mm angle and T-iron guide at the top and bottom respectively, including applying a priming coat of approved steel primer.					
	Window	3	1.500		1.500		6.750
						Total Quantity	6.750 sqm
						Total Deducted Quantity	0.000 sqm
						Net Total Quantity	6.750 sqm
						Say 6.750 sqm @ Rs 5765.99 / sqm	<b>Rs 38920.43</b>
18	10.5.1	Providing and fixing 1 mm thick M.S. sheet door with frame of 40x40x6 mm angle iron and 3 mm M.S. gusset plates at the junctions and corners, all necessary fittings complete, including applying a priming coat of approved steel primer.Using M.S. angels 40x40x6 mm for diagonal braces					
	Door	1	1.000	2.400			2.400
						Total Quantity	2.400 sqm
						Total Deducted Quantity	0.000 sqm
						Net Total Quantity	2.400 sqm
						Say 2.400 sqm @ Rs 5114.64 / sqm	<b>Rs 12275.14</b>
19	10.6.1	Supplying and fixing rolling shutters of approved make, made of required size M.S. laths, interlocked together through their entire length and jointed together at the end by end locks, mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation complete, including the cost of providing and fixing necessary 27.5 cm long wire springs manufactured from high tensile steel wire of adequate strength conforming to IS: 4454 - part 1 and M.S. top cover of required thickness for rolling shutters.80x1.25 mm M.S. laths with 1.25 mm thick top cover					
	Front gate	1	3.000		3.000		9.000
						Total Quantity	9.000 sqm
						Total Deducted Quantity	0.000 sqm
						Net Total Quantity	9.000 sqm
						Say 9.000 sqm @ Rs 3400.56 / sqm	<b>Rs 30605.04</b>
20	13.61.1						



	Painting with synthetic enamel paint of approved brand and manufacture to give an even shade:Two or more coats on new work							
	Door	1	1.000		2.400	2.25	5.400	
	Window	3	1.500		1.500	2.0	13.500	
	Rs	1	3.000		3.000	2.5	22.500	
	Total Quantity						41.400 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						41.400 sqm	
	Say 41.400 sqm @ Rs 140.37 / sqm						<b>Rs 5811.32</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>16Transformer Building (Cost Index:33.05 %)</b>								
1	2.8.1 Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.All kinds of soil							
	Column Footing	15	1.900	1.900	1.500		81.225	
	Ramp	3	3.000	2.000	0.150		2.700	
	Cable Trench	1	20.000	1.000	0.850		17.000	
	Total Quantity						100.925 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						100.925 cum	
	Say 100.925 cum @ Rs 291.38 / cum						<b>Rs 29407.53</b>	
2	4.1.8 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)							
	Column Footing	15	1.900	1.900	0.100		5.415	
	Ramp	3	3.000	2.000	0.100		1.801	
	Cable Trench	1	20.000	1.000	0.100		2.000	
	Total Quantity						9.216 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						9.216 cum	
	Say 9.216 cum @ Rs 6687.23 / cum						<b>Rs 61629.51</b>	
3	5.1.2 Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of							

	centering, shuttering, finishing and reinforcement - All work up to plinth level:1:1:5:3 (1 cement 1.5 coarse sand :3 graded stone aggregate 20 mm nominal size							
	Column Footing	15	1.700	1.700	0.250		10.838	
	Trapezoidal Portion	15/3	1.700	1.700	0.500		7.225	
	Column pedestal	15	0.200	0.500	1.100		1.651	
	Plinth Beam	2	3.700	0.200	0.450		0.667	
	„	3	4.900	0.200	0.450		1.324	
	„	3*4	3.150	0.200	0.450		3.402	
	Ramp Top	3	3.000	3.000	0.100		2.700	
	Total Quantity						27.807 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						27.807 cum	
	Say 27.807 cum @ Rs 8914.95 / cum						<b>Rs 247898.01</b>	
4	50.5.33.2 Providing and laying in position machine batched and machine mixed design mix M-20 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge. Note:- Cement content considered in this item is @ 330 kg/cum. Excess or less cement used as per design mix is payable or recoverable separately. All work above plinth level upto floor V level							
	Column Above plinth	15	0.200	0.500	5.000		7.500	
	Lintel	2	8.600	0.200	0.200		0.688	
	„	12	3.150	0.200	0.200		1.512	
	Shade	1	14.800	0.600	0.100		0.889	
	„	2	10.100	0.600	0.100		1.212	
	„	1	14.800	0.750	0.100		1.110	
	Girder Beam	2	13.200	0.300	0.300		2.376	
	Corbell	2*5	0.200	0.400	0.450		0.361	
	Roof beam	2	8.600	0.200	0.500		1.720	
	„	12	3.150	0.200	0.300		2.268	
	Roof slab	1	14.200	10.700	0.120		18.233	
	Total Quantity						37.869 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						37.869 cum	

	Say 37.869 cum @ Rs 10858.34 / cum						<b>Rs 411194.48</b>
5	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete						
	Footing Side	15*4	1.700		0.250		25.500
	Ramb side	3*2	3.000	0.100			1.801
	Total Quantity						27.301 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						27.301 sqm
	Say 27.301 sqm @ Rs 329.03 / sqm						<b>Rs 8982.85</b>
6	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform						
	Shade	1	14.800	0.600			8.880
	„	2	10.100	0.600			12.120
	„	1	14.800	0.750			11.101
	Edge	1	36.200	0.100			3.621
	„	1	16.000	0.100			1.600
	Roof Slab	4	3.150	4.000			50.400
	„	4	3.150	5.500			69.300
	Slab Pro.	1	48.600	0.300			14.580
	Slab edge	1	49.800	0.120			5.976
	Total Quantity						177.578 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						177.578 sqm
	Say 177.578 sqm @ Rs 800.50 / sqm						<b>Rs 142151.19</b>
7	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers						
	lintel	12*2	3.150	0.200			15.121
	„	2*2	8.600	0.200			6.880
	Girder beam	2*1	13.200	0.900			23.760
	Roof Beem	12*2	3.150	0.300			22.680
	„	2*2	8.600	0.500			17.200

	Plinth beam	12*2	3.150	0.450			34.020		
	„	2*2	3.700	0.450			6.660		
	„	3*2	4.900	0.450			13.230		
	Total Quantity						139.551 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						139.551 sqm		
	Say 139.551 sqm @ Rs 637.64 / sqm						<b>Rs 88983.30</b>		
8	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts								
	Column Pedestal	15	1.400	1.100			23.100		
	„,Colun	15	1.400	5.000			105.000		
	Corbel	10	0.400	1.100			4.400		
	„	10	0.200	0.450			0.901		
	Total Quantity						133.401 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						133.401 sqm		
	Say 133.401 sqm @ Rs 847.46 / sqm						<b>Rs 113052.01</b>		
9	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more								
	@ 100Kg of Steel per 1Cum of cc	1	27.807+37 .869			100.0	6567.600		
	Total Quantity						6567.600 kilogram		
	Total Deducted Quantity						0.000 kilogram		
	Net Total Quantity						6567.600 kilogram		
	Say 6567.600 kilogram @ Rs 96.46 / kilogram						<b>Rs 633510.70</b>		
10	50.6.7.2 Laterate masonry with neatly dressed laterate stone of size 40x20x15cm or nearest size in cement mortar 1:6 for super structure above plinth level up to floor two level including all cost of materials, labour charges etc.								
	Wall	12	3.150	0.200	4.700		35.532		
	„	2	3.700	0.200	4.500		6.661		
	„	3	4.900	0.200	4.500		13.230		
	cable trench	2	20.000	0.200	0.750		6.000		

	ramp side	6*1/2	3.000	0.200	0.400		0.721		
	parapet	1	49.000	0.200	0.400		3.921		
	Window	9	1.500	0.200	1.500		-4.050		
	Rs	2	3.000	0.200	3.000		-3.600		
	„	1	3.000	0.200	2.400		-1.440		
	Op	2	1.500	0.200	2.400		-1.440		
	„	1	4.900	0.200	1.500		-1.470		
	Total Quantity						66.065 cum		
	Total Deducted Quantity						-12.000 cum		
	Net Total Quantity						54.065 cum		
	Say 54.065 cum @ Rs 7872.98 / cum							<b>Rs 425652.66</b>	
11	13.1.1 12 mm cement plaster of mix:1:4 ( 1 cement : 4 fine sand)								
	Inside	2	13.200	5.000			132.000		
	„	2	4.000	5.000			40.000		
	„	4	6.500	5.000			130.000		
	„	4	5.500	5.000			110.000		
	Column	7	0.800	5.000			28.000		
	Cable trench	2	20.000	0.750			30.000		
	„	4	0.600	0.750			1.800		
	„ Top	2	42.400	0.230			19.504		
	Out side	2	13.600	5.450			148.240		
	„	2	10.100	5.450			110.090		
	Ramp side	6*1/2	3.000	0.450			4.051		
	parapet	1	49.000	1.000			49.000		
	Window	9	1.500	1.500			-20.250		
	Rs	2*2	3.000	3.000			-36.000		
	„	1*2	3.000	2.400			-14.399		
	Ope	2*2	1.500	2.400			-14.399		
	„	1	4.900	1.500			-7.350		
	Ventilator	14	0.900	0.600			-7.560		
	Total Quantity						802.685 sqm		
	Total Deducted Quantity						-99.958 sqm		

	Net Total Quantity						702.727 sqm	
	Say 702.727 sqm @ Rs 308.21 / sqm						<b>Rs 216587.49</b>	
12	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)							
	roof top	1	13.800	10.300			142.141	
	Shade top	1	14.800	0.600			8.880	
	„	1	14.800	0.750			11.101	
	,	2	10.100	0.600			12.120	
	Ramp top	3	3.000	3.000			27.000	
	Total Quantity						201.242 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						201.242 sqm	
	Say 201.242 sqm @ Rs 393.69 / sqm						<b>Rs 79226.96</b>	
13	13.16.1 6 mm cement plaster of mix:1:3 ( 1 cement : 3 fine sand)							
	Roof Bottom	1	13.200	4.000			52.800	
	„	2	6.500	5.500			71.500	
	Beam	3*2	3.700	0.500			11.101	
	„	3*2	4.900	0.500			14.701	
	Shade Bott.	1	14.800	0.600			8.880	
	„	1	14.800	0.750			11.101	
	„	2	10.100	0.600			12.120	
	Total Quantity						182.203 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						182.203 sqm	
	Say 182.203 sqm @ Rs 262.57 / sqm						<b>Rs 47841.04</b>	
14	11.41.2 Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS : 15622, of approved make, in all colours and shades, laid on 20 mm thick cement mortar 1:4(1 cement : 4 coarse sand), including grouting the joints with white cement and matching pigments etc., complete. Size of Tile 600 x 600 mm.							
	Floor	1	13.200	4.000			52.800	
	Skirting	1	34.400	0.100			3.440	
	Flor	2	5.500	6.500			71.500	
	Skirting	2	24.000	0.100			4.801	

	Cable Trench	1	20.000	0.600			-12.000		
	Total Quantity						132.541 sqm		
	Total Deducted Quantity						-12.000 sqm		
	Net Total Quantity						120.541 sqm		
	Say 120.541 sqm @ Rs 1733.18 / sqm						<b>Rs 208919.25</b>		
15	10.6.1 Supplying and fixing rolling shutters of approved make, made of required size M.S. laths, interlocked together through their entire length and jointed together at the end by end locks, mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation complete, including the cost of providing and fixing necessary 27.5 cm long wire springs manufactured from high tensile steel wire of adequate strength conforming to IS: 4454 - part 1 and M.S. top cover of required thickness for rolling shutters.80x1.25 mm M.S. laths with 1.25 mm thick top cover								
	Rolling shutter	2	3.000	3.000			18.000		
	„	1	3.000	2.400			7.200		
	Total Quantity						25.200 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						25.200 sqm		
	Say 25.200 sqm @ Rs 3400.56 / sqm						<b>Rs 85694.11</b>		
16	9.48.1 Providing and fixing M.S. Grills of required pattern in frames of windows etc. with M.S. flats, square or round bars etc. including priming coat with approved steel primer all complete.Fixed to steel windows by welding								
	Window grill	9	1.500	1.500		16.0	324.000		
	Ventilator	14	0.900	0.600		16.0	120.961		
	Total Quantity						444.961 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						444.961 kg		
	Say 444.961 kg @ Rs 190.93 / kg						<b>Rs 84956.40</b>		
17	21.1.1.1 Providing and fixing aluminium work for doors, windows, ventilators and partitions with extruded built up standard tubular sections/ appropriate Z sections and other sections of approved make conforming to IS : 733 and IS: 1285, fixing with dash fasteners of required dia and size, including necessary filling up the gaps at junctions, i.e. at top, bottom and sides with required EPDM rubber/ neoprene gasket etc. Aluminium sections shall be smooth, rust free, straight, mitred and jointed mechanically wherever required including cleat angle, Aluminium snap beading for glazing /paneling, C.P. brass/ stainless steel screws, all complete as per architectural drawings and the directions of Engineer-in-charge.(Glazing, paneling and dash fasteners to be paid for separately):For fixed portionAnodised aluminium (anodised								

	transparent or dyed to required shade according to IS : 1868, Minimum anodic coating of grade AC 15)						
	Window	9	1.500	1.500		4.5	91.125
	Ventilator	14	0.900	0.600		4.5	34.020
	Total Quantity						125.145 kg
	Total Deducted Quantity						0.000 kg
	Net Total Quantity						125.145 kg
	Say 125.145 kg @ Rs 489.69 / kg						<b>Rs 61282.26</b>
18	21.3.1 Providing and fixing glazing in aluminium door, window, ventilator shutters and partitions etc. with EPDM rubber / neoprene gasket etc. complete as per the architectural drawings and the directions of Engineer - in -Charge. ( Cost of aluminium snap beading shall be paid in basic item):With float glass panes of 4.0 mm thickness						
	Window	9*2	0.720	1.420			18.404
	Venti	14	0.820	0.520			5.970
	Total Quantity						24.374 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						24.374 sqm
	Say 24.374 sqm @ Rs 1154.61 / sqm						<b>Rs 28142.46</b>
19	13.43.1 Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface:Water thinnable cement primer						
	Inside	2	13.200	5.000			132.000
	„	2	4.000	5.000			40.000
	„	4	6.500	5.000			130.000
	„	4	5.500	5.000			110.000
	Column	7	0.800	5.000			28.000
	„ Top	2	42.400	0.230			19.504
	Out side	2	13.600	5.450			148.240
	„	2	10.100	5.450			110.090
	Ramp side	6*1/2	3.000	0.450			4.051
	parapet	1	49.000	1.000			49.000
	Window	9	1.500	1.500			-20.250
	Rs	2*2	3.000	3.000			-36.000
	„	1*2	3.000	2.400			-14.399
	Ope	2*2	1.500	2.400			-14.399



	„	1	4.900	1.500			-7.350	
	Ventilator	14	0.900	0.600			-7.560	
	Roof Bottom	1	13.200	4.000			52.800	
	„	2	6.500	5.500			71.500	
	Beam	3*2	3.700	0.500			11.101	
	„	3*2	4.900	0.500			14.701	
	Shade Bott.	1	14.800	0.600			8.880	
	„	1	14.800	0.750			11.101	
	„	2	10.100	0.600			12.120	
							Total Quantity	953.088 sqm
							Total Deducted Quantity	-99.958 sqm
							Net Total Quantity	853.130 sqm
							Say 853.130 sqm @ Rs 69.32 / sqm	<b>Rs 59138.97</b>
20	13.61.1	Painting with synthetic enamel paint of approved brand and manufacture to give an even shade:Two or more coats on new work						
	Window	9	1.500	1.500			20.250	
	Vent.	14	0.900	0.600			7.561	
	Rs	2	3.000	3.000		2.5	45.000	
	„	1	3.000	2.400		2.5	18.000	
							Total Quantity	90.811 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	90.811 sqm
							Say 90.811 sqm @ Rs 140.37 / sqm	<b>Rs 12747.14</b>
21	13.82.2	Wall painting with acrylic emulsion paint, having VOC (Volatile Organic Compound) content less than 50 grams/ litre, of approved brand and manufacture including applying additional coats wherever required, to achieve even shade and colour.Two coats						
	Inside	2	13.200	5.000			132.000	
	„	2	4.000	5.000			40.000	
	„	4	6.500	5.000			130.000	
	„	4	5.500	5.000			110.000	
	Column	7	0.800	5.000			28.000	
	„ Top	2	42.400	0.230			19.504	

	Out side	2	13.600	5.450			148.240		
	„	2	10.100	5.450			110.090		
	Ramp side	6*1/2	3.000	0.450			4.051		
	parapet	1	49.000	1.000			49.000		
	Window	9	1.500	1.500			-20.250		
	Rs	2*2	3.000	3.000			-36.000		
	„	1*2	3.000	2.400			-14.399		
	Ope	2*2	1.500	2.400			-14.399		
	„	1	4.900	1.500			-7.350		
	Ventilator	14	0.900	0.600			-7.560		
	Roof Bottom	1	13.200	4.000			52.800		
	„	2	6.500	5.500			71.500		
	Beam	3*2	3.700	0.500			11.101		
	„	3*2	4.900	0.500			14.701		
	Shade Bott.	1	14.800	0.600			8.880		
	„	1	14.800	0.750			11.101		
	„	2	10.100	0.600			12.120		
	Kerala Water Authority Total Quantity						953.088 sqm		
	Total Deducted Quantity						-99.958 sqm		
	Net Total Quantity						853.130 sqm		
	Say 853.130 sqm @ Rs 123.40 / sqm						<b>Rs 105276.24</b>		
SI No	Description	No	L	B	D	CF	Quantity	Remark	
<b>17Centrifuge Building (Cost Index:33.05 %)</b>									
1	2.8.1 Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.All kinds of soil								
	Footing	10	2.000	2.000	1.600		64.000		
	Ramp	1	3.000	3.000	0.150		1.350		
	Total Quantity						65.350 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						65.350 cum		
	Say 65.350 cum @ Rs 291.38 / cum						<b>Rs 19041.68</b>		

2	4.1.8 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)							
	Footing	10	2.000	2.000	0.100		4.000	
	Plinth Bottom	9	3.130	0.350	0.100		0.986	
	„	4	2.800	0.350	0.100		0.392	
	„	4	2.980	0.350	0.100		0.418	
	Floor PCC	6	3.130	3.330	0.100		6.254	
	Ramp	1	3.000	3.000	0.100		0.900	
							Total Quantity	12.950 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	12.950 cum
							Say 12.950 cum @ Rs 6687.23 / cum	<b>Rs 86599.63</b>
3	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Plinth inside	6	3.130	3.330	0.350		21.889	
	Ramp	1/2	3.000	3.000	0.300		1.350	
							Total Quantity	23.239 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	23.239 cum
							Say 23.239 cum @ Rs 253.73 / cum	<b>Rs 5896.43</b>
4	5.1.3 Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level:1:2:4 ( 1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	Ramp	1	3.000	3.000	0.100		0.900	
							Total Quantity	0.900 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	0.900 cum
							Say 0.900 cum @ Rs 8427.59 / cum	<b>Rs 7584.83</b>
5	5.37.1 Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and							

	transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in-charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level							
	Column Footing	10	1.800	1.800	0.200		6.481	
	„	10/3	1.800	1.800	0.700		7.560	
	Grade slab	6	3.130	3.330	0.120		7.505	
	Column pedestal	10	0.250	0.600	0.400		0.600	
	Plinth beam	9	3.130	0.250	0.450		3.170	
	„	4	2.800	0.250	0.450		1.260	
	„	4	3.980	0.250	0.450		1.791	
						Total Quantity	28.367 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	28.367 cum	
						Say 28.367 cum @ Rs 9700.81 / cum	<b>Rs 275182.88</b>	
6	50.5.33.2 Providing and laying in position machine batched and machine mixed design mix M-20 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.Note:- Cement content considered in this item is @ 330 kg/cum. Excess or less cement used as per design mix is payable or recoverable separately. All work above plinth level upto floor V level							
	GF Column	10	0.250	0.600	4.000		6.000	
	„,Beam Bi	9	3.130	0.250	0.350		2.465	
	„	4	2.800	0.250	0.350		0.980	
	„	2	6.200	0.250	0.550		1.706	
	GF Slab	1	10.800	7.800	0.120		10.109	
	FF Column	10	0.250	0.600	4.000		6.000	
	Beam	9	3.130	0.250	0.350		2.465	
		4	2.800	0.250	0.350		0.980	
		4	2.980	0.250	0.550		1.639	
	FF Slab	1	11.000	8.000	0.120		10.560	

	Lintel	1	3.330	0.200	0.400		0.267	
	Shade	1	3.500	0.750	0.100		0.263	
	Stair Opening	1	2.000	3.330	0.120		-0.799	
	Total Quantity						43.434 cum	
	Total Deducted Quantity						-0.799 cum	
	Net Total Quantity						42.635 cum	
	Say 42.635 cum @ Rs 10858.34 / cum						<b>Rs 462945.33</b>	
7	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
	Column Footing	10*4	1.800	1.800	0.200		25.921	
	Total Quantity						25.921 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						25.921 sqm	
	Say 25.921 sqm @ Rs 329.03 / sqm						<b>Rs 8528.79</b>	
8	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform							
	Floor slab	6	3.130	3.330			62.538	
	Op Side	1	8.660	0.120			1.040	
	FF Slab	6	3.130	3.330			62.538	
	Proj	2	11.000	0.300			6.600	
	„	2	7.400	0.300			4.440	
	Proj. GF	2	10.800	0.200			4.320	
	„	2	7.400	0.200			2.961	
	Slab edge	1	37.200	0.120			4.464	
	„	1	38.000	0.120			4.560	
	Shade	1	3.500	0.750			2.625	
	„ Edge	2	0.750	0.100			0.151	
	Total Quantity						156.237 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						156.237 sqm	
	Say 156.237 sqm @ Rs 800.50 / sqm						<b>Rs 125067.72</b>	
9	5.9.5							

	Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers								
	Plinth Beam	9*2	3.130	0.450			25.353		
	„	4*2	2.800	0.450			10.080		
	„	4*2	2.980	0.450			10.728		
	Lintel	1*2	3.330	0.400			2.664		
	Op Bottom	1	3.330	0.200			0.666		
	Beam GF & FF	18*2	3.130	0.350			39.438		
	„	8*2	2.800	0.350			15.680		
	„	4*2	6.200	0.550			27.281		
	Total Quantity						131.890 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						131.890 sqm		
	Say 131.890 sqm @ Rs 637.64 / sqm						<b>Rs 84098.34</b>		
10	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts								
	Column Pedestal	10	1.700		0.850		14.450		
	GF Column	10	1.700		4.000		68.000		
	FF Column	10	1.700		4.000		68.000		
	Total Quantity						150.450 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						150.450 sqm		
	Say 150.450 sqm @ Rs 847.46 / sqm						<b>Rs 127500.36</b>		
11	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more								
	@120kg / 1Cum CC	1	28.37+42.57			120.0	8512.800		
	Total Quantity						8512.800 kilogram		
	Total Deducted Quantity						0.000 kilogram		
	Net Total Quantity						8512.800 kilogram		
	Say 8512.800 kilogram @ Rs 96.46 / kilogram						<b>Rs 821144.69</b>		
12	50.6.7.2 Laterate masonry with neatly dressed laterate stone of size 40x20x15cm or nearest size in cement								

	mortar 1:6 for super structure above plinth level up to floor two level including all cost of materials, labour charges etc.							
	Wall	5	3.130	0.200	3.650		11.425	
	„	4	2.800	0.200	3.650		8.176	
	Over RS	1	3.130	0.200	0.350		0.220	
	FF wall	6	3.130	0.200	3.650		13.710	
	„	4	2.800	0.200	3.650		8.176	
	Total Quantity						41.707 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						41.707 cum	
	Say 41.707 cum @ Rs 7872.98 / cum						<b>Rs 328358.38</b>	
13	13.1.1 12 mm cement plaster of mix:1:4 ( 1 cement : 4 fine sand)							
	inside	2	7.000		4.000		56.000	
	„	2	10.000		4.000		80.000	
	column	2*4	0.350		4.000		11.200	
	FF inside	2	7.000		4.000		56.000	
	„	2	10.000		4.000		80.000	
	Column	2*4	0.350		4.000		11.200	
	Out side wall	1	35.600		8.450		300.820	
	parapt	1	37.200		1.000		37.200	
	Rolling Shutter	1*2	3.000	3.000			-18.000	
	Total Quantity						632.420 sqm	
	Total Deducted Quantity						-18.000 sqm	
	Net Total Quantity						614.420 sqm	
	Say 614.420 sqm @ Rs 308.21 / sqm						<b>Rs 189370.39</b>	
14	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)							
	Roof top	1	10.600	7.600			80.560	
	Shade toop	1	3.500	0.750			2.625	
	Ramp	1	3.000	3.000			9.000	
	Total Quantity						92.185 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						92.185 sqm	

	Say 92.185 sqm @ Rs 393.69 / sqm						<b>Rs 36292.31</b>	
15	13.16.1 6 mm cement plaster of mix:1:3 ( 1 cement : 3 fine sand)							
	Slab Bott	2	10.000	7.000			140.000	
	Beam	4*2	6.200	0.550			27.281	
	„	2*2	9.400	0.350			13.160	
	Proj GF	1	36.400	0.550			20.020	
	„ FF	1	36.800	0.450			16.560	
	Shade	1	3.500	0.750			2.625	
	Ramp side	2*1/2	3.000	0.450			1.350	
	Total Quantity						220.996 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						220.996 sqm	
	Say 220.996 sqm @ Rs 262.57 / sqm						<b>Rs 58026.92</b>	
16	11.41.2 Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS : 15622, of approved make, in all colours and shades, laid on 20 mm thick cement mortar 1:4(1 cement : 4 coarse sand), including grouting the joints with white cement and matching pigments etc., complete. Size of Tile 600 x 600 mm.							
	GF & FF Floor	2	10.000	7.000			140.000	
	Skirting	2	34.000	0.100			6.801	
	Stair Portion	1	3.130	2.000			-6.260	
	Total Quantity						146.801 sqm	
	Total Deducted Quantity						-6.260 sqm	
	Net Total Quantity						140.541 sqm	
	Say 140.541 sqm @ Rs 1733.18 / sqm						<b>Rs 243582.85</b>	
17	10.6.2 Supplying and fixing rolling shutters of approved make, made of required size M.S. laths, interlocked together through their entire length and jointed together at the end by end locks, mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation complete, including the cost of providing and fixing necessary 27.5 cm long wire springs manufactured from high tensile steel wire of adequate strength conforming to IS: 4454 - part 1 and M.S. top cover of required thickness for rolling shutters.80x1.20 mm M.S. laths with 1.20 mm thick top cover							
	Roling Shuter	1	3.000	3.000			9.000	
	Total Quantity						9.000 sqm	



		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					9.000 sqm	
		Say 9.000 sqm @ Rs 3238.30 / sqm					<b>Rs 29144.70</b>	
18	10.25.1 Item Shifted to Sub head 14 as item 14.73Item Shifted to head 14 as item 14.74Steel work welded in built up sections/framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.In stringers, treads,landings etc. of stair cases, including use of chequered plate wherever required, all complete							
	Stair	2	2.500	0.900		30.0	135.000	
	Landing	1	2.000	1.000		30.0	60.000	
	Hand rail	1	9.000		0.900	15.0	121.500	
	„	1	5.500		0.900	15.0	74.250	
		Total Quantity					390.750 kg	
		Total Deducted Quantity					0.000 kg	
		Net Total Quantity					390.750 kg	
		Say 390.750 kg @ Rs 108.17 / kg					<b>Rs 42267.43</b>	
19	13.43.1 Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface:Water thinnable cement primer							
	inside	2	7.000		4.000		56.000	
	„	2	10.000		4.000		80.000	
	column	2*4	0.350		4.000		11.200	
	FF inside	2	7.000		4.000		56.000	
	„	2	10.000		4.000		80.000	
	Column	2*4	0.350		4.000		11.200	
	Out side wall	1	35.600		8.450		300.820	
	parapt	1	37.200		1.000		37.200	
	Rolling Shutter	1*2	3.000	3.000			-18.000	
	Slab Bott	2	10.000	7.000			140.000	
	Beam	4*2	6.200	0.550			27.281	
	„	2*2	9.400	0.350			13.160	
	Proj GF	1	36.400	0.550			20.020	
	„ FF	1	36.800	0.450			16.560	
	Shade	1	3.500	0.750			2.625	
	Ramp side	2*1/2	3.000	0.450			1.350	

		Total Quantity					853.416 sqm	
		Total Deducted Quantity					-18.000 sqm	
		Net Total Quantity					835.416 sqm	
		Say 835.416 sqm @ Rs 69.32 / sqm					<b>Rs 57911.04</b>	
20	13.61.1	Painting with synthetic enamel paint of approved brand and manufacture to give an even shade:Two or more coats on new work						
	Rolling Shutter	1	3.000	3.000		2.5	22.500	
	Stair	2	2.500	0.900			4.500	
	Landing	1	2.000	1.000			2.000	
	Hand rail	1	14.500	0.900			13.050	
		Total Quantity					42.050 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					42.050 sqm	
		Say 42.050 sqm @ Rs 140.37 / sqm					<b>Rs 5902.56</b>	
21	13.82.2	Wall painting with acrylic emulsion paint, having VOC (Volatile Organic Compound) content less than 50 grams/ litre, of approved brand and manufacture including applying additional coats wherever required, to achieve even shade and colour.Two coats						
	inside	2	7.000		4.000		56.000	
	„	2	10.000		4.000		80.000	
	column	2*4	0.350		4.000		11.200	
	FF inside	2	7.000		4.000		56.000	
	„	2	10.000		4.000		80.000	
	Column	2*4	0.350		4.000		11.200	
	Out side wall	1	35.600		8.450		300.820	
	parapt	1	37.200		1.000		37.200	
	Rolling Shutter	1*2	3.000	3.000			-18.000	
	Slab Bott	2	10.000	7.000			140.000	
	Beam	4*2	6.200	0.550			27.281	
	„	2*2	9.400	0.350			13.160	
	Proj GF	1	36.400	0.550			20.020	
	„ FF	1	36.800	0.450			16.560	
	Shade	1	3.500	0.750			2.625	

	Ramp side	2*1/2	3.000	0.450			1.350	
	Total Quantity						853.416 sqm	
	Total Deducted Quantity						-18.000 sqm	
	Net Total Quantity						835.416 sqm	
	Say 835.416 sqm @ Rs 123.40 / sqm						<b>Rs 103090.33</b>	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
<b>18PSF/ACF Foundation (Cost Index:33.05 %)</b>								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	16.200	8.200	0.300		39.852	
	Total Quantity						39.852 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						39.852 cum	
	Say 39.852 cum @ Rs 210.02 / cum						<b>Rs 8369.72</b>	
2	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	16.200	8.200	0.150		19.926	
	Total Quantity						19.926 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						19.926 cum	
	Say 19.926 cum @ Rs 7076.06 / cum						<b>Rs 140997.57</b>	
3	5.37.1 Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level							
		1	16.000	8.000	0.300		38.400	
	Total Quantity						38.400 cum	

							Total Deducted Quantity	0.000 cum		
							Net Total Quantity	38.400 cum		
							Say 38.400 cum @ Rs 9700.81 / cum	<b>Rs 372511.10</b>		
4	5.9.1	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete								
		1	48.000		0.300		14.400			
							Total Quantity	14.400 sqm		
							Total Deducted Quantity	0.000 sqm		
							Net Total Quantity	14.400 sqm		
							Say 14.400 sqm @ Rs 329.03 / sqm	<b>Rs 4738.03</b>		
5	5.22.6	Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more								
		1	38.400			40.0	1536.000			
							Total Quantity	1536.000 kilogram		
							Total Deducted Quantity	0.000 kilogram		
							Net Total Quantity	1536.000 kilogram		
							Say 1536.000 kilogram @ Rs 96.46 / kilogram	<b>Rs 148162.56</b>		
6	13.7.1	12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)								
		1	16.000	8.000			128.000			
		1	48.000		0.300		14.400			
							Total Quantity	142.400 sqm		
							Total Deducted Quantity	0.000 sqm		
							Net Total Quantity	142.400 sqm		
							Say 142.400 sqm @ Rs 393.69 / sqm	<b>Rs 56061.46</b>		
SI No	Description	No	L	B	D	CF	Quantity	Remark		
<b>19Sludge Shed (Cost Index:33.05 %)</b>										
1	2.8.1	Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.All kinds of soil								
		4	1.700	1.700	1.600		18.496			
							Total Quantity	18.496 cum		

		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					18.496 cum	
		Say 18.496 cum @ Rs 291.38 / cum					<b>Rs 5389.36</b>	
2	4.1.8 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)							
	Column Footing	4	1.700	1.700	0.100		1.156	
	Floor PCC	1	5.000	5.000	0.100		2.500	
	Plinth Bottom	2	5.000	0.350	0.100		0.351	
		2	4.600	0.350	0.100		0.322	
		Total Quantity					4.329 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					4.329 cum	
		Say 4.329 cum @ Rs 6687.23 / cum					<b>Rs 28949.02</b>	
3	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Plinth inside filling	1	5.000	5.000	0.350		8.750	
		Total Quantity					8.750 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					8.750 cum	
		Say 8.750 cum @ Rs 253.73 / cum					<b>Rs 2220.14</b>	
4	50.6.7.1 Laterate masonry with neatly dressed laterate stone of size 40x20x15cm or nearest size in cement mortar 1:6 for foundation and basement including all cost of materials, labour charges etc.							
	Outer wall	2	5.000	0.200	4.300		8.600	
		2	4.600	0.200	4.300		7.912	
	Rolling shutter	1	2.400	0.200	3.000		-1.440	
		Total Quantity					16.512 cum	
		Total Deducted Quantity					-1.440 cum	
		Net Total Quantity					15.072 cum	
		Say 15.072 cum @ Rs 7139.74 / cum					<b>Rs 107610.16</b>	
5	50.5.33.2 Providing and laying in position machine batched and machine mixed design mix M-20 grade cement							

	concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge. Note:- Cement content considered in this item is @ 330 kg/cum. Excess or less cement used as per design mix is payable or recoverable separately. All work above plinth level upto floor V level								
	Column								
Column	4	0.200	0.400	4.500		1.441			
	Lintel								
over wall	2	4.600	0.200	0.200		0.368			
	1	5.000	0.200	0.200		0.200			
	1	5.000	0.200	0.300		0.300			
	shade								
	1	5.400	0.600	0.100		0.325			
	Tie beam								
	2	5.000	0.200	0.200		0.400			
	2	4.600	0.200	0.200		0.368			
	Total Quantity						3.402 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						3.402 cum		
	Say 3.402 cum @ Rs 10858.34 / cum						<b>Rs 36940.07</b>		
6	5.37.1 Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately. All work upto plinth level								
	Column footing-raft								
Column Footing	4	1.500	1.500	0.150		1.350			
Isolated Portion	4/3	1.500	1.500	0.350		1.050			
	Column footing-Column								
Column Pedestal	4	0.200	0.400	0.900		0.289			

Plinth beam									
	PB1	2	5.000	0.200	0.450		0.900		
	PB2	2	4.600	0.200	0.450		0.828		
	Total Quantity						4.417 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						4.417 cum		
	Say 4.417 cum @ Rs 9700.81 / cum						<b>Rs 42848.48</b>		
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more								
	@100 Kg / Cum of Concrete Qty , ie	1	3.402+4.4 17		100.000		781.900		
	Total Quantity						781.900 kilogram		
	Total Deducted Quantity						0.000 kilogram		
	Net Total Quantity						781.900 kilogram		
	Say 781.900 kilogram @ Rs 96.46 / kilogram						<b>Rs 75422.07</b>		
8	5.9.1 Centering and shuttering including strutting, etc. and removal of form for: Foundations, footings, bases of columns, etc for mass concrete								
	Column footing	4*4	1.500		0.150		3.600		
	Total Quantity						3.600 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						3.600 sqm		
	Say 3.600 sqm @ Rs 329.03 / sqm						<b>Rs 1184.51</b>		
9	5.9.6 Centering and shuttering including strutting, etc. and removal of form for: Columns, Pillars, Piers, Abutments, Posts and Struts								
		4	1.200		4.500		21.600		
	Total Quantity						21.600 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						21.600 sqm		
	Say 21.600 sqm @ Rs 847.46 / sqm						<b>Rs 18305.14</b>		
10	5.9.5 Centering and shuttering including strutting, etc. and removal of form for: Lintels, beams, plinth beams, girders bressumers and cantilevers								

		Lintel						
	over wall	2*2	4.600		0.200		3.680	
		1*2	5.000		0.200		2.000	
		1*2	5.000		0.300		3.000	
	Bottom	1	2.400	0.200			0.480	
	shade	1	5.600	0.600			3.360	
	Tie beam	2*2	5.000		0.200		4.000	
		2*2	4.600		0.200		3.680	
		Plinth beam						
	PB1	2*2	5.000		0.450		9.000	
	PB2	2*2	4.600		0.450		8.280	
							Total Quantity	37.480 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	37.480 sqm
							Say 37.480 sqm @ Rs 637.64 / sqm	<b>Rs 23898.75</b>
11	12.1.1 Providing corrugate G.S. sheet roofing including vertical/ curved surface fixed with polymer coated J or L hooks, bolts and nuts 8 mm diameter with bitumen and G.I. limpet washers or with G.I. limpet washers filled with white lead, including a coat of approved steel primer and two coats of approved paint on overlapping of sheets complete ( up to any pitch in horizontal / vertical or curved surfaces), excluding the cost of purlins, rafters and trusses and including cutting to size and shape wherever required.1.00 mm thick with zinc coating not less than 275 gm/m2							
	Roofing	2	4.000	6.600			52.800	
							Total Quantity	52.800 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	52.800 sqm
							Say 52.800 sqm @ Rs 1425.63 / sqm	<b>Rs 75273.26</b>
12	13.1.1 12 mm cement plaster of mix:1:4 ( 1 cement : 4 fine sand)							
	inside wall	4	5.000	4.500			90.000	
	outside wall	4	5.400	4.900			105.841	
	basement	4	5.400	0.300			6.480	
	Tie beam top	4	5.200	0.200			4.160	
	Rolling shutter	2	2.400	3.000			-14.399	
							Total Quantity	206.481 sqm



		Total Deducted Quantity					-14.399 sqm	
		Net Total Quantity					192.082 sqm	
		Say 192.082 sqm @ Rs 308.21 / sqm					<b>Rs 59201.59</b>	
13	13.9.2 Cement plaster 1:3 ( 1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
		1	5.000	5.000			25.000	
		Total Quantity					25.000 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					25.000 sqm	
		Say 25.000 sqm @ Rs 532.13 / sqm					<b>Rs 13303.25</b>	
14	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	For truss - 75x75mm IS angle	4*2	3.800			6.78	206.112	
	Horizontal Tie,	4*2	5.400			6.78	292.896	
	Brazing 45x45 mm MS Angle	4*2	2.000			3.95	63.200	
		4*4	1.000			3.95	63.200	
	vertical	4*1	2.000			3.95	31.600	
	Purlin 50x50 mm MS Tub 16g	2*5	6.500			4.42	287.300	
		Total Quantity					944.308 kg	
		Total Deducted Quantity					0.000 kg	
		Net Total Quantity					944.308 kg	
		Say 944.308 kg @ Rs 117.55 / kg					<b>Rs 111003.41</b>	
15	13.43.1 Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface:Water thinnable cement primer							
	inside wall	4	5.000	4.500			90.000	
	outside wall	4	5.400	4.900			105.841	
	basement	4	5.400	0.300			6.480	
	Tie beam top	4	5.200	0.200			4.160	
	Rolling shutter	2	2.400	3.000			-14.399	
		Total Quantity					206.481 sqm	

	Total Deducted Quantity						-14.399 sqm	
	Net Total Quantity						192.082 sqm	
	Say 192.082 sqm @ Rs 69.32 / sqm						<b>Rs 13315.12</b>	
16	13.82.2 Wall painting with acrylic emulsion paint, having VOC (Volatile Organic Compound) content less than 50 grams/ litre, of approved brand and manufacture including applying additional coats wherever required, to achieve even shade and colour.Two coats							
	inside wall	4	5.000	4.500			90.000	
	outside wall	4	5.400	4.900			105.841	
	basement	4	5.400	0.300			6.480	
	Tie beam top	4	5.200	0.200			4.160	
	Rolling shutter	2	2.400	3.000			-14.399	
	Total Quantity						206.481 sqm	
	Total Deducted Quantity						-14.399 sqm	
	Net Total Quantity						192.082 sqm	
	Say 192.082 sqm @ Rs 123.40 / sqm						<b>Rs 23702.92</b>	
17	13.48.3 Finishing with Deluxe Multi surface paint system for interiors and exteriors using primer as per manufacturers specifications.Painting Steel work with Deluxe Multi Surface Paint to give an even shade. Two or more coat applied @ 0.90 ltr/10 sqm over an under coat of primer applied @ 0.80 ltr/10 sqm of approved brand and manufacture							
	Rolling Shutter	1	2.400	3.000		2.5	18.000	
	Truss work	4 *1/2	5.400	2.000		0.5	10.800	
	Purline	2*5	5.800	0.200			11.600	
	Total Quantity						40.400 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						40.400 sqm	
	Say 40.400 sqm @ Rs 145.36 / sqm						<b>Rs 5872.54</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>20STP Land Development and Approach Road and internal Service Roads (Cost Index:33.05 %)</b>								
1	2.8.1 Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.All kinds of soil							

	Road side Protection wall foundation	1	50.000	(1.70+0.95)/2	0.700		46.375		
	„	1	750.000	0.950	0.700		498.750		
	Total Quantity						545.125 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						545.125 cum		
	Say 545.125 cum @ Rs 291.38 / cum						<b>Rs 158838.52</b>		
2	4.1.8 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)								
	Road side Protection wall foundation	1	50.000	(1.70+0.95)/2	0.100		6.625		
	„	1	750.000	0.950	0.100		71.250		
	Total Quantity						77.875 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						77.875 cum		
	Say 77.875 cum @ Rs 6687.23 / cum						<b>Rs 520768.04</b>		
3	7.1.1 Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with:Cement mortar 1:6 (1 cement : 6 coarse sand)								
	Road side Protection wall foundation	1	50.000	(1.70+0.95)/2	0.600		39.750		
	„	1	750.000	0.950	0.600		427.500		
	Total Quantity						467.250 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						467.250 cum		
	Say 467.250 cum @ Rs 7069.81 / cum						<b>Rs 3303368.72</b>		
4	7.2.1 Random rubble masonry with hard stone in superstructure above plinth level and upto floor five level, including leveling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) at window sills, ceiling level and the like.Cement mortar 1:6 (1 cement : 6 coarse sand)								
	Road side Protection wall	1	50.000	(1.50+0.50)/2	(2.50+1.50)/2		100.000		

		1	750.000	$(0.75+0.50)/2$	1.500		703.125	
	Total Quantity						803.125 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						803.125 cum	
	Say 803.125 cum @ Rs 8721.89 / cum						<b>Rs 7004767.91</b>	
5	5.1.2 Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level:1:1:5:3 (1 cement 1.5 coarse sand :3 graded stone aggregate 20 mm nominal size							
	RR Top Belt	1	50.000	1.000	0.100		5.000	
	„	1	800.000	0.500	0.100		40.000	
	Total Quantity						45.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						45.000 cum	
	Say 45.000 cum @ Rs 8914.95 / cum						<b>Rs 401172.75</b>	
6	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers							
	RR Top Belt	2	50.000		0.100		10.000	
	„	2	800.000		0.100		160.000	
	Total Quantity						170.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						170.000 sqm	
	Say 170.000 sqm @ Rs 637.64 / sqm						<b>Rs 108398.80</b>	
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	@60Kg/1Cum of CC	1	45.000			60.0	2700.000	
	Total Quantity						2700.000 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						2700.000 kilogram	
	Say 2700.000 kilogram @ Rs 96.46 / kilogram						<b>Rs 260442.00</b>	
8	2.32 Clearing grass and removal of the rubbish up to a distance of 50 m outside the periphery of the area cleared.							

	STP Site Area	1	100.000	80.000			8000.000	
	Total Quantity						8000.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						8000.000 sqm	
	Say 8000.000 sqm @ Rs 7.38 / sqm						<b>Rs 59040.00</b>	
9	2.33.3 Felling trees of the girth (measured at a height of 1 m above ground level) including cutting of trunks and branches, removing the roots and stacking of serviceable material and disposal of unserviceable material. Beyond 120 cm girth up to and including 240 cm girth							
	STP Site Area	12					12.000	
	Total Quantity						12.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						12.000 No	
	Say 12.000 No @ Rs 9079.27 / No						<b>Rs 108951.24</b>	
10	od339382/2021_2022 Filling with contractor own earth (excluding rock) in open areas in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, With all lead and lift as per direction of site Engineer-in-charge.							
	Preparation of new road Base	1	50.000	5.000	(2.0+1.0)/2		375.000	
	„	1	750.000	5.000	1.0000		3750.000	
	„	1	200.000	6.000	1.000		1200.000	
	STP Site Filling	1	100.000	80.000	2.000		16000.000	
	Total Quantity						21325.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						21325.000 cum	
	Say 21325.000 cum @ Rs 406.11 / cum						<b>Rs 8660295.75</b>	
11	100.41.39 Supply ,stacking,spreading and consolidating of Quarry Muck in the trench of pipe line, including carriage, loading ,unloading & stacking up to any lead.							
	Preparation of new road Base	1	1000.000	5.000	0.300		1500.000	
	STP Site Filling	1	100.000	80.000	0.200		1600.000	
	Total Quantity						3100.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3100.000 cum	

	Say 3100.000 cum @ Rs 543.16 / cum						<b>Rs 1683796.00</b>
12	od339234/2021_2022 Construction of granular sub-base by providing graded material, spreading in uniform layers with a motor grader on a prepared surface, mixing by mix in-place method with rotavator at OMC, and compacting with a vibratory roller to achieve the desired density, complete as per clause 401. Grading-V - For sub-base cum drainage layer - Mix in Place Method						
	Preparation of new approach road Base	1	1000.000	3.500	0.300		1050.000
	Internal Roads	1	200.000	3.500	0.200		140.000
	STP Site	1	100.000	80.000	0.200		1600.000
	Total Quantity						2790.000 cum
	Total Deducted Quantity						0.000 cum
	Net Total Quantity						2790.000 cum
	Say 2790.000 cum @ Rs 3729.38 / cum						<b>Rs 10404970.20</b>
13	od339248/2021_2022 Providing and applying primer coat with bitumen emulsion ( SS) on prepared surface of granular Base including clearing of road surface and spraying primer at the rate of 0.70 - 1.0 kg/sqm using mechanical means						
	Formation of Approach Road	1	1000.000	3.200			3200.000
	Internal Roads	1	200.000	3.200			640.000
	Total Quantity						3840.000 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						3840.000 sqm
	Say 3840.000 sqm @ Rs 59.03 / sqm						<b>Rs 226675.20</b>
14	od339249/2021_2022 Providing and applying tack coat with bitumen emulsion( RS) using emulsion pressure distributor at the rate of 0.20 - 0.30 kg per sqm on the prepared bituminous surface cleaned with mechanical broom						
	Formation of Approach Road	1	1000.000	3.200			3200.000
	Internal Roads	1	200.000	3.200			640.000
	Total Quantity						3840.000 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						3840.000 sqm
	Say 3840.000 sqm @ Rs 10.41 / sqm						<b>Rs 39974.40</b>
15	od339250/2021_2022						

	Providing, laying and rolling of open graded premix carpet of 20 mm thickness with 0.27 cum of 12 mm departmental aggregates premixed with 12.96 kg of bitumen per 10 sqm using penetration grade bitumen to required line, grade and level on a previously prepared base, after priming the existing surface with 5 kg of bitumen (VG 30) 10 sqm including mixing in a suitable plant, laying and rolling with a three wheel static roller of 80-100 KN capacity, finished to required level and grades, followed by a seal coat of 0.09 cum of 6 mm departmental aggregates premixed with 8.64 kg of bitumen per 10 sqm. By Manual Means.							
	Formation of Approach Road	1	1000.000	3.200			3200.000	
	Internal Roads	1	200.000	3.200			640.000	
	Total Quantity						3840.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						3840.000 sqm	
	Say 3840.000 sqm @ Rs 176.52 / sqm						<b>Rs 677836.80</b>	
16	od339251/2021_2022 Seal Coat - Manual Means - Type C - Bitumen S-65 Providing and laying seal coat sealing the voids in a bituminous surface laid to the specified levels, grade and cross fall using Type A, Type B and Type C as per Technical Specification Clause 510 A. By Manual Means:-Case - III : Type C							
	Formation of Approach Road	1	1000.000	3.200			3200.000	
	Internal Roads	1	200.000	3.200			640.000	
	Total Quantity						3840.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						3840.000 sqm	
	Say 3840.000 sqm @ Rs 78.00 / sqm						<b>Rs 299520.00</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>21 Storm Water Drains (Cost Index:33.05 %)</b>								
1	2.8.1 Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. All kinds of soil							
	For Drain	1	300.000	0.800	0.800		192.000	
	Total Quantity						192.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						192.000 cum	
	Say 192.000 cum @ Rs 291.38 / cum						<b>Rs 55944.96</b>	

2	4.1.8 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)							
	Drain bottom	1	300.000	0.800	0.100		24.000	
	Total Quantity						24.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						24.000 cum	
	Say 24.000 cum @ Rs 6687.23 / cum						<b>Rs 160493.52</b>	
3	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	Drain Bottom	1	300.000	0.800	0.100		24.000	
	Side wall	2	300.000	0.200	0.600		72.000	
	Total Quantity						96.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						96.000 cum	
	Say 96.000 cum @ Rs 7841.17 / cum						<b>Rs 752752.32</b>	
4	5.9.2 Centering and shuttering including strutting, etc. and removal of form:Walls (any thickness) including attached pilasters, buttersesses, plinth and string courses etc.							
	Drain inside	1*2	300.000	0.600			360.000	
	Total Quantity						360.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						360.000 sqm	
	Say 360.000 sqm @ Rs 703.77 / sqm						<b>Rs 253357.20</b>	
5	13.1.1 12 mm cement plaster of mix:1:4 ( 1 cement : 4 fine sand)							
	Drain Bottom and Wall Top	1	300.000	0.800			240.000	
	Side wall	1*2	300.000	0.600			360.000	
	Total Quantity						600.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						600.000 sqm	
	Say 600.000 sqm @ Rs 308.21 / sqm						<b>Rs 184926.00</b>	



SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>22Compound wall &amp;Gate (Cost Index:33.05 %)</b>								
1	2.8.1 Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.All kinds of soil							
	Compound wall foundation	1	354.000	0.500	0.450		79.650	
	Gate Pillar footing	3	1.000	1.000	0.750		2.250	
	Total Quantity						81.900 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						81.900 cum	
	Say 81.900 cum @ Rs 291.38 / cum						<b>Rs 23864.02</b>	
2	4.1.8 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)							
	Compound wall foundation	1	354.000	0.500	0.100		17.700	
	Gate pillar	3	1.000	1.000	0.100		0.301	
	Total Quantity						18.001 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						18.001 cum	
	Say 18.001 cum @ Rs 6687.23 / cum						<b>Rs 120376.83</b>	
3	7.1.1 Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with:Cement mortar 1:6 (1 cement : 6 coarse sand)							
	Compound wall foundation	1	354.000	0.450	0.450		71.685	
	Total Quantity						71.685 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						71.685 cum	
	Say 71.685 cum @ Rs 7069.81 / cum						<b>Rs 506799.33</b>	
4	50.6.7.2 Laterate masonry with neatly dressed laterate stone of size 40x20x15cm or nearest size in cement							

	mortar 1:6 for super structure above plinth level up to floor two level including all cost of materials, labour charges etc.							
	Wall	1	354.000	0.200	1.800		127.440	
	Pillar Addl.	118	0.350	0.150	1.800		11.151	
	Total Quantity						138.591 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						138.591 cum	
	Say 138.591 cum @ Rs 7872.98 / cum						<b>Rs 1091124.17</b>	
5	5.1.2 Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level:1:1:5:3 (1 cement 1.5 coarse sand :3 graded stone aggregate 20 mm nominal size							
	Gate Piller Footing	3	1.000	1.000	0.150		0.450	
	„	3/3	1.000	1.000	0.450		0.450	
	Total Quantity						0.900 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.900 cum	
	Say 0.900 cum @ Rs 8914.95 / cum						<b>Rs 8023.46</b>	
6	5.2.2 Reinforced cement concrete work in walls (any thickness), including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, piers, abutments, posts and struts etc. up tot floor five level excluding cost of centering, shuttering, finishing and reinforcement :1:1.5:3( 1 cement : 1.5 coarse sand : 3 graded stone aggregate 20 mm nominal size)							
	gate pillar	3	0.300	0.300	2.100		0.567	
	Total Quantity						0.567 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.567 cum	
	Say 0.567 cum @ Rs 10748.84 / cum						<b>Rs 6094.59</b>	
7	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
	Footing side	3*4	1.000		0.150		1.800	
	Total Quantity						1.800 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1.800 sqm	
	Say 1.800 sqm @ Rs 329.03 / sqm						<b>Rs 592.25</b>	

8	5.9.2 Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, buttersesses, plinth and string courses etc.							
	gate pille	3*4	0.300		2.100		7.561	
	Total Quantity						7.561 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						7.561 sqm	
	Say 7.561 sqm @ Rs 703.77 / sqm						<b>Rs 5321.20</b>	
9	13.1.1 12 mm cement plaster of mix:1:4 ( 1 cement : 4 fine sand)							
	Compound wall sides	2	354.000	1.800			1274.400	
	Piller sides	118*2	0.150	1.800			63.721	
	Top	1	354.000	0.230			81.420	
	Piiller Top	118	0.150	0.350			6.195	
	Gate pillar	2	1.000	2.100			4.200	
	„	1	1.200	2.100			2.520	
	Top	3	0.300	0.300			0.270	
	Total Quantity						1432.726 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1432.726 sqm	
	Say 1432.726 sqm @ Rs 308.21 / sqm						<b>Rs 441580.48</b>	
10	13.43.1 Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface:Water thinnable cement primer							
	Compound wall sides	2	354.000	1.800			1274.400	
	Piller sides	118*2	0.150	1.800			63.721	
	Top	1	354.000	0.230			81.420	
	Piiller Top	118	0.150	0.350			6.195	
	Gate pillar	2	1.000	2.100			4.200	
	„	1	1.200	2.100			2.520	
	Top	3	0.300	0.300			0.270	
	Total Quantity						1432.726 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1432.726 sqm	

	Say 1432.726 sqm @ Rs 69.32 / sqm						<b>Rs 99316.57</b>	
11	13.60.1 Wall painting with acrylic emulsion paint of approved brand and manufacture to give an even shade:Two or more coats on new work							
	Compound wall sides	2	354.000	1.800			1274.400	
	Pillar sides	118*2	0.150	1.800			63.721	
	Top	1	354.000	0.230			81.420	
	Piiller Top	118	0.150	0.350			6.195	
	Gate pillar	2	1.000	2.100			4.200	
	„	1	1.200	2.100			2.520	
	Top	3	0.300	0.300			0.270	
	Total Quantity						1432.726 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1432.726 sqm	
	Say 1432.726 sqm @ Rs 148.55 / sqm						<b>Rs 212831.45</b>	
12	10.25.2 Item Shifted to Sub head 14 as item 14.73Item Shifted to head 14 as item 14.74Steel work welded in built up sections/framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works							
	Main gate	1	4.000	1.800	30.0		216.000	
	Vicat Gate	1	1.000	1.800	20.0		36.000	
	Total Quantity						252.000 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						252.000 kg	
	Say 252.000 kg @ Rs 151.28 / kg						<b>Rs 38122.56</b>	
13	13.62.1 Painting with synthetic enamel paint of approved brand and manufacture of required colour to give an even shade:Two or more coats on new work over an under coat of suitable shade with ordinary paint of approved brand and manufacture .							
	Main gate	1	4.000	1.800			7.200	
	Vicat Gate	1	1.000	1.800			1.800	
	Total Quantity						9.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						9.000 sqm	
	Say 9.000 sqm @ Rs 204.63 / sqm						<b>Rs 1841.67</b>	

Sl No	Description	No	L	B	D	CF	Quantity	Remark	
<b>23 Operation and Maintenance cost for STP and Allied works - 1st Year (Cost Index:33.05 %)</b>									
1	od341889/2021_2022 Labour/Workers for operation and maintenance for 4MLD STP allied works								
		1					1.000		
		Total Quantity						1.000 set	
		Total Deducted Quantity						0.000 set	
		Net Total Quantity						1.000 set	
		Say 1.000 set @ Rs 4981396.06 / set						<b>Rs 4981396.06</b>	
2	od341891/2021_2022 Annul maintenance( Day today if needed) of electrical, civil ,mechanical and other connected items and including replacement damaged of electrical , mechanical and civil, Including painting of items as per the direction of departmental officials								
		1					1.000		
		Total Quantity						1.000 set	
		Total Deducted Quantity						0.000 set	
		Net Total Quantity						1.000 set	
		Say 1.000 set @ Rs 813050.00 / set						<b>Rs 813050.00</b>	
3	od341893/2021_2022 Consumables Gas chlorine, Fuel for generator, chemicals ,Cotton waste ,Lubricants (oil and Grease) soap ,Glass ware,safety equipment etc								
		1					1.000		
		Total Quantity						1.000 set	
		Total Deducted Quantity						0.000 set	
		Net Total Quantity						1.000 set	
		Say 1.000 set @ Rs 892032.00 / set						<b>Rs 892032.00</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
<b>24 Operation and Maintenance cost for STP and Allied works - 2nd Year to 10th year (Cost Index:33.05 %)</b>									
1	od341901/2021_2022 Operation and Maintenance cost for STP and Allied works - 2nd year to 10th year								
	4 MLD STP - Operation and Maintenance for 9 year (Second year to 10 th year)								
	2 nd Year-Add 8% to 1st year	1	1.080				1.080		
	3 rd Year-Add 16% to 1st year	1	1.160				1.160		

	4 th Year-Add 24% to 1st year	1	1.240					1.240	
	5 th Year-Add 32% to 1st year	1	1.320					1.320	
	6 th Year-Add 40% to 1st year	1	1.400					1.400	
	7 th Year-Add 48% to 1st year	1	1.480					1.480	
	8 th Year-Add 56% to 1st year	1	1.560					1.560	
	9 th Year-Add 64% to 1st year	1	1.640					1.640	
	10 th Year-Add 72% to 1st year	1	1.720					1.720	
	Total Quantity							12.600 No	
	Total Deducted Quantity							0.000 No	
	Net Total Quantity							12.600 No	
	Say 12.600 No @ Rs 6686478.06 / No							<b>Rs 84249623.56</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
<b>25Landscaping and Green belt formation around the STP compound</b>									
							Lump-Sum Total	<b>Rs 1000000.00</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
<b>26Electricity charges for 4 Mld STP (Cost Index:33.05 %)</b>									
1	od20547/2022_2023 Electricity charges for 4 MLD STP in pachakadu zone Rs.10171398.79/Year								
	Electricity charges for 4 MLD STP in pachakadu zone Rs.10171398.79/Year	10						10.000	
	Total Quantity							10.000 No	
	Total Deducted Quantity							0.000 No	
	Net Total Quantity							10.000 No	
	Say 10.000 No @ Rs 11814079.69 / No							<b>Rs 118140796.90</b>	
							Total	<b>299085399.69</b>	
							Centage @	<b>10.0%</b>	
							Centage Amount	<b>29908539.97</b>	

Provision for GST payments (in %) @	<b>18.0%</b>
Amount reserved for GST payments	<b>53835371.94</b>
Total & Centage	<b>382829311.61</b>
Lumpsum for round off	<b>0.00</b>
<b>GRAND TOTAL Rs</b>	<b>382829311.61</b>
<b>Rounded Grand Total Rs 38,28,29,312</b>	
<b>Rupees Thirty Eight Crore Twenty Eight Lakh Twenty Nine Thousand Three Hundred and Twelve Only</b>	



Kerala Water Authority

**PRICE**

## General Abstract

**SEWERAGE SCHEME TO KASARAGOD MUNICIPALITY(PHASE-1) -  
CONSTRUCTION OF 4 MLD CAPACITY SEWAGE TREATMENT PLANT AT  
PACHAKADU THURUTHU AND LAYING SEWERAGE NET WORK -ELECTRO-  
MECHANICAL**

(Dsr year: 2018)

SI No	Heading Description	Amount
1	<b>MECHANICAL WORKS</b>	19739825.10
2	<b>ELECTRICAL WORKS</b>	10084198.98
3	<b>Charges for Power allocation to KSEB and power extension by cable</b>	10000000.00
4	<b>Tools and Plants</b>	200000.00
5	<b>Provision for Supply and fixing of Odour controle system</b>	10000000.00
6	<b>Provisions for solar panels with control units</b>	2500000.00
7	<b>Provision for Automating entire plant by SCADA system</b>	2500000.00
	Total	<b>55024024.08</b>
	Centage @	<b>10.0%</b>
	Centage Amount	<b>5502402.41</b>
	Provision for GST payments (in %) @	<b>18.0%</b>
	Amount reserved for GST payments	<b>9904324.33</b>
	Total & Centage	<b>70430750.82</b>
	Lumpsum for round off	<b>0.00</b>
	<b>GRAND TOTAL Rs</b>	<b>70430750.82</b>
	<b>Rounded Grand Total Rs</b>	<b>7,04,30,751</b>
	<b>Rupees Seven Crore Four Lakh Thirty Thousand Seven Hundred and Fifty One Only</b>	



## Detailed Estimate

**SEWERAGE SCHEME TO KASARAGOD MUNICIPALITY(PHASE-1) -  
CONSTRUCTION OF 4 MLD CAPACITY SEWAGE TREATMENT PLANT AT  
PACHAKADU THURUTHU AND LAYING SEWERAGE NET WORK -ELECTRO-  
MECHANICAL**

(Dsr year: 2018)

SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>1MECHANICAL WORKS (Cost Index:33.05 %)</b>								
1	od340727/2021_2022 Supply at site,erection, testing and commissioning of self priming, non clog centrifugal submersible sewage transfer pump for rated continuous duty and efficiency (from reputed manufacturers complying to IS 1520 and conforming to other relevant standards), CI construction, bronze impeller,complete with 3 phase motor, SS shaft, with automatic pedestal coupling, delivery bend, required wire chain, washers, SS bolts etc including Double Flange DI/CI PN 1 rating sluice valves, Pressure gauges, Double Flange DI/CI PN 1 rating NRVs with DI/I/Pipes connecting common delivery suitable for operation on 415 +/-10% volts, 50 HZ, AC power supply etc. complete in all respects with detachable arrangements, level indicators for automatic switch on & switch off as required by the standard specifications complete with all accessories as per technical specification or as directed by Engineer In Charge.Pumps shall have dry run protection & high/ low level alarm. Electrical Control panel shall be supplied with the pump as per the specifications in the Electrical BOQ Motor : three phase motor with IP 68 Protection"-Pump for septage tank to inlet							
		2					2.000	
							Total Quantity	2.000 No
							Total Deducted Quantity	0.000 No
							Net Total Quantity	2.000 No
							Say 2.000 No @ Rs 74336.00 / No	<b>Rs 148672.00</b>
2	od340729/2021_2022 Supply,erection, testing and commissioning of direct driven floating mixers of approximately 4HP or as required with the rotating arm for rated continuous duty mixing and efficiency, complete set with 3 phase motor, including rotary paddles, gear box, cables, wall mooring and anchoring system with all electro mechanical equipments etc complete for the equalization tank . Electrical Control panel shall be supplied with the pump as per the specifications in the Electrical BOQ or as directed by the Engineer in Charge							
		2					2.000	
							Total Quantity	2.000 No
							Total Deducted Quantity	0.000 No
							Net Total Quantity	2.000 No
							Say 2.000 No @ Rs 139380.00 / No	<b>Rs 278760.00</b>

3	od340731/2021_2022 Supply at site,erection, testing and commissioning of self priming, non clog centrifugal submersible sewage transfer pump for rated continuous duty and efficiency (from reputed manufacturers complying to IS 1520 and conforming to other relevant standards), CI construction, bronze impeller,complete with 3 phase motor, SS shaft, with automatic pedestal coupling, delivery bend, required wire chain, washers, SS bolts etc including Double Flange DI/CI PN 1 rating sluice valves, Pressure gauges, Double Flange DI/CI PN 1 rating NRVs with DI/I/Pipes connecting common delivery suitable for operation on 415 /-10% volts, 50 HZ, AC power supply etc. complete in all respects with detachable arrangements, level indicators for automatic switch on & switch off as required by the standard specifications complete with all accessories as per technical specification or as directed by Engineer In Charge.Pumps shall have dry run protection & high/ low level alarm. Electrical Control panel shall be supplied with the pump as per the specifications in the Electrical BOQ Motor : three phase motor with IP 68 Protection"-Sludge Thickener Feed Pump & Clarifier to sludge sump						
	Sludge Thickener Feed Pump	2					2.000
	Clarifier to sludge sump	2					2.000
	Total Quantity						4.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						4.000 No
	Say 4.000 No @ Rs 87112.50 / No						<b>Rs 348450.00</b>
4	od340734/2021_2022 Supply at site,erection, testing and commissioning of self priming, non clog centrifugal submersible sewage transfer pump for rated continuous duty and efficiency (from reputed manufacturers complying to IS 1520 and conforming to other relevant standards), CI construction, bronze impeller,complete with 3 phase motor, SS shaft, with automatic pedestal coupling, delivery bend, required wire chain, washers, SS bolts etc including Double Flange DI/CI PN 1 rating sluice valves, Pressure gauges, Double Flange DI/CI PN 1 rating NRVs with DI/I/Pipes connecting common delivery suitable for operation on 415 /-10% volts, 50 HZ, AC power supply etc. complete in all respects with detachable arrangements, level indicators for automatic switch on & switch off as required by the standard specifications complete with all accessories as per technical specification or as directed by Engineer In Charge.Pumps shall have dry run protection & high/ low level alarm. Electrical Control panel shall be supplied with the pump as per the specifications in the Electrical BOQ Motor : three phase motor with IP 68 Protection"- Sludge transfer to centrifuge pump						
		2					2.000
	Total Quantity						2.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						2.000 No
	Say 2.000 No @ Rs 37168.00 / No						<b>Rs 74336.00</b>
5	od340736/2021_2022 Supply at site,erection, testing and commissioning of self priming, non clog centrifugal submersible						

	sewage transfer pump for rated continuous duty and efficiency (from reputed manufacturers complying to IS 1520 and conforming to other relevant standards), CI construction, bronze impeller, complete with 3 phase motor, SS shaft, with automatic pedestal coupling, delivery bend, required wire chain, washers, SS bolts etc including Double Flange DI/CI PN 1 rating sluice valves, Pressure gauges, Double Flange DI/CI PN 1 rating NRVs with DI/I/Pipes connecting common delivery suitable for operation on 415 +/-10% volts, 50 HZ, AC power supply etc. complete in all respects with detachable arrangements, level indicators for automatic switch on & switch off as required by the standard specifications complete with all accessories as per technical specification or as directed by Engineer In Charge. Pumps shall have dry run protection & high/ low level alarm. Electrical Control panel shall be supplied with the pump as per the specifications in the Electrical BOQ Motor : three phase motor with IP 68 Protection"-Centrate sump to equalisation tank Pump								
		2					2.000		
		Total Quantity					2.000 No		
		Total Deducted Quantity					0.000 No		
		Net Total Quantity					2.000 No		
		Say 2.000 No @ Rs 74336.00 / No					<b>Rs 148672.00</b>		
6	od340738/2021_2022 Supplying and fixing of mono block centrifugal pump, for rated continuous duty and best efficiency CI construction, CI impeller, complete with 3 phase motor, FRP motor cover, pressure gauge, operation on 415 +/-10% volts, 50 HZ, AC power supply etc including sluice valves, Pressure gauges, NRVs with DI/I/Pipes connecting common delivery suitable for complete in all respects as required by the standard specifications and shall suit following capacities complete with all accessories as per technical specification. Pumps shall have dry run protection & high/ low level alarm. Electrical Control panel shall be supplied with the pump as per the specifications in the Electrical BOQ Motor : three phase motor with IP 68 Protection"- Pump for clarifier to PSF								
		2					2.000		
		Total Quantity					2.000 No		
		Total Deducted Quantity					0.000 No		
		Net Total Quantity					2.000 No		
		Say 2.000 No @ Rs 766590.00 / No					<b>Rs 1533180.00</b>		
7	od340739/2021_2022 Supplying and fixing of mono block centrifugal pump, for rated continuous duty and best efficiency CI construction, CI impeller, complete with 3 phase motor, FRP motor cover, pressure gauge, operation on 415 +/-10% volts, 50 HZ, AC power supply etc including sluice valves, Pressure gauges, NRVs with DI/I/Pipes connecting common delivery suitable for complete in all respects as required by the standard specifications and shall suit following capacities complete with all accessories as per technical specification. Pumps shall have dry run protection & high/ low level alarm. Electrical Control panel shall be supplied with the pump as per the specifications in the Electrical BOQ Motor : three phase motor with IP 68 Protection"- Treated water to septage tank								
		2					2.000		

							Total Quantity	2.000 No
							Total Deducted Quantity	0.000 No
							Net Total Quantity	2.000 No
							Say 2.000 No @ Rs 153318.00 / No	<b>Rs 306636.00</b>
8	od340742/2021_2022	"Air Blower Supply,erection, testing and commissioning of twin lobe air blower for indoor application complete with acoustic canopy, air filter, motor of 1500 rpm , pulleys, pressure gauges, pressure relief valve, acoustic hood, suction silencer with suitable flanges, common motor and compressor base frame with motor belt tightening arrangement interconnecting line with flanges including all accessories complete as per technical specification or as Directed by Engineer in Charge Capacity: 5528 m <sup>3</sup> /hr. Pressure: 0.6 kg/sqcm Motor : three phase motor with IP 68 Protection (2W + 1 S)"						
			3					3.000
							Total Quantity	3.000 No
							Total Deducted Quantity	0.000 No
							Net Total Quantity	3.000 No
							Say 3.000 No @ Rs 574942.50 / No	<b>Rs 1724827.50</b>
9	od340744/2021_2022	"Bubble Diffuser for MBBR Tank Supplying at site, erection, testing & commissioning of Fine Bubble Diffuser (retrievable type using rope and pulley arrangement) for the aeration system of the MBBR Tansk (2Nos) with diffusers of sufficient size and length made of EPDM make with SS tee 1" x 1", SS lifting hook 8 mm, SS foundation bolt 6 mm, SS C clamp suitable for 1" O.D, hose, PP Rope, PP swivel nut, PP sleeve, Silicone Washer, SS hose clamp, RCC block complete at a minimum rating of 95m/hr-as per technical specification or as directed by the Engineer in Charge"						
			2					2.000
							Total Quantity	2.000 No
							Total Deducted Quantity	0.000 No
							Net Total Quantity	2.000 No
							Say 2.000 No @ Rs 209070.00 / No	<b>Rs 418140.00</b>
10	od340745/2021_2022	"Bubble Diffuser for Equalisation Tank Supplying at site, erection, testing & commissioning of Coarse Bubble Diffuser (retrievable type using rope and pulley arrangement) for the aeration system of the Equalization Tank with diffusers of sufficient size and length made of EPDM make with SS tee 1" x 1", SS lifting hook 8 mm, SS foundation bolt 6 mm, SS C clamp suitable for 1" O.D, hose, PP Rope, PP swivel nut, PP sleeve, Silicone Washer, SS hose clamp, RCC block complete at a minimum rating of 95m/hr as per technical specification or as directed by the Engineer in Charge"						
			2					2.000
							Total Quantity	2.000 No

							Total Deducted Quantity	0.000 No
							Net Total Quantity	2.000 No
							Say 2.000 No @ Rs 80724.25 / No	<b>Rs 161448.50</b>
11	od340748/2021_2022 "Air Grid Pipe Supply and installation of air pipes (HDPE) aly into valves and other accessories as required for the blowers to various tanks as a complete unit"		1					1.000
							Total Quantity	1.000 set
							Total Deducted Quantity	0.000 set
							Net Total Quantity	1.000 set
							Say 1.000 set @ Rs 174225.00 / set	<b>Rs 174225.00</b>
12	od340749/2021_2022 "MBBR Media Supplying and fixing of non- clogging freely moving biomass media of polypropylene construction Sp.Gravity 0.93 for MBBR reactor with surface area not less than 450m/m, length 16-20 mm, dia 22 mm complete as per technical specification or as directed by Engineer in Charge"		1			250.0		250.000
							Total Quantity	250.000 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	250.000 cum
							Say 250.000 cum @ Rs 10453.50 / cum	<b>Rs 2613375.00</b>
13	od340752/2021_2022 "Gas Chlorinator system Supply at site, erection, testing and commissioning of electronic chlorine dosing system (gas filled Chlorine) with all wetted parts in PP construction suitable for pumping Chlorine gas including booster pumps, valves, suctions and delivery lines using heavy duty PVC tubes, gas line diffusers, emergency repair kit, FRP motor cover etc.complete with all accessories. Capacity : 500gm to 1kg/hr with 2nos of chlorine tonners"		2					2.000
							Total Quantity	2.000 set
							Total Deducted Quantity	0.000 set
							Net Total Quantity	2.000 set
							Say 2.000 set @ Rs 464600.00 / set	<b>Rs 929200.00</b>
14	od340754/2021_2022 "Electromagnetic flow meter Supply, installation, testing and commissioning of electro magnetic/ Ultra Sonic D/F permanent conduit flow meter with flow recorder, digital flow indicator, flow integrator with sensors, 7digit totaliser, transmittal							

	and digital display arrangements and all accessories including housing arrangements, internal data logger, to save upto 2000 linesof data etc. complete to fix as per the specifications . Flow range of 10 to 600LPS, One display shall be installed at the main control centre"						
		2					2.000
	Total Quantity						2.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						2.000 No
	Say 2.000 No @ Rs 87112.50 / No						<b>Rs 174225.00</b>
15	od340755/2021_2022 "Lifting Mechanism for Air Grid Supply , installation & commissioning of the manually operating chain pulley mechanism to lift the equipments from a height not less than 5m including all equipments , foundation etc"						
		5					5.000
	Total Quantity						5.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						5.000 No
	Say 5.000 No @ Rs 11615.00 / No						<b>Rs 58075.00</b>
16	od340756/2021_2022 "SS Gates Supplying at site, installation testing and commissioning of all materials, fabricating, fixing and commissioning of spindle operated open channel sluice gates/shutter of DI make with a peak flow of 145LPS and velocity less than 1m/s at the inleta and outlet of the screen channel to suit the channel sizes as per drawings, tender specifications and as directed by Engineer in Charge"						
		8					8.000
	Total Quantity						8.000 set
	Total Deducted Quantity						0.000 set
	Net Total Quantity						8.000 set
	Say 8.000 set @ Rs 17422.50 / set						<b>Rs 139380.00</b>
17	od340757/2021_2022 "Mechanical Coarse Screen Supplying all materials, fabricating, fixing and commissioning of mechanical SS Screen Bar of following or nearest suitable size made of flats having 50mm x 10mm and 20mm clear space across the screen chamber channel (fixed type) at 70 inclination including cost of mechanical screen grab bucket and arrangement for automated scrapping clogged materials suitable for operation on 415+/-10% volts, 50 HZ, AC power supply etc. complete in all respects as required by the standard specifications complete with all accessories as per technical specification"						
		1					1.000
	Total Quantity						1.000 set

								Total Deducted Quantity	0.000 set
								Net Total Quantity	1.000 set
								Say 1.000 set @ Rs 69690.00 / set	<b>Rs 69690.00</b>
18	od340758/2021_2022 "Mechanical Fine Screen Supplying all materials, fabricating, fixing and commissioning of mechanical SS Screen Bar of following or nearest suitable size made of flats having 50mm x 10mm and 6mm clear space across the screen chamber channel (fixed type) at 70 inclination including cost of mechanical screen grab bucket and arrangement for automated scrapping clogged materials suitable for operation on 415+/-10% volts, 50 HZ, AC power supply etc. complete in all respects as required by the standard specifications complete with all accessories as per technical specification"								
			1						1.000
								Total Quantity	1.000 set
								Total Deducted Quantity	0.000 set
								Net Total Quantity	1.000 set
								Say 1.000 set @ Rs 116150.00 / set	<b>Rs 116150.00</b>
19	od340759/2021_2022 "Manual Coarse Screen Supplying all materials, fabricating, fixing and commissioning of Manual SS Screen Bar of following or nearest suitable size made of flats having 50mm x 10mm and 20mm clear space across the screen chamber channel (fixed type) at 45 inclination including cost of screen grab bucket and arrangement for manual scrapping clogged materials as per drawings, tender specifications and as directed by Engineer in Charge"								
			1						1.000
								Total Quantity	1.000 set
								Total Deducted Quantity	0.000 set
								Net Total Quantity	1.000 set
								Say 1.000 set @ Rs 34845.00 / set	<b>Rs 34845.00</b>
20	od340760/2021_2022 "Gritting Mechanism Supplying at site all electro-mechanical equipments, fabricating, fixing and commissioning of the gritting mechanism to suit gritting chamber sizes as per drawings, tender specifications or as directed by Engineer in Charge."								
			2						2.000
								Total Quantity	2.000 No
								Total Deducted Quantity	0.000 No
								Net Total Quantity	2.000 No
								Say 2.000 No @ Rs 545905.00 / No	<b>Rs 1091810.00</b>

21	od340761/2021_2022 "Clarifier Mechanism Supplying all materials, fabricating, fixing and commissioning of Bridge mounted central driven type clarifier mechanical rake for the half diameter of the Clarifier Tank as per drawings including all feed well, drive and rake mechanism with removable scrappers with sufficient 3phase motor and gears etc complete as per tender specifications and as directed by Engineer in Charge"		1				1.000	
		Total Quantity					1.000 No	
		Total Deducted Quantity					0.000 No	
		Net Total Quantity					1.000 No	
		Say 1.000 No @ Rs 813050.00 / No					<b>Rs 813050.00</b>	
22	od340762/2021_2022 "Sludge Thickener Mechanism Supplying all materials, fabricating, fixing and commissioning of Bridge mounted central driven type sludge thickening mechanism for the full diameter of the Sludge Thickener tank as per drawings including all feed well, drive and rake mechanism with removable scrappers with sufficient 3phase motor and gears etc complete as per tender specifications and as directed by Engineer in Charge"		1				1.000	
		Total Quantity					1.000 No	
		Total Deducted Quantity					0.000 No	
		Net Total Quantity					1.000 No	
		Say 1.000 No @ Rs 313605.00 / No					<b>Rs 313605.00</b>	
23	od340763/2021_2022 "Poly Electrolyte dosing system Supplying and fixing of electronic dosing pump with all wetted parts in PP construction suitable for pumping Poly Electrolyte solution including cost of suitable agitators, control gears, valve, suction and delivery lines using heavy duty PVC tubes, HD, FRP motor cover etc. and complete with all accessories to prepare 5% solution of 0.2kg/hr"		2				2.000	
		Total Quantity					2.000 No	
		Total Deducted Quantity					0.000 No	
		Net Total Quantity					2.000 No	
		Say 2.000 No @ Rs 92920.00 / No					<b>Rs 185840.00</b>	
24	od340764/2021_2022 "High Pressure Jet Pump Supply and commissioning of portable high pressure water pumps (along with 500litre water tanks to supply water to the pumps) all mounted on a suitable medium vehicle platform for clearing the wells, pumps, and other equipments using high pressure gauges, safety arrangements etc complete as per standards"							



		1					1.000	
	Total Quantity						1.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						1.000 No	
	Say 1.000 No @ Rs 34845.00 / No						<b>Rs 34845.00</b>	
25	od340765/2021_2022 "Portable Hoist - 500kg Supply and commissioning of portable Monkey type Hoist with capacity upto 500kg, with lifting height of 6m, 5HP Motor, 415V 50Hz all mounted on a suitable medium vehicle platform for easy shifting of equipments and materials whenever required with complete set as per standards"							
		1					1.000	
	Total Quantity						1.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						1.000 No	
	Say 1.000 No @ Rs 104535.00 / No						<b>Rs 104535.00</b>	
26	od340766/2021_2022 "Wheel Barrow Supply of three wheel type wheel barrow of capacity 200ltrs"							
		1					1.000	
	Total Quantity						1.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						1.000 No	
	Say 1.000 No @ Rs 29037.50 / No						<b>Rs 29037.50</b>	
27	od340767/2021_2022 "Aluminium Ladder Supply, Installation of aluminium ladders with caging on each elevated structures of required height as per the drawings or as directed by the Engineer in Charges"							
		4					4.000	
	Total Quantity						4.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						4.000 No	
	Say 4.000 No @ Rs 6969.00 / No						<b>Rs 27876.00</b>	
28	od340768/2021_2022 "FRP Ladder Supply, Installation of FRP ladders with caging on each elevated structures of required height as per the drawings or as directed by the Engineer in Charges"							

		6					6.000	
	Total Quantity						6.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						6.000 No	
	Say 6.000 No @ Rs 34845.00 / No						<b>Rs 209070.00</b>	
29	od340769/2021_2022 "Monorail Crane Supply, Installation and commissioning in position mechanically operated mono rail crane of load bearing capacity of 2tonnes suitable for operation on 415+/-10% volts, 50 HZ, AC power supply etc. with 6m lift & span upto 20m complete in all respects as required by the standard specifications complete with all accessories as per technical specification"							
		1					1.000	
	Total Quantity						1.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						1.000 No	
	Say 1.000 No @ Rs 406525.00 / No						<b>Rs 406525.00</b>	
30	od340770/2021_2022 "Pressure sand filter Supply at site, erection and commissioning of pressure sand filter vertical type pressure vessel fabricated with MS construction with epoxy coating inside and anti corrosive treatment outside, two coats of paint outside ( pain quality as instructed by Engineer) withstand a minimum test pressure of 7.0Kg/cm with as operating pressure of 3.5 Kg/cm, complete with valves and dual filter media including graded pebble and sand and antracite , frontal piping, butterfly valves, internals, pressure gauges, strainers, supporting structure, back wash arrangement, etc and all other accessories tested twice the working pressure supported over pebble/gravel with inspection manholes etc complete as per specification or as directed by Engineer in Charge. The scope shall include complete piping with MS fabricated pipes and specials including valves Flow Rate:52 m3/hour Diameter - 2.4m. Height - 2.5m"							
		4					4.000	
	Total Quantity						4.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						4.000 No	
	Say 4.000 No @ Rs 522675.00 / No						<b>Rs 2090700.00</b>	
31	od340771/2021_2022 "Activated Carbon filter Supply at site, erection and commissioning of Activated Carbon filter vertical type pressure vessel fabricated with MS construction with epoxy coating inside and anti corrosive treatment outside, two coats of paint outside ( pain quality as instructed by Engineer) withstand a minimum test pressure of 7.0Kg/cm with as operating pressure of 3.5 Kg/cm, complete with valves and filter media including activated carbon of approved grade and quality , frontal piping, butterfly valves, internals, pressure gauges, strainers, supporting structure, back wash arrangement, etc and all other							

	accessories tested twice the working pressure supported over pebble/gravel with inspection manholes etc complete as per specification or as directed by Engineer in Charge. The scope shall include complete piping with MS fabricated pipes and specials including valves Flow rate - 52 m/hr. Diameter - 2.6m. Height - 2.5m"								
		4					4.000		
		Total Quantity					4.000 No		
		Total Deducted Quantity					0.000 No		
		Net Total Quantity					4.000 No		
		Say 4.000 No @ Rs 551712.50 / No					<b>Rs 2206850.00</b>		
32	od340772/2021_2022 "Centrifuge System Supply at site, installation and commissioning of filter press /centrifuge system. Filter Press shall be automated, recessed type press with SS fabricated structure pipe button surface and SS flat parallel bar, with PP cloth. Filter operations to be mechanical. Outlet cake consistency should not be more than 35% moisture. The capacity of the filter press shall be 1cum/hr. The Filter Press Unit shall be mounted on a platform and all around drain system to be provided to prevent the filtrate water from contaminating the entire surroundings as per the specifications or as directed by the engineer in charge"								
		2					2.000		
		Total Quantity					2.000 No		
		Total Deducted Quantity					0.000 No		
		Net Total Quantity					2.000 No		
		Say 2.000 No @ Rs 348450.00 / No					<b>Rs 696900.00</b>		
33	od340773/2021_2022 SLUDGE DEWATERING and Packing UNIT -Volute is a dewatering unit for convenient sludge dewatering.Machine is available for dry sludge (DS) output of 1.0kg/hr to 750kg/hr the Sludge to be dried from 70% moisture content to 10%.The similar type can be suggested.The Packing of the dried sludge to be packed in the packing machine.The necessary electrification civil works,cost of packing machine,cost of gunny bags for 6months.The machines suggested should be cost effective								
		1					1.000		
		Total Quantity					1.000 L.S		
		Total Deducted Quantity					0.000 L.S		
		Net Total Quantity					1.000 L.S		
		Say 1.000 L.S @ Rs 1500000.00 / L.S					<b>Rs 1500000.00</b>		
34	10.28 Providing and fixing stainless steel (Grade 304) railing made of Hollow tubes, channels, plates etc., including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete, i/c fixing the railing with necessary accessories & stainless steel dash fasteners, stainless steel bolts etc., of required size on the top of the floor or the side of waist slab with suitable arrangement as per approval of Engineer-in-charge, (for								

	payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.)							
		1				8.0	8.000	
	Total Quantity						8.000 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						8.000 kg	
	Say 8.000 kg @ Rs 664.65 / kg						<b>Rs 5317.20</b>	
35	18.73.1 Providing and laying Double Flanged ( Screwed / Welded ) Centrifugally (Spun) Ductile Iron Pipes of Class K - 9 conforming to IS: 8329 :100 mm dia Ductile Iron Double Flanged							
		1	20.000				20.000	
	Total Quantity						20.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						20.000 metre	
	Say 20.000 metre @ Rs 1769.96 / metre						<b>Rs 35399.20</b>	
36	18.73.2 Providing and laying Double Flanged ( Screwed / Welded ) Centrifugally (Spun) Ductile Iron Pipes of Class K - 9 conforming to IS: 8329 :150 mm dia Ductile Iron Double Flanged							
		1	20.000				20.000	
	Total Quantity						20.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						20.000 metre	
	Say 20.000 metre @ Rs 2655.21 / metre						<b>Rs 53104.20</b>	
37	18.73.3 Providing and laying Double Flanged ( Screwed / Welded ) Centrifugally (Spun) Ductile Iron Pipes of Class K - 9 conforming to IS: 8329 :200 mm dia Ductile Iron Double Flanged							
		1	20.000				20.000	
	Total Quantity						20.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						20.000 metre	
	Say 20.000 metre @ Rs 3351.06 / metre						<b>Rs 67021.20</b>	
38	18.73.8 Providing and laying Double Flanged ( Screwed / Welded ) Centrifugally (Spun) Ductile Iron Pipes of Class K - 9 conforming to IS: 8329 :450 mm dia Ductile Iron Double Flanged							
		1	40.000				40.000	
	Total Quantity						40.000 metre	

	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						40.000 metre	
	Say 40.000 metre @ Rs 10401.32 / metre						<b>Rs 416052.80</b>	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
<b>2ELECTRICAL WORKS (Cost Index:33.05 %)</b>								
1	od340728/2021_2022 "250kVA Indoor Transformer and 11 kv indoor free standing cubcle type vcb switch gear panel of suitable capacity Supplying, installation, testing and commissioning of 250KVA, 11KV/433V, 3-Phase, 50 Hz, Dyn 11, indoor ONAN type, copper wound transformer with OFF load tap changing arrangement on HV and LV side complete with all accessories i/c first filling of filtered dehydrated oil and confirming to IS 2026 (Part 1 to Part 5) & as per specification attached complete in all respects as required at site or as directed by the Engineer In Charge including supply installation commissioning of suitable rated 11kv cubicle type vcb panel and suitable rated 11kv cable and termination	1					1.000	
	Total Quantity						1.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						1.000 No	
	Say 1.000 No @ Rs 1000000.00 / No						<b>Rs 1000000.00</b>	
2	od340730/2021_2022 "CT - PT Unit and TOD meter Supplying, installation, testing and commissioning of Indoor type 11KV CT-PT Unit 3Phase Dry type conforming to IS 2026 (Part 1 to Part 5) & as per KSEB specification complete in all respects as required at site or as directed by the Engineer In Charge"	1					1.000	
	Total Quantity						1.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						1.000 No	
	Say 1.000 No @ Rs 200000.00 / No						<b>Rs 200000.00</b>	
3	od340732/2021_2022 "10kA Surge (Lightning Arrester) Supply & Installation of Heavy Duty hot dipped galvanized 10kA lightning arrester suitable for the 11kV incoming line complying IS: 3070 (Part - III) & IEC 60099 - 4 (2009) 50Hz, rated voltage of 12kV with a operating load of 10kV with terminals made of MS/Aluminium with Zinc plating full set or as directed by the Engineer in Charge"	2					2.000	
	Total Quantity						2.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						2.000 No	

								Say 2.000 No @ Rs 4646.00 / No	<b>Rs 9292.00</b>
4	od340733/2021_2022	Main LT panel Supplying, installation, testing and commissioning of S3phase 415V, 50Hz, floor mounted MS Cubicle type panel board suitable for connecting 250 kva transformer and all motors including all inter connections, wiring in all etc using 14 gauge CRCA sheet painted with 2coats of superior quality enamel paint of approved color over a coat of superior quality iron primer of approved quality as per specification complete in all respects as required at site conforming to relevant BIS standards and KSEB standards or as directed by the Engineer In Charge. 							
		1							1.000
		Total Quantity							1.000 No
		Total Deducted Quantity							0.000 No
		Net Total Quantity							1.000 No
		Say 1.000 No @ Rs 350000.00 / No							<b>Rs 350000.00</b>
5	od340735/2021_2022	"Earthing Equipments for Transformer Earthing with copper earth plate 600 mm X 600 mm X 3 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 meter long etc. with charcoal/ coke and salt as required."							
		1							1.000
		Total Quantity							1.000 L.S
		Total Deducted Quantity							0.000 L.S
		Net Total Quantity							1.000 L.S
		Say 1.000 L.S @ Rs 250000.00 / L.S							<b>Rs 250000.00</b>
6	od340737/2021_2022	"250KVA Diesel Generator Providing, Installing, Testing and Commissioning of ?Silent Type? Diesel Generating set alongwith having Prime Power Rating of 250 KVA, 415 volts at 1500 RPM, 0.8 lagging power factor at 415 V suitable for 50 Hz, 3 phase system& for 0.85 Load Factor .							
		1							1.000
		Total Quantity							1.000 No
		Total Deducted Quantity							0.000 No
		Net Total Quantity							1.000 No
		Say 1.000 No @ Rs 1509950.00 / No							<b>Rs 1509950.00</b>
7	od340740/2021_2022	"Auto Mains Failure Unit (AMF Panel) Fabricating, Installing, Testing & Commissioning of automatic mains failure control including auto by-pass panel, suitable for 250 KVA silent type DG set complete with relays, timers, set of CTs for metering & protection and energy analyser to indicate currents, phase and line voltages, frequency, power factor, KWH, KVARH & provision for overload, short circuit, restricted earth fault, under frequency, control cabling from AMF panel to diesel engine and elsewhere if required, all complete .							

		1					1.000		
	Total Quantity						1.000 No		
	Total Deducted Quantity						0.000 No		
	Net Total Quantity						1.000 No		
	Say 1.000 No @ Rs 232300.00 / No						<b>Rs 232300.00</b>		
8	od340741/2021_2022 "Earthing Equipments for DG Earthing with copper earth plate 600 mm X 600 mm X 3 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 meter long etc. with charcoal/ coke and salt as required."								
		1					1.000		
	Total Quantity						1.000 L.S		
	Total Deducted Quantity						0.000 L.S		
	Net Total Quantity						1.000 L.S		
	Say 1.000 L.S @ Rs 102139.99 / L.S						<b>Rs 102139.99</b>		
9	od340743/2021_2022 "Main Control Centre Design, Fabrication, Supply, Installation and commissioning of Electrical Control Panel of cubical construction with fully automated feature (indoor type) preferably floor mounted fabricated of 2mm thick CRCA Sheets compartmentised with hinge lock doors with Dust, vermi proof and powder coated with approved shade. The panel shall have enough size to accommodate the individual control centres of each equipment set with individual MCCB's/MCB of appropriate capacity and also to have provision for Busbars, ACBs & RCCB's as specified below with cable alley, interconnections having all accessories mounting and internal wiring, earth terminals, numbering etc, complete in all respect suitable for operation on 415V, 3 phase 50Hz AC supply with enclosure protection class IP 54 as required. Including supply, installation, termination testing & Commissioning of the all power and control cables as per specifications or as directed by the Engineer In Charge."								
		1					1.000		
	Total Quantity						1.000 L.S		
	Total Deducted Quantity						0.000 L.S		
	Net Total Quantity						1.000 L.S		
	Say 1.000 L.S @ Rs 232300.00 / L.S						<b>Rs 232300.00</b>		
10	od340746/2021_2022 Wiring for Each equipment Supplying and Laying of PVC insulated and PVC sheathed / XLPE power cable of Aluminium conductor XLPE power cables as per IS:7098/Part-I/88 with latest ammendments 1.1 kv grad of required size direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc. as required in the specifications or as directed by the Engineer in Charge.								
		1					1.000		





	Say 1.000 L.S @ Rs 274846.91 / L.S						<b>Rs 274846.91</b>	
14	od340753/2021_2022 "EXTERNAL LIGHTING Providing external lighting arrangements by supplying and laying of PVC insulated and PVC sheathed / XLPE power cable of Copper conductor XLPE control cables as per is:7098/Part-I/88 with latest amendments 1.1 kv grade of required size direct in ground including MCCB/MCB/RCCB, supply and erection of mettalic poles, strret light poles, earthing and safety equipments ,fire extinguishers ,etc . complete including necessary excavation, sand cushioning, protective covering and refilling the trench etc. as required in the specifications or as directed by the Engineer in Charge."							
		1					1.000	
Total Quantity							1.000 L.S	
Total Deducted Quantity							0.000 L.S	
Net Total Quantity							1.000 L.S	
Say 1.000 L.S @ Rs 1626100.00 / L.S							<b>Rs 1626100.00</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>3Charges for Power allocation to KSEB and power extension by cable</b>								
Lump-Sum Total							<b>Rs 10000000.00</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>4Tools and Plants</b>								
Lump-Sum Total							<b>Rs 200000.00</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>5Provision for Supply and fixing of Odour controle system</b>								
Lump-Sum Total							<b>Rs 10000000.00</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>6Provisions for solar panels with control units</b>								
Lump-Sum Total							<b>Rs 2500000.00</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>7Provision for Automating entire plant by SCADA system</b>								
Lump-Sum Total							<b>Rs 2500000.00</b>	
Total							<b>55024024.08</b>	
Centage @							<b>10.0%</b>	
Centage Amount							<b>5502402.41</b>	
Provision for GST payments (in %) @							<b>18.0%</b>	
Amount reserved for GST payments							<b>9904324.33</b>	
Total & Centage							<b>70430750.82</b>	
Lumpsum for round off							<b>0.00</b>	
<b>GRAND TOTAL Rs</b>							<b>70430750.82</b>	

**Rounded Grand Total Rs 7,04,30,751**

**Rupees Seven Crore Four Lakh Thirty Thousand Seven Hundred and Fifty One Only**



Kerala Water Authority

**PRICE**

## General Abstract

**SEWERAGE SCHEME TO KASARAGOD MUNICIPALITY(PHASE-1) -  
CONSTRUCTION OF 4 MLD CAPACITY SEWAGE TREATMENT PLANT AT  
PACHAKADU THURUTHU AND LAYING SEWERAGE NET WORK -NETWORK  
DESIGN**

(Dsr year: 2018)

SI No	Heading Description	Amount
1	Laying of sewer network	154232675.36
2	Road Restoration work of laying of sewers and pumping main.	21003069.55
3	Construction of Collection wellcum Pumping stations	1355689.52
4	Compound wall with gate for Collection wellcum Pumping stations	883593.28
5	Construction of Receiving Chanel and screen chamber at Collection well	743916.47
6	Construction of Valve chamber	278367.47
7	Construction of Control room and Generator Room for wellcum pumphouse	1431038.41
8	Bath cum Toilets	348813.99
9	Collection wellcum Pump house Mechanical, Electrical - Pumpsets, grit chamber screen, generator, transformer & allied works complete	5237993.16
10	Pumping mains	12037090.57
11	Construction of Man holes	78715141.56
12	Road Restoration - to PWD/NH	38720382.51
13	Lifting Stations and Allied work	15179689.20
14	Water Supply and Sanatory arrangements, Electrical wiring in pumping stations	400000.00
15	Line extension , Deposit to KSEB, etc	1000000.00
16	Sewer Network - Operation and Maintanance cost for 1st Year	4625966.23
17	Sewer Network -Operation and Maintanse Cost for 2 nd Year to 10 th Year	58287174.50
18	Sewer Connection Charges- Including material,labour and connection deposite charges	30000000.00
19	Electricity charges for sewer net work portion	39379704.00
Total		<b>463860305.77</b>
Centage @		<b>10.0%</b>
Centage Amount		<b>46386030.58</b>
Provision for GST payments (in %) @		<b>18.0%</b>
Amount reserved for GST payments		<b>83494855.04</b>
Total & Centage		<b>593741191.39</b>
Lumpsum for round off		<b>0.00</b>

<b>GRAND TOTAL Rs</b>	<b>593741191.39</b>
<b>Rounded Grand Total Rs 59,37,41,191</b>	
<b>Rupees Fifty Nine Crore Thirty Seven Lakh Forty One Thousand One Hundred and Ninety One Only</b>	



Kerala Water Authority

# PRICE

## Detailed Estimate

**SEWERAGE SCHEME TO KASARAGOD MUNICIPALITY(PHASE-1) -  
CONSTRUCTION OF 4 MLD CAPACITY SEWAGE TREATMENT PLANT AT  
PACHAKADU THURUTHU AND LAYING SEWERAGE NET WORK -NETWORK  
DESIGN**

(Dsr year: 2018)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
<b>1Laying of sewer network (Cost Index:33.05 %)</b>								
1	100.59.1 Cutting the bituminous / concrete roads with cutting machine for a minimum depth of 200mm along the sides of proposed alignment of the pipe to be laid without causing any damage to other utilities, including the charges for hire and conveyance of tools and plant, cost of consumables and charges for lighting, watching, ribbon fencing, caution boards, traffice diversion, and as per the direction of departmental officers etc. complete, before carrying out the demolition of bituminous / concrete road by mechanical means and carrying out the excavation.							
	Sewer lines from 225mm to 450mm(NHAI-BMBC)	2	2500.000				5000.000	
	Sewer lines from 225mm to 450mm(PWD-BMBC)	2	2000.000				4000.000	
	Sewer lines from 225mm to 450mm(Municipal - BT)	2	8014.000				16028.000	
	Sewer lines from 225mm to 450mm(Municipal - CC)	2	8500.000				17000.000	
	Inspection Chamber to Manhole	2	12552.000				25104.000	1046X2X6
							Total Quantity	67132.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	67132.000 metre
							Say 67132.000 metre @ Rs 29.87 / metre	<b>Rs 2005232.84</b>
2	15.43.2 Dismantling manually / by mechanical means including stacking of serviceable material and disposal of							

	unserviceable material within 50 metres lead as per direction of Engineer -in-Charge:Bituminous road							
	Sewer lines from 225 mm to 450mm(NHAI-BMBC)	1	2500.000	1.000			2500.000	
	Sewer lines from 225 mm to 450mm(PWD-BMBC)	1	2000.000	1.000			2000.000	
	Sewer lines from 225 mm to 450mm(Municipal - BT)	1	8014.000	1.000			8014.000	
	Inspection Chamber to Manhole(BT portion only 50%)	1	6276.000	0.600			3765.600	(1046X2X6)0.5
	Total Quantity						16279.600 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						16279.600 sqm	
	Say 16279.600 sqm @ Rs 354.18 / sqm						<b>Rs 5765908.73</b>	
3	15.2.1 Demolishing cement concrete manually / by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in-Charge.Nominal concrete 1:3:6 or richer mix (i/c equivalent design mix)							
	Sewer lines from 225 mm to 450mm(Municipal - CC)	1	8500.000	1.000	0.150		1275.000	
	Inspection Chamber to Manhole(CC portion 50%)	1	6276.000	0.600	0.150		564.840	(1046X2X6)0.5
	Total Quantity						1839.840 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1839.840 cum	
	Say 1839.840 cum @ Rs 2006.81 / cum						<b>Rs 3692209.31</b>	
4	4.1.2 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:1/2:3 (cement : 1 1/2 coarse sand : 3 graded stone aggregate 20 mm nominal size)							

	Sewer lines from 225mm to 450mm(Municipal - CC)	1	8500.000	1.000	0.150		1275.000		
	Inspection Chamber to Manhole(CC portion 50%)	1	6276.000	0.600	0.150		564.840	(1046X2X6)0.5	
	Total Quantity						1839.840 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						1839.840 cum		
	Say 1839.840 cum @ Rs 8328.46 / cum						<b>Rs 15323033.85</b>		
5	100.8.2 Fencing 1.50m high with two rows of casuarina poles (girth 15cm to 24cm) tied with coir yarn on vertical casuarina pole (girth 15cm to 24cm) fixed at 1.5m intervals. NEW DATA (Prepared based on PWD SDB - Item No.1009)								
	Sewer lines from 225mm to 450mm	1	21014.400			0.4	8405.760		
	Inspection Chamber to Manhole	1	12552.000			0.4	5020.800	1046X3X4	
	Total Quantity						13426.560 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						13426.560 metre		
	Say 13426.560 metre @ Rs 95.04 / metre						<b>Rs 1276060.26</b>		
6	100.8.1 Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009)								
	Sewer lines from 225mm to 450mm	1	21014.400			0.6	12608.641		
	Inspection Chamber to Manhole	1	12552.000			0.6	7531.200	1046X3X4	
	Total Quantity						20139.841 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						20139.841 metre		
	Say 20139.841 metre @ Rs 27.66 / metre						<b>Rs 557068.00</b>		
7	100.1.1 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and								

	then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : All kinds of soil (Ref. Item No. 2.10.1 of DSR)							
	Sewer lines from 225 mm to 450 mm (From calculation sheet)	1	23811.460			0.45	10715.157	
	Inspection Chamber to Manhole	1	12552.000	0.600	1.000	0.45	3389.040	1046X3X4
	Concrete Portion							
	Sewer lines from 225 mm to 450mm (Municipal - CC)	1	8500.000	1.000	0.150		-1275.000	
	Inspection Chamber to Manhole (CC portion 50%)	1	6276.000	0.600	0.150		-564.839	(1046X2X6)0.5
	Bituminous Portion							
	Sewer lines from 225 mm to 450mm (NHAI-BMBC)	1	2500.000	1.000	0.300		-750.000	
	Sewer lines from 225 mm to 450mm (PWD-BMBC)	1	2000.000	1.000	0.300		-600.000	
	Sewer lines from 225 mm to 450mm (Municipal - BT)	1	8014.000	1.000	0.300		-2404.200	
	Inspection Chamber to Manhole (BT portion only 50%)	1	6276.000	0.600	0.300		-1129.679	(1046X2X6)0.5
	Total Quantity						14104.197 cum	
	Total Deducted Quantity						-6723.718 cum	
	Net Total Quantity						7380.479 cum	
	Say 7380.479 cum @ Rs 545.11 / cum						<b>Rs 4023172.91</b>	
8	100.15 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and							



	then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m :" Ordinary Rock. (Ref. Item No. 2.13.1 of DSR)							
	Sewer lines from 225 mm to 450 mm ( From calculation sheet)	1	23811.460			0.4	9524.584	
	Inspection Chamber to Manhole	1	12552.000	0.600	1.000	0.4	3012.480	1046X3X4
	Total Quantity						12537.064 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						12537.064 cum	
	Say 12537.064 cum @ Rs 791.65 / cum						<b>Rs 9924966.72</b>	
9	100.2.7 "Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : Medium Rock (blasting prohibited) New Data derived from DAR							
	Sewer lines from 225 mm to 450 mm ( From calculation sheet)	1	23811.460			0.15	3571.719	
	Inspection Chamber to Manhole	1	12552.000	0.600	1.000	0.15	1129.680	1046X3X4
	Total Quantity						4701.399 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						4701.399 cum	
	Say 4701.399 cum @ Rs 1316.46 / cum						<b>Rs 6189203.73</b>	
10	100.1.2 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 1.5m but not exceeding 3 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m: 1.50m to 3.0m All kinds of soil							

	(Ref. Item No. 2.11 of DSR)							
	From calculation sheet- sewerline 225 to 450mm	1	4193.350			0.45	1887.008	
	Total Quantity						1887.008 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1887.008 cum	
	Say 1887.008 cum @ Rs 649.48 / cum						<b>Rs 1225573.96</b>	
11	<p>100.1.6 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 1.5m but not exceeding 3 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 1.50m to 3.0m. Ordinary Rock. (Ref. Item No. 2.14 of DSR)</p>							
	From calculation sheet- sewerline 225 to 450mm	1	4193.350			0.4	1677.341	
	Total Quantity						1677.341 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1677.341 cum	
	Say 1677.341 cum @ Rs 978.85 / cum						<b>Rs 1641865.24</b>	
12	<p>100.2.8 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m but not exceeding 3 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : (Rate is over corresponding basic item for depth up to 1.5 metre) 1.5m to 3.0m Medium Rock (blasting prohibited) New Data derived from DAR</p>							
	From calculation sheet- sewerline 225 to 450mm	1	4193.350			0.15	629.003	
	Total Quantity						629.003 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						629.003 cum	
	Say 629.003 cum @ Rs 1503.66 / cum						<b>Rs 945806.65</b>	

13	2.17.2 Close timbering in case of shafts, wells, cesspits, manholes and the like including strutting, shoring and packing cavities (wherever required) etc. complete (Measurements to be taken of the face area timbered).Depth exceeding 1.5 m but not exceeding 3 m								
		2	21014.000	3.000		0.2	25216.801		
		Total Quantity						25216.801 sqm	
		Total Deducted Quantity						0.000 sqm	
		Net Total Quantity						25216.801 sqm	
		Say 25216.801 sqm @ Rs 187.73 / sqm						<b>Rs 4733950.05</b>	
14	2.23 Extra for planking and strutting in open timbering if required to be left permanently in position (Face area of the timber permanently left to be measured).								
		2	21014.000	3.000		0.05	6304.201		
		Total Quantity						6304.201 sqm	
		Total Deducted Quantity						0.000 sqm	
		Net Total Quantity						6304.201 sqm	
		Say 6304.201 sqm @ Rs 947.78 / sqm						<b>Rs 5974995.62</b>	
15	od330790/2021_2022 Installation of PE pipe between 110mm & 225mm outer dia by HDD method for on grade gravity sewer including preparing and setting up the plant and equipment,preparing new pipe work material making of entry pit and exit pit up to required depth installing new pipe work and commissioning system or making the system or making the system ready for commissioning by HDD operating including all related civil and mechanical works like excavation shoring/strutting etc drilling stringing reaming and pulling back the new pipe work on the designed borne path alignment proper disposal of drilling fluid and back fill of site after completion all inclusive as per Conditions HDPE pipes also using Ground penetrating radar survey in corridor with to detect buried utilities on the map of corridor with information of locations and depths to the top of various utilities detected .work to be conducted using 500MHZ and 300MHZ antenna or latest forthe best possible resolution and penetration								
	225mm dia PE pipe	1	1174.500				1174.500		
		Total Quantity						1174.500 metre	
		Total Deducted Quantity						0.000 metre	
		Net Total Quantity						1174.500 metre	
		Say 1174.500 metre @ Rs 5013.17 / metre						<b>Rs 5887968.17</b>	
16	od330783/2021_2022 :Installation of PE -250mm-315mm mm dia PE pipe by horizontal directional drilling method in all types of soil above /below water table for pumping /gravity /distribution main including preparing and setting up the plat and equipment, installing new pipe work, testing and commissioning excluding cost of pipe (6 m line pipe with butt joint all related civil /mechanical works like entry /exits pit as necessary. De watering ,drilling stringing, reaming, pulling back the new pipe on the designed alignment and								

	monitoring by approved guidance system. wastage of pipes, proper disposal of drilling fluid /bentonite slurry. Proper back filling og pit and holes by approved borrow material as per specification approved method statement or as directed by engineer in charge. also using Ground penetrating radar survey in corridor with to detect buried utilities on the map of corridor with information of locations and depths to the top of various utilities detected. work to be conducted using 500MHZ and 300MHZ antenna or latest for the best possible resolution and penetration including hydrolic testing							
	250 mm PE pipe	1	191.800				191.800	
	280 mm PE pipe	1	227.100				227.100	
	315 mm PE pipe	1	75.900				75.900	
	Total Quantity						494.800 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						494.800 metre	
	Say 494.800 metre @ Rs 6348.83 / metre						<b>Rs 3141401.08</b>	
17	od330833/2021_2022 Supplying, Providing bedding with m sand for sewer lines as per specifications to be laid wherever necessary with all lead and lift.							
	beding for lines	1	21014.400	0.600	0.100	0.7	882.605	
	Total Quantity						882.605 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						882.605 cum	
	Say 882.605 cum @ Rs 2246.62 / cum						<b>Rs 1982878.05</b>	
18	4.1.5 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)							
	P C C bedding concrete where ever necessary	1	21014.400	0.600	0.100	0.25	315.217	
	Total Quantity						315.217 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						315.217 cum	
	Say 315.217 cum @ Rs 7229.54 / cum						<b>Rs 2278873.91</b>	
19	100.98.227 Supply of uPVC Pipe, IS 4985: 2000 , 8kg/cm2, 200mm Dia.							
	For house connection IC to MH	1	12552.000				12552.000	1046X3X4

	Total Quantity						12552.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						12552.000 metre	
	Say 12552.000 metre @ Rs 1393.80 / metre						<b>Rs 17494977.60</b>	
20	od330834/2021_2022 Conveying to site, lowering into trenches, laying to correct line and grade using CC holding clamps, 200mm PVC SN 8 (8 Kg/Cm2) S & S Sewerage pipes conforming to I.S.15328, including jointing the pipes using rubber rings as per approved methods with rubber gasket for flexible joints as per specification including cost of gasket, to correct line , de watering with all rates of recuperation etc, providing bedding for pipe line trenches with available earth, hydraulic testing the line to the required test pressure as per IS, CPHEEO specifications, lighting, watching, providing caution boards etc. wherever required, during laying and jointing the pipes including hire for all tools etc complete including commissioning for the following diamters							
	For house connection IC to MH	1	12552.000				12552.000	1046X3X4
	Total Quantity						12552.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						12552.000 metre	
	Say 12552.000 metre @ Rs 290.67 / metre						<b>Rs 3648489.84</b>	
21	60.2.3 Bailing out water using pump above 5 HP and Up to 10 HP-Bailing out water with engine and pump set above 5HP and up to 10HP, including conveyance to site and erection, cost of fuel, lubrication oil and other stores, pay of staff etc complete							
		25	8.000	5.000*.74 6			746.000	
	Total Quantity						746.000 hour	
	Total Deducted Quantity						0.000 hour	
	Net Total Quantity						746.000 hour	
	Say 746.000 hour @ Rs 424.97 / hour						<b>Rs 317027.62</b>	
22	60.2.4 BAILING OUT WATER USING PUMP ABOVE 10HP AND UP TO 20HP - Bailing out water with engine and pump set above 10HP and up to 20HP, including conveyance to site and erection, cost of fuel, lubrication oil and other stores, pay of staff etc complete							
		10	15.000*.7 46	8.000			895.200	
	Total Quantity						895.200 hour	
	Total Deducted Quantity						0.000 hour	
	Net Total Quantity						895.200 hour	

	Say 895.200 hour @ Rs 527.56 / hour						<b>Rs 472271.71</b>	
23	60.2.5 BAILING OUT WATER USING PUMP ABOVE 20HP AND UP TO 30HP -Bailing out water with engine and pump set above 25HP and up to 30HP, including conveyance to site and erection, cost of fuel, lubrication oil and other stores, pay of staff etc complete							
		15	25.000*.7 46	8.000			2238.000	
	Total Quantity						2238.000 hour	
	Total Deducted Quantity						0.000 hour	
	Net Total Quantity						2238.000 hour	
	Say 2238.000 hour @ Rs 954.93 / hour						<b>Rs 2137133.34</b>	
24	od331132/2021_2022 Supply of PE Pipe PE 100 (IS 14333/ sewerage pipe with latest IS), 8kg, 225mm Outer Dia							
	HDPE Pipe PE 100 , 8kg, 225mm Outer Dia	1	18067.600				18067.600	
	Total Quantity						18067.600 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						18067.600 metre	
	Say 18067.600 metre @ Rs 1336.89 / metre						<b>Rs 24154393.76</b>	
25	od330836/2021_2022 Supply of PE Pipe PE 100 (IS 14333/ sewerage pipe with latest IS), 8kg, 250mm Outer Dia.							
	HDPE Pipe PE 100 , 8kg, 250mm Outer Dia.	1	1169.700				1169.700	
	Total Quantity						1169.700 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1169.700 metre	
	Say 1169.700 metre @ Rs 2079.09 / metre						<b>Rs 2431911.57</b>	
26	od331229/2021_2022 Supply of PE Pipe PE 100 (IS 14333/ sewerage pipe with latest IS), 8kg, 280mm Outer Dia.							
	HDPE Pipe PE 100, 8kg, 280mm Outer Dia.	1	731.500				731.500	
	Total Quantity						731.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						731.500 metre	

	Say 731.500 metre @ Rs 2066.31 / metre						<b>Rs 1511505.77</b>	
27	od331182/2021_2022 Supply of PE Pipe PE 100 (IS 14333/ sewerage pipe with latest IS), 8kg, 315mm Outer Dia.							
	HDPE Pipe PE 100 , 8kg, 315mm Outer Dia.	1	792.700				792.700	
	Total Quantity						792.700 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						792.700 metre	
	Say 792.700 metre @ Rs 2624.99 / metre						<b>Rs 2080829.57</b>	
28	od331228/2021_2022 Supply of PE Pipe PE 100 (IS 14333/ sewerage pipe with latest IS), 8kg, 355mm Outer Dia.							
	HDPE Pipe PE 100 , 8kg, 355mm Outer Dia.	1	119.900				119.900	
	Total Quantity						119.900 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						119.900 metre	
	Say 119.900 metre @ Rs 3313.76 / metre						<b>Rs 397319.82</b>	
29	od331377/2021_2022 Supply of PE Pipe PE 100 (IS 14333/ sewerage pipe with latest IS), 8kg, 400mm Outer Dia.							
	HDPE Pipe PE 100 , 8kg, 400mm Outer Dia.	1	126.900				126.900	
	Total Quantity						126.900 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						126.900 metre	
	Say 126.900 metre @ Rs 4215.86 / metre						<b>Rs 534992.63</b>	
30	od331378/2021_2022 Supply of PE Pipe PE 100 (IS 14333/ sewerage pipe with latest IS), 8kg, 450mm Outer Dia.							
	HDPE Pipe PE 100, 8kg, 450mm Outer Dia.	1	6.100				6.100	
	Total Quantity						6.100 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						6.100 metre	

	Say 6.100 metre @ Rs 5335.20 / metre						<b>Rs 32544.72</b>	
31	<p>100.10.8 Laying HDPE pipes (IS : 4984)on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete but excluding cost of pipe and fittings. 225 mm OD HDPE pipe NEW DATA</p>							
	HDPE Pipe PE 100 , 8kg, 225mm Outer Dia	1	18067.600				18067.600	
	Total Quantity						18067.600 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						18067.600 metre	
	Say 18067.600 metre @ Rs 370.21 / metre						<b>Rs 668806.20</b>	
32	<p>100.10.9 Laying HDPE pipes (IS : 4984)on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete but excluding cost of pipe and fittings. 250 mm OD HDPE pipe NEW DATA</p>							
	HDPE Pipe PE 100 , 8kg, 250mm Outer Dia.	1	1169.700				1169.700	
	Total Quantity						1169.700 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1169.700 metre	
	Say 1169.700 metre @ Rs 433.54 / metre						<b>Rs 507111.74</b>	
33	<p>100.10.10 Laying HDPE pipes (IS : 4984)on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete but excluding cost of pipe and fittings. 280 mm OD HDPE pipe NEW DATA</p>							



	HDPE Pipe PE 100, 8kg, 280mm Outer Dia.	1	731.500				731.500	
	Total Quantity						731.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						731.500 metre	
	Say 731.500 metre @ Rs 510.05 / metre						<b>Rs 373101.58</b>	
34	100.10.11 Laying HDPE pipes (IS : 4984)on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete but excluding cost of pipe and fittings. 315 mm OD HDPE pipe NEW DATA							
	HDPE Pipe PE 100 , 8kg, 315mm Outer Dia.	1	792.700				792.700	
	Total Quantity						792.700 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						792.700 metre	
	Say 792.700 metre @ Rs 570.12 / metre						<b>Rs 451934.12</b>	
35	100.10.12 Laying HDPE pipes (IS : 4984)on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete but excluding cost of pipe and fittings. 355 mm OD HDPE pipe NEW DATA							
	HDPE Pipe PE 100 , 8kg, 355mm Outer Dia.	1	119.900				119.900	
	Total Quantity						119.900 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						119.900 metre	
	Say 119.900 metre @ Rs 643.30 / metre						<b>Rs 77131.67</b>	

36	100.10.13 Laying HDPE pipes (IS : 4984)on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete but excluding cost of pipe and fittings. 400 mm OD HDPE pipe NEW DATA							
	HDPE Pipe PE 100 , 8kg, 400mm Outer Dia.	1	126.900				126.900	
	Total Quantity						126.900 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						126.900 metre	
	Say 126.900 metre @ Rs 716.61 / metre						<b>Rs 90937.81</b>	
37	100.10.14 Laying HDPE pipes (IS : 4984)on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete but excluding cost of pipe and fittings 450 mm OD HDPE pipe NEW DATA							
	HDPE Pipe PE 100, 8kg, 450mm Outer Dia.	1	6.100				6.100	
	Total Quantity						6.100 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						6.100 metre	
	Say 6.100 metre @ Rs 796.70 / metre						<b>Rs 4859.87</b>	
38	od330837/2021_2022 Constructing inspection chambers of size 0.45x0.45m (inside) and 0.60m deep with RCC M20 using 20mm broken stone for floor slab ,RCC M20 slab using 20mm broken stone for removable cover slab, Brick work in CM 1:6 for walls, PCC 1:4:8 using 20mm broken stone for levelling course below foundation including earth work excavation in all classes of soil,, plastering the inside with CM 1:3, 9mm thick with neat cement flush coat, providing necessary slope in the benching towards main sewer, providing provision for connecting main sewer and service connections, conveying, lifting, placing the cover slab in position by suitable means, conveying and disposing the surplus earth with all lead and lift as per drawings and specifications , including the cost of reinforcement , testing the chamber and sulphate							

	resistant cement shall be used for the the construction of inspection chamber							
	Inspection chambers of inside size 0.45x0.45x0.6 m	523					523.000	2092x0.25 =523
	Total Quantity						523.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						523.000 No	
	Say 523.000 No @ Rs 7095.90 / No						<b>Rs 3711155.70</b>	
39	<p>od330838/2021_2022</p> <p>Constructing inspection chambers of size 0.45x0.45m (inside) and 0.45m deep with RCC M20 using 20mm broken stone for floor slab ,RCC M20 slab using 20mm broken stone for removable cover slab, Brick work in CM 1:6 for walls, PCC 1:4:8 using 20mm broken stone for leveling course below foundation including earth work excavation in all classes of soil, , plastering the inside with CM 1:3, 9mm thick with neat cement flush coat, providing necessary slope in the benching towards main sewer, providing provision for connecting main sewer and service connections, conveying, lifting, placing the cover slab in position by suitable means, conveying and disposing the surplus earth with all lead and lift as per drawings and specifications , including the cost of reinforcement , testing the chamber and sulphate resistant cement shall be used for the the construction of inspection chamber</p>							
	Inspection chambers of inside size 0.45x0.45x0.45m	314					314.000	2092x0.15 =313.8
	Total Quantity						314.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						314.000 No	
	Say 314.000 No @ Rs 3582.61 / No						<b>Rs 1124939.54</b>	
40	<p>od330839/2021_2022</p> <p>Constructing inspection chambers of size 0.60x0.60m (inside) and 0.90m deep with RCC M20 using 20mm broken stone for floor slab ,RCC M20 slab using 20mm broken stone for removable cover slab, Brick work in CM 1:6 for walls, PCC 1:4:8 using 20mm broken stone for leveling course below foundation including earth work excavation in all classes of soil, plastering the inside with CM 1:3, 9mm thick with neat cement flush coat, providing necessary slope in the benching towards main sewer, providing provision for connecting main sewer and service connections, conveying, lifting, placing the cover slab in position by suitable means, conveying and disposing the surplus earth with all lead and lift as per drawings and specifications , including the cost of reinforcement , testing the chamber and sulphate resistant cement shall be used for the the construction of inspection chamber</p>							
	Inspection chambers of inside size 0.6 X 0.6 X 0.9 m	418					418.000	2092x0.20 =418
	Total Quantity						418.000 No	
	Total Deducted Quantity						0.000 No	

	Net Total Quantity						418.000 No	
	Say 418.000 No @ Rs 7732.35 / No						<b>Rs 3232122.30</b>	
41	od330840/2021_2022 Constructing inspection chambers of size 0.60x0.60m (inside) and 0.60m deep with RCC M20 using 20mm broken stone for floor slab ,RCC M20 slab using 20mm broken stone for removable cover slab, Brick work in CM 1:6 for walls, PCC 1:4:8 using 20mm broken stone for leveling course below foundation including earth work excavation in all classes of soil, plastering the inside with CM 1:3, 9mm thick with neat cement flush coat, providing necessary slope in the benching towards main sewer, providing provision for connecting main sewer and service connections, conveying, lifting, placing the cover slab in position by suitable means, conveying and disposing the surplus earth with all lead and lift as per drawings and specifications , including the cost of reinforcement , testing the chamber and sulphate resistant cement shall be used for the the construction of inspection chamber							
	Inspection chambers of inside size 0.6x0.6x0.6 m	418					418.000	2092x0.2=418
	Total Quantity						418.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						418.000 No	
	Say 418.000 No @ Rs 7287.07 / No						<b>Rs 3045995.26</b>	
42	od330841/2021_2022 Constructing inspection chambers of size 0.60x0.60m (inside) and 0.75m deep with RCC M20 using 20mm broken stone for floor slab ,RCC M20 slab using 20mm broken stone for removable cover slab, Brick work in CM 1:6 for walls, PCC 1:4:8 using 20mm broken stone for leveling course below foundation including earth work excavation in all classes of soil, plastering the inside with CM 1:3, 9mm thick with neat cement flush coat, providing necessary slope in the benching towards main sewer, providing provision for connecting main sewer and service connections, conveying, lifting, placing the cover slab in position by suitable means, conveying and disposing the surplus earth with all lead and lift as per drawings and specifications , including the cost of reinforcement , testing the chamber and sulphate resistant cement shall be used for the the construction of inspection chamber							
	Inspection chambers of inside size 0.6x0.6x0.75 m	419					419.000	2092x0.2=419
	Total Quantity						419.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						419.000 No	
	Say 419.000 No @ Rs 7496.45 / No						<b>Rs 3141012.55</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>2Road Restoration work of laying of sewers and pumping main. (Cost Index:33.05 %)</b>								

1	od335034/2021_2022 Excavation for roadwork in soil with hydraulic excavator of 0.9 cum bucket capacity including cutting and loading in tippers, trimming bottom and side slopes, in accordance with requirements of lines, grades and cross sections, and transporting to the embankment location within all lifts and lead up to 1000 m							
	Sewer lines from 225mm to 450mm	1	8014.000	1.500	0.300		3606.300	21014x0.6
	Inspection Chamber to Manhole	1	6276.000	1.500	0.300		2824.200	(1046X3X4)0.6
	Pumping main(100mm to 300mm DI)	1	1200.000	0.700	0.300		252.000	
	Total Quantity						6682.500 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						6682.500 cum	
	Say 6682.500 cum @ Rs 58.08 / cum						<b>Rs 388119.60</b>	
2	100.41.39 Supply ,stacking,spreading and consolidating of Quarry Muck in the trench of pipe line, including carriage, loading ,unloading & stacking up to any lead.							
	Sewer lines from 225mm to 450mm	1	8014.000	1.500	0.150		1803.150	21014x0.6
	Inspection Chamber to Manhole	1	6276.000	1.500	0.150		1412.100	(1046X3X4)0.6
	Pumping main(100mm to 300mm DI)	1	1200.000	0.700	0.150		126.000	
	Total Quantity						3341.250 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3341.250 cum	
	Say 3341.250 cum @ Rs 543.16 / cum						<b>Rs 1814833.35</b>	
3	16.79 Providing , laying spreading and compacting graded stone aggregate ( size range 53 mm to 0.075 mm) to wet mix macadam (WMM) specification including premixing the material with water at OMC in mechanical mix plant, carriage of mixed material by tipper to site, for all leads & lifts, laying in uniform layers with mechanical paver finisher in sub - base / base course on well prepared surface and compacting with vibratory roller of 8 to 10 tonne capacity to achieve the desired density, complete as per specifications and directions of Engineer - in- Charge.							
	Sewer lines from 225mm to 450mm	1	8014.000	1.500	0.150		1803.150	21014x0.6
	Inspection Chamber to Manhole	1	6276.000	1.500	0.150		1412.100	(1046X3X4)0.6

	Pumping main(100mm to 300mm DI)	1	1200.000	0.700	0.150		126.000		
	Total Quantity						3341.250 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						3341.250 cum		
	Say 3341.250 cum @ Rs 3050.90 / cum						<b>Rs 10193819.63</b>		
4	od330801/2021_2022 Providing and applying primer coat with bitumen emulsion ( SS) on prepared surface of granular Base including clearing of road surface and spraying primer at the rate of 0.70 - 1.0 kg/sqm using mechanical means								
	Sewer lines from 225mm to 450mm	1	8014.000	1.500			12021.000	21014x0.6	
	Inspection Chamber to Manhole	1	6276.000	1.500			9414.000	(1046X3X4)0.6	
	Pumping main(100mm to 300mm DI)	1	1200.000	0.700			840.000		
	Total Quantity						22275.000 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						22275.000 sqm		
	Say 22275.000 sqm @ Rs 59.03 / sqm						<b>Rs 1314893.25</b>		
5	od330806/2021_2022 Providing and applying tack coat with bitumen emulsion( RS) using emulsion pressure distributor at the rate of 0.20 - 0.30 kg per sqm on the prepared bituminous surface cleaned with mechanical broom								
	Sewer lines from 225mm to 450mm	1	8014.000	1.800			14425.200	21014x0.6	
	Inspection Chamber to Manhole	1	6276.000	1.800			11296.801	(1046X3X4)0.6	
	Pumping main(100mm to 300mm DI)	1	1200.000	1.500			1800.000		
	Total Quantity						27522.001 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						27522.001 sqm		
	Say 27522.001 sqm @ Rs 10.41 / sqm						<b>Rs 286504.03</b>		
6	od330808/2021_2022 Providing, laying and rolling of open graded premix carpet of 20 mm thickness with 0.27 cum of 12 mm departmental aggregates premixed with 12.96 kg of bitumen per 10 sqm using penetration grade bitumen to required line, grade and level on a previously prepared base, after priming the								

	existing surface with 5 kg of bitumen (VG 30) 10 sqm including mixing in a suitable plant, laying and rolling with a three wheel static roller of 80-100 KN capacity, finished to required level and grades,followed by a seal coat of 0.09 cum of 6 mm departmental aggregates premixed with 8.64 kg of bitumen per 10 sqm.By Manual Means.							
	Sewer lines from 225mm to 450mm	1	8014.000	1.800			14425.200	
	Inspection Chamber to Manhole	1	6276.000	1.800			11296.801	
	Pumping main(100mm to 300mm DI)	1	1200.000	1.500			1800.000	
	Total Quantity						27522.001 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						27522.001 sqm	
	Say 27522.001 sqm @ Rs 176.52 / sqm						<b>Rs 4858183.62</b>	
7	od330812/2021_2022 Seal Coat - Manual Means - Type C - Bitumen S-65 Providing and laying seal coat sealing the voids in a bituminous surface laid to the specified levels, grade and cross fall using Type A, Type B and Type C as per Technical Specification Clause 510 A.By Manual Means:-Case - III : Type C							
	Sewer lines from 225mm to 450mm	1	8014.000	1.800			14425.200	
	Inspection Chamber to Manhole	1	6276.000	1.800			11296.801	
	Pumping main(100mm to 300mm DI)	1	1200.000	1.500			1800.000	
	Total Quantity						27522.001 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						27522.001 sqm	
	Say 27522.001 sqm @ Rs 78.00 / sqm						<b>Rs 2146716.08</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>3Construction of Collection wellcum Pumping stations (Cost Index:33.05 %)</b>								
1	2.31 Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50 m outside the periphery of the area cleared							
		1	20.000	20.000			400.000	average 40 cents
	Total Quantity						400.000 sqm	
	Total Deducted Quantity						0.000 sqm	

	Net Total Quantity						400.000 sqm	
	Say 400.000 sqm @ Rs 14.50 / sqm						<b>Rs 5800.00</b>	
2	<p>100.3.5.1 Earthwork open well excavation (above water) for wells of dia. above 3.5m and upto 6.0 m in all kinds of soil and conveying and depositing the spoil within initial lead of 50m and lift up to 1.5 m including neat banking. NEW DATA (Prepared based on PHED SDB - Item No.1089 &amp; 1092)</p>							
	CW-5m dia, Depth 4.38 m	1	3.140	3.1*3.1	1.500		45.264	
	Total Quantity						45.264 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						45.264 cum	
	Say 45.264 cum @ Rs 461.35 / cum						<b>Rs 20882.55</b>	
3	<p>100.3.5.2 Earthwork open well excavation (above water) for wells of dia. above 3.5m and upto 6.0 m in all kinds of soil and conveying and depositing the spoil within initial lead of 50m and lift from 1.5m to 3.0 m including neat banking. NEW DATA (Prepared based on PHED SDB - Item No.1089 &amp; 1092)</p>							
	CW-5m dia, Depth 4.38 m	1	3.140	3.1*3.1	1.500		45.264	
	Kerala Water Authority Total Quantity						45.264 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						45.264 cum	
	Say 45.264 cum @ Rs 507.52 / cum						<b>Rs 22972.39</b>	
4	<p>100.3.5.13 Earthwork open well excavation (in or under water) for wells of dia. above 3.5m and upto 6.0 m in all kinds of soil and conveying and depositing the spoil within initial lead of 50m and lift from 3.0m to 4.5 m including neat banking. NEW DATA (Prepared based on PHED SDB - Item No.1090 &amp; 1093)</p>							
	CW-5m dia, Depth 4.38 m	1	3.140	3.1*3.1	1.500		45.264	
	Total Quantity						45.264 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						45.264 cum	
	Say 45.264 cum @ Rs 664.32 / cum						<b>Rs 30069.78</b>	
5	<p>100.3.6.4 Earthwork open well excavation (above water) for wells of dia. above 3.5m and upto 6.0 m in ordinary rock and conveying and depositing the spoil within initial lead of 50m and lift from 4.5m to 6.00 m</p>							



	including neat banking. NEW DATA (Prepared based on PHED SDB - Item No.1095)						
	CW-5m dia, Depth 4.38 m	1	3.140	3.1*3.1	0.380		11.467
	Total Quantity						11.467 cum
	Total Deducted Quantity						0.000 cum
	Net Total Quantity						11.467 cum
	Say 11.467 cum @ Rs 1516.70 / cum						<b>Rs 17392.00</b>
6	100.7.1 Bailing out water with 5 HP engine and pumpset including conveyance to the site, erection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete. NEW DATA (Prepared based on PHED SDB - Item No.1070)						
	CW	1	200.000				200.000
	Total Quantity						200.000 Kwh
	Total Deducted Quantity						0.000 Kwh
	Net Total Quantity						200.000 Kwh
	Say 200.000 Kwh @ Rs 36.26 / Kwh						<b>Rs 7252.00</b>
7	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 ( 1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)						
	CW-5m dia, Depth 4.38 m	1	3.140	3.1*3.1	0.200		6.036
	Total Quantity						6.036 cum
	Total Deducted Quantity						0.000 cum
	Net Total Quantity						6.036 cum
	Say 6.036 cum @ Rs 7076.06 / cum						<b>Rs 42711.10</b>
8	5.37.1 Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level						

	CW-5m dia, Depth 4.38 m - Bottom plugging	1	3.140	3.1*3.1	0.300		9.053		
	Side wall	1	3.140*5.3	0.300	4.380		21.868		
	Cover slab	1	3.140	2.8*2.8	0.300		7.386		
	manhole	2	0.500	0.500	0.300		-0.150		
	Total Quantity						38.307 cum		
	Total Deducted Quantity						-0.150 cum		
	Net Total Quantity						38.157 cum		
	Say 38.157 cum @ Rs 9700.81 / cum						<b>Rs 370153.81</b>		
9	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).								
	Qty taken from item no-8	1	38.157				38.157		
	Total Quantity						38.157 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						38.157 cum		
	Say 38.157 cum @ Rs 80.56 / cum						<b>Rs 3073.93</b>		
10	4.12 Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .								
	Qty taken from item no-8*340	1	38.157	340.000			12973.380		
	Total Quantity						12973.380 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						12973.380 kg		
	Say 12973.380 kg @ Rs 1.33 / kg						<b>Rs 17254.60</b>		
11	2.17.3 Close timbering in case of shafts, wells, cesspits, manholes and the like including strutting, shoring and packing cavities (wherever required) etc. complete (Measurements to be taken of the face area timbered).Depth exceeding 3 m but not exceeding 4.5 m								
	CW-5m dia, Depth 4.38 m	1	3.140	3.1*3.1	5.000		150.877		
	Total Quantity						150.877 sqm		
	Total Deducted Quantity						0.000 sqm		

	Net Total Quantity						150.877 sqm	
	Say 150.877 sqm @ Rs 217.07 / sqm						<b>Rs 32750.87</b>	
12	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
	CW-5m dia, Depth 4.38 m-Bottom plugging	1	3.140	6.200	0.200		3.894	
	Total Quantity						3.894 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						3.894 sqm	
	Say 3.894 sqm @ Rs 329.03 / sqm						<b>Rs 1281.24</b>	
13	5.9.2 Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, buttersesses, plinth and string courses etc.							
	CW-5m dia, Depth 4.38-Wall inside	1	3.140	5.000	5.940		93.259	
	Wall outside	1	3.140	5.600	5.940		104.449	
	Total Quantity						197.708 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						197.708 sqm	
	Say 197.708 sqm @ Rs 703.77 / sqm						<b>Rs 139140.96</b>	
14	5.9.20 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform with water proof ply 12 mm thick							
	CW-5m dia, Depth 4.38-Cover slab	1	3.140	2.8*2.8			24.618	
	Coverslab side edge	1	3.140	5.600	0.300		5.276	
	Total Quantity						29.894 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						29.894 sqm	
	Say 29.894 sqm @ Rs 900.08 / sqm						<b>Rs 26906.99</b>	
15	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	Qty taken from item no-8*340	1	38.157	80.000			3052.560	

	Total Quantity						3052.560 kilogram
	Total Deducted Quantity						0.000 kilogram
	Net Total Quantity						3052.560 kilogram
	Say 3052.560 kilogram @ Rs 96.46 / kilogram						<b>Rs 294449.94</b>
16	od338067/2021_2022 Extra for providing epoxy coating for reinforcement bars.						
	Qty taken from item no-8*340	1	38.157	80.000			3052.560
	Total Quantity						3052.560 kg
	Total Deducted Quantity						0.000 kg
	Net Total Quantity						3052.560 kg
	Say 3052.560 kg @ Rs 2.32 / kg						<b>Rs 7081.94</b>
17	22.23.1 Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For vertical surface two coats @ 0.70 kg per sqm						
	CW-5m dia, Depth 4.38-Wall inside	1	3.140	5.000	5.940		93.259
	Wall outside	1	3.140	5.600	5.940		104.449
	Total Quantity						197.708 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						197.708 sqm
	Say 197.708 sqm @ Rs 559.61 / sqm						<b>Rs 110639.37</b>
18	22.23.2 Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN						

	1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystallineslurry shall be capable of self-healing of cracks up to a width of 0.50mm. The workshall be carried out all complete as per specification and the direction of the engineerin-charge. The product performance shall carry guarantee for 10 years against anyleakage.For horizontal surface one coat @1.10 kg per sqm.							
	CW-5m dia, Depth 4.38-base slab	1	3.140	2.5*2.5			19.625	
	cover slab - bottom	1	3.140	2.5*2.5			19.625	
	Total Quantity						39.250 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						39.250 sqm	
	Say 39.250 sqm @ Rs 431.28 / sqm						<b>Rs 16927.74</b>	
19	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)							
	CW-5m dia, Depth 4.38-Wall inside	1	3.140	5.000	5.940		93.259	
	Wall outside	1	3.140	5.600	5.940		104.449	
	CW-5m dia, Depth 4.38-base slab	1	3.140	2.5*2.5			19.625	
	cover slab - bottom	1	3.140	2.5*2.5			19.625	
	Kerala Water Authority Total Quantity						236.958 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						236.958 sqm	
	Say 236.958 sqm @ Rs 393.69 / sqm						<b>Rs 93288.00</b>	
20	13.44.1 Finishing walls with water proofing cement paint of required shade:New work (Two or more coats applied @ 3.84 kg/10 sqm)							
	CW-5m dia, Depth 4.38-Wall inside	1	3.140	5.000	5.940		93.259	
	Wall outside	1	3.140	5.600	5.940		104.449	
	CW-5m dia, Depth 4.38-base slab	1	3.140	2.5*2.5			19.625	
	cover slab - bottom	1	3.140	2.5*2.5			19.625	
	Total Quantity						236.958 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						236.958 sqm	
	Say 236.958 sqm @ Rs 105.38 / sqm						<b>Rs 24970.63</b>	

21	13.65.1 Painting with black anti- corrosive bitumastic paint of approved brand and manufacture to give an even shade:Two or more coats on new work							
	CW-5m dia, Depth 4.38-Wall inside	1	3.140	5.000	5.940		93.259	
	Wall outside	1	3.140	5.600	5.940		104.449	
	CW-5m dia, Depth 4.38-base slab	1	3.140	2.5*2.5			19.625	
	cover slab - bottom	1	3.140	2.5*2.5			19.625	
	Total Quantity						236.958 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						236.958 sqm	
	Say 236.958 sqm @ Rs 122.47 / sqm						<b>Rs 29020.25</b>	
22	100.41.34 Supplying and fixing Rectangular CI manhole cover 455x610 mm with frame (low duty) charges including all cost, labour charges etc complete.							
	CW	2					2.000	
	Total Quantity						2.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						2.000 No	
	Say 2.000 No @ Rs 2745.75 / No						<b>Rs 5491.50</b>	
23	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Filling around the Stening							
	CW-5m dia, Depth 4.38 m	1	3.140*5.6	4.380	0.500		38.509	
	Total Quantity						38.509 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						38.509 cum	
	Say 38.509 cum @ Rs 253.73 / cum						<b>Rs 9770.89</b>	
24	od330810/2021_2022 Supplying providing and fixing CI encapsulated steps at 30.00cm c/c in a staggered manner including all labour charges, etc complete as per the instruction of the engineer in-charge.							
	Qty as per BOQ	12					12.000	

	Total Quantity						12.000 No		
	Total Deducted Quantity						0.000 No		
	Net Total Quantity						12.000 No		
	Say 12.000 No @ Rs 424.89 / No						<b>Rs 5098.68</b>		
25	100.36.1 Filling water with 5000 litre tankers fitted in lorry and conveying water from a distance of 5 km (average) to the reservoir site and pumping the water into the reservoir of height not less than 3 m using 5 HP diesel engine pump set , hire for tanker lorry, tools and other appliances and cost of water etc. complete. "(Ref. No. 000, Technical Circular)"								
	CW-5m dia, Depth 4.38-Wall inside	1	3.140	2.5*2.5	5.940		116.573		
	Total Quantity						116.573 Kilo litre		
	Total Deducted Quantity						0.000 Kilo litre		
	Net Total Quantity						116.573 Kilo litre		
	Say 116.573 Kilo litre @ Rs 182.79 / Kilo litre						<b>Rs 21308.38</b>		
SI No	Description	No	L	B	D	CF	Quantity	Remark	
<b>4Compound wall with gate for Collection wellcum Pumping stations (Cost Index:33.05 %)</b>									
1	2.2.1 Earth work in rough excavation, banking excavated earth in layers not exceeding 20 cm in depth, breaking clods, watering, rolling each layer with 1/2 tonne roller or wooden or steel rammers, and rolling every 3rd and top-most layer with power roller of minimum 8 tonnes and dressing up in embankments for roads, flood banks, marginal banks and guide banks or filling up ground depressions, lead up to 50 m and lift up to 1.5 m:All kinds of soil								
		1	80.000	0.600	0.500		24.000		
	Total Quantity						24.000 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						24.000 cum		
	Say 24.000 cum @ Rs 862.56 / cum						<b>Rs 20701.44</b>		
2	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 ( 1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)								
		1	80.000	0.600	0.200		9.601		
	Total Quantity						9.601 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						9.601 cum		
	Say 9.601 cum @ Rs 7076.06 / cum						<b>Rs 67937.25</b>		

3	7.1.1 Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with:Cement mortar 1:6 (1 cement : 6 coarse sand)	1	80.000	0.500	0.500	20.000		
		Total Quantity					20.000 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					20.000 cum	
		Say 20.000 cum @ Rs 7069.81 / cum					<b>Rs 141396.20</b>	
4	5.1.2 Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level:1:1:5:3 (1 cement 1.5 coarse sand :3 graded stone aggregate 20 mm nominal size)	1	80.000	0.500	0.150	6.000		
		Total Quantity					6.000 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					6.000 cum	
		Say 6.000 cum @ Rs 8914.95 / cum					<b>Rs 53489.70</b>	
5	6.1.2 Brick work with common burnt clay F.P.S (non modular) bricks of class designation 7.5 in foundation and plinth in:Cement mortar 1:6 (1 cement : 6 coarse sand)	1	80.000	0.220	2.000	35.200		
		Total Quantity					35.200 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					35.200 cum	
		Say 35.200 cum @ Rs 7112.12 / cum					<b>Rs 250346.62</b>	
6	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	1	6.000		50.0	300.000		
		Total Quantity					300.000 kilogram	
		Total Deducted Quantity					0.000 kilogram	
		Net Total Quantity					300.000 kilogram	
		Say 300.000 kilogram @ Rs 96.46 / kilogram					<b>Rs 28938.00</b>	
7	13.1.2 12 mm cement plaster of mix:1:6 (1 cement : 6 fine sand).							



		1	80.000		4.220		337.600		
	Total Quantity						337.600 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						337.600 sqm		
	Say 337.600 sqm @ Rs 293.64 / sqm						<b>Rs 99132.86</b>		
8	13.43.1	Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface:Water thinnable cement primer							
		2	160.000		1.800		576.000		
	Total Quantity						576.000 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						576.000 sqm		
	Say 576.000 sqm @ Rs 69.32 / sqm						<b>Rs 39928.32</b>		
9	13.44.1	Finishing walls with water proofing cement paint of required shade:New work (Two or more coats applied @ 3.84 kg/10 sqm)							
		2	160.000		1.800		576.000		
	Total Quantity						576.000 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						576.000 sqm		
	Say 576.000 sqm @ Rs 105.38 / sqm						<b>Rs 60698.88</b>		
10	10.25.2	Item Shifted to Sub head 14 as item 14.73Item Shifted to head 14 as item 14.74Steel work welded in built up sections/framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works							
	MS gate	1	800.000				800.000		
	Total Quantity						800.000 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						800.000 kg		
	Say 800.000 kg @ Rs 151.28 / kg						<b>Rs 121024.00</b>		
SI No	Description	No	L	B	D	CF	Quantity	Remark	
<b>5Construction of Receiving Chanel and screen chamber at Collection well (Cost Index:33.05 %)</b>									

1	100.1.1 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : All kinds of soil (Ref. Item No. 2.10.1 of DSR)							
	screenchamber out side dim 6.2X1.75	1	7.000	2.550	1.500	0.6	16.065	out side dim 6.2X1.75x 3.33
	Total Quantity						16.065 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						16.065 cum	
	Say 16.065 cum @ Rs 545.11 / cum						<b>Rs 8757.19</b>	
2	100.1.2 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 1.5m but not exceeding 3 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m: 1.50m to 3.0m All kinds of soil (Ref. Item No. 2.11 of DSR)							
	screenchamber out side dim 6.2X1.75	1	7.000	2.550	1.500	0.6	16.065	out side dim 6.2X1.75x 3.33
	Total Quantity						16.065 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						16.065 cum	
	Say 16.065 cum @ Rs 649.48 / cum						<b>Rs 10433.90</b>	
3	100.1.3 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 3m in depth but not exceeding 4.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 3.0m to 4.50m All kinds of soil (Ref. Item No. 2.12 of DSR)							

	screenchamber out side dim 6.2X1.75	1	7.000	2.550	0.330	0.6	3.535	out side dim 6.2X1.75x 3.33	
	Total Quantity						3.535 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						3.535 cum		
	Say 3.535 cum @ Rs 753.86 / cum						<b>Rs 2664.90</b>		
4	<p>100.15 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m :"</p> <p>Ordinary Rock. (Ref. Item No. 2.13.1 of DSR)</p>								
	screenchamber out side dim 6.2X1.75	1	7.000	2.550	1.500	0.4	10.710	out side dim 6.2X1.75x 3.33	
	Total Quantity						10.710 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						10.710 cum		
	Say 10.710 cum @ Rs 791.65 / cum						<b>Rs 8478.57</b>		
5	<p>100.16 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 1.5m but not exceeding 3 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 1.50m to 3.0m.</p> <p>Ordinary Rock. (Ref. Item No. 2.14 of DSR)</p>								
	screenchamber out side dim 6.2X1.75	1	7.000	2.550	1.500	0.4	10.710	out side dim 6.2X1.75x 3.33	
	Total Quantity						10.710 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						10.710 cum		
	Say 10.710 cum @ Rs 978.85 / cum						<b>Rs 10483.48</b>		

6	<p>100.1.7 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 3m in depth but not exceeding 4.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 3.0m to 4.50m. Ordinary Rock. (Ref. Item No. 2.15 of DSR)</p>							
	screenchamber out side dim 6.2X1.75	1	7.000	2.550	0.330	0.4	2.357	out side dim 6.2X1.75x 3.33
	Total Quantity						2.357 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.357 cum	
	Say 2.357 cum @ Rs 1166.05 / cum						<b>Rs 2748.38</b>	
7	<p>2.16.3 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth exceeding 3 m but not exceeding 4.5 m</p>							
	screenchamber out side dim 6.2X1.75	1	(7.000*2+ 2.55*2)		3.330		63.604	out side dim 6.2X1.75x 3.33
	Total Quantity						63.604 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						63.604 sqm	
	Say 63.604 sqm @ Rs 192.39 / sqm						<b>Rs 12236.77</b>	
8	<p>100.7.1 Bailing out water with 5 HP engine and pumpset including conveyance to the site, erection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete. NEW DATA (Prepared based on PHED SDB - Item No.1070)</p>							
		1	200.000				200.000	
	Total Quantity						200.000 Kwh	
	Total Deducted Quantity						0.000 Kwh	
	Net Total Quantity						200.000 Kwh	
	Say 200.000 Kwh @ Rs 36.26 / Kwh						<b>Rs 7252.00</b>	
9	<p>4.1.6</p>							

	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 ( 1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)						
	screenchamber out side dim 6.2X1.75	1	7.000	2.550	0.200	3.570	out side dim 6.2X1.75x 3.33
	Total Quantity						3.570 cum
	Total Deducted Quantity						0.000 cum
	Net Total Quantity						3.570 cum
	Say 3.570 cum @ Rs 7076.06 / cum						<b>Rs 25261.53</b>
10	<p>5.37.1</p> <p>Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in -charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level</p>						
	screenchamber out side dim 6.2X1.75- base slab	1	6.600	2.150	0.250	3.548	out side dim 6.2X1.75x 3.33
	side wall allround	1	15.900	0.250	2.880	11.448	
	inside partition wall	2	1.250	0.250	2.880	1.800	
		1	3.200	0.250	2.880	2.304	
	working platform	1	1.200	1.750	0.250	0.525	
	Total Quantity						19.625 cum
	Total Deducted Quantity						0.000 cum
	Net Total Quantity						19.625 cum
	Say 19.625 cum @ Rs 9700.81 / cum						<b>Rs 190378.40</b>
11	<p>5.34.1</p> <p>Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).</p>						

	screenchamber out side dim 6.2X1.75-base slab	1	6.600	2.150	0.250		3.548	out side dim 6.2X1.75x 3.33	
	side wall allround	1	15.900	0.250	2.880		11.448		
	inside partition wall	2	1.250	0.250	2.880		1.800		
		1	3.200	0.250	2.880		2.304		
	working platform	1	1.200	1.750	0.250		0.525		
	Total Quantity						19.625 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						19.625 cum		
	Say 19.625 cum @ Rs 80.56 / cum						<b>Rs 1580.99</b>		
12	4.12 Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .								
	screenchamber out side dim 6.2X1.75-base slab	1	6.600	2.150	0.250	340.0	1206.150	out side dim 6.2X1.75x 3.33	
	side wall allround	1	15.900	0.250	2.880	340.0	3892.320		
	inside partition wall	2	1.250	0.250	2.880	340.0	612.000		
		1	3.200	0.250	2.880	340.0	783.360		
	working platform	1	1.200	1.750	0.250	340.0	178.500		
	Total Quantity						6672.330 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						6672.330 kg		
	Say 6672.330 kg @ Rs 1.33 / kg						<b>Rs 8874.20</b>		
13	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more								
	Qty vide item no - 10*100kg/m3 cc	1	19.625	100.000			1962.500		
	Total Quantity						1962.500 kilogram		
	Total Deducted Quantity						0.000 kilogram		
	Net Total Quantity						1962.500 kilogram		
	Say 1962.500 kilogram @ Rs 96.46 / kilogram						<b>Rs 189302.75</b>		

14	od338067/2021_2022 Extra for providing epoxy coating for reinforcement bars.							
	Qty vide item no - 10*100kg/m3 cc	1	19.625	100.000			1962.500	
	Total Quantity						1962.500 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						1962.500 kg	
	Say 1962.500 kg @ Rs 2.32 / kg						<b>Rs 4553.00</b>	
15	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
	screenchamber out side dim 6.2X1.75- base slab	1	6.600*2+2 .15*2		0.250		4.375	out side dim 6.2X1.75x 3.33
	Total Quantity						4.375 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						4.375 sqm	
	Say 4.375 sqm @ Rs 329.03 / sqm						<b>Rs 1439.51</b>	
16	5.9.2 Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, butresses, plinth and string courses etc.							
	side wall allround - outside	1	15.900		2.880		45.792	
	inside	1	5.7*2+1.2 5*2		2.880		40.032	
	inside partition wall	2*2	1.250		2.880		14.400	
		1*2	3.200		2.880		18.432	
	Total Quantity						118.656 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						118.656 sqm	
	Say 118.656 sqm @ Rs 703.77 / sqm						<b>Rs 83506.53</b>	
17	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform							
	working platform -top slab	1	1.200	1.750			2.100	

		1	1.2*2+1.7 5*2		0.250		1.475		
	Total Quantity						3.575 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						3.575 sqm		
	Say 3.575 sqm @ Rs 800.50 / sqm						<b>Rs 2861.79</b>		
18	<p>22.23.1 Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage &amp; water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e. by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For vertical surface two coats @ 0.70 kg per sqm</p>								
	side wall allround - outside	1	15.900		2.880		45.792		
	inside	1	5.7*2+1.2 5*2		2.880		40.032		
	inside partition wall	2*2	1.250		2.880		14.400		
		1*2	3.200		2.880		18.432		
	Total Quantity						118.656 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						118.656 sqm		
	Say 118.656 sqm @ Rs 559.61 / sqm						<b>Rs 66401.08</b>		
19	<p>22.23.2 Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage &amp; water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e. by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For horizontal surface one coat @ 1.10 kg per sqm.</p>								



	screenchamber out side dim 6.2X1.75-base slab	1	6.600	2.150			14.190	out side dim 6.2X1.75x 3.33	
	working platform -top slab	1	1.200	1.750			2.100		
	Total Quantity						16.290 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						16.290 sqm		
	Say 16.290 sqm @ Rs 431.28 / sqm						<b>Rs 7025.55</b>		
20	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)								
	side wall allround - outside	1	15.900		2.880		45.792		
	inside	1	5.7*2+1.2 5*2		2.880		40.032		
	inside partition wall	2*2	1.250		2.880		14.400		
		1*2	3.200		2.880		18.432		
	screenchamber out side dim 6.2X1.75-base slab	1	6.600	2.150			14.190	out side dim 6.2X1.75x 3.33	
	working platform -top slab top&bottom	2	1.200	1.750			4.200		
	Total Quantity						137.046 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						137.046 sqm		
	Say 137.046 sqm @ Rs 393.69 / sqm						<b>Rs 53953.64</b>		
21	13.44.1 Finishing walls with water proofing cement paint of required shade:New work (Two or more coats applied @ 3.84 kg/10 sqm)								
	side wall allround - outside	1	15.900		2.880		45.792		
	inside	1	5.7*2+1.2 5*2		2.880		40.032		
	inside partition wall	2*2	1.250		2.880		14.400		
		1*2	3.200		2.880		18.432		

	screenchamber out side dim 6.2X1.75-base slab	1	6.600	2.150			14.190	out side dim 6.2X1.75x 3.33	
	working platform -top slab top&bottom	2	1.200	1.750			4.200		
	Total Quantity						137.046 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						137.046 sqm		
	Say 137.046 sqm @ Rs 105.38 / sqm						<b>Rs 14441.91</b>		
22	13.65.1 Painting with black anti- corrosive bitumastic paint of approved brand and manufacture to give an even shade:Two or more coats on new work								
	side wall allround - outside	1	15.900		2.880		45.792		
	inside	1	5.7*2+1.2 5*2		2.880		40.032		
	inside partition wall	2*2	1.250		2.880		14.400		
		1*2	3.200		2.880		18.432		
	screenchamber out side dim 6.2X1.75-base slab	1	6.600	2.150			14.190	out side dim 6.2X1.75x 3.33	
	working platform -top slab top&bottom	2	1.200	1.750			4.200		
	Total Quantity						137.046 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						137.046 sqm		
	Say 137.046 sqm @ Rs 122.47 / sqm						<b>Rs 16784.02</b>		
23	od338072/2021_2022 Supplying providing and fixing CI encapsulated steps at 30.00cm c/c in a staggered manner including all labour charges, etc complete as per the instruction of the engineer in-charge.								
		6					6.000		
	Total Quantity						6.000 No		
	Total Deducted Quantity						0.000 No		
	Net Total Quantity						6.000 No		
	Say 6.000 No @ Rs 424.89 / No						<b>Rs 2549.34</b>		

24	50.2.25.1 Filling with contractor's own earth ( excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m as per direction of site Engineer-in-charge		1	15.900	0.300	3.330		15.885	
		Total Quantity						15.885 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						15.885 cum	
		Say 15.885 cum @ Rs 515.97 / cum						<b>Rs 8196.18</b>	
25	100.36.1 Filling water with 5000 litre tankers fitted in lorry and conveying water from a distance of 5 km (average) to the reservoir site and pumping the water into the reservoir of height not less than 3 m using 5 HP diesel engine pump set , hire for tanker lorry, tools and other appliances and cost of water etc. complete. "(Ref. No. 000, Technical Circular)"								
	screen chamber inside dim 5.7x1.25x2.88		1	5.700	1.250	2.880		20.520	
		Total Quantity						20.520 Kilo litre	
		Total Deducted Quantity						0.000 Kilo litre	
		Net Total Quantity						20.520 Kilo litre	
		Say 20.520 Kilo litre @ Rs 182.79 / Kilo litre						<b>Rs 3750.85</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
<b>6Construction of Valve chamber (Cost Index:33.05 %)</b>									
1	100.1.1 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : All kinds of soil (Ref. Item No. 2.10.1 of DSR)								
	Qty- valve chamber-1 (4X2M)		1	4.800	2.800	1.500		20.160	chamber 1- 4*2*1.5
	qty - valve chamber 2 (2X1M)		1	2.800	1.800	1.500		7.561	chamber - 2 2*1*1.5
		Total Quantity						27.721 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						27.721 cum	
		Say 27.721 cum @ Rs 545.11 / cum						<b>Rs 15110.99</b>	

2	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 ( 1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Qty- valve chamber-1 (4X2M)	1	4.800	2.800	0.150		2.016	chamber 1- 4*2*1.5
	qty - valve chamber 2 (2X1M)	1	2.800	1.800	0.150		0.756	chamber - 2 2*1*1.5
	Total Quantity						2.772 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.772 cum	
	Say 2.772 cum @ Rs 7076.06 / cum						<b>Rs 19614.84</b>	
3	5.1.2 Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level:1:1:5:3 (1 cement 1.5 coarse sand :3 graded stone aggregate 20 mm nominal size)							
	Qty- valve chamber-1 (4X2M)-Bottom cc	1	4.400	2.400	0.200		2.112	chamber 1- 4*2*1.5
	side wall	1	12.800	0.200	1.200		3.073	
	cover slab	1	4.400	2.400	0.200		2.112	
	qty - valve chamber 2 (2X1M)-Bottom cc	1	2.400	1.400	0.200		0.672	chamber - 2 2*1*1.5
	side wall	1	6.800	0.200	1.200		1.633	
	cover slab	1	2.400	1.400	0.200		0.672	
	Total Quantity						10.274 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						10.274 cum	
	Say 10.274 cum @ Rs 8914.95 / cum						<b>Rs 91592.20</b>	
4	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
	Qty- valve chamber-1 (4X2M)-pcc	1	4.8*2+2.8*2	0.150			2.280	chamber 1- 4*2*1.5
	RCC base slab	1	4.400*2+2.4*2	0.200			2.721	
	qty - valve chamber 2 (2X1M)-Bottom pcc	1	2.8*2+1.8*2	0.150			1.380	chamber - 2 2*1*1.5

	RCC base slab	1	2.4*2+1.4* 2	0.200			1.520	
	Total Quantity						7.901 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						7.901 sqm	
	Say 7.901 sqm @ Rs 329.03 / sqm						<b>Rs 2599.67</b>	
5	5.9.2 Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, buttersesses, plinth and string courses etc.							
	Qty- valve chamber-1 (4X2M)-wall inside	1	12.000	1.300			15.601	chamber 1- 4*2*1.5
	side wall-out side	1	13.600	1.300			17.680	
	qty - valve chamber 2 (2X1M)-wall inside	1	6.000	1.300			7.801	chamber - 2 2*1*1.5
	side wall-out side	1	7.600	1.300			9.880	
	Total Quantity						50.962 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						50.962 sqm	
	Say 50.962 sqm @ Rs 703.77 / sqm						<b>Rs 35865.53</b>	
6	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform							
	Chamber-1	1	4.400	2.400			10.560	
	Chamber 2	1	2.400	1.400			3.360	
	Total Quantity						13.920 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						13.920 sqm	
	Say 13.920 sqm @ Rs 800.50 / sqm						<b>Rs 11142.96</b>	
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
		1	10.274			80.0	821.920	
	Total Quantity						821.920 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						821.920 kilogram	
	Say 821.920 kilogram @ Rs 96.46 / kilogram						<b>Rs 79282.40</b>	

8	13.9.1 Cement plaster 1:3 ( 1 cement : 3 coarse sand) finished with a floating coat of neat cement.12 mm cement plaster							
	Qty- valve chamber-1 (4X2M)-wall inside	1	12.000	1.300			15.601	chamber 1- 4*2*1.5
	side wall-out side	1	13.600	1.300			17.680	
	qty - valve chamber 2 (2X1M)-wall inside	1	6.000	1.300			7.801	chamber - 2 2*1*1.5
	side wall-out side	1	7.600	1.300			9.880	
	Total Quantity						50.962 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						50.962 sqm	
	Say 50.962 sqm @ Rs 404.41 / sqm						<b>Rs 20609.54</b>	
9	od330810/2021_2022 Supplying providing and fixing CI encapsulated steps at 30.00cm c/c in a staggered manner including all labour charges, etc complete as per the instruction of the engineer in-charge.							
	Qty	6					6.000	
	Total Quantity						6.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						6.000 No	
	Say 6.000 No @ Rs 424.89 / No						<b>Rs 2549.34</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>7Construction of Control room and Generator Room for wellcum pumphouse (Cost Index:33.05 %)</b>								
1	2.2.1 Earth work in rough excavation, banking excavated earth in layers not exceeding 20 cm in depth, breaking clods, watering, rolling each layer with 1/2 tonne roller or wooden or steel rammers, and rolling every 3rd and top-most layer with power roller of minimum 8 tonnes and dressing up in embankments for roads, flood banks, marginal banks and guide banks or filling up ground depressions, lead up to 50 m and lift up to 1.5 m:All kinds of soil							
	For Column footing	8	1.700	1.700	1.600		36.992	
	Total Quantity						36.992 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						36.992 cum	
	Say 36.992 cum @ Rs 862.56 / cum						<b>Rs 31907.82</b>	
2	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 ( 1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm							

	nominal size)							
	For column footing	8	1.700	1.700	0.200		4.624	
	Floor	2	5.000	4.000	0.150		6.000	
	Total Quantity						10.624 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						10.624 cum	
	Say 10.624 cum @ Rs 7076.06 / cum						<b>Rs 75176.06</b>	
3	5.1.2 Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level:1:1:5:3 (1 cement 1.5 coarse sand :3 graded stone aggregate 20 mm nominal size							
	Footing	8	1.500	1.500	0.200		3.600	
		8	0.850	0.850	0.700		4.046	
	Column Pedestal	8	0.200	0.400	0.500		0.321	
	Grade slab	2	5.000	4.000	0.150		6.000	
	Plinth beam	2	10.000	0.200	0.450		1.800	
	„	4	4.000	0.200	0.450		1.441	
	Ramp	1	3.000	1.500	0.200		0.900	
	Kerala Water Authority Total Quantity						18.108 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						18.108 cum	
	Say 18.108 cum @ Rs 8914.95 / cum						<b>Rs 161431.91</b>	
4	5.2.2 Reinforced cement concrete work in walls (any thickness), including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, piers, abutments, posts and struts etc. up tot floor five level excluding cost of centering, shuttering, finishing and reinforcement :1:1.5:3( 1 cement : 1.5 coarse sand : 3 graded stone aggregate 20 mm nominal size)							
	Column Above Plinth	8	0.200	0.400	5.000		3.201	
	Lintel	1	18.000	0.200	0.250		0.900	
	Shade	1	18.000	0.750	0.120		1.620	
	Beam	4	3.600	0.200	0.450		1.297	
	„	2*3	3.270	0.200	0.450		1.766	
	Slab	1	11.200	5.000	0.120		6.720	
	Total Quantity						15.504 cum	
	Total Deducted Quantity						0.000 cum	

	Net Total Quantity						15.504 cum	
	Say 15.504 cum @ Rs 10748.84 / cum						<b>Rs 166650.02</b>	
5	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
	Footing PCC	8*4	1.700	1.700	0.200		18.496	
	Footing RCC	8*4	1.500	1.500	0.200		14.400	
	Total Quantity						32.896 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						32.896 sqm	
	Say 32.896 sqm @ Rs 329.03 / sqm						<b>Rs 10823.77</b>	
6	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers							
	Plinth beam	2	10.600		0.450*2		19.080	
	„	4	4.000		0.450*2		14.400	
	Lintel	1	36.000		0.25*2		18.000	
	Beam	1	36.000		(0.330*2)+ 0.2		30.961	
	Total Quantity						82.441 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						82.441 sqm	
	Say 82.441 sqm @ Rs 637.64 / sqm						<b>Rs 52567.68</b>	
7	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts							
	Column up to Plinth	8	0.2*2+0.4* 2		0.500		4.801	
	Column above Plinth	8	1.200	4.900			47.040	
	Total Quantity						51.841 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						51.841 sqm	
	Say 51.841 sqm @ Rs 847.46 / sqm						<b>Rs 43933.17</b>	
8	5.9.20 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform with water proof ply 12 mm thick							



	Shade	1	18.000	0.750+0.1 2			15.660		
	Beam	4	3.600	0.200+0.4 5*2			15.841		
	„	2*3	3.270	0.200+0.4 5*2			21.582		
	Slab	1	11.200	5.000			56.000		
	Total Quantity						109.083 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						109.083 sqm		
	Say 109.083 sqm @ Rs 900.08 / sqm						<b>Rs 98183.43</b>		
9	50.6.7.2 Laterate masonry with neatly dressed laterate stone of size 40x20x15cm or nearest size in cement mortar 1:6 for super structure above plinth level up to floor two level including all cost of materials, labour charges etc.								
	Masonry wall	6	3.270	0.200	4.650		18.247		
	„	2	3.600	0.200	4.550		6.553		
	„	1	4.000	0.200	4.900		3.921		
	Parapet wall	1	31.600	0.200	0.400		2.529		
	Lintel	4	3.270	0.200	0.150		-0.392		
	„	2	3.270	0.200	0.300		-0.392		
	„	2	3.600	0.200	0.150		-0.216		
	„	1	4.000	0.200	0.150		-0.120		
	RS Opening	2	3.270	0.200	3.000		-3.924		
	Window	4	1.500	0.200	1.500		-1.800		
	Door op	1	1.500	2.400			-3.599		
	Total Quantity						31.250 cum		
	Total Deducted Quantity						-10.443 cum		
	Net Total Quantity						20.807 cum		
	Say 20.807 cum @ Rs 7872.98 / cum						<b>Rs 163813.09</b>		
10	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more								
	@ 80 Kg of Steel of 1 Cum of CC	1	33.612			80.0	2688.960		
	Total Quantity						2688.960 kilogram		

	Total Deducted Quantity							0.000 kilogram
	Net Total Quantity							2688.960 kilogram
	Say 2688.960 kilogram @ Rs 96.46 / kilogram							<b>Rs 259377.08</b>
11	13.1.1 12 mm cement plaster of mix:1:4 ( 1 cement : 4 fine sand)							
	Room inside	2	18.000	4.900			176.400	
	Column sides	4*2	0.200	4.900			7.841	
	Op. Side	2	9.270	0.200			3.708	
	„	1	6.300	0.200			1.260	
	Out side	1	30.000	4.900			147.000	
	Parapet wall	1	31.600	1.000			31.600	
	Window	4	1.500	1.500			-9.000	
	Open.	1*2	1.500	2.400			-7.199	
	Rs	2*2	3.270		3.000		-39.240	
	Total Quantity							367.809 sqm
	Total Deducted Quantity							-55.439 sqm
	Net Total Quantity							312.370 sqm
	Say 312.370 sqm @ Rs 308.21 / sqm							<b>Rs 96275.56</b>
12	50.13.1 9 mm cement plastering of mix : 1:3 (1 cement : 3 fine sand ) including all cost of materials, labour charges etc complete							
	Ceiling	2	5.000	4.000			40.000	
	Beam sides	2*2	4.000	0.330			5.280	
	Slab Proj.	1	31.500	0.300			9.450	
	Edge	1	32.400	0.150			4.860	
	Shade Bottom & Top	2	11.800	0.750			17.701	
	„	2	11.800	0.600			14.160	
	„	2*2	4.400	0.600			10.560	
	Vertical	2*2	0.600	0.900			2.160	
	Roof Top	1	10.200	4.000			40.800	
	Total Quantity							144.971 sqm
	Total Deducted Quantity							0.000 sqm
	Net Total Quantity							144.971 sqm
	Say 144.971 sqm @ Rs 285.86 / sqm							<b>Rs 41441.41</b>

13	10.6.1 Supplying and fixing rolling shutters of approved make, made of required size M.S. laths, interlocked together through their entire length and jointed together at the end by end locks, mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation complete, including the cost of providing and fixing necessary 27.5 cm long wire springs manufactured from high tensile steel wire of adequate strength conforming to IS: 4454 - part 1 and M.S. top cover of required thickness for rolling shutters.80x1.25 mm M.S. laths with 1.25 mm thick top cover								
		2	3.270		3.000		19.620		
		Total Quantity					19.620 sqm		
		Total Deducted Quantity					0.000 sqm		
		Net Total Quantity					19.620 sqm		
		Say 19.620 sqm @ Rs 3400.56 / sqm					<b>Rs 66718.99</b>		
14	od330822/2021_2022 Supplying and providing aluminium window with powder coated aluminium sections for frames and shutters with 4mm thick glass panels as per drawings and specifications including all fittings and fixing charges								
	Windows	4	1.500		1.500		9.000		
		Total Quantity					9.000 sqm		
		Total Deducted Quantity					0.000 sqm		
		Net Total Quantity					9.000 sqm		
		Say 9.000 sqm @ Rs 3771.86 / sqm					<b>Rs 33946.74</b>		
15	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)								
	Screading Concrete (Panel Room)	1	4.000	5.000	0.040		0.800		
		Total Quantity					0.800 cum		
		Total Deducted Quantity					0.000 cum		
		Net Total Quantity					0.800 cum		
		Say 0.800 cum @ Rs 7841.17 / cum					<b>Rs 6272.94</b>		
16	13.9.1 Cement plaster 1:3 ( 1 cement : 3 coarse sand) finished with a floating coat of neat cement.12 mm cement plaster								
	Floor Finishing	2	4.000	5.000			40.000		
	Rammp	2	3.000	1.500			9.000		



	„	1	6.300	0.200			1.260	
	Out side	1	30.000	4.900			147.000	
	Parapet wall	1	31.600	1.000			31.600	
	Window	4	1.500	1.500			-9.000	
	Open.	1*2	1.500	2.400			-7.199	
	Rs	2*2	3.270		3.000		-39.240	
	Ceiling	2	5.000	4.000			40.000	
	Beam sides	2*2	4.000	0.330			5.280	
	Slab Proj.	1	31.500	0.300			9.450	
	Edge	1	32.400	0.150			4.860	
	Shade Bottom & Top	2	11.800	0.750			17.701	
	„	2	11.800	0.600			14.160	
	„	2*2	4.400	0.600			10.560	
	Vertical	2*2	0.600	0.900			2.160	
						Total Quantity	471.980 sqm	
						Total Deducted Quantity	-55.439 sqm	
						Net Total Quantity	416.541 sqm	
						Say 416.541 sqm @ Rs 105.38 / sqm	<b>Rs 43895.09</b>	
19	10.25.2 Item Shifted to Sub head 14 as item 14.73 Item Shifted to head 14 as item 14.74 Steel work welded in built up sections/framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required. In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works							
	Window grill	4	1.500	1.500		16.0	144.000	
						Total Quantity	144.000 kg	
						Total Deducted Quantity	0.000 kg	
						Net Total Quantity	144.000 kg	
						Say 144.000 kg @ Rs 151.28 / kg	<b>Rs 21784.32</b>	
20	13.61.1 Painting with synthetic enamel paint of approved brand and manufacture to give an even shade: Two or more coats on new work							
	Window	4	1.500	1.500			9.000	
	Rolling shutter	2	3.270	3.000		2.5	49.051	
						Total Quantity	58.051 sqm	
						Total Deducted Quantity	0.000 sqm	

SI No	Description	No	L	B	D	CF	Quantity	Remark
Net Total Quantity							58.051 sqm	
Say 58.051 sqm @ Rs 140.37 / sqm								<b>Rs 8148.62</b>
<b>8Bath cum Toilets (Cost Index:33.05 %)</b>								
1	2.2.1 Earth work in rough excavation, banking excavated earth in layers not exceeding 20 cm in depth, breaking clods, watering, rolling each layer with 1/2 tonne roller or wooden or steel rammers, and rolling every 3rd and top-most layer with power roller of minimum 8 tonnes and dressing up in embankments for roads, flood banks, marginal banks and guide banks or filling up ground depressions, lead up to 50 m and lift up to 1.5 m:All kinds of soil							
	WALL	1	9.920	0.900	0.700		6.250	
	STEPS	1	1.000	0.750	0.150		0.113	
Total Quantity							6.363 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							6.363 cum	
Say 6.363 cum @ Rs 862.56 / cum								<b>Rs 5488.47</b>
2	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 ( 1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	WALL	1	9.920	0.900	0.100		0.893	
	STEPS	1	1.000	0.750	0.100		0.076	
Total Quantity							0.969 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							0.969 cum	
Say 0.969 cum @ Rs 7076.06 / cum								<b>Rs 6856.70</b>
3	7.1.1 Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with:Cement mortar 1:6 (1 cement : 6 coarse sand)							
	FOUNDATION	2	9.920	0.600	0.600		7.143	
	BASEMENT	2	9.920	0.450	0.450		4.018	
Total Quantity							11.161 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							11.161 cum	
Say 11.161 cum @ Rs 7069.81 / cum								<b>Rs 78906.15</b>

4	6.4.1 Brick work with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in superstructure above plinth level up to floor V level in all shapes and sizes in:Cement mortar 1:4 ( 1 cement : 4 coarse sand)(from floor 2 level up to floor 5 level)							
	Walls	2	9.920	0.230	2.700		12.321	
	steps	2*3	1.000	0.250	0.150		0.225	
	door	2	0.800	0.230	1.700		-0.625	
	windows/ventilator	2	0.700	0.230	0.500		-0.161	
	Total Quantity						12.546 cum	
	Total Deducted Quantity						-0.786 cum	
	Net Total Quantity						11.760 cum	
	Say 11.760 cum @ Rs 9020.06 / cum						<b>Rs 106075.91</b>	
5	5.3 Reinforced cement concrete work in beams, suspended floors, roofs, having slope up to 15 <sup>0</sup> landings, balconies, shelves, chajjas, lintels, bands, plain window sills, staircases and spiral stair cases up to floor five level excluding the cost of centering, shuttering, finishing and reinforcement, with1:1.5:3 (1 cement : 1.5 coarse sand (Zone III) : 3 graded stone aggregate 20 mm nominal size).							
	roof slab	2	3.160	2.660	0.150		2.522	
	lintel	2	9.920	0.230	0.150		0.685	
	sunshade	2	2.580	0.600	0.100		0.310	
	Total Quantity						3.517 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.517 cum	
	Say 3.517 cum @ Rs 11277.58 / cum						<b>Rs 39663.25</b>	
6	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
		1	3.500			80.0	280.000	
	Total Quantity						280.000 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						280.000 kilogram	
	Say 280.000 kilogram @ Rs 96.46 / kilogram						<b>Rs 27008.80</b>	
7	4.1.8 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)							

		2	2.000	2.500	0.100		1.000	
	Total Quantity						1.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.000 cum	
	Say 1.000 cum @ Rs 6687.23 / cum						<b>Rs 6687.23</b>	
8	13.1.1 12 mm cement plaster of mix:1:4 ( 1 cement : 4 fine sand)							
	Walls	2*2	9.920		2.700		107.137	
	steps	2*3	1.000		0.150		0.900	
	door	2	0.800		1.700		-2.720	
	windows/ventilator	2	0.700		0.500		-0.700	
	Total Quantity						108.037 sqm	
	Total Deducted Quantity						-3.420 sqm	
	Net Total Quantity						104.617 sqm	
	Say 104.617 sqm @ Rs 308.21 / sqm						<b>Rs 32244.01</b>	
9	50.13.1 9 mm cement plastering of mix : 1:3 (1 cement : 3 fine sand ) including all cost of materials, labour charges etc complete							
	roof slab	2*2	3.160	2.660			33.623	
	sunshade	2*2	2.800	0.600			6.720	
	Total Quantity						40.343 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						40.343 sqm	
	Say 40.343 sqm @ Rs 285.86 / sqm						<b>Rs 11532.45</b>	
10	13.33.1 Pointing on stone work with cement mortar 1:3 ( 1 cement : 3 fine sand):Flush/ Ruled pointing							
	FOUNDATION	2	9.920		0.600		11.904	
	BASEMENT	2	9.920		0.450		8.928	
	Total Quantity						20.832 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						20.832 sqm	
	Say 20.832 sqm @ Rs 329.70 / sqm						<b>Rs 6868.31</b>	
11	od330814/2021_2022 Supplying and fixing PVC door of size 0.8x2.10m as per the standard specification including all fittings and labour charges ,etc. .complete							



		1	2.000				2.000	
	Total Quantity						2.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						2.000 No	
	Say 2.000 No @ Rs 4696.84 / No						<b>Rs 9393.68</b>	
12	5.18.1 Providing precast cement concrete jali 1:2:4 ( 1 cement : 2 coarse sand : 4 graded stone aggregate 6 mm nominal size) reinforced with 1.6 mm dia mild steel wire including centering and shuttering, roughening cleaning, fixing and finishing in cement mortar 1:3 (1 cement : 3 fine sand ) etc. complete excluding plastering of the jambs, sills and soffits.50 mm thick							
		2	1.500		1.000		3.000	
	Total Quantity						3.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						3.000 sqm	
	Say 3.000 sqm @ Rs 1702.64 / sqm						<b>Rs 5107.92</b>	
13	11.37 Providing and laying Ceramic glazed floor tiles of size 300x300 mm (thickness to be specified by the manufacturer), of 1st quality conforming to IS : 15622, of approved make, in colours such as White, Ivory, Grey, Fume Red Brown, laid on 20 mm thick cement mortar 1:4 (1 Cement : 4 Coarse sand), including pointing the joints with white cement and matching pigment etc., complete.							
		2	3.000	1.500			9.000	
	Total Quantity						9.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						9.000 sqm	
	Say 9.000 sqm @ Rs 1070.59 / sqm						<b>Rs 9635.31</b>	
14	13.37.1 White washing with lime to give an even shade:New work (three or more coats)							
	side wall	2	3.000		1.800		10.800	
	top	2	3.000		1.500		9.000	
	Total Quantity						19.800 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						19.800 sqm	
	Say 19.800 sqm @ Rs 33.00 / sqm						<b>Rs 653.40</b>	
15	13.40 Distemping with dry distemper of approved brand and manufacture (two or more coats) of required shade on new work, over and including water thinnable priming coat to give an even shade:							

	side wall	2	3.000		1.800		10.800	
	top	2	3.000		1.500		9.000	
	Total Quantity						19.800 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						19.800 sqm	
	Say 19.800 sqm @ Rs 135.98 / sqm						<b>Rs 2692.40</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>9Collection wellcum Pump house Mechanical, Electrical - Pumpsets, grit chamber screen, generator, transformer &amp; allied works complete (Cost Index:33.05 %)</b>								



Kerala Water Authority

**PRICE**

1	<p>od330782/2021_2022</p> <p>Supply, delivery and erection of non-clog sewage submersible pump sets with stainless steel impeller to pass soft solids upto 50mm size per separate special specification. including cost of required submersible cable to suit the site condition ,starter with control board, Submersible cables required as per site conditions should be supplied with two capacitance type level guards for operating automatically autocoupler SS chain ,guide rail etc for the following duty condition. MSB(Separate pannels for H&amp;C PS 1,Asramom and H&amp;C PS 2 pump houses)&lt;br&gt;Fabrication supply,conveyance,installation testing and commissioning of floor/wall mounting dust and vermin proof cubicle type MV panel board confirming of the fallowing components/devicess and complying to IS 8623&lt;br&gt;Fabrication of fully partitioned ,dust and vermin proof enclosure for panel assembly as per form 4 of IS 8623 using 2mm CRCA sheet as per approved design and requirement, with front and rear accessembly ,bus bar chambers,hinged doors for all switch gear components ,earthing the door using 4sq.mm braided copper conductor, providing necessary cut-outs for mounting meters,relays,indication lamps,bus bar inter connections etc,detachable covers for busbar chamber and cable alley,power coating the assembly after subjecting to 7 tank process etc as required. CRCA sheet alone be used for the fabrication.Angles/flats/slotted angles etc shall not be used forthe fabrication of panel assembly. The panel shaii be provided with base frame from ISMS 75.Necessary barriers and shrouding with 2mm/3mm SMC Sheets shall be provided.Heavy duty neoprene beeding of aproprate sizes shall be used to make the panel dust and vermin proof. The control board should have necessary tripping devices and indicating devices for safety of motor and pumpsets with necessary isolator near the wet well site - lpd and head in m as follow as per actual site condition.&gt;Outgoing&lt;br&gt;(i)H&amp;C PS2: 150A TP MCCB to control the submersible pump set-5Nos, &lt;br&gt;(b). 150 A TP MCCB to control the capacitor bank - 1 no(c)Providing suitable rating capacitor bank with APFC Panel-1No.(d)150A 25Ka TP MCCB spare -1No.&lt;br&gt; (ii)ASRAMOM: a,150A 16KA TP MCCB to control submersible pump sets at Asramom-5Nos,b,150A 16 KA TPMCCB to control the capacitor bank-1No c, Providing suitable rating capacitor bank with APFC Panel (d) (iii)H&amp;C PS1(a)150A 25 KA TPMCCB -2 Nos,(b) 150A 25KA TPMCCB-2Nos,(c)150A 25 KA TPMCCB-2Nos (d) Providing suitable ratings(3Nos 40Kvar) capacitor bank with APFC Panel-1No.&lt;br&gt;N.B (a) Necessary CTs should be provided for safe guarding the instruments wherever necessary .Interlocking should be provided for standby pump sets.&lt;br&gt;(b) &lt;br&gt;Cabling &lt;br&gt; Supply ,delivery and laying of following size L.T cable (1.1KV Grade)including jointing material,cable carrier system like trenches,cable trays pipe sleeves etc as per IE rules including cost of flat submersible cable connecting main panel board and submersible pump sets thro starter control board and isolator 3 ½ core 95 sq mm armoured aluminum conductor cable length as per site condition.connection from suction up to header line.(three year additional replacement warranty additional to 2 years = total 5 year -Including replacement of parts or pump,motors,panel board fully.)</p>						
CW	2	50.000				100.000	
Total Quantity						100.000 Hp	
Total Deducted Quantity						0.000 Hp	
Net Total Quantity						100.000 Hp	
Say 100.000 Hp @ Rs 25395.04 / Hp						<b>Rs 2539504.00</b>	
2	<p>od330789/2021_2022</p> <p>Supply and delivery of suitable flexible joint coupling upto 300mm for easy dismantling of delivery pipes and valves with Tie bolts with angular deflection 5 Degree</p>						

		2					2.000	
	Total Quantity						2.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						2.000 No	
	Say 2.000 No @ Rs 13800.00 / No						<b>Rs 27600.00</b>	
3	od330813/2021_2022 Supply, delivery and erection of Multistage force Pump 600LPM X 30M head suitable for cleaning the screen chamber,Pumpset during servicing with 16 m of 20 mm dia hose required for operating the pump .							
	One for each pumping station	1					1.000	
	Total Quantity						1.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						1.000 set	
	Say 1.000 set @ Rs 63250.00 / set						<b>Rs 63250.00</b>	
4	od330816/2021_2022 Supply and delivery of breathing apparatus with Oxygen cylinder mask etc complete .							
		1					1.000	
	Total Quantity						1.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						1.000 set	
	Say 1.000 set @ Rs 86250.00 / set						<b>Rs 86250.00</b>	
5	od330817/2021_2022 Supply and delivery of Diaphragm type pressure gauge with necessary S.S tubes and isolating valves							
	One for each pumping station	1					1.000	
	Total Quantity						1.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						1.000 No	
	Say 1.000 No @ Rs 6900.00 / No						<b>Rs 6900.00</b>	
6	od330818/2021_2022 Supply and delivery of spare parts for pumps,motors and starter for maintenance.							
		1					1.000	
	Total Quantity						1.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						1.000 No	

		Say 1.000 No @ Rs 28750.00 / No					<b>Rs 28750.00</b>	
7	od330819/2021_2022 Supply and fixing of Electro magnetic flow meter suitable for remote sensing operation with required pipes, specials and accessories at laminar flow region (full flow) including cost of pit cover slab etc							
		1					1.000	
	Total Quantity						1.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						1.000 No	
	Say 1.000 No @ Rs 345000.00 / No					<b>Rs 345000.00</b>		
8	od330820/2021_2022 Supply, delivery and usage of tools required for maintenance works including double end spanners, ring spanners, screw drivers, electrical megger, Tong testers, hand gloves etc.							
	One for each pumping station	1					1.000	
	Total Quantity						1.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						1.000 set	
	Say 1.000 set @ Rs 11615.00 / set					<b>Rs 11615.00</b>		
9	od330821/2021_2022 Supply, delivery and erecting of following safety items ,including cost of same. I. Fire extinguisher of 5 Kg capacity (powder type 2 no's) II. Fire buckets with stand 5no's III. Electric quality Rubber mat to be laid in front of all the panel boards including starter panels 							
	One for each pumping station	1					1.000	
	Total Quantity						1.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						1.000 No	
	Say 1.000 No @ Rs 46000.00 / No					<b>Rs 46000.00</b>		
10	100.98.463 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Cap PN 1.6, Size 300mm.							
		1					1.000	
	Total Quantity						1.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						1.000 No	
	Say 1.000 No @ Rs 21653.95 / No					<b>Rs 21653.95</b>		

11	od330823/2021_2022 Supply and delivery of 300 mm Non-Return Ball valve made up of DI and ball of Aluminum with MVR coated for the common header.						
		1					1.000
	Total Quantity						1.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						1.000 No
	Say 1.000 No @ Rs 38303.51 / No						<b>Rs 38303.51</b>
12	100.31.1.7 "Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 300 mm diameter. Class I" Data derived from item no.18.31.6.1 of DAR						
	SV&NRV	2					2.000
	Total Quantity						2.000 Nos
	Total Deducted Quantity						0.000 Nos
	Net Total Quantity						2.000 Nos
	Say 2.000 Nos @ Rs 2545.85 / Nos						<b>Rs 5091.70</b>
13	od330824/2021_2022 Supply, delivery and erection of 300 mm CI DF Pipes and fittings suitable for the pump set offered and as per drawings enclosed including cost of puddle collars required						
		1					1.000
	Total Quantity						1.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						1.000 No
	Say 1.000 No @ Rs 12075.00 / No						<b>Rs 12075.00</b>
14	od330826/2021_2022 Supply and fixing of stainless steel screen made of bars of size 50 mm x 10 mm for fixing across the screen chamber channel (fixed type ) at 45 degree inclination for a clear passage of 40 mm solids and suitable for manual cleaning including cost of of screen ,Grab bucket and lifting arrangement material and fixing charges for 1.00m x 1.30m size.						
	for each ps	1					1.000
	Total Quantity						1.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						1.000 No
	Say 1.000 No @ Rs 103500.00 / No						<b>Rs 103500.00</b>

15	od330827/2021_2022 Supply , delivery , erecting and maintenance of 2 ton or suitable capacity hand operated pulley block hoist with mono rail traveling on single girder with over head traveling trolley for a clear lift according to site condition for a travel of 9 (well dia+3m) meters or suitable design for erection and easy loading and unloading of Pumps and specials from trucks.							
	one for each pump house	1					1.000	
	Total Quantity						1.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						1.000 No	
	Say 1.000 No @ Rs 402500.00 / No						<b>Rs 402500.00</b>	
16	od330829/2021_2022 Electrical and Mechanical works for sewage pumping stations including supply of suitable Generators							
		1					1.000	
	Total Quantity						1.000 L.S	
	Total Deducted Quantity						0.000 L.S	
	Net Total Quantity						1.000 L.S	
	Say 1.000 L.S @ Rs 1500000.00 / L.S						<b>Rs 1500000.00</b>	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
<b>10 Pumping mains (Cost Index:33.05 %)</b>								
1	100.59.1 Cutting the bituminous / concrete roads with cutting machine for a minimum depth of 200mm along the sides of proposed alignment of the pipe to be laid without causing any damage to other utilities, including the charges for hire and conveyance of tools and plant, cost of consumables and charges for lighting, watching, ribbon fencing, caution boards, traffic diversion, and as per the direction of departmental officers etc. complete, before carrying out the demolition of bituminous / concrete road by mechanical means and carrying out the excavation.							
	LS1 to MH-id 111-(100mmDI)	2	10.000				20.000	
	LS 2 to MH-id 45 (150mm DI)	2	242.000				484.000	
	LS 3 to MH-id 795 (150mm DI)	2	10.000				20.000	
	LS 4 to MH-id 764 (100mm DI)	2	10.000				20.000	
	LS 5 to MH-id 628 (200mm DI)	2	10.000				20.000	

	LS6 to MH-id 158(100mmDI)	2	10.000				20.000	
	LS7 to MH-id 544(100mmDI)	2	10.000				20.000	
	LS8 to MH-id 541(100mmDI)	2	10.000				20.000	
	LS9 to MH-id 495(150mmDI)	2	10.000				20.000	
	LS10 to MH-id 99(150mmDI)	2	10.000				20.000	
	LS11 to MH-id 318(150mmDI)	2	150.000				300.000	
	CW Tto STP	2	2000.000				4000.000	
	Total Quantity						4964.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						4964.000 metre	
	Say 4964.000 metre @ Rs 29.87 / metre						<b>Rs 148274.68</b>	
2	15.43.2	Dismantling manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charge:Bituminous road						
	LS3 to MH-id 795(150mmDI)	1	10.000	0.700			7.000	
	LS6 to MH-id 158(100mmDI)	1	10.000	0.700			7.000	
	LS7 to MH-id 544(100mmDI)	1	10.000	0.600			6.000	
	LS8 to MH-id 541(100mmDI)	1	10.000	0.600			6.000	
	LS9 to MH-id 495(150mmDI)	1	10.000	0.700			7.000	
	LS11 to MH-id 318(150mmDI)	1	150.000	0.700			105.000	
	CW Tto STP	1	1000.000	0.700			700.000	2000m ,1000m bt,1000m cc
	Total Quantity						838.000 sqm	
	Total Deducted Quantity						0.000 sqm	



	Net Total Quantity						838.000 sqm	
	Say 838.000 sqm @ Rs 354.18 / sqm						<b>Rs 296802.84</b>	
3	15.2.1 Demolishing cement concrete manually / by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in-Charge.Nominal concrete 1:3:6 or richer mix (i/c equivalent design mix)							
	LS1 to MH-id 111-(100mmDI)	1	10.000	0.600	0.150		0.900	
	LS 2 to MH-id 45 (150 mm DI)	1	242.000	0.700	0.150		25.410	
	LS 4 to MH-id 764 (100 mm DI)	1	10.000	0.600	0.150		0.900	
	LS 5 to MH-id 628 (200 mm DI)	1	10.000	0.700	0.150		1.050	
	LS10 to MH-id 99 (150 mm DI)	1	10.000	0.700	0.150		1.050	
	CW Tto STP	1	1000.000	0.700	0.150		105.000	
	Total Quantity						134.310 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						134.310 cum	
	Say 134.310 cum @ Rs 2006.81 / cum						<b>Rs 269534.65</b>	
4	100.1.1 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : All kinds of soil (Ref. Item No. 2.10.1 of DSR)							
	LS1 to MH-id 111-(100mmDI)	1	10.000	0.600	0.850	0.45	2.295	
	LS 2 to MH-id 45 (150 mm DI)	1	242.000	0.700	0.850	0.45	64.796	
	LS 3 to MH-id 795 (150 mm DI)	1	10.000	0.700	0.700	0.45	2.205	
	LS 4 to MH-id 764 (100 mm DI)	1	10.000	0.600	0.850	0.45	2.295	
	LS 5 to MH-id 628 (200 mm DI)	1	10.000	0.700	0.850	0.45	2.678	

LS6 to MH-id 158(100mmDI)	1	10.000	0.700	0.700	0.45	2.205	
LS7 to MH-id 544(100mmDI)	1	10.000	0.600	0.700	0.45	1.890	
LS8 to MH-id 541(100mmDI)	1	10.000	0.600	0.700	0.45	1.890	
LS9 to MH-id 495(150mmDI)	1	10.000	0.700	0.700	0.45	2.205	
LS10 to MH-id 99(150mmDI)	1	10.000	0.700	0.850	0.45	2.678	
LS11 to MH-id 318(150mmDI)	1	150.000	0.700	0.700	0.45	33.075	
CW Tto STP cc	1	1000.000	0.700	0.850	0.45	267.750	
bt	1	1000.000	0.700	0.700	0.45	220.500	
LS3 to MH-id 795(150mmDI)	1	10.000	0.700	0.300		-2.100	
LS6 to MH-id 158(100mmDI)	1	10.000	0.700	0.300		-2.100	
LS7 to MH-id 544(100mmDI)	1	10.000	0.600	0.300		-1.799	
LS8 to MH-id 541(100mmDI)	1	10.000	0.600	0.300		-1.799	
LS9 to MH-id 495(150mmDI)	1	10.000	0.700	0.300		-2.100	
LS11 to MH-id 318(150mmDI)	1	150.000	0.700	0.300		-31.500	
CW Tto STP	1	1000.000	0.700	0.300		-210.000	2000m ,1000m bt,1000m cc
LS1 to MH-id 111- (100mmDI)	1	10.000	0.600	0.150		-0.900	
LS2 to MH-id 45(150mmDI)	1	242.000	0.700	0.150		-25.410	
LS4 to MH-id 764(100mmDI)	1	10.000	0.600	0.150		-0.900	
LS5 to MH-id 628(200mmDI)	1	10.000	0.700	0.150		-1.050	

	LS10 to MH-id 99 (150 mm DI)	1	10.000	0.700	0.150		-1.050		
	CW Tto STP	1	1000.000	0.700	0.150		-105.000		
	Total Quantity						606.462 cum		
	Total Deducted Quantity						-385.708 cum		
	Net Total Quantity						220.754 cum		
	Say 220.754 cum @ Rs 545.11 / cum						<b>Rs 120335.21</b>		
5	<p>100.15 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m :"</p> <p>Ordinary Rock. (Ref. Item No. 2.13.1 of DSR)</p>								
	LS1 to MH-id 111- (100mmDI)	1	10.000	0.600	0.850	0.4	2.040		
	LS 2 to MH-id 45 (150 mm DI)	1	242.000	0.700	0.850	0.4	57.596		
	LS 3 to MH-id 795 (150 mm DI)	1	10.000	0.700	0.700	0.4	1.960		
	LS 4 to MH-id 764 (100 mm DI)	1	10.000	0.600	0.850	0.4	2.040		
	LS 5 to MH-id 628 (200 mm DI)	1	10.000	0.700	0.850	0.4	2.381		
	LS 6 to MH-id 158 (100 mm DI)	1	10.000	0.700	0.700	0.4	1.960		
	LS 7 to MH-id 544 (100 mm DI)	1	10.000	0.600	0.700	0.4	1.680		
	LS 8 to MH-id 541 (100 mm DI)	1	10.000	0.600	0.700	0.4	1.680		
	LS 9 to MH-id 495 (150 mm DI)	1	10.000	0.700	0.700	0.4	1.960		
	LS10 to MH-id 99 (150 mm DI)	1	10.000	0.700	0.850	0.4	2.381		
	LS11 to MH-id 318 (150 mm DI)	1	150.000	0.700	0.700	0.4	29.401		
	CW Tto STP cc	1	1000.000	0.700	0.850	0.4	238.000		

	bt	1	1000.000	0.700	0.700	0.4	196.000		
	Total Quantity						539.079 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						539.079 cum		
	Say 539.079 cum @ Rs 791.65 / cum						<b>Rs 426761.89</b>		
6	<p>100.2.7  "Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m :  Medium Rock (blasting prohibited)  New Data derived from DAR</p>								
	LS1 to MH-id 111- (100mmDI	1	10.000	0.600	0.850	0.15	0.765		
	LS 2 to MH-id 45 (150 mm DI)	1	242.000	0.700	0.850	0.15	21.599		
	LS 3 to MH-id 795 (150 mm DI)	1	10.000	0.700	0.700	0.15	0.735		
	LS 4 to MH-id 764 (100 mm DI)	1	10.000	0.600	0.850	0.15	0.765		
	LS 5 to MH-id 628 (200 mm DI)	1	10.000	0.700	0.850	0.15	0.893		
	LS 6 to MH-id 158 (100 mm DI)	1	10.000	0.700	0.700	0.15	0.735		
	LS 7 to MH-id 544 (100 mm DI)	1	10.000	0.600	0.700	0.15	0.630		
	LS 8 to MH-id 541 (100 mm DI)	1	10.000	0.600	0.700	0.15	0.630		
	LS 9 to MH-id 495 (150 mm DI)	1	10.000	0.700	0.700	0.15	0.735		
	LS 10 to MH-id 99 (150 mm DI)	1	10.000	0.700	0.850	0.15	0.893		
	LS 11 to MH-id 318 (150 mm DI)	1	150.000	0.700	0.700	0.15	11.025		
	CW Tto STP cc	1	1000.000	0.700	0.850	0.15	89.250		
	bt	1	1000.000	0.700	0.700	0.15	73.500		
	Total Quantity						202.155 cum		

						Total Deducted Quantity	0.000 cum
						Net Total Quantity	202.155 cum
						Say 202.155 cum @ Rs 1316.46 / cum	<b>Rs 266128.97</b>
7	100.8.1 Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009)						
		1	2482.000			0.6	1489.200
						Total Quantity	1489.200 metre
						Total Deducted Quantity	0.000 metre
						Net Total Quantity	1489.200 metre
						Say 1489.200 metre @ Rs 27.66 / metre	<b>Rs 41191.27</b>
8	100.98.115 Supply of DI K9 Pipe Conforming to IS 8329/2000, 100mm Dia.						
	DI K9 Pipe , 100mm Dia.	1	50.000				50.000
						Total Quantity	50.000 metre
						Total Deducted Quantity	0.000 metre
						Net Total Quantity	50.000 metre
						Say 50.000 metre @ Rs 1143.05 / metre	<b>Rs 57152.50</b>
9	100.98.116 Supply of DI K9 Pipe Conforming to IS 8329/2000, 150mm Dia.						
	DI K9 Pipe 150mm Dia.	1	422.000				422.000
						Total Quantity	422.000 metre
						Total Deducted Quantity	0.000 metre
						Net Total Quantity	422.000 metre
						Say 422.000 metre @ Rs 1673.35 / metre	<b>Rs 706153.70</b>
10	100.98.117 Supply of DI K9 Pipe Conforming to IS 8329/2000, 200mm Dia.						
	DI K9 Pipe, 200mm Dia.	1	10.000				10.000
						Total Quantity	10.000 metre
						Total Deducted Quantity	0.000 metre
						Net Total Quantity	10.000 metre
						Say 10.000 metre @ Rs 2100.55 / metre	<b>Rs 21005.50</b>

11	100.98.119 Supply of DI K9 Pipe Conforming to IS 8329/2000, 300mm Dia.							
	DI K9 Pipe , 300mm Dia.	1	2000.000				2000.000	
	Total Quantity						2000.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						2000.000 metre	
	Say 2000.000 metre @ Rs 3537.65 / metre						<b>Rs 7075300.00</b>	
12	100.14.1 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 100 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.15 in DAR							
	DI K9 Pipe , 100mm Dia.	1	50.000				50.000	
	Total Quantity						50.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						50.000 metre	
	Say 50.000 metre @ Rs 57.74 / metre						<b>Rs 2887.00</b>	
13	100.14.2 Kerala Water Authority Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 150 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.16 in DAR							
	DI K9 Pipe 150mm Dia.	1	422.000				422.000	
	Total Quantity						422.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						422.000 metre	
	Say 422.000 metre @ Rs 86.02 / metre						<b>Rs 36300.44</b>	
14	100.14.3 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 200 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.17 in DAR							
	DI K9 Pipe, 200mm Dia.	1	10.000				10.000	
	Total Quantity						10.000 metre	

							Total Deducted Quantity	0.000 metre
							Net Total Quantity	10.000 metre
							Say 10.000 metre @ Rs 119.81 / metre	<b>Rs 1198.10</b>
15	100.14.5 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 300 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.19 in DAR							
	DI K9 Pipe , 300mm Dia.	1	2000.000					2000.000
							Total Quantity	2000.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	2000.000 metre
							Say 2000.000 metre @ Rs 201.30 / metre	<b>Rs 402600.00</b>
16	18.70.1 Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and including the cost of rubber gasket:100 mm dia pipes							
	DI K9 Pipe , 100mm Dia.	1	10.000					10.000
							Total Quantity	10.000 joint
							Total Deducted Quantity	0.000 joint
							Net Total Quantity	10.000 joint
							Say 10.000 joint @ Rs 105.84 / joint	<b>Rs 1058.40</b>
17	18.70.2 Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and including the cost of rubber gasket:150 mm dia pipes							
	150mm DI	85						85.000 422/5
							Total Quantity	85.000 joint
							Total Deducted Quantity	0.000 joint
							Net Total Quantity	85.000 joint
							Say 85.000 joint @ Rs 173.10 / joint	<b>Rs 14713.50</b>
18	18.70.3 Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and including the cost of rubber gasket:200 mm dia pipes							
	200mm DI	2						2.000
							Total Quantity	2.000 joint

							Total Deducted Quantity	0.000 joint
							Net Total Quantity	2.000 joint
							Say 2.000 joint @ Rs 253.93 / joint	<b>Rs 507.86</b>
19	18.70.5	Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and including the cost of rubber gasket:300 mm dia pipe						
	300mm DI	400						400.000
							Total Quantity	400.000 joint
							Total Deducted Quantity	0.000 joint
							Net Total Quantity	400.000 joint
							Say 400.000 joint @ Rs 404.87 / joint	<b>Rs 161948.00</b>
20	18.83.2	Labour for cutting C.I. pipe with steel saw.100 mm diameter C.I. pipe						
	100 DI	4						4.000
							Total Quantity	4.000 Each Cut
							Total Deducted Quantity	0.000 Each Cut
							Net Total Quantity	4.000 Each Cut
							Say 4.000 Each Cut @ Rs 168.64 / Each Cut	<b>Rs 674.56</b>
21	18.83.4	Labour for cutting C.I. pipe with steel saw.150 mm diameter C.I. pipe						
	150mm DI	26						26.000
							Total Quantity	26.000 Each Cut
							Total Deducted Quantity	0.000 Each Cut
							Net Total Quantity	26.000 Each Cut
							Say 26.000 Each Cut @ Rs 316.93 / Each Cut	<b>Rs 8240.18</b>
22	18.83.5	Labour for cutting C.I. pipe with steel saw.200 mm diameter C.I. pipe						
	200mm DI	1						1.000
							Total Quantity	1.000 Each Cut
							Total Deducted Quantity	0.000 Each Cut
							Net Total Quantity	1.000 Each Cut
							Say 1.000 Each Cut @ Rs 422.63 / Each Cut	<b>Rs 422.63</b>
23	18.83.7	Labour for cutting C.I. pipe with steel saw.300 mm diameter C.I. pipe						
	300mm DI	40						40.000



						Total Quantity	40.000 Each Cut
						Total Deducted Quantity	0.000 Each Cut
						Net Total Quantity	40.000 Each Cut
						Say 40.000 Each Cut @ Rs 631.39 / Each Cut	<b>Rs 25255.60</b>
24	18.68.1	Providing and laying D.I specials of class K - 12 suitable for push - on jointing as per IS : 9523 :Upt 600 mm dia					
		1	20.000				20.000
						Total Quantity	20.000 quintal
						Total Deducted Quantity	0.000 quintal
						Net Total Quantity	20.000 quintal
						Say 20.000 quintal @ Rs 19744.62 / quintal	<b>Rs 394892.40</b>
25	100.35.1	Testing 100mm DI/CI pipeline with potable water to the required test pressure 100 mm dia Observed Data derived from item no.1016 of PHED DATA					
	DI K9 Pipe , 100mm Dia.	1	50.000				50.000
						Total Quantity	50.000 metre
						Total Deducted Quantity	0.000 metre
						Net Total Quantity	50.000 metre
						Say 50.000 metre @ Rs 22.92 / metre	<b>Rs 1146.00</b>
26	100.35.2	Testing 150mm DI/CI pipeline with potable water to the required test pressure 150 mm dia Observed Data derived from item no.1018 of PHED DATA					
	DI K9 Pipe 150mm Dia.	1	422.000				422.000
						Total Quantity	422.000 metre
						Total Deducted Quantity	0.000 metre
						Net Total Quantity	422.000 metre
						Say 422.000 metre @ Rs 30.99 / metre	<b>Rs 13077.78</b>
27	100.35.3	Testing 200mm DI/CI pipeline with potable water to the required test pressure 200 mm dia Observed Data derived from item no.1020 of PHED DATA					
	200mm DI	1	10.000				10.000

		Total Quantity					10.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					10.000 metre	
		Say 10.000 metre @ Rs 39.20 / metre					<b>Rs 392.00</b>	
28	100.35.5 Testing 300mm DI/CI pipeline with potable water to the required test pressure. 300 mm dia Observed Data derived from item no.1023 of PHED DATA							
	300mm D	1	2000.000				2000.000	
		Total Quantity					2000.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					2000.000 metre	
		Say 2000.000 metre @ Rs 54.64 / metre					<b>Rs 109280.00</b>	
29	5.1.3 Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level:1:2:4 ( 1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	pipe supports/ anchor blocks	15	1.000	1.000	1.000		15.000	
		Kerala Water Authority Total Quantity					15.000 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					15.000 cum	
		Say 15.000 cum @ Rs 8427.59 / cum					<b>Rs 126413.85</b>	
30	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
		15	2.000				30.000	
	For item no...airvalve and scour valve chamber	2	9.200		1.300		23.920	
		Total Quantity					53.920 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					53.920 sqm	
		Say 53.920 sqm @ Rs 329.03 / sqm					<b>Rs 17741.30</b>	
31	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							

		1	15.000			80.0	1200.000		
	For item no.....air valve and scour valve chamber	1	2.487			80.0	198.960		
	Total Quantity						1398.960 kilogram		
	Total Deducted Quantity						0.000 kilogram		
	Net Total Quantity						1398.960 kilogram		
	Say 1398.960 kilogram @ Rs 96.46 / kilogram						<b>Rs 134943.68</b>		
32	2.8.1 Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.All kinds of soil								
	Air valve & Scour valve Chamber	2	1.300	1.300	1.500		5.070		
	Total Quantity						5.070 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						5.070 cum		
	Say 5.070 cum @ Rs 291.38 / cum						<b>Rs 1477.30</b>		
33	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)								
	Air valve & Scour valve chamber	2	1.300	1.300	1.500	0.2	1.014		
	Total Quantity						1.014 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						1.014 cum		
	Say 1.014 cum @ Rs 7841.17 / cum						<b>Rs 7950.95</b>		
34	5.2.2 Reinforced cement concrete work in walls (any thickness), including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, piers, abutments, posts and struts etc. up tot floor five level excluding cost of centering, shuttering, finishing and reinforcement :1:1.5:3( 1 cement : 1.5 coarse sand : 3 graded stone aggregate 20 mm nominal size)								
	air valve & Scour valve back to collection well-sidewall	2	4*1.15	0.150	1.100		1.518		

	bottom	2	1.150	1.150	0.150		0.397		
	cover slab	2	1.300	1.300	0.200		0.677		
	for MH cover	2	3.14/4	0.560	0.600	0.2	-0.105		
	Total Quantity						2.592 cum		
	Total Deducted Quantity						-0.105 cum		
	Net Total Quantity						2.487 cum		
	Say 2.487 cum @ Rs 10748.84 / cum						<b>Rs 26732.37</b>		
35	4.1.2 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:1/2:3 (cement : 1 1/2 coarse sand : 3 graded stone aggregate 20 mm nominal size)								
	LS1 to MH-id 111- (100mmDI)	1	10.000	0.600	0.150		0.900		
	LS 2 to MH-id 45 (150 mm DI)	1	242.000	0.700	0.150		25.410		
	LS 4 to MH-id 764 (100 mm DI)	1	10.000	0.600	0.150		0.900		
	LS 5 to MH-id 628 (200 mm DI)	1	10.000	0.700	0.150		1.050		
	LS10 to MH-id 99 (150 mm DI)	1	10.000	0.700	0.150		1.050		
	CW Tto STP	1	1000.000	0.700	0.150		105.000	bt- 1000,cc- 1000 total -2000	
	Total Quantity						134.310 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						134.310 cum		
	Say 134.310 cum @ Rs 8328.46 / cum						<b>Rs 1118595.46</b>		
SI No	Description	No	L	B	D	CF	Quantity	Remark	
<b>11Construction of Man holes (Cost Index:33.05 %)</b>									

1	od330784/2021_2022 Constructing manholes of different depths as per drawings and specifications on sewer lines and provided with tight fitting approved make heavy duty CI manhole cover with frame 600 mm dia, embedded into the cover slab, providing provision of encapsulated PVC/CI foot rests @ 30 cm apart in a staggered manner, bottom slab, side wall and cover slab with RCC M30 with a provision of PCC 1:3:6, 10 cm thick below floor slab, inside to be plastered with CM. 1:3, 12mm thick one coat with a neat cement flushing coat, two coats of anticorrosive bituminous paint to the outside surfaces, providing benching and channelling inside the manhole with CC M30 as per drawings and specifications. The rate shall include earthwork excavation for all leads and lifts, backfilling, de-watering, side protection with steel shoring, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc. and disposing the surplus earth away with all leads and lifts as directed upto manhole depth 1.5m ( internal dia-1200mm)						
	MH-up to 1.5m depth, 1.2m dia	724					724.000
	Total Quantity						724.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						724.000 No
	Say 724.000 No @ Rs 57046.57 / No						<b>Rs 41301716.68</b>
2	od330788/2021_2022 Constructing manholes of different depths as per drawings and specifications on sewer lines and provided with tight fitting approved make heavy CI manhole cover with frame 600 mm dia, embedded into the cover slab, providing provision of encapsulated PVC/CI foot rests @ 30 cm apart in a staggered manner, bottom slab, side wall and cover slab with RCC M30 with a provision of PCC 1:3:6, 10 cm thick below floor slab, inside to be plastered with CM. 1:3, 12mm thick one coat with a neat cement flushing coat, two coats of anticorrosive bituminous paint to the outside surfaces, providing benching and channelling inside the manhole with CC M30 as per drawings and specifications. The rate shall include earthwork excavation for all leads and lifts, backfilling, de-watering, side protection with steel shoring, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc. and disposing the surplus earth away with all leads and lifts as directed upto manhole depth 2.5m ( internal diameter 1200m)						
	MH- up to 2.5m depth, 1.2m dia	174					174.000
	Total Quantity						174.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						174.000 No
	Say 174.000 No @ Rs 75213.42 / No						<b>Rs 13087135.08</b>
3	od330791/2021_2022 Constructing manholes of different depths as per drawings and specifications on sewer lines and provided with tight fitting approved make heavy CI manhole cover with frame 600 mm dia, embedded into the cover slab, providing provision of encapsulated PVC/CI foot rests @ 30 cm apart in a staggered manner, bottom slab, side wall and cover slab with RCC M30 with a provision of PCC 1:3:6, 10 cm thick						

	below floor slab, inside to be plastered with CM. 1:3, 12mm thick one coat with a neat cement flushing coat, two coats of anticorrosive bituminous paint to the outside surfaces, providing benching and channelling inside the manhole with CC M30 as per drawings and specifications. The rate shall include earthwork excavation for all leads and lifts, backfilling, de-watering, side protection with steel shoring, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.and disposing the surplus earth away with all leads and lifts as directed upto manhole depth 3.5m ( internal diameter - 1500mm )						
	upto manhole depth 3.5m ( internal diameter - 1500mm )	110					110.000
	Total Quantity						110.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						110.000 No
	Say 110.000 No @ Rs 150804.07 / No						<b>Rs 16588447.70</b>
4	od330797/2021_2022 Constructing manholes of different depths as per drawings and specifications on sewer lines and provided with tight fitting approved make heavy CI manhole cover with frame 600 mm dia, embedded into the cover slab, providing provision of encapsulated PVC/CI foot rests @ 30 cm apart in a staggered manner, bottom slab, side wall and cover slabwith RCC M30 with a provision of PCC 1:3:6, 10 cm thick below floor slab, inside to be plastered with CM. 1:3, 12mm thick one coat with a neat cement flushing coat, two coats of anticorrosive bituminous paint to the outside surfaces, providing benching and channelling inside the manhole with CC M30 as per drawings and specifications. The rate shall include earthwork excavation for all leads and lifts, backfilling, de-watering, side protection with steel shoring, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.and disposing the surplus earth away with all leads and lifts as directed upto manhole depth upto 4.5m ( internal diameter-1500mm)						
	upto manhole depth upto 4.5m ( internal diameter-1500mm)	33					33.000
	Total Quantity						33.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						33.000 No
	Say 33.000 No @ Rs 192105.61 / No						<b>Rs 6339485.13</b>
5	od330802/2021_2022 Constructing manholes of different depths as per drawings and specifications on sewer lines and provided with tight fitting approved make heavy CI manhole cover with frame 600 mm dia, embedded into the cover slab, providing provision of encapsulated PVC/CI foot rests @ 30 cm apart in a staggered manner, bottom slab, side wall and cover slabwith RCC M30 with a provision of PCC 1:3:6, 10 cm thick below floor slab, inside to be plastered with CM. 1:3, 12mm thick one coat with a neat cement flushing coat, two coats of anticorrosive bituminous paint to the outside surfaces, providing benching and channelling inside the manhole with CC M30 as per drawings and specifications. The rate shall include						

	earthwork excavation for all leads and lifts, backfilling, de-watering, side protection with steel shoring, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.and disposing the surplus earth away with all leads and lifts as directed upto manhole depth upto 5.50m (internal diameter-1500mm)							
	upto manhole depth upto 5.50m (internal diameter-1500mm)	5					5.000	
	Total Quantity						5.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						5.000 No	
	Say 5.000 No @ Rs 231093.65 / No						<b>Rs 1155468.25</b>	
6	od330805/2021_2022 Constructing manholes of different depths as per drawings and specifications on sewer lines and provided with tight fitting approved make heavy CI manhole cover with frame 600 mm dia, embedded into the cover slab, providing provision of encapsulated PVC/CI foot rests @ 30 cm apart in a staggered manner, bottom slab, side wall and cover slabwith RCC M30 with a provision of PCC 1:3:6, 10 cm thick below floor slab, inside to be plastered with CM. 1:3, 12mm thick one coat with a neat cement flushing coat, two coats of anticorrosive bituminous paint to the outside surfaces, providing benching and channelling inside the manhole with CC M30 as per drawings and specifications. The rate shall include earthwork excavation for all leads and lifts, backfilling, de-watering, side protection with steel shoring, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.and disposing the surplus earth away with all leads and lifts as directed upto manhole depth upto 6.50m (internal diameter-1500mm)							
		1					1.000	
	Total Quantity						1.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						1.000 No	
	Say 1.000 No @ Rs 242888.72 / No						<b>Rs 242888.72</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>12Road Restoration - to PWD/NH (Cost Index:33.05 %)</b>								
1	od330780/2021_2022 PWD Berm Cutting (G.O.(Ms)No. 59/2020/PWD dtd.30.07.2020)							
	IC to MH Line -200mm	1	3138.000	1.500		0.1	470.701	12552X0.5X0.5=3138
	Total Quantity						470.701 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						470.701 sqm	
	Say 470.701 sqm @ Rs 304.95 / sqm						<b>Rs 143540.27</b>	

2	od330781/2021_2022 PWD Road reformation Charges- BT Cutting(G.O.(Ms)No. 59/2 02 0/PWD dtd.30.07.2020)							
	IC to MH Line -200mm	1	3138.000	1.500		0.6	2824.200	12552X0. 5X0.5=31 38
	Total Quantity						2824.200 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						2824.200 sqm	
	Say 2824.200 sqm @ Rs 3692.36 / sqm						<b>Rs 10427963.11</b>	
3	od330785/2021_2022 Road restoration charges for BM & BC Tar Cutting(G.O.(Ms)No. 59/2 02 0/PWD dtd.30.07.2020)							
	Sewer line -225 to 450 mm (NHA)	1	2500.000	1.500			3750.000	
	Sewer line -225 to 450 mm (PWD)	1	2000.000	1.500			3000.000	
	IC to MH Line -200mm	1	3138.000	1.500		0.3	1412.100	12552X0. 5X0.5=31 38
	Total Quantity						8162.100 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						8162.100 sqm	
	Say 8162.100 sqm @ Rs 3448.73 / sqm						<b>Rs 28148879.13</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>13Lifting Stations and Allied work (Cost Index:33.05 %)</b>								
1	100.3.3.1 Earthwork open well excavation (above water) for wells of dia. above 2.5m and upto 3.50 m in all kinds of soil and conveying and depositing the spoil within initial lead of 50m and lift up to 1.5 m including neat banking. NEW DATA (Prepared based on PHED SDB - Item No.1080 & 1083)							
	2m dia- LS1-depth 4.97m	1	3.140	1.600*1.6 0	1.500		12.058	Depth 4.97m
	2m dia- LS2-depth 3.71	1	3.140	1.600*1.6 0	1.500		12.058	
	2m dia- LS4-depth 7.05m	1	3.140	1.600*1.6 0	1.500		12.058	
	2m dia- LS6-depth 5.24m	1	3.140	1.600*1.6 0	1.500		12.058	



	2m dia- LS7-depth 6.41m	1	3.140	1.600*1.6 0	1.500		12.058		
	2m dia- LS8-depth 5.99m	1	3.140	1.600*1.6 0	1.500		12.058		
	2m dia- LS11- depth3.44m	1	3.140	1.600*1.6 0	1.500		12.058		
	Total Quantity						84.406 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						84.406 cum		
	Say 84.406 cum @ Rs 501.00 / cum							<b>Rs 42287.41</b>	
2	<p>100.3.3.2 Earthwork open well excavation (above water) for wells of dia. above 2.5m and upto 3.50 m in all kinds of soil and conveying and depositing the spoil within initial lead of 50m and lift from 1.5m to 3.0 m including neat banking. NEW DATA (Prepared based on PHED SDB - Item No.1082 &amp; 1085)</p>								
	2m dia- LS1-depth 4.97m	1	3.140	1.600*1.6 0	1.500		12.058	Depth 4.97m	
	2m dia- LS2-depth 3.71	1	3.140	1.600*1.6 0	1.500		12.058		
	2m dia- LS4-depth 7.05m	1	3.140	1.600*1.6 0	1.500		12.058		
	2m dia- LS6-depth 5.24m	1	3.140	1.600*1.6 0	1.500		12.058		
	2m dia- LS7-depth 6.41m	1	3.140	1.600*1.6 0	1.500		12.058		
	2m dia- LS8-depth 5.99m	1	3.140	1.600*1.6 0	1.500		12.058		
	2m dia- LS11- depth3.44m	1	3.140	1.600*1.6 0	1.500		12.058		
	Total Quantity						84.406 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						84.406 cum		
	Say 84.406 cum @ Rs 551.09 / cum							<b>Rs 46515.30</b>	
3	<p>100.3.3.13 Earthwork open well excavation (in or under water) for wells of dia. above 2.5m and upto 3.50 m in all kinds of soil and conveying and depositing the spoil within initial lead of 50m and lift from 3.0m to 4.5 m including neat banking. NEW DATA (Prepared based on PHED SDB - Item No.1081 &amp; 1084)</p>								

	2m dia- LS1-depth 4.97m	1	3.140	1.600*1.6 0	1.500		12.058	Depth 4.97m
	2m dia- LS2-depth 3.71	1	3.140	1.600*1.6 0	1.210		9.727	
	2m dia- LS4-depth 7.05m	1	3.140	1.600*1.6 0	1.500		12.058	
	2m dia- LS6-depth 5.24m	1	3.140	1.600*1.6 0	1.500		12.058	
	2m dia- LS7-depth 6.41m	1	3.140	1.600*1.6 0	1.500		12.058	
	2m dia- LS8-depth 5.99m	1	3.140	1.600*1.6 0	1.500		12.058	
	2m dia- LS11- depth3.44m	1	3.140	1.600*1.6 0	0.940		7.557	
	Total Quantity						77.574 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						77.574 cum	
	Say 77.574 cum @ Rs 721.40 / cum						<b>Rs 55961.88</b>	
4	100.3.4.14 Earthwork open well excavation (in or under water) for wells of dia. above 2.5m and upto 3.50 m in ordinary rock in ordinary rock and conveying and depositing the spoil within initial lead of 50m and lift from 4.5m to 6.0 m including neat banking. NEW DATA (Prepared based on PHED SDB - Item No.1087)							
	2m dia- LS1-depth 4.97m	1	3.140	1.600*1.6 0	0.970		7.798	Depth 4.97m
	2m dia- LS4-depth 7.05m	1	3.140	1.600*1.6 0	1.500		12.058	
	2m dia- LS6-depth 5.24m	1	3.140	1.600*1.6 0	1.240		9.968	
	2m dia- LS7-depth 6.41m	1	3.140	1.600*1.6 0	1.500		12.058	
	2m dia- LS8-depth 5.99m	1	3.140	1.600*1.6 0	1.500		12.058	
	Total Quantity						53.940 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						53.940 cum	
	Say 53.940 cum @ Rs 2025.89 / cum						<b>Rs 109276.51</b>	
5	100.3.4.15							

	Earthwork open well excavation (in or under water) for wells of dia. above 2.5m and upto 3.50 m in ordinary rock in ordinary rock and conveying and depositing the spoil within initial lead of 50m and lift from 6.0m to 7.5 m including neat banking. NEW DATA (Prepared based on PHED SDB - Item No.1087)							
	2m dia- LS4-depth 7.05m	1	3.140	1.600*1.6 0	1.500		12.058	
	2m dia- LS7-depth 6.41m	1	3.140	1.600*1.6 0	0.910		7.315	
	2m dia- LS8-depth 5.99m	1	3.140	1.600*1.6 0	0.490		3.939	
	Total Quantity						23.312 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						23.312 cum	
	Say 23.312 cum @ Rs 2181.69 / cum						<b>Rs 50859.56</b>	
6	100.3.5.1 Earthwork open well excavation (above water) for wells of dia. above 3.5m and upto 6.0 m in all kinds of soil and conveying and depositing the spoil within initial lead of 50m and lift up to 1.5 m including neat banking. NEW DATA (Prepared based on PHED SDB - Item No.1089 & 1092)							
	3m dia LS-3, Depth 5.96	1	3.140	2.1*2.1	1.500		20.772	
	5m dia LS-5, Depth 5.94	1	3.140	3.1*3.1	1.500		45.264	
	3m dia LS-9, Depth 5.98	1	3.140	2.1*2.1	1.500		20.772	
	3m dia LS-10, Depth 5.25	1	3.140	2.1*2.1	1.500		20.772	
	Total Quantity						107.580 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						107.580 cum	
	Say 107.580 cum @ Rs 461.35 / cum						<b>Rs 49632.03</b>	
7	100.3.5.2 Earthwork open well excavation (above water) for wells of dia. above 3.5m and upto 6.0 m in all kinds of soil and conveying and depositing the spoil within initial lead of 50m and lift from 1.5m to 3.0 m including neat banking. NEW DATA (Prepared based on PHED SDB - Item No.1089 & 1092)							
	3m dia LS-3, Depth 5.96	1	3.140	2.1*2.1	1.500		20.772	

	5m dia LS-5, Depth 5.94	1	3.140	3.1*3.1	1.500		45.264		
	3m dia LS-9, Depth 5.98	1	3.140	2.1*2.1	1.500		20.772		
	3m dia LS-10, Depth 5.25	1	3.140	2.1*2.1	1.500		20.772		
	Total Quantity						107.580 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						107.580 cum		
	Say 107.580 cum @ Rs 507.52 / cum							<b>Rs 54599.00</b>	
8	100.3.5.13 Earthwork open well excavation (in or under water) for wells of dia. above 3.5m and upto 6.0 m in all kinds of soil and conveying and depositing the spoil within initial lead of 50m and lift from 3.0m to 4.5 m including neat banking. NEW DATA (Prepared based on PHED SDB - Item No.1090 & 1093)								
	3m dia LS-3, Depth 5.96	1	3.140	2.1*2.1	1.500		20.772		
	5m dia LS-5, Depth 5.94	1	3.140	3.1*3.1	1.500		45.264		
	3m dia LS-9, Depth 5.98	1	3.140	2.1*2.1	1.500		20.772		
	3m dia LS-10, Depth 5.25	1	3.140	2.1*2.1	1.500		20.772		
	Total Quantity						107.580 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						107.580 cum		
	Say 107.580 cum @ Rs 664.32 / cum							<b>Rs 71467.55</b>	
9	100.3.6.4 Earthwork open well excavation (above water) for wells of dia. above 3.5m and upto 6.0 m in ordinary rock and conveying and depositing the spoil within initial lead of 50m and lift from 4.5m to 6.00 m including neat banking. NEW DATA (Prepared based on PHED SDB - Item No.1095)								
	3m dia LS-3, Depth 5.96	1	3.140	2.1*2.1	1.500		20.772		
	5m dia LS-5, Depth 5.94	1	3.140	3.1*3.1	1.500		45.264		
	3m dia LS-9, Depth 5.98	1	3.140	2.1*2.1	1.500		20.772		

	3m dia LS-10, Depth 5.25	1	3.140	2.1*2.1	1.250		17.310	
	Total Quantity						104.118 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						104.118 cum	
	Say 104.118 cum @ Rs 1516.70 / cum						<b>Rs 157915.77</b>	
10	<p>100.3.6.5 Earthwork open well excavation (above water) for wells of dia. above 3.5m and upto 6.0 m in ordinary rock and conveying and depositing the spoil within initial lead of 50m and lift from 6.0m to 7.5 m including neat banking. NEW DATA (Prepared based on PHED SDB - Item No.1095)</p>							
	3m dia LS-3, Depth 5.96	1	3.140	2.1*2.1	0.460		6.370	
	5m dia LS-5, Depth 5.94	1	3.140	3.1*3.1	0.440		13.278	
	3m dia LS-9, Depth 5.98	1	3.140	2.1*2.1	0.480		6.647	
	Total Quantity						26.295 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						26.295 cum	
	Say 26.295 cum @ Rs 1633.39 / cum						<b>Rs 42949.99</b>	
11	<p>100.7.1 Bailing out water with 5 HP engine and pumpset including conveyance to the site, erection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete. NEW DATA (Prepared based on PHED SDB - Item No.1070)</p>							
		11	200.000				2200.000	
	Total Quantity						2200.000 Kwh	
	Total Deducted Quantity						0.000 Kwh	
	Net Total Quantity						2200.000 Kwh	
	Say 2200.000 Kwh @ Rs 36.26 / Kwh						<b>Rs 79772.00</b>	
12	<p>2.17.3 Close timbering in case of shafts, wells, cesspits, manholes and the like including strutting, shoring and packing cavities (wherever required) etc. complete (Measurements to be taken of the face area timbered).Depth exceeding 3 m but not exceeding 4.5 m</p>							
	2m dia- LS1-depth 4.97m	1	3.140	3.700	5.470		63.551	Depth 4.97m

	2m dia- LS2-depth 3.71	1	3.140	3.700	4.210		48.912		
	2m dia- LS4-depth 7.05m	1	3.140	3.700	7.500		87.135		
	2m dia- LS6-depth 5.24m	1	3.140	3.700	5.740		66.688		
	2m dia- LS7-depth 6.41m	1	3.140	3.700	6.910		80.281		
	2m dia- LS8-depth 5.99m	1	3.140	3.700	6.490		75.401		
	2m dia- LS11- depth3.44m	1	3.140	3.700	3.940		45.775		
	3m dia LS-3, Depth 5.96	1	3.140	4.600	6.460		93.309		
	5m dia LS-5, Depth 5.94	1	3.140	6.600	6.440		133.463		
	3m dia LS-9, Depth 5.98	1	3.140	4.600	6.480		93.598		
	3m dia LS-10, Depth 5.25	1	3.140	4.600	5.750		83.053		
Kerala Water Authority							Total Quantity	871.166 sqm	
							Total Deducted Quantity	0.000 sqm	
							Net Total Quantity	871.166 sqm	
							Say 871.166 sqm @ Rs 217.07 / sqm	<b>Rs 189104.00</b>	
13	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 ( 1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)								
	2m dia- LS1-depth 4.97m	1	3.140	1.600*1.6 0	0.200		1.608	Depth 4.97m	
	2m dia- LS2-depth 3.71	1	3.140	1.600*1.6 0	0.200		1.608		
	2m dia- LS4-depth 7.05m	1	3.140	1.600*1.6 0	0.200		1.608		
	2m dia- LS6-depth 5.24m	1	3.140	1.600*1.6 0	0.200		1.608		
	2m dia- LS7-depth 6.41m	1	3.140	1.600*1.6 0	0.200		1.608		

	2m dia- LS8-depth 5.99m	1	3.140	1.600*1.6 0	0.200		1.608		
	2m dia- LS11- depth3.44m	1	3.140	1.600*1.6 0	0.200		1.608		
	3m dia LS-3, Depth 5.96	1	3.140	2.1*2.1	0.200		2.770		
	5m dia LS-5, Depth 5.94	1	3.140	3.1*3.1	0.200		6.036		
	3m dia LS-9, Depth 5.98	1	3.140	2.1*2.1	0.200		2.770		
	3m dia LS-10, Depth 5.25	1	3.140	2.1*2.1	0.200		2.770		
	Total Quantity						25.602 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						25.602 cum		
	Say 25.602 cum @ Rs 7076.06 / cum							<b>Rs 181161.29</b>	
14	<p>5.37.1 Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in-charge. Note:- Cement content considered in this item is @330 kg/cum. Excess /less cement used as per design mix is payable/recoverable separately.All work upto plinth level</p>								
	2m dia- LS1-depth 4.97m- bottom plugging	1	3.140	1.600*1.6 0	0.300		2.412	Depth 4.97m	
	side wall	1	3.140*2.3	0.300	4.970		10.769		
	coverslab	1	3.140	1.3*1.3	0.250		1.327		
	2m dia- LS2-depth 3.71-bottom plugging	1	3.140	1.600*1.6 0	0.300		2.412		
	side wall	1	3.140*2.3	0.300	3.710		8.039		
	coverslab	1	3.140	1.3*1.3	0.250		1.327		
	2m dia- LS4-depth 7.05m-bottom plugging	1	3.140	1.600*1.6 0	0.300		2.412		
	side wall	1	3.140*2.3	0.300	7.050		15.275		
	coverslab	1	3.140	1.3*1.3	0.250		1.327		

2m dia- LS6-depth 5.24m-bottom plugging	1	3.140	1.600*1.6 0	0.300		2.412	
side wall	1	3.140*2.3	0.300	5.240		11.353	
coverslab	1	3.140	1.3*1.3	0.250		1.327	
2m dia- LS7-depth 6.41m-bottom plugging	1	3.140	1.600*1.6 0	0.300		2.412	
side wall	1	3.140*2.3	0.300	6.410		13.888	
coverslab	1	3.140	1.3*1.3	0.250		1.327	
2m dia- LS8-depth 5.99m-bottom plugging	1	3.140	1.600*1.6 0	0.300		2.412	
side wall	1	3.140*2.3	0.300	5.990		12.978	
coverslab	1	3.140	1.3*1.3	0.250		1.327	
2m dia- LS11- depth3.44m-bottom plugging	1	3.140	1.600*1.6 0	0.300		2.412	
side wall	1	3.140*2.3	0.300	3.440		7.454	
coverslab	1	3.140	1.3*1.3	0.250		1.327	
3m dia LS-3, Depth 5.96-Bottom plugging	1	3.140	2.1*2.1	0.300		4.155	
Side wall	1	3.140*3.3	0.300	5.960		18.528	
Cover slab	1	3.140	1.8*1.8	0.300		3.053	
5m dia LS-5, Depth 5.94-Bottom plugging	1	3.140	3.1*3.1	0.300		9.053	
Side wall	1	3.140*5.3	0.300	5.940		29.657	
Cover slab	1	3.140	2.8*2.8	0.300		7.386	
3m dia LS-9, Depth 5.98-Bottom plugging	1	3.140	2.1*2.1	0.300		4.155	
Side wall	1	3.140*3.3	0.300	5.980		18.590	
Cover slab	1	3.140	1.8*1.8	0.300		3.053	
3m dia LS-10, Depth 5.25-Bottom plugging	1	3.140	2.1*2.1	0.300		4.155	
Side wall	1	3.140*3.3	0.300	0.300		0.933	
Cover slab	1	3.140	1.8*1.8	0.300		3.053	
manhole	7	0.500	0.500	0.250		-0.437	
manhole	4	0.500	0.500	0.300		-0.300	
Total Quantity						211.700 cum	



	Total Deducted Quantity						-0.737 cum	
	Net Total Quantity						210.963 cum	
	Say 210.963 cum @ Rs 9700.81 / cum						<b>Rs 2046511.98</b>	
15	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Qty taken from item no-13	1	210.963				210.963	
	Total Quantity						210.963 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						210.963 cum	
	Say 210.963 cum @ Rs 80.56 / cum						<b>Rs 16995.18</b>	
16	4.12 Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification .							
	Qty taken from item no-13*340	1	210.963	340.000			71727.420	
	Total Quantity						71727.420 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						71727.420 kg	
	Say 71727.420 kg @ Rs 1.33 / kg						<b>Rs 95397.47</b>	
17	5.9.2 Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, buttersesses, plinth and string courses etc.							
	2m dia- LS1-depth 4.97m-Wall inside	1	3.140	2.000	4.970		31.212	Depth 4.97m
	Wall outside	1	3.140	2.600	4.970		40.576	
	2m dia- LS2-depth 3.71-Wall inside	1	3.140	2.000	3.710		23.299	
	Wall outside	1	3.140	2.600	3.710		30.289	
	2m dia- LS4-depth 7.05m-Wall inside	1	3.140	2.000	7.050		44.274	
	Wall outside	1	3.140	2.600	7.050		57.557	
	2m dia- LS6-depth 5.24m-Wall inside	1	3.140	2.000	5.240		32.908	

	Wall outside	1	3.140	2.600	5.240		42.780	
	2m dia- LS7-depth 6.41m-Wall inside	1	3.140	2.000	6.410		40.255	
	Wall outside	1	3.140	2.600	6.410		52.332	
	2m dia- LS8-depth 5.99m-Wall inside	1	3.140	2.000	5.990		37.618	
	Wall outside	1	3.140	2.600	5.990		48.903	
	2m dia- LS11- depth3.44m-Wall inside	1	3.140	2.000	3.440		21.604	
	Wall outside	1	3.140	2.600	3.440		28.085	
	3m dia LS-3, Depth 5.96-Wall inside	1	3.140	3.000	5.960		56.144	
	Wall outside	1	3.140	3.600	5.960		67.372	
	5m dia LS-5, Depth 5.94-Wall inside	1	3.140	5.000	5.940		93.259	
	Wall outside	1	3.140	5.600	5.940		104.449	
	3m dia LS-9, Depth 5.98-Wall inside	1	3.140	3.000	5.980		56.332	
	Wall outside	1	3.140	3.600	5.980		67.598	
	3m dia LS-10, Depth 5.25-Wall inside	1	3.140	3.000	5.250		49.455	
	Wall outside	1	3.140	3.600	5.250		59.346	
						Total Quantity	1085.647 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	1085.647 sqm	
						Say 1085.647 sqm @ Rs 703.77 / sqm	<b>Rs 764045.79</b>	
18	5.9.20 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform with water proof ply 12 mm thick							
	2m dia- LS1-depth 4.97m-coverslab	1	3.140	1.3*1.3			5.307	Depth 4.97m
	coverslab side	1	3.140	2.600	0.250		2.042	
	2m dia- LS2-depth 3.71-coverslab	1	3.140	1.3*1.3			5.307	
	coverslab side	1	3.140	2.600	0.250		2.042	

	2m dia- LS4-depth 7.05m-coverslab	1	3.140	1.3*1.3			5.307	
	coverslab side	1	3.140	2.600	0.250		2.042	
	2m dia- LS6-depth 5.24m-bottom- coverslab	1	3.140	1.3*1.3			5.307	
	coverslab side	1	3.140	2.600	0.250		2.042	
	2m dia- LS7-depth 6.41m-bottom- coverslab	1	3.140	1.3*1.3			5.307	
	coverslab side	1	3.140	2.600	0.250		2.042	
	2m dia- LS8-depth 5.99m-bottom- coverslab	1	3.140	1.3*1.3			5.307	
	coverslab side	1	3.140	2.600	0.250		2.042	
	2m dia- LS11- depth3.44m-coverslab	1	3.140	1.3*1.3			5.307	
	coverslab side	1	3.140	2.600	0.250		2.042	
	3m dia LS-3, Depth 5.96-Cover slab	1	3.140	1.8*1.8			10.174	
	Coverslab side wall	1	3.140	3.600	0.300		3.392	
	5m dia LS-5, Depth 5.94-Cover slab	1	3.140	2.8*2.8			24.618	
	Coverslab side wall	1	3.140	5.600	0.300		5.276	
	3m dia LS-9, Depth 5.98-Cover slab	1	3.140	1.8*1.8			10.174	
	Coverslab side wall	1	3.140	3.600	0.300		3.392	
	3m dia LS-10, Depth 5.25-Cover slab	1	3.140	1.8*1.8			10.174	
	Coverslab side wall	1	3.140	3.600	0.300		3.392	
						Total Quantity	122.035 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	122.035 sqm	
						Say 122.035 sqm @ Rs 900.08 / sqm	<b>Rs 109841.26</b>	
19	5.22.1 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelMild steel and Medium Tensile steel bars							

	Qty taken from item no - 13 Steel reinforcement @ 100Kg/ 1Cum of CC	1	210.963	100.000			21096.300	
	Total Quantity						21096.300 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						21096.300 kg	
	Say 21096.300 kg @ Rs 94.86 / kg						<b>Rs 2001195.02</b>	
20	od338067/2021_2022 Extra for providing epoxy coating for reinforcement bars.							
	Qty taken from item no - 13 Steel reinforcement @ 100Kg/ 1Cum of CC	1	210.963	100.000			21096.300	
	Total Quantity						21096.300 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						21096.300 kg	
	Say 21096.300 kg @ Rs 2.32 / kg						<b>Rs 48943.42</b>	
21	22.23.1 Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer in-charge. The product performance shall carry guarantee for 10 years against any leakage. For vertical surface two coats @ 0.70 kg per sqm							
	2m dia- LS1-depth 4.97m-Wall inside	1	3.140	2.000	4.970		31.212	Depth 4.97m
	Wall outside	1	3.140	2.600	4.970		40.576	
	2m dia- LS2-depth 3.71m-Wall inside	1	3.140	2.000	3.710		23.299	
	Wall outside	1	3.140	2.600	3.710		30.289	
	2m dia- LS4-depth 7.05m-Wall inside	1	3.140	2.000	7.050		44.274	
	Wall outside	1	3.140	2.600	7.050		57.557	

	2m dia- LS6-depth 5.24m-Wall inside	1	3.140	2.000	5.240		32.908	
	Wall outside	1	3.140	2.600	5.240		42.780	
	2m dia- LS7-depth 6.41m-Wall inside	1	3.140	2.000	6.410		40.255	
	Wall outside	1	3.140	2.600	6.410		52.332	
	2m dia- LS8-depth 5.99m-Wall inside	1	3.140	2.000	5.990		37.618	
	Wall outside	1	3.140	2.600	5.990		48.903	
	2m dia- LS11- depth3.44m-Wall inside	1	3.140	2.000	3.440		21.604	
	Wall outside	1	3.140	2.600	3.440		28.085	
	3m dia LS-3, Depth 5.96-Wall inside	1	3.140	3.000	5.960		56.144	
	Wall outside	1	3.140	3.600	5.960		67.372	
	5m dia LS-5, Depth 5.94-Wall inside	1	3.140	5.000	5.940		93.259	
	Wall outside	1	3.140	5.600	5.940		104.449	
	3m dia LS-9, Depth 5.98-Wall inside	1	3.140	3.000	5.980		56.332	
	Wall outside	1	3.140	3.600	5.980		67.598	
	3m dia LS-10, Depth 5.25-Wall inside	1	3.140	3.000	5.250		49.455	
	Wall outside	1	3.140	3.600	5.250		59.346	
						Total Quantity	1085.647 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	1085.647 sqm	
						Say 1085.647 sqm @ Rs 559.61 / sqm	<b>Rs 607538.92</b>	
22	22.23.2 Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable							

of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer-in-charge. The product performance shall carry guarantee for 10 years against any leakage. For horizontal surface one coat @ 1.10 kg per sqm.								
2m dia- LS1-depth 4 . 9 7 m - cover slab & base slab	2	3.140	1.3*1.3				10.614	Depth 4.97m
2m dia- LS2-depth 3.71-cover slab & base slab	2	3.140	1.3*1.3				10.614	
2m dia- LS4-depth 7 . 0 5 m - cover slab & base slab	2	3.140	1.3*1.3				10.614	
2m dia- LS6-depth 5 . 2 4 m - b o t t o m - cover slab & base slab	2	3.140	1.3*1.3				10.614	
2m dia- LS7-depth 6 . 4 1 m - b o t t o m - cover slab & base slab	2	3.140	1.3*1.3				10.614	
2m dia- LS8-depth 5 . 9 9 m - b o t t o m - cover slab & base slab	2	3.140	1.3*1.3				10.614	
2m dia- LS11- depth 3 . 4 4 m - cover slab & base slab	2	3.140	1.3*1.3				10.614	
3m dia LS-3, Depth 5.96-Cover slab & base slab	2	3.140	1.8*1.8				20.348	
5m dia LS-5, Depth 5.94-Cover slab & base slab	2	3.140	2.8*2.8				49.236	
3m dia LS-9, Depth 5.98-Cover slab & base slab	2	3.140	1.8*1.8				20.348	
3m dia LS-10, Depth 5.25-Cover slab & base slab	2	3.140	1.8*1.8				20.348	
Total Quantity							184.578 sqm	
Total Deducted Quantity							0.000 sqm	
Net Total Quantity							184.578 sqm	
Say 184.578 sqm @ Rs 431.28 / sqm							<b>Rs 79604.80</b>	

23	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)							
	2m dia- LS1-depth 4.97m-Wall inside	1	3.140	2.000	4.970		31.212	Depth 4.97m
	Wall outside	1	3.140	2.600	4.970		40.576	
	2m dia- LS2-depth 3.71-Wall inside	1	3.140	2.000	3.710		23.299	
	Wall outside	1	3.140	2.600	3.710		30.289	
	2m dia- LS4-depth 7.05m-Wall inside	1	3.140	2.000	7.050		44.274	
	Wall outside	1	3.140	2.600	7.050		57.557	
	2m dia- LS6-depth 5.24m-Wall inside	1	3.140	2.000	5.240		32.908	
	Wall outside	1	3.140	2.600	5.240		42.780	
	2m dia- LS7-depth 6.41m-Wall inside	1	3.140	2.000	6.410		40.255	
	Wall outside	1	3.140	2.600	6.410		52.332	
	2m dia- LS8-depth 5.99m-Wall inside	1	3.140	2.000	5.990		37.618	
	Wall outside	1	3.140	2.600	5.990		48.903	
	2m dia- LS11- depth3.44m-Wall inside	1	3.140	2.000	3.440		21.604	
	Wall outside	1	3.140	2.600	3.440		28.085	
	3m dia LS-3, Depth 5.96-Wall inside	1	3.140	3.000	5.960		56.144	
	Wall outside	1	3.140	3.600	5.960		67.372	
	5m dia LS-5, Depth 5.94-Wall inside	1	3.140	5.000	5.940		93.259	
	Wall outside	1	3.140	5.600	5.940		104.449	
	3m dia LS-9, Depth 5.98-Wall inside	1	3.140	3.000	5.980		56.332	
	Wall outside	1	3.140	3.600	5.980		67.598	
	3m dia LS-10, Depth 5.25-Wall inside	1	3.140	3.000	5.250		49.455	
	Wall outside	1	3.140	3.600	5.250		59.346	

	2m dia- LS1-depth 4 . 9 7 m - coverslab&base slab	2	3.140	1.3*1.3			10.614	Depth 4.97m
	2m dia- LS2-depth 3.71-coverslab&base slab	2	3.140	1.3*1.3			10.614	
	2m dia- LS4-depth 7 . 0 5 m - coverslab&base slab	2	3.140	1.3*1.3			10.614	
	2m dia- LS6-depth 5 . 2 4 m - b o t t o m - coverslab&base slab	2	3.140	1.3*1.3			10.614	
	2m dia- LS7-depth 6 . 4 1 m - b o t t o m - coverslab&base slab	2	3.140	1.3*1.3			10.614	
	2m dia- LS8-depth 5 . 9 9 m - b o t t o m - coverslab&base slab	2	3.140	1.3*1.3			10.614	
	2m dia- LS11- d e p t h 3 . 4 4 m - coverslab&base slab	2	3.140	1.3*1.3			10.614	
	3m dia LS-3, Depth 5.96-Cover slab&base slab	2	3.140	1.8*1.8			20.348	
	5m dia LS-5, Depth 5.94-Cover slab&base slab	2	3.140	2.8*2.8			49.236	
	3m dia LS-9, Depth 5.98-Cover slab&base slab	2	3.140	1.8*1.8			20.348	
	3m dia LS-10, Depth 5.25-Cover slab&base slab	2	3.140	1.8*1.8			20.348	
	Total Quantity						1270.225 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1270.225 sqm	
	Say 1270.225 sqm @ Rs 393.69 / sqm						<b>Rs 500074.88</b>	
24	13.44.1 Finishing walls with water proofing cement paint of required shade:New work (Two or more coats applied @ 3.84 kg/10 sqm)							



	Qty vide item no 25	1	1270.225				1270.225	
	Total Quantity						1270.225 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1270.225 sqm	
	Say 1270.225 sqm @ Rs 105.38 / sqm						<b>Rs 133856.31</b>	
25	13.65.1 Painting with black anti- corrosive bitumastic paint of approved brand and manufacture to give an even shade:Two or more coats on new work							
	Qty vide item no 25	1	1270.225				1270.225	
	Total Quantity						1270.225 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1270.225 sqm	
	Say 1270.225 sqm @ Rs 122.47 / sqm						<b>Rs 155564.46</b>	
26	100.41.34 Supplying and fixing Rectangular CI manhole cover 455x610 mm with frame (low duty) charges including all cost, labour charges etc complete.							
	Fixing on Cover slab	11					11.000	
	Total Quantity						11.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						11.000 No	
	Say 11.000 No @ Rs 2745.75 / No						<b>Rs 30203.25</b>	
27	100.36.1 Filling water with 5000 litre tankers fitted in lorry and conveying water from a distance of 5 km (average) to the reservoir site and pumping the water into the reservoir of height not less than 3 m using 5 HP diesel engine pump set , hire for tanker lorry, tools and other appliances and cost of water etc. complete. "(Ref. No. 000, Technical Circular)"							
	2m dia- LS1-depth 4.97m	1	3.140	1.000*1	4.970		15.606	Depth 4.97m
	2m dia- LS2-depth 3.71	1	3.140	1.000*1	3.710		11.650	
	2m dia- LS4-depth 7.05m	1	3.140	1.000*1	7.050		22.137	
	2m dia- LS6-depth 5.24m	1	3.140	1.000*1	5.240		16.454	
	2m dia- LS7-depth 6.41m	1	3.140	1.000*1	6.410		20.128	

	2m dia- LS8-depth 5.99m	1	3.140	1.000*1	5.990		18.809		
	2m dia- LS11- depth3.44m	1	3.140	1.000*1	3.440		10.802		
	3m dia LS-3, Depth 5.96	1	3.140	1.5*1.5	5.960		42.108		
	5m dia LS-5, Depth 5.94	1	3.140	2.5*2.5	5.940		116.573		
	3m dia LS-9, Depth 5.98	1	3.140	1.5*1.5	5.980		42.249		
	3m dia LS-10, Depth 5.25	1	3.140	1.5*1.5	5.250		37.092		
	Total Quantity						353.608 Kilo litre		
	Total Deducted Quantity						0.000 Kilo litre		
	Net Total Quantity						353.608 Kilo litre		
	Say 353.608 Kilo litre @ Rs 182.79 / Kilo litre						<b>Rs 64636.01</b>		
28	<p>2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.</p> <p style="text-align: center;">Kerala Water Authority Filling around the Stening</p>								
	2m dia- LS1-depth 4.97m	1	3.140*2.6	4.970	0.500		20.288	Depth 4.97m	
	2m dia- LS2-depth 3.71	1	3.140*2.6	3.710	0.500		15.145		
	2m dia- LS4-depth 7.05m	1	3.140*2.6	7.050	0.500		28.779		
	2m dia- LS6-depth 5.24m	1	3.140*2.6	5.240	0.500		21.390		
	2m dia- LS7-depth 6.41m	1	3.140*2.6	6.410	0.500		26.166		
	2m dia- LS8-depth 5.99m	1	3.140*2.6	5.990	0.500		24.452		
	2m dia- LS11- depth3.44m	1	3.140*2.6	3.440	0.500		14.043		
	Filling around the Stening								
	3m dia LS-3, Depth 5.96	1	3.140*3.6	5.960	0.500		33.686		

	5m dia LS-5, Depth 5.94	1	3.140*5.6	5.940	0.500		52.225		
	3m dia LS-9, Depth 5.98	1	3.140*3.6	5.980	0.500		33.799		
	3m dia LS-10, Depth 5.25	1	3.14*3.6	5.250	0.500		29.673		
	Total Quantity						299.646 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						299.646 cum		
	Say 299.646 cum @ Rs 253.73 / cum							<b>Rs 76029.18</b>	
29	od330828/2021_2022 Pump set - Supply, Installation, Commissioning, testing and trial run of SUBMERSIBLE SLURRY HANDLING Type Pump Set								
	LS1 to MH-id 111	2	0.500				1.000		
	LS2 to MH-id 45	2	4.000				8.000		
	LS3 to MH-id 795	2	2.000				4.000		
	LS4 to MH-id 764	2	0.500				1.000		
	LS5 to MH-id 628	2	4.000				8.000		
	LS6 to MH-id 158	2	0.500				1.000		
	LS7 to MH-id 544	2	0.500				1.000		
	LS8 to MH-id 541	2	1.000				2.000		
	LS9 to MH-id 495	2	2.000				4.000		
	LS10 to MH-id 99	2	2.000				4.000		
	LS11 to MH-id 318	2	3.000				6.000		
	Total Quantity						40.000 Hp		
	Total Deducted Quantity						0.000 Hp		
	Net Total Quantity						40.000 Hp		
	Say 40.000 Hp @ Rs 29037.50 / Hp							<b>Rs 1161500.00</b>	
30	od330830/2021_2022 Supple and erection of Indoor Type Generator (Suitable Capacity-1KVA to 5 KVA)								
		11					11.000		
	Total Quantity						11.000 L.S		
	Total Deducted Quantity						0.000 L.S		
	Net Total Quantity						11.000 L.S		
	Say 11.000 L.S @ Rs 139380.00 / L.S							<b>Rs 1533180.00</b>	

31	od330831/2021_2022 Automatic Control system								
		11					11.000		
	Total Quantity							11.000 No	
	Total Deducted Quantity							0.000 No	
	Net Total Quantity							11.000 No	
	Say 11.000 No @ Rs 100000.00 / No							<b>Rs 1100000.00</b>	
32	od330832/2021_2022 Control Room and Generator Room								
		11					11.000		
	Total Quantity							11.000 No	
	Total Deducted Quantity							0.000 No	
	Net Total Quantity							11.000 No	
	Say 11.000 No @ Rs 320279.00 / No							<b>Rs 3523069.00</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
<b>14Water Supply and Sanatory arrangements, Electrical wiring in pumping stations</b>									
Lump-Sum Total							<b>Rs 400000.00</b>		
SI No	Description	No	L	B	D	CF	Quantity	Remark	
<b>15Line extension, Deposit to KSEB, etc</b>									
Lump-Sum Total							<b>Rs 1000000.00</b>		
SI No	Description	No	L	B	D	CF	Quantity	Remark	
<b>16Sewer Network - Operation and Maintanance cost for 1st Year (Cost Index:33.05 %)</b>									
1	od340466/2021_2022 Labour for operation the well and connected works as per the direction of departmental officers. 								
		1					1.000		
	Total Quantity							1.000 No	
	Total Deducted Quantity							0.000 No	
	Net Total Quantity							1.000 No	
	Say 1.000 No @ Rs 2193073.63 / No							<b>Rs 2193073.63</b>	
2	od340467/2021_2022 Sewer line,well maintenance - Sewer cleaners including necessary accessories required for cleaning of sewer lines with safety equipment and vehicles								
		1					1.000		
	Total Quantity							1.000 No	
	Total Deducted Quantity							0.000 No	

	Net Total Quantity						1.000 No	
	Say 1.000 No @ Rs 1808005.60 / No						<b>Rs 1808005.60</b>	
3	od340468/2021_2022 Annul maintenance( Day today if needed) of electrical, civil ,mechanical and other connected items and including replacement damaged of electrical , mechanical and civil, Including painting of items as per the direction of departmental officials							
		1					1.000	
	Total Quantity						1.000 L.S	
	Total Deducted Quantity						0.000 L.S	
	Net Total Quantity						1.000 L.S	
	Say 1.000 L.S @ Rs 261337.50 / L.S						<b>Rs 261337.50</b>	
4	od340469/2021_2022 Consumables Fuel for generator,Cotton waste ,Lubricants (oil and Grease)soap ,Glass ware,safety equipment etc							
		1					1.000	
	Total Quantity						1.000 L.S	
	Total Deducted Quantity						0.000 L.S	
	Net Total Quantity						1.000 L.S	
	Say 1.000 L.S @ Rs 363549.50 / L.S						<b>Rs 363549.50</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>17Sewer Network -Operation and Maintanse Cost for 2 nd Year to 10 th Year (Cost Index:33.05 %)</b>								
1	od340470/2021_2022 Sewer Network - Operation and Maintenance for 9 year (Second year to 10 th year)							
	Sewer Network - Operation and Maintenance for 9 year (Second year to 10 th year)							
	2 nd Year-Add 8% to 1st year	1	1.080				1.080	
	3 rd Year-Add 16% to 1st year	1	1.160				1.160	
	4 th Year-Add 24% to 1st year	1	1.240				1.240	
	5 th Year-Add 32% to 1st year	1	1.320				1.320	
	6 th Year-Add 40% to 1st year	1	1.400				1.400	
	7 th Year-Add 48% to 1st year	1	1.480				1.480	

	8 th Year-Add 56% to 1st year	1	1.560					1.560	
	9 th Year-Add 64% to 1st year	1	1.640					1.640	
	10th Year-Add 72% to 1st year	1	1.720					1.720	
	Total Quantity							12.600 No	
	Total Deducted Quantity							0.000 No	
	Net Total Quantity							12.600 No	
	Say 12.600 No @ Rs 4625966.23 / No							<b>Rs 58287174.50</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
<b>18Sewer Connection Charges- Including material,labour and connection deposite charges (Cost Index:33.05 %)</b>									
1	od19556/2022_2023 Sewer Connection Charges- Including material,labour and connection deposite charges								
	Total house connction @ 2024 including D/ND	3000					3000.000	Population @2024=1 3567 D- 2713 ND- 287	
	Kerala Water Authority Total Quantity							3000.000 L.S	
	Total Deducted Quantity							0.000 L.S	
	Net Total Quantity							3000.000 L.S	
	Say 3000.000 L.S @ Rs 10000.00 / L.S							<b>Rs 30000000.00</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
<b>19Electricity charges for sewer net work portion (Cost Index:33.05 %)</b>									
1	od20389/2022_2023 Electricity charges for sewer net work portion in pachakadu zone @ 3937970.40/Year								
	Electricity charges for 4 MLD STP in pachakadu zone for 10 year	10					10.000		
	Total Quantity							10.000 Nos	
	Total Deducted Quantity							0.000 Nos	
	Net Total Quantity							10.000 Nos	
	Say 10.000 Nos @ Rs 3937970.40 / Nos							<b>Rs 39379704.00</b>	
Total							<b>463860305.77</b>		

Centage @	<b>10.0%</b>
Centage Amount	<b>46386030.58</b>
Provision for GST payments (in %) @	<b>18.0%</b>
Amount reserved for GST payments	<b>83494855.04</b>
Total & Centage	<b>593741191.39</b>
Lumpsum for round off	<b>0.00</b>
<b>GRAND TOTAL Rs</b>	<b>593741191.39</b>
<b>Rounded Grand Total Rs 59,37,41,191</b>	
<b>Rupees Fifty Nine Crore Thirty Seven Lakh Forty One Thousand One Hundred and Ninety One Only</b>	



Kerala Water Authority

**PRICE**