

# **KERALA WATER AUTHORITY**



## **DETAILED PROJECT REPORT**

### **SEWERAGE SYSTEM TO KASARAGOD MUNICIPALITY PHASE 2 - CONSTRUCTION OF 4MLD CAPACITY SEWAGE TREATMENT PLANT AT KORAKOD VAYAL AND LAYING SEWERAGE NETWORK**



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

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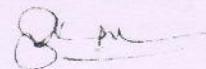
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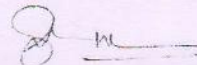
## PROJECT AT A GLANCE

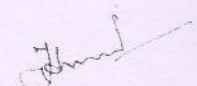
Sl. No.	Item	Description
1	Name of the Project	Sewerage System to Kasaragod Municipality -Phase 2- Construction of 4 MLD capacity Sewage Treatment Plant and Laying Sewerage Network to Korakod Vayal zone of Kasaragod Municipality
2	Name of District	Kasaragod
3	Name of Municipality	Kasaragod
4	Project area covered(km2)	10.6
5	Population Benefitted (in year 2054)	45789
6	STP Capacity	4 MLD
7	Total Network Length	26.18 km
8	Number of Wells	0
9	Number of Pumping Stations	9
10	Number of Manholes	1160
11	Number of Connections	3000
12	O&M cost for 10 Years including 18% GST (including electricity charges)	331179421.2
13	Electricity charge for one year	15663708.55
14	Amount required for Land acquisition	20000000
15	Total cost including 10years O&M cost	1081000000
16	Implementation agency	Kerala Water Authority
17	Period of execution	2 Years

  
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## ABSTRACT OF ESTIMATE

SL NO	HEADING DESCRIPTION	AMOUNT IN RS.
1	Cost of STP	76886095.60
2	Cost of ELECTRO MECHANICAL ITEMS	57254104.08
3	Cost of NETWORK (Including sewer connection charges)	417712635.23
4	O&M charges for 10 years (STP + Network)	280660526.48
5	Centage @10% (1+2+3+4)	83251336.14
6	GST @18% (1+2+3+4)	149852405.05
7	DPR PREPERATION CHARGES @2.5% (1+2+3)	13796320.87
8	Unforeseen items (including LS round off)	1586576.55
9	Grand Total	1081000000.00
	<b>Rupees One hundred Eight Crore Ten Lakhs Only</b>	

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## 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 Korakod Vayal zone (Zone-2) 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 10.6 km<sup>2</sup> area in Kasaragod Municipality's Korakod Vayal zone with the design population of 45789. Co-Treatment is proposed along with the Sewage Treatment Plant for Zone-2 covering this septage zones of Municipality. This proposal includes 4 MLD STP with MBBR technology at Korakod vayal in Kasaragod Municipality, a sewer network of 26.184 km, 1160 manholes and 9 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 108.1 Crores

  
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# **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 Korakod 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.



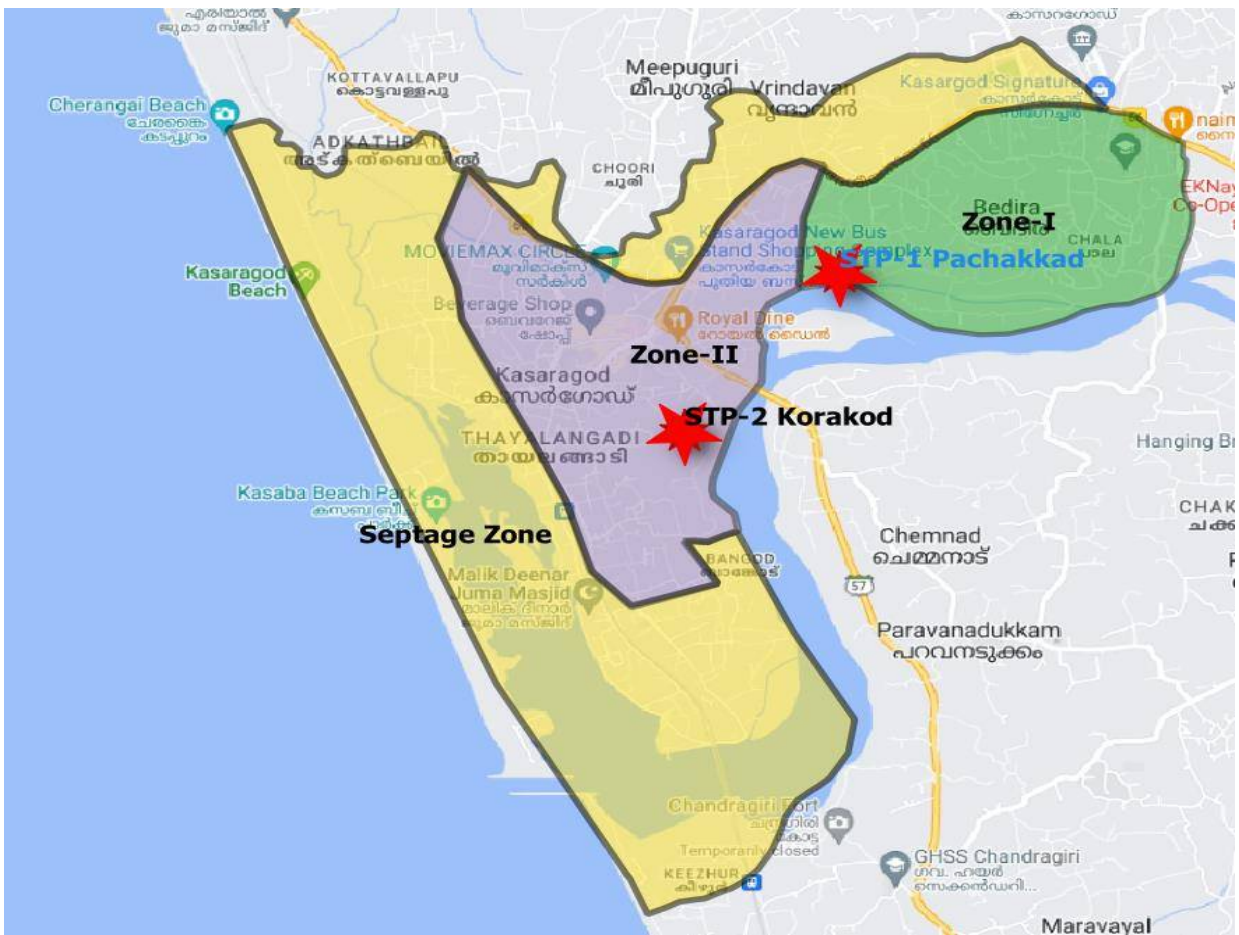
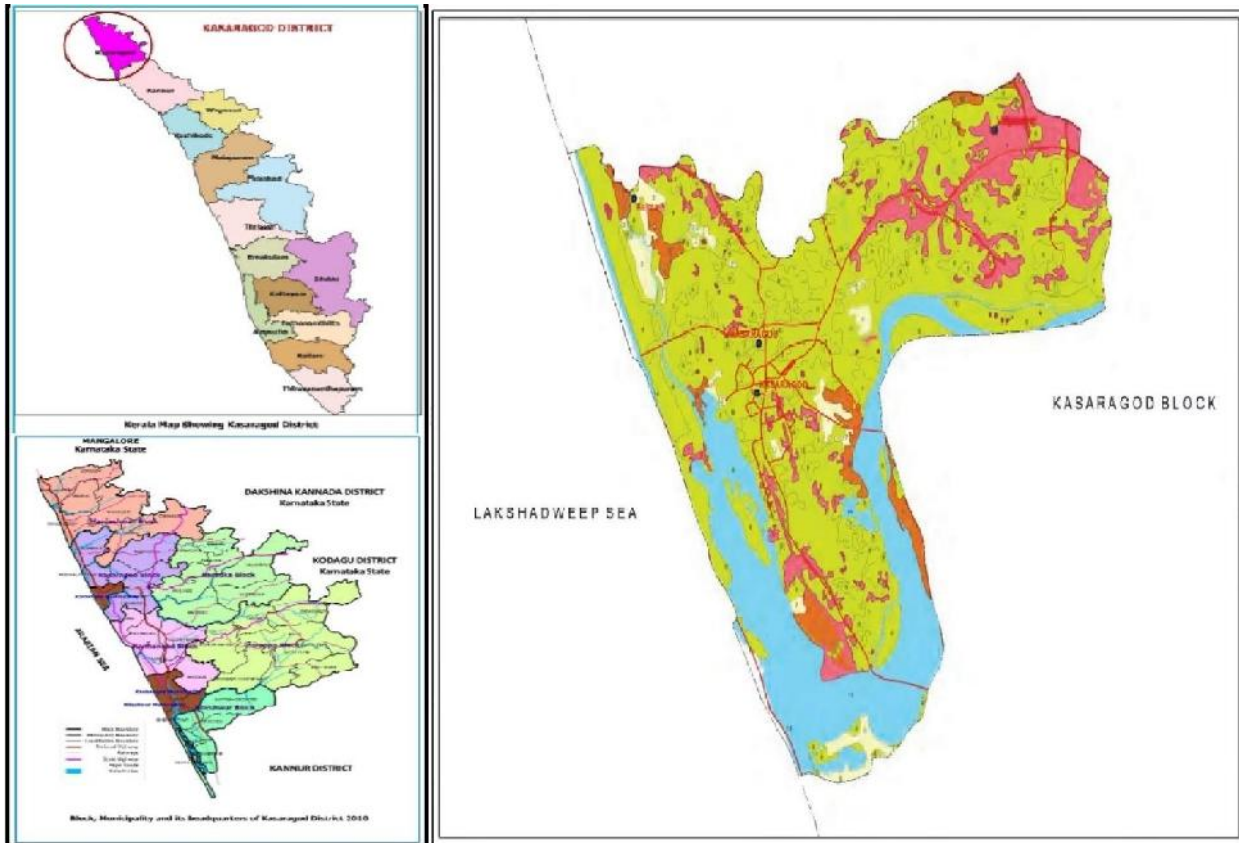


Figure 1.1 Project Area

#### 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

Population as per 2011 census	No.of households	Male	Female	Transgender	SC/ST
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 Panchayaths

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.

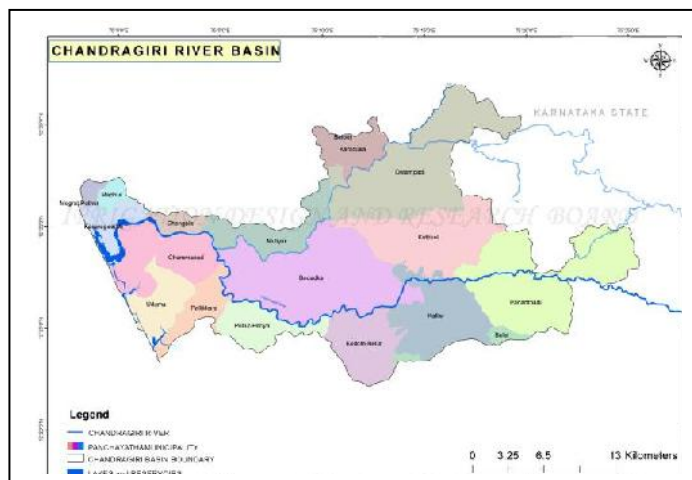


Figure 1.2 River Basin Maps

## **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 is detected in 70% of wells in Kerala and emphasising the need for a well-planned sewerage system.

## 2.4 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.

## 2.5 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)

## **2.6 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

## **2.7 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

## **2.8 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.

## **2.9 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.



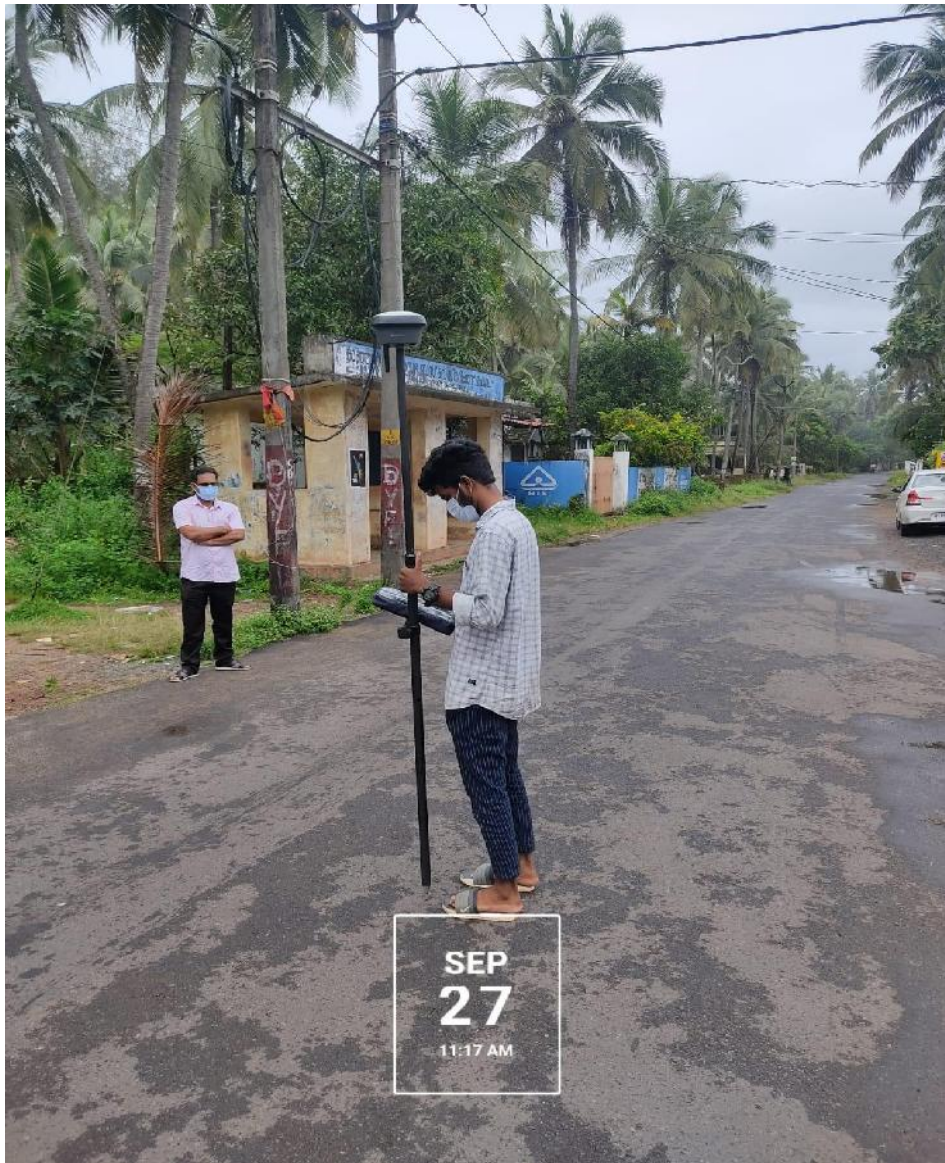


Figure 2.2 DGPS Survey

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.

## 2.10 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

S. N	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.N	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 diameter 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

S.N	EVALUATION CRITERIA	RCC PIPES	DI PIPES	PE PIPES	DWC PIPES	PE
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 online system or with extra couplers.	
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 sewage 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 be 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. PVC pipes are smooth, light, and 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/ u

PVC 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 up to 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

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)

#### 3.7.1 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 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.

### **3.7.3 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.

### **3.7.4 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.

## **3.8 MATERIAL OF CONSTRUCTION FOR MANHOLE**

### **3.8.1 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 up to 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

### **3.8.2 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 up to 6.0m or more depth. This will make the construction very easy and faster. So the same are proposed for Kasaragod scheme.

### **3.8.3 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%

<b>Decadal increase</b>	8.58%
<b>Current Year</b>	2022
<b>Execution Period</b>	2 Year
<b>Design Year</b>	2054
<b>Design Period</b>	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	Korakod Vayal	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 septage 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, septage treatment is proposed.

Table 4.3 STP Capacity Calculation

Design Period	30
Decadal increase in Population	8.58%
Sewerage return ratio	80%
Septage return ratio	10%

Year	Population		Projected Population		
	2011	2021	2024	2039	2054
Kasaragod Municipality	54172	58820	60215	67965	75715
Network area of Zone-2	12668	13755	14082	15895	17707
Septage area of Zone-2	20091	21815	22333	25208	28082

Year	Rate of supply	Water Demand (MLD)			
		2021	2024	2039	2054
Kasaragod Municipality	150	8.82	9.03	10.19	11.36
Network area of Zone-1	150	2.06	2.11	2.38	2.66
Septage area of Zone-1	150	3.27	3.35	3.78	4.21

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%	0.41	0.42	0.48	0.53	1.98	2.02	2.29	2.55
Septage area of Zone-1	20%	0.65	0.67	0.76	0.84	0.39	0.4	0.45	0.51

Total sewage flow (Dry weather flow)	2.55	MLD
Total septage load	0.51	MLD
Maximum infiltration limited to 5000 Ltr/km/day	0.131	MLD
Number of persons giving un authorised connection	1 in 50	
Number of households in 2021	2751	
Number of households in 2054	3541	
Number of houses giving unauthorised connection	71	
Unauthorised water entering the sewer	0.3905	MLD
Capacity of Sewage Treatment plant	4	MLD

Zone 2 coverage area of 10.6 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 26184.7 m. The proposed location of treatment plant is near Korakod Vayal. The capacity of the plant is 4 MLD. Co- Treatment is proposed along with the Sewage Treatment Plant for Zone-2. The capacity of Plant is arrived adding the part septage load in Kasaragod Municipality.

#### 4.2 SEWERAGE NETWORK AND MANHOLES

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 5.72 m from the existing ground level.

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 9 lifting stations for this zone-2 with a common STP, pumping route of Lifting stations are given in table.

Table 4.4 Pumping Route from lifting station to manholes

SI.No.	From Lifting Station	To Manhole ID
1	LS-1	351
2	LS-A	101
3	LS-2	659
4	LS-3	125
5	LS-4	30
6	LS-B	30
7	LS-5	369
8	LS-6	146
9	LS-C	90

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.

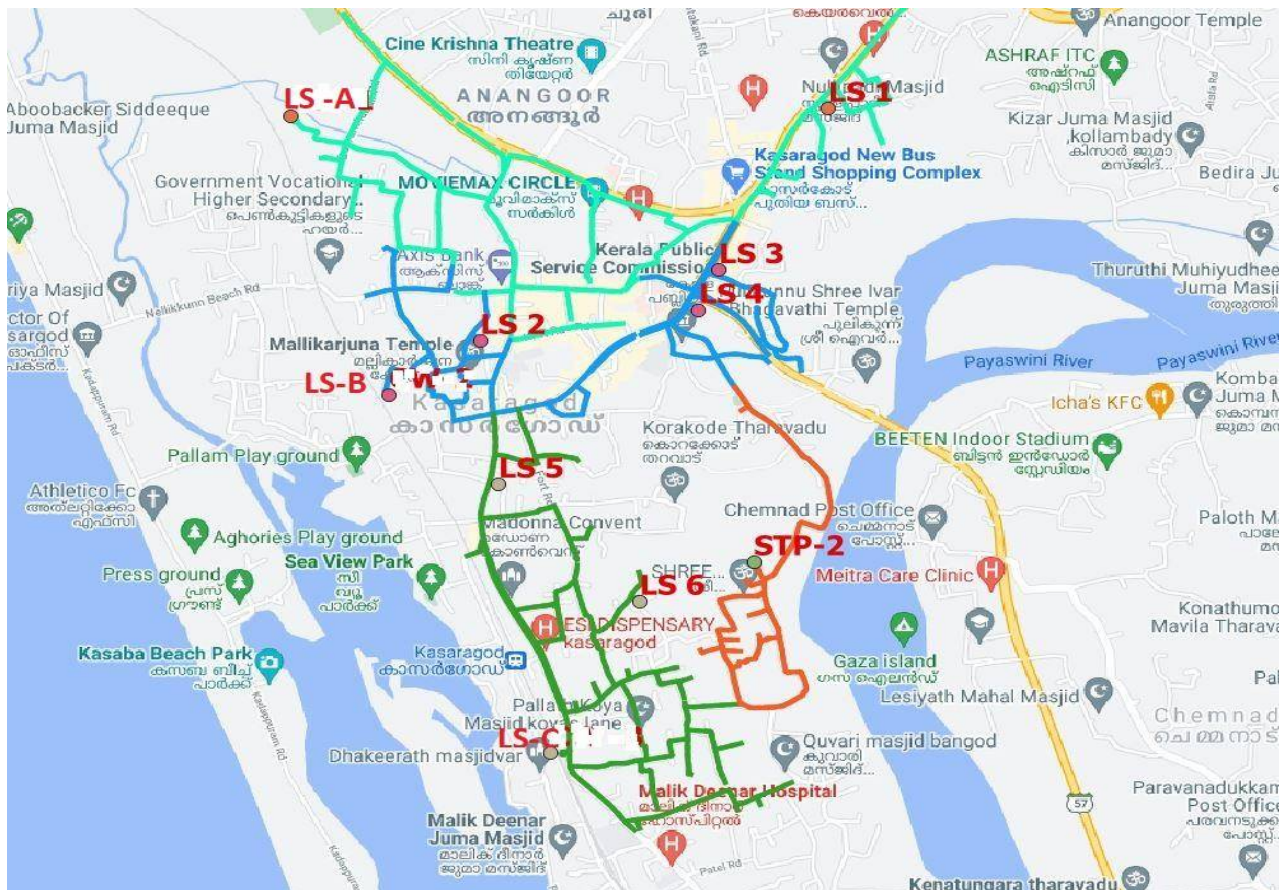


Figure 4.1 Network Sketch



#### 4.2.1 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	23147.40
2	250	PE PE100	169.00
3	280	PE PE100	649.50
4	315	PE PE100	1507.60
5	355	PE PE100	249.70
6	400	PE PE100	397.40
7	560	PE PE100	64.10
	<b>Total</b>		<b>26184.70</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	22144.40	1003.00	23147.40
250	169.00	-	169.00
280	649.50	-	649.50
315	1507.60	-	1507.60
355	249.70	-	249.70
400	397.40	-	397.40
560	64.10	-	64.10

## 4.2.2 MANHOLES

Total number of manholes comes to 1160

Table 4.7 Details of Manholes

Manhole depth in Meters	No of manholes
Up to 1.5	855
1.5 to 2.5	216
2.5 to 3.5	52
3.5 to 4.5	25
4.5 to 5.5	7
5.5 to 6.5	5
<b>Total</b>	<b>1160</b>

## 4.3 PUMPING STATION AND RISING MAIN

### 4.3.1 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.

### 4.3.2 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

### 4.3.3 DETAILS OF LIFTING STATIONS

Table 4.8 Lifting station details

SI 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	7.007	10	4.20	1.40	2	5.56
2	LS-A	29.106	10	17.46	2.7	3	4.46
3	LS-2	1.848	10	1.11	1.5	2	2.77
4	LS-3	7.7	10	4.62	1.6	2	2.94
5	LS-4	11.319	10	6.79	2.2	2	3.47
6	LS-B	40.733	10	24.44	3.7	3	5.00
7	LS-5	6.16	10	3.7	1.5	2	2.77
8	LS-6	1.001	10	0.60	0.75	2	2.00
9	LS-C	26.411	10	15.85	2.5	3	3.82

### 4.3.1 PUMPING MAINS AND LIFTING MAINS

Table 4.9 Pumping mains and Lifting mains

SI NO	Name	Length in metres	Diameter in mm	Material	Route
1	LS-1	445	100	DI	LS-1 TO MHID-351
2	LS-A	810	200	DI	LS-A TO MHID-101
3	LS-2	110	100	DI	LS-2 TO MHID-659
4	LS-3	172	100	DI	LS-3 TO MHID-125
5	LS-4	440	150	DI	LS-4 TO MHID-30
6	LS-B	1700	250	DI	LS-B TO MHID-30
7	LS-5	315	100	DI	LS-5 TO MHID-369
8	LS-6	195	100	DI	LS-6 TO MHID-146
9	LS-C	850	200	DI	LS-C TO MHID-90
10	Well at STP to Receiving chamber	30	300	DI	Well to Receiving Chamber
11	Septage Tank to Receiving chamber	30	100	DI	Septage Tank to Receiving chamber

#### 4.4 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.

##### 4.4.1 DETAILS OF PUMP SETS

Table 4.10 Details of pump sets

SI NO	Name	Number of Pup sets	HP	Type	Remarks
1	LS-1	2	3	Submersible	
2	LS-A	2	15	Submersible	
3	LS-2	2	0.5	Submersible	
4	LS-3	2	2	Submersible	
5	LS-4	2	6	Submersible	
6	LS-B	2	37	Submersible	
7	LS-5	2	2	Submersible	
8	LS-6	2	0.5	Submersible	
9	LS-C	2	12	Submersible	
12	Well at STP to Receiving chamber	2	30	Submersible	
13	Septage Tank to Receiving chamber	2	1.5	Submersible	

#### 4.5 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.

##### 4.5.1 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 are desirable. Such measures and precautions include the erection and maintenance of signs (to fore warn 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 plank is properly back filled.
9. Proper backfilling 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.

#### **4.6 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.

#### **4.7 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
Bio chemical 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
Bio chemical Oxygen Demand(BOD5)	mg/l	<10
Chemical Oxygen Demand(COD)	mg/l	<50
pH	Units	6.5– 7.5
Total Suspended Solids(TSS)	mg/l	<10
Total Dissolved Solids(TDS)	mg/l	100

## 5.3 CAPACITY CALCULATION OF STP

The details of forecasting of population and demand for zone2 is shown below

Last census Population 2011	12668 Persons
Population for sewerage zone-2011	12668
Decennial increase	8.58 %
Current year	2022
Design period	30 Years
Execution period	2 Years
Projected population 2054	17707 Persons
Per capita water supply	150 LPCD
Waste water generated	80% of water supply
Quantity of waste water generated	2.13 MLD
Groundwater Infiltration for pipeline & Manholes	5000L/km/day
Total Ground water infiltration	5000x 26 = 0.131 MLD
Number of persons per house	5Persons
Average roof area	55m <sup>2</sup>
Rainfall intensity	100mm/day
Number of house hold sin 2054	3541 Nos
Waste water generated accounted for Rain water	0.3905 MLD
Non domestic demand	0.42 MLD
Total sewerage load	3.0715 MLD
Septage load for co-treatment	0.51 MLD

Total

3.581 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	<ul style="list-style-type: none"> <li>Removal of rags, floating matter, grit, oil and grease etc.</li> </ul>	<ul style="list-style-type: none"> <li>Screening</li> <li>Grit removal</li> <li>Oil and grease trap</li> </ul>
2	Secondary	<ul style="list-style-type: none"> <li>Removal of Bio degradable organic matter and suspended solids</li> <li>Also include nutrient removal (Nitrate and Phosphate) in advanced technologies</li> </ul>	<ul style="list-style-type: none"> <li>Aerobic suspended growth (Aerobic and anaerobic)Lagoon</li> <li>Nitrate and phosphate removal</li> <li>Chemical oxidation</li> <li>Suspended growth</li> <li>Nitrification/De-nitrification</li> <li>Air stripping</li> <li>Ion exchange</li> <li>Chemical treatment</li> <li>Biological nutrient removal</li> </ul>
3	Tertiary	<ul style="list-style-type: none"> <li>Polishing the effluent for reuse application</li> </ul>	<ul style="list-style-type: none"> <li>Pathogen removal</li> <li>Chlorine compounds</li> <li>O<sub>3</sub> ,UV Radiation</li> <li>Membrane filtration</li> <li>Filtration variation</li> <li>Carbon Adsorption</li> <li>Iron exchange</li> </ul>

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

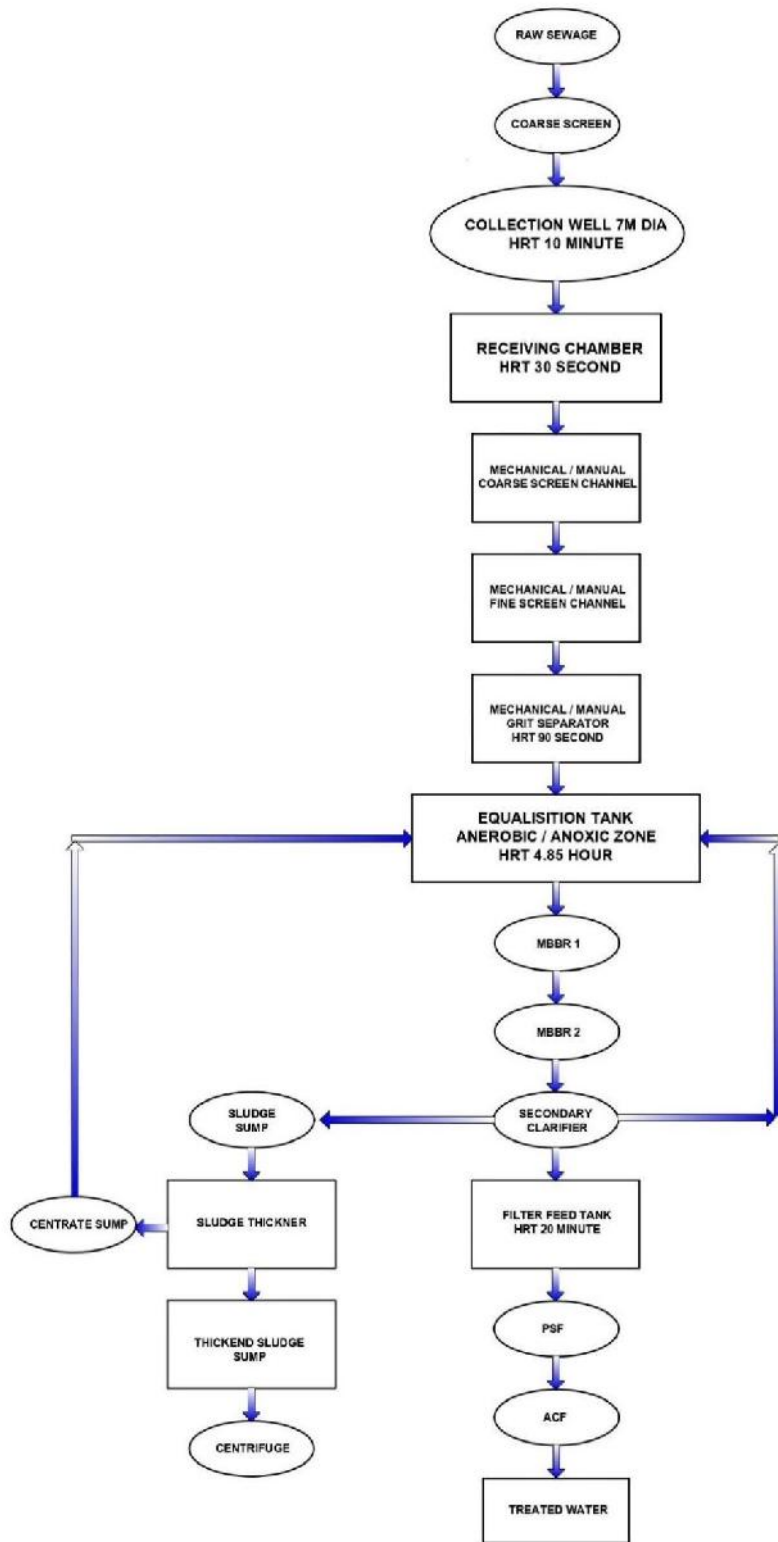


Figure 5.1 Process Flow Diagram

## **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

## **5.7 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 Ódegaard 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 wastewater 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 Denitrification
6. Post-Anoxic Denitrification (Harlan H. Bengtson).

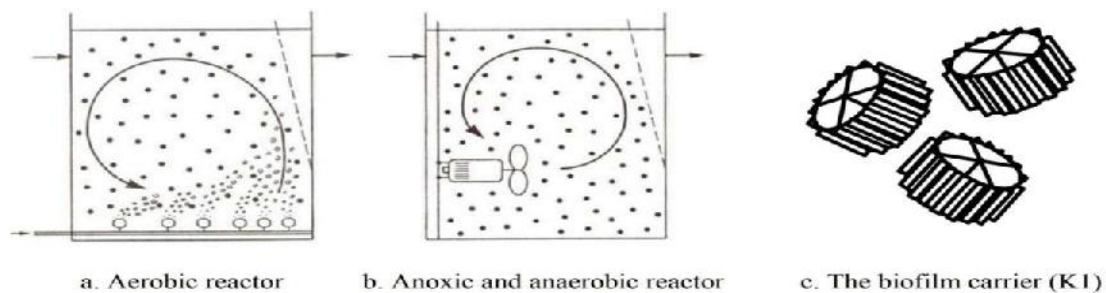


Figure 5.2 MBBR Carrier media in a MBBR tank

The idea behind the development of the moving bed biofilm process was to adopt the best from both the activated sludge process and the bio filter 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  $\text{g/m}^2$  /day, that is 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 g BOD/day can be calculated. Then dividing BOD loading rate in g/day by the SALR in  $\text{g/m}^2$  /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 de nitrification 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.

### **5.7.1 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 settleability.

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.

### **5.7.2 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.

### **5.7.3 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.

#### **5.7.4 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

### **5.8 PROPOSED TREATMENT UNITS**

#### **5.8.1 RECEIVING CHAMBER**

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 38.08ltr/sec whereas peak flow is taken as 95.22ltr/sec. Dimension of receiving chamber is 2.25×1.0×1.0m with a freeboard of 0.5m.

#### **5.8.2 SCREEN CHANNEL**

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.

#### **5.8.3 GRIT SEPARATOR**

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 x2.50 m.

#### **5.8.4 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.

#### **5.8.5 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 14.6 m is proposed with a depth of 4.50m. Equalization tank is divided into Anaerobic and Anoxic areas with the help of baffle wall for denitrification

#### **5.8.6 MIXING EQUIPMENT**

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

#### **5.8.7 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.

#### **5.8.8 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. Biofilm 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 the 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.

#### **5.8.9 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 anaeration 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 5528cum/hr are provided.

### **5.8.10 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.

### **5.8.11 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 2.2-man depth 2.35 mis provided.

### **5.8.12 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 17.93cum/hr

### **5.8.13 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.

### **5.8.14 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

### **5.8.15 SLUDGE CENTRIFUGE**

Centrifugal thickening and dewatering of sewage sludge is 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.

### **5.8.16 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 affected 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 $\phi$  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 pressures and filter are sand and anthracite (Dual media).

#### 5.8.17 ACTIVATED CARBONFILTER(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 compounds and/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 provides

a large surface area/pore structure, allowing contaminants the maximum possible exposure to the active sites within the filter media.

The dimension of Activated Carbon Filter is 2.6mØx2.5m height.



Figure 5.4 Activated Carbon Filter

#### **5.8.18 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.

#### **5.8.19 CHLORINE CONTACT TANK**

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

#### **5.8.20 EFFLUENT CHANNEL**

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

#### **5.8.21 OUT FALL**

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

### **5.9 DETAILED DESIGN**

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

### **5.10 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

### **5.11 OTHER FACILITIES**

Following provisions are also included in the proposal

- Comfort room cum office in the laboratory
- Internal Roads
- Storm Water Drain
- Providing Lawns
- Planting trees
- Bye-passing Arrangements
- Walk ways for all major elevated units
- Walkways/ground pavements
- Water Supply and sanitation arrangements
- Laboratory

### **5.12 PLAN FOR REUSE OF RECYCLED SEWAGE**

In the planning and implementation of water reclamation and reuse, the reclaimed water application will usually govern the wastewater 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

### **5.13 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.

#### **5.14 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.

#### **5.15 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.

##### **5.15.1 SEPTAGE MANAGEMENT**

Sanitation often focuses only on the provisioning of physical infrastructure toilets or latrine 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.

### 5.15.2 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.

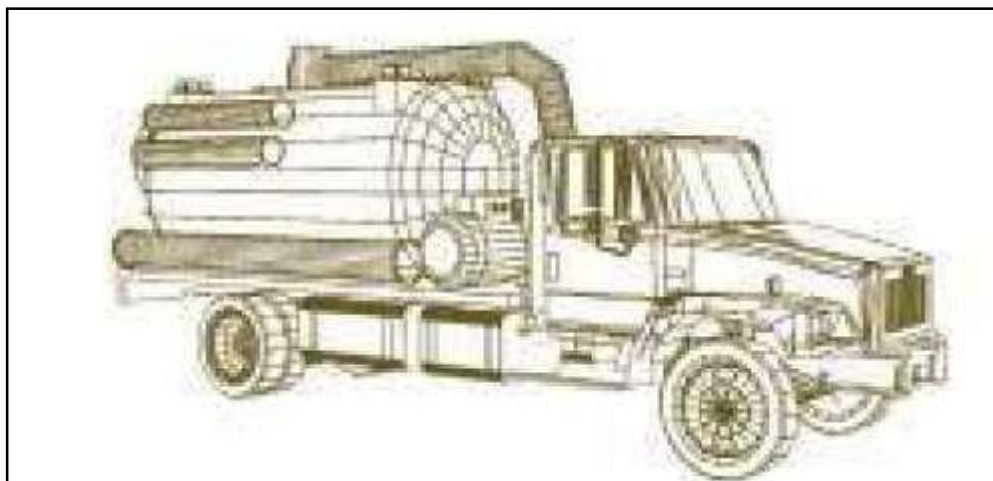


Figure 5.5 Truck-mounted vacuum tankers

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.

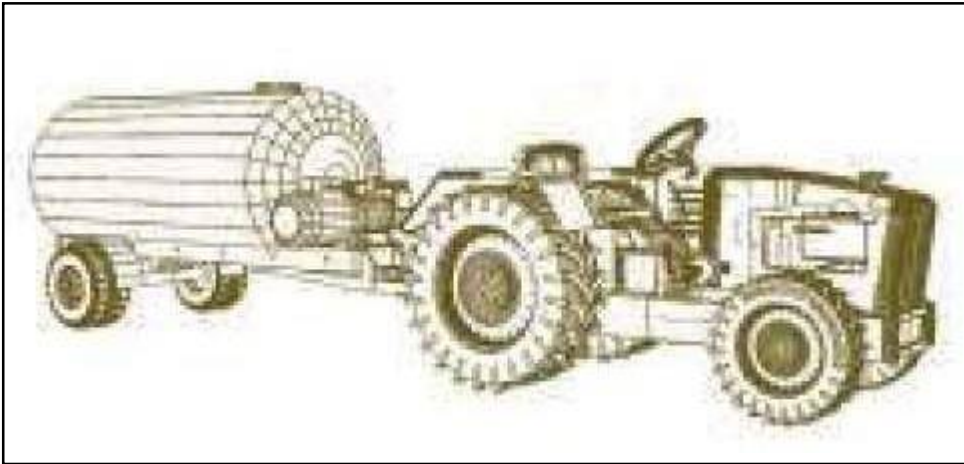


Figure 5.6 Tractor-mounted tankers

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 Korakod Vayal in Kasaragod Municipality where Co-treatment facility will be provided.

### 5.15.3 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.

### 5.16 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	SurveyNo:14/3,4,5,6 Thalangara Village, Lat Lon.12.49580378, 74.99462937
2	STP Link road	45	Korakod Vayal, 12.49580378, 74.99462937
3	LS-1	1	12.50989810, 74.99689596
4	LS-A	1.5	12.50937274, 74.98091408
5	LS-2	1	12.50222986, 74.98612375
6	LS-3	1	12.50442017, 74.99348622
7	LS-4	1	12.50302173, 74.99307432
8	LS-B	1.5	12.50035410, 74.98361257
9	LS-5	1	12.49727409, 74.98681682
10	LS-6	1	12.49345908, 74.99102215
11	LS-C	1.5	12.48837092, 74.98904994





Figure 5.7 STP-Location

### 5.17 SMART MANAGEMENT AND ON-LINE MONITORING USING INTERNET OF THINGS (Io T)

Advancement in the field of digital technology has enabled the wastewater treatment system operator and managers to control and enhance the performance of various components of the system. Internet of things (Io T) 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 wastewater 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 unit have been suggested.

#### 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 characteristics 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 in to consideration the advantages and disadvantages of each.
- D. Monitor odour missions from the treated air for process adjustments and for feedback to evaluate the solution’s effectiveness.

Hydrogen sulphide (H<sub>2</sub> S) is the most common odorous gas found in sewage collection and treatment systems and results from the reduction of sulphate by bacteria under an aerobic condition. 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.

#### 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 pipe with holes rather than effluent troughs. The submerged pipes do not splash the primary effluent, thereby reducing their release of hydrogen sulphide.
  
- Wash down 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 a low 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 a nasty 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.
- Re paint 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
Oxidizers	
Ozone	Atmospheric hydrogen sulphide only
Hydrogen peroxide	Hydrogen sulphide, also acts as oxygen source
Chlorine	Hydrogen sulphide and other reduced sulphur compounds
Sodium and calcium hypochlorite	Hydrogen sulphide and other reduced sulphur compounds
Potassium permanganate	Hydrogen sulphide 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.

#### **6.1.3 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

#### **6.1.4 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 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.

## **6.2 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.

### **6.2.1 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.

### **6.2.2 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

- syst Complaints register
- Stock of equipment
- Disposal of silt, garbage removed after cleanings sewer, 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.

### **6.2.3 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

### **6.2.4 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.

### **6.2.5 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`

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.

### **6.3 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. Never the less, 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.

### **6.4 O&M CHARGES**

O&M charges for 10 years (STP + Network) excluding centage and GST	Rs. 253071526.48
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## **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 OTHER PROJECTS**

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

		Year 2022						Year 2023					
		12	34	56	78	9 10	1112	12	34	5 6	78	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 management 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 guide lines 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 Korakod Vayal in Kasaragod Municipality, a sewer network of 26.184 km, 1160 manholes, 9 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

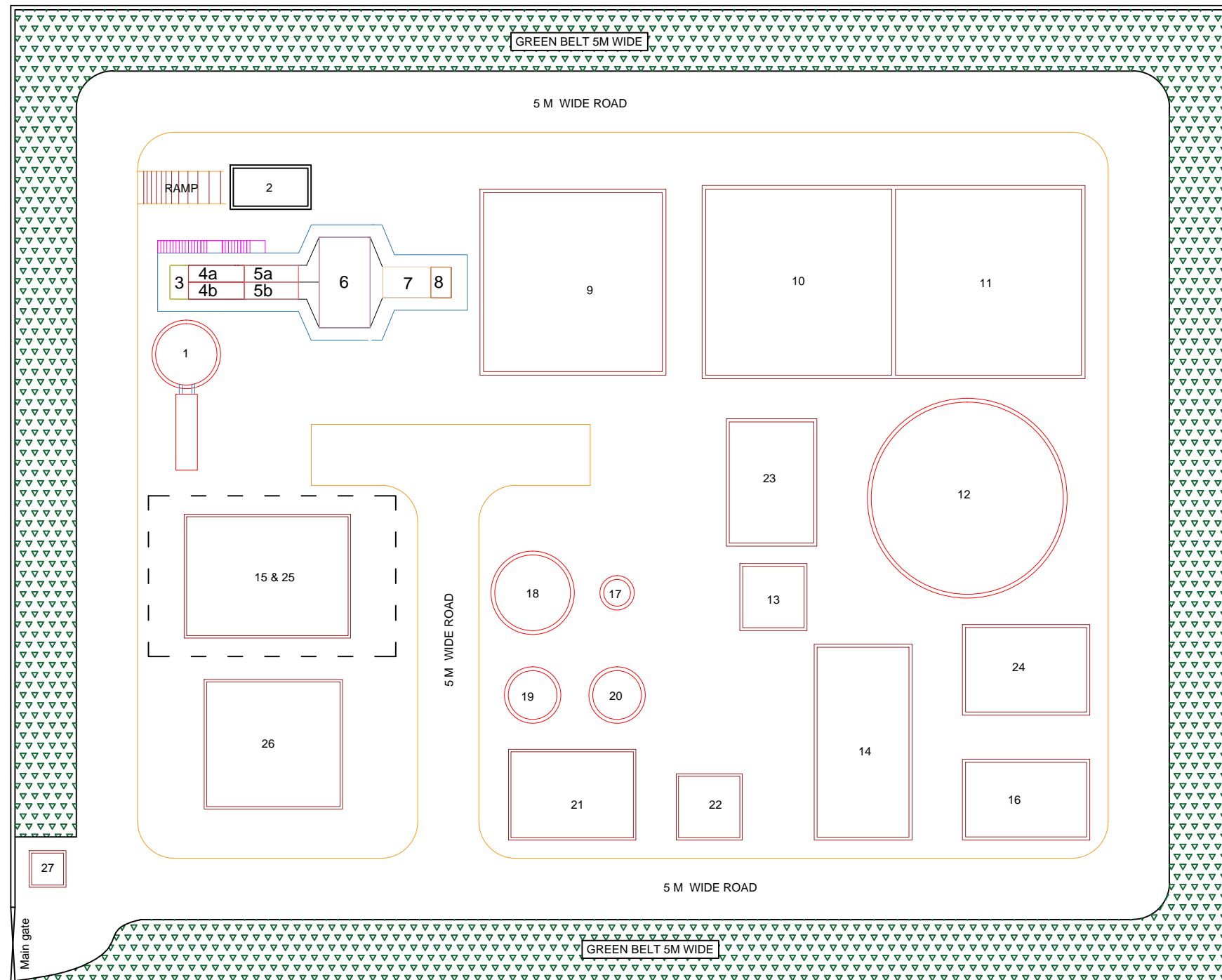


<b>Pump for clarified water to PSF and ACF</b>						
Type of pump set	CF					
Number of pumps	<b>2.00</b>	W	<b>1</b>	SB		
Discharge of clarified water required/pum set	0.00	m <sup>3</sup> /hour				
Working hours of pumps	<b>20.00</b>	hours				
Discharge required/pump set	0.00	m <sup>3</sup> /hour	0.0E+00	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	RAW SEWAGE WELL	
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	THICKEND SLUDGE SUMP
21	CENTRIFUGE BUILDING
22	SLUDGE SHED
23	AIR BLOWER ROOM
24	CHLORINATION ROOM
25	TRANSFORMER YARD
26	ADMINISTRATIVE BUILDING
27	SECURITY ROOM



### GENERAL NOTES

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- FOR ESTIMATION PURPOSE ONLY

No.	Revision/ 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

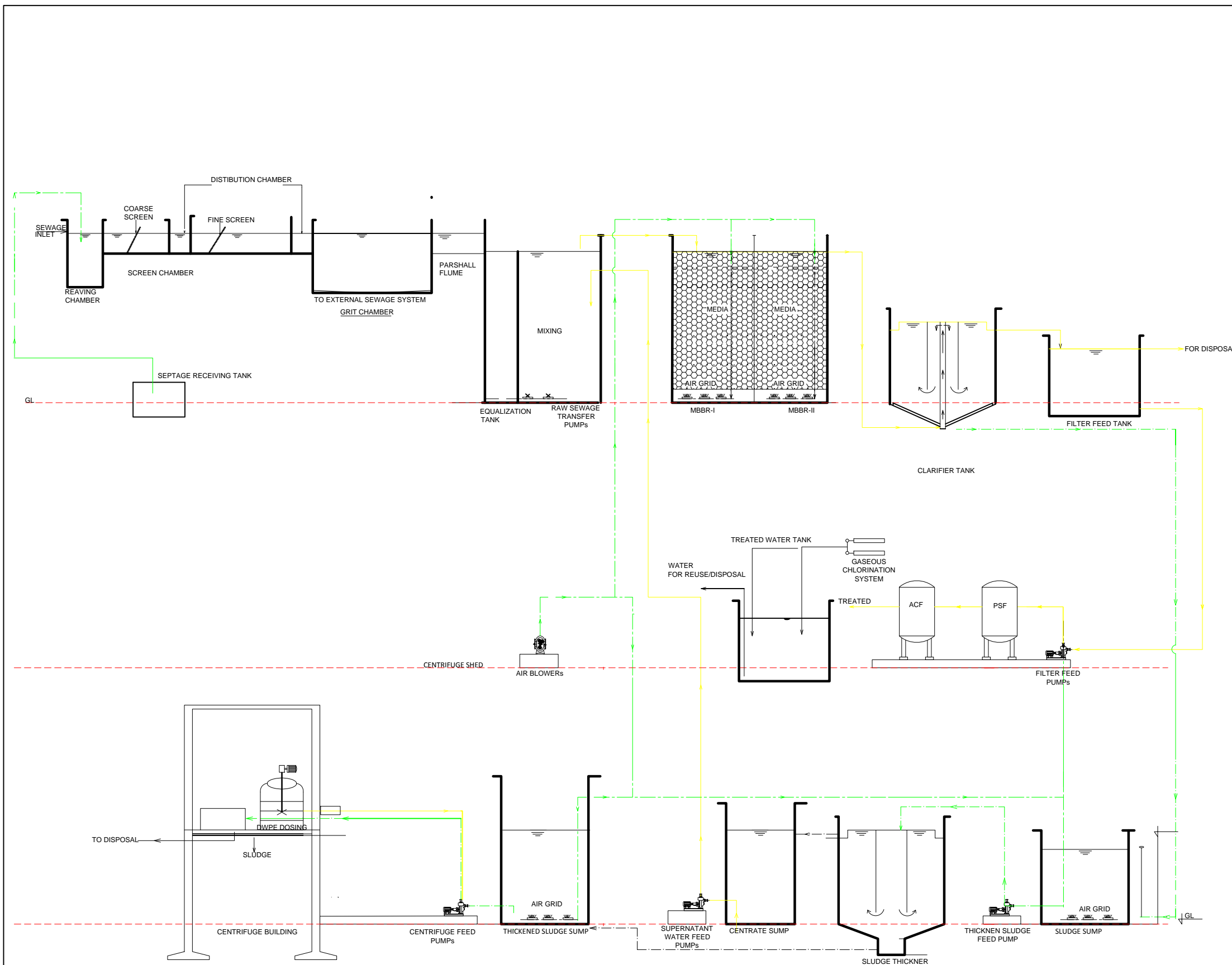
### DRAWING TITLE

STP LAYOUT

DWG No :- KSD/PHASE -2 / 1

Not in scale

AE	AEE	EE	SE	CE
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**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

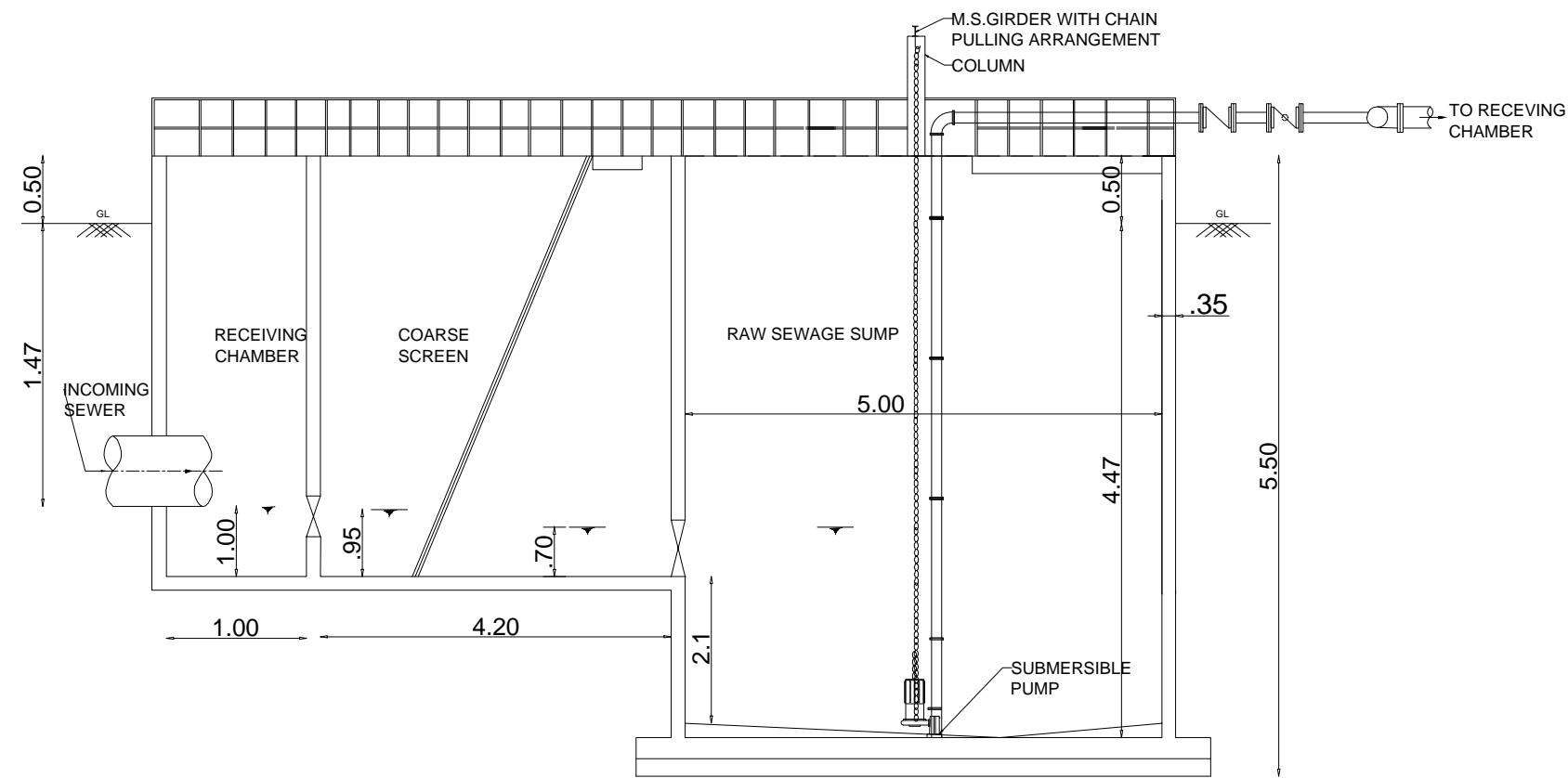
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HYDRAULIC FLOW DIAGRAM

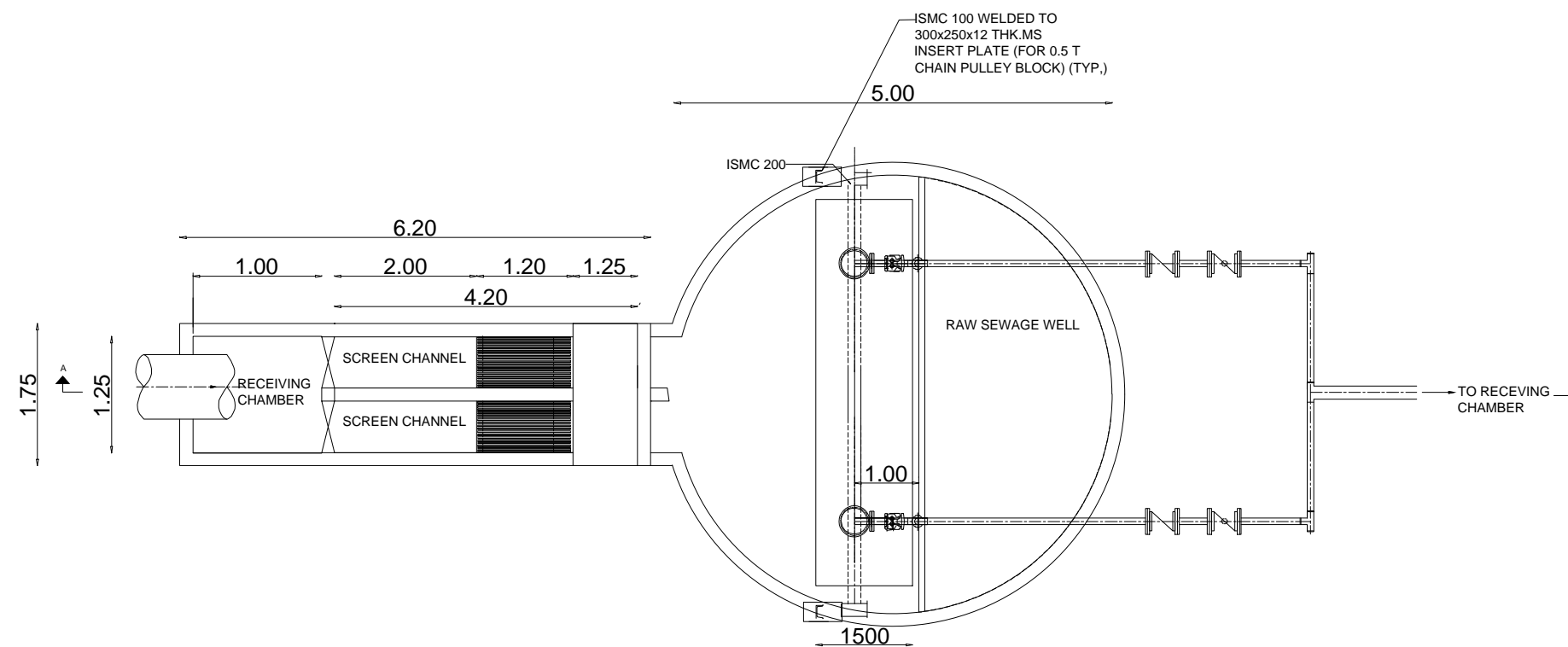
**DWG No :- KSD/PHASE -2 / 2**

Not in scale

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**SECTION  
: A-A**



**PLAN**

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**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 KORAKODVAYAL AND LAYING SEWERAGE NET WORK

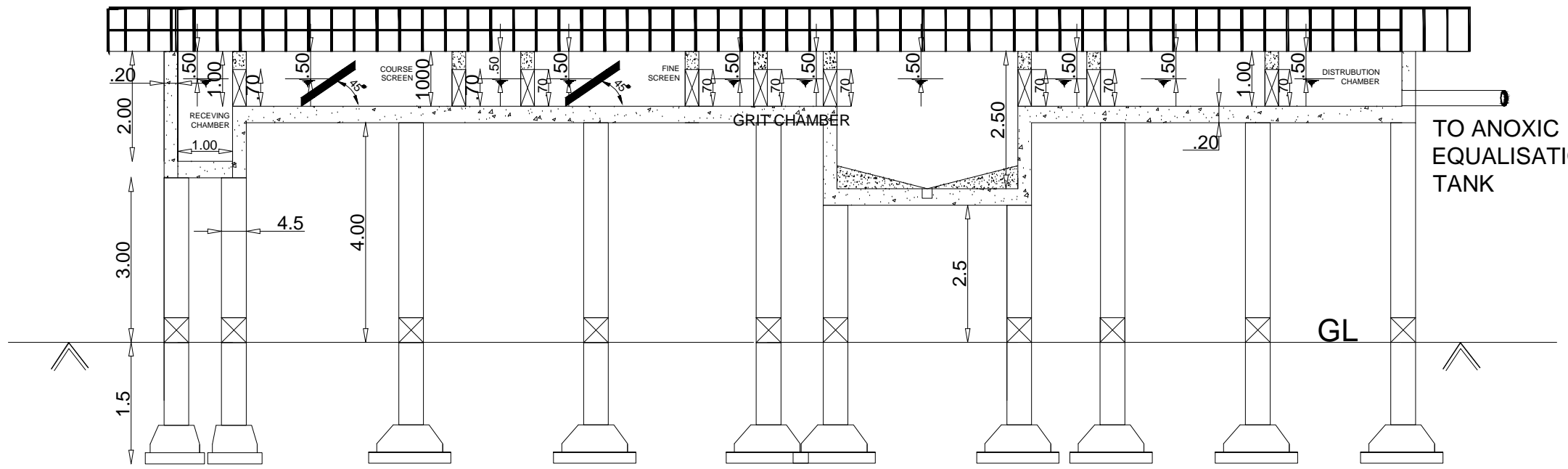
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DETAILS OF RECEIVING CHAMBER  
SCREEN RAW SEWAGE WELL

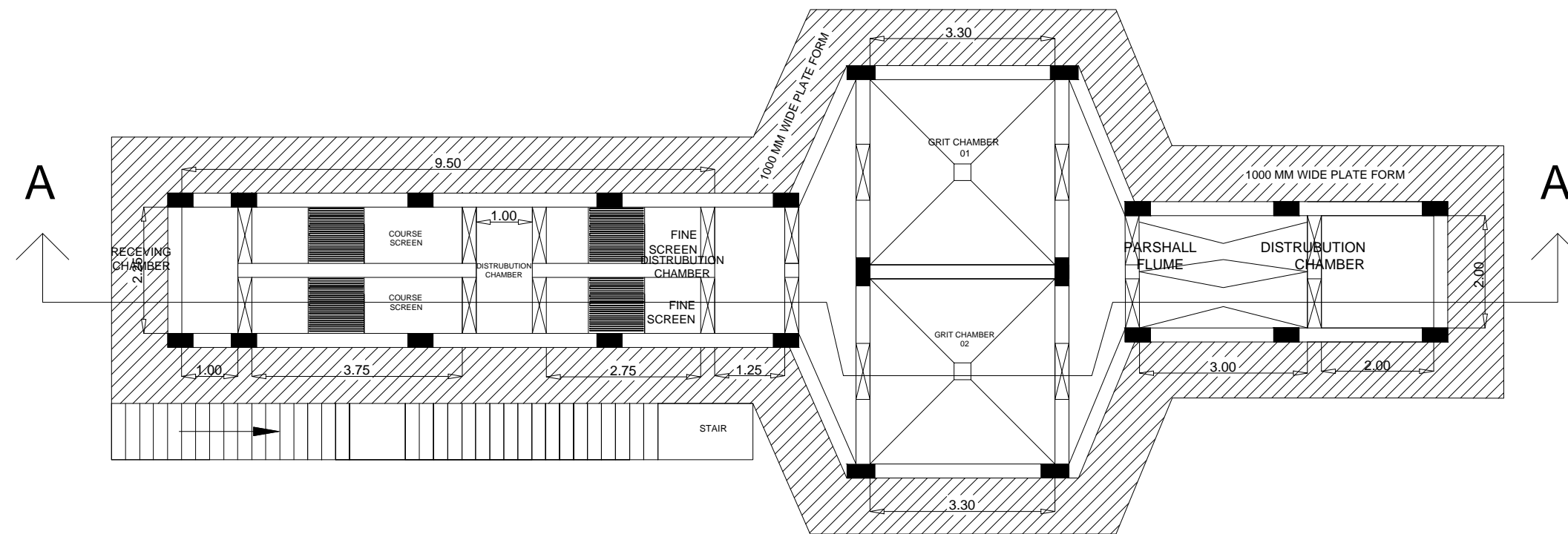
**DWG No :- KSD/PHASE -2 / 3**

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SECTION: A-A



PLAN

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**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

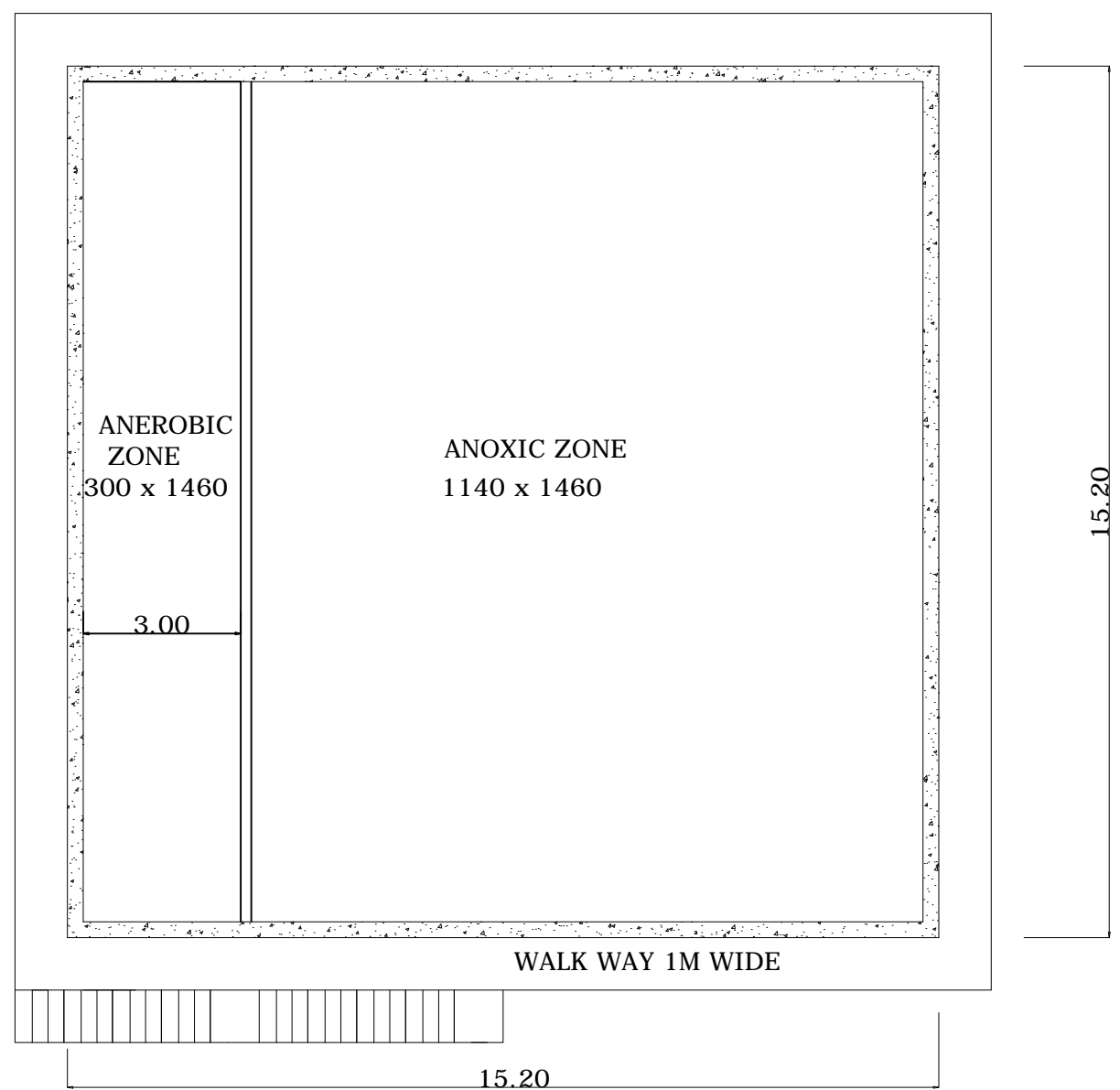
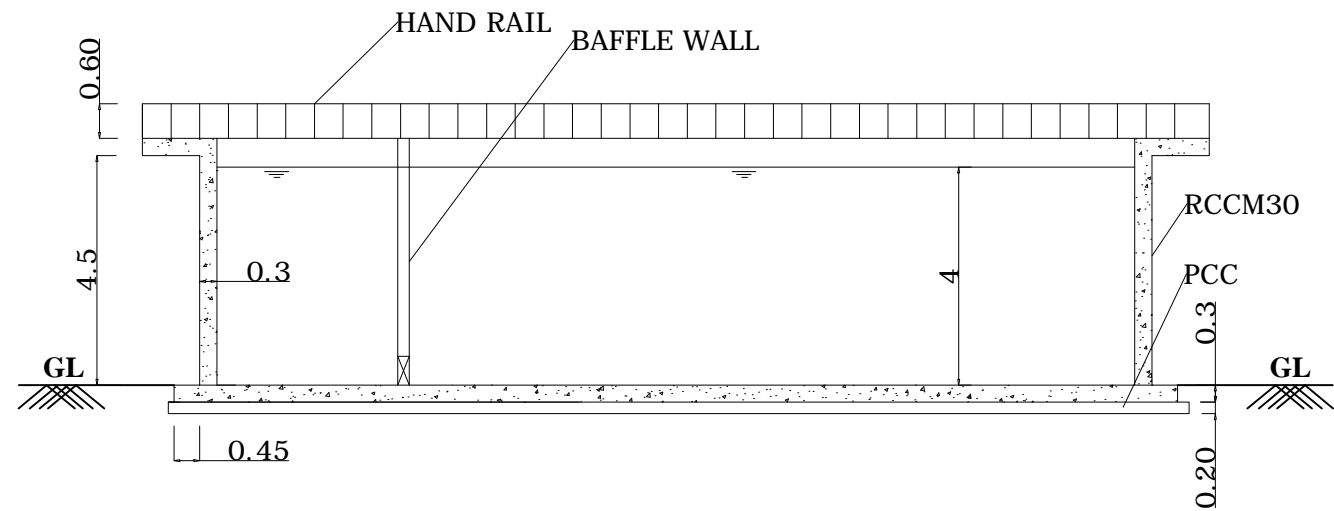
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DETAILS COURS & FINE SCREEN, GRIT  
CHAMBER & DISTRIBUTION CHAMBER

**DWG No :- KSD/PHASE -2 / 4**

Not in scale

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**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**

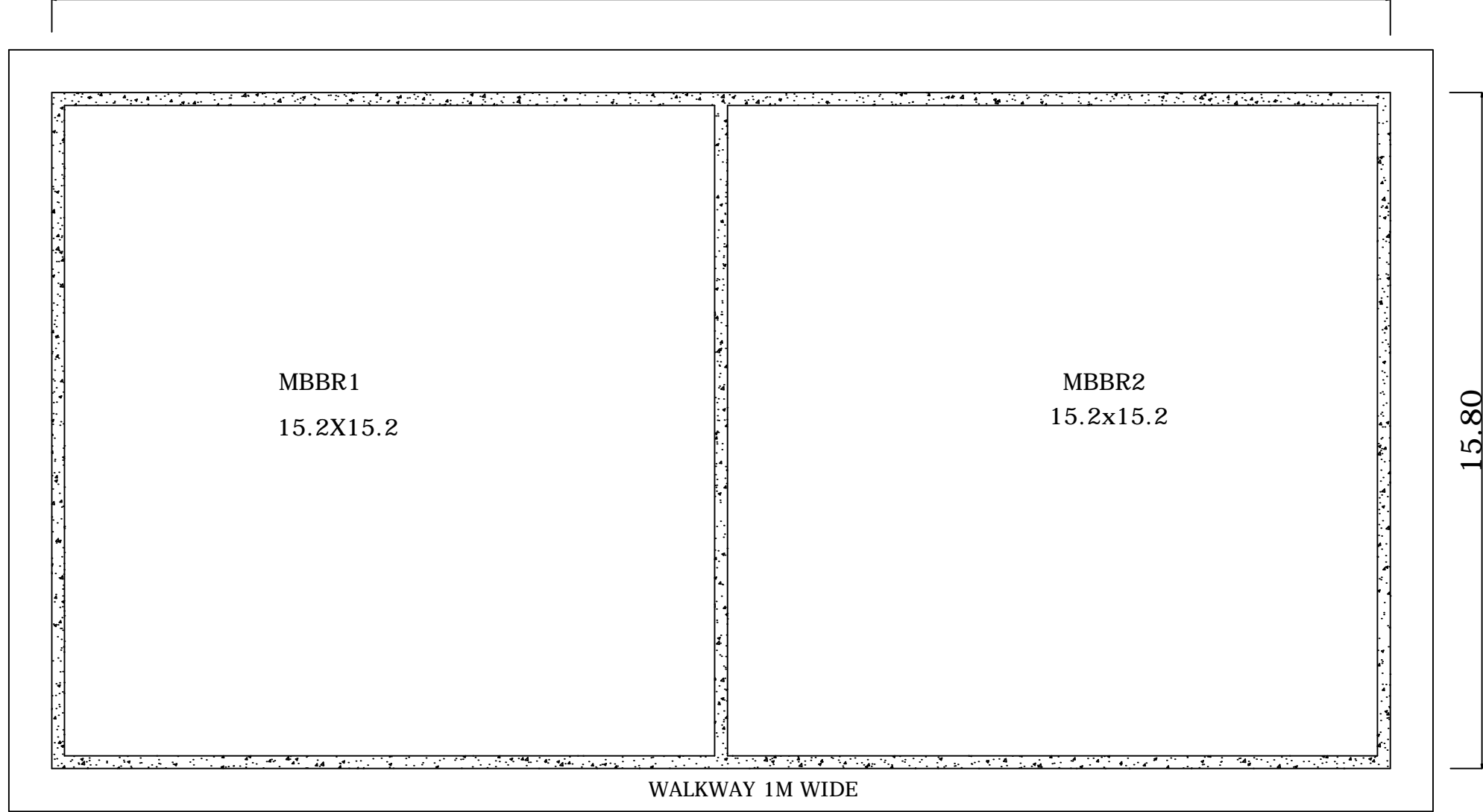
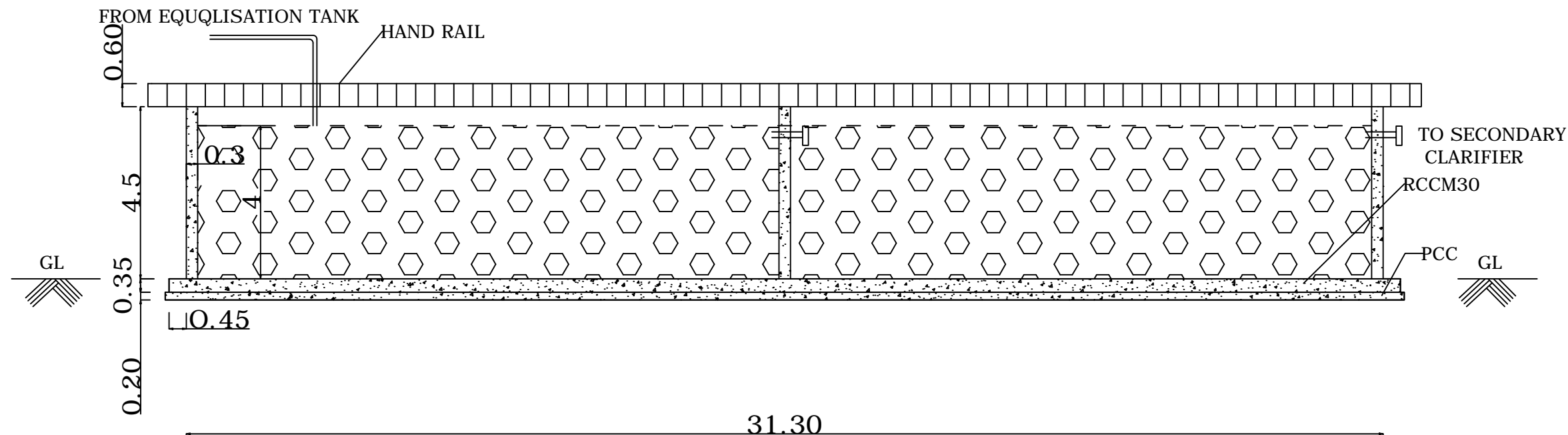
EQUALIZATION TANK

**DWG No :- KSD/PHASE -2 / 5**

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**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

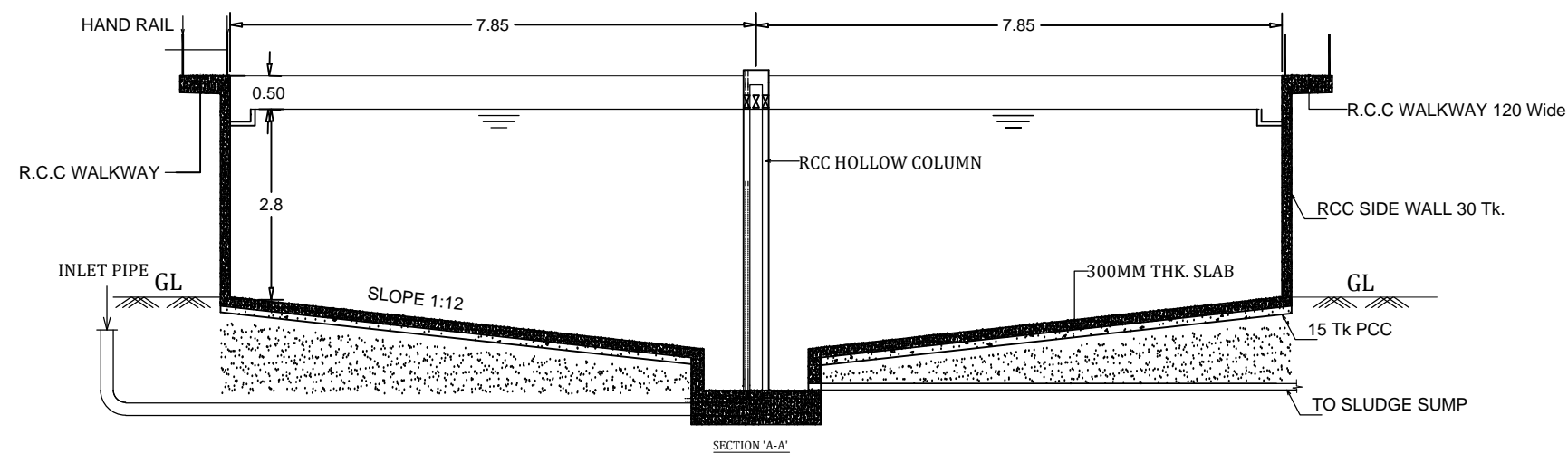
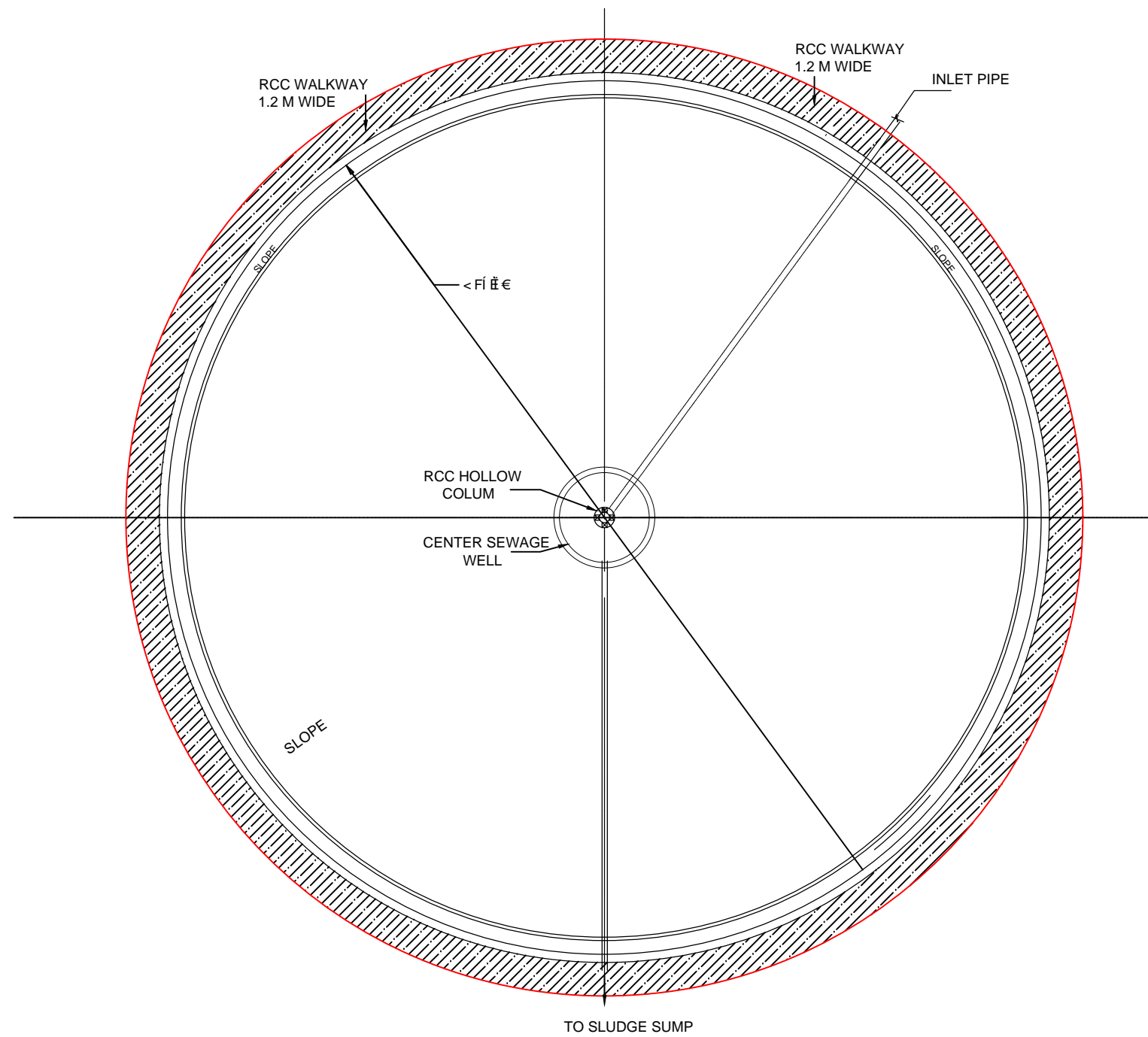
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MBBR TANK 1&2

**DWG NO :- KSD/PHASE -2 / 6**

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**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**

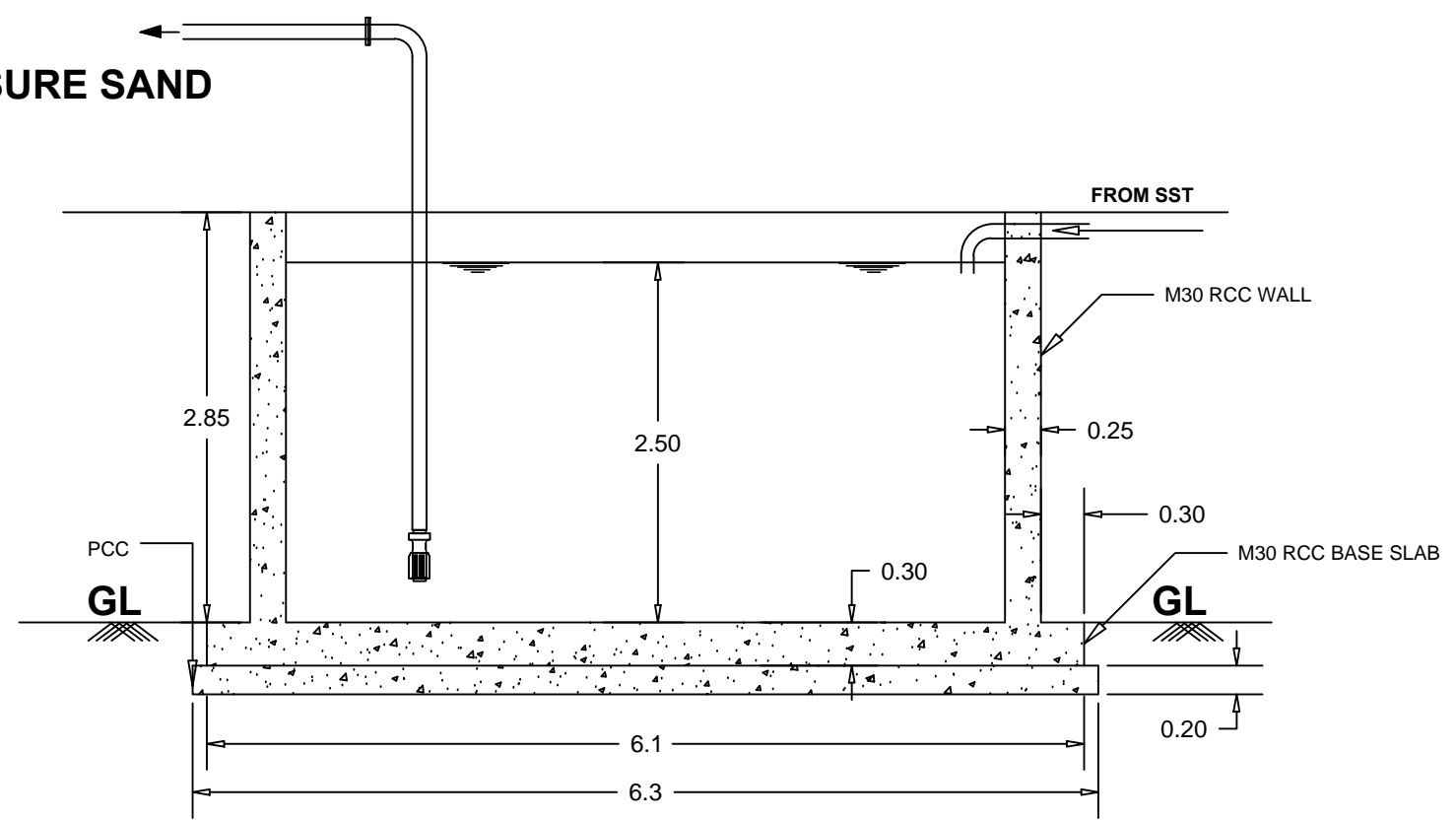
SECONDARY CLARIFIER TANK

**DWG NO :- KSD/PHASE -2 / 7**

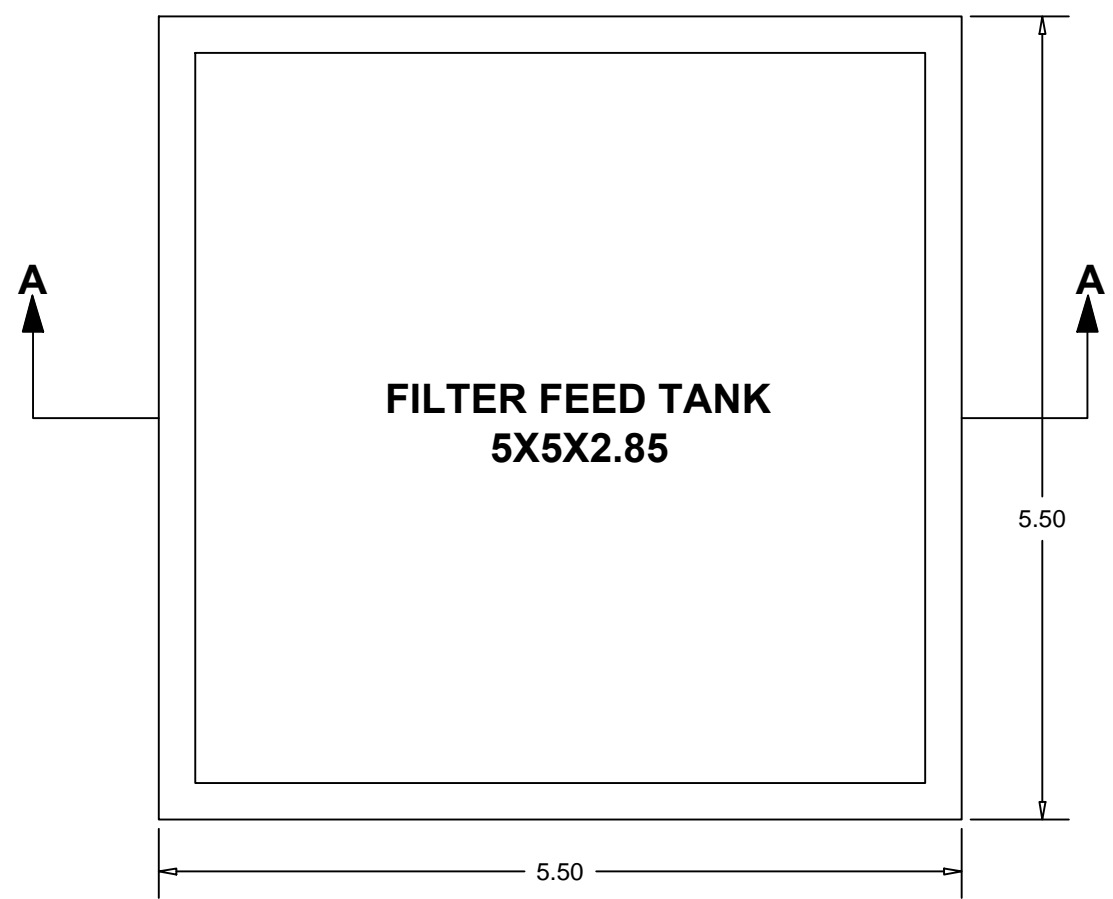
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**TO PRESSURE SAND FILTER**



**SECTION AA**



**FILTER FEED TANK  
5X5X2.85**

**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-2) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
KORAKODVAYAL AND LAYING  
SEWERAGE NET WORK

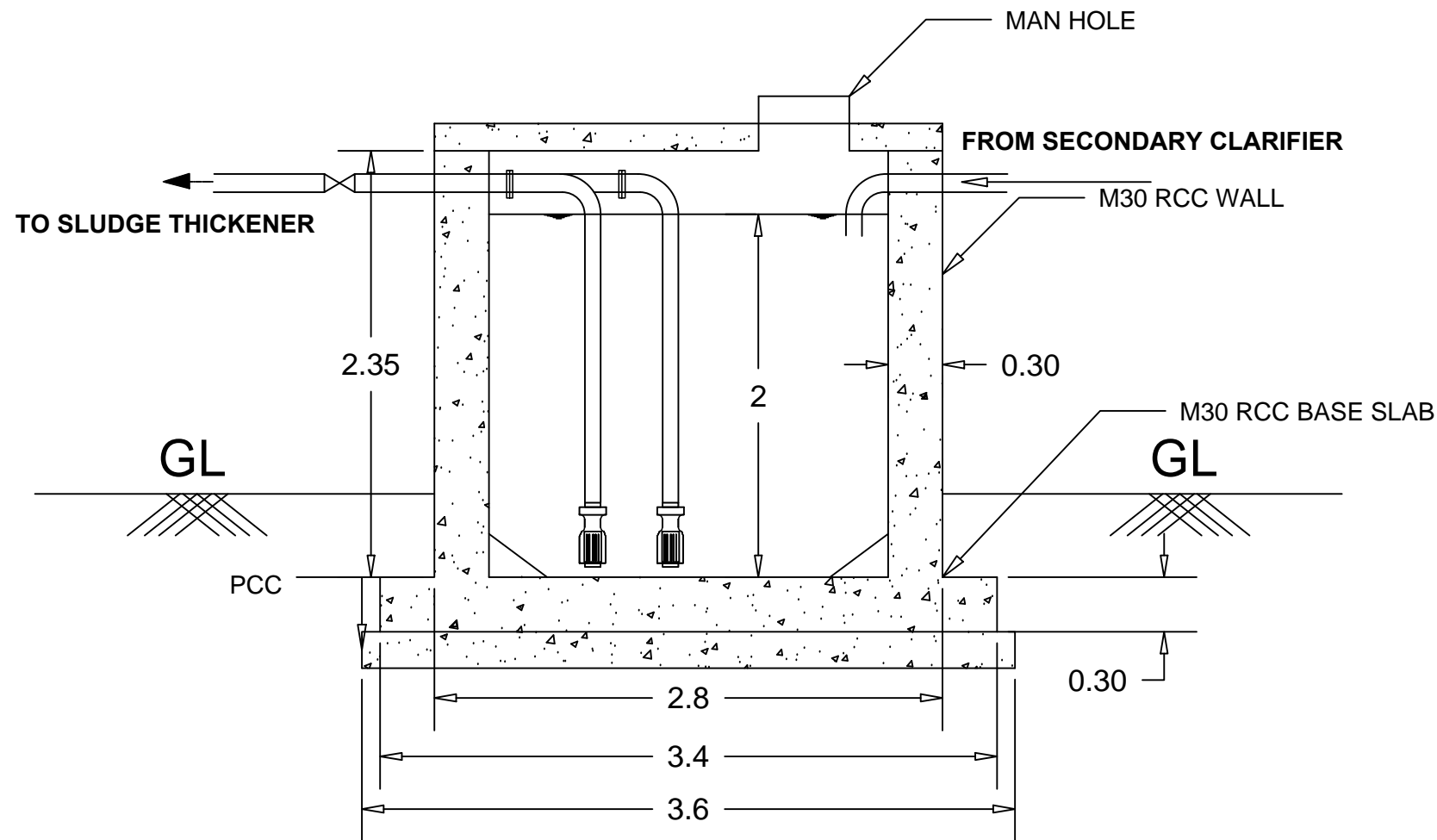
**DRAWING TITLE**

FILTER FEED TANK

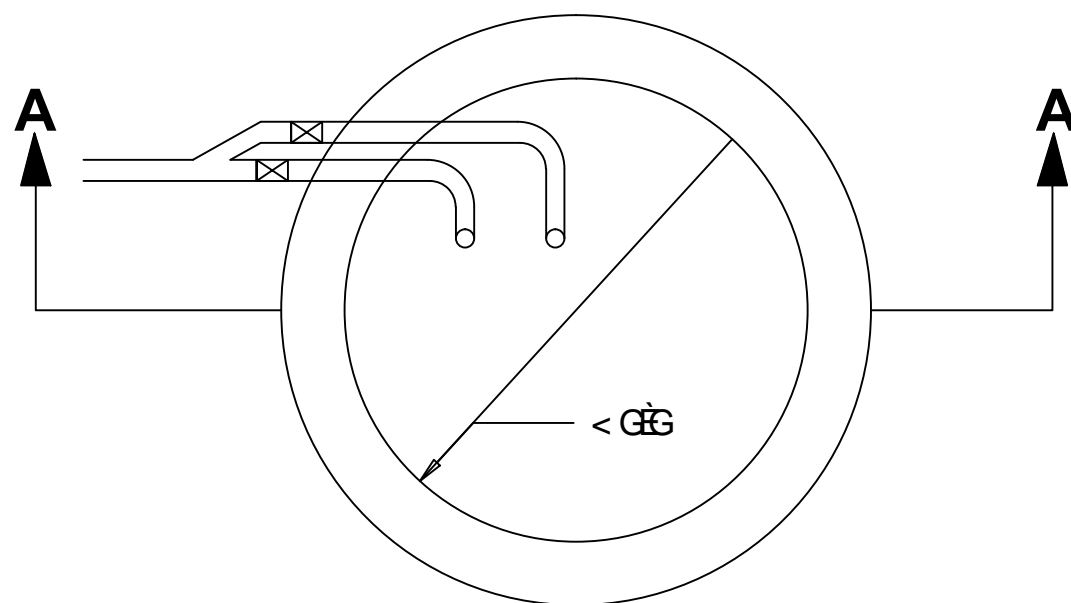
**DWG NO :- KSD/PHASE -2 / 8**

Not in scale

AE	AEE	EE	SE	CE
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**SECTION AA**



**PLAN**

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
- DIMENSIONS NOT IN SCALE
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No.	Revision/ 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

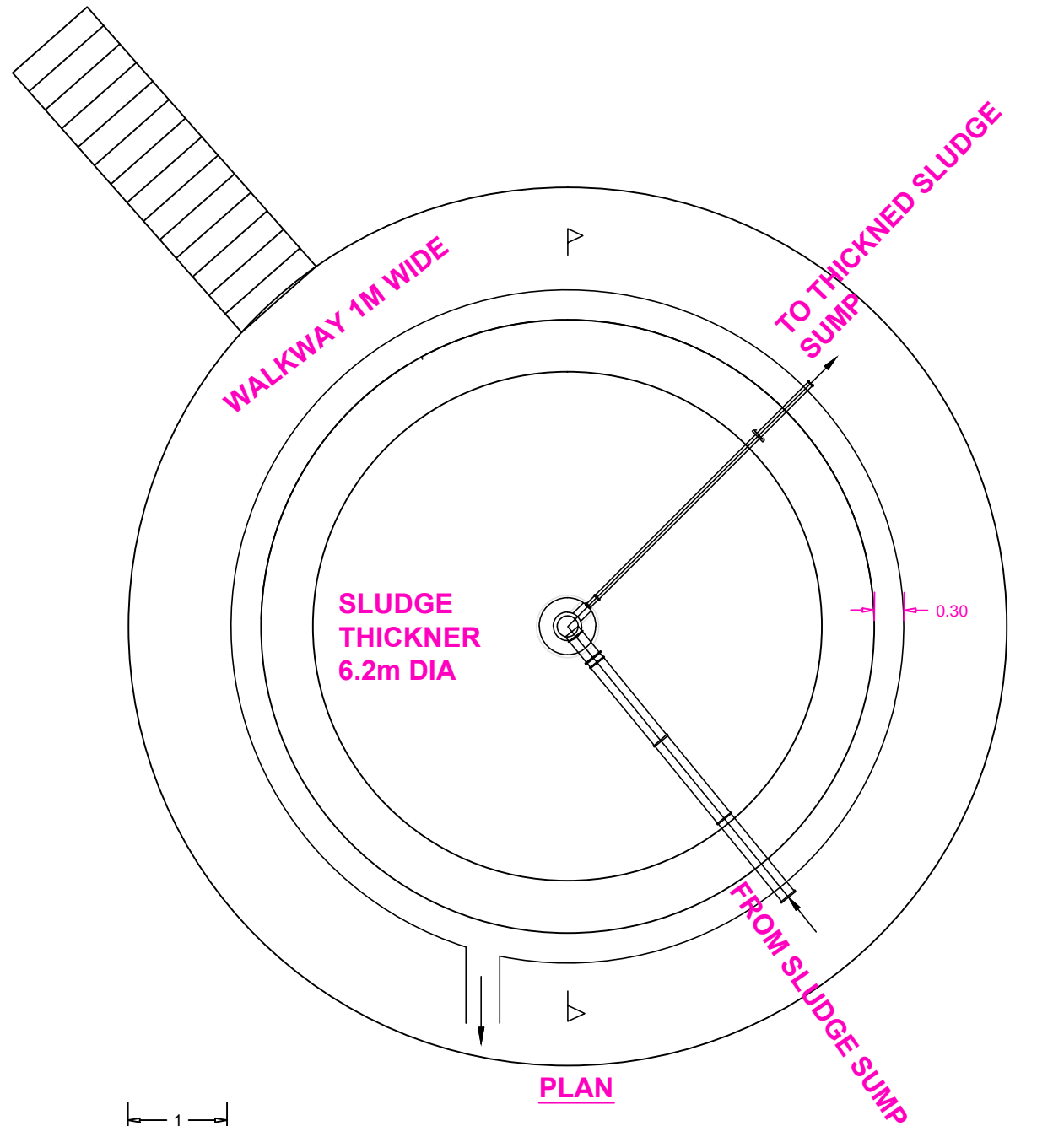
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SLUDGE SUMP

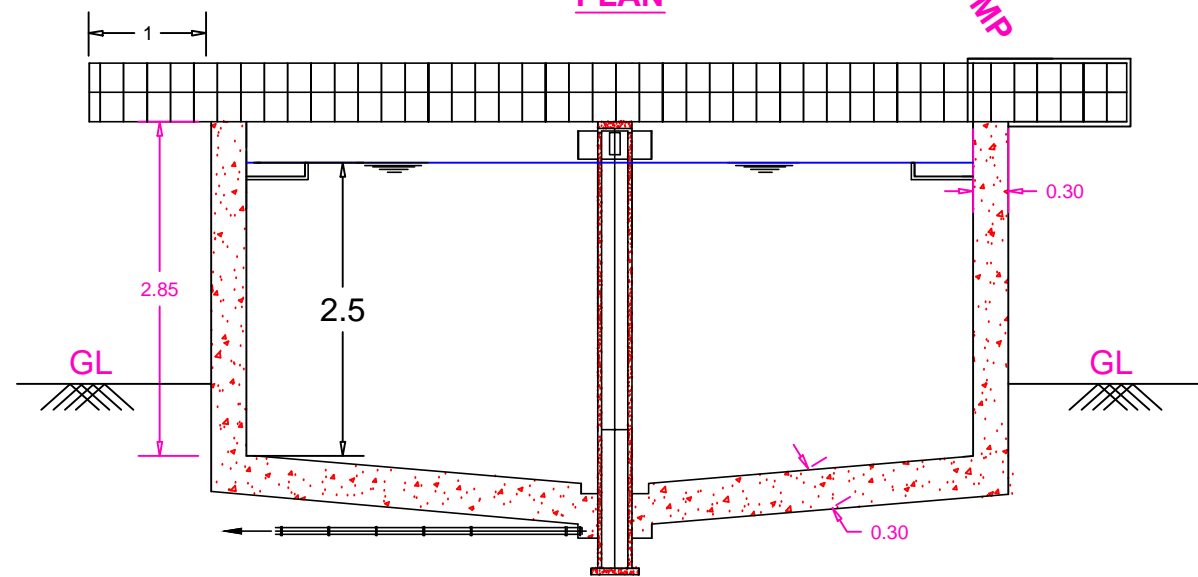
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Not in scale

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**PLAN**



**SECTION AA**

**GENERAL NOTES**

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- DIMENSIONS NOT IN SCALE
- FOR ESTIMATION PURPOSE ONLY

No.	Rivision/ Issue	Date



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

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

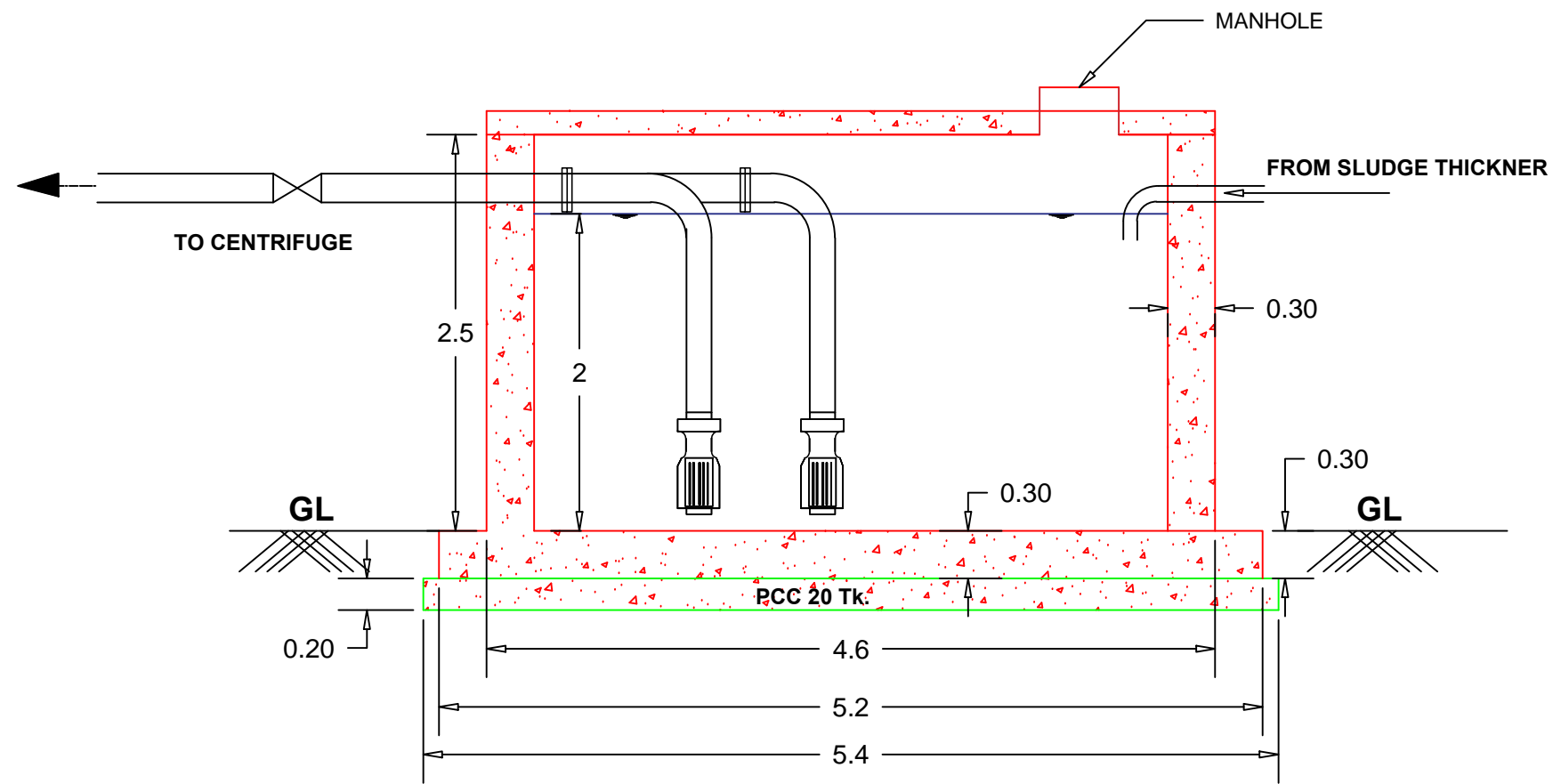
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SLUDGE THICKNER

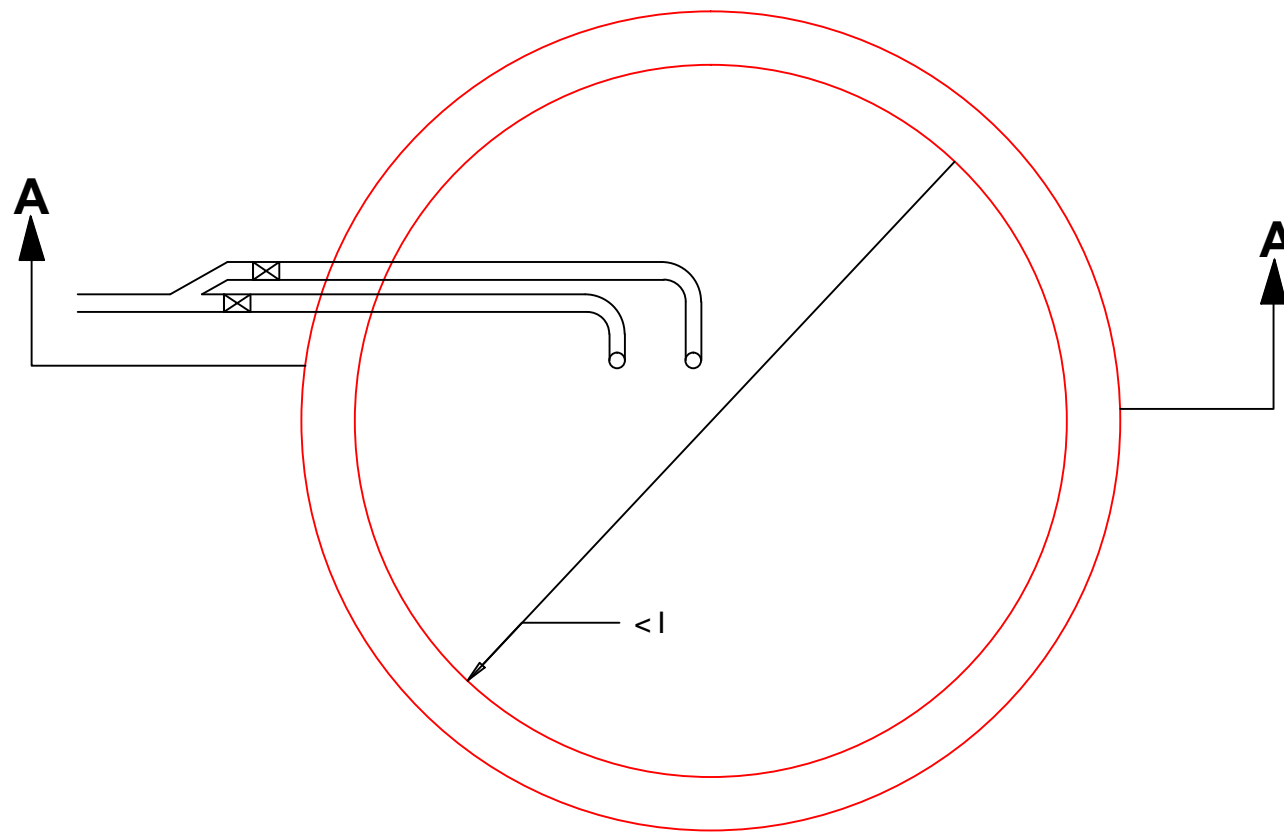
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Not in scale

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**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**

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

**DRAWING TITLE**

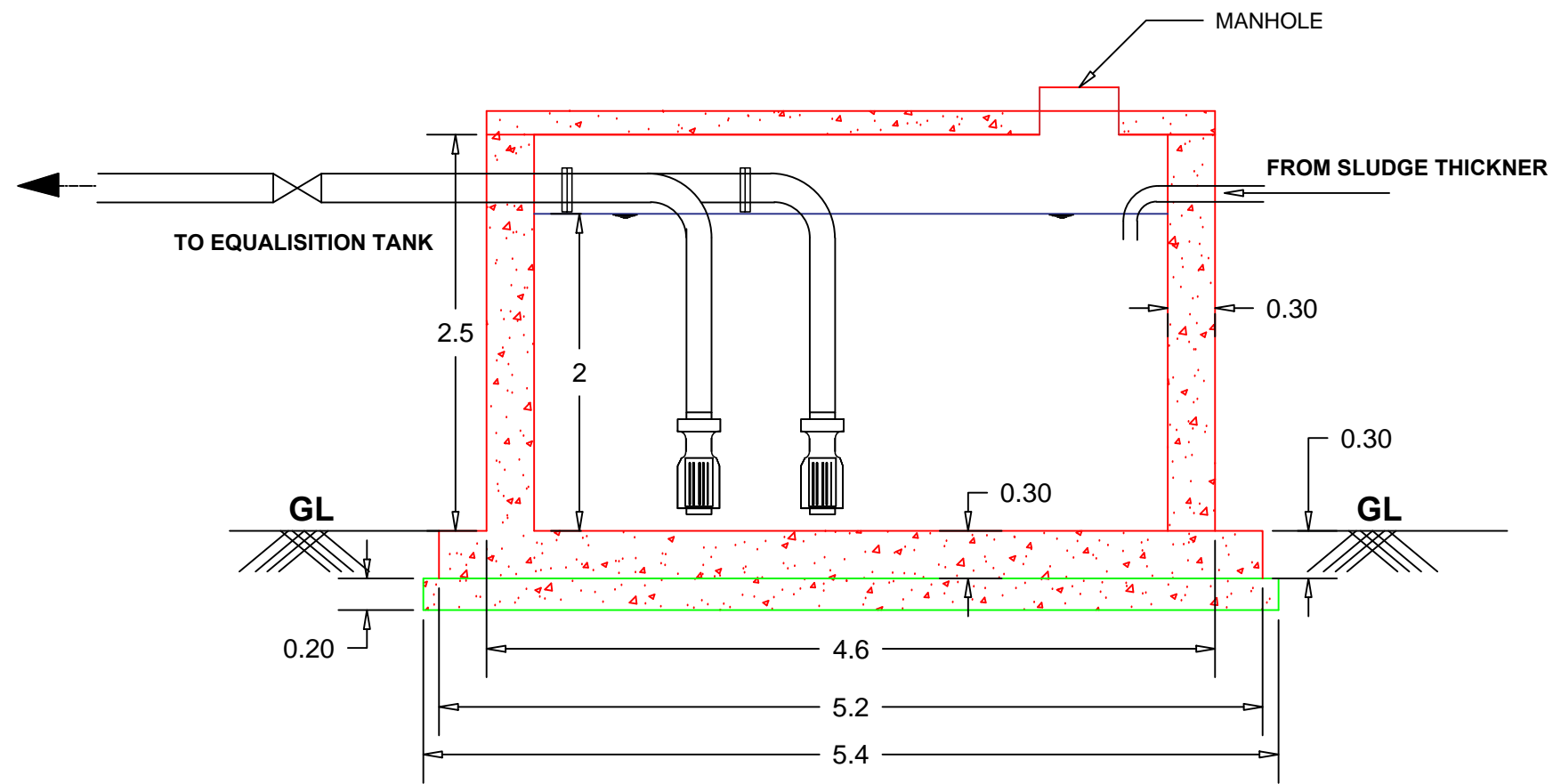
THICKNED SLUDGE SUMP

**DWG NO :- KSD/PHASE -2 / 11**

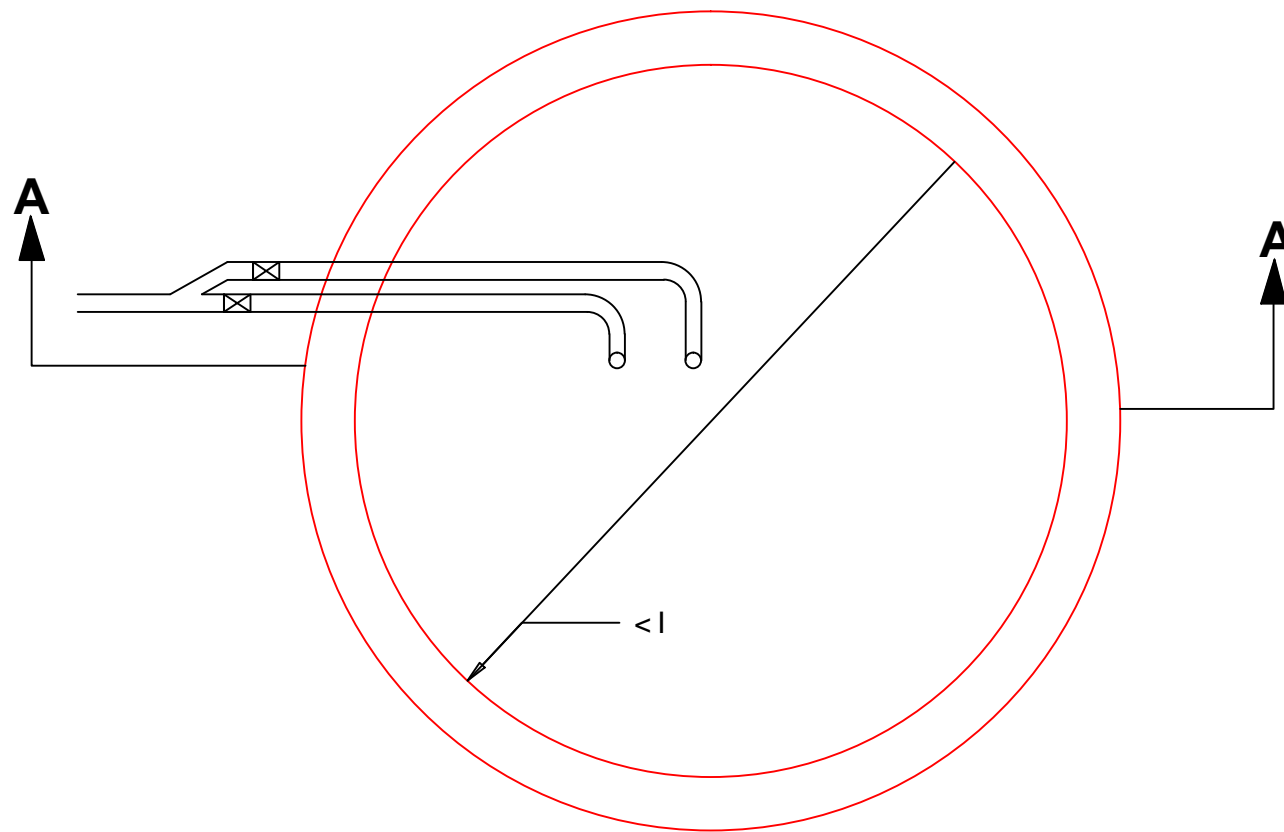
Not in scale

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**SECTION AA**



**PLAN**

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
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No.	Revision/ Issue	Date



**PPD & SEWERAGE CIRCLE,  
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KASARAGOD MUNICIPALITY  
(PHASE-2) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
KORAKODVAYAL AND LAYING  
SEWERAGE NET WORK

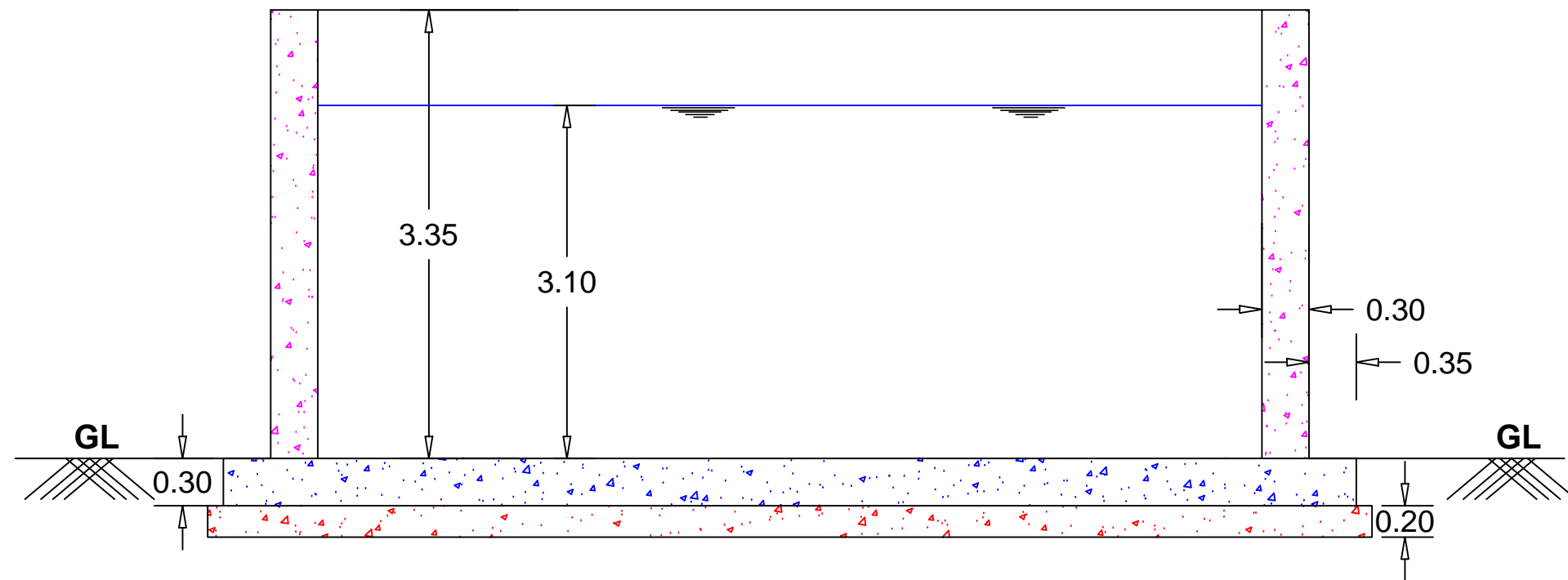
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CENTRATE SUMP

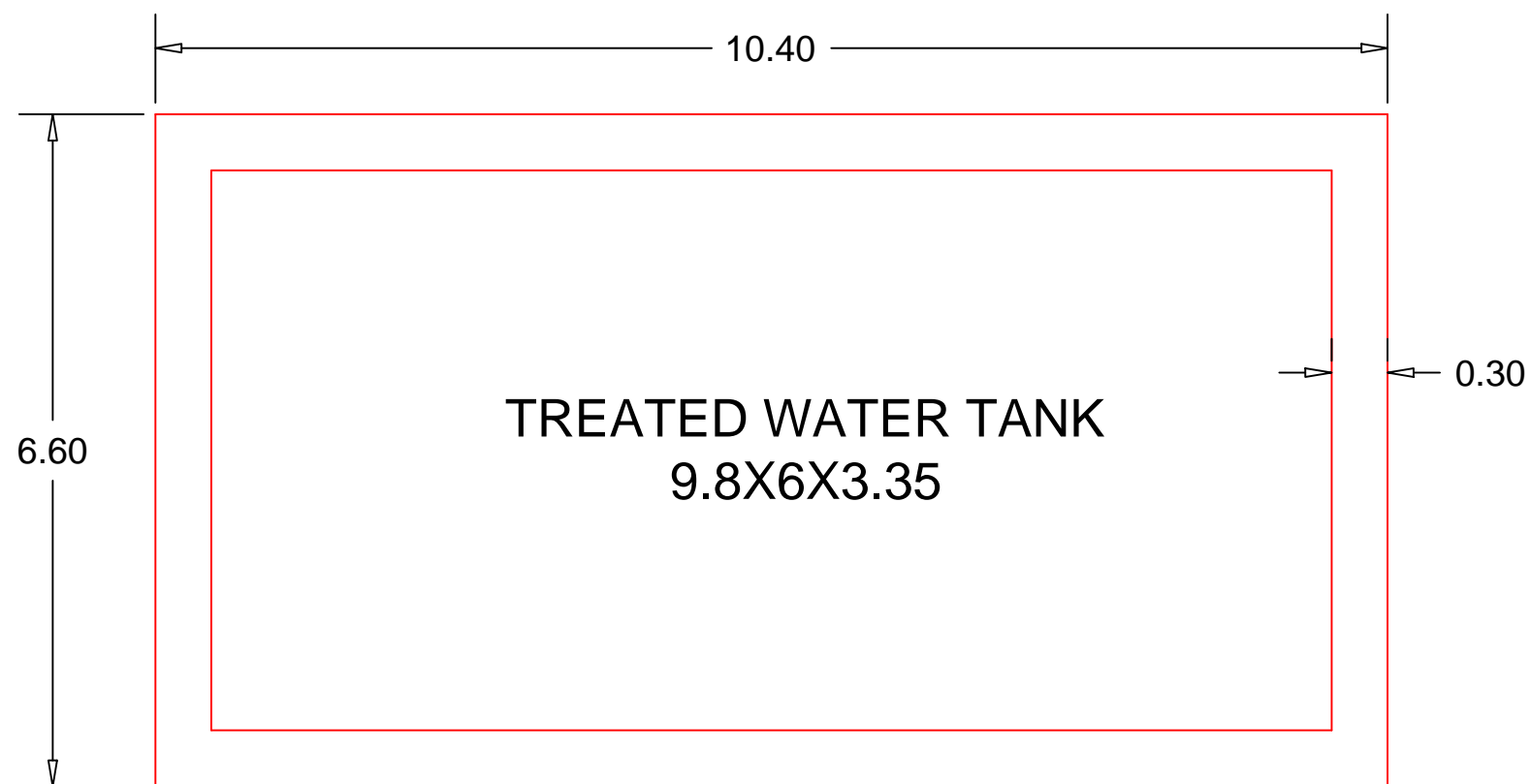
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Not in scale

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SECTION



PLAN

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
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No.	Rivision/ Issue	Date



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

**PROJECT NAME**

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

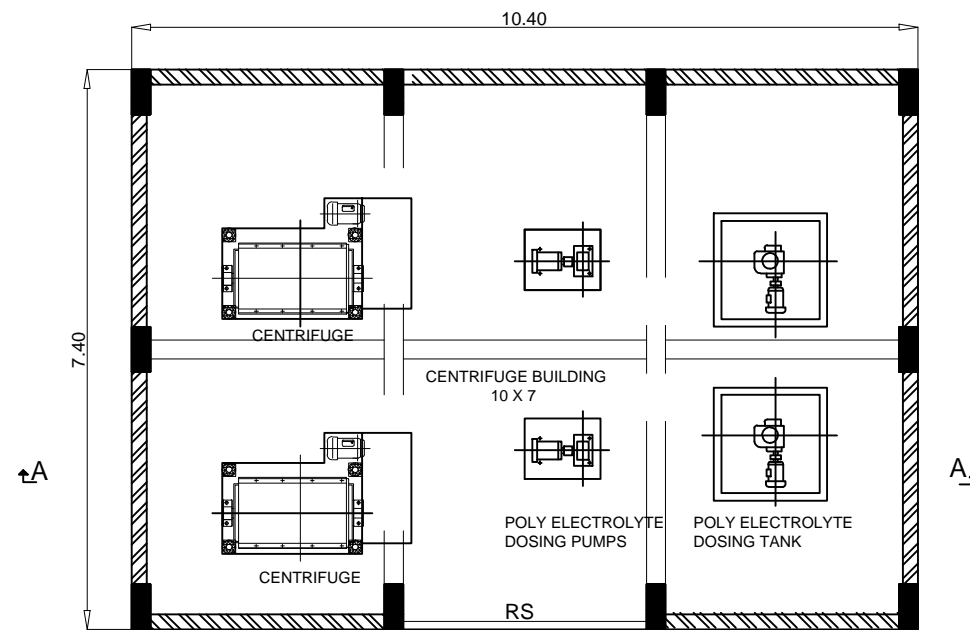
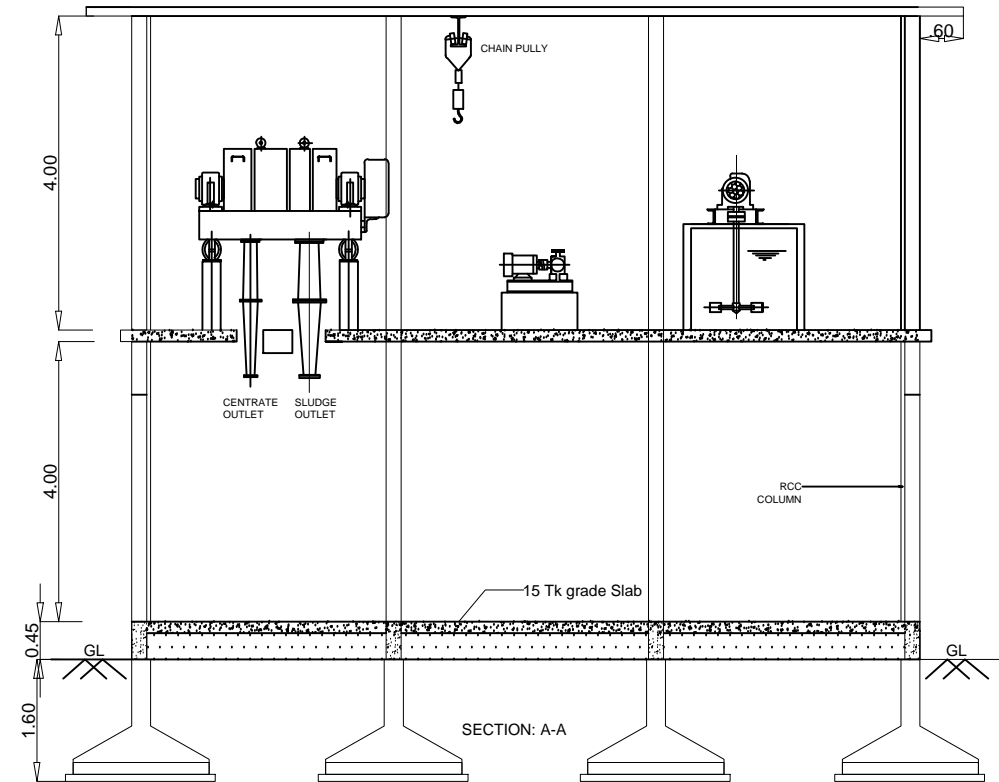
**DRAWING TITLE**

TREATED WATER TANK

**DWG NO :- KSD/PHASE -2 / 13**

Not in scale

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**GENERAL NOTES**

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No.	Revision/ 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

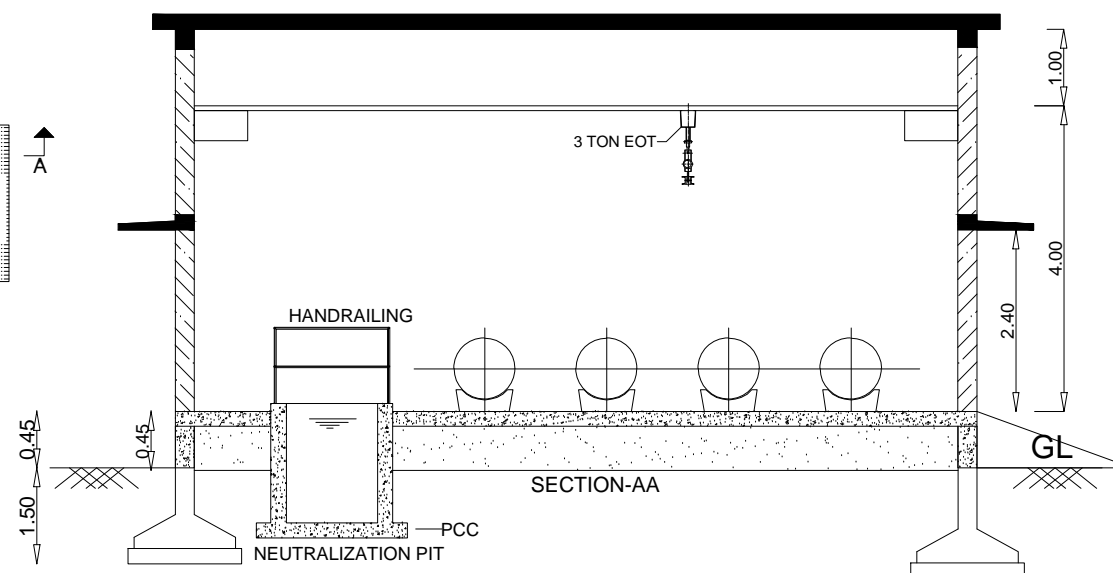
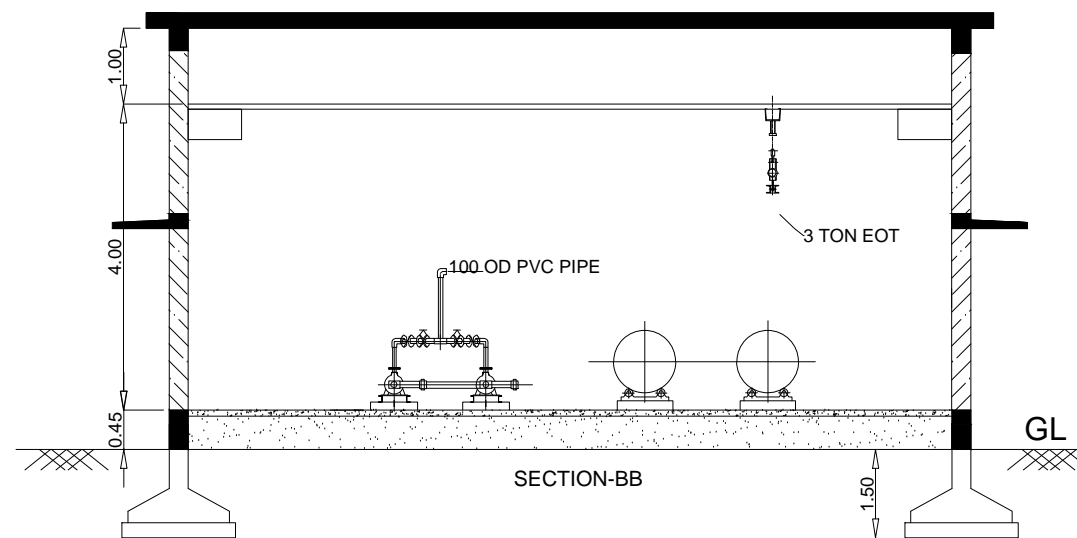
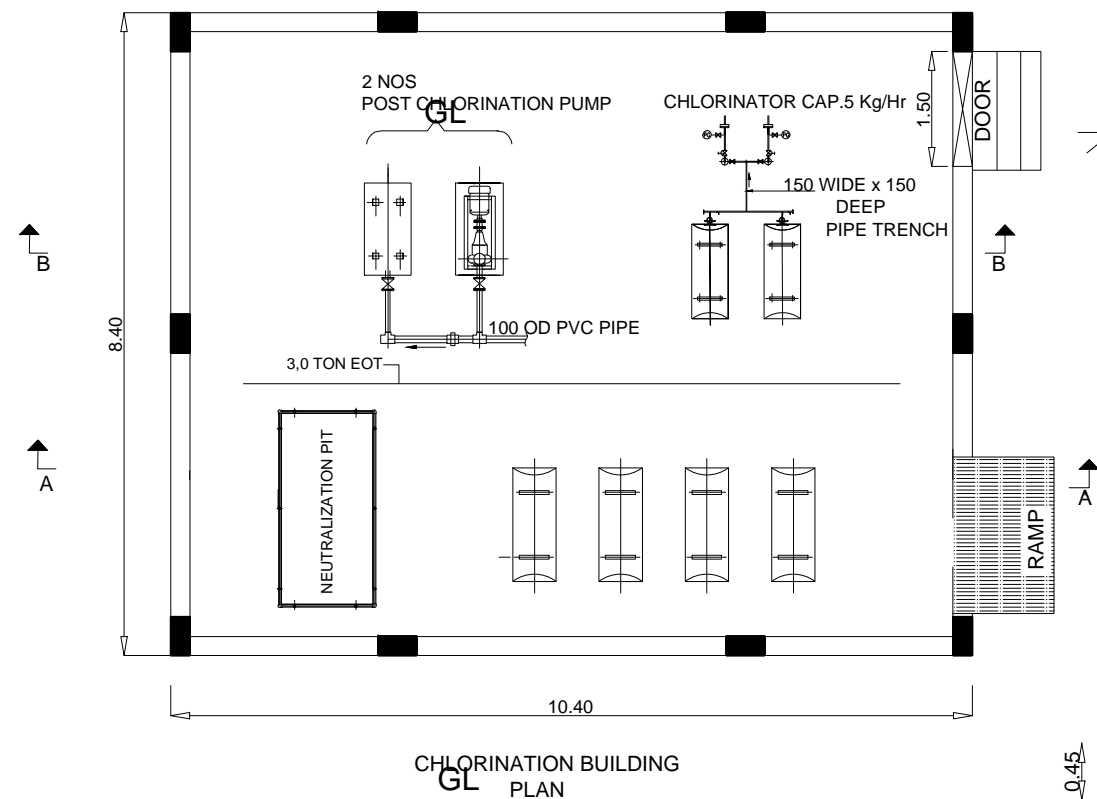
**DRAWING TITLE**

CENTRIFUGE BUILDING

**DWG NO :- KSD/PHASE -2 / 14**

Not in scale

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**GENERAL NOTES**

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No.	Revision/ 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

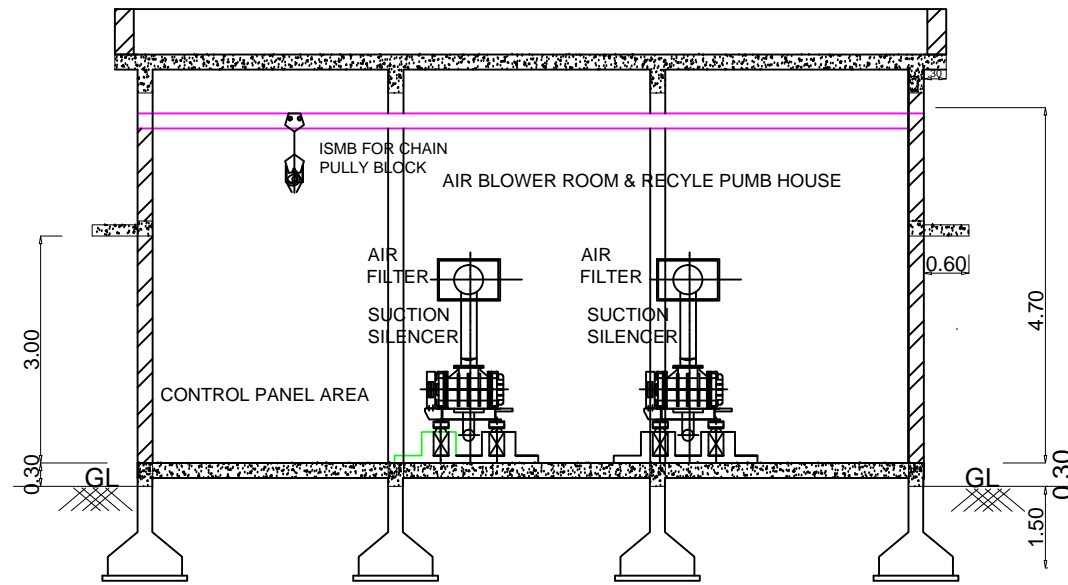
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CHLORINATION ROOM

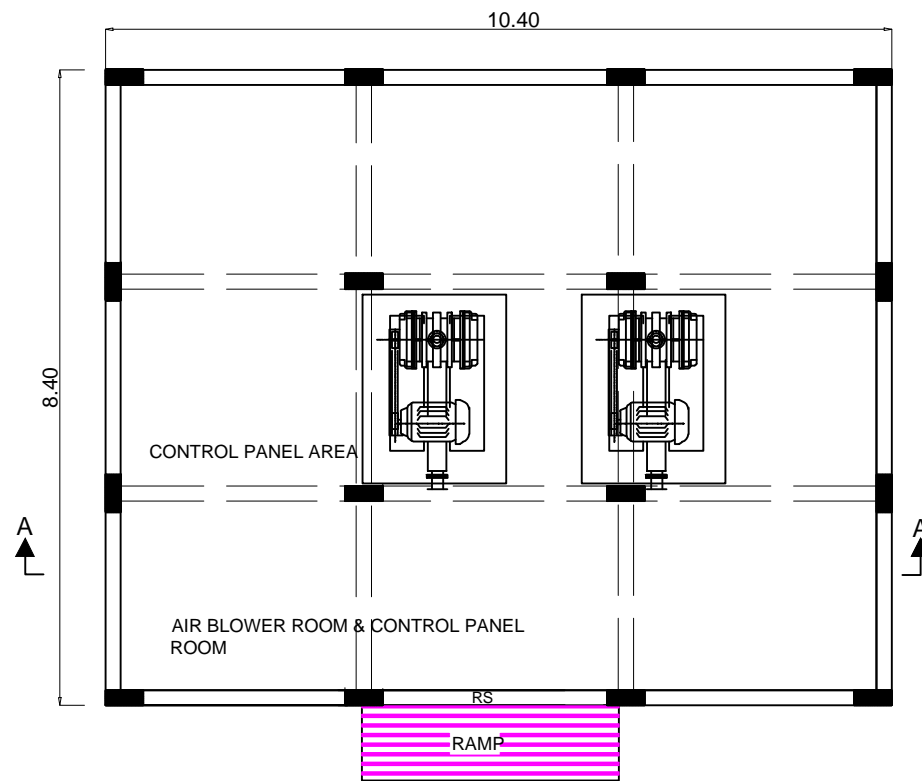
**DWG NO :- KSD/PHASE -2 / 15**

Not in scale

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SECTION A-A



PLAN

**GENERAL NOTES**

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No.	Revision/ 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**

AIR BLOWER ROOM  
AND CONTROL PANEL ROOM

**DWG NO :- KSD/PHASE -2 / 16**

Not in scale

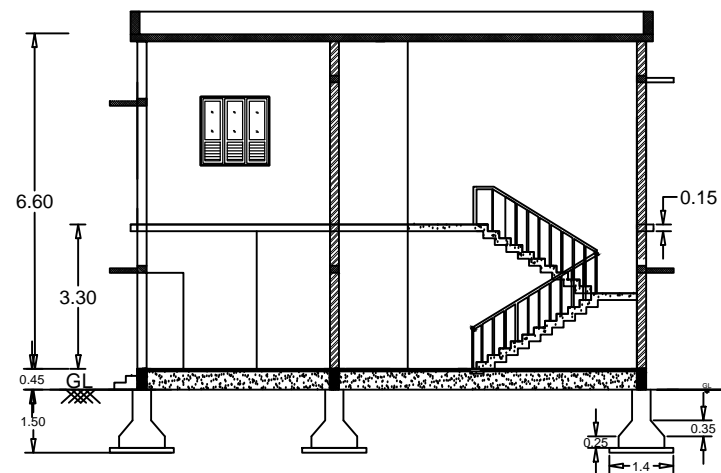
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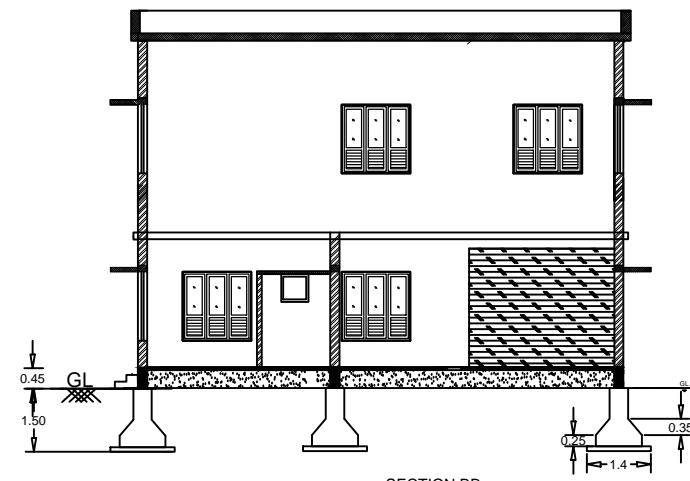
FRONT ELEVATION



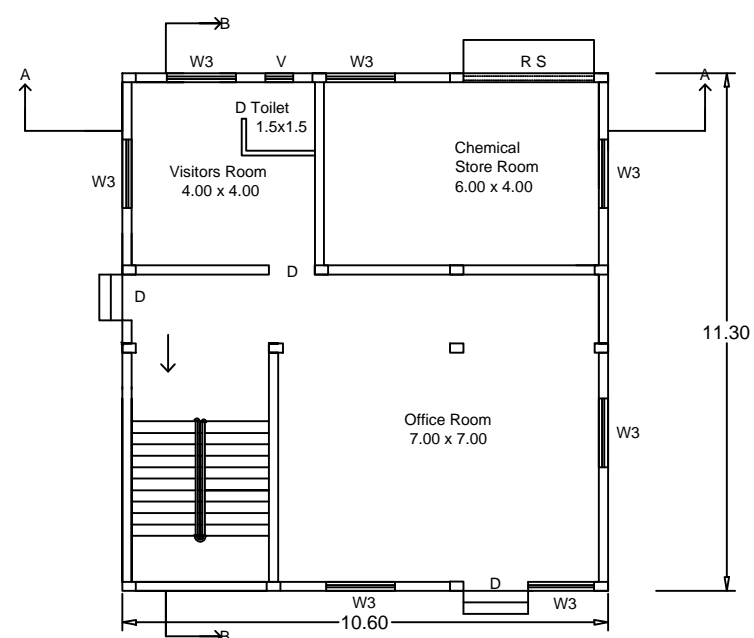
SIDE ELEVATION



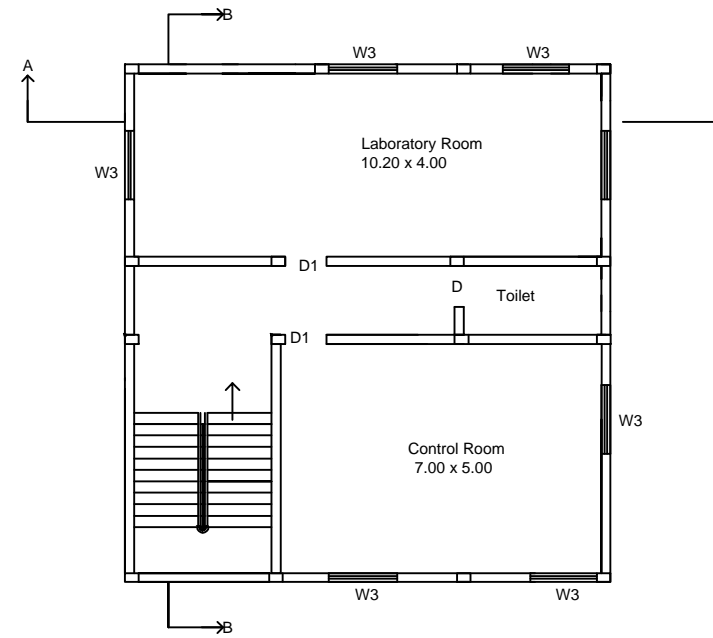
SECTION BB



SECTION BB



GROUND FLOOR PLAN



FIRST FLOOR PLAN

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
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No.	Revision/ 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**

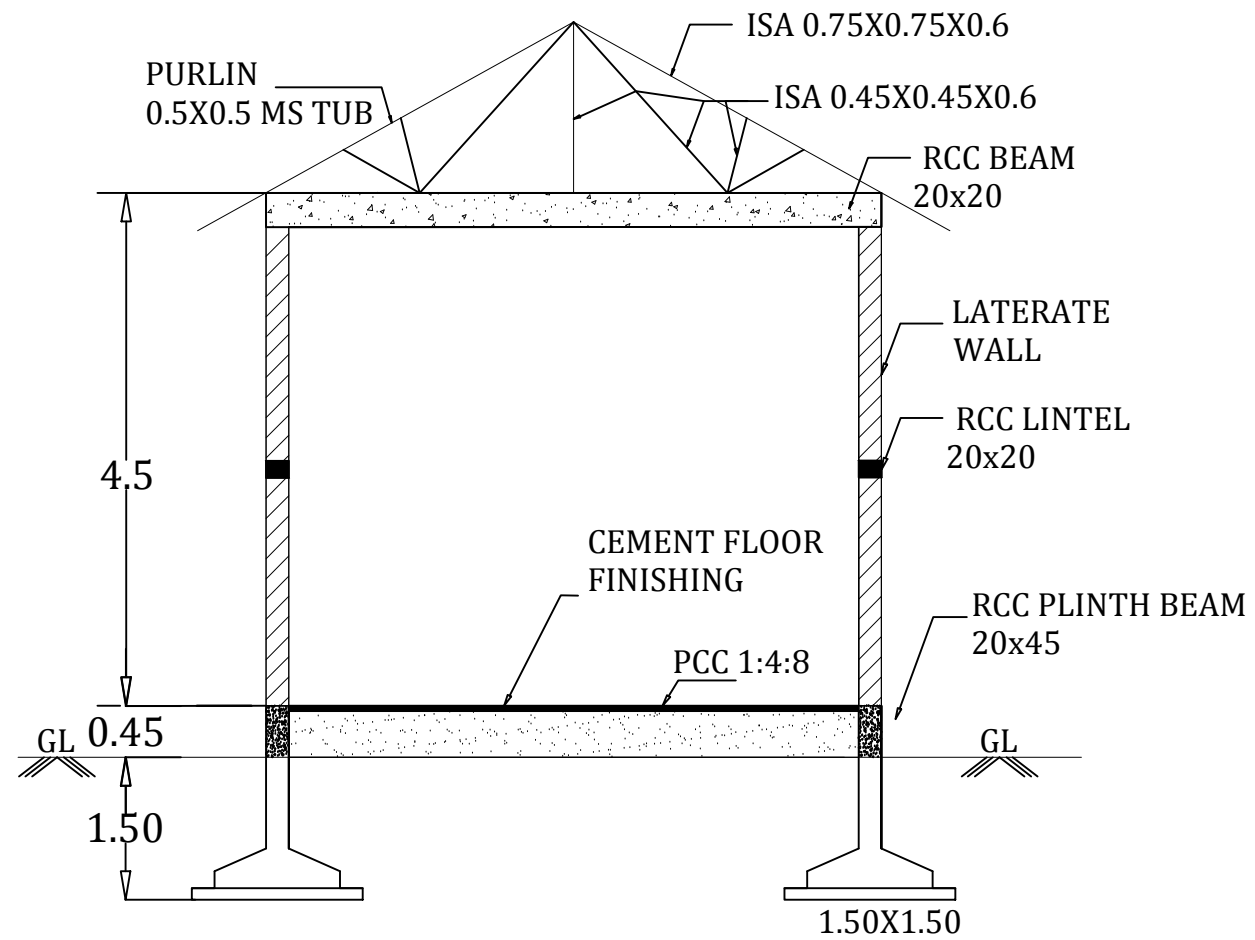
ADMINISTRATIVE BUILDING  
MCC AND LAB

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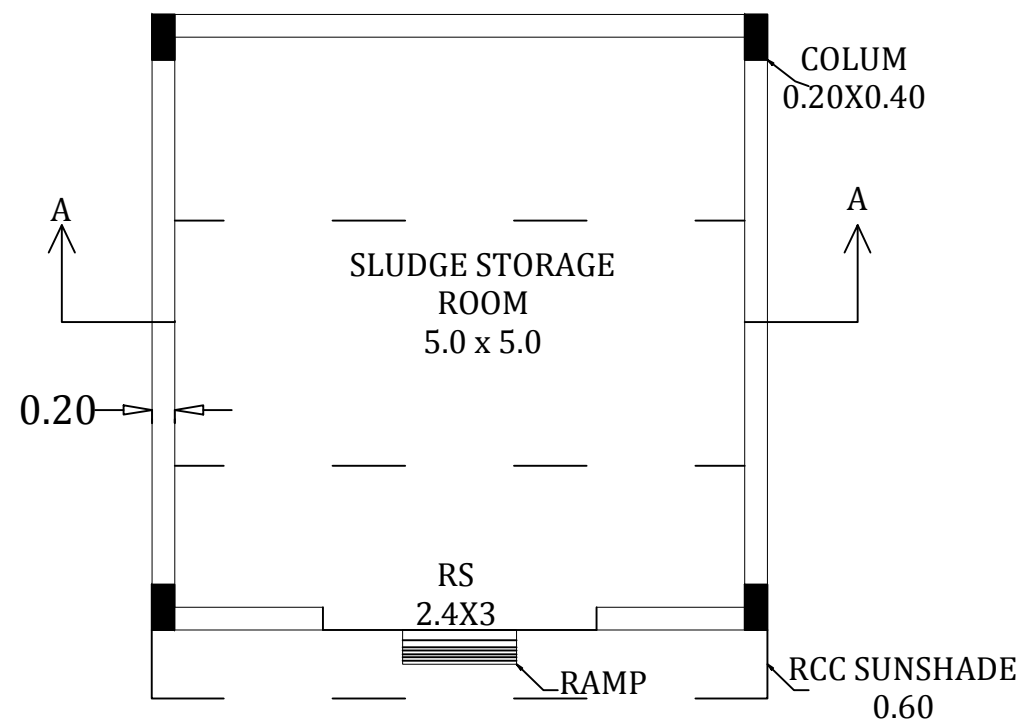
Not in scale

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**SECTION**



**PLAN**

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
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No.	Revision/ 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**

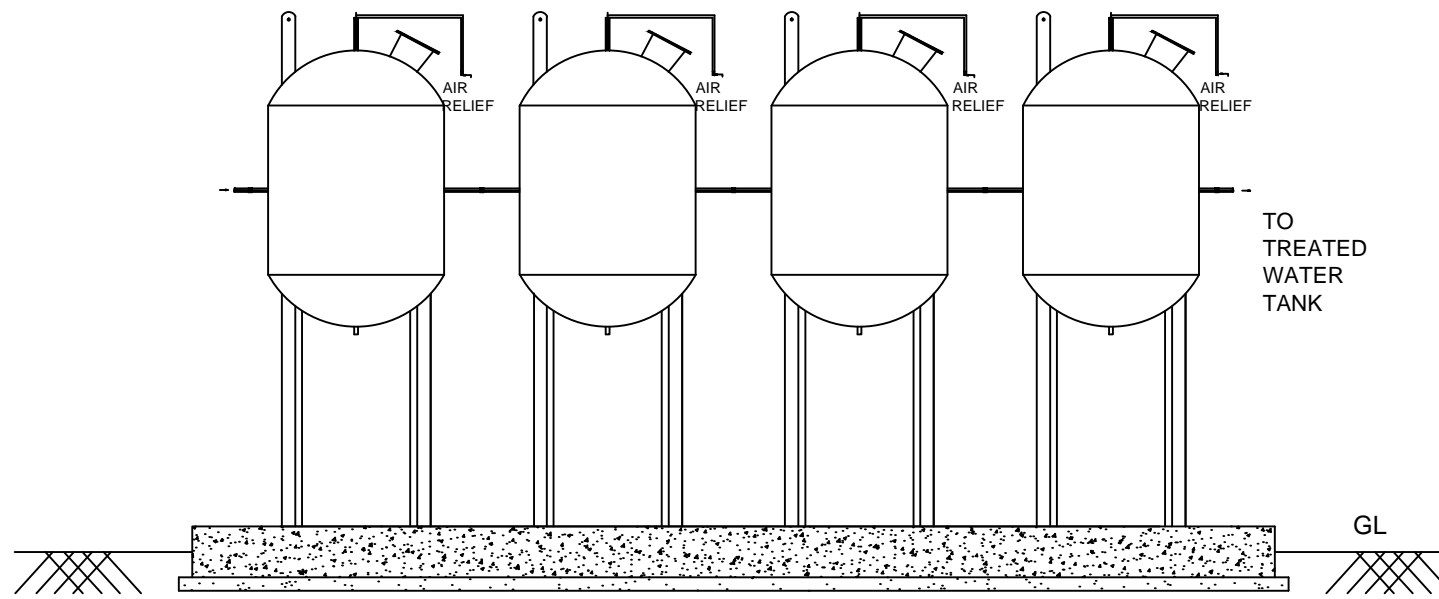
SLUDGE STORAGE ROOM

**DWG NO :- KSD/PHASE -2 / 18**

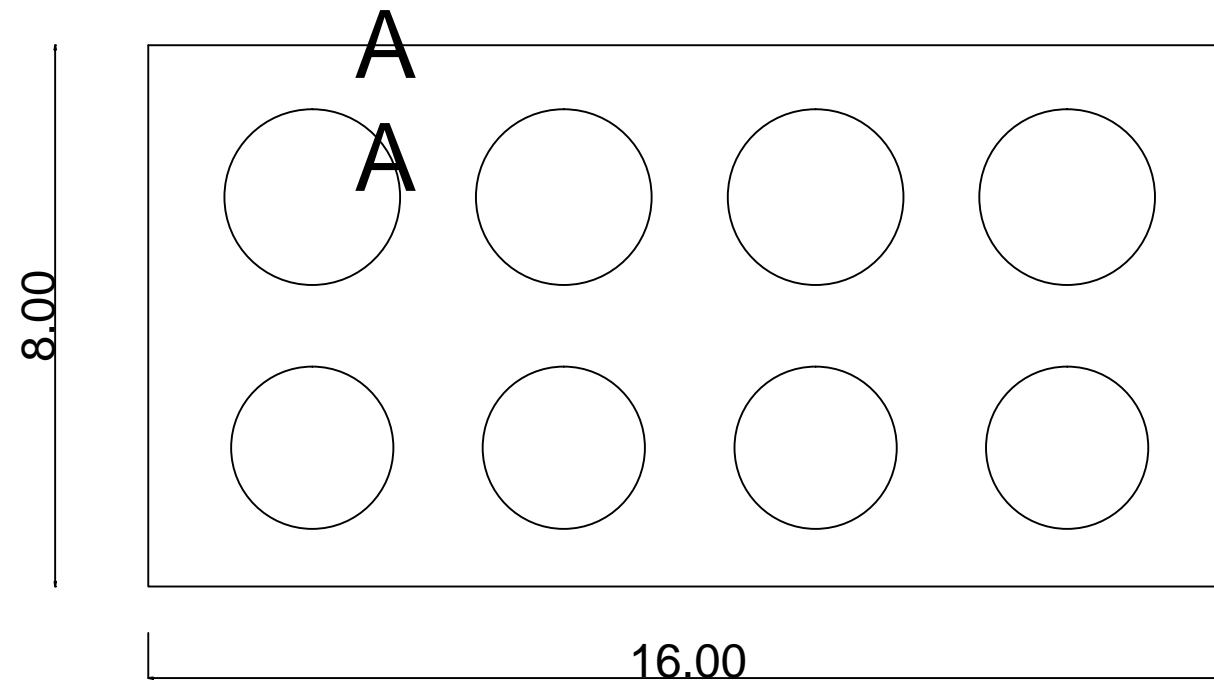
Not in scale

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INLET  
FROM  
FILTER  
FEED  
PUMP



# 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

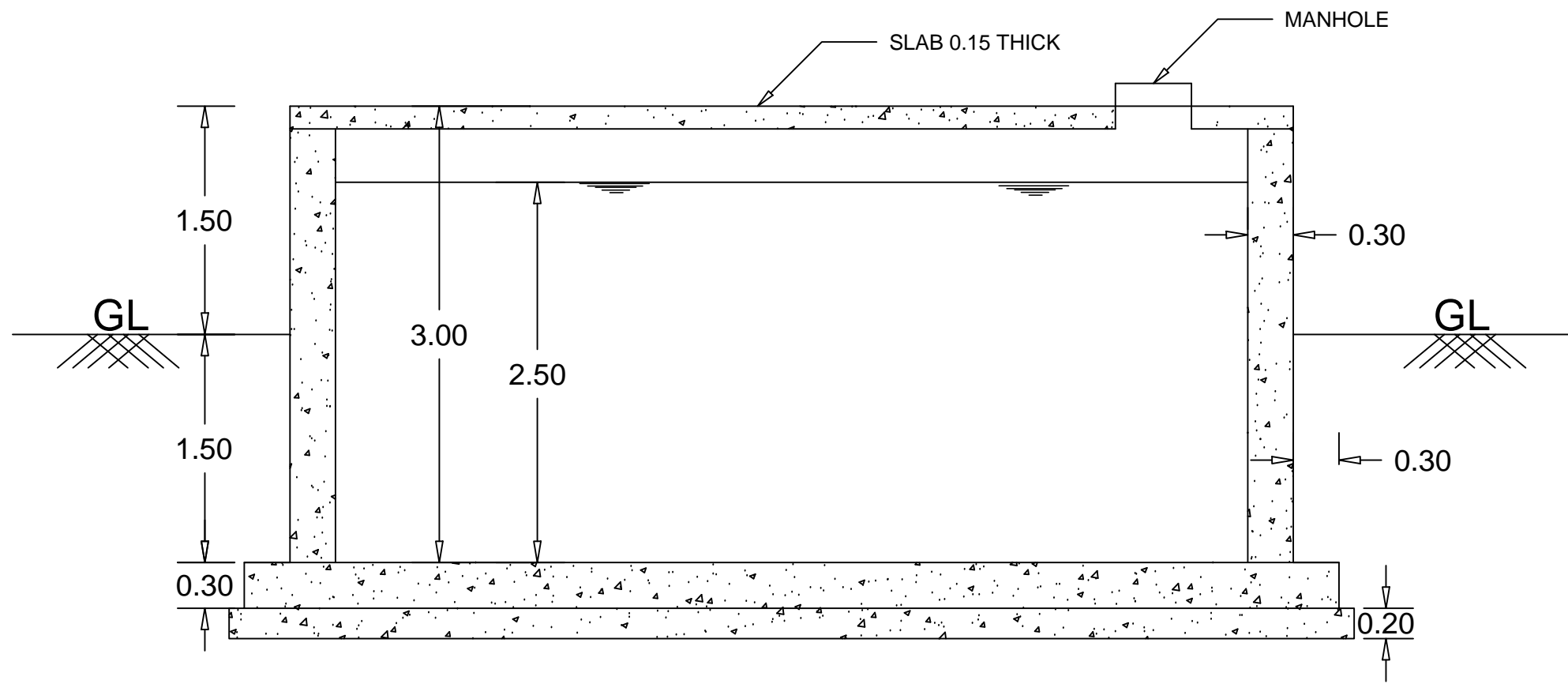
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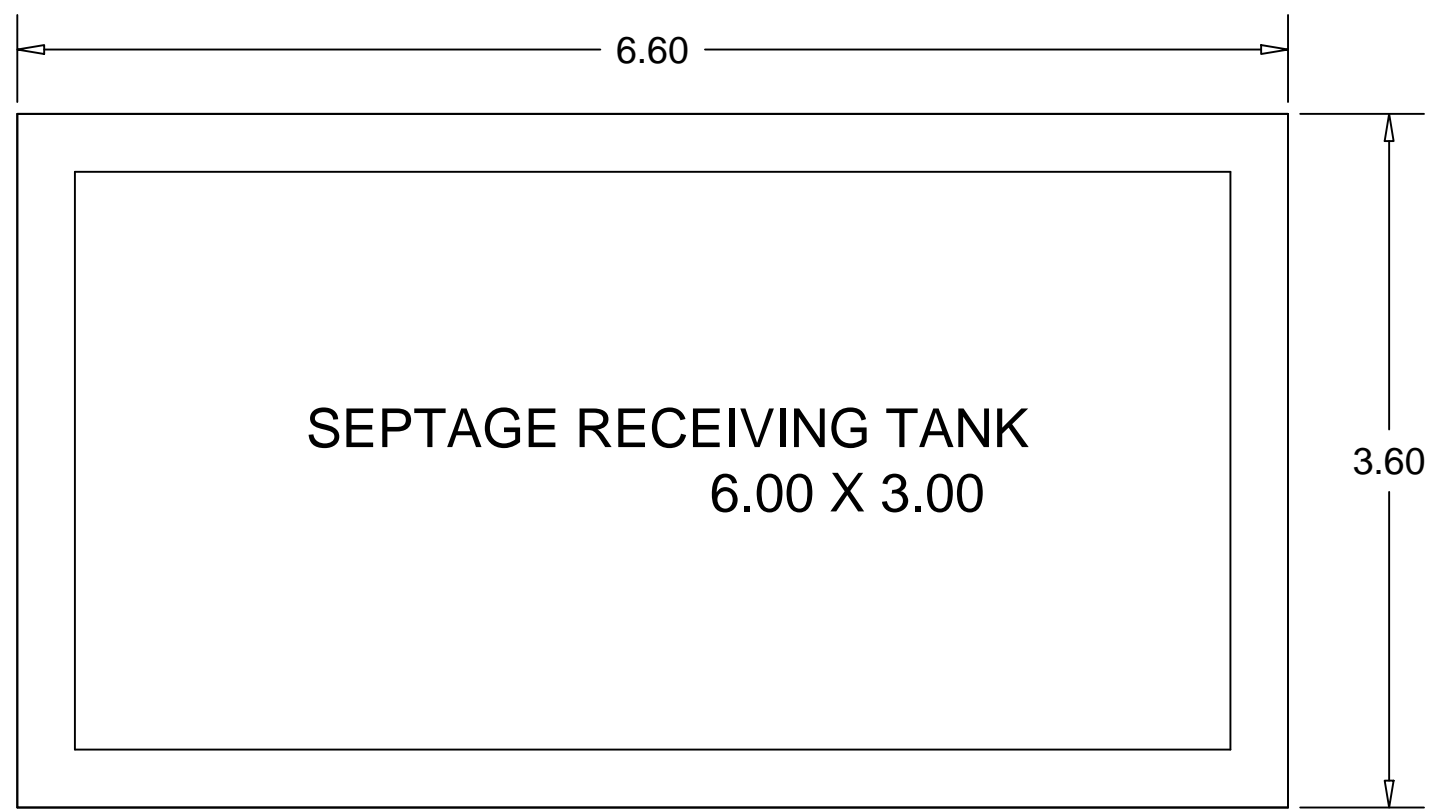
**DWG NO :- KSD/PHASE -2 / 19**

Not in scale

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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-2) - CONSTRUCTION OF 4  
MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
KORAKODVAYAL AND LAYING  
SEWERAGE NET WORK

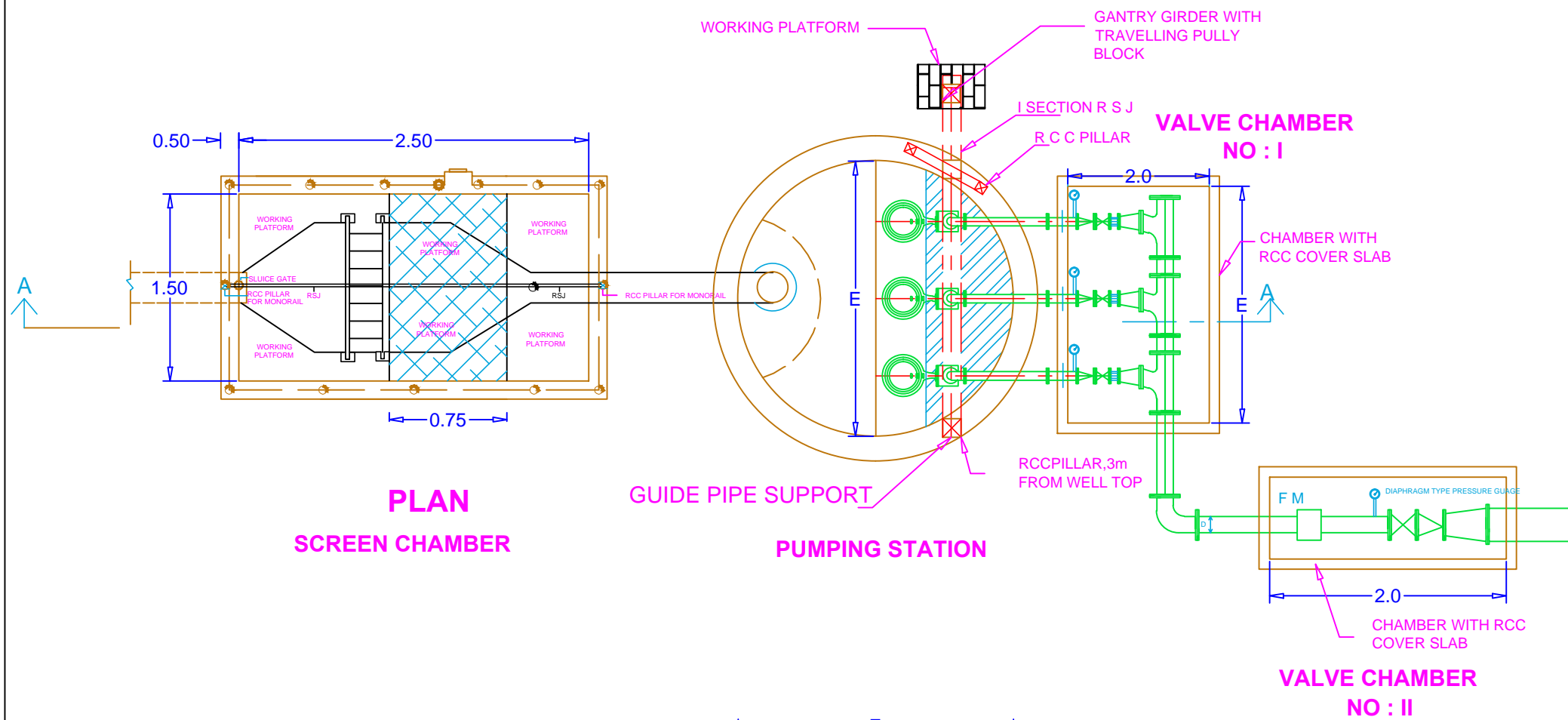
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SEPTAGE RECEIVING TANK

**DWG NO :- KSD/PHASE -2 / 20**

Not in scale

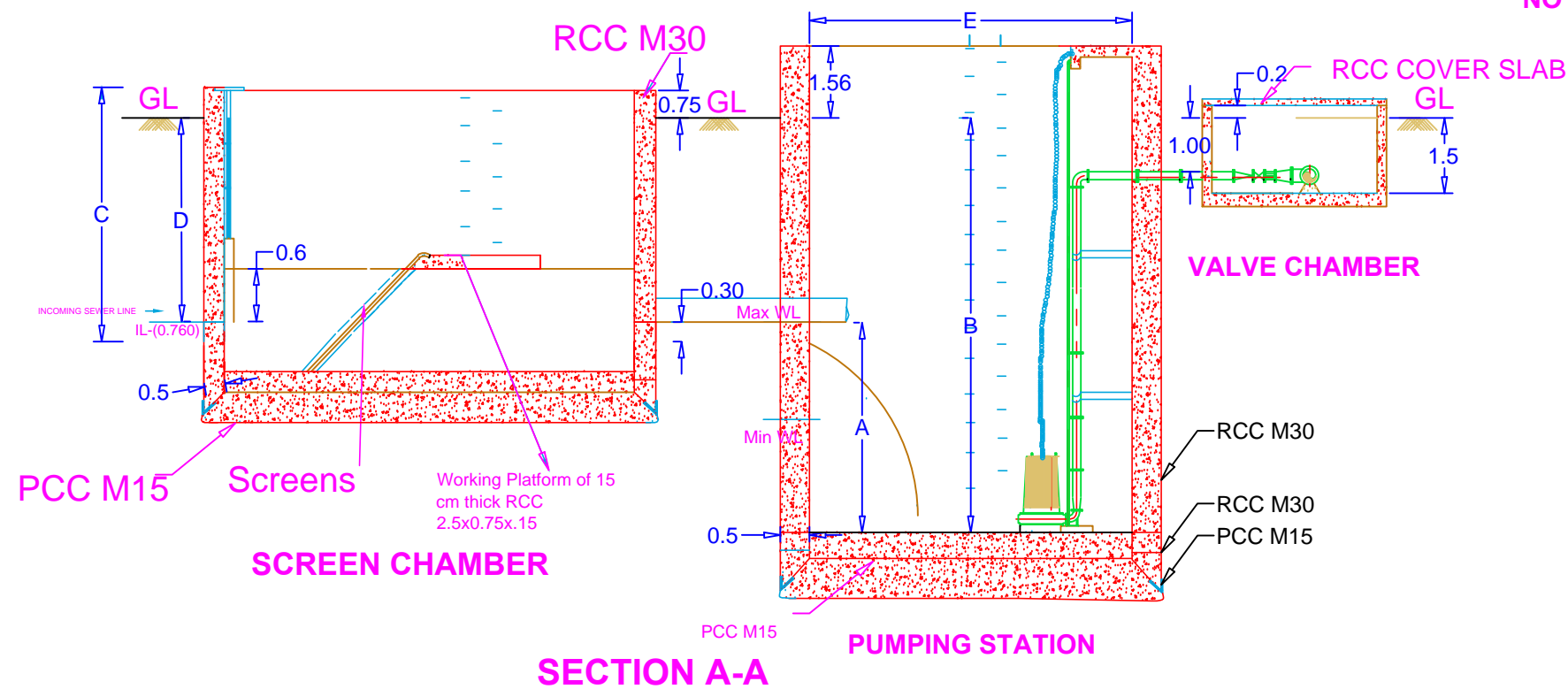
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**PLAN**  
**SCREEN CHAMBER**

**PUMPING STATION**

**VALVE CHAMBER NO : II**



**SCREEN CHAMBER**

**SECTION A-A**

**PUMPING STATION**

**VALVE CHAMBER**

**GENERAL NOTES**

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

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

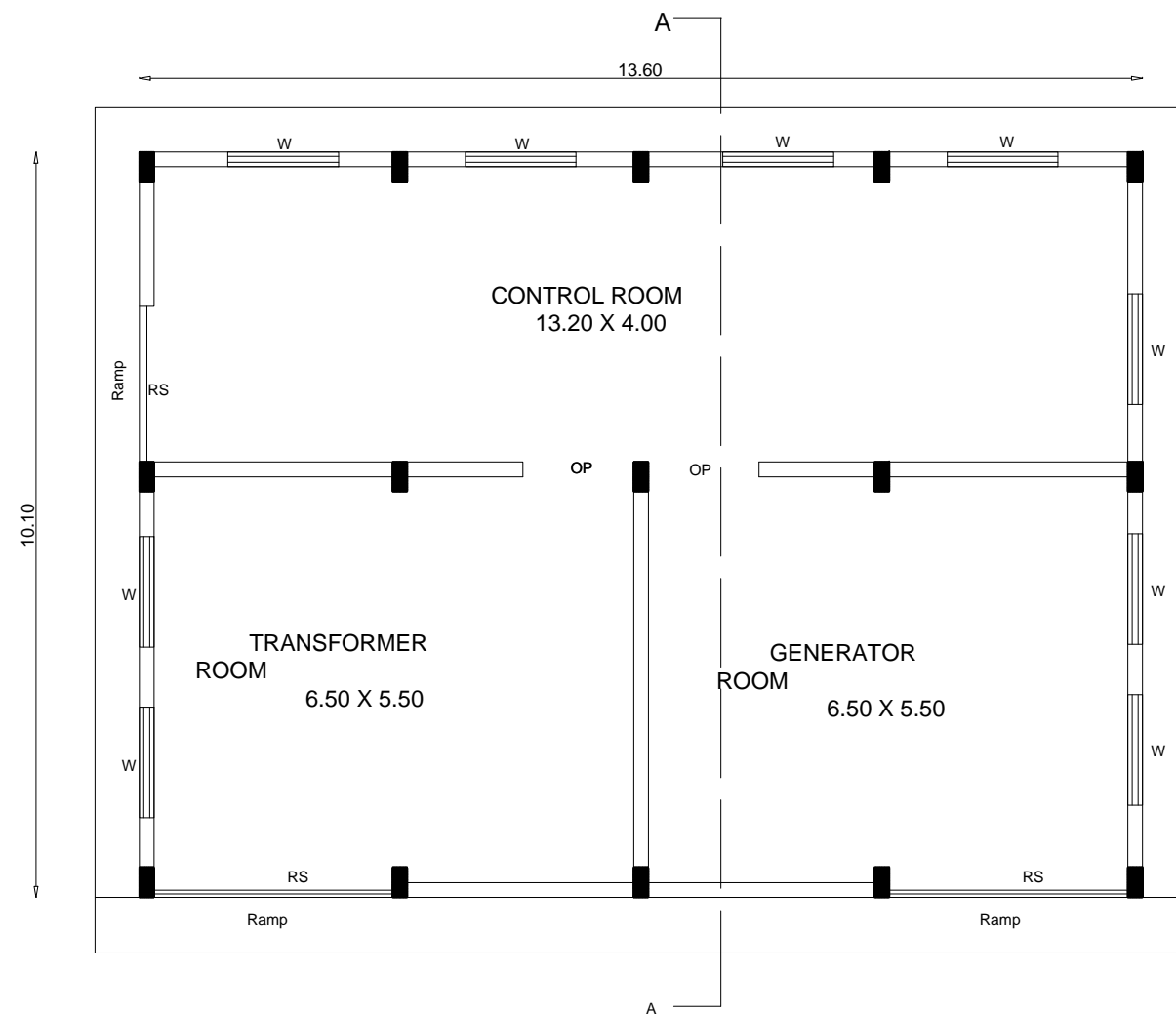
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GENERAL ARRANGEMENT OF  
PUMPING STATION

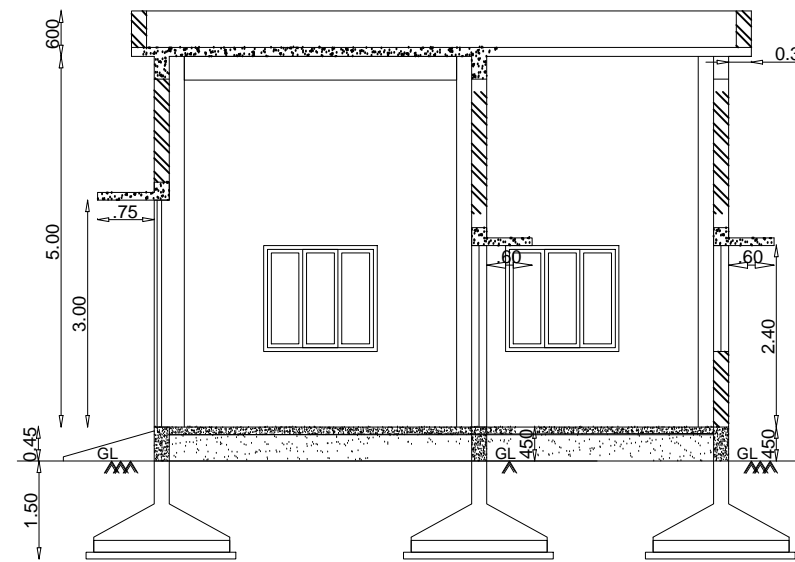
**DWG No :- KSD/PHASE -2 / 21**

Not in scale

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PLAN OF GENERATOR WITH DG ROOM



SECTION A A

**GENERAL NOTES**

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No.	Revision/ Issue	Date



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

**PROJECT NAME**

SEWERAGE SCHEME TO  
KASARAGOD MUNICIPALITY  
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MLD CAPACITY SEWAGE  
TREATMENT PLANT AT  
KORAKODVAYAL AND LAYING  
SEWERAGE NET WORK

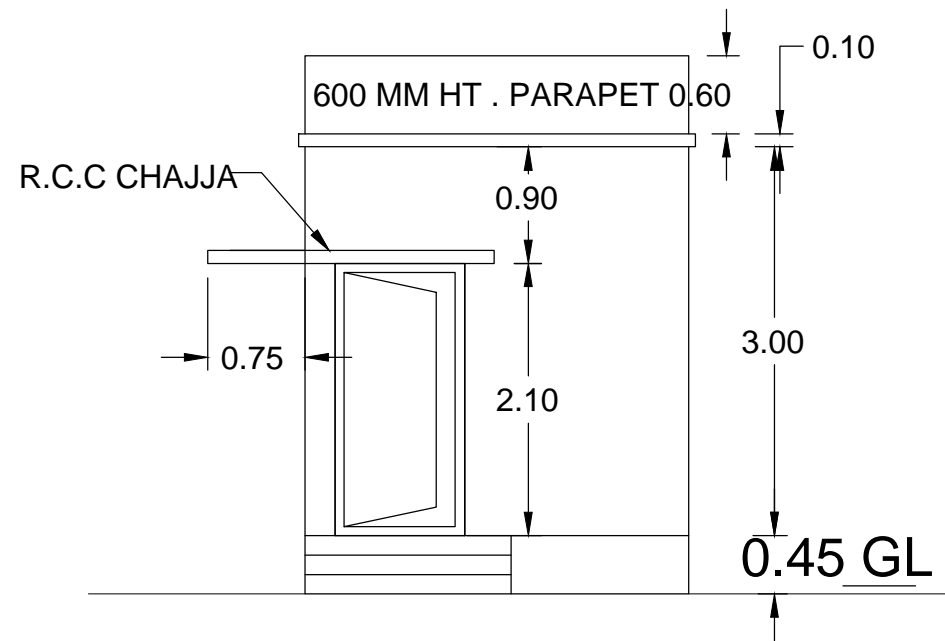
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GENERATOR WITH CONTROL ROOM

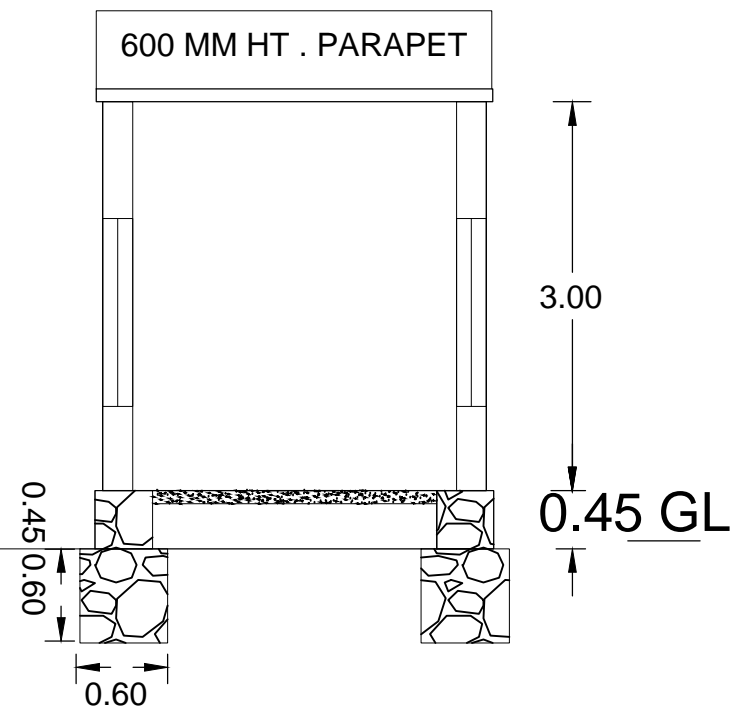
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Not in scale

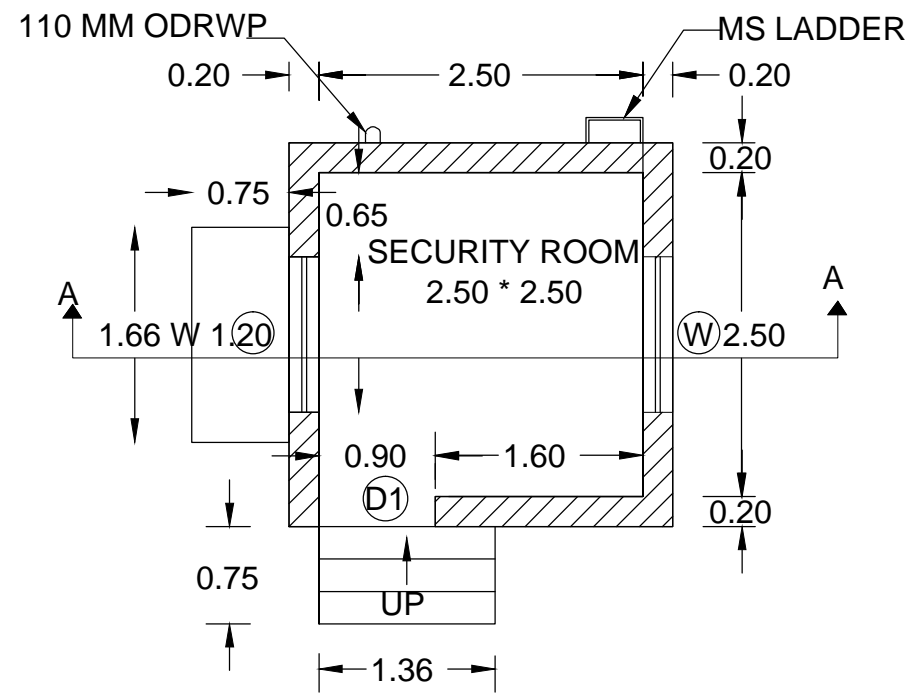
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**ELEVATION**



**SECTION**



**PLAN**

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
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No.	Revision/ 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**

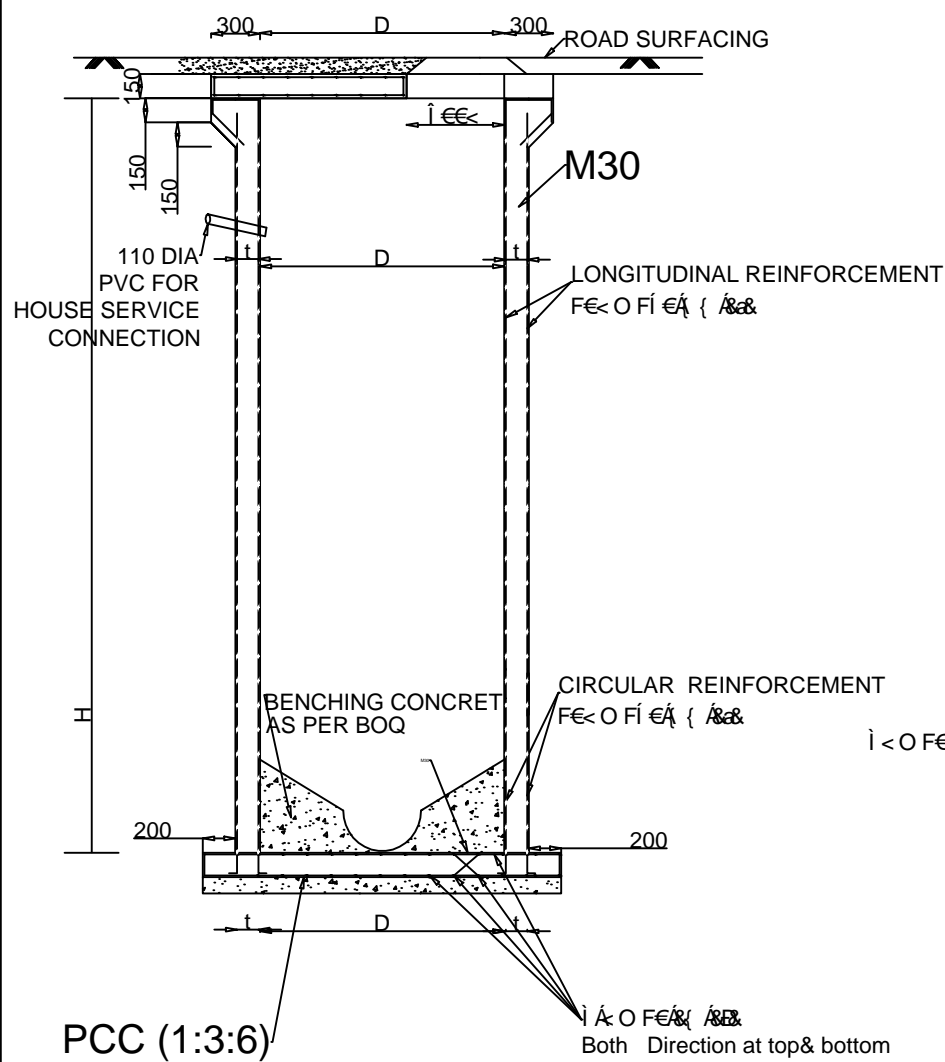
SECURITY ROOM

**DWG NO :- KSD/PHASE -2 / 23**

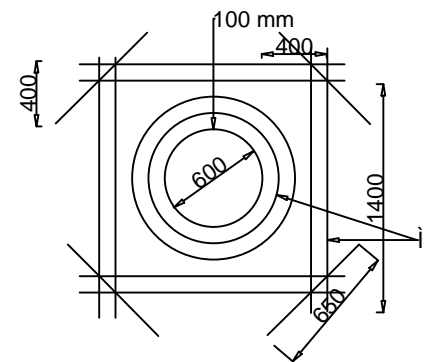
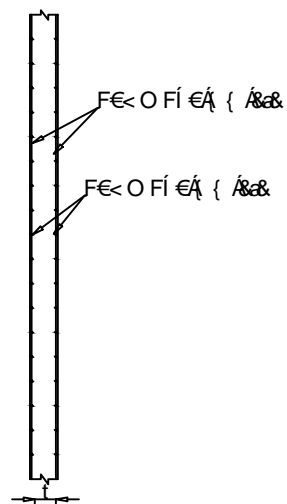
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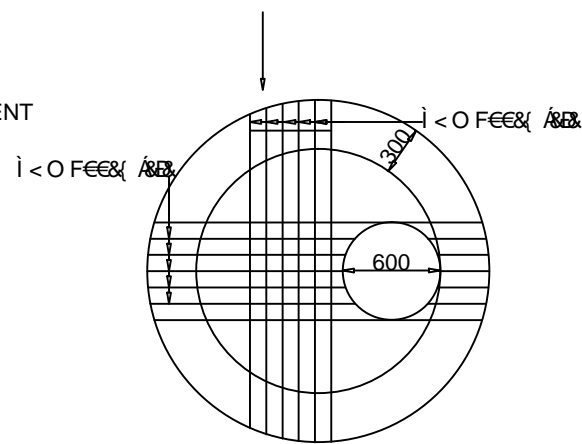




SECTION



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



Reinforcement at Both top & Bottom

COVER SLAB

**GENERAL NOTES**

- ALL DIMENSIONS ARE IN METERS
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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-2) - CONSTRUCTION OF 4 MLD CAPACITY SEWAGE TREATMENT PLANT AT KORAKODVAYAL AND LAYING SEWERAGE NET WORK

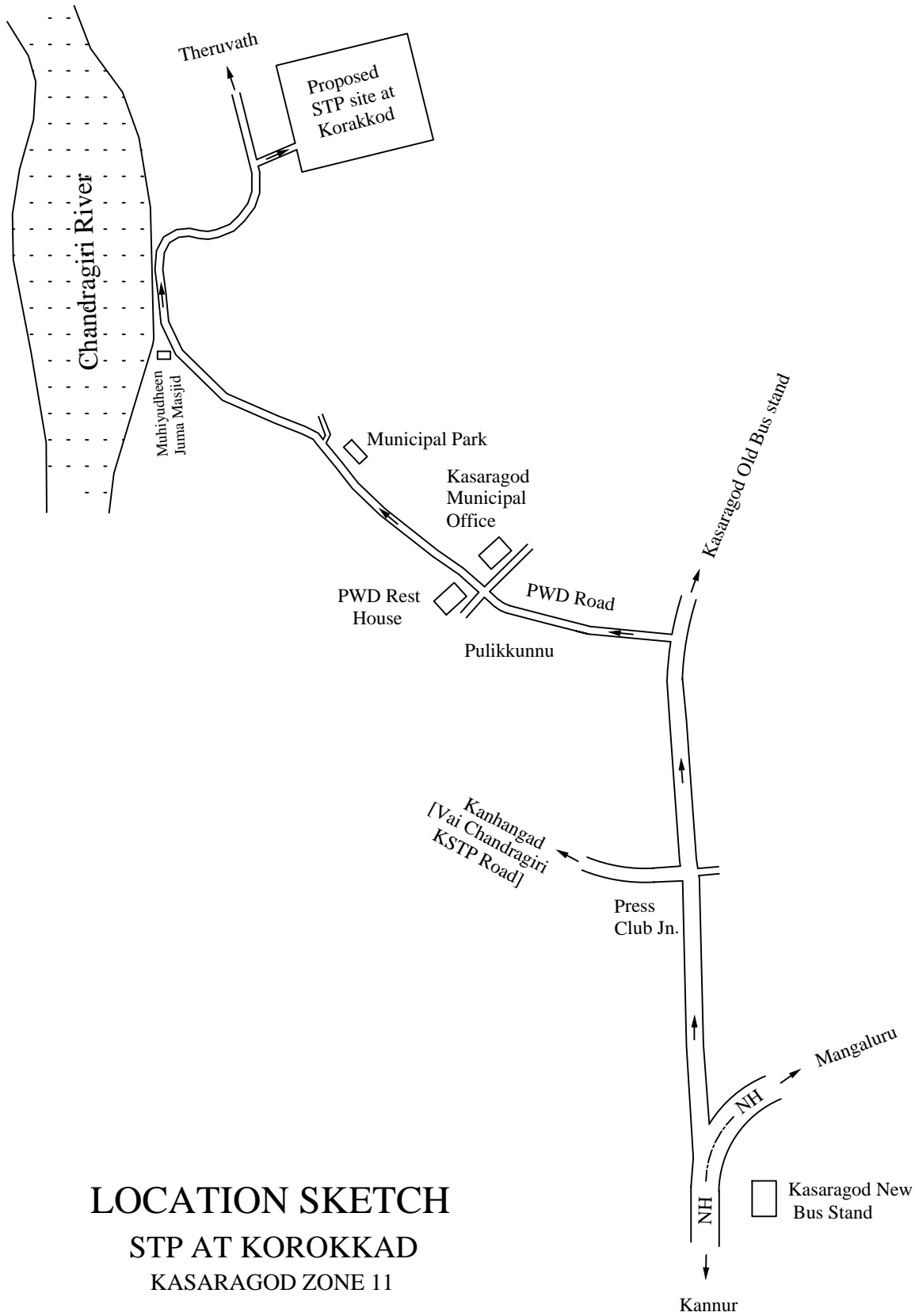
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TYPICAL MANHOLE DETAILS

DWG No :- KSD/PHASE -2 / 24

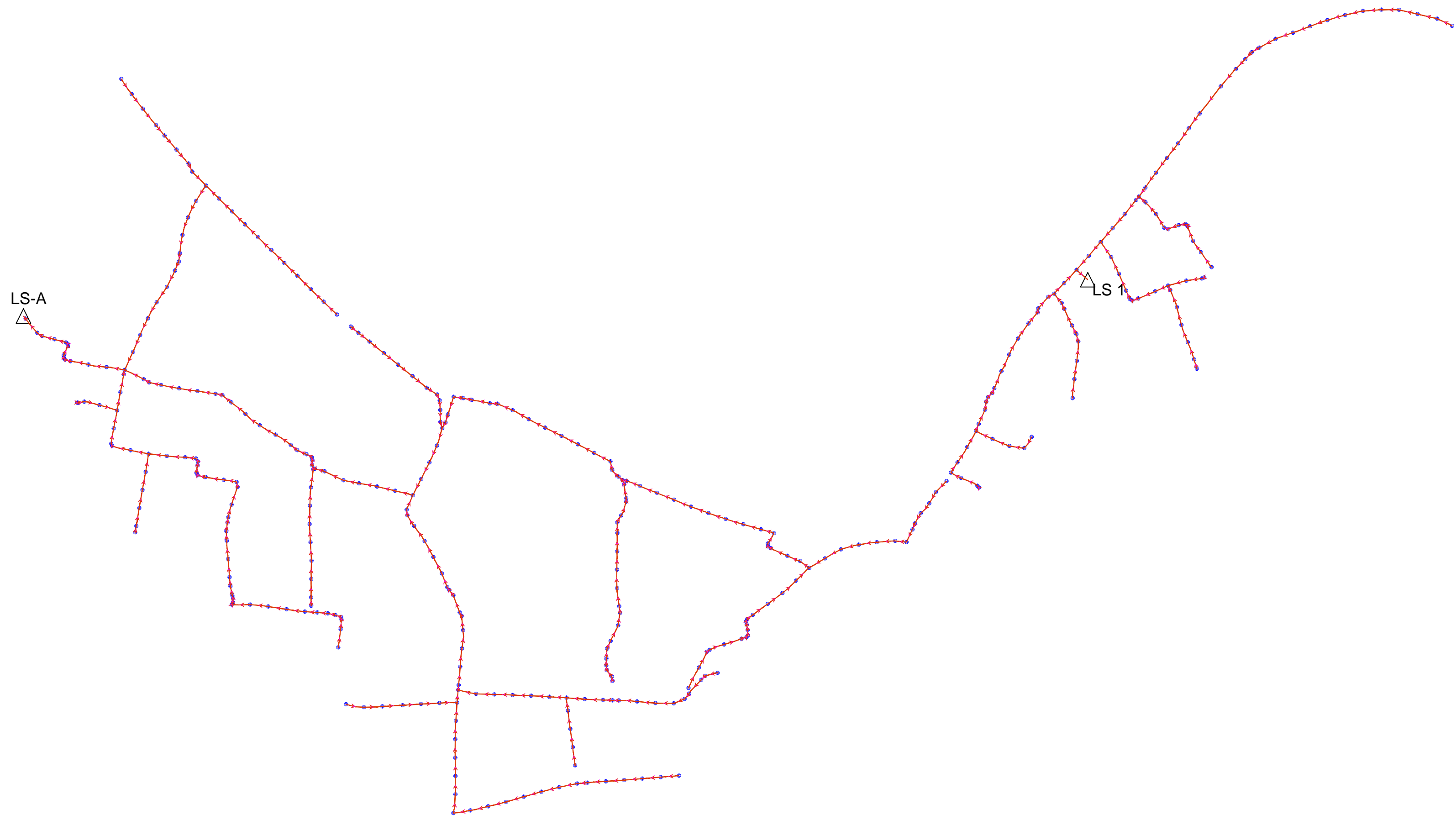
Not in scale

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**LOCATION SKETCH**  
**STP AT KOROKKAD**  
 KASARAGOD ZONE 11

□ Kasaragod New Bus Stand



**GENERAL NOTES**

ALL DIMENSIONS ARE IN METERS  
 DIMENSIONS NOT IN SCALE  
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No.	Revision/ 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

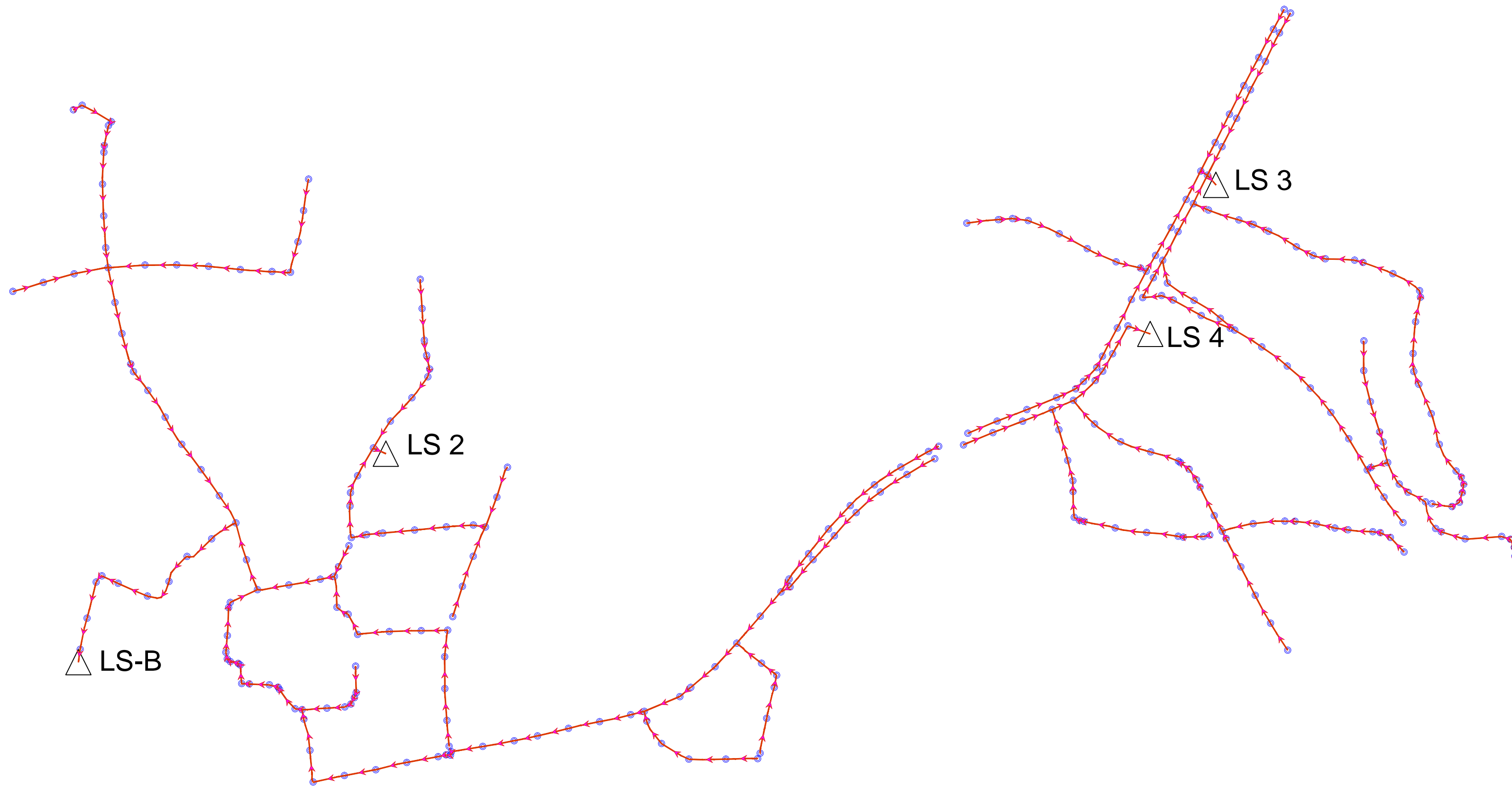
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NET WORK LAYOUT - ZONE -2A

**DWG NO :- KSD/PHASE -2 / 31**

Not in scale

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**GENERAL NOTES**

ALL DIMENSIONS ARE IN METERS  
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No.	Revision/ 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

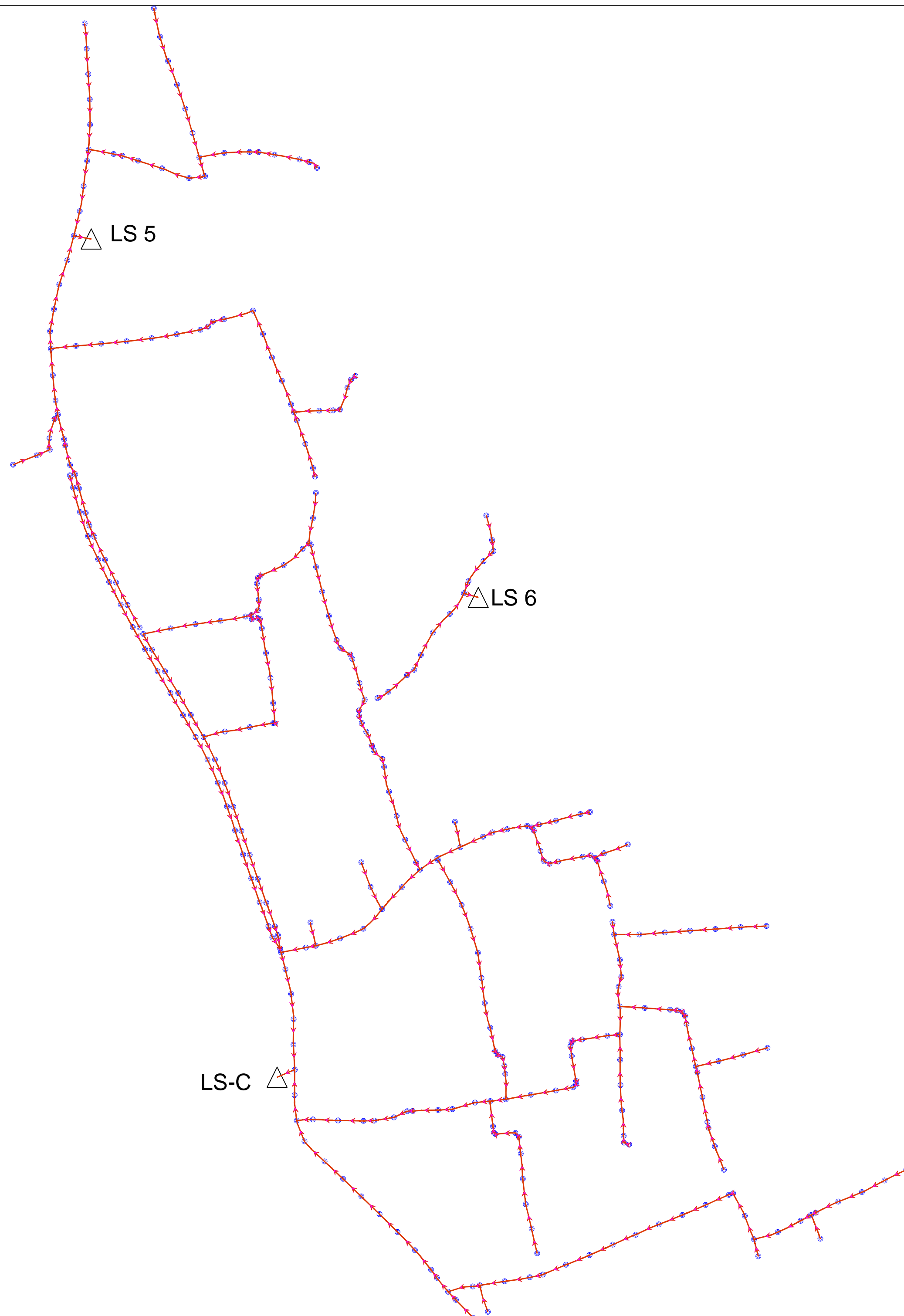
DRAWING TITLE

NET WORK LAYOUT - ZONE -2B

**DWG NO :- KSD/PHASE -2 / 32**

Not in scale

AE	AEE	EE	SE	CE
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**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

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SEWERAGE SCHEME TO KASARAGOD  
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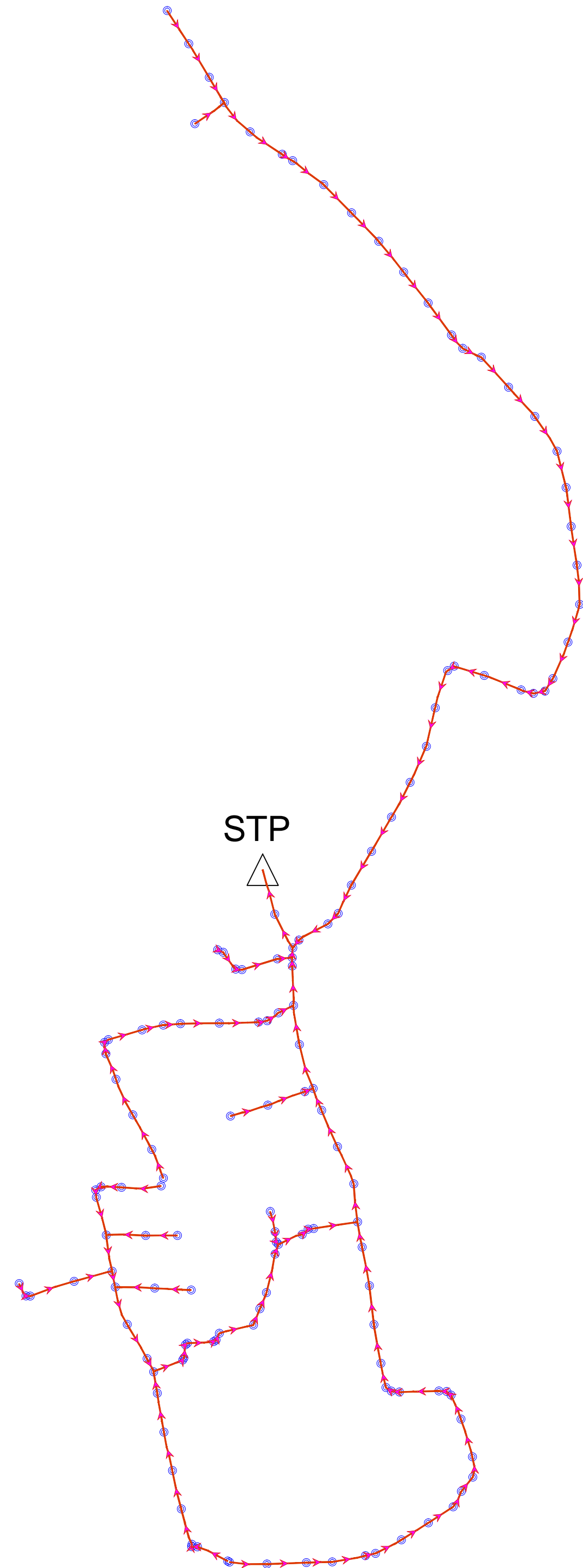
**DRAWING TITLE**

NET WORK LAYOUT - ZONE -2C

**DWG NO :- KSD/PHASE -2 / 33**

Not in scale

AE	AEE	EE	SE	CE
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**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-2) -  
 CONSTRUCTION OF 4 MLD CAPACITY  
 SEWAGE TREATMENT PLANT AT  
 KORAKODVAYAL AND LAYING  
 SEWERAGE NET WORK

DRAWING TITLE

NET WORK LAYOUT - ZONE -2D

**DWG NO :- KSD/PHASE -2 / 34**

Not in scale

AE	AEE	EE	SE	CE
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**APPENDIX III**  
**DESIGN OF WETWELLS AND LIFTING STATIONS**

Sl no.	Name of wetwell/Ls	Peak flow LPS	Detention Period in min.	Storage capacity m <sup>3</sup>	SWD (m)	Area m <sup>2</sup>	Size	Depth up to invert of pipe (m)	Total Depth (m)
1	LS1	7.007	10.00	4.20	1.40	3.00	1.95	4.164	5.56
		7.007					say 2 m dia		
2	LS-A	29.106	10.00	17.46	2.70	6.47	2.87	1.761	4.46
		29.106					say 3 m dia		
3	LS2	1.848	10.00	1.11	1.50	0.74	0.97	1.266	2.77
		1.848					say 2 m dia		
4	LS3	7.700	10.00	4.62	1.60	2.89	1.92	1.339	2.94
		7.700					say 2 m dia		
5	LS4	11.319	10.00	6.79	2.20	3.09	1.98	1.266	3.47
		11.319					say 2 m dia		
6	LS-B	40.733	10.00	24.44	3.70	6.61	2.90	1.299	5.00
		40.733					say 3 m dia		
7	LS5	6.160	10.00	3.70	1.50	2.46	1.77	1.273	2.77
		6.160					say 2 m dia		
8	LS6	1.001	10.00	0.60	0.75	0.80	1.01	1.251	2.00
		1.001					say 2 m dia		
9	LS-C	26.411	10.00	15.85	2.50	6.34	2.84	1.322	3.82
		26.411					say 3 m dia		
10	Well at STP	89.320	10.00	53.59	3.50	15.31	4.42	1.471	4.97
		89.320					say 5 m dia		





APPENDIX : V - FLEX TABLE - CONDUITS  
SEWERAGE NETWORK DESIGN TO KASRAGOD MUNICIPALITY ZONE -2- CONDUIT TABLE

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculate d) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
410	p20	n21	25.44	n22	24.61	30	2.768	HDPE	26.63	25.8	225
411	p21	n22	24.61	n23	23.58	30	3.436	HDPE	25.8	24.77	225
412	p22	n23	23.58	n24	22.45	30	3.769	HDPE	24.77	23.64	225
413	p23	n24	22.45	n25	21.23	30	4.069	HDPE	23.64	22.42	225
414	p24	n25	21.23	n26	19.97	30	4.204	HDPE	22.42	21.16	225
415	p25	n27	19.43	n26	19.97	16.7	3.228	HDPE	20.62	21.16	225
416	p27	n28	19.66	n29	19.47	30	0.633	HDPE	20.85	20.66	225
417	p28	n29	19.47	n30	18.63	30	2.801	HDPE	20.66	19.82	225
418	p29	n30	18.63	n31	17.52	30	3.702	HDPE	19.82	18.71	225
419	p30	n32	16.63	n31	17.52	21.5	4.134	HDPE	17.82	18.71	225
420	p31	n27	19.43	n33	18.74	30	2.301	HDPE	20.62	19.93	225
421	p32	n34	18.18	n35	17.61	30	1.901	HDPE	19.37	18.8	225
422	p33	n35	17.61	n36	17.02	30	1.967	HDPE	18.8	18.21	225
423	p34	n36	17.02	n37	16.31	30	2.367	HDPE	18.21	17.5	225
424	p35	n37	16.31	n38	15.59	30	2.401	HDPE	17.5	16.78	225
425	p36	n38	15.59	n39	14.78	28.3	2.864	HDPE	16.78	15.97	225
426	p37	n39	14.78	n41	14.45	30.8	1.072	HDPE	15.97	15.64	225
427	p38	n41	14.45	n42	14.32	30	0.433	HDPE	15.64	15.51	225
428	p39	n42	14.32	n43	14.1	30	0.733	HDPE	15.51	15.29	225
429	p40	n43	14.1	n44	13.66	30	1.467	HDPE	15.29	14.85	225
430	p41	n44	13.66	n45	13.12	30	1.8	HDPE	14.85	14.31	225
431	p42	n46	12.55	n47	13.06	29.1	1.754	HDPE	13.74	14.25	225
432	p43	n47	13.06	n48	14.09	30	3.436	HDPE	14.25	15.28	225
433	p44	n48	14.09	n49	14.95	30	2.868	HDPE	15.28	16.14	225
434	p45	n49	14.95	n51	15.9	33.2	2.865	HDPE	16.14	17.09	225
435	p46	n51	15.9	n52	16.69	30	2.634	HDPE	17.09	17.88	225
436	p47	n52	16.69	n53	17.27	30	1.934	HDPE	17.88	18.46	225
437	p228	n284	14.26	n285	14.158	30	0.34	HDPE	15.45	15.83	225
438	p229	n285	14.158	n286	14.056	30	0.34	HDPE	15.83	15.68	225
439	p230	n286	14.056	n288	13.939	34.5	0.34	HDPE	15.68	15.26	225
440	p297	n288	13.939	n369	13.82	22	0.54	HDPE	15.26	15.01	225
441	p298	n369	13.82	n370	13.01	30	2.701	HDPE	15.01	14.2	225
442	p299	n370	13.01	n371	12.13	30	2.934	HDPE	14.2	13.32	225
443	p307	n372	11.72	n382	10.56	31.8	3.869	HDPE	12.91	11.75	225
444	p308	n382	8.866	n384	8.22	29.8	2.171	HDPE	11.75	9.41	225
445	p309	n384	8.22	n385	7.14	30	3.602	HDPE	9.41	8.33	225
446	p310	n385	7.14	n386	6.29	30	2.834	HDPE	8.33	7.48	225
447	p311	n386	6.29	n387	5.51	30	2.601	HDPE	7.48	6.7	225
448	p312	n388	3.828	n389	2.33	29.9	5	HDPE	5.2	3.52	225
449	p313	n389	2.33	n390	2.04	30	0.967	HDPE	3.52	3.23	225
450	p314	n390	2.04	n391	1.938	30	0.34	HDPE	3.23	3.26	225
451	p315	n391	1.938	n392	1.836	30	0.34	HDPE	3.26	3.52	225
452	p316	n392	1.836	n393	1.734	30	0.34	HDPE	3.52	3.35	225
453	p317	n393	1.734	n1602	1.625	32.3	0.34	HDPE	3.35	3.29	225
454	p333	n382	8.866	n415	8.968	30	0.34	HDPE	11.75	11.16	225
455	p334	n415	8.968	n416	9.07	30	0.34	HDPE	11.16	10.66	225
456	p335	n416	9.07	n417	9.172	30	0.34	HDPE	10.66	10.45	225
457	p336	n417	9.172	n418	9.274	30	0.34	HDPE	10.45	10.56	225
458	p337	n418	9.274	n419	9.376	30	0.34	HDPE	10.56	10.62	225
459	p338	n419	9.376	n420	9.478	30	0.34	HDPE	10.62	10.68	225
460	p340	n420	9.478	n422	9.58	30	0.34	HDPE	10.68	10.77	225
461	p343	n422	9.58	n425	9.9	30	1.067	HDPE	10.77	11.09	225
462	p344	n425	9.9	n426	10.118	30	0.727	HDPE	11.09	11.37	225
463	p346	n426	10.118	n429	10.22	30	0.34	HDPE	11.37	11.41	225
464	p350	n430	10.15	n433	10.095	16.2	0.34	HDPE	11.34	11.35	225
465	p351	n433	10.095	n434	10.017	22.9	0.34	HDPE	11.35	11.47	225
466	p353	n434	10.017	n436	9.915	30	0.34	HDPE	11.47	11.42	225
467	p362	n448	9.711	n449	9.609	30	0.34	HDPE	10.91	10.81	225
468	p370	n458	8.613	n459	8.715	30	0.34	HDPE	10.32	10.29	225
469	p436	n547	8.85	n548	8.952	30	0.34	HDPE	10.59	10.85	225
470	p437	n548	8.952	n549	9.054	30	0.34	HDPE	10.85	11.55	225
471	p438	n550	9.156	n551	9.258	30	0.34	HDPE	12.39	13.18	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)
472	p439	n551	9.258	n552	9.36	30	0.34	HDPE	13.18	13.93	225
473	p440	n552	9.36	n553	9.462	30	0.34	HDPE	13.93	14.09	225
474	p450	n563	9.512	n564	9.562	14.8	0.34	HDPE	13.63	13.29	225
475	p451	n564	9.562	n565	9.592	8.9	0.34	HDPE	13.29	13.04	225
476	p452	n566	11.52	n567	11.6	23.5	0.34	HDPE	12.8	12.79	225
477	p453	n567	11.6	n568	11.93	30	1.1	HDPE	12.79	13.12	225
478	p454	n568	11.93	n569	12.238	30	1.027	HDPE	13.12	13.49	225
479	p455	n569	12.238	n570	12.34	30	0.34	HDPE	13.49	13.53	225
480	p456	n570	12.34	n571	12.86	30	1.733	HDPE	13.53	14.05	225
481	p457	n571	12.86	n572	13.43	30	1.901	HDPE	14.05	14.62	225
482	p458	n572	13.43	n573	14.18	30	2.501	HDPE	14.62	15.37	225
483	p459	n574	15.081	n575	15.157	22.2	0.34	HDPE	16.32	16.94	225
484	p511	n649	21.99	n650	22.85	23.3	3.686	HDPE	23.18	24.04	225
485	p512	n650	22.85	n651	23.69	30	2.801	HDPE	24.04	24.88	225
486	p513	n651	23.69	n652	24.51	30	2.734	HDPE	24.88	25.7	225
487	p514	n652	24.51	n653	25.14	30	2.101	HDPE	25.7	26.33	225
488	p515	n653	25.14	n654	25.96	30	2.734	HDPE	26.33	27.15	225
489	p516	n655	17.861	n656	17.782	23.4	0.34	HDPE	21.88	21.77	225
490	p518	n656	17.782	n659	17.68	30	0.34	HDPE	21.77	21.76	225
491	p520	n659	20.57	n661	20.79	30	0.733	HDPE	21.76	21.98	225
492	p521	n661	20.79	n662	21.05	30	0.867	HDPE	21.98	22.24	225
493	p523	n662	21.05	n665	21.56	30	1.7	HDPE	22.24	22.75	225
494	p525	n665	21.56	n667	22.23	30	2.234	HDPE	22.75	23.42	225
495	p572	n755	29.05	n731	28.47	21.7	2.677	HDPE	30.24	29.66	225
496	p580	n741	28.41	n742	29.907	29.9	5	HDPE	29.6	31.29	225
497	p581	n742	30.1	n743	31.593	29.8	5	HDPE	31.29	34.19	225
498	p582	n743	33	n744	34.231	24.6	5	HDPE	34.19	37.71	225
499	p583	n744	36.52	n746	37.631	22.2	5	HDPE	37.71	40.11	225
500	p584	n741	28.41	n747	29.15	30	2.467	HDPE	29.6	30.34	225
501	p585	n747	29.15	n748	30.08	30	3.101	HDPE	30.34	31.27	225
502	p586	n748	30.08	n749	30.57	19.6	2.495	HDPE	31.27	31.76	225
503	p587	n749	30.57	n750	30.64	18.6	0.376	HDPE	31.76	31.83	225
504	p588	n750	30.64	n751	31	30	1.2	HDPE	31.83	32.19	225
505	p590	n754	29.67	n755	29.05	21.2	2.923	HDPE	30.86	30.24	225
506	p591	n756	27.365	n757	26.83	10.7	5	HDPE	28.74	28.02	225
507	p592	n758	23.568	n759	22.07	30	5	HDPE	24.88	23.26	225
508	p593	n759	22.07	n760	21.04	30	3.436	HDPE	23.26	22.23	225
509	p594	n760	21.04	n761	19.948	30	3.642	HDPE	22.23	21.17	225
510	p595	n761	19.948	n762	18.45	30	5	HDPE	21.17	19.64	225
511	p596	n762	18.308	n763	16.81	29.9	5	HDPE	19.64	18	225
512	p597	n764	15.663	n765	15.587	22.4	0.34	HDPE	17.77	17.09	225
513	p598	n765	15.587	n766	15.29	30	0.989	HDPE	17.09	16.48	225
514	p599	n767	15.224	n755	15.157	19.8	0.34	HDPE	16.45	16.94	225
515	p601	n655	17.861	n768	17.927	19.2	0.34	HDPE	21.88	20.76	225
516	p602	n769	17.963	n770	18.065	30	0.34	HDPE	20.6	19.58	225
517	p603	n4912	18.16	n772	19.64	31.9	4.634	HDPE	19.35	20.83	225
518	p604	n772	19.64	n773	21.137	29.9	5	HDPE	20.83	22.59	225
519	p605	n773	21.4	n4911	22.959	31.2	5	HDPE	22.59	24.67	225
520	p618	n662	21.05	n792	21.246	30	0.653	HDPE	22.24	22.44	225
521	p619	n792	21.246	n793	21.348	30	0.34	HDPE	22.44	22.67	225
522	p620	n793	21.348	n794	21.45	30	0.34	HDPE	22.67	22.64	225
523	p622	n796	21.85	n797	22.33	10.2	4.72	HDPE	23.04	23.52	225
524	p623	n797	22.33	n798	22.441	30	0.368	HDPE	23.52	24.39	225
525	p624	n799	23.67	n800	24.067	7.9	5	HDPE	24.86	25.43	225
526	p625	n800	24.24	n801	25.738	29.9	5	HDPE	25.43	27.16	225
527	p626	n801	25.738	n802	27.21	30	4.913	HDPE	27.16	28.4	225
528	p627	n802	27.21	n803	27.5	30	0.967	HDPE	28.4	28.69	225
529	p628	n803	27.5	n804	28.41	29.9	3.039	HDPE	28.69	29.6	225
530	p629	n804	28.41	n805	29.09	16	4.245	HDPE	29.6	30.28	225
531	p632	n799	22.518	n4978	22.623	30.8	0.34	HDPE	24.86	24.12	225
532	p638	n819	25.15	n820	25.048	30	0.34	HDPE	26.34	26.54	225
533	p639	n820	25.048	n821	24.972	22.5	0.34	HDPE	26.54	26.45	225
534	p642	n825	23.82	n827	23.44	25.6	1.482	HDPE	25.01	24.63	225
535	p643	n827	23.44	n828	23.06	26	1.46	HDPE	24.63	24.25	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculate d) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
536	p644	n828	23.06	n829	23.011	14.4	0.34	HDPE	24.25	24.46	225
537	p645	n830	22.988	n829	23.011	6.7	0.34	HDPE	24.23	24.46	225
538	p646	n829	23.011	n831	23.91	18.3	4.913	HDPE	24.46	25.1	225
539	p649	n831	23.91	n834	24.86	30	3.169	HDPE	25.1	26.05	225
540	p650	n835	25.71	n836	26.38	30	2.234	HDPE	26.9	27.57	225
541	p653	n836	26.38	n840	26.77	30	1.3	HDPE	27.57	27.96	225
542	p655	n840	26.77	n842	27.08	30	1.033	HDPE	27.96	28.27	225
543	p657	n842	27.08	n844	28.3	56.3	2.169	HDPE	28.27	29.49	225
544	p659	n844	28.3	n847	29.65	37.2	3.627	HDPE	29.49	30.84	225
545	p666	n847	29.65	n857	30.28	22.7	2.781	HDPE	30.84	31.47	225
546	p668	n860	30.7	n861	30.81	14.5	0.758	HDPE	31.89	32	225
547	p669	n862	31.29	n863	31.82	30	1.767	HDPE	32.48	33.01	225
548	p671	n863	31.82	n866	32.41	30	1.967	HDPE	33.01	33.6	225
549	p673	n866	32.41	n868	32.94	30	1.767	HDPE	33.6	34.13	225
550	p675	n868	32.94	n870	33.42	30	1.6	HDPE	34.13	34.61	225
551	p677	n870	33.42	n872	34.26	30	2.801	HDPE	34.61	35.45	225
552	p680	n875	35.47	n876	36.92	29	5	HDPE	36.66	38.49	225
553	p681	n876	37.3	n878	38.82	30.9	4.916	HDPE	38.49	40.01	225
554	p684	n883	40.42	n884	41.71	26.9	4.788	HDPE	41.61	42.9	225
555	p1180	n763	15.726	n1515	15.828	30	0.34	HDPE	18	17.37	225
556	p1181	n1515	15.828	n1516	15.93	30	0.34	HDPE	17.37	17.12	225
557	p1182	n1516	15.93	n1517	16.04	30	0.367	HDPE	17.12	17.23	225
558	p1183	n1517	16.04	n1518	16.29	30	0.833	HDPE	17.23	17.48	225
559	p1186	n1519	16.43	n1522	16.54	5.2	2.12	HDPE	17.62	17.73	225
560	p1187	n1523	17.63	n1524	18.77	30	3.803	HDPE	18.82	19.96	225
561	p1188	n1524	18.77	n1525	19.61	25.4	3.307	HDPE	19.96	20.8	225
562	p1190	n1528	20.08	n1529	21.527	28.9	5	HDPE	21.27	25.13	225
563	p1191	n1529	23.94	n4684	25.814	37.5	5	HDPE	25.13	29.06	225
564	p1192	n1531	9.617	n1532	9.694	22.6	0.34	HDPE	12.74	12.21	225
565	p1193	n1532	9.694	n1533	9.713	5.5	0.34	HDPE	12.21	12.19	225
566	p1194	n1533	9.713	n1534	9.796	24.5	0.34	HDPE	12.19	11.25	225
567	p1195	n1534	9.796	n1535	9.841	13	0.34	HDPE	11.25	11.14	225
568	p1196	n1536	9.898	n1537	10	30	0.34	HDPE	11.14	11.19	225
569	p1197	n1537	10	n1538	10.39	30	1.3	HDPE	11.19	11.58	225
570	p1198	n1538	10.39	n1539	10.78	30	1.3	HDPE	11.58	11.97	225
571	p1199	n1539	10.78	n1540	11.56	30	2.601	HDPE	11.97	12.75	225
572	p1200	n1541	11.88	n1543	12.87	20.5	4.832	HDPE	13.07	14.06	225
573	p1201	n1543	12.87	n1544	14.02	28.5	4.041	HDPE	14.06	15.21	225
574	p1202	n1545	14.82	n1546	15.632	16.2	5	HDPE	16.01	17.21	225
575	p1203	n1547	17.41	n4735	18.103	13.9	5	HDPE	18.6	19.88	225
576	p1205	n4772	8.511	n1552	7.374	29.8	3.811	HDPE	10.3	8.92	225
577	p1206	n1553	6.69	n1554	7.66	19.4	5	HDPE	7.88	9.15	225
578	p1207	n1555	6.43	n1556	5.12	30	4.372	HDPE	7.62	6.31	225
579	p1208	n1556	5.12	n1557	5.018	30	0.34	HDPE	6.31	6.3	225
580	p1209	n1557	5.018	n1558	4.916	30	0.34	HDPE	6.3	6.31	225
581	p1210	n1558	4.916	n1559	4.814	30	0.34	HDPE	6.31	6.58	225
582	p1211	n1559	5.39	n1561	6.17	25.5	3.062	HDPE	6.58	7.36	225
583	p1212	n1562	6.44	n1563	7.24	20.4	3.929	HDPE	7.63	8.43	225
584	p1214	n1563	7.24	n1566	8.28	30	3.469	HDPE	8.43	9.47	225
585	p1216	n1566	8.28	n1568	8.92	30	2.134	HDPE	9.47	10.11	225
586	p1218	n1568	8.92	n1570	9.63	30	2.367	HDPE	10.11	10.82	225
587	p1221	n1570	9.63	n1573	9.9	24.2	1.114	HDPE	10.82	11.09	225
588	p1222	n1574	10.81	n1575	11.17	30	1.2	HDPE	12	12.36	225
589	p1223	n1575	11.17	n1576	11.61	30	1.467	HDPE	12.36	12.8	225
590	p1224	n1576	11.61	n1577	11.952	30	1.139	HDPE	12.8	13.28	225
591	p1225	n1559	4.814	n1578	4.669	30	0.483	HDPE	6.58	5.88	250
592	p1226	n1579	4.139	n1580	3.819	30	1.067	HDPE	5.35	5.03	250
593	p1227	n1580	3.819	n1581	3.689	26	0.5	HDPE	5.03	4.9	250
594	p1228	n1581	3.689	n1583	3.574	34	0.34	HDPE	4.9	5.04	250
596	p1230	n1586	3.509	n1587	3.487	7	0.313	HDPE	5.07	4.87	280
597	p1231	n1588	3.446	n1589	3.415	9.9	0.313	HDPE	4.79	4.82	280
598	p1232	n1590	3.321	n1591	3.214	30	0.357	HDPE	4.57	4.45	280
599	p1233	n1591	3.214	n1592	3.054	30	0.533	HDPE	4.45	4.29	280
600	p1234	n1592	3.054	n1593	2.944	30	0.367	HDPE	4.29	4.18	280



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)
601	p1235	n1593	2.944	n1594	2.774	30	0.567	HDPE	4.18	4.01	280
602	p1236	n1594	2.774	n1595	2.716	18.5	0.313	HDPE	4.01	4.36	280
603	p1237	n1595	2.716	n1596	2.68	11.5	0.313	HDPE	4.36	4.16	280
604	p1238	n1596	2.68	n1597	2.586	30	0.313	HDPE	4.16	3.84	280
605	p1239	n1597	2.586	n1598	2.474	30	0.373	HDPE	3.84	3.71	280
606	p1240	n1598	2.474	n1599	2.38	30	0.313	HDPE	3.71	3.69	280
607	p1241	n1600	2.286	n1602	1.625	34.7	1.903	HDPE	3.61	3.29	280
608	p1244	n1602	1.625	n1604	1.55	30	0.249	HDPE	3.29	3.25	315
609	p1245	n1604	1.55	n1605	1.475	30	0.249	HDPE	3.25	3.33	315
610	p1246	n1605	1.475	n1606	1.401	30	0.249	HDPE	3.33	3.23	315
611	p1247	n1606	1.401	n1607	1.379	8.8	0.249	HDPE	3.23	3.2	315
612	p1248	n1608	1.2	n1609	1.177	9.2	0.249	HDPE	2.71	2.8	315
613	p1249	n1609	1.177	n1610	1.102	30	0.249	HDPE	2.8	2.87	315
614	p1250	n1602	2.1	n1611	2.23	7.2	1.795	HDPE	3.29	3.42	225
615	p1251	n1611	2.23	n1612	3.02	30	2.634	HDPE	3.42	4.21	225
616	p1252	n1612	3.02	n1613	3.422	29.9	1.342	HDPE	4.21	6.61	225
617	p1253	n1614	3.611	n1615	3.523	25.7	0.34	HDPE	5.12	5.76	225
618	p1254	n1615	3.523	n1613	3.422	30	0.34	HDPE	5.76	6.61	225
619	p1255	n1613	5.42	n1617	6.917	29.9	5	HDPE	6.61	8.61	225
620	p1256	n1617	6.917	n1618	7.706	25.5	3.102	HDPE	8.61	9.73	225
621	p1257	n4756	7.718	n1620	7.824	31	0.34	HDPE	9.78	10.73	225
622	p1258	n1620	7.824	n1622	7.926	30.1	0.34	HDPE	10.73	10.85	225
623	p1259	n1622	9.66	n1623	11.158	29.9	5	HDPE	10.85	12.57	225
624	p1260	n1623	11.38	n1624	12.877	29.9	5	HDPE	12.57	14.63	225
625	p1261	n1624	13.44	n1625	14.935	29.9	5	HDPE	14.63	17.01	225
626	p1262	n1626	17.95	n1627	18.467	10.3	5	HDPE	19.14	20.04	225
627	p1263	n1628	8.028	n1629	8.13	30	0.34	HDPE	10.37	9.77	225
628	p1264	n1629	8.13	n1630	8.19	17.7	0.34	HDPE	9.77	9.38	225
629	p1265	n1631	8.51	n1632	8.947	12.6	3.461	HDPE	9.7	10.39	225
630	p1266	n1633	8.961	n1634	9.006	13.1	0.34	HDPE	10.57	10.74	225
631	p1267	n1634	9.006	n1635	9.108	30	0.34	HDPE	10.74	10.4	225
632	p1268	n1635	9.108	n1636	9.18	21.3	0.34	HDPE	10.4	10.37	225
633	p1269	n4753	9.32	n1638	10.25	30.6	3.042	HDPE	10.51	11.44	225
634	p1270	n1638	10.25	n1639	11.311	21.2	5	HDPE	11.44	12.6	225
635	p1271	n1640	13.944	n1641	15.046	29.9	3.685	HDPE	15.47	17.76	225
636	p1272	n1641	15.046	n1642	15.148	29.9	0.34	HDPE	17.76	19.68	225
637	p1273	n1643	4.05	n1644	4.26	30	0.7	HDPE	5.24	5.45	225
638	p1274	n1644	4.26	n1645	5.29	30	3.436	HDPE	5.45	6.48	225
639	p1275	n1645	5.29	n1646	6.783	29.9	5	HDPE	6.48	9.46	225
640	p1276	n1646	8.27	n1647	9.764	29.9	5	HDPE	9.46	12.23	225
641	p1277	n1647	11.04	n1648	12.51	30	4.907	HDPE	12.23	13.7	225
642	p1278	n1648	12.51	n1649	14.008	30	5	HDPE	13.7	15.26	225
643	p1291	n1668	15.303	n1669	15.405	29.9	0.34	HDPE	21.08	18.8	225
644	p1292	n1669	15.405	n1671	15.506	29.9	0.34	HDPE	18.8	17.53	225
645	p1293	n1671	15.506	n1672	15.608	30	0.34	HDPE	17.53	16.96	225
646	p1294	n1672	15.608	n1673	15.71	30	0.34	HDPE	16.96	16.9	225
647	p1295	n1673	15.71	n1675	16.746	20.7	5	HDPE	16.9	18.49	225
648	p1296	n1676	19.59	n1677	20.226	12.7	5	HDPE	20.78	22.49	225
649	p1297	n1678	23.52	n1679	24.315	15.9	5	HDPE	24.71	25.73	225
650	p1298	n1679	24.315	n1680	25.49	30	3.919	HDPE	25.73	26.68	225
651	p1324	n46	12.55	n1711	11.979	20.8	2.745	HDPE	13.74	13.41	225
652	p1325	n1711	11.979	n1713	12.08	29.7	0.34	HDPE	13.41	13.27	225
653	p1326	n1713	12.08	n1714	12.32	30	0.8	HDPE	13.27	13.51	225
654	p1327	n1714	12.32	n1715	12.68	30	1.2	HDPE	13.51	13.87	225
655	p1328	n1715	12.68	n1716	13.52	30	2.801	HDPE	13.87	14.71	225
656	p1329	n1716	13.52	n1717	15	30	4.94	HDPE	14.71	16.19	225
657	p1330	n1717	15	n32	16.391	27.8	5	HDPE	16.19	17.82	225
658	p1331	n32	16.63	n1719	18.126	29.9	5	HDPE	17.82	20.13	225
659	p1332	n1719	18.94	n1720	20.436	29.9	5	HDPE	20.13	22.27	225
660	p1333	n1720	21.08	n1550	21.856	15.5	5	HDPE	22.27	23.34	225
661	p1334	n1550	22.15	n1721	22.658	10.2	5	HDPE	23.34	24.04	225
662	p1335	n1721	22.85	n1722	24.348	30	5	HDPE	24.04	25.57	225
663	p1336	n1722	24.348	n1723	25.33	30	3.276	HDPE	25.57	26.52	225
664	p1337	n1724	26.16	n1725	27.11	19	5	HDPE	27.35	28.52	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculate d) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
665	p1338	n1725	27.33	n1727	27.914	11.7	5	HDPE	28.52	29.3	225
666	p1339	n1727	28.11	n1728	29.608	29.9	5	HDPE	29.3	31.11	225
667	p1340	n1729	30.361	n1730	31.03	21.2	3.164	HDPE	31.64	32.22	225
668	p4025	n34	18.18	n33	18.74	30	1.867	HDPE	19.37	19.93	225
669	p4026	n45	13.12	n46	12.55	30	1.901	HDPE	14.31	13.74	225
670	p4027	n1577	11.952	n1711	11.979	8	0.34	HDPE	13.28	13.41	225
671	p4031	n1723	25.33	n1724	26.16	29.9	2.772	HDPE	26.52	27.35	225
672	p4036	n1729	30.361	n1728	29.92	8.8	5	HDPE	31.64	31.11	225
673	p4081	n758	23.69	n4706	24.617	18.5	5	HDPE	24.88	26.57	225
674	p4082	n4706	25.38	n757	26.508	22.6	5	HDPE	26.57	28.02	225
675	p4089	n731	28.47	n756	27.55	19.3	4.774	HDPE	29.66	28.74	225
676	p4100	n754	29.67	n4720	30.39	25	2.882	HDPE	30.86	31.58	225
678	p4103	n751	31	n752	31.09	3.7	2.404	HDPE	32.19	32.28	225
679	p4110	n1528	19.877	n1525	19.61	5.3	5	HDPE	21.27	20.8	225
680	p4111	n1523	17.63	n4726	17.22	8.3	4.918	HDPE	18.82	18.41	225
681	p4112	n4726	17.22	n4727	17.09	3.7	3.507	HDPE	18.41	18.28	225
682	p4113	n4727	17.09	n4728	16.65	9.1	4.863	HDPE	18.28	17.84	225
683	p4114	n4728	16.65	n1522	16.54	8.9	1.238	HDPE	17.84	17.73	225
684	p4115	n1519	16.43	n4729	16.39	4.3	0.935	HDPE	17.62	17.58	225
685	p4116	n4729	16.39	n1518	16.29	11.6	0.866	HDPE	17.58	17.48	225
686	p4119	n763	15.726	n764	15.663	18.7	0.34	HDPE	18	17.77	225
687	p4121	n766	15.29	n4733	15.24	5.4	0.926	HDPE	16.48	16.43	225
688	p4122	n4733	15.24	n767	15.224	4.8	0.34	HDPE	16.43	16.45	225
689	p4124	n573	14.18	n574	15.081	30	3.005	HDPE	15.37	16.32	225
690	p4126	n4734	19.022	n4735	18.69	6.6	5	HDPE	20.7	19.88	225
691	p4128	n1547	17.142	n4736	16.76	7.6	5	HDPE	18.6	17.95	225
692	p4129	n4736	16.561	n1546	16.02	10.8	5	HDPE	17.95	17.21	225
693	p4130	n1545	14.705	n1544	14.02	13.7	5	HDPE	16.01	15.21	225
694	p4132	n1541	11.88	n1540	11.56	11	2.909	HDPE	13.07	12.75	225
695	p4133	n1535	9.841	n1536	9.898	17	0.34	HDPE	11.14	11.14	225
696	p4134	n566	11.52	n565	11.498	6.5	0.34	HDPE	12.8	13.04	225
697	p4135	n565	9.592	n1531	9.617	7.4	0.34	HDPE	13.04	12.74	225
698	p4137	n553	9.462	n563	9.512	14.6	0.34	HDPE	14.09	13.63	225
699	p4153	n1675	17.3	n1676	18.151	17	5	HDPE	18.49	20.78	225
700	p4154	n1677	21.3	n4746	21.785	9.7	5	HDPE	22.49	24.1	225
701	p4155	n4746	22.91	n1678	23.12	4.2	5	HDPE	24.1	24.71	225
702	p4156	n1650	14.763	n1649	14.07	13.9	5	HDPE	16.32	15.26	225
703	p4157	n1668	15.303	n4747	15.29	3.8	0.34	HDPE	21.08	20.96	225
704	p4158	n4747	15.29	n4748	15.266	7.1	0.34	HDPE	20.96	20.9	225
705	p4159	n4748	15.266	n4749	15.25	4.7	0.34	HDPE	20.9	20.77	225
706	p4160	n4749	15.25	n4750	15.198	15.3	0.34	HDPE	20.77	20.34	225
707	p4161	n4750	15.198	n1642	15.148	14.7	0.34	HDPE	20.34	19.68	225
708	p4162	n1640	13.944	n4751	13.16	15.7	5	HDPE	15.47	14.35	225
709	p4163	n4751	12.783	n4752	12.07	14.3	5	HDPE	14.35	13.26	225
710	p4164	n4752	11.847	n1639	11.41	8.7	5	HDPE	13.26	12.6	225
711	p4165	n1636	9.18	n4753	9.32	8.1	1.733	HDPE	10.37	10.51	225
712	p4167	n1633	8.961	n1632	8.947	4.3	0.34	HDPE	10.57	10.39	225
713	p4168	n1631	8.51	n4754	8.29	6.3	3.512	HDPE	9.7	9.48	225
714	p4169	n1630	8.19	n4754	8.29	6	1.661	HDPE	9.38	9.48	225
715	p4172	n1622	7.926	n1628	8.028	30	0.34	HDPE	10.85	10.37	225
716	p4174	n1618	7.706	n4756	7.718	3.5	0.34	HDPE	9.73	9.78	225
717	p4175	n4757	3.65	n4758	3.644	1.9	0.34	HDPE	4.84	4.89	225
718	p4177	n4758	3.644	n1614	3.611	9.7	0.34	HDPE	4.89	5.12	225
719	p4179	n1574	10.81	n4760	10.55	23.4	1.113	HDPE	12	11.74	225
720	p4181	n4760	10.55	n4762	10.49	6.4	0.932	HDPE	11.74	11.68	225
721	p4182	n4762	10.49	n4763	10.06	30	1.433	HDPE	11.68	11.25	225
722	p4183	n4763	10.06	n4764	9.95	10.7	1.023	HDPE	11.25	11.14	225
723	p4184	n1573	9.9	n4764	9.95	5.8	0.866	HDPE	11.09	11.14	225
724	p4187	n1562	6.44	n1561	6.17	9.6	2.805	HDPE	7.63	7.36	225
725	p4189	n1579	4.139	n1578	4.669	30	1.767	HDPE	5.35	5.88	250
726	p4191	n1643	4.05	n1586	3.509	29.9	1.811	HDPE	5.24	5.07	225
727	p4193	n1586	3.509	n1585	3.518	2.7	0.34	HDPE	5.07	5	250
728	p4194	n1587	3.487	n4767	3.462	8.1	0.313	HDPE	4.87	4.78	280
729	p4195	n4767	3.462	n1588	3.446	5	0.313	HDPE	4.78	4.79	280

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculate d) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
730	p4196	n1589	3.415	n4768	3.364	16.4	0.313	HDPE	4.82	4.66	280
731	p4197	n1590	3.321	n4768	3.364	13.6	0.313	HDPE	4.57	4.66	280
732	p4198	n1555	6.43	n1553	6.69	10.6	2.46	HDPE	7.62	7.88	225
733	p4199	n1555	6.43	n4769	6.66	10.5	2.186	HDPE	7.62	7.85	225
734	p4200	n4769	6.66	n1552	7.374	14.3	5	HDPE	7.85	8.92	225
735	p4201	n1554	7.96	n4770	8.748	15.8	5	HDPE	9.15	10.19	225
736	p4202	n4771	9.31	n4770	9	10.3	2.998	HDPE	10.5	10.19	225
737	p4207	n4772	8.511	n4774	8.564	15.5	0.34	HDPE	10.3	10.29	225
738	p4208	n4774	8.564	n458	8.613	14.5	0.34	HDPE	10.29	10.32	225
739	p4211	n459	8.715	n4776	8.758	12.6	0.34	HDPE	10.29	10.46	225
740	p4213	n4776	8.758	n547	8.85	27	0.34	HDPE	10.46	10.59	225
741	p4217	n449	9.609	n4771	9.31	20.4	1.467	HDPE	10.81	10.5	225
742	p4226	n436	9.915	n4780	9.813	30	0.34	HDPE	11.42	11.12	225
743	p4227	n4780	9.813	n448	9.711	30	0.34	HDPE	11.12	10.91	225
744	p4229	n1600	2.286	n4783	2.317	10	0.313	HDPE	3.61	3.77	280
745	p4230	n4783	2.317	n1599	2.38	20	0.313	HDPE	3.77	3.69	280
746	p4231	n1607	1.379	n4784	1.37	3.7	0.249	HDPE	3.2	3.09	315
747	p4232	n4784	1.37	n4785	1.36	3.9	0.249	HDPE	3.09	3.1	315
748	p4233	n4785	1.36	n4786	1.319	16.5	0.249	HDPE	3.1	3.09	315
749	p4234	n4786	1.319	n4787	1.309	3.9	0.249	HDPE	3.09	2.88	315
750	p4235	n4788	1.301	n4787	1.309	3.4	0.249	HDPE	2.84	2.88	315
751	p4236	n1608	1.2	n4789	1.252	20.8	0.249	HDPE	2.71	2.8	315
752	p4237	CW-1	1.089	n1610	1.102	5.5	0.249	HDPE	2.85	2.87	315
753	p4238	n388	4.01	n4791	4.812	16	5	HDPE	5.2	6.2	225
754	p4239	n4791	5.01	n387	5.51	13.9	3.592	HDPE	6.2	6.7	225
755	p4241	n372	11.72	n371	12.13	14.8	2.774	HDPE	12.91	13.32	225
756	p4388	n549	9.054	n550	9.156	30	0.34	HDPE	11.55	12.39	225
757	p4435	n654	25.96	n4886	26.21	8.4	2.988	HDPE	27.15	27.4	225
758	p4436	n3	26.91	n4887	26.64	7.9	3.422	HDPE	28.1	27.83	225
759	p4438	n4887	26.64	n4886	26.21	9.9	4.361	HDPE	27.83	27.4	225
760	p4439	n3	26.91	n4888	27.32	13.1	3.139	HDPE	28.1	28.51	225
761	p4440	n4888	27.32	n4889	28.1	25.8	3.027	HDPE	28.51	29.29	225
762	p4441	n4889	28.1	n741	28.41	12	2.585	HDPE	29.29	29.6	225
763	p4470	n4912	18.16	n4913	18.119	12	0.34	HDPE	19.35	19.4	225
764	p4471	n770	18.065	n4913	18.119	16	0.34	HDPE	19.58	19.4	225
765	p4472	n768	17.927	n769	17.963	10.7	0.34	HDPE	20.76	20.6	225
766	p4474	n649	21.99	n4914	21.77	6.7	3.31	HDPE	23.18	22.96	225
767	p4475	n4914	21.77	n4915	20.95	24.9	3.287	HDPE	22.96	22.14	225
768	p4476	n655	20.69	n4915	20.95	11	2.355	HDPE	21.88	22.14	225
769	p4574	n794	21.45	n4976	21.66	15	1.402	HDPE	22.64	22.85	225
770	p4575	n4976	21.66	n796	21.85	4.8	3.941	HDPE	22.85	23.04	225
771	p4576	n798	22.441	n799	22.518	22.9	0.34	HDPE	24.39	24.86	225
772	p4580	n4978	22.623	n4979	22.71	25.6	0.34	HDPE	24.12	23.9	225
773	p4581	n4979	22.71	n810	22.75	4.4	0.91	HDPE	23.9	23.94	225
774	p4592	n821	24.972	n4986	24.816	25.7	0.606	HDPE	26.45	26.03	225
775	p4593	n4986	24.816	n822	24.68	2.7	5	HDPE	26.03	25.87	225
776	p4594	n822	24.68	n4987	24.57	2.5	4.338	HDPE	25.87	25.76	225
777	p4595	n4987	24.57	n4988	24.41	10.6	1.505	HDPE	25.76	25.6	225
778	p4596	n4990	23.9	n4988	24.41	18.7	2.724	HDPE	25.09	25.6	225
779	p4598	n825	23.82	n4990	23.9	6.4	1.244	HDPE	25.01	25.09	225
780	p4600	n667	22.23	n830	22.988	30	2.528	HDPE	23.42	24.23	225
781	p4602	n834	24.86	n835	25.71	30	2.834	HDPE	26.05	26.9	225
782	p4626	n857	30.28	n860	30.7	15.5	2.713	HDPE	31.47	31.89	225
783	p4629	n861	30.81	n862	31.29	30	1.6	HDPE	32	32.48	225
784	p4663	n872	34.26	n875	35.47	30	4.036	HDPE	35.45	36.66	225
785	p4665	n878	38.82	n883	40.42	33	4.85	HDPE	40.01	41.61	225
786	p5686	n1625	15.82	n1626	17.316	29.9	5	HDPE	17.01	19.14	225
787	p5691	n4788	1.301	n4789	1.252	19.7	0.249	HDPE	2.84	2.8	315
793	CO-2	n1585	3.518	n1583	3.574	16.3	0.34	HDPE	5	5.04	250
805	CO-4	n659	17.68	LS 1	17.596	24.5	0.34	HDPE	21.76	21.76	225
329	p49	n55	16.94	n54	17.03	17.4	0.515	HDPE	18.13	18.22	225
330	p50	n56	10.806	n57	10.76	13.5	0.34	HDPE	13.67	13.09	225
331	p51	n57	10.76	n58	10.658	30	0.34	HDPE	13.09	11.91	225
332	p52	n59	8.789	n58	10.658	30	6.233	HDPE	10.77	11.91	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)
333	p53	n59	8.789	n60	7.14	29.9	5.516	HDPE	10.77	8.33	225
334	p54	n60	7.14	n62	5.09	36.1	5.672	HDPE	8.33	6.84	225
335	p56	n62	5.09	n63	5.033	27.5	0.21	HDPE	6.84	6.35	355
336	p57	n63	5.033	n64	4.671	30	1.208	HDPE	6.35	5.97	355
337	p58	n64	4.671	n65	4.421	30	0.834	HDPE	5.97	5.72	355
338	p59	n65	4.421	n66	3.721	30	2.334	HDPE	5.72	5.02	355
339	p60	n66	3.721	n67	3.181	30	1.8	HDPE	5.02	4.48	355
340	p61	n67	3.181	n68	3.011	16.9	1.006	HDPE	4.48	4.31	355
341	p62	n68	3.011	n69	2.993	8.1	0.215	HDPE	4.31	4.4	355
342	p63	n69	2.993	n71	2.891	35	0.293	HDPE	4.4	4.19	355
343	p64	n71	2.891	n72	2.421	30	1.567	HDPE	4.19	3.72	355
344	p75	n85	10.445	n84	10.475	9.1	0.34	HDPE	14.58	14.24	225
345	p76	n84	10.475	n86	10.577	30	0.34	HDPE	14.24	13.11	225
346	p77	n86	10.577	n88	10.68	30.3	0.34	HDPE	13.11	11.87	225
347	p1123	n1439	23.49	n1440	22.4	30	3.636	HDPE	24.68	23.59	225
348	p1124	n1441	23.48	n1442	22.34	30	3.803	HDPE	24.67	23.53	225
349	p1125	n1440	22.4	n1443	21.29	30	3.702	HDPE	23.59	22.48	225
350	p1126	n1442	22.34	n1444	21.41	30	3.101	HDPE	23.53	22.6	225
351	p1127	n1443	21.29	n1445	20.46	30	2.768	HDPE	22.48	21.65	225
352	p1128	n1444	21.41	n1446	20.56	30	2.834	HDPE	22.6	21.75	225
353	p1129	n1446	20.56	n1447	19.97	30	1.967	HDPE	21.75	21.16	225
354	p1130	n1448	19.87	n1449	19.518	30	1.173	HDPE	21.06	20.79	225
355	p1131	n1447	19.97	n1450	19.493	30	1.591	HDPE	21.16	20.96	225
356	p1132	n1449	19.518	n1451	19.62	30	0.34	HDPE	20.79	20.81	225
357	p1133	n1450	19.493	n1452	19.627	30	0.448	HDPE	20.96	20.93	225
358	p1134	n1452	19.627	n1454	19.68	15.6	0.34	HDPE	20.93	20.87	225
359	p1135	n1454	19.68	n1455	20.036	30	1.186	HDPE	20.87	22.19	225
360	p1136	n1456	20.138	n1457	20.24	30	0.34	HDPE	22.8	21.87	225
361	p1155	n1457	20.24	n1485	20.3	17.7	0.34	HDPE	21.87	21.54	225
362	p1156	n4653	20.34	n1487	21.01	27.6	2.428	HDPE	21.53	22.2	225
363	p1157	n1488	21.09	n1489	21.249	30	0.531	HDPE	22.28	23.21	225
364	p1158	n1489	21.249	n1490	21.351	30	0.34	HDPE	23.21	24.13	225
365	p1162	n1490	21.351	n1495	21.373	6.2	0.34	HDPE	24.13	24.87	225
366	p1163	n1495	21.373	n1496	21.453	23.6	0.34	HDPE	24.87	27.42	225
367	p1164	n1496	21.453	n1497	21.555	30	0.34	HDPE	27.42	26.82	225
368	p1165	n1497	21.555	n1498	21.613	17.1	0.34	HDPE	26.82	25.43	225
369	p1166	n1498	21.613	n1499	21.656	12.9	0.34	HDPE	25.43	24.76	225
370	p1167	n1499	21.656	n1500	21.758	30	0.34	HDPE	24.76	24.1	225
371	p1168	n1500	21.758	n1501	21.86	30	0.34	HDPE	24.1	23.05	225
372	p1169	n1501	21.86	n1502	22.4	30	1.801	HDPE	23.05	23.59	225
373	p1170	n1503	28.49	n1504	30.398	19.1	10	HDPE	29.68	32.77	225
374	p1172	n1505	32.19	n1506	32.127	18.7	0.34	HDPE	33.38	33.46	225
375	p1173	n1506	32.127	n1507	31.74	11.3	3.434	HDPE	33.46	32.93	225
376	p1174	n1507	31.74	n1508	30.29	23.2	6.263	HDPE	32.93	31.48	225
377	p1175	n1508	30.29	n1509	32.277	19.9	10	HDPE	31.48	33.53	225
378	p1176	n1509	32.34	n1510	33.336	10	10	HDPE	33.53	34.6	225
379	p1177	n1510	33.41	n1511	36.393	29.8	10	HDPE	34.6	37.76	225
380	p1178	n1511	36.393	n1512	37.875	29.9	4.95	HDPE	37.76	39.45	225
381	p1285	n4742	24.035	n1667	20.87	31.7	10	HDPE	25.61	22.06	225
382	p1287	n1663	17.754	n1664	19.324	30	5.24	HDPE	19.02	20.59	315
383	p1288	n1664	19.324	n1665	20.645	30	4.408	HDPE	20.59	22.17	315
384	p1289	n1665	20.645	n1666	20.72	30	0.249	HDPE	22.17	22.6	315
385	p1299	n1680	25.49	n1681	24.03	30	4.873	HDPE	26.68	25.22	225
386	p1300	n1681	24.03	n1682	21.08	29.8	9.886	HDPE	25.22	22.27	225
387	p1301	n1682	20.001	n54	17.03	29.7	10	HDPE	22.27	18.22	225
388	p1317	n1702	17.4	n1703	17.28	30	0.4	HDPE	18.59	18.47	225
389	p1318	n1703	17.28	n1704	17.178	30	0.34	HDPE	18.47	18.37	225
390	p1319	n1704	17.178	n1661	16.415	32.6	2.343	HDPE	18.37	18.27	225
392	p1322	n1708	16.634	n1709	16.736	30	0.34	HDPE	18.47	18.57	225
393	p1323	n1710	16.838	n55	16.94	30	0.34	HDPE	18.28	18.13	225
394	p1341	n1730	31.03	n1731	30.85	30	0.6	HDPE	32.22	32.04	225
395	p1342	n4686	29.85	n1733	27.46	31.7	7.532	HDPE	31.04	28.65	225
396	p1343	n1733	27.46	n1734	24.56	29.9	9.712	HDPE	28.65	25.75	225
397	p1344	n1734	24.56	n1735	22.14	29.9	8.094	HDPE	25.75	23.33	225

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398	p1345	n1735	22.14	n1736	20.86	23.8	5.385	HDPE	23.33	22.05	225
399	p1346	n1451	19.62	n1737	19.85	30	0.767	HDPE	20.81	21.04	225
400	p1347	n1737	19.85	n1738	20.31	30	1.533	HDPE	21.04	21.5	225
401	p1348	n1739	19.95	n1856	20.29	30.6	1.113	HDPE	21.14	21.48	225
403	p1350	n1743	20.71	n1744	20.989	21.3	1.309	HDPE	21.9	22.5	225
405	p1352	n1742	21.68	n1746	22.97	30	4.304	HDPE	22.87	24.16	225
406	p1353	n1745	22.52	n1747	23.074	30	1.847	HDPE	23.71	24.9	225
407	p1354	n1746	22.97	n1748	23.431	30	1.535	HDPE	24.16	25.22	225
408	p1355	n1749	23.472	n1750	23.533	17.9	0.34	HDPE	25.55	26.15	225
409	p1356	n1751	23.176	n1752	23.271	27.9	0.34	HDPE	26.05	27.45	225
410	p1357	n1753	23.567	n1754	23.634	20	0.34	HDPE	26.71	27.31	225
411	p1358	n1752	23.271	n1755	23.344	21.7	0.34	HDPE	27.45	27.43	225
412	p1359	n1754	23.634	n1756	23.736	30	0.34	HDPE	27.31	27.11	225
413	p1360	n1755	23.344	n1757	23.446	30	0.34	HDPE	27.43	26.83	225
414	p1361	n1756	23.736	n1758	23.838	30	0.34	HDPE	27.11	26.43	225
415	p1362	n1757	23.446	n1759	23.548	30	0.34	HDPE	26.83	26.05	225
416	p1363	n1758	23.838	n1760	23.94	30	0.34	HDPE	26.43	25.13	225
417	p1364	n1759	23.548	n1761	23.65	30	0.34	HDPE	26.05	24.84	225
420	p1367	n19	22.77	n1764	22.25	30	1.734	HDPE	23.96	23.44	225
421	p1368	n1763	22.81	n1765	22.31	30	1.667	HDPE	24	23.5	225
422	p1369	n1764	22.25	n1766	22.05	30	0.667	HDPE	23.44	23.24	225
423	p1370	n1765	22.31	n1767	21.95	30	1.2	HDPE	23.5	23.14	225
424	p1371	n1766	22.05	n1768	21.89	30	0.533	HDPE	23.24	23.08	225
425	p1372	n1767	21.95	n1769	21.75	30	0.667	HDPE	23.14	22.94	225
426	p1373	n1768	21.89	n1770	21.7	30	0.633	HDPE	23.08	22.89	225
427	p1374	n1769	21.75	n1771	21.59	30	0.533	HDPE	22.94	22.78	225
428	p1375	n1770	21.7	n1772	21.598	30	0.34	HDPE	22.89	22.82	225
429	p1376	n1771	21.59	n1773	21.38	30	0.7	HDPE	22.78	22.57	225
430	p1377	n1772	21.598	n1774	21.496	30	0.34	HDPE	22.82	22.81	225
431	p1378	n1773	21.38	n4616	21.266	33.6	0.34	HDPE	22.57	22.68	225
432	p1379	n1776	21.131	n2072	21.016	33.7	0.34	HDPE	23.46	24.25	225
433	p1380	n1778	20.914	n1779	20.812	30	0.34	HDPE	25.02	25.35	225
434	p1382	n1782	20.598	n1783	20.497	30	0.34	HDPE	24.12	22.81	225
435	p1383	n1783	20.497	n1784	20.1	30	1.323	HDPE	22.81	21.29	225
436	p1384	n1784	20.1	n1785	18.63	30	4.907	HDPE	21.29	19.82	225
437	p1385	n1785	18.63	n1786	17.35	22.5	5.689	HDPE	19.82	18.54	225
438	p1386	n1786	17.35	n1787	15.61	30	5.81	HDPE	18.54	16.8	225
439	p1387	n1787	15.61	n1788	14.02	29.9	5.307	HDPE	16.8	15.21	225
440	p1388	n1789	13.53	n1790	12.9	30	2.101	HDPE	14.72	14.09	225
441	p1389	n1790	12.9	n1791	12.31	30	1.967	HDPE	14.09	13.5	225
442	p1390	n1791	12.31	n1792	11.47	30	2.801	HDPE	13.5	12.66	225
443	p1391	n1792	11.47	n88	10.68	30	2.634	HDPE	12.66	11.87	225
444	p1392	n1793	13.114	n1794	11.234	29.9	6.279	HDPE	14.38	12.5	315
445	p1393	n1795	10.774	n1796	8.984	22.4	7.988	HDPE	12.04	10.25	315
446	p1394	n1796	8.984	n1797	6.624	29.9	7.89	HDPE	10.25	7.89	315
447	p1395	n1797	6.624	n1798	5.314	30	4.372	HDPE	7.89	6.58	315
448	p1396	n1798	5.314	n1799	5.24	30	0.249	HDPE	6.58	6.52	315
449	p1397	n1799	5.24	n1800	5.165	30	0.249	HDPE	6.52	6.52	315
450	p1398	n1800	5.165	n62	5.09	30	0.249	HDPE	6.52	6.84	315
451	p1404	n59	8.789	n1807	8.885	28.2	0.34	HDPE	10.77	10.7	225
452	p1405	n1808	8.902	n1809	8.992	26.5	0.34	HDPE	10.57	10.35	225
453	p1406	n1810	9.77	n76	10.217	17.7	2.527	HDPE	10.96	11.52	225
454	p1407	n76	10.217	n1811	10.241	7.1	0.34	HDPE	11.52	11.84	225
455	p1408	n1812	10.343	n1813	10.422	23.3	0.34	HDPE	13.52	14.35	225
456	p1409	n85	13.39	n1814	14.34	23.4	4.053	HDPE	14.58	15.53	225
457	p1410	n1814	14.34	n1815	14.97	16.8	3.741	HDPE	15.53	16.16	225
458	p1411	n1816	15.04	n1817	15.16	6.8	1.777	HDPE	16.23	16.35	225
459	p1412	n1818	15.38	n1819	15.85	25	1.878	HDPE	16.57	17.04	225
460	p1414	n56	10.806	n1821	13.415	29.3	8.905	HDPE	13.67	15.3	225
461	p1415	n1821	13.415	n1823	13.457	12.5	0.34	HDPE	15.3	16.22	225
462	p1416	n1823	13.457	n1820	13.529	21	0.34	HDPE	16.22	17.25	225
463	p1418	n1820	13.529	n1825	13.631	30	0.34	HDPE	17.25	17.62	225
464	p1419	n1825	13.631	n1826	13.733	30	0.34	HDPE	17.62	17.43	225
465	p1420	n1826	13.733	n1827	13.818	25	0.34	HDPE	17.43	17.89	225

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466	p1421	n1828	14.19	n1829	14.107	24.4	0.34	HDPE	15.38	16.12	225
467	p1422	n1829	14.107	n1830	14.005	30	0.34	HDPE	16.12	17.03	225
468	p1423	n1831	13.903	n1827	13.818	25.2	0.34	HDPE	17.55	17.89	225
469	p1424	n1832	16.75	n1833	16.3	30	1.5	HDPE	17.94	17.49	225
470	p1425	n1833	16.3	n1834	15.83	30	1.567	HDPE	17.49	17.02	225
471	p1426	n1834	15.83	n1835	14.556	30	4.248	HDPE	17.02	16.45	225
472	p1427	n1836	14	n1837	12.72	25.5	5.016	HDPE	15.19	13.91	225
473	p1428	n1837	12.72	n1838	11.81	30	3.034	HDPE	13.91	13	225
474	p1429	n1838	11.81	n1839	10.89	30	3.068	HDPE	13	12.08	225
475	p1430	n1840	10.47	n1841	10.421	14.6	0.34	HDPE	11.66	11.73	225
476	p1431	n56	10.806	n1842	10.839	9.8	0.34	HDPE	13.67	13.16	225
478	p1433	n1841	10.421	n1843	7.68	29.8	9.184	HDPE	11.73	8.87	225
479	p1434	n1843	7.68	n1844	7.44	12.6	1.905	HDPE	8.87	8.63	225
480	p1435	n1844	7.44	n1845	6.98	17.4	2.645	HDPE	8.63	8.17	225
481	p1436	n1845	6.98	n1846	6.878	30	0.34	HDPE	8.17	8.15	225
482	p1437	n1846	6.878	n1848	7.91	29.9	3.447	HDPE	8.15	9.1	225
483	p1438	n1848	7.91	n1849	9.88	29.9	6.582	HDPE	9.1	11.07	225
484	p1439	n1849	9.88	n1850	10.94	24.7	4.286	HDPE	11.07	12.13	225
485	p1440	n1851	11.04	n1852	11.98	13.3	7.057	HDPE	12.23	13.17	225
486	p1441	n1852	11.98	n1854	12.67	14.3	4.815	HDPE	13.17	13.86	225
487	p1442	n1854	12.67	n1855	13.73	30	3.536	HDPE	13.86	14.92	225
488	p1443	n1855	13.73	n49	14.95	27.6	4.422	HDPE	14.92	16.14	225
489	p1444	n1856	20.29	n1857	20.89	21.9	2.74	HDPE	21.48	22.08	225
490	p1445	n1857	20.89	n1858	22.52	30	5.441	HDPE	22.08	23.71	225
491	p1446	n1744	20.989	n1860	21.05	18	0.34	HDPE	22.5	22.24	225
492	p1447	n1861	21.53	n1862	23	30	4.907	HDPE	22.72	24.19	225
493	p1448	n1858	22.52	n1863	23.97	30	4.84	HDPE	23.71	25.16	225
494	p1449	n1862	23	n1864	24.51	30	5.04	HDPE	24.19	25.7	225
495	p1450	n1865	24.74	n1866	26.03	30	4.304	HDPE	25.93	27.22	225
496	p1451	n1866	26.03	n1867	27.15	30	3.736	HDPE	27.22	28.34	225
497	p1452	n1867	27.15	n1868	28.05	30	3.001	HDPE	28.34	29.24	225
498	p1453	n1868	28.05	n1869	28.74	30	2.301	HDPE	29.24	29.93	225
499	p1454	n1869	28.74	n1870	28.92	30	0.6	HDPE	29.93	30.36	225
500	p1455	n1870	28.92	n1873	29.036	34.1	0.34	HDPE	30.36	30.62	225
501	p1456	n1508	30.29	n1872	29.34	16.6	5.733	HDPE	31.48	30.53	225
502	p1457	n1873	29.036	n1874	29.138	30	0.34	HDPE	30.62	30.6	225
503	p1458	n1874	29.138	n1875	29.24	30	0.34	HDPE	30.6	30.43	225
504	p1484	n1505	32.19	n1906	34.939	27.5	10	HDPE	33.38	36.72	225
505	p1485	n1906	35.53	n1907	35.58	6	0.829	HDPE	36.72	36.77	225
506	p1486	n1907	35.58	n1908	35.943	23.4	1.549	HDPE	36.77	37.37	225
507	p1487	n1908	35.943	n4644	36.06	34.6	0.34	HDPE	37.37	37.25	225
508	p1488	n1910	36.72	n1911	37.399	8.4	8.089	HDPE	37.91	38.6	225
509	p1489	n1911	37.399	n1912	37.49	26.9	0.34	HDPE	38.6	38.68	225
510	p1513	n1942	41.87	n1943	41.79	23.5	0.34	HDPE	43.06	43.04	225
511	p1514	n1944	41.63	n1945	41.7	17.6	0.397	HDPE	42.82	42.89	225
512	p1515	n1944	41.63	n1946	41.56	20.5	0.34	HDPE	42.82	42.89	225
513	p1516	n1947	41.528	n1948	41.27	30	0.86	HDPE	42.81	42.46	225
514	p1517	n1949	40.54	n1948	41.27	30	2.434	HDPE	41.73	42.46	225
515	p1518	n1752	26.26	n1950	29.03	29.9	9.274	HDPE	27.45	30.22	225
516	p1519	n1950	29.03	n1951	32.01	29.8	10	HDPE	30.22	33.67	225
517	p1520	n1951	32.48	n1952	35.08	29.9	8.701	HDPE	33.67	36.27	225
518	p1521	n1952	35.08	n1953	37.16	27.6	7.539	HDPE	36.27	38.35	225
519	p1522	n1954	39.15	n1955	40.15	30	3.336	HDPE	40.34	41.34	225
520	p1523	n1955	40.15	n1949	40.54	16.5	2.362	HDPE	41.34	41.73	225
521	p1524	n1956	40.576	n1957	40.678	30	0.34	HDPE	41.81	41.88	225
522	p1525	n1957	40.678	n1958	40.78	30	0.34	HDPE	41.88	41.97	225
523	p1526	n1958	40.78	n1959	41.06	30	0.933	HDPE	41.97	42.25	225
524	p1527	n1959	41.06	n1960	41.34	30	0.933	HDPE	42.25	42.53	225
525	p1570	n1755	26.24	n2018	27.13	20.2	4.399	HDPE	27.43	28.32	225
526	p1571	n2018	27.13	n2019	29.31	29.9	7.286	HDPE	28.32	30.5	225
527	p1572	n2020	31.01	n2021	32.12	24.3	4.564	HDPE	32.2	33.31	225
528	p1573	n2022	32.45	n2023	34.5	29.9	6.852	HDPE	33.64	35.69	225
529	p1574	n2023	34.5	n2024	36.53	29.9	6.782	HDPE	35.69	37.72	225
530	p1575	n2024	36.53	n2025	37.83	30	4.338	HDPE	37.72	39.02	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)
531	p1607	n2072	21.016	n2073	23.009	30	6.644	HDPE	24.25	24.21	225
532	p1608	n2073	23.009	n2074	23.07	18.2	0.34	HDPE	24.21	24.26	225
533	p1609	n2075	23.39	n2076	24.5	30	3.702	HDPE	24.58	25.69	225
534	p1610	n2076	24.5	n2078	25.86	33.5	4.065	HDPE	25.69	27.05	225
535	p1618	n1781	23.158	n2085	23.19	9.5	0.34	HDPE	24.59	24.38	225
536	p1619	n2085	23.19	n2086	23.53	25.5	1.333	HDPE	24.38	24.72	225
537	p1620	n2086	23.53	n2088	24.7	29.7	3.943	HDPE	24.72	25.89	225
538	p1621	n2088	24.7	n2090	25.3	34.8	1.725	HDPE	25.89	26.49	225
539	p1622	n2090	25.3	n2091	26.31	30	3.37	HDPE	26.49	27.5	225
540	p3301	n4335	14.76	n4336	14.658	30	0.34	HDPE	15.95	16.08	225
541	p3848	n1789	13.53	n4603	13.64	7.6	1.438	HDPE	14.72	14.83	225
542	p3850	n4603	13.64	n4604	13.85	4.2	5.03	HDPE	14.83	15.04	225
543	p3852	n4604	13.85	n1788	14.02	3.4	5.031	HDPE	15.04	15.21	225
544	p3874	n1782	20.598	n1781	20.643	13.2	0.34	HDPE	24.12	24.59	225
545	p3882	n2075	23.39	n2074	23.07	11.6	2.747	HDPE	24.58	24.26	225
546	p3884	n1781	20.643	n4614	20.766	36.2	0.34	HDPE	24.59	25.48	225
547	p3885	n4614	20.766	n1779	20.812	13.5	0.34	HDPE	25.48	25.35	225
548	p3886	n1778	20.914	n2072	21.016	30	0.34	HDPE	25.02	24.25	225
549	p3888	n1776	21.131	n4615	21.233	30	0.34	HDPE	23.46	22.91	225
550	p3889	n4615	21.233	n4616	21.266	9.8	0.34	HDPE	22.91	22.68	225
551	p3891	n4615	21.233	n1774	21.496	14.4	1.835	HDPE	22.91	22.81	225
552	p3892	n19	22.77	n1762	22.91	10.6	1.316	HDPE	23.96	24.1	225
553	p3903	n2021	32.12	n4623	32.25	5.6	2.3	HDPE	33.31	33.44	225
554	p3904	n4623	32.25	n2022	32.45	4.5	4.473	HDPE	33.44	33.64	225
555	p3909	n2025	37.83	n4626	38.02	4.9	3.852	HDPE	39.02	39.21	225
556	p3910	n4626	38.02	n4627	39	18.9	5.196	HDPE	39.21	40.19	225
557	p3911	n4627	39	n2026	39.55	6.1	8.942	HDPE	40.19	40.74	225
558	p3912	n1949	40.54	n1956	40.576	7.8	0.461	HDPE	41.73	41.81	225
559	p3913	n1947	41.528	n1946	41.56	9.5	0.34	HDPE	42.81	42.89	225
560	p3914	n1945	41.7	n1943	41.79	12.4	0.728	HDPE	42.89	43.04	225
561	p3915	n1942	41.87	n4628	41.934	7.1	0.905	HDPE	43.06	43.15	225
562	p3916	n4628	41.934	n4629	41.97	10.6	0.34	HDPE	43.15	43.16	225
563	p3917	n4629	41.97	n1941	42.08	18.8	0.584	HDPE	43.16	43.27	225
564	p3940	n1910	36.72	n4643	36.26	8.3	5.535	HDPE	37.91	37.45	225
565	p3941	n4643	36.26	n4644	36.06	8.7	2.303	HDPE	37.45	37.25	225
566	p3943	n1503	27.887	n4645	27.08	8.1	10	HDPE	29.68	28.27	225
567	p3945	n4645	26.02	n4647	25.07	9.5	10	HDPE	28.27	26.26	225
568	p3946	n4647	24.382	n4648	23.59	7.9	10	HDPE	26.26	24.78	225
569	p3947	n4648	23.445	n4649	22.73	7.2	10	HDPE	24.78	23.92	225
570	p3948	n4649	22.73	n1502	22.4	7.5	4.392	HDPE	23.92	23.59	225
571	p3949	n1873	29.036	n1872	29.34	4.1	7.348	HDPE	30.62	30.53	225
572	p3951	n1512	37.875	n4650	37.97	28	0.34	HDPE	39.45	39.16	225
573	p3956	n1488	21.09	n1487	21.01	8.2	0.974	HDPE	22.28	22.2	225
574	p3957	n1485	20.3	n4653	20.34	11.9	0.34	HDPE	21.54	21.53	225
575	p3959	n1954	39.15	n4654	38.78	7.5	4.91	HDPE	40.34	39.97	225
576	p3960	n4654	38.78	n4655	38.09	12.1	5.684	HDPE	39.97	39.28	225
577	p3961	n4655	38.09	n4656	37.33	10.3	7.407	HDPE	39.28	38.52	225
578	p3962	n1953	37.16	n4656	37.33	2.3	7.309	HDPE	38.35	38.52	225
579	p3963	n2020	31.01	n4657	30.55	10.1	4.536	HDPE	32.2	31.74	225
580	p3964	n4657	30.55	n2019	29.31	19.8	6.259	HDPE	31.74	30.5	225
581	p3965	n1753	23.567	n1750	23.533	10	0.34	HDPE	26.71	26.15	225
582	p3966	n1749	23.472	n1748	23.431	12.1	0.34	HDPE	25.55	25.22	225
583	p3967	n1751	23.176	n4658	23.138	11.2	0.34	HDPE	26.05	25.62	225
584	p3968	n4658	23.138	n1747	23.074	18.8	0.34	HDPE	25.62	24.9	225
585	p3971	n1860	21.05	n1861	21.53	11.9	4.044	HDPE	22.24	22.72	225
586	p3973	n1863	23.97	n1865	24.74	17.6	4.377	HDPE	25.16	25.93	225
587	p3974	n1813	10.422	n85	10.445	6.6	0.34	HDPE	14.35	14.58	225
588	p3975	n1815	14.97	n1816	15.04	6.4	1.095	HDPE	16.16	16.23	225
589	p3976	n1817	15.16	n1818	15.38	5	4.429	HDPE	16.35	16.57	225
590	p3978	n1830	14.005	n1831	13.903	30	0.34	HDPE	17.03	17.55	225
591	p3980	n4336	14.658	n1835	14.556	30	0.34	HDPE	16.08	16.45	225
592	p3983	n1836	14	n1835	14.556	11.6	4.801	HDPE	15.19	16.45	225
593	p3986	n1840	10.47	n1839	10.89	15.4	2.729	HDPE	11.66	12.08	225
594	p3989	n1807	8.885	n1808	8.902	5.1	0.34	HDPE	10.7	10.57	225



ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculate d) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
595	p3990	n1809	8.992	n4663	9.046	15.8	0.34	HDPE	10.35	10.26	225
596	p3991	n4663	9.046	n4664	9.068	6.4	0.34	HDPE	10.26	10.29	225
597	p3992	n4664	9.068	n4665	9.08	3.7	0.34	HDPE	10.29	10.27	225
598	p3993	n4665	9.08	n4666	9.6	7.6	6.835	HDPE	10.27	10.79	225
599	p3994	n4666	9.6	n1810	9.77	2.3	7.253	HDPE	10.79	10.96	225
600	p3995	n1811	10.241	n4667	10.305	19	0.34	HDPE	11.84	12.82	225
601	p3996	n4667	10.305	n4668	10.334	8.5	0.34	HDPE	12.82	13.35	225
602	p3997	n4668	10.334	n1812	10.343	2.5	0.34	HDPE	13.35	13.52	225
603	p4000	CW-2	2.191	n72	2.421	12.2	1.885	HDPE	3.49	3.72	355
604	p4003	n1795	10.774	n1794	11.234	7.5	6.133	HDPE	12.04	12.5	315
605	p4004	n1793	13.114	n4672	14.554	30	4.805	HDPE	14.38	15.82	315
606	p4005	n4672	14.554	n1661	16.415	33.3	5.58	HDPE	15.82	18.27	315
607	p4011	n1663	17.754	n1661	16.415	18.9	7.077	HDPE	19.02	18.27	315
608	p4012	n1661	16.415	n4677	16.533	34.7	0.34	HDPE	18.27	18.22	225
609	p4013	n1709	16.736	n1710	16.838	30	0.34	HDPE	18.57	18.28	225
610	p4023	n1850	10.94	n1851	11.04	7.4	1.344	HDPE	12.13	12.23	225
611	p4037	n1731	30.85	n4685	30.55	13.2	2.273	HDPE	32.04	31.74	225
612	p4038	n4685	30.55	n4686	29.85	15	4.679	HDPE	31.74	31.04	225
613	p4040	n1736	20.86	n1741	20.82	6.2	0.645	HDPE	22.05	22.01	225
614	p4041	n1741	20.82	n1738	20.31	17.3	2.951	HDPE	22.01	21.5	225
615	p4042	n1743	20.71	n1856	20.29	18.6	2.26	HDPE	21.9	21.48	225
616	p4046	n1739	19.95	n1452	19.627	30	1.077	HDPE	21.14	20.93	225
617	p4048	n1455	20.036	n4688	20.084	14.2	0.34	HDPE	22.19	22.71	225
618	p4049	n4688	20.084	n1456	20.138	15.8	0.34	HDPE	22.71	22.8	225
619	p4073	n1448	19.87	n1445	20.46	30	1.967	HDPE	21.06	21.65	225
620	p4074	n1441	23.48	n4703	24.42	21.5	4.38	HDPE	24.67	25.61	225
621	p4075	n1439	23.49	n4704	24.33	21.2	3.957	HDPE	24.68	25.52	225
622	p4143	n1658	24.75	n4742	24.035	9.3	7.676	HDPE	25.94	25.61	225
623	p4145	n1666	20.72	n4743	20.735	6.3	0.249	HDPE	22.6	22.62	315
624	p4146	n4743	20.735	n4744	20.783	19.1	0.249	HDPE	22.62	22.26	315
625	p4147	n4744	20.783	n1667	20.794	4.6	0.249	HDPE	22.26	22.06	315
629	CO-2	n1708	16.634	n4677	16.533	29.9	0.34	HDPE	18.47	18.22	225
637	CO-6	n1450	19.493	LS 3	19.451	12.2	0.34	HDPE	20.96	20.79	225
640	CO-8	n1745	22.52	LS 4	22.444	22.4	0.34	HDPE	23.71	23.71	225
641	CO-10	n1449	19.518	n1450	19.493	7.5	0.34	HDPE	20.79	20.96	225
642	CO-12	n1742	21.68	n1741	20.82	30	2.87	HDPE	22.87	22.01	225
658	CO-14	n1846	6.878	LS 2	6.834	13	0.34	HDPE	8.15	8.1	225
660	p1432(1)	n1842	10.839	MH-5	10.914	22.1	0.34	HDPE	13.16	12.104	225
376	p1640	n2114	24.75	n2115	24.245	11.7	4.321	HDPE	25.94	25.77	225
377	p1641	n2116	23.217	n2117	21.72	29.9	5	HDPE	24.81	22.91	225
378	p1642	n2118	18.134	n2119	16.64	29.9	5	HDPE	20.51	17.83	225
379	p1643	n2119	16.448	n2120	14.95	29.9	5	HDPE	17.83	16.14	225
380	p1644	n1785	18.63	n2122	17.64	34.8	3.302	HDPE	19.82	18.83	225
381	p1645	n2122	17.64	n2123	17.04	30	2.001	HDPE	18.83	18.23	225
382	p1646	n2123	17.04	n2124	16.68	30	1.2	HDPE	18.23	17.87	225
383	p1647	n2125	16.14	n2126	15.57	30	1.901	HDPE	17.33	16.76	225
384	p1648	n2126	15.57	n2120	14.95	30	2.067	HDPE	16.76	16.14	225
385	p1649	n2120	14.95	n2127	14.43	23.2	2.238	HDPE	16.14	15.62	225
386	p1650	n2127	14.43	n2128	13.97	19.2	2.397	HDPE	15.62	15.16	225
387	p1651	n2128	13.97	n2130	13.27	33.9	2.066	HDPE	15.16	14.46	225
388	p1652	n2131	12.6	n2132	11.75	19.5	4.359	HDPE	13.79	12.94	225
389	p1653	n2133	11.43	n2134	10.22	30	4.037	HDPE	12.62	11.41	225
390	p1654	n4604	13.85	n2136	12.86	29.9	3.533	HDPE	15.04	14.05	225
391	p1655	n2136	12.86	n2137	12.24	30	2.067	HDPE	14.05	13.43	225
392	p1656	n2137	12.24	n2138	11.66	30	1.934	HDPE	13.43	12.85	225
393	p1657	n2138	11.66	n2139	11.14	30	1.733	HDPE	12.85	12.33	225
394	p1658	n2139	11.14	n2134	10.22	29.3	3.139	HDPE	12.33	11.41	225
395	p1668	n2150	9.88	n2151	9.61	30	0.9	HDPE	11.07	10.8	225
396	p1669	n2151	9.61	n2152	9.43	30	0.6	HDPE	10.8	10.62	225
397	p1670	n2152	9.43	n2153	9.328	30	0.34	HDPE	10.62	10.53	225
398	p1676	n2153	9.328	n2161	9.55	30	0.74	HDPE	10.53	10.74	225
399	p1689	n2175	10.73	n2176	11.46	30	2.435	HDPE	11.92	12.65	225
400	p1690	n2176	11.46	n2177	12.34	30	2.934	HDPE	12.65	13.53	225
401	p1691	n2177	12.34	n2178	13.25	30	3.034	HDPE	13.53	14.44	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculate d) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
402	p1692	n2178	13.25	n2179	13.693	30	1.477	HDPE	14.44	15.37	225
403	p1693	n2179	13.693	n2180	13.795	30	0.34	HDPE	15.37	15.7	225
404	p1694	n2180	13.795	n2181	13.892	28.4	0.34	HDPE	15.7	15.43	225
405	p1695	n2182	13.925	n2183	13.954	8.4	0.34	HDPE	15.46	15.44	225
406	p1696	n2183	13.954	n2184	13.999	13.5	0.34	HDPE	15.44	15.41	225
407	p1697	n2184	13.999	n2186	14.12	35.6	0.34	HDPE	15.41	15.31	225
408	p1710	n2175	10.73	n2200	11.38	31.3	2.078	HDPE	11.92	12.57	225
409	p1711	n2200	11.38	n2201	12.49	30	3.702	HDPE	12.57	13.68	225
410	p1712	n2202	13.7	n2203	14.98	30	4.271	HDPE	14.89	16.17	225
411	p1713	n2204	13.49	n2205	14.44	23.6	4.022	HDPE	14.68	15.63	225
412	p1714	n2205	14.44	n2206	15.124	13.7	5	HDPE	15.63	16.97	225
413	p1716	n2206	15.124	n2208	15.698	16.9	3.39	HDPE	16.97	17.08	225
414	p1717	n2208	15.698	n2209	15.8	30	0.34	HDPE	17.08	16.99	225
415	p1718	n2210	16.669	n2211	16.567	30	0.34	HDPE	18.11	18.44	225
416	p1719	n2212	17.07	n2213	17.276	30	0.687	HDPE	18.26	18.57	225
417	p1720	n2211	16.567	n2214	16.465	30	0.34	HDPE	18.44	18.63	225
418	p1721	n2214	16.465	n2215	16.363	30	0.34	HDPE	18.63	18.72	225
419	p1722	n2216	17.378	n2217	17.48	30	0.34	HDPE	18.63	18.67	225
420	p1723	n2215	16.363	n2218	16.261	30	0.34	HDPE	18.72	18.94	225
421	p1724	n2217	17.48	n2219	17.726	30	0.82	HDPE	18.67	18.99	225
422	p1725	n2218	16.261	n2220	16.159	30	0.34	HDPE	18.94	19.24	225
423	p1726	n2219	17.726	n2221	17.828	30	0.34	HDPE	18.99	19.25	225
424	p1727	n2220	16.159	n2222	16.057	30	0.34	HDPE	19.24	19.05	225
425	p1728	n2221	17.828	n2223	17.93	30	0.34	HDPE	19.25	19.12	225
426	p1729	n2224	19.81	n2225	21.307	29.9	5	HDPE	21	22.94	225
427	p1730	n2225	21.75	n2226	23.246	29.9	5	HDPE	22.94	25.3	225
428	p1731	n2226	24.11	n2227	25.606	29.9	5	HDPE	25.3	27.55	225
429	p1732	n2228	27.53	n2229	28.194	13.3	5	HDPE	28.72	29.92	225
430	p1733	n2229	28.73	n2230	29.621	19	4.702	HDPE	29.92	31.31	225
431	p1734	n4547	29.658	n2232	29.76	30.1	0.34	HDPE	31.14	30.95	225
432	p1735	n2232	29.76	n2233	31.257	29.9	5	HDPE	30.95	32.77	225
433	p1736	n2234	31.867	n2235	31.968	30	0.34	HDPE	33.92	34.68	225
434	p1738	n2238	27.852	n2239	26.36	29.8	5	HDPE	30.63	27.55	225
435	p1739	n2239	25.024	n2240	23.53	29.9	5	HDPE	27.55	24.72	225
436	p1740	n2186	14.12	n2241	14.9	30	2.601	HDPE	15.31	16.09	225
437	p1741	n2241	14.9	n2242	16.397	29.9	5	HDPE	16.09	17.78	225
438	p1742	n2242	16.59	n2243	18.085	29.9	5	HDPE	17.78	20.16	225
439	p1743	n2243	18.97	n2244	20.464	29.9	5	HDPE	20.16	22.81	225
440	p1744	n2244	21.62	n2245	22.113	9.9	5	HDPE	22.81	23.74	225
441	p1745	n2240	23.055	n2245	22.55	10.1	5	HDPE	24.72	23.74	225
442	p1746	n2245	22.55	n2246	24.038	29.8	5	HDPE	23.74	27.46	225
443	p1747	n2246	26.27	n2247	27.099	16.6	5	HDPE	27.46	29.76	225
444	p1748	n4549	29.8	n2249	31.171	27.4	5	HDPE	30.99	33.09	225
445	p1755	n2258	15.956	n2259	15.854	30	0.34	HDPE	18.42	17.68	225
446	p1756	n2260	17.83	n2261	17.33	21.3	2.35	HDPE	19.02	18.52	225
447	p1757	n2261	17.33	n2262	16.59	30	2.467	HDPE	18.52	17.78	225
448	p1758	n2259	15.854	n2263	15.52	30	1.112	HDPE	17.68	16.71	225
449	p1759	n2262	16.59	n2264	15.65	30	3.134	HDPE	17.78	16.84	225
450	p1760	n2263	15.52	n2265	14.26	30	4.204	HDPE	16.71	15.45	225
451	p1761	n2265	14.26	n2266	13.02	30	4.137	HDPE	15.45	14.21	225
452	p1762	n2267	14.25	n2268	13.042	30	4.032	HDPE	15.44	14.25	225
453	p1763	n2268	13.042	n2270	13.13	26.1	0.34	HDPE	14.25	14.32	225
454	p1764	n2270	13.13	n2271	13.87	30	2.467	HDPE	14.32	15.06	225
455	p1765	n2271	13.87	n2272	14.28	28	1.466	HDPE	15.06	15.47	225
456	p1766	n2273	14.38	n2274	14.95	24.1	2.363	HDPE	15.57	16.14	225
457	p1767	n2274	14.95	n2275	16.448	30	5	HDPE	16.14	17.7	225
458	p1768	n2275	16.51	n2276	18.001	29.8	5	HDPE	17.7	21.01	225
459	p1769	n2276	19.82	n2277	21.307	29.7	5	HDPE	21.01	25.04	225
460	p1770	n2277	23.85	n2278	24.421	11.4	5	HDPE	25.04	26.62	225
461	p1773	n2282	30.996	n2283	29.64	27.1	5	HDPE	33.82	30.83	225
462	p1774	n2283	28.675	n2284	27.18	29.9	5	HDPE	30.83	28.37	225
463	p1775	n2284	27.18	n2285	25.92	30	4.204	HDPE	28.37	27.11	225
464	p1776	n2285	25.92	n2286	25.35	30	1.901	HDPE	27.11	26.54	225
465	p1777	n2286	25.35	n2287	25.26	10.1	0.896	HDPE	26.54	26.45	225

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculate d) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
466	p1778	n2288	25.037	n2289	23.54	29.9	5	HDPE	26.32	24.73	225
467	p1779	n2289	21.838	n2290	20.81	20.5	5	HDPE	24.73	22	225
468	p1780	n2291	21.31	n2292	21.259	15	0.34	HDPE	22.5	22.69	225
469	p1781	n2292	21.259	n2293	20.049	29.7	4.077	HDPE	22.69	21.59	225
470	p1782	n2293	20.049	n2294	19.51	10.8	5	HDPE	21.59	20.7	225
471	p1783	n2294	19.478	n2295	18.52	19.2	5	HDPE	20.7	19.71	225
472	p1784	n2295	18.52	n2296	17.63	30	2.969	HDPE	19.71	18.82	225
473	p1785	n2296	17.63	n2298	16.58	29.8	3.521	HDPE	18.82	17.77	225
474	p1786	n2298	16.067	n2299	14.57	29.9	5	HDPE	17.77	15.76	225
475	p1787	n2299	14.57	n2302	14.92	15.1	2.319	HDPE	15.76	16.11	225
476	p1789	n2302	14.92	n2303	16.416	29.9	5	HDPE	16.11	18.11	225
477	p1790	n2303	16.416	n2305	17.16	16.7	4.453	HDPE	18.11	18.35	225
478	p1791	n2305	17.16	n2306	17.813	13.1	5	HDPE	18.35	19.76	225
479	p1792	n2306	18.57	n2307	20.067	29.9	5	HDPE	19.76	21.62	225
480	p1835	n2266	13.02	n2366	11.93	30	3.636	HDPE	14.21	13.12	225
481	p1836	n2268	13.042	n2367	11.93	30	3.707	HDPE	14.25	13.12	225
482	p1837	n2366	11.93	n2368	10.94	30	3.302	HDPE	13.12	12.13	225
483	p1838	n2367	11.93	n2369	10.93	30	3.336	HDPE	13.12	12.12	225
484	p1839	n2368	10.94	n2370	10.17	30	2.568	HDPE	12.13	11.36	225
485	p1840	n2369	10.93	n2371	10.18	30	2.501	HDPE	12.12	11.37	225
486	p1841	n2370	10.17	n2372	9.73	30	1.467	HDPE	11.36	10.92	225
487	p1842	n2371	10.18	n2373	9.68	30	1.667	HDPE	11.37	10.87	225
488	p1843	n2372	9.73	n2374	9.37	30	1.2	HDPE	10.92	10.56	225
489	p1844	n2373	9.68	n2375	9.44	30	0.8	HDPE	10.87	10.63	225
490	p1845	n2375	9.44	n2376	9.31	30	0.433	HDPE	10.63	10.5	225
491	p1846	n2377	9.17	n2378	9.068	30	0.34	HDPE	10.36	10.51	225
492	p1847	n2376	9.31	n2379	9.208	30	0.34	HDPE	10.5	10.53	225
493	p1848	n2378	9.068	n2380	8.68	30	1.294	HDPE	10.51	9.87	225
494	p1849	n2379	9.208	n2381	8.72	30	1.627	HDPE	10.53	9.91	225
495	p1850	n2382	8.21	n2384	8.65	11.9	3.713	HDPE	9.4	9.84	225
496	p1851	n2384	8.65	n2385	10.068	28.4	5	HDPE	9.84	12.46	225
497	p1852	n2384	8.65	n2386	9.69	30	3.469	HDPE	9.84	10.88	225
498	p1853	n2386	9.69	n2388	10.41	29.8	2.418	HDPE	10.88	11.6	225
499	p1854	n2388	10.41	n2389	10.85	32.2	1.366	HDPE	11.6	12.04	225
500	p1855	n2389	10.85	n2390	12.344	29.9	5	HDPE	12.04	14.35	225
501	p1856	n2390	12.344	n4605	13.43	30.8	3.526	HDPE	14.35	14.62	225
502	p1857	n2389	10.85	n2393	11.008	34.8	0.454	HDPE	12.04	12.2	225
503	p1858	n2393	11.008	n2394	11.11	30	0.34	HDPE	12.2	12.3	225
504	p1859	n2394	11.11	n2396	11.6	9.8	5	HDPE	12.3	13.33	225
505	p1860	n2396	12.14	n2397	13.57	30	4.773	HDPE	13.33	14.76	225
506	p1861	n2397	13.57	n2398	14.29	30	2.401	HDPE	14.76	15.48	225
507	p1862	n2398	14.29	n2399	14.93	30	2.134	HDPE	15.48	16.12	225
508	p1863	n2399	14.93	n2400	15.81	30	2.934	HDPE	16.12	17	225
509	p1864	n2400	15.81	n2402	15.94	9.6	1.349	HDPE	17	17.13	225
510	p1865	n2402	15.94	n2403	16.21	14.9	1.816	HDPE	17.13	17.4	225
511	p1866	n2404	16.23	n2405	16.64	18.3	2.234	HDPE	17.42	17.83	225
512	p1867	n2406	17.221	n2405	16.64	11.6	5	HDPE	18.63	17.83	225
513	p1868	n2407	18.81	n2290	19.54	14.6	5	HDPE	20	22	225
514	p1869	n2394	11.11	n2409	11.57	24.8	1.856	HDPE	12.3	12.76	225
515	p1870	n2409	11.57	n2410	11.75	30	0.6	HDPE	12.76	12.94	225
516	p1872	n2410	11.75	n4532	13.278	30.5	5	HDPE	12.94	15.33	225
517	p1873	n2410	11.75	n2413	12	29.6	0.845	HDPE	12.94	13.19	225
518	p1874	n2414	12.85	n2415	13.92	24	4.458	HDPE	14.04	15.11	225
519	p1875	n2416	14.27	n2418	14.748	9.6	5	HDPE	15.46	15.94	225
520	p1876	n2418	14.75	n2419	15.77	20.4	5	HDPE	15.94	17.07	225
521	p1877	n2419	15.77	n2420	16.71	30	3.137	HDPE	17.07	17.9	225
522	p1878	n2421	14.87	n2422	15.09	13.1	1.687	HDPE	16.06	16.28	225
523	p1879	n2423	15.3	n2424	15.694	30	1.314	HDPE	16.49	16.93	225
524	p1880	n2424	15.694	n2425	15.726	9.4	0.34	HDPE	16.93	17.26	225
525	p1881	n2426	16.817	n2427	17.55	30	2.446	HDPE	18.37	18.74	225
526	p1882	n2428	15.761	n2429	15.848	25.6	0.34	HDPE	17.55	17.69	225
527	p1883	n2429	15.848	n2430	15.95	30	0.34	HDPE	17.69	17.14	225
529	p1888	n2436	17.83	n2437	18.33	30	1.667	HDPE	19.02	19.52	225
530	p1889	n2437	18.33	n2438	18.91	30	1.934	HDPE	19.52	20.1	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)
531	p1890	n2438	18.91	n2440	19.84	30.5	3.051	HDPE	20.1	21.03	225
532	p2238	n3103	23.73	n2910	24.28	28.6	1.922	HDPE	24.92	25.47	225
533	p2303	n2990	7.73	n2991	7.22	20.6	2.471	HDPE	8.92	8.41	225
534	p2304	n2991	7.22	n2992	6.298	30	3.076	HDPE	8.41	7.61	225
535	p2305	n2992	6.298	n2993	4.8	30	5	HDPE	7.61	5.99	225
536	p2306	n2993	4.8	n2994	3.78	30	3.402	HDPE	5.99	4.97	225
537	p2308	n2996	3.51	n2997	3.973	30	1.543	HDPE	4.7	5.17	225
538	p2309	n2997	3.973	n2998	4.47	26.3	1.889	HDPE	5.17	5.66	225
539	p2310	n2998	4.47	n3000	5.21	33.7	2.198	HDPE	5.66	6.4	225
540	p2311	n3000	5.21	n3001	5.86	30	2.167	HDPE	6.4	7.05	225
541	p2312	n3001	5.86	n3002	6.8	30	3.135	HDPE	7.05	7.99	225
542	p2313	n3002	6.8	n3003	8.298	30	5	HDPE	7.99	9.56	225
543	p2314	n3003	8.37	n3004	9.867	29.9	5	HDPE	9.56	11.53	225
544	p2315	n3004	10.34	n3005	11.837	29.9	5	HDPE	11.53	13.58	225
545	p2316	n3005	12.39	n3006	13.887	29.9	5	HDPE	13.58	15.65	225
546	p2317	n3006	14.46	n3007	15.044	11.7	5	HDPE	15.65	16.47	225
547	p2318	n3007	15.28	n3008	16.342	21.2	5	HDPE	16.47	17.93	225
548	p2319	n3009	17.67	n3010	19.167	29.9	5	HDPE	18.86	20.71	225
549	p2320	n3011	11.5	n3012	11.19	30	1.033	HDPE	12.69	12.38	225
550	p2321	n3012	11.19	n3013	10.49	30	2.334	HDPE	12.38	11.68	225
551	p2322	n3013	10.49	n3014	9.89	30	2.001	HDPE	11.68	11.08	225
552	p2323	n3014	9.89	n3016	9.41	30	1.601	HDPE	11.08	10.6	225
553	p2324	n3016	9.41	n3017	9.01	30	1.333	HDPE	10.6	10.2	225
554	p2325	n3017	9.01	n3018	8.11	30	3.001	HDPE	10.2	9.3	225
555	p2326	n3018	8.11	n3019	7.11	30	3.336	HDPE	9.3	8.3	225
556	p2327	n3019	7.11	n3020	6.67	28.1	1.565	HDPE	8.3	7.86	225
557	p2329	n3022	6.307	n3023	6.07	30	0.789	HDPE	7.53	7.26	225
558	p2335	n3032	11.67	n3034	10.578	23.6	4.629	HDPE	12.86	11.78	225
559	p2336	n3034	10.578	n3036	8.92	33.2	5	HDPE	11.78	10.11	225
560	p2339	n3036	8.92	n3039	9.18	30	0.868	HDPE	10.11	10.37	225
561	p2340	n3039	9.18	n3040	9.39	30	0.7	HDPE	10.37	10.58	225
562	p2341	n3040	9.39	n3041	9.79	30	1.333	HDPE	10.58	10.98	225
563	p2342	n3041	9.79	n3042	10.62	30	2.769	HDPE	10.98	11.81	225
564	p2343	n2997	3.973	n3044	4.038	19.2	0.34	HDPE	5.17	5.27	225
565	p2345	n3044	4.038	n3047	4.14	30	0.34	HDPE	5.27	5.33	225
566	p2347	n3047	4.14	n3049	4.248	30	0.36	HDPE	5.33	5.48	225
567	p2349	n3051	4.292	n4504	4.371	23.4	0.34	HDPE	5.54	5.73	225
568	p2353	n3057	4.53	n3058	4.85	30	1.067	HDPE	5.72	6.04	225
569	p2355	n3058	4.85	n3060	5.12	17.1	1.575	HDPE	6.04	6.31	225
570	p2356	n3061	5.28	n3063	5.92	18	3.558	HDPE	6.47	7.11	225
571	p2358	n3063	5.92	n3023	6.07	18.6	0.806	HDPE	7.11	7.26	225
572	p2359	n3023	6.07	n3065	6.88	30	2.701	HDPE	7.26	8.07	225
573	p2360	n3065	6.88	n3066	7.15	30	0.9	HDPE	8.07	8.34	225
574	p2361	n3067	7.35	n3068	7.4	4.4	1.148	HDPE	8.54	8.59	225
575	p2362	n3068	7.4	n3069	7.68	30	0.933	HDPE	8.59	8.87	225
576	p2363	n3070	8.167	n3071	8.29	11.3	1.096	HDPE	9.4	9.48	225
577	p2364	n3071	8.29	n3072	8.71	30	1.4	HDPE	9.48	9.9	225
578	p2365	n3072	8.71	n3036	8.92	14.9	1.409	HDPE	9.9	10.11	225
579	p2367	n3034	10.578	n3076	11.926	29.8	4.521	HDPE	11.78	13.17	225
580	p2368	n3076	11.926	n3077	12.028	30	0.34	HDPE	13.17	14.1	225
581	p2369	n3078	12.13	n3079	12.232	30	0.34	HDPE	13.98	13.46	225
582	p2370	n3079	12.232	n3080	12.306	21.8	0.34	HDPE	13.46	13.57	225
583	p2372	n3080	12.306	n3083	12.63	27.8	1.166	HDPE	13.57	13.82	225
584	p2373	n3083	12.63	n3084	13.06	30	1.433	HDPE	13.82	14.25	225
585	p2374	n3084	13.06	n3085	14.556	29.9	5	HDPE	14.25	16.06	225
586	p2375	n3086	12.48	n3087	13.26	30	2.601	HDPE	13.67	14.45	225
587	p2376	n3088	13.52	n3089	14.679	23.2	5	HDPE	14.71	16.17	225
588	p2377	n3089	14.98	n3090	16.476	29.9	5	HDPE	16.17	18.52	225
589	p2379	n3091	19.97	n3092	20.83	30	2.868	HDPE	21.16	22.02	225
590	p2380	n3092	20.83	n3094	22.25	29.8	4.767	HDPE	22.02	23.44	225
591	p2381	n3094	22.25	n3095	23.27	20.9	4.887	HDPE	23.44	24.46	225
592	p2382	n3094	22.25	n3097	23.254	29.4	3.408	HDPE	23.44	25.01	225
593	p2383	n3097	23.254	n3098	23.356	30	0.34	HDPE	25.01	25.58	225
594	p2384	n3098	23.356	n3099	23.404	14.1	0.34	HDPE	25.58	25.71	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)
595	p2385	n3100	23.424	n3101	23.526	30	0.34	HDPE	25.65	25.38	225
596	p2386	n3101	23.526	n3102	23.628	30	0.34	HDPE	25.38	25.26	225
597	p2387	n3102	23.628	n3103	23.73	30	0.34	HDPE	25.26	24.92	225
598	p2388	n3099	23.404	n3104	24.62	30	4.057	HDPE	25.71	25.81	225
599	p2394	n3008	16.74	n3111	18.236	29.9	5	HDPE	17.93	19.93	225
600	p2395	n3111	18.236	n3112	18.303	8.5	0.799	HDPE	19.93	20.58	225
601	p2396	n3112	19.39	n3113	20.44	32.7	3.209	HDPE	20.58	21.63	225
602	p2397	n3112	18.303	n3114	18.405	30	0.34	HDPE	20.58	19.94	225
603	p2398	n3114	18.405	n3115	18.507	30	0.34	HDPE	19.94	19.79	225
604	p2399	n3063	5.92	n3116	6.21	30	0.967	HDPE	7.11	7.4	225
605	p2400	n3116	6.21	n3117	6.44	7.7	2.972	HDPE	7.4	7.63	225
606	p2401	n3118	6.49	n3120	7.25	23.5	3.237	HDPE	7.68	8.44	225
607	p2402	n3120	7.25	n3121	7.563	6.3	5	HDPE	8.44	8.87	225
608	p2403	n3121	7.563	n3122	8.48	19.9	4.598	HDPE	8.87	9.67	225
609	p2404	n3122	8.48	n3123	9.64	30	3.869	HDPE	9.67	10.83	225
611	p2406	n3125	11.2	n3126	12.68	29.6	5	HDPE	12.39	15.24	225
612	p2407	n3126	14.05	n3127	15.545	29.9	5	HDPE	15.24	17.83	225
613	p2409	n3115	18.507	n3128	18.56	15.6	0.34	HDPE	19.79	19.75	225
614	p2414	n3128	18.56	n3134	18.7	30	0.467	HDPE	19.75	19.89	225
615	p2415	n3134	18.7	n3135	18.91	30	0.7	HDPE	19.89	20.1	225
616	p2416	n3135	18.91	n3136	19.03	30	0.398	HDPE	20.1	20.38	225
617	p2419	n3136	19.03	n3139	19.13	29.6	0.34	HDPE	20.38	20.32	225
618	p2420	n3139	19.13	n3140	19.41	30	0.933	HDPE	20.32	20.6	225
619	p2421	n3140	19.41	n3141	19.63	30	0.733	HDPE	20.6	20.82	225
620	p2422	n3141	19.63	n3142	19.79	30	0.533	HDPE	20.82	20.98	225
621	p2423	n3142	19.79	n3143	19.953	30	0.541	HDPE	20.98	21.17	225
622	p3499	n3009	17.408	n3008	16.74	13.4	5	HDPE	18.86	17.93	225
623	p3503	n3091	19.97	n3143	19.953	5.2	0.34	HDPE	21.16	21.17	225
624	p3504	n3087	13.26	n3088	13.52	6.8	3.838	HDPE	14.45	14.71	225
625	p3507	n3080	12.306	n4435	12.33	7.1	0.34	HDPE	13.57	13.52	225
626	p3508	n4435	12.33	n3086	12.48	30	0.5	HDPE	13.52	13.67	225
627	p3509	n3099	23.404	n3100	23.424	6.1	0.34	HDPE	25.71	25.65	225
629	p3633	n2406	17.44	n4493	17.854	8.3	5	HDPE	18.63	19.32	225
630	p3634	n2407	18.477	n4493	18.13	6.9	5	HDPE	20	19.32	225
631	p3635	n3042	10.62	n4494	11.025	8.1	5	HDPE	11.81	12.65	225
632	p3636	n4494	11.46	n4496	11.787	6.5	5	HDPE	12.65	13.45	225
633	p3640	n3070	8.167	n4498	8.04	2.5	5	HDPE	9.4	9.23	225
634	p3642	n4498	8.04	n4499	8.026	4.3	0.34	HDPE	9.23	9.24	225
635	p3643	n4499	8.026	n3069	7.68	11.8	2.918	HDPE	9.24	8.87	225
636	p3646	n3077	12.028	n4500	12.056	8.2	0.34	HDPE	14.1	14.27	225
637	p3647	n4500	12.056	n4501	12.077	6.1	0.34	HDPE	14.27	14.26	225
638	p3648	n4501	12.077	n4502	12.098	6.3	0.34	HDPE	14.26	14.18	225
639	p3649	n4502	12.098	n3078	12.13	9.4	0.34	HDPE	14.18	13.98	225
640	p3653	n3049	4.248	n3051	4.292	12.7	0.34	HDPE	5.48	5.54	225
641	p3657	n4504	4.371	n4506	4.43	17.4	0.34	HDPE	5.73	5.62	225
642	p3659	n4506	4.43	n3057	4.53	6.4	1.554	HDPE	5.62	5.72	225
643	p3662	n3060	5.12	n3061	5.28	27.8	0.576	HDPE	6.31	6.47	225
644	p3665	n3117	6.44	n3118	6.49	2.5	1.987	HDPE	7.63	7.68	225
645	p3667	n3066	7.15	n4509	7.31	21	0.763	HDPE	8.34	8.5	225
646	p3668	n3067	7.35	n4509	7.31	4.7	0.858	HDPE	8.54	8.5	225
647	p3669	n4510	3.314	n2994	3.78	29.7	1.551	HDPE	4.58	4.97	225
648	p3670	n3022	6.307	n4511	6.34	9.8	0.34	HDPE	7.53	7.53	225
649	p3671	n4511	6.34	n4512	6.46	10.3	1.158	HDPE	7.53	7.65	225
650	p3672	n4512	6.46	n4513	6.62	6.2	2.581	HDPE	7.65	7.81	225
651	p3673	n4513	6.62	n3020	6.67	5.5	0.909	HDPE	7.81	7.86	225
652	p3675	n3032	11.67	n4515	12.16	12.3	3.99	HDPE	12.86	13.35	225
653	p3676	n4515	12.16	n3030	13.164	20.1	5	HDPE	13.35	14.4	225
654	p3678	n3028	14.743	n3030	13.21	30.7	5	HDPE	16.33	14.4	225
655	p3680	n4517	15.96	n4518	16.89	30.2	3.079	HDPE	17.15	18.08	225
656	p3682	n4519	15.66	n3028	15.14	15.3	3.388	HDPE	16.85	16.33	225
657	p3685	n2425	15.726	n4522	15.746	5.9	0.34	HDPE	17.26	17.41	225
658	p3686	n4522	15.746	n2428	15.761	4.4	0.34	HDPE	17.41	17.55	225
659	p3687	n4522	16.22	n2426	16.817	11.9	5	HDPE	17.41	18.37	225
660	p3692	n2423	15.3	n4527	15.15	10.4	1.446	HDPE	16.49	16.34	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)
661	p3693	n2422	15.09	n4527	15.15	6.6	0.912	HDPE	16.28	16.34	225
662	p3694	n2421	14.87	n4528	14.44	25.5	1.686	HDPE	16.06	15.63	225
663	p3695	n4528	14.44	n2416	14.27	4.5	3.789	HDPE	15.63	15.46	225
664	p3697	n2415	13.92	n2416	14.204	5.7	5	HDPE	15.11	15.46	225
665	p3699	n2420	16.71	n4530	16.82	11.6	0.946	HDPE	17.9	18.01	225
666	p3700	n2414	12.85	n4531	12.23	17.9	3.473	HDPE	14.04	13.42	225
667	p3701	n2413	12	n4531	12.23	12.1	1.896	HDPE	13.19	13.42	225
668	p3710	n2382	8.21	n2990	7.73	29.9	1.604	HDPE	9.4	8.92	225
669	p3712	n2990	7.73	n4534	7.91	4.8	3.764	HDPE	8.92	9.1	225
670	p3713	n4535	8.32	n4534	7.91	16	2.567	HDPE	9.51	9.1	225
671	p3714	n4536	8.47	n4534	7.91	16.1	3.478	HDPE	9.66	9.1	225
672	p3715	n2381	8.72	n4536	8.47	10.6	2.358	HDPE	9.91	9.66	225
673	p3716	n2380	8.68	n4535	8.32	14	2.568	HDPE	9.87	9.51	225
674	p3717	n2374	9.37	n2377	9.17	30	0.667	HDPE	10.56	10.36	225
675	p3719	n2404	16.23	n2403	16.21	5.4	0.37	HDPE	17.42	17.4	225
676	p3723	n2272	14.28	n2273	14.38	2	4.941	HDPE	15.47	15.57	225
677	p3725	n2264	15.65	n2267	14.25	30	4.671	HDPE	16.84	15.44	225
678	p3726	n2287	25.26	n4539	25.19	14.3	0.491	HDPE	26.45	26.38	225
679	p3727	n4539	25.19	n2288	25.037	5.7	2.703	HDPE	26.38	26.32	225
680	p3730	n2222	16.057	n2258	15.956	30	0.34	HDPE	19.05	18.42	225
682	p3733	n2260	17.83	n2224	19.478	33	5	HDPE	19.02	21	225
683	p3734	n2227	26.36	n4542	26.713	7.1	5	HDPE	27.55	28.11	225
684	p3735	n4542	26.92	n2228	27.399	9.6	5	HDPE	28.11	28.72	225
686	p3738	n4544	26.161	n4545	25.81	7	5	HDPE	27.51	27	225
687	p3739	n4545	25.585	n2278	25.43	3.1	5	HDPE	27	26.62	225
688	p3740	n2230	29.621	n4546	29.643	6.6	0.34	HDPE	31.31	31.36	225
689	p3741	n4547	29.658	n4546	29.643	4.3	0.34	HDPE	31.14	31.36	225
690	p3742	n2233	31.58	n2234	31.867	10.1	2.831	HDPE	32.77	33.92	225
691	p3745	n2235	31.968	n2236	32.07	30	0.34	HDPE	34.68	33.26	225
692	p3746	n2238	29.44	n2237	29.959	10.4	5	HDPE	30.63	31.91	225
693	p3747	n2247	28.57	n4549	28.968	8	5	HDPE	29.76	30.99	225
694	p3750	n2249	31.9	n4551	31.958	10.5	0.552	HDPE	33.09	33.2	225
695	p3751	n4551	31.958	n4552	31.98	6.5	0.34	HDPE	33.2	33.17	225
696	p3807	n2115	24.245	n2116	23.62	12.5	5	HDPE	25.77	24.81	225
697	p3808	n2117	21.371	n4582	20.42	19	5	HDPE	22.91	21.61	225
698	p3809	n4582	19.864	n2118	19.32	10.9	5	HDPE	21.61	20.51	225
699	p3810	n2216	17.378	n4583	17.33	14.3	0.34	HDPE	18.63	18.65	225
700	p3811	n4583	17.33	n2213	17.276	15.7	0.34	HDPE	18.65	18.57	225
701	p3812	n2212	17.07	n4584	16.81	17.3	1.499	HDPE	18.26	18	225
702	p3813	n2210	16.669	n4585	16.72	15	0.34	HDPE	18.11	17.91	225
703	p3815	n4586	16.45	n4584	16.81	12.6	2.848	HDPE	17.64	18	225
704	p3816	n4586	16.45	n2207	15.344	23.9	4.631	HDPE	17.64	16.75	225
705	p3817	n2207	15.344	n2203	14.98	7.3	5	HDPE	16.75	16.17	225
706	p3818	n2204	13.49	n2202	13.344	6.4	2.298	HDPE	14.68	14.89	225
707	p3819	n2202	13.344	n2201	12.49	17.1	5	HDPE	14.89	13.68	225
708	p3823	n2175	10.73	n4590	10.41	20.9	1.533	HDPE	11.92	11.6	225
709	p3825	n4590	10.41	n4591	10.14	26.4	1.022	HDPE	11.6	11.33	225
710	p3826	n4591	10.14	n4593	9.84	29.9	1.002	HDPE	11.33	11.03	225
711	p3828	n4593	9.84	n2161	9.55	30	0.967	HDPE	11.03	10.74	225
712	p3830	n2181	13.892	n2182	13.925	9.7	0.34	HDPE	15.43	15.46	225
713	p3840	n2150	9.88	n2134	10.22	13.8	2.473	HDPE	11.07	11.41	225
714	p3841	n2133	11.43	n2132	11.75	10.5	3.053	HDPE	12.62	12.94	225
715	p3842	n2131	12.6	n2130	13.27	30	2.234	HDPE	13.79	14.46	225
716	p3844	n2125	16.14	n2124	16.68	30	1.8	HDPE	17.33	17.87	225
717	p5688	n4518	16.89	n2436	17.83	29.9	3.145	HDPE	18.08	19.02	225
719	CO-2	n2996	3.51	n4510	3.314	30.3	0.647	HDPE	4.7	4.58	225
723	CO-4	n4510	3.314	CW -3	3.258	22.6	0.249	HDPE	4.58	4.58	315
726	CO-6	n4517	15.96	n3028	14.743	29.7	4.096	HDPE	17.15	16.33	225
727	CO-8	n3125	11.152	n3123	9.64	30.2	5	HDPE	12.39	10.83	225
731	CO-10	n2299	14.57	LS 6	14.509	17.9	0.34	HDPE	15.76	15.76	225
738	CO-14	n2153	9.328	LS 5	9.257	20.9	0.34	HDPE	10.53	10.53	225
172	p1528	n1960	41.264	n1961	40.934	30	1.1	HDPE	42.53	42.2	315
173	p1529	n1961	40.934	n1962	38.654	29.9	7.625	HDPE	42.2	39.92	315
174	p1533	n1962	38.654	n1967	36.874	22.3	7.993	HDPE	39.92	38.14	315

ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculate d) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
175	p1534	n1967	36.874	n4573	38.08	27.6	4.371	HDPE	38.14	39.27	225
176	p1536	n1967	36.874	n1971	34.384	29.9	8.328	HDPE	38.14	35.65	315
177	p1537	n1971	34.384	n1972	31.486	29.9	9.707	HDPE	35.65	32.77	315
178	p1538	n1972	31.486	n1973	30.564	9.2	10	HDPE	32.77	31.83	315
179	p1543	n1973	30.564	n1981	27.674	29.9	9.678	HDPE	31.83	28.94	315
180	p1544	n1981	27.674	n1982	26.824	30	2.834	HDPE	28.94	28.09	315
181	p1545	n1982	26.824	n1983	26.354	30	1.567	HDPE	28.09	27.62	315
182	p1546	n1983	26.354	n1984	24.944	30	4.706	HDPE	27.62	26.21	315
183	p1547	n1984	24.944	n1985	23.244	30	5.676	HDPE	26.21	24.51	315
184	p1548	n1985	23.244	n1986	22.014	30	4.104	HDPE	24.51	23.28	315
185	p1549	n1986	22.014	n1987	21.374	13.4	4.769	HDPE	23.28	22.64	315
186	p1550	n1987	21.374	n1988	19.979	15.6	8.948	HDPE	22.64	21.37	315
187	p1551	n1988	19.979	n1990	16.904	30.8	10	HDPE	21.37	18.17	315
188	p1552	n1990	16.904	n1991	14.094	29.9	9.407	HDPE	18.17	15.36	315
189	p1553	n1991	14.094	n4569	11.204	31.3	9.221	HDPE	15.36	12.47	315
190	p1554	n1993	7.574	n1994	4.594	29.8	10	HDPE	9.29	5.86	315
191	p1555	n1994	4.255	n1995	1.274	29.8	10	HDPE	5.86	2.54	315
192	p1556	n1995	1.274	n1998	0.584	29.8	2.313	HDPE	2.54	1.92	315
193	p1557	n1998	0.584	n1999	0.484	30	0.333	HDPE	1.92	1.82	400
194	p1558	n1999	0.484	n2000	0.422	30	0.207	HDPE	1.82	2.01	400
195	p1559	n2001	0.38	n2002	0.36	9.8	0.209	HDPE	2.2	2.01	400
196	p1560	n2002	0.36	n2003	0.297	30	0.209	HDPE	2.01	1.95	400
197	p1561	n2004	0.234	n2005	0.171	30	0.211	HDPE	1.67	1.6	400
198	p1562	n4564	0.107	n2007	0.043	30	0.213	HDPE	1.69	1.61	400
199	p1563	n2007	0.043	n2008	-0.02	30	0.213	HDPE	1.61	1.66	400
200	p1564	n2008	-0.02	n2009	-0.084	30	0.213	HDPE	1.66	1.72	400
201	p1565	n2009	-0.084	n2010	-0.149	30	0.214	HDPE	1.72	1.79	400
202	p1566	n2010	-0.149	n2011	-0.199	23.6	0.215	HDPE	1.79	1.81	400
203	p1567	n2012	-0.223	n2013	-0.278	25.2	0.216	HDPE	1.77	1.87	400
204	p1568	n4561	-0.294	n2015	-0.329	29	0.12	HDPE	2.04	1.4	560
205	p1569	n2015	-0.329	STP-2	-0.371	35.1	0.12	HDPE	1.4	1.15	560
206	p1813	n2338	21.87	n2339	22.06	4.8	3.984	HDPE	23.06	23.25	225
207	p1814	n2339	22.06	n2340	22.63	15.7	3.64	HDPE	23.25	23.82	225
208	p1815	n2340	22.63	n4478	23.56	30.2	3.077	HDPE	23.82	24.75	225
209	p1816	n2342	24	n2343	23.9	23.5	0.426	HDPE	25.19	25.09	225
210	p1817	n2343	23.9	n2344	22.98	30	3.069	HDPE	25.09	24.17	225
211	p1818	n2344	22.98	n2345	22.05	30	3.102	HDPE	24.17	23.24	225
212	p1819	n2345	22.05	n2346	20.607	20.8	6.925	HDPE	23.24	21.85	225
213	p1820	n2346	20.607	n2347	19.74	8.7	10	HDPE	21.85	20.93	225
214	p1821	n2348	18.671	n2349	16.01	26.6	10	HDPE	20.57	17.2	225
215	p1822	n2349	15.261	n2350	13.61	16.5	10	HDPE	17.2	14.8	225
216	p1823	n2351	9.408	n2352	6.45	29.6	10	HDPE	12.65	7.64	225
217	p1824	n2352	5.423	n2353	2.45	29.7	10	HDPE	7.64	3.64	225
218	p1825	n2353	2.45	n2354	1.82	6.8	9.326	HDPE	3.64	3.01	225
219	p1826	n2354	1.82	n2355	1.5	10.2	3.134	HDPE	3.01	2.69	225
220	p1828	n4557	1.084	n2358	1	16	0.527	HDPE	2.3	2.19	225
221	p1829	n2358	1	n2359	0.92	4.7	1.694	HDPE	2.19	2.11	225
222	p1830	n4561	0.723	n2361	0.744	7.4	0.289	HDPE	2.04	2.01	315
223	p1831	n2361	0.744	n2362	0.814	6.4	1.089	HDPE	2.01	2.08	315
224	p1832	n2362	0.814	n2363	0.97	30	0.519	HDPE	2.08	2.54	315
225	p1833	n2363	0.97	n2364	1.048	30	0.26	HDPE	2.54	2.44	315
226	p1834	n2364	1.048	n2491	1.139	35	0.259	HDPE	2.44	2.47	315
227	p1891	n2441	20.707	n2442	17.73	29.8	10	HDPE	22.6	18.92	225
228	p1892	n2442	17.641	n2443	18.18	30	1.797	HDPE	18.92	19.37	225
229	p1893	n2443	18.18	n2444	18.99	24.2	3.348	HDPE	19.37	20.18	225
230	p1894	n2442	17.641	n2445	14.86	27.8	10	HDPE	18.92	16.05	225
231	p1895	n2445	14.715	n2446	15.6	30	2.951	HDPE	16.05	16.79	225
232	p1896	n2446	15.6	n4476	16.2	35.2	1.701	HDPE	16.79	17.41	225
233	p1897	n2448	16.21	n2449	16.38	10.7	1.587	HDPE	17.4	17.57	225
234	p1898	n2445	14.715	n2450	13.49	12.2	10	HDPE	16.05	14.68	225
235	p1899	n2450	12.584	n2451	12.686	30	0.34	HDPE	14.68	14.14	225
236	p1900	n2451	12.686	n2452	12.78	27.7	0.34	HDPE	14.14	13.97	225
237	p1901	n2450	12.584	n2453	12.22	30	1.214	HDPE	14.68	13.41	225
238	p1902	n2453	12.22	n2454	11.7	30	1.733	HDPE	13.41	12.89	225



ID	Label	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Slope (Calculate d) (%)	Material	Elevation Ground (Start) (m)	Elevation Ground (Stop) (m)	Diameter (mm)
239	p1903	n2454	11.7	n2455	11.228	11.2	4.21	HDPE	12.89	12.47	225
240	p1904	n2456	11.414	n2457	13.504	29.9	6.988	HDPE	12.65	14.74	280
241	p1905	n2457	13.504	n2458	16.334	29.9	9.474	HDPE	14.74	17.57	280
242	p1906	n2458	16.334	n2459	18.444	29.9	7.052	HDPE	17.57	19.68	280
243	p1907	n2459	18.444	n2460	19.784	28.2	4.76	HDPE	19.68	21.02	280
244	p1908	n2461	19.97	n2462	20.73	25.5	2.983	HDPE	21.16	21.92	225
245	p1909	n2463	20.73	n2464	20.33	28.5	1.403	HDPE	21.92	21.52	225
246	p1910	n2464	20.33	n2465	19.93	30	1.333	HDPE	21.52	21.12	225
247	p1911	n2465	19.93	n2467	19.863	19.6	0.34	HDPE	21.12	21.18	225
248	p1912	n2467	19.863	n2468	19.776	25.7	0.34	HDPE	21.18	21.46	225
249	p1913	n2469	19.75	n2470	19.674	22.2	0.34	HDPE	21.55	22.29	225
250	p1914	n2470	19.674	n2471	19.592	24.1	0.34	HDPE	22.29	23.36	225
251	p1916	n2473	19.516	n2474	19.471	13.3	0.34	HDPE	23.52	22.37	225
252	p1918	n2476	19.423	n2477	19.06	15.8	2.299	HDPE	20.99	20.25	225
253	p1919	n2477	19.06	n2478	18.39	30	2.234	HDPE	20.25	19.58	225
254	p1920	n2478	18.39	n2479	16.941	19.7	7.357	HDPE	19.58	18.31	225
255	p1921	n2480	15.83	n2481	14.24	30	5.307	HDPE	17.02	15.43	225
256	p1922	n2482	13.78	n2483	13.06	18.7	3.854	HDPE	14.97	14.25	225
257	p1923	n2483	13.06	n2484	10.166	29.9	9.672	HDPE	14.25	12.16	225
258	p1924	n2484	10.166	n2485	7.19	29.8	10	HDPE	12.16	8.38	225
259	p1925	n2485	6.508	n2486	3.53	29.8	10	HDPE	8.38	4.72	225
260	p1926	n2486	3.53	n2487	2.074	19.3	7.524	HDPE	4.72	3.34	225
261	p1927	n2488	5.899	n2489	2.94	29.6	10	HDPE	8.78	4.13	225
262	p1928	n2489	2.94	n2490	1.6	29.9	4.476	HDPE	4.13	2.79	225
263	p1929	n2491	1.139	n2492	1.184	17.8	0.255	HDPE	2.47	2.45	315
264	p1930	n2492	1.184	n2493	1.334	30	0.5	HDPE	2.45	2.6	315
265	p1931	n2493	1.334	n2495	1.704	31	1.195	HDPE	2.6	2.97	315
266	p1932	n2495	1.704	n2487	2.074	29	1.274	HDPE	2.97	3.34	315
267	p1934	n2487	2.074	n2497	2.444	33.7	1.096	HDPE	3.34	3.71	315
268	p1935	n2498	2.614	n4471	3.745	19.7	5.743	HDPE	3.88	5.16	315
269	p1936	n2500	5.82	n2501	4.744	15.9	6.763	HDPE	7.01	6.1	225
270	p1937	n2501	4.744	n2503	3.97	7.7	10	HDPE	6.1	5.16	225
271	p1938	n2504	3.764	n2505	4.324	30	1.866	HDPE	5.03	5.56	280
272	p1939	n2505	4.324	n2507	4.624	13.3	2.249	HDPE	5.56	5.86	280
273	p1940	n2507	4.624	n2508	5.404	13.3	5.873	HDPE	5.86	6.64	280
274	p1941	n2508	5.404	n2510	6.224	26.6	3.08	HDPE	6.64	7.46	280
275	p1942	n2510	6.224	n2511	6.504	5.8	4.805	HDPE	7.46	7.74	280
276	p1943	n2512	6.724	n2513	7.644	20	4.602	HDPE	7.96	8.88	280
277	p1944	n2514	8.854	n2455	11.228	23.7	10	HDPE	10.09	12.47	280
278	p3560	n2468	19.776	n2469	19.75	7.8	0.34	HDPE	21.46	21.55	225
279	p3561	n2471	19.592	n2473	19.516	22.4	0.34	HDPE	23.36	23.52	225
280	p3562	n2474	19.471	n2476	19.423	13.9	0.34	HDPE	22.37	20.99	225
281	p3563	n2479	16.941	n4461	16.51	4.3	10	HDPE	18.31	17.7	225
282	p3564	n4461	16.416	n2480	15.83	5.9	10	HDPE	17.7	17.02	225
283	p3565	n2481	14.24	n4463	13.97	6.3	4.293	HDPE	15.43	15.16	225
284	p3567	n4463	13.97	n2482	13.78	4.9	3.852	HDPE	15.16	14.97	225
285	p3572	n2440	19.794	n2460	19.784	1.8	0.551	HDPE	21.03	21.02	280
286	p3573	n2440	19.794	n2461	19.97	4.5	3.918	HDPE	21.03	21.16	225
287	p3574	n2456	11.414	n2455	11.228	16.5	1.125	HDPE	12.65	12.47	280
288	p3576	n2514	8.854	n4467	8.744	1.8	5.949	HDPE	10.09	9.98	280
289	p3578	n4467	8.744	n4469	7.764	10.1	9.684	HDPE	9.98	9	280
290	p3579	n4469	7.764	n2513	7.644	1.8	6.572	HDPE	9	8.88	280
291	p3580	n2512	6.724	n2511	6.504	2.2	9.87	HDPE	7.96	7.74	280
292	p3583	n2504	3.764	n4471	3.745	7.7	0.249	HDPE	5.03	5.16	315
293	p3586	n4471	3.745	n2503	3.97	2.4	9.155	HDPE	5.16	5.16	225
294	p3588	n2498	2.614	n4472	2.494	5.9	2.017	HDPE	3.88	3.76	315
295	p3589	n4472	2.494	n2497	2.444	4.2	1.192	HDPE	3.76	3.71	315
296	p3592	n2491	1.139	n2490	1.6	6.8	6.794	HDPE	2.47	2.79	225
297	p3595	n2355	1.5	n2363	0.97	12.9	4.11	HDPE	2.69	2.54	225
298	p3596	n2350	12.774	n2351	11.46	13.1	10	HDPE	14.8	12.65	225
299	p3598	n2347	19.736	n2348	19.38	3.6	10	HDPE	20.93	20.57	225
300	p3599	n2448	16.21	n4476	16.2	3.1	0.34	HDPE	17.4	17.41	225
301	p3602	n2338	21.87	n2441	21.41	5.6	8.244	HDPE	23.06	22.6	225
302	p3759	n4557	1.084	n4558	1.1	4.7	0.34	HDPE	2.3	2.29	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)
303	p3761	n2359	0.92	n4560	0.824	28.2	0.34	HDPE	2.11	2.02	225
304	p3762	n4560	0.824	n2361	0.744	11.3	0.71	HDPE	2.02	2.01	225
305	p3766	n4561	-0.294	n2013	-0.278	7.6	0.217	HDPE	2.04	1.87	400
306	p3769	n2012	-0.223	n2011	-0.199	11.1	0.215	HDPE	1.77	1.81	400
307	p3771	n4564	0.107	n2005	0.171	30	0.212	HDPE	1.69	1.6	400
308	p3772	n2004	0.234	n4565	0.247	6.1	0.21	HDPE	1.67	1.79	400
309	p3773	n4565	0.247	n2003	0.297	23.9	0.21	HDPE	1.79	1.95	400
310	p3774	n2001	0.38	n4566	0.399	8.8	0.208	HDPE	2.2	2.36	400
311	p3776	n4566	0.399	n2000	0.422	11.3	0.208	HDPE	2.36	2.01	400
312	p3779	n1993	8.024	n4569	10.859	28.4	10	HDPE	9.29	12.47	315

APPENDIX : VI - FLEX TABLE - MANHOLES

SEWERAGE NETWORK DESIGN KASARAGOD MUNICIPALITY ZONE-2 -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	n3	28.1	28.1	26.91	1.001	1.078	26.938	26.938	1.19
31	n21	26.63	26.63	25.44	0	0.077	25.448	25.448	1.19
32	n22	25.8	25.8	24.61	0.077	0.154	24.621	24.621	1.19
33	n23	24.77	24.77	23.58	0.154	0.231	23.593	23.593	1.19
34	n24	23.64	23.64	22.45	0.231	0.308	22.465	22.465	1.19
35	n25	22.42	22.42	21.23	0.308	0.385	21.247	21.247	1.19
36	n26	21.16	21.16	19.97	0.385	0.462	19.988	19.988	1.19
37	n27	20.62	20.62	19.43	0.462	0.539	19.45	19.45	1.19
38	n28	20.85	20.85	19.66	0	0.077	19.668	19.668	1.19
39	n29	20.66	20.66	19.47	0.077	0.154	19.481	19.481	1.19
40	n30	19.82	19.82	18.63	0.154	0.231	18.643	18.643	1.19
41	n31	18.71	18.71	17.52	0.231	0.308	17.535	17.535	1.19
42	n32	17.82	17.82	16.391	1.232	1.309	16.421	16.421	1.43
43	n33	19.93	19.93	18.74	0.539	0.616	18.761	18.761	1.19
44	n34	19.37	19.37	18.18	0.616	0.693	18.202	18.202	1.19
45	n35	18.8	18.8	17.61	0.693	0.77	17.633	17.633	1.19
46	n36	18.21	18.21	17.02	0.77	0.847	17.044	17.044	1.19
47	n37	17.5	17.5	16.31	0.847	0.924	16.336	16.336	1.19
48	n38	16.78	16.78	15.59	0.924	1.001	15.617	15.617	1.19
49	n39	15.97	15.97	14.78	1.001	1.078	14.808	14.808	1.19
50	n41	15.64	15.64	14.45	1.078	1.155	14.481	14.481	1.19
51	n42	15.51	15.51	14.32	1.155	1.232	14.35	14.35	1.19
52	n43	15.29	15.29	14.1	1.232	1.309	14.13	14.13	1.19
53	n44	14.85	14.85	13.66	1.309	1.386	13.691	13.691	1.19
54	n45	14.31	14.31	13.12	1.386	1.463	13.152	13.152	1.19
55	n46	13.74	13.74	12.55	1.925	2.002	12.588	12.588	1.19
56	n47	14.25	14.25	13.06	0.385	0.462	13.078	13.078	1.19
57	n48	15.28	15.28	14.09	0.308	0.385	14.107	14.107	1.19
58	n49	16.14	16.14	14.95	0.231	0.308	14.965	14.965	1.19
59	n51	17.09	17.09	15.9	0.154	0.231	15.913	15.913	1.19
60	n52	17.88	17.88	16.69	0.077	0.154	16.701	16.701	1.19
61	n53	18.46	18.46	17.27	0	0.077	17.278	17.278	1.19
62	n284	15.45	15.45	14.26	0	0.077	14.269	14.269	1.19
63	n285	15.83	15.83	14.158	0.077	0.154	14.171	14.171	1.67
64	n286	15.68	15.68	14.056	0.154	0.231	14.071	14.071	1.62
65	n288	15.26	15.26	13.939	0.231	0.308	13.954	13.954	1.32
66	n369	15.01	15.01	13.82	0.308	0.385	13.837	13.837	1.19
67	n370	14.2	14.2	13.01	0.385	0.462	13.028	13.028	1.19
68	n371	13.32	13.32	12.13	0.462	0.539	12.15	12.15	1.19
69	n372	12.91	12.91	11.72	0.539	0.616	11.741	11.741	1.19
70	n382	11.75	11.75	8.866	1.386	1.463	8.898	8.898	2.88
71	n384	9.41	9.41	8.22	1.463	1.54	8.253	8.253	1.19
72	n385	8.33	8.33	7.14	1.54	1.617	7.174	7.174	1.19
73	n386	7.48	7.48	6.29	1.617	1.694	6.325	6.325	1.19
74	n387	6.7	6.7	5.51	1.694	1.771	5.546	5.546	1.19
75	n388	5.2	5.2	3.828	1.848	1.925	3.864	3.864	1.37
76	n389	3.52	3.52	2.33	1.925	2.002	2.368	2.368	1.19
77	n390	3.23	3.23	2.04	2.002	2.079	2.084	2.084	1.19
78	n391	3.26	3.26	1.938	2.079	2.156	1.983	1.983	1.32
79	n392	3.52	3.52	1.836	2.156	2.233	1.881	1.881	1.68

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	n393	3.35	3.35	1.734	2.233	2.31	1.799	1.799	1.62
81	n415	11.16	11.16	8.968	0.693	0.77	8.995	8.995	2.19
82	n416	10.66	10.66	9.07	0.616	0.693	9.096	9.096	1.59
83	n417	10.45	10.45	9.172	0.539	0.616	9.196	9.196	1.28
84	n418	10.56	10.56	9.274	0.462	0.539	9.297	9.297	1.29
85	n419	10.62	10.62	9.376	0.385	0.462	9.397	9.397	1.24
86	n420	10.68	10.68	9.478	0.308	0.385	9.497	9.497	1.2
87	n422	10.77	10.77	9.58	0.231	0.308	9.598	9.598	1.19
88	n425	11.09	11.09	9.9	0.154	0.231	9.913	9.913	1.19
89	n426	11.37	11.37	10.118	0.077	0.154	10.129	10.129	1.25
90	n429	11.41	11.41	10.22	0	0.077	10.229	10.229	1.19
91	n430	11.34	11.34	10.15	0	0.077	10.159	10.159	1.19
92	n433	11.35	11.35	10.095	0.077	0.154	10.108	10.108	1.25
93	n434	11.47	11.47	10.017	0.154	0.231	10.032	10.032	1.45
94	n436	11.42	11.42	9.915	0.231	0.308	9.933	9.933	1.5
95	n448	10.91	10.91	9.711	0.385	0.462	9.732	9.732	1.2
96	n449	10.81	10.81	9.609	0.462	0.539	9.629	9.629	1.2
97	n458	10.32	10.32	8.613	12.782	12.859	8.732	8.732	1.71
98	n459	10.29	10.29	8.715	12.705	12.782	8.833	8.833	1.57
99	n547	10.59	10.59	8.85	12.551	12.628	8.967	8.967	1.74
100	n548	10.85	10.85	8.952	12.474	12.551	9.069	9.069	1.9
101	n549	11.55	11.55	9.054	12.397	12.474	9.17	9.17	2.5
102	n550	12.39	12.39	9.156	12.32	12.397	9.272	9.272	3.23
103	n551	13.18	13.18	9.258	12.243	12.32	9.373	9.373	3.92
104	n552	13.93	13.93	9.36	12.166	12.243	9.475	9.475	4.57
105	n553	14.09	14.09	9.462	12.089	12.166	9.576	9.576	4.63
106	n563	13.63	13.63	9.512	12.012	12.089	9.626	9.626	4.12
107	n564	13.29	13.29	9.562	11.935	12.012	9.675	9.675	3.73
108	n565	13.04	13.04	9.592	11.858	11.935	9.705	9.705	3.45
109	n566	12.8	12.8	11.52	10.318	10.395	11.623	11.623	1.28
110	n567	12.79	12.79	11.6	10.241	10.318	11.703	11.703	1.19
111	n568	13.12	13.12	11.93	10.164	10.241	12.017	12.017	1.19
112	n569	13.49	13.49	12.238	10.087	10.164	12.325	12.325	1.25
113	n570	13.53	13.53	12.34	10.01	10.087	12.442	12.442	1.19
114	n571	14.05	14.05	12.86	9.933	10.01	12.946	12.946	1.19
115	n572	14.62	14.62	13.43	9.856	9.933	13.516	13.516	1.19
116	n573	15.37	15.37	14.18	9.779	9.856	14.266	14.266	1.19
117	n574	16.32	16.32	15.081	9.702	9.779	15.166	15.166	1.24
118	n575	16.94	16.94	15.157	9.625	9.702	15.256	15.256	1.78
119	n649	23.18	23.18	21.99	1.617	1.694	22.025	22.025	1.19
120	n650	24.04	24.04	22.85	1.54	1.617	22.884	22.884	1.19
121	n651	24.88	24.88	23.69	1.463	1.54	23.723	23.723	1.19
122	n652	25.7	25.7	24.51	1.386	1.463	24.542	24.542	1.19
123	n653	26.33	26.33	25.14	1.309	1.386	25.171	25.171	1.19
124	n654	27.15	27.15	25.96	1.232	1.309	25.99	25.99	1.19
125	n655	21.88	21.88	17.861	2.464	2.541	17.909	17.909	4.02
126	n656	21.77	21.77	17.782	2.541	2.618	17.831	17.831	3.99
127	n659	21.76	21.76	17.68	6.93	7.007	17.762	17.762	4.08
128	n661	21.98	21.98	20.79	4.235	4.312	20.846	20.846	1.19
129	n662	22.24	22.24	21.05	4.158	4.235	21.105	21.105	1.19
130	n665	22.75	22.75	21.56	2.772	2.849	21.605	21.605	1.19
131	n667	23.42	23.42	22.23	2.695	2.772	22.274	22.274	1.19
132	n731	29.66	29.66	28.47	7.238	7.315	28.543	28.543	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)
133	n741	29.6	29.6	28.41	0.77	0.847	28.434	28.434	1.19
134	n742	31.29	31.29	29.907	0.231	0.308	29.922	29.922	1.38
135	n743	34.19	34.19	31.593	0.154	0.231	31.605	31.605	2.6
136	n744	37.71	37.71	34.231	0.077	0.154	34.241	34.241	3.48
137	n746	40.11	40.11	37.631	0	0.077	37.638	37.638	2.48
138	n747	30.34	30.34	29.15	0.385	0.462	29.168	29.168	1.19
139	n748	31.27	31.27	30.08	0.308	0.385	30.097	30.097	1.19
140	n749	31.76	31.76	30.57	0.231	0.308	30.585	30.585	1.19
141	n750	31.83	31.83	30.64	0.154	0.231	30.655	30.655	1.19
142	n751	32.19	32.19	31	0.077	0.154	31.011	31.011	1.19
143	n752	32.28	32.28	31.09	0	0.077	31.098	31.098	1.19
144	n754	30.86	30.86	29.67	7.084	7.161	29.742	29.742	1.19
145	n755	30.24	30.24	29.05	7.161	7.238	29.123	29.123	1.19
146	n756	28.74	28.74	27.365	7.315	7.392	27.438	27.438	1.38
147	n757	28.02	28.02	26.508	7.392	7.469	26.582	26.582	1.51
148	n758	24.88	24.88	23.568	7.546	7.623	23.643	23.643	1.31
149	n759	23.26	23.26	22.07	7.623	7.7	22.145	22.145	1.19
150	n760	22.23	22.23	21.04	7.7	7.777	21.116	21.116	1.19
151	n761	21.17	21.17	19.948	7.777	7.854	20.024	20.024	1.22
152	n762	19.64	19.64	18.308	7.854	7.931	18.384	18.384	1.33
153	n763	18	18	15.726	9.163	9.24	15.823	15.823	2.27
154	n764	17.77	17.77	15.663	9.24	9.317	15.76	15.76	2.11
155	n765	17.09	17.09	15.587	9.317	9.394	15.67	15.67	1.5
156	n766	16.48	16.48	15.29	9.394	9.471	15.374	15.374	1.19
157	n767	16.45	16.45	15.224	9.548	9.625	15.323	15.323	1.23
158	n768	20.76	20.76	17.927	0.539	0.616	17.951	17.951	2.83
159	n769	20.6	20.6	17.963	0.462	0.539	17.986	17.986	2.64
160	n770	19.58	19.58	18.065	0.385	0.462	18.086	18.086	1.51
161	n772	20.83	20.83	19.64	0.154	0.231	19.653	19.653	1.19
162	n773	22.59	22.59	21.137	0.077	0.154	21.147	21.147	1.45
163	n792	22.44	22.44	21.246	1.232	1.309	21.276	21.276	1.19
164	n793	22.67	22.67	21.348	1.155	1.232	21.382	21.382	1.32
165	n794	22.64	22.64	21.45	1.078	1.155	21.483	21.483	1.19
166	n796	23.04	23.04	21.85	0.924	1.001	21.877	21.877	1.19
167	n797	23.52	23.52	22.33	0.847	0.924	22.356	22.356	1.19
168	n798	24.39	24.39	22.441	0.77	0.847	22.468	22.468	1.95
169	n799	24.86	24.86	22.518	0.693	0.77	22.545	22.545	2.34
170	n800	25.43	25.43	24.067	0.385	0.462	24.085	24.085	1.36
171	n801	27.16	27.16	25.738	0.308	0.385	25.754	25.754	1.42
172	n802	28.4	28.4	27.21	0.231	0.308	27.225	27.225	1.19
173	n803	28.69	28.69	27.5	0.154	0.231	27.513	27.513	1.19
174	n804	29.6	29.6	28.41	0.077	0.154	28.421	28.421	1.19
175	n805	30.28	30.28	29.09	0	0.077	29.098	29.098	1.19
176	n810	23.94	23.94	22.75	0	0.077	22.758	22.758	1.19
177	n819	26.34	26.34	25.15	0	0.077	25.159	25.159	1.19
178	n820	26.54	26.54	25.048	0.077	0.154	25.061	25.061	1.49
179	n821	26.45	26.45	24.972	0.154	0.231	24.985	24.985	1.48
180	n822	25.87	25.87	24.68	0.308	0.385	24.697	24.697	1.19
181	n825	25.01	25.01	23.82	0.616	0.693	23.842	23.842	1.19
182	n827	24.63	24.63	23.44	0.693	0.77	23.463	23.463	1.19
183	n828	24.25	24.25	23.06	0.77	0.847	23.088	23.088	1.19
184	n829	24.46	24.46	23.011	2.541	2.618	23.06	23.06	1.45
185	n830	24.23	24.23	22.988	2.618	2.695	23.032	23.032	1.24

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186	n831	25.1	25.1	23.91	1.617	1.694	23.945	23.945	1.19
187	n834	26.05	26.05	24.86	1.54	1.617	24.894	24.894	1.19
188	n835	26.9	26.9	25.71	1.463	1.54	25.743	25.743	1.19
189	n836	27.57	27.57	26.38	1.386	1.463	26.412	26.412	1.19
190	n840	27.96	27.96	26.77	1.309	1.386	26.801	26.801	1.19
191	n842	28.27	28.27	27.08	1.232	1.309	27.11	27.11	1.19
192	n844	29.49	29.49	28.3	1.155	1.232	28.33	28.33	1.19
193	n847	30.84	30.84	29.65	1.078	1.155	29.679	29.679	1.19
194	n857	31.47	31.47	30.28	1.001	1.078	30.308	30.308	1.19
195	n860	31.89	31.89	30.7	0.924	1.001	30.727	30.727	1.19
196	n861	32	32	30.81	0.847	0.924	30.836	30.836	1.19
197	n862	32.48	32.48	31.29	0.77	0.847	31.314	31.314	1.19
198	n863	33.01	33.01	31.82	0.693	0.77	31.843	31.843	1.19
199	n866	33.6	33.6	32.41	0.616	0.693	32.432	32.432	1.19
200	n868	34.13	34.13	32.94	0.539	0.616	32.961	32.961	1.19
201	n870	34.61	34.61	33.42	0.462	0.539	33.44	33.44	1.19
202	n872	35.45	35.45	34.26	0.385	0.462	34.278	34.278	1.19
203	n875	36.66	36.66	35.47	0.308	0.385	35.487	35.487	1.19
204	n876	38.49	38.49	36.92	0.231	0.308	36.934	36.934	1.57
205	n878	40.01	40.01	38.82	0.154	0.231	38.833	38.833	1.19
206	n883	41.61	41.61	40.42	0.077	0.154	40.431	40.431	1.19
207	n884	42.9	42.9	41.71	0	0.077	41.718	41.718	1.19
208	n1515	17.37	17.37	15.828	1.155	1.232	15.862	15.862	1.54
209	n1516	17.12	17.12	15.93	1.078	1.155	15.963	15.963	1.19
210	n1517	17.23	17.23	16.04	1.001	1.078	16.071	16.071	1.19
211	n1518	17.48	17.48	16.29	0.924	1.001	16.317	16.317	1.19
212	n1519	17.62	17.62	16.43	0.77	0.847	16.454	16.454	1.19
213	n1522	17.73	17.73	16.54	0.693	0.77	16.563	16.563	1.19
214	n1523	18.82	18.82	17.63	0.385	0.462	17.648	17.648	1.19
215	n1524	19.96	19.96	18.77	0.308	0.385	18.787	18.787	1.19
216	n1525	20.8	20.8	19.61	0.231	0.308	19.625	19.625	1.19
217	n1528	21.27	21.27	19.877	0.154	0.231	19.89	19.89	1.39
218	n1529	25.13	25.13	21.527	0.077	0.154	21.538	21.538	3.6
219	n1531	12.74	12.74	9.617	1.386	1.463	9.706	9.706	3.12
220	n1532	12.21	12.21	9.694	1.309	1.386	9.73	9.73	2.52
221	n1533	12.19	12.19	9.713	1.232	1.309	9.748	9.748	2.48
222	n1534	11.25	11.25	9.796	1.155	1.232	9.83	9.83	1.45
223	n1535	11.14	11.14	9.841	1.078	1.155	9.873	9.873	1.3
224	n1536	11.14	11.14	9.898	1.001	1.078	9.93	9.93	1.24
225	n1537	11.19	11.19	10	0.924	1.001	10.031	10.031	1.19
226	n1538	11.58	11.58	10.39	0.847	0.924	10.416	10.416	1.19
227	n1539	11.97	11.97	10.78	0.77	0.847	10.804	10.804	1.19
228	n1540	12.75	12.75	11.56	0.693	0.77	11.583	11.583	1.19
229	n1541	13.07	13.07	11.88	0.616	0.693	11.902	11.902	1.19
230	n1543	14.06	14.06	12.87	0.539	0.616	12.891	12.891	1.19
231	n1544	15.21	15.21	14.02	0.462	0.539	14.04	14.04	1.19
232	n1545	16.01	16.01	14.705	0.385	0.462	14.723	14.723	1.3
233	n1546	17.21	17.21	15.632	0.308	0.385	15.648	15.648	1.58
234	n1547	18.6	18.6	17.142	0.154	0.231	17.155	17.155	1.46
235	n1550	23.34	23.34	21.856	0.693	0.77	21.879	21.879	1.48
236	n1552	8.92	8.92	7.374	13.013	13.09	7.473	7.473	1.55
237	n1553	7.88	7.88	6.69	0.77	0.847	6.714	6.714	1.19
238	n1554	9.15	9.15	7.66	0.693	0.77	7.683	7.683	1.49

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239	n1555	7.62	7.62	6.43	14.014	14.091	6.533	6.533	1.19
240	n1556	6.31	6.31	5.12	14.091	14.168	5.247	5.247	1.19
241	n1557	6.3	6.3	5.018	14.168	14.245	5.146	5.146	1.28
242	n1558	6.31	6.31	4.916	14.245	14.322	5.044	5.044	1.39
243	n1559	6.58	6.58	4.814	19.25	19.327	4.942	4.942	1.77
244	n1561	7.36	7.36	6.17	4.851	4.928	6.23	6.23	1.19
245	n1562	7.63	7.63	6.44	4.774	4.851	6.499	6.499	1.19
246	n1563	8.43	8.43	7.24	4.697	4.774	7.299	7.299	1.19
247	n1566	9.47	9.47	8.28	4.62	4.697	8.338	8.338	1.19
248	n1568	10.11	10.11	8.92	4.543	4.62	8.978	8.978	1.19
249	n1570	10.82	10.82	9.63	4.466	4.543	9.687	9.687	1.19
250	n1573	11.09	11.09	9.9	4.389	4.466	9.957	9.957	1.19
251	n1574	12	12	10.81	4.004	4.081	10.864	10.864	1.19
252	n1575	12.36	12.36	11.17	3.927	4.004	11.224	11.224	1.19
253	n1576	12.8	12.8	11.61	3.85	3.927	11.663	11.663	1.19
254	n1577	13.28	13.28	11.952	3.773	3.85	12.004	12.004	1.33
255	n1578	5.88	5.88	4.669	19.327	19.404	4.787	4.787	1.21
256	n1579	5.35	5.35	4.139	19.404	19.481	4.257	4.257	1.21
257	n1580	5.03	5.03	3.819	19.481	19.558	3.946	3.946	1.21
258	n1581	4.9	4.9	3.689	19.558	19.635	3.835	3.835	1.21
259	n1583	5.04	5.04	3.574	19.635	19.712	3.719	3.719	1.47
261	n1585	5	5	3.518	19.712	19.789	3.661	3.661	1.48
262	n1586	5.07	5.07	3.509	20.405	20.482	3.649	3.649	1.56
263	n1587	4.87	4.87	3.487	20.482	20.559	3.628	3.628	1.38
264	n1588	4.79	4.79	3.446	20.636	20.713	3.588	3.588	1.34
265	n1589	4.82	4.82	3.415	20.713	20.79	3.557	3.557	1.4
266	n1590	4.57	4.57	3.321	20.867	20.944	3.457	3.457	1.25
267	n1591	4.45	4.45	3.214	20.944	21.021	3.335	3.335	1.24
268	n1592	4.29	4.29	3.054	21.021	21.098	3.19	3.19	1.24
269	n1593	4.18	4.18	2.944	21.098	21.175	3.063	3.063	1.24
270	n1594	4.01	4.01	2.774	21.175	21.252	2.918	2.918	1.24
271	n1595	4.36	4.36	2.716	21.252	21.329	2.86	2.86	1.64
272	n1596	4.16	4.16	2.68	21.329	21.406	2.824	2.824	1.48
273	n1597	3.84	3.84	2.586	21.406	21.483	2.723	2.723	1.25
274	n1598	3.71	3.71	2.474	21.483	21.56	2.619	2.619	1.24
275	n1599	3.69	3.69	2.38	21.56	21.637	2.525	2.525	1.31
276	n1600	3.61	3.61	2.286	21.714	21.791	2.407	2.407	1.32
277	n1602	3.29	3.29	1.625	28.028	28.105	1.795	1.795	1.67
278	n1604	3.25	3.25	1.55	28.105	28.182	1.721	1.721	1.7
279	n1605	3.33	3.33	1.475	28.182	28.259	1.647	1.647	1.85
280	n1606	3.23	3.23	1.401	28.259	28.336	1.573	1.573	1.83
281	n1607	3.2	3.2	1.379	28.336	28.413	1.551	1.551	1.82
282	n1608	2.71	2.71	1.2	28.875	28.952	1.374	1.374	1.51
283	n1609	2.8	2.8	1.177	28.952	29.029	1.35	1.35	1.62
284	n1610	2.87	2.87	1.102	29.029	29.106	1.263	1.263	1.77
285	n1611	3.42	3.42	2.23	3.85	3.927	2.283	2.283	1.19
286	n1612	4.21	4.21	3.02	3.773	3.85	3.073	3.073	1.19
287	n1613	6.61	6.61	3.422	3.696	3.773	3.473	3.473	3.19
288	n1614	5.12	5.12	3.611	0.154	0.231	3.626	3.626	1.51
289	n1615	5.76	5.76	3.523	0.231	0.308	3.541	3.541	2.24
290	n1617	8.61	8.61	6.917	3.311	3.388	6.966	6.966	1.69
291	n1618	9.73	9.73	7.706	3.234	3.311	7.755	7.755	2.02
292	n1620	10.73	10.73	7.824	3.08	3.157	7.877	7.877	2.91



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293	n1622	10.85	10.85	7.926	3.003	3.08	7.979	7.979	2.92
294	n1623	12.57	12.57	11.158	0.308	0.385	11.174	11.174	1.41
295	n1624	14.63	14.63	12.877	0.231	0.308	12.891	12.891	1.75
296	n1625	17.01	17.01	14.935	0.154	0.231	14.948	14.948	2.07
297	n1626	19.14	19.14	17.316	0.077	0.154	17.327	17.327	1.82
298	n1627	20.04	20.04	18.467	0	0.077	18.474	18.474	1.57
299	n1628	10.37	10.37	8.028	2.541	2.618	8.077	8.077	2.34
300	n1629	9.77	9.77	8.13	2.464	2.541	8.178	8.178	1.64
301	n1630	9.38	9.38	8.19	2.387	2.464	8.238	8.238	1.19
302	n1631	9.7	9.7	8.51	2.233	2.31	8.551	8.551	1.19
303	n1632	10.39	10.39	8.947	2.156	2.233	8.986	8.986	1.44
304	n1633	10.57	10.57	8.961	2.079	2.156	9.006	9.006	1.61
305	n1634	10.74	10.74	9.006	2.002	2.079	9.049	9.049	1.73
306	n1635	10.4	10.4	9.108	1.925	2.002	9.151	9.151	1.29
307	n1636	10.37	10.37	9.18	1.848	1.925	9.222	9.222	1.19
308	n1638	11.44	11.44	10.25	1.694	1.771	10.286	10.286	1.19
309	n1639	12.6	12.6	11.311	1.617	1.694	11.345	11.345	1.29
310	n1640	15.47	15.47	13.944	1.386	1.463	13.976	13.976	1.53
311	n1641	17.76	17.76	15.046	1.309	1.386	15.077	15.077	2.71
312	n1642	19.68	19.68	15.148	1.232	1.309	15.182	15.182	4.53
313	n1643	5.24	5.24	4.05	0.539	0.616	4.071	4.071	1.19
314	n1644	5.45	5.45	4.26	0.462	0.539	4.28	4.28	1.19
315	n1645	6.48	6.48	5.29	0.385	0.462	5.308	5.308	1.19
316	n1646	9.46	9.46	6.783	0.308	0.385	6.799	6.799	2.68
317	n1647	12.23	12.23	9.764	0.231	0.308	9.778	9.778	2.47
318	n1648	13.7	13.7	12.51	0.154	0.231	12.523	12.523	1.19
319	n1649	15.26	15.26	14.008	0.077	0.154	14.019	14.019	1.25
320	n1650	16.32	16.32	14.763	0	0.077	14.771	14.771	1.56
321	n1668	21.08	21.08	15.303	0.847	0.924	15.332	15.332	5.78
322	n1669	18.8	18.8	15.405	0.77	0.847	15.433	15.433	3.4
323	n1671	17.53	17.53	15.506	0.693	0.77	15.533	15.533	2.02
324	n1672	16.96	16.96	15.608	0.616	0.693	15.634	15.634	1.35
325	n1673	16.9	16.9	15.71	0.539	0.616	15.734	15.734	1.19
326	n1675	18.49	18.49	16.746	0.462	0.539	16.766	16.766	1.74
327	n1676	20.78	20.78	18.151	0.385	0.462	18.169	18.169	2.63
328	n1677	22.49	22.49	20.226	0.308	0.385	20.243	20.243	2.26
329	n1678	24.71	24.71	23.12	0.154	0.231	23.132	23.132	1.59
330	n1679	25.73	25.73	24.315	0.077	0.154	24.326	24.326	1.41
331	n1680	26.68	26.68	25.49	0	0.077	25.498	25.498	1.19
332	n1711	13.41	13.41	11.979	3.696	3.773	12.038	12.038	1.43
333	n1713	13.27	13.27	12.08	1.617	1.694	12.12	12.12	1.19
334	n1714	13.51	13.51	12.32	1.54	1.617	12.354	12.354	1.19
335	n1715	13.87	13.87	12.68	1.463	1.54	12.713	12.713	1.19
336	n1716	14.71	14.71	13.52	1.386	1.463	13.552	13.552	1.19
337	n1717	16.19	16.19	15	1.309	1.386	15.031	15.031	1.19
338	n1719	20.13	20.13	18.126	0.847	0.924	18.151	18.151	2
339	n1720	22.27	22.27	20.436	0.77	0.847	20.46	20.46	1.83
340	n1721	24.04	24.04	22.658	0.616	0.693	22.68	22.68	1.38
341	n1722	25.57	25.57	24.348	0.539	0.616	24.369	24.369	1.22
342	n1723	26.52	26.52	25.33	0.462	0.539	25.35	25.35	1.19
343	n1724	27.35	27.35	26.16	0.385	0.462	26.178	26.178	1.19
344	n1725	28.52	28.52	27.11	0.308	0.385	27.127	27.127	1.41
345	n1727	29.3	29.3	27.914	0.231	0.308	27.928	27.928	1.39

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)
346	n1728	31.11	31.11	29.608	0.154	0.231	29.62	29.62	1.5
347	n1729	31.64	31.64	30.361	0.077	0.154	30.371	30.371	1.28
348	n1730	32.22	32.22	31.03	0	0.077	31.038	31.038	1.19
349	n4684	29.06	29.06	25.814	0	0.077	25.822	25.822	3.25
350	n4706	26.57	26.57	24.617	7.469	7.546	24.691	24.691	1.95
351	n4720	31.58	31.58	30.39	0	7.084	30.462	30.462	1.19
352	n4726	18.41	18.41	17.22	0.462	0.539	17.24	17.24	1.19
353	n4727	18.28	18.28	17.09	0.539	0.616	17.111	17.111	1.19
354	n4728	17.84	17.84	16.65	0.616	0.693	16.672	16.672	1.19
355	n4729	17.58	17.58	16.39	0.847	0.924	16.416	16.416	1.19
356	n4733	16.43	16.43	15.24	9.471	9.548	15.339	15.339	1.19
357	n4734	20.7	20.7	19.022	0	0.077	19.03	19.03	1.68
358	n4735	19.88	19.88	18.103	0.077	0.154	18.114	18.114	1.78
359	n4736	17.95	17.95	16.561	0.231	0.308	16.576	16.576	1.39
360	n4746	24.1	24.1	21.785	0.231	0.308	21.8	21.8	2.31
361	n4747	20.96	20.96	15.29	0.924	1.001	15.32	15.32	5.67
362	n4748	20.9	20.9	15.266	1.001	1.078	15.297	15.297	5.63
363	n4749	20.77	20.77	15.25	1.078	1.155	15.282	15.282	5.52
364	n4750	20.34	20.34	15.198	1.155	1.232	15.231	15.231	5.14
365	n4751	14.35	14.35	12.783	1.463	1.54	12.816	12.816	1.57
366	n4752	13.26	13.26	11.847	1.54	1.617	11.881	11.881	1.41
367	n4753	10.51	10.51	9.32	1.771	1.848	9.356	9.356	1.19
368	n4754	9.48	9.48	8.29	2.31	2.387	8.331	8.331	1.19
369	n4756	9.78	9.78	7.718	3.157	3.234	7.773	7.773	2.06
370	n4757	4.84	4.84	3.65	0	0.077	3.659	3.659	1.19
371	n4758	4.89	4.89	3.644	0.077	0.154	3.656	3.656	1.25
372	n4760	11.74	11.74	10.55	4.081	4.158	10.605	10.605	1.19
373	n4762	11.68	11.68	10.49	4.158	4.235	10.545	10.545	1.19
374	n4763	11.25	11.25	10.06	4.235	4.312	10.116	10.116	1.19
375	n4764	11.14	11.14	9.95	4.312	4.389	10.006	10.006	1.19
376	n4767	4.78	4.78	3.462	20.559	20.636	3.603	3.603	1.32
377	n4768	4.66	4.66	3.364	20.79	20.867	3.505	3.505	1.3
378	n4769	7.85	7.85	6.66	13.09	13.167	6.76	6.76	1.19
379	n4770	10.19	10.19	8.748	0.616	0.693	8.77	8.77	1.44
380	n4771	10.5	10.5	9.31	0.539	0.616	9.331	9.331	1.19
381	n4772	10.3	10.3	8.511	12.936	13.013	8.61	8.61	1.79
382	n4774	10.29	10.29	8.564	12.859	12.936	8.683	8.683	1.73
383	n4776	10.46	10.46	8.758	12.628	12.705	8.876	8.876	1.7
384	n4780	11.12	11.12	9.813	0.308	0.385	9.833	9.833	1.31
385	n4783	3.77	3.77	2.317	21.637	21.714	2.46	2.46	1.45
386	n4784	3.09	3.09	1.37	28.413	28.49	1.542	1.542	1.72
387	n4785	3.1	3.1	1.36	28.49	28.567	1.533	1.533	1.74
388	n4786	3.09	3.09	1.319	28.567	28.644	1.492	1.492	1.77
389	n4787	2.88	2.88	1.309	28.644	28.721	1.483	1.483	1.57
390	n4788	2.84	2.84	1.301	28.721	28.798	1.474	1.474	1.54
391	n4789	2.8	2.8	1.252	28.798	28.875	1.426	1.426	1.55
393	n4791	6.2	6.2	4.812	1.771	1.848	4.848	4.848	1.39
394	n4886	27.4	27.4	26.21	1.155	1.232	26.24	26.24	1.19
395	n4887	27.83	27.83	26.64	1.078	1.155	26.669	26.669	1.19
396	n4888	28.51	28.51	27.32	0.924	1.001	27.347	27.347	1.19
397	n4889	29.29	29.29	28.1	0.847	0.924	28.126	28.126	1.19
398	n4911	24.67	24.67	22.959	0	0.077	22.966	22.966	1.71
399	n4912	19.35	19.35	18.16	0.231	0.308	18.178	18.178	1.19

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400	n4913	19.4	19.4	18.119	0.308	0.385	18.139	18.139	1.28
401	n4914	22.96	22.96	21.77	1.694	1.771	21.806	21.806	1.19
402	n4915	22.14	22.14	20.95	1.771	1.848	20.986	20.986	1.19
403	n4976	22.85	22.85	21.66	1.001	1.078	21.688	21.688	1.19
404	n4978	24.12	24.12	22.623	0.154	0.231	22.638	22.638	1.5
405	n4979	23.9	23.9	22.71	0.077	0.154	22.723	22.723	1.19
406	n4986	26.03	26.03	24.816	0.231	0.308	24.83	24.83	1.21
407	n4987	25.76	25.76	24.57	0.385	0.462	24.588	24.588	1.19
408	n4988	25.6	25.6	24.41	0.462	0.539	24.43	24.43	1.19
409	n4990	25.09	25.09	23.9	0.539	0.616	23.921	23.921	1.19
30	n19	23.96	23.96	22.77	0.077	0.154	22.781	22.781	1.19
31	n49	16.14	16.14	14.95	0	0.077	14.958	14.958	1.19
32	n54	18.22	18.22	17.03	0.231	0.308	17.046	17.046	1.19
33	n55	18.13	18.13	16.94	0.308	0.385	16.959	16.959	1.19
34	n56	13.67	13.67	10.806	2.772	2.849	10.857	10.857	2.86
35	n57	13.09	13.09	10.76	2.849	2.926	10.811	10.811	2.33
36	n58	11.91	11.91	10.658	2.926	3.003	10.704	10.704	1.25
37	n59	10.77	10.77	8.789	8.316	8.393	8.867	8.867	1.98
38	n60	8.33	8.33	7.14	8.393	8.47	7.219	7.219	1.19
39	n62	6.84	6.84	5.09	39.963	40.04	5.293	5.293	1.75
40	n63	6.35	6.35	5.033	40.04	40.117	5.187	5.187	1.32
41	n64	5.97	5.97	4.671	40.117	40.194	4.825	4.825	1.3
42	n65	5.72	5.72	4.421	40.194	40.271	4.575	4.575	1.3
43	n66	5.02	5.02	3.721	40.271	40.348	3.875	3.875	1.3
44	n67	4.48	4.48	3.181	40.348	40.425	3.335	3.335	1.3
45	n68	4.31	4.31	3.011	40.425	40.502	3.207	3.207	1.3
46	n69	4.4	4.4	2.993	40.502	40.579	3.181	3.181	1.41
47	n71	4.19	4.19	2.891	40.579	40.656	3.046	3.046	1.3
48	n72	3.72	3.72	2.421	40.656	40.733	2.576	2.576	1.3
49	n76	11.52	11.52	10.217	4.62	4.697	10.275	10.275	1.3
50	n84	14.24	14.24	10.475	3.619	3.696	10.534	10.534	3.76
51	n85	14.58	14.58	10.445	4.158	4.235	10.507	10.507	4.14
52	n86	13.11	13.11	10.577	3.542	3.619	10.635	10.635	2.53
53	n88	11.87	11.87	10.68	3.465	3.542	10.737	10.737	1.19
54	n1439	24.68	24.68	23.49	0.077	0.154	23.501	23.501	1.19
55	n1440	23.59	23.59	22.4	0.154	0.231	22.413	22.413	1.19
56	n1441	24.67	24.67	23.48	0.077	0.154	23.491	23.491	1.19
57	n1442	23.53	23.53	22.34	0.154	0.231	22.353	22.353	1.19
58	n1443	22.48	22.48	21.29	0.231	0.308	21.305	21.305	1.19
59	n1444	22.6	22.6	21.41	0.231	0.308	21.425	21.425	1.19
60	n1445	21.65	21.65	20.46	0.308	0.385	20.477	20.477	1.19
61	n1446	21.75	21.75	20.56	0.308	0.385	20.577	20.577	1.19
62	n1447	21.16	21.16	19.97	0.385	0.462	19.988	19.988	1.19
63	n1448	21.06	21.06	19.87	0.385	0.462	19.888	19.888	1.19
64	n1449	20.79	20.79	19.518	2.156	2.233	19.581	19.581	1.27
65	n1450	20.96	20.96	19.493	7.623	7.7	19.58	19.58	1.47
66	n1451	20.81	20.81	19.62	1.617	1.694	19.66	19.66	1.19
67	n1452	20.93	20.93	19.627	4.851	4.928	19.69	19.69	1.3
68	n1454	20.87	20.87	19.68	1.848	1.925	19.722	19.722	1.19
69	n1455	22.19	22.19	20.036	1.771	1.848	20.072	20.072	2.15
70	n1456	22.8	22.8	20.138	1.617	1.694	20.177	20.177	2.66
71	n1457	21.87	21.87	20.24	1.54	1.617	20.278	20.278	1.63
72	n1485	21.54	21.54	20.3	1.463	1.54	20.337	20.337	1.24

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73	n1487	22.2	22.2	21.01	1.309	1.386	21.041	21.041	1.19
74	n1488	22.28	22.28	21.09	1.232	1.309	21.12	21.12	1.19
75	n1489	23.21	23.21	21.249	1.155	1.232	21.28	21.28	1.96
76	n1490	24.13	24.13	21.351	1.078	1.155	21.384	21.384	2.78
77	n1495	24.87	24.87	21.373	1.001	1.078	21.404	21.404	3.5
78	n1496	27.42	27.42	21.453	0.924	1.001	21.483	21.483	5.97
79	n1497	26.82	26.82	21.555	0.847	0.924	21.584	21.584	5.27
80	n1498	25.43	25.43	21.613	0.77	0.847	21.641	21.641	3.82
81	n1499	24.76	24.76	21.656	0.693	0.77	21.683	21.683	3.1
82	n1500	24.1	24.1	21.758	0.616	0.693	21.784	21.784	2.34
83	n1501	23.05	23.05	21.86	0.539	0.616	21.884	21.884	1.19
84	n1502	23.59	23.59	22.4	0.462	0.539	22.42	22.42	1.19
85	n1503	29.68	29.68	27.887	0.077	0.154	27.897	27.897	1.79
86	n1504	32.77	32.77	30.398	0	0.077	30.406	30.406	2.37
87	n1505	33.38	33.38	32.19	0.616	0.693	32.216	32.216	1.19
88	n1506	33.46	33.46	32.127	0.693	0.77	32.15	32.15	1.33
89	n1507	32.93	32.93	31.74	0.77	0.847	31.764	31.764	1.19
90	n1508	31.48	31.48	30.29	1.232	1.309	30.32	30.32	1.19
91	n1509	33.53	33.53	32.277	0.308	0.385	32.294	32.294	1.25
92	n1510	34.6	34.6	33.336	0.231	0.308	33.351	33.351	1.26
93	n1511	37.76	37.76	36.393	0.154	0.231	36.406	36.406	1.37
94	n1512	39.45	39.45	37.875	0.077	0.154	37.886	37.886	1.57
95	n1658	25.94	25.94	24.75	0	0.077	24.758	24.758	1.19
96	n1661	18.27	18.27	16.415	30.723	30.8	16.554	16.554	1.86
97	n1663	19.02	19.02	17.754	29.722	29.799	17.892	17.892	1.27
98	n1664	20.59	20.59	19.324	29.645	29.722	19.461	19.461	1.27
99	n1665	22.17	22.17	20.645	29.568	29.645	20.782	20.782	1.52
100	n1666	22.6	22.6	20.72	29.491	29.568	20.895	20.895	1.88
101	n1667	22.06	22.06	20.794	0.154	29.337	20.97	20.97	1.27
102	n1680	26.68	26.68	25.49	0	0.077	25.498	25.498	1.19
103	n1681	25.22	25.22	24.03	0.077	0.154	24.041	24.041	1.19
104	n1682	22.27	22.27	20.001	0.154	0.231	20.014	20.014	2.27
105	n1702	18.59	18.59	17.4	0	0.077	17.409	17.409	1.19
106	n1703	18.47	18.47	17.28	0.077	0.154	17.293	17.293	1.19
107	n1704	18.37	18.37	17.178	0.154	0.231	17.191	17.191	1.19
109	n1708	18.47	18.47	16.634	0.539	0.616	16.658	16.658	1.84
110	n1709	18.57	18.57	16.736	0.462	0.539	16.759	16.759	1.83
111	n1710	18.28	18.28	16.838	0.385	0.462	16.859	16.859	1.44
112	n1730	32.22	32.22	31.03	0	0.077	31.038	31.038	1.19
113	n1731	32.04	32.04	30.85	0.077	0.154	30.861	30.861	1.19
114	n1733	28.65	28.65	27.46	0.308	0.385	27.477	27.477	1.19
115	n1734	25.75	25.75	24.56	0.385	0.462	24.578	24.578	1.19
116	n1735	23.33	23.33	22.14	0.462	0.539	22.16	22.16	1.19
117	n1736	22.05	22.05	20.86	0.539	0.616	20.881	20.881	1.19
118	n1737	21.04	21.04	19.85	1.54	1.617	19.884	19.884	1.19
119	n1738	21.5	21.5	20.31	1.463	1.54	20.343	20.343	1.19
120	n1739	21.14	21.14	19.95	2.849	2.926	19.996	19.996	1.19
121	n1741	22.01	22.01	20.82	1.386	1.463	20.852	20.852	1.19
122	n1742	22.87	22.87	21.68	0.693	0.77	21.703	21.703	1.19
123	n1743	21.9	21.9	20.71	0.385	0.462	20.728	20.728	1.19
124	n1744	22.5	22.5	20.989	0.308	0.385	21.006	21.006	1.51
125	n1745	23.71	23.71	22.52	3.542	11.319	22.629	22.629	1.19
126	n1746	24.16	24.16	22.97	0.616	0.693	22.992	22.992	1.19

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127	n1747	24.9	24.9	23.074	3.465	3.542	23.124	23.124	1.83
128	n1748	25.22	25.22	23.431	0.539	0.616	23.451	23.451	1.79
129	n1749	25.55	25.55	23.472	0.462	0.539	23.494	23.494	2.08
130	n1750	26.15	26.15	23.533	0.385	0.462	23.553	23.553	2.62
131	n1751	26.05	26.05	23.176	3.311	3.388	23.232	23.232	2.87
132	n1752	27.45	27.45	23.271	3.234	3.311	23.326	23.326	4.18
133	n1753	26.71	26.71	23.567	0.308	0.385	23.586	23.586	3.14
134	n1754	27.31	27.31	23.634	0.231	0.308	23.652	23.652	3.68
135	n1755	27.43	27.43	23.344	1.232	1.309	23.379	23.379	4.09
136	n1756	27.11	27.11	23.736	0.154	0.231	23.751	23.751	3.37
137	n1757	26.83	26.83	23.446	0.154	0.231	23.461	23.461	3.38
138	n1758	26.43	26.43	23.838	0.077	0.154	23.851	23.851	2.59
139	n1759	26.05	26.05	23.548	0.077	0.154	23.561	23.561	2.5
140	n1760	25.13	25.13	23.94	0	0.077	23.949	23.949	1.19
141	n1761	24.84	24.84	23.65	0	0.077	23.659	23.659	1.19
142	n1762	24.1	24.1	22.91	0	0.077	22.918	22.918	1.19
143	n1763	24	24	22.81	0	0.077	22.818	22.818	1.19
144	n1764	23.44	23.44	22.25	0.154	0.231	22.263	22.263	1.19
145	n1765	23.5	23.5	22.31	0.077	0.154	22.321	22.321	1.19
146	n1766	23.24	23.24	22.05	0.231	0.308	22.066	22.066	1.19
147	n1767	23.14	23.14	21.95	0.154	0.231	21.963	21.963	1.19
148	n1768	23.08	23.08	21.89	0.308	0.385	21.907	21.907	1.19
149	n1769	22.94	22.94	21.75	0.231	0.308	21.766	21.766	1.19
150	n1770	22.89	22.89	21.7	0.385	0.462	21.721	21.721	1.19
151	n1771	22.78	22.78	21.59	0.308	0.385	21.607	21.607	1.19
152	n1772	22.82	22.82	21.598	0.462	0.539	21.621	21.621	1.22
153	n1773	22.57	22.57	21.38	0.385	0.462	21.401	21.401	1.19
154	n1774	22.81	22.81	21.496	0.539	0.616	21.517	21.517	1.31
155	n1776	23.46	23.46	21.131	1.232	1.309	21.165	21.165	2.33
156	n1778	25.02	25.02	20.914	1.771	1.848	20.955	20.955	4.11
157	n1779	25.35	25.35	20.812	1.848	1.925	20.854	20.854	4.54
158	n1781	24.59	24.59	20.643	2.387	2.464	20.691	20.691	3.95
159	n1782	24.12	24.12	20.598	2.464	2.541	20.647	20.647	3.52
160	n1783	22.81	22.81	20.497	2.541	2.618	20.54	20.54	2.31
161	n1784	21.29	21.29	20.1	2.618	2.695	20.144	20.144	1.19
162	n1785	19.82	19.82	18.63	2.695	2.772	18.674	18.674	1.19
163	n1786	18.54	18.54	17.35	2.772	2.849	17.395	17.395	1.19
164	n1787	16.8	16.8	15.61	2.849	2.926	15.656	15.656	1.19
165	n1788	15.21	15.21	14.02	2.926	3.003	14.066	14.066	1.19
166	n1789	14.72	14.72	13.53	3.157	3.234	13.578	13.578	1.19
167	n1790	14.09	14.09	12.9	3.234	3.311	12.949	12.949	1.19
168	n1791	13.5	13.5	12.31	3.311	3.388	12.359	12.359	1.19
169	n1792	12.66	12.66	11.47	3.388	3.465	11.52	11.52	1.19
170	n1793	14.38	14.38	13.114	30.877	30.954	13.254	13.254	1.27
171	n1794	12.5	12.5	11.234	30.954	31.031	11.375	11.375	1.27
172	n1795	12.04	12.04	10.774	31.031	31.108	10.915	10.915	1.27
173	n1796	10.25	10.25	8.984	31.108	31.185	9.125	9.125	1.27
174	n1797	7.89	7.89	6.624	31.185	31.262	6.765	6.765	1.27
175	n1798	6.58	6.58	5.314	31.262	31.339	5.499	5.499	1.27
176	n1799	6.52	6.52	5.24	31.339	31.416	5.426	5.426	1.28
177	n1800	6.52	6.52	5.165	31.416	31.493	5.355	5.355	1.35
178	n1807	10.7	10.7	8.885	5.236	5.313	8.956	8.956	1.81
179	n1808	10.57	10.57	8.902	5.159	5.236	8.972	8.972	1.67

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)
180	n1809	10.35	10.35	8.992	5.082	5.159	9.062	9.062	1.36
181	n1810	10.96	10.96	9.77	4.697	4.774	9.829	9.829	1.19
182	n1811	11.84	11.84	10.241	4.543	4.62	10.306	10.306	1.6
183	n1812	13.52	13.52	10.343	4.312	4.389	10.407	10.407	3.18
184	n1813	14.35	14.35	10.422	4.235	4.312	10.485	10.485	3.93
185	n1814	15.53	15.53	14.34	0.385	0.462	14.358	14.358	1.19
186	n1815	16.16	16.16	14.97	0.308	0.385	14.987	14.987	1.19
187	n1816	16.23	16.23	15.04	0.231	0.308	15.055	15.055	1.19
188	n1817	16.35	16.35	15.16	0.154	0.231	15.173	15.173	1.19
189	n1818	16.57	16.57	15.38	0.077	0.154	15.391	15.391	1.19
190	n1819	17.04	17.04	15.85	0	0.077	15.858	15.858	1.19
191	n1820	17.25	17.25	13.529	0.539	0.616	13.553	13.553	3.72
192	n1821	15.3	15.3	13.415	0.693	0.77	13.438	13.438	1.89
193	n1823	16.22	16.22	13.457	0.616	0.693	13.483	13.483	2.76
194	n1825	17.62	17.62	13.631	0.462	0.539	13.653	13.653	3.99
195	n1826	17.43	17.43	13.733	0.385	0.462	13.754	13.754	3.7
196	n1827	17.89	17.89	13.818	0.308	0.385	13.837	13.837	4.07
197	n1828	15.38	15.38	14.19	0	0.077	14.199	14.199	1.19
198	n1829	16.12	16.12	14.107	0.077	0.154	14.12	14.12	2.01
199	n1830	17.03	17.03	14.005	0.154	0.231	14.02	14.02	3.02
200	n1831	17.55	17.55	13.903	0.231	0.308	13.921	13.921	3.65
201	n1832	17.94	17.94	16.75	0	0.077	16.758	16.758	1.19
202	n1833	17.49	17.49	16.3	0.077	0.154	16.311	16.311	1.19
203	n1834	17.02	17.02	15.83	0.154	0.231	15.843	15.843	1.19
204	n1835	16.45	16.45	14.556	0.385	0.462	14.574	14.574	1.89
205	n1836	15.19	15.19	14	0.462	0.539	14.02	14.02	1.19
206	n1837	13.91	13.91	12.72	0.539	0.616	12.741	12.741	1.19
207	n1838	13	13	11.81	0.616	0.693	11.832	11.832	1.19
208	n1839	12.08	12.08	10.89	0.693	0.77	10.913	10.913	1.19
209	n1840	11.66	11.66	10.47	0.77	0.847	10.498	10.498	1.19
210	n1841	11.73	11.73	10.421	0.847	0.924	10.446	10.446	1.31
211	n1842	13.16	13.16	10.839	1.925	2.002	10.882	10.882	2.32
212	n1843	8.87	8.87	7.68	0.924	1.001	7.707	7.707	1.19
213	n1844	8.63	8.63	7.44	1.001	1.078	7.468	7.468	1.19
214	n1845	8.17	8.17	6.98	1.078	1.155	7.013	7.013	1.19
215	n1846	8.15	8.15	6.878	1.771	1.848	6.919	6.919	1.27
216	n1848	9.1	9.1	7.91	0.539	0.616	7.931	7.931	1.19
217	n1849	11.07	11.07	9.88	0.462	0.539	9.9	9.9	1.19
218	n1850	12.13	12.13	10.94	0.385	0.462	10.958	10.958	1.19
219	n1851	12.23	12.23	11.04	0.308	0.385	11.057	11.057	1.19
220	n1852	13.17	13.17	11.98	0.231	0.308	11.995	11.995	1.19
221	n1854	13.86	13.86	12.67	0.154	0.231	12.683	12.683	1.19
222	n1855	14.92	14.92	13.73	0.077	0.154	13.741	13.741	1.19
223	n1856	21.48	21.48	20.29	2.772	2.849	20.335	20.335	1.19
224	n1857	22.08	22.08	20.89	2.233	2.31	20.931	20.931	1.19
225	n1858	23.71	23.71	22.52	2.156	2.233	22.56	22.56	1.19
226	n1860	22.24	22.24	21.05	0.231	0.308	21.068	21.068	1.19
227	n1861	22.72	22.72	21.53	0.154	0.231	21.543	21.543	1.19
228	n1862	24.19	24.19	23	0.077	0.154	23.011	23.011	1.19
229	n1863	25.16	25.16	23.97	2.079	2.156	24.009	24.009	1.19
230	n1864	25.7	25.7	24.51	0	0.077	24.518	24.518	1.19
231	n1865	25.93	25.93	24.74	2.002	2.079	24.778	24.778	1.19
232	n1866	27.22	27.22	26.03	1.925	2.002	26.068	26.068	1.19

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233	n1867	28.34	28.34	27.15	1.848	1.925	27.187	27.187	1.19
234	n1868	29.24	29.24	28.05	1.771	1.848	28.086	28.086	1.19
235	n1869	29.93	29.93	28.74	1.694	1.771	28.776	28.776	1.19
236	n1870	30.36	30.36	28.92	1.617	1.694	28.955	28.955	1.44
237	n1872	30.53	30.53	29.34	1.309	1.386	29.371	29.371	1.19
238	n1873	30.62	30.62	29.036	1.54	1.617	29.075	29.075	1.58
239	n1874	30.6	30.6	29.138	0.077	0.154	29.151	29.151	1.46
240	n1875	30.43	30.43	29.24	0	0.077	29.249	29.249	1.19
241	n1906	36.72	36.72	34.939	0.539	0.616	34.96	34.96	1.78
242	n1907	36.77	36.77	35.58	0.462	0.539	35.6	35.6	1.19
243	n1908	37.37	37.37	35.943	0.385	0.462	35.961	35.961	1.43
244	n1910	37.91	37.91	36.72	0.154	0.231	36.733	36.733	1.19
245	n1911	38.6	38.6	37.399	0.077	0.154	37.409	37.409	1.2
246	n1912	38.68	38.68	37.49	0	0.077	37.499	37.499	1.19
247	n1941	43.27	43.27	42.08	0	0.077	42.088	42.088	1.19
248	n1942	43.06	43.06	41.87	0.231	0.308	41.888	41.888	1.19
249	n1943	43.04	43.04	41.79	0.308	0.385	41.807	41.807	1.25
250	n1944	42.82	42.82	41.63	0.462	0.539	41.653	41.653	1.19
251	n1945	42.89	42.89	41.7	0.385	0.462	41.72	41.72	1.19
252	n1946	42.89	42.89	41.56	0.539	0.616	41.585	41.585	1.33
253	n1947	42.81	42.81	41.528	0.616	0.693	41.55	41.55	1.28
254	n1948	42.46	42.46	41.27	0.693	0.77	41.293	41.293	1.19
255	n1949	41.73	41.73	40.54	1.155	1.232	40.57	40.57	1.19
256	n1950	30.22	30.22	29.03	1.848	1.925	29.067	29.067	1.19
257	n1951	33.67	33.67	32.01	1.771	1.848	32.046	32.046	1.66
258	n1952	36.27	36.27	35.08	1.694	1.771	35.116	35.116	1.19
259	n1953	38.35	38.35	37.16	1.617	1.694	37.195	37.195	1.19
260	n1954	40.34	40.34	39.15	1.309	1.386	39.181	39.181	1.19
261	n1955	41.34	41.34	40.15	1.232	1.309	40.18	40.18	1.19
262	n1956	41.81	41.81	40.576	0.308	0.385	40.594	40.594	1.23
263	n1957	41.88	41.88	40.678	0.231	0.308	40.696	40.696	1.2
264	n1958	41.97	41.97	40.78	0.154	0.231	40.795	40.795	1.19
265	n1959	42.25	42.25	41.06	0.077	0.154	41.071	41.071	1.19
266	n1960	42.53	42.53	41.34	0	0.077	41.348	41.348	1.19
267	n2018	28.32	28.32	27.13	0.924	1.001	27.157	27.157	1.19
268	n2019	30.5	30.5	29.31	0.847	0.924	29.336	29.336	1.19
269	n2020	32.2	32.2	31.01	0.693	0.77	31.033	31.033	1.19
270	n2021	33.31	33.31	32.12	0.616	0.693	32.142	32.142	1.19
271	n2022	33.64	33.64	32.45	0.462	0.539	32.47	32.47	1.19
272	n2023	35.69	35.69	34.5	0.385	0.462	34.518	34.518	1.19
273	n2024	37.72	37.72	36.53	0.308	0.385	36.547	36.547	1.19
274	n2025	39.02	39.02	37.83	0.231	0.308	37.845	37.845	1.19
275	n2026	40.74	40.74	39.55	0	0.077	39.558	39.558	1.19
276	n2072	24.25	24.25	21.016	1.694	1.771	21.056	21.056	3.23
277	n2073	24.21	24.21	23.009	0.308	0.385	23.025	23.025	1.2
278	n2074	24.26	24.26	23.07	0.231	0.308	23.088	23.088	1.19
279	n2075	24.58	24.58	23.39	0.154	0.231	23.403	23.403	1.19
280	n2076	25.69	25.69	24.5	0.077	0.154	24.511	24.511	1.19
281	n2078	27.05	27.05	25.86	0	0.077	25.868	25.868	1.19
282	n2085	24.38	24.38	23.19	0.308	0.385	23.209	23.209	1.19
283	n2086	24.72	24.72	23.53	0.231	0.308	23.545	23.545	1.19
284	n2088	25.89	25.89	24.7	0.154	0.231	24.713	24.713	1.19
285	n2090	26.49	26.49	25.3	0.077	0.154	25.311	25.311	1.19



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286	n2091	27.5	27.5	26.31	0	0.077	26.318	26.318	1.19
287	n4335	15.95	15.95	14.76	0	0.077	14.769	14.769	1.19
288	n4336	16.08	16.08	14.658	0.077	0.154	14.671	14.671	1.42
289	n4603	14.83	14.83	13.64	3.08	3.157	13.688	13.688	1.19
290	n4604	15.04	15.04	13.85	3.003	3.08	13.897	13.897	1.19
291	n4614	25.48	25.48	20.766	1.925	2.002	20.809	20.809	4.71
292	n4615	22.91	22.91	21.233	1.155	1.232	21.266	21.266	1.68
293	n4616	22.68	22.68	21.266	0.462	0.539	21.289	21.289	1.41
294	n4623	33.44	33.44	32.25	0.539	0.616	32.271	32.271	1.19
295	n4626	39.21	39.21	38.02	0.154	0.231	38.033	38.033	1.19
296	n4627	40.19	40.19	39	0.077	0.154	39.011	39.011	1.19
297	n4628	43.15	43.15	41.934	0.154	0.231	41.947	41.947	1.22
298	n4629	43.16	43.16	41.97	0.077	0.154	41.983	41.983	1.19
299	n4643	37.45	37.45	36.26	0.231	0.308	36.275	36.275	1.19
300	n4644	37.25	37.25	36.06	0.308	0.385	36.079	36.079	1.19
301	n4645	28.27	28.27	26.02	0.154	0.231	26.033	26.033	2.25
302	n4647	26.26	26.26	24.382	0.231	0.308	24.396	24.396	1.88
303	n4648	24.78	24.78	23.445	0.308	0.385	23.461	23.461	1.34
304	n4649	23.92	23.92	22.73	0.385	0.462	22.748	22.748	1.19
305	n4650	39.16	39.16	37.97	0	0.077	37.979	37.979	1.19
306	n4653	21.53	21.53	20.34	1.386	1.463	20.377	20.377	1.19
307	n4654	39.97	39.97	38.78	1.386	1.463	38.812	38.812	1.19
308	n4655	39.28	39.28	38.09	1.463	1.54	38.123	38.123	1.19
309	n4656	38.52	38.52	37.33	1.54	1.617	37.364	37.364	1.19
310	n4657	31.74	31.74	30.55	0.77	0.847	30.574	30.574	1.19
311	n4658	25.62	25.62	23.138	3.388	3.465	23.194	23.194	2.48
312	n4663	10.26	10.26	9.046	5.005	5.082	9.115	9.115	1.21
313	n4664	10.29	10.29	9.068	4.928	5.005	9.136	9.136	1.22
314	n4665	10.27	10.27	9.08	4.851	4.928	9.148	9.148	1.19
315	n4666	10.79	10.79	9.6	4.774	4.851	9.659	9.659	1.19
316	n4667	12.82	12.82	10.305	4.466	4.543	10.37	10.37	2.51
317	n4668	13.35	13.35	10.334	4.389	4.466	10.398	10.398	3.02
319	n4672	15.82	15.82	14.554	30.8	30.877	14.694	14.694	1.27
320	n4677	18.22	18.22	16.533	0.616	0.693	16.561	16.561	1.69
321	n4685	31.74	31.74	30.55	0.154	0.231	30.563	30.563	1.19
322	n4686	31.04	31.04	29.85	0.231	0.308	29.865	29.865	1.19
323	n4688	22.71	22.71	20.084	1.694	1.771	20.124	20.124	2.63
324	n4703	25.61	25.61	24.42	0	0.077	24.428	24.428	1.19
325	n4704	25.52	25.52	24.33	0	0.077	24.338	24.338	1.19
326	n4742	25.61	25.61	24.035	0.077	0.154	24.046	24.046	1.57
327	n4743	22.62	22.62	20.735	29.414	29.491	20.911	20.911	1.88
328	n4744	22.26	22.26	20.783	29.337	29.414	20.959	20.959	1.48
659	MH-5	12.104	12.104	10.914	0	1.925	10.956	10.956	1.19
30	n1785	19.82	19.82	18.63	0	0.077	18.638	18.638	1.19
31	n2114	25.94	25.94	24.75	0	0.077	24.758	24.758	1.19
32	n2115	25.77	25.77	24.245	0.077	0.154	24.255	24.255	1.53
33	n2116	24.81	24.81	23.217	0.154	0.231	23.23	23.23	1.59
34	n2117	22.91	22.91	21.371	0.231	0.308	21.386	21.386	1.54
35	n2118	20.51	20.51	18.134	0.385	0.462	18.152	18.152	2.38
36	n2119	17.83	17.83	16.448	0.462	0.539	16.467	16.467	1.38
37	n2120	16.14	16.14	14.95	1.001	1.078	14.978	14.978	1.19
38	n2122	18.83	18.83	17.64	0.077	0.154	17.651	17.651	1.19
39	n2123	18.23	18.23	17.04	0.154	0.231	17.053	17.053	1.19

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40	n2124	17.87	17.87	16.68	0.231	0.308	16.695	16.695	1.19
41	n2125	17.33	17.33	16.14	0.308	0.385	16.157	16.157	1.19
42	n2126	16.76	16.76	15.57	0.385	0.462	15.588	15.588	1.19
43	n2127	15.62	15.62	14.43	1.078	1.155	14.459	14.459	1.19
44	n2128	15.16	15.16	13.97	1.155	1.232	14	14	1.19
45	n2130	14.46	14.46	13.27	1.232	1.309	13.3	13.3	1.19
46	n2131	13.79	13.79	12.6	1.309	1.386	12.631	12.631	1.19
47	n2132	12.94	12.94	11.75	1.386	1.463	11.782	11.782	1.19
48	n2133	12.62	12.62	11.43	1.463	1.54	11.463	11.463	1.19
49	n2134	11.41	11.41	10.22	1.925	2.002	10.258	10.258	1.19
50	n2136	14.05	14.05	12.86	0.077	0.154	12.871	12.871	1.19
51	n2137	13.43	13.43	12.24	0.154	0.231	12.253	12.253	1.19
52	n2138	12.85	12.85	11.66	0.231	0.308	11.675	11.675	1.19
53	n2139	12.33	12.33	11.14	0.308	0.385	11.157	11.157	1.19
54	n2150	11.07	11.07	9.88	2.002	2.079	9.918	9.918	1.19
55	n2151	10.8	10.8	9.61	2.079	2.156	9.649	9.649	1.19
56	n2152	10.62	10.62	9.43	2.156	2.233	9.475	9.475	1.19
57	n2153	10.53	10.53	9.328	6.083	6.16	9.405	9.405	1.2
58	n2161	10.74	10.74	9.55	3.773	3.85	9.603	9.603	1.19
59	n2175	11.92	11.92	10.73	3.465	3.542	10.78	10.78	1.19
60	n2176	12.65	12.65	11.46	1.848	1.925	11.497	11.497	1.19
61	n2177	13.53	13.53	12.34	1.771	1.848	12.376	12.376	1.19
62	n2178	14.44	14.44	13.25	1.694	1.771	13.286	13.286	1.19
63	n2179	15.37	15.37	13.693	1.617	1.694	13.728	13.728	1.68
64	n2180	15.7	15.7	13.795	1.54	1.617	13.834	13.834	1.9
65	n2181	15.43	15.43	13.892	1.463	1.54	13.929	13.929	1.54
66	n2182	15.46	15.46	13.925	1.386	1.463	13.962	13.962	1.54
67	n2183	15.44	15.44	13.954	1.309	1.386	13.989	13.989	1.49
68	n2184	15.41	15.41	13.999	1.232	1.309	14.034	14.034	1.41
69	n2186	15.31	15.31	14.12	1.155	1.232	14.154	14.154	1.19
70	n2200	12.57	12.57	11.38	1.463	1.54	11.413	11.413	1.19
71	n2201	13.68	13.68	12.49	1.386	1.463	12.522	12.522	1.19
72	n2202	14.89	14.89	13.344	1.309	1.386	13.375	13.375	1.55
73	n2203	16.17	16.17	14.98	0.847	0.924	15.006	15.006	1.19
74	n2204	14.68	14.68	13.49	0.308	0.385	13.507	13.507	1.19
75	n2205	15.63	15.63	14.44	0.231	0.308	14.455	14.455	1.19
76	n2206	16.97	16.97	15.124	0.154	0.231	15.137	15.137	1.85
77	n2207	16.75	16.75	15.344	0.77	0.847	15.369	15.369	1.41
78	n2208	17.08	17.08	15.698	0.077	0.154	15.709	15.709	1.38
79	n2209	16.99	16.99	15.8	0	0.077	15.809	15.809	1.19
80	n2210	18.11	18.11	16.669	6.237	6.314	16.747	16.747	1.44
81	n2211	18.44	18.44	16.567	6.314	6.391	16.646	16.646	1.87
82	n2212	18.26	18.26	17.07	0.539	0.616	17.091	17.091	1.19
83	n2213	18.57	18.57	17.276	0.462	0.539	17.296	17.296	1.29
84	n2214	18.63	18.63	16.465	6.391	6.468	16.544	16.544	2.16
85	n2215	18.72	18.72	16.363	6.468	6.545	16.443	16.443	2.36
86	n2216	18.63	18.63	17.378	0.308	0.385	17.397	17.397	1.25
87	n2217	18.67	18.67	17.48	0.231	0.308	17.498	17.498	1.19
88	n2218	18.94	18.94	16.261	6.545	6.622	16.341	16.341	2.68
89	n2219	18.99	18.99	17.726	0.154	0.231	17.739	17.739	1.26
90	n2220	19.24	19.24	16.159	6.622	6.699	16.24	16.24	3.08
91	n2221	19.25	19.25	17.828	0.077	0.154	17.841	17.841	1.42
92	n2222	19.05	19.05	16.057	6.699	6.776	16.138	16.138	2.99

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93	n2223	19.12	19.12	17.93	0	0.077	17.939	17.939	1.19
94	n2224	21	21	19.478	1.078	1.155	19.507	19.507	1.52
95	n2225	22.94	22.94	21.307	1.001	1.078	21.335	21.335	1.63
96	n2226	25.3	25.3	23.246	0.924	1.001	23.272	23.272	2.05
97	n2227	27.55	27.55	25.606	0.847	0.924	25.631	25.631	1.94
98	n2228	28.72	28.72	27.399	0.693	0.77	27.422	27.422	1.32
99	n2229	29.92	29.92	28.194	0.616	0.693	28.216	28.216	1.73
100	n2230	31.31	31.31	29.621	0.539	0.616	29.642	29.642	1.69
101	n2232	30.95	30.95	29.76	0.308	0.385	29.779	29.779	1.19
102	n2233	32.77	32.77	31.257	0.231	0.308	31.271	31.271	1.51
103	n2234	33.92	33.92	31.867	0.154	0.231	31.879	31.879	2.05
104	n2235	34.68	34.68	31.968	0.077	0.154	31.981	31.981	2.71
105	n2236	33.26	33.26	32.07	0	0.077	32.079	32.079	1.19
106	n2237	31.91	31.91	29.959	0	0.077	29.966	29.966	1.95
107	n2238	30.63	30.63	27.852	0.077	0.154	27.863	27.863	2.78
108	n2239	27.55	27.55	25.024	0.154	0.231	25.036	25.036	2.53
109	n2240	24.72	24.72	23.055	0.231	0.308	23.07	23.07	1.66
110	n2241	16.09	16.09	14.9	1.078	1.155	14.929	14.929	1.19
111	n2242	17.78	17.78	16.397	1.001	1.078	16.424	16.424	1.38
112	n2243	20.16	20.16	18.085	0.924	1.001	18.112	18.112	2.07
113	n2244	22.81	22.81	20.464	0.847	0.924	20.49	20.49	2.35
114	n2245	23.74	23.74	22.113	0.77	0.847	22.137	22.137	1.63
115	n2246	27.46	27.46	24.038	0.385	0.462	24.056	24.056	3.42
116	n2247	29.76	29.76	27.099	0.308	0.385	27.115	27.115	2.66
117	n2249	33.09	33.09	31.171	0.154	0.231	31.184	31.184	1.92
118	n2258	18.42	18.42	15.956	6.776	6.853	16.037	16.037	2.46
119	n2259	17.68	17.68	15.854	6.853	6.93	15.924	15.924	1.83
120	n2260	19.02	19.02	17.83	1.155	1.232	17.86	17.86	1.19
121	n2261	18.52	18.52	17.33	1.232	1.309	17.36	17.36	1.19
122	n2262	17.78	17.78	16.59	1.309	1.386	16.621	16.621	1.19
123	n2263	16.71	16.71	15.52	6.93	7.007	15.592	15.592	1.19
124	n2264	16.84	16.84	15.65	1.386	1.463	15.682	15.682	1.19
125	n2265	15.45	15.45	14.26	7.007	7.084	14.332	14.332	1.19
126	n2266	14.21	14.21	13.02	7.084	7.161	13.092	13.092	1.19
127	n2267	15.44	15.44	14.25	1.463	1.54	14.283	14.283	1.19
128	n2268	14.25	14.25	13.042	2.387	2.464	13.083	13.083	1.21
129	n2270	14.32	14.32	13.13	0.77	0.847	13.158	13.158	1.19
130	n2271	15.06	15.06	13.87	0.693	0.77	13.893	13.893	1.19
131	n2272	15.47	15.47	14.28	0.616	0.693	14.302	14.302	1.19
132	n2273	15.57	15.57	14.38	0.539	0.616	14.401	14.401	1.19
133	n2274	16.14	16.14	14.95	0.462	0.539	14.97	14.97	1.19
134	n2275	17.7	17.7	16.448	0.385	0.462	16.466	16.466	1.25
135	n2276	21.01	21.01	18.001	0.308	0.385	18.017	18.017	3.01
136	n2277	25.04	25.04	21.307	0.231	0.308	21.321	21.321	3.73
137	n2278	26.62	26.62	24.421	0.154	0.231	24.434	24.434	2.2
138	n2282	33.82	33.82	30.996	0	0.077	31.003	31.003	2.82
139	n2283	30.83	30.83	28.675	0.077	0.154	28.685	28.685	2.16
140	n2284	28.37	28.37	27.18	0.154	0.231	27.193	27.193	1.19
141	n2285	27.11	27.11	25.92	0.231	0.308	25.935	25.935	1.19
142	n2286	26.54	26.54	25.35	0.308	0.385	25.367	25.367	1.19
143	n2287	26.45	26.45	25.26	0.385	0.462	25.279	25.279	1.19
144	n2288	26.32	26.32	25.037	0.539	0.616	25.058	25.058	1.28
145	n2289	24.73	24.73	21.838	0.616	0.693	21.86	21.86	2.89

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146	n2290	22	22	19.54	0.693	1.771	19.575	19.575	2.46
147	n2291	22.5	22.5	21.31	0	0.077	21.319	21.319	1.19
148	n2292	22.69	22.69	21.259	0.077	0.154	21.27	21.27	1.43
149	n2293	21.59	21.59	20.049	0.154	0.231	20.061	20.061	1.54
150	n2294	20.7	20.7	19.478	0.231	0.308	19.493	19.493	1.22
151	n2295	19.71	19.71	18.52	0.308	0.385	18.537	18.537	1.19
152	n2296	18.82	18.82	17.63	0.385	0.462	17.648	17.648	1.19
153	n2298	17.77	17.77	16.067	0.462	0.539	16.086	16.086	1.7
154	n2299	15.76	15.76	14.57	0.924	1.001	14.601	14.601	1.19
155	n2302	16.11	16.11	14.92	0.308	0.385	14.937	14.937	1.19
156	n2303	18.11	18.11	16.416	0.231	0.308	16.43	16.43	1.69
157	n2305	18.35	18.35	17.16	0.154	0.231	17.173	17.173	1.19
158	n2306	19.76	19.76	17.813	0.077	0.154	17.824	17.824	1.95
159	n2307	21.62	21.62	20.067	0	0.077	20.074	20.074	1.55
160	n2366	13.12	13.12	11.93	7.161	7.238	12.003	12.003	1.19
161	n2367	13.12	13.12	11.93	2.464	2.541	11.973	11.973	1.19
162	n2368	12.13	12.13	10.94	7.238	7.315	11.013	11.013	1.19
163	n2369	12.12	12.12	10.93	2.541	2.618	10.973	10.973	1.19
164	n2370	11.36	11.36	10.17	7.315	7.392	10.244	10.244	1.19
165	n2371	11.37	11.37	10.18	2.618	2.695	10.224	10.224	1.19
166	n2372	10.92	10.92	9.73	7.392	7.469	9.804	9.804	1.19
167	n2373	10.87	10.87	9.68	2.695	2.772	9.724	9.724	1.19
168	n2374	10.56	10.56	9.37	7.469	7.546	9.444	9.444	1.19
169	n2375	10.63	10.63	9.44	2.772	2.849	9.488	9.488	1.19
170	n2376	10.5	10.5	9.31	2.849	2.926	9.362	9.362	1.19
171	n2377	10.36	10.36	9.17	7.546	7.623	9.256	9.256	1.19
172	n2378	10.51	10.51	9.068	7.623	7.7	9.143	9.143	1.44
173	n2379	10.53	10.53	9.208	2.926	3.003	9.254	9.254	1.32
174	n2380	9.87	9.87	8.68	7.7	7.777	8.756	8.756	1.19
175	n2381	9.91	9.91	8.72	3.003	3.08	8.767	8.767	1.19
176	n2382	9.4	9.4	8.21	5.313	5.39	8.273	8.273	1.19
177	n2384	9.84	9.84	8.65	5.236	5.313	8.712	8.712	1.19
178	n2385	12.46	12.46	10.068	0	0.077	10.075	10.075	2.39
179	n2386	10.88	10.88	9.69	5.082	5.159	9.751	9.751	1.19
180	n2388	11.6	11.6	10.41	5.005	5.082	10.471	10.471	1.19
181	n2389	12.04	12.04	10.85	4.928	5.005	10.91	10.91	1.19
182	n2390	14.35	14.35	12.344	0.077	0.154	12.354	12.354	2.01
183	n2393	12.2	12.2	11.008	4.697	4.774	11.07	11.07	1.19
184	n2394	12.3	12.3	11.11	4.62	4.697	11.176	11.176	1.19
185	n2396	13.33	13.33	11.6	2.618	2.695	11.644	11.644	1.73
186	n2397	14.76	14.76	13.57	2.541	2.618	13.613	13.613	1.19
187	n2398	15.48	15.48	14.29	2.464	2.541	14.333	14.333	1.19
188	n2399	16.12	16.12	14.93	2.387	2.464	14.972	14.972	1.19
189	n2400	17	17	15.81	2.31	2.387	15.851	15.851	1.19
190	n2402	17.13	17.13	15.94	2.233	2.31	15.981	15.981	1.19
191	n2403	17.4	17.4	16.21	2.156	2.233	16.25	16.25	1.19
192	n2404	17.42	17.42	16.23	2.079	2.156	16.274	16.274	1.19
193	n2405	17.83	17.83	16.64	2.002	2.079	16.678	16.678	1.19
194	n2406	18.63	18.63	17.221	1.925	2.002	17.259	17.259	1.41
195	n2407	20	20	18.477	1.771	1.848	18.513	18.513	1.52
196	n2409	12.76	12.76	11.57	1.848	1.925	11.607	11.607	1.19
197	n2410	12.94	12.94	11.75	1.771	1.848	11.786	11.786	1.19
198	n2413	13.19	13.19	12	1.617	1.694	12.035	12.035	1.19

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199	n2414	14.04	14.04	12.85	1.463	1.54	12.883	12.883	1.19
200	n2415	15.11	15.11	13.92	1.386	1.463	13.952	13.952	1.19
201	n2416	15.46	15.46	14.204	1.309	1.386	14.235	14.235	1.26
202	n2418	15.94	15.94	14.748	0.231	0.308	14.762	14.762	1.19
203	n2419	17.07	17.07	15.77	0.154	0.231	15.782	15.782	1.3
204	n2420	17.9	17.9	16.71	0.077	0.154	16.721	16.721	1.19
205	n2421	16.06	16.06	14.87	0.847	0.924	14.896	14.896	1.19
206	n2422	16.28	16.28	15.09	0.77	0.847	15.114	15.114	1.19
207	n2423	16.49	16.49	15.3	0.616	0.693	15.322	15.322	1.19
208	n2424	16.93	16.93	15.694	0.539	0.616	15.715	15.715	1.24
209	n2425	17.26	17.26	15.726	0.462	0.539	15.749	15.749	1.53
210	n2426	18.37	18.37	16.817	0.077	0.154	16.827	16.827	1.55
211	n2427	18.74	18.74	17.55	0	0.077	17.558	17.558	1.19
212	n2428	17.55	17.55	15.761	0.154	0.231	15.776	15.776	1.79
213	n2429	17.69	17.69	15.848	0.077	0.154	15.861	15.861	1.84
214	n2430	17.14	17.14	15.95	0	0.077	15.959	15.959	1.19
216	n2436	19.02	19.02	17.83	0.231	0.308	17.845	17.845	1.19
217	n2437	19.52	19.52	18.33	0.154	0.231	18.343	18.343	1.19
218	n2438	20.1	20.1	18.91	0.077	0.154	18.921	18.921	1.19
219	n2440	21.03	21.03	19.84	0	0.077	19.848	19.848	1.19
220	n2910	25.47	25.47	24.28	0	0.077	24.288	24.288	1.19
221	n2990	8.92	8.92	7.73	16.478	16.555	7.842	7.842	1.19
222	n2991	8.41	8.41	7.22	16.555	16.632	7.332	7.332	1.19
223	n2992	7.61	7.61	6.298	16.632	16.709	6.41	6.41	1.31
224	n2993	5.99	5.99	4.8	16.709	16.786	4.913	4.913	1.19
225	n2994	4.97	4.97	3.78	16.786	16.863	3.893	3.893	1.19
227	n2996	4.7	4.7	3.51	9.394	9.471	3.594	3.594	1.19
228	n2997	5.17	5.17	3.973	9.317	9.394	4.056	4.056	1.2
229	n2998	5.66	5.66	4.47	2.926	3.003	4.516	4.516	1.19
230	n3000	6.4	6.4	5.21	2.849	2.926	5.256	5.256	1.19
231	n3001	7.05	7.05	5.86	2.772	2.849	5.905	5.905	1.19
232	n3002	7.99	7.99	6.8	2.695	2.772	6.844	6.844	1.19
233	n3003	9.56	9.56	8.298	2.618	2.695	8.342	8.342	1.26
234	n3004	11.53	11.53	9.867	2.541	2.618	9.91	9.91	1.66
235	n3005	13.58	13.58	11.837	2.464	2.541	11.879	11.879	1.74
236	n3006	15.65	15.65	13.887	2.387	2.464	13.928	13.928	1.76
237	n3007	16.47	16.47	15.044	2.31	2.387	15.085	15.085	1.43
238	n3008	17.93	17.93	16.342	2.233	2.31	16.382	16.382	1.59
239	n3009	18.86	18.86	17.408	0.077	0.154	17.419	17.419	1.45
240	n3010	20.71	20.71	19.167	0	0.077	19.175	19.175	1.54
241	n3011	12.69	12.69	11.5	0	0.077	11.508	11.508	1.19
242	n3012	12.38	12.38	11.19	0.077	0.154	11.201	11.201	1.19
243	n3013	11.68	11.68	10.49	0.154	0.231	10.503	10.503	1.19
244	n3014	11.08	11.08	9.89	0.231	0.308	9.905	9.905	1.19
245	n3016	10.6	10.6	9.41	0.308	0.385	9.427	9.427	1.19
246	n3017	10.2	10.2	9.01	0.385	0.462	9.028	9.028	1.19
247	n3018	9.3	9.3	8.11	0.462	0.539	8.13	8.13	1.19
248	n3019	8.3	8.3	7.11	0.539	0.616	7.131	7.131	1.19
249	n3020	7.86	7.86	6.67	0.616	0.693	6.692	6.692	1.19
250	n3022	7.53	7.53	6.307	0.924	1.001	6.333	6.333	1.22
251	n3023	7.26	7.26	6.07	4.62	4.697	6.128	6.128	1.19
252	n3028	16.33	16.33	14.743	0.539	0.616	14.764	14.764	1.59
253	n3030	14.4	14.4	13.164	0.616	0.693	13.186	13.186	1.24

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254	n3032	12.86	12.86	11.67	0.77	0.847	11.694	11.694	1.19
255	n3034	11.78	11.78	10.578	2.156	2.233	10.618	10.618	1.2
256	n3036	10.11	10.11	8.92	2.695	2.772	8.964	8.964	1.19
257	n3039	10.37	10.37	9.18	0.385	0.462	9.198	9.198	1.19
258	n3040	10.58	10.58	9.39	0.308	0.385	9.407	9.407	1.19
259	n3041	10.98	10.98	9.79	0.231	0.308	9.805	9.805	1.19
260	n3042	11.81	11.81	10.62	0.154	0.231	10.633	10.633	1.19
261	n3044	5.27	5.27	4.038	6.237	6.314	4.116	4.116	1.23
262	n3047	5.33	5.33	4.14	6.16	6.237	4.217	4.217	1.19
263	n3049	5.48	5.48	4.248	6.083	6.16	4.324	4.324	1.23
264	n3051	5.54	5.54	4.292	6.006	6.083	4.367	4.367	1.25
265	n3057	5.72	5.72	4.53	5.775	5.852	4.595	4.595	1.19
266	n3058	6.04	6.04	4.85	5.698	5.775	4.915	4.915	1.19
267	n3060	6.31	6.31	5.12	5.621	5.698	5.184	5.184	1.19
268	n3061	6.47	6.47	5.28	5.544	5.621	5.344	5.344	1.19
269	n3063	7.11	7.11	5.92	5.467	5.544	5.983	5.983	1.19
270	n3065	8.07	8.07	6.88	3.542	3.619	6.931	6.931	1.19
271	n3066	8.34	8.34	7.15	3.465	3.542	7.2	7.2	1.19
272	n3067	8.54	8.54	7.35	3.311	3.388	7.399	7.399	1.19
273	n3068	8.59	8.59	7.4	3.234	3.311	7.449	7.449	1.19
274	n3069	8.87	8.87	7.68	3.157	3.234	7.728	7.728	1.19
275	n3070	9.4	9.4	8.167	2.926	3.003	8.213	8.213	1.23
276	n3071	9.48	9.48	8.29	2.849	2.926	8.336	8.336	1.19
277	n3072	9.9	9.9	8.71	2.772	2.849	8.755	8.755	1.19
278	n3076	13.17	13.17	11.926	1.232	1.309	11.957	11.957	1.24
279	n3077	14.1	14.1	12.028	1.155	1.232	12.062	12.062	2.07
280	n3078	13.98	13.98	12.13	0.847	0.924	12.16	12.16	1.85
281	n3079	13.46	13.46	12.232	0.77	0.847	12.26	12.26	1.23
282	n3080	13.57	13.57	12.306	0.693	0.77	12.333	12.333	1.26
283	n3083	13.82	13.82	12.63	0.154	0.231	12.643	12.643	1.19
284	n3084	14.25	14.25	13.06	0.077	0.154	13.071	13.071	1.19
285	n3085	16.06	16.06	14.556	0	0.077	14.564	14.564	1.5
286	n3086	13.67	13.67	12.48	0.308	0.385	12.498	12.498	1.19
287	n3087	14.45	14.45	13.26	0.231	0.308	13.275	13.275	1.19
288	n3088	14.71	14.71	13.52	0.154	0.231	13.533	13.533	1.19
289	n3089	16.17	16.17	14.679	0.077	0.154	14.689	14.689	1.49
290	n3090	18.52	18.52	16.476	0	0.077	16.483	16.483	2.04
291	n3091	21.16	21.16	19.97	0.924	1.001	20.001	20.001	1.19
292	n3092	22.02	22.02	20.83	0.847	0.924	20.856	20.856	1.19
293	n3094	23.44	23.44	22.25	0.77	0.847	22.274	22.274	1.19
294	n3095	24.46	24.46	23.27	0	0.077	23.278	23.278	1.19
295	n3097	25.01	25.01	23.254	0.616	0.693	23.276	23.276	1.76
296	n3098	25.58	25.58	23.356	0.539	0.616	23.38	23.38	2.22
297	n3099	25.71	25.71	23.404	0.462	0.539	23.426	23.426	2.31
298	n3100	25.65	25.65	23.424	0.308	0.385	23.443	23.443	2.23
299	n3101	25.38	25.38	23.526	0.231	0.308	23.544	23.544	1.85
300	n3102	25.26	25.26	23.628	0.154	0.231	23.643	23.643	1.63
301	n3103	24.92	24.92	23.73	0.077	0.154	23.743	23.743	1.19
302	n3104	25.81	25.81	24.62	0	0.077	24.628	24.628	1.19
303	n3111	19.93	19.93	18.236	2.002	2.079	18.274	18.274	1.69
304	n3112	20.58	20.58	18.303	1.925	2.002	18.341	18.341	2.28
305	n3113	21.63	21.63	20.44	0	0.077	20.448	20.448	1.19
306	n3114	19.94	19.94	18.405	1.771	1.848	18.446	18.446	1.53

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307	n3115	19.79	19.79	18.507	1.694	1.771	18.548	18.548	1.28
308	n3116	7.4	7.4	6.21	0.693	0.77	6.233	6.233	1.19
309	n3117	7.63	7.63	6.44	0.616	0.693	6.462	6.462	1.19
310	n3118	7.68	7.68	6.49	0.539	0.616	6.511	6.511	1.19
311	n3120	8.44	8.44	7.25	0.462	0.539	7.27	7.27	1.19
312	n3121	8.87	8.87	7.563	0.385	0.462	7.581	7.581	1.31
313	n3122	9.67	9.67	8.48	0.308	0.385	8.497	8.497	1.19
314	n3123	10.83	10.83	9.64	0.231	0.308	9.655	9.655	1.19
316	n3125	12.39	12.39	11.152	0.154	0.231	11.164	11.164	1.24
317	n3126	15.24	15.24	12.68	0.077	0.154	12.69	12.69	2.56
318	n3127	17.83	17.83	15.545	0	0.077	15.552	15.552	2.29
319	n3128	19.75	19.75	18.56	1.617	1.694	18.6	18.6	1.19
320	n3134	19.89	19.89	18.7	1.54	1.617	18.736	18.736	1.19
321	n3135	20.1	20.1	18.91	1.463	1.54	18.943	18.943	1.19
322	n3136	20.38	20.38	19.03	1.386	1.463	19.065	19.065	1.35
323	n3139	20.32	20.32	19.13	1.309	1.386	19.166	19.166	1.19
324	n3140	20.6	20.6	19.41	1.232	1.309	19.44	19.44	1.19
325	n3141	20.82	20.82	19.63	1.155	1.232	19.66	19.66	1.19
326	n3142	20.98	20.98	19.79	1.078	1.155	19.819	19.819	1.19
327	n3143	21.17	21.17	19.953	1.001	1.078	19.981	19.981	1.22
328	n4435	13.52	13.52	12.33	0.385	0.462	12.351	12.351	1.19
329	n4493	19.32	19.32	17.854	1.848	1.925	17.891	17.891	1.47
330	n4494	12.65	12.65	11.025	0.077	0.154	11.036	11.036	1.62
331	n4496	13.45	13.45	11.787	0	0.077	11.795	11.795	1.66
332	n4498	9.23	9.23	8.04	3.003	3.08	8.093	8.093	1.19
333	n4499	9.24	9.24	8.026	3.08	3.157	8.073	8.073	1.21
334	n4500	14.27	14.27	12.056	1.078	1.155	12.089	12.089	2.21
335	n4501	14.26	14.26	12.077	1.001	1.078	12.108	12.108	2.18
336	n4502	14.18	14.18	12.098	0.924	1.001	12.129	12.129	2.08
337	n4504	5.73	5.73	4.371	5.929	6.006	4.446	4.446	1.36
338	n4506	5.62	5.62	4.43	5.852	5.929	4.505	4.505	1.19
339	n4509	8.5	8.5	7.31	3.388	3.465	7.36	7.36	1.19
340	n4510	4.58	4.58	3.314	26.334	26.411	3.476	3.476	1.27
341	n4511	7.53	7.53	6.34	0.847	0.924	6.37	6.37	1.19
342	n4512	7.65	7.65	6.46	0.77	0.847	6.484	6.484	1.19
343	n4513	7.81	7.81	6.62	0.693	0.77	6.643	6.643	1.19
344	n4515	13.35	13.35	12.16	0.693	0.77	12.183	12.183	1.19
345	n4517	17.15	17.15	15.96	0.385	0.462	15.978	15.978	1.19
346	n4518	18.08	18.08	16.89	0.308	0.385	16.907	16.907	1.19
347	n4519	16.85	16.85	15.66	0	0.077	15.668	15.668	1.19
348	n4522	17.41	17.41	15.746	0.385	0.462	15.767	15.767	1.66
349	n4527	16.34	16.34	15.15	0.693	0.77	15.173	15.173	1.19
350	n4528	15.63	15.63	14.44	0.924	1.001	14.467	14.467	1.19
351	n4530	18.01	18.01	16.82	0	0.077	16.828	16.828	1.19
352	n4531	13.42	13.42	12.23	1.54	1.617	12.264	12.264	1.19
353	n4532	15.33	15.33	13.278	0	0.077	13.285	13.285	2.05
354	n4534	9.1	9.1	7.91	11.011	11.088	8.001	8.001	1.19
355	n4535	9.51	9.51	8.32	7.777	7.854	8.396	8.396	1.19
356	n4536	9.66	9.66	8.47	3.08	3.157	8.518	8.518	1.19
357	n4539	26.38	26.38	25.19	0.462	0.539	25.21	25.21	1.19
358	n4542	28.11	28.11	26.713	0.77	0.847	26.737	26.737	1.4
359	n4544	27.51	27.51	26.161	0	0.077	26.168	26.168	1.35
360	n4545	27	27	25.585	0.077	0.154	25.595	25.595	1.42



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361	n4546	31.36	31.36	29.643	0.462	0.539	29.666	29.666	1.72
362	n4547	31.14	31.14	29.658	0.385	0.462	29.679	29.679	1.48
363	n4549	30.99	30.99	28.968	0.231	0.308	28.983	28.983	2.02
364	n4551	33.2	33.2	31.958	0.077	0.154	31.969	31.969	1.24
365	n4552	33.17	33.17	31.98	0	0.077	31.989	31.989	1.19
366	n4582	21.61	21.61	19.864	0.308	0.385	19.881	19.881	1.75
367	n4583	18.65	18.65	17.33	0.385	0.462	17.351	17.351	1.32
368	n4584	18	18	16.81	0.616	0.693	16.832	16.832	1.19
369	n4585	17.91	17.91	16.72	0	6.237	16.797	16.797	1.19
370	n4586	17.64	17.64	16.45	0.693	0.77	16.473	16.473	1.19
371	n4590	11.6	11.6	10.41	3.542	3.619	10.461	10.461	1.19
372	n4591	11.33	11.33	10.14	3.619	3.696	10.192	10.192	1.19
373	n4593	11.03	11.03	9.84	3.696	3.773	9.892	9.892	1.19
374	n4604	15.04	15.04	13.85	0	0.077	13.858	13.858	1.19
375	n4605	14.62	14.62	13.43	0	0.077	13.438	13.438	1.19
30	n1960	42.53	42.53	41.264	0	52.129	41.448	41.448	1.27
31	n1961	42.2	42.2	40.934	52.129	52.206	41.118	41.118	1.27
32	n1962	39.92	39.92	38.654	52.206	52.283	38.838	38.838	1.27
33	n1967	38.14	38.14	36.874	52.36	52.437	37.058	37.058	1.27
34	n1971	35.65	35.65	34.384	52.437	52.514	34.569	34.569	1.27
35	n1972	32.77	32.77	31.486	52.514	52.591	31.67	31.67	1.28
36	n1973	31.83	31.83	30.564	52.591	52.668	30.749	30.749	1.27
37	n1981	28.94	28.94	27.674	52.668	52.745	27.859	27.859	1.27
38	n1982	28.09	28.09	26.824	52.745	52.822	27.009	27.009	1.27
39	n1983	27.62	27.62	26.354	52.822	52.899	26.539	26.539	1.27
40	n1984	26.21	26.21	24.944	52.899	52.976	25.129	25.129	1.27
41	n1985	24.51	24.51	23.244	52.976	53.053	23.43	23.43	1.27
42	n1986	23.28	23.28	22.014	53.053	53.13	22.2	22.2	1.27
43	n1987	22.64	22.64	21.374	53.13	53.207	21.56	21.56	1.27
44	n1988	21.37	21.37	19.979	53.207	53.284	20.165	20.165	1.39
45	n1990	18.17	18.17	16.904	53.284	53.361	17.09	17.09	1.27
46	n1991	15.36	15.36	14.094	53.361	53.438	14.28	14.28	1.27
47	n1993	9.29	9.29	7.574	53.515	53.592	7.76	7.76	1.72
48	n1994	5.86	5.86	4.255	53.592	53.669	4.442	4.442	1.6
49	n1995	2.54	2.54	1.274	53.669	53.746	1.461	1.461	1.27
50	n1998	1.92	1.92	0.621	53.746	53.823	0.801	0.801	1.3
51	n1999	1.82	1.82	0.442	53.823	53.9	0.679	0.679	1.38
52	n2000	2.01	2.01	0.397	53.9	53.977	0.635	0.635	1.61
53	n2001	2.2	2.2	0.367	54.054	54.131	0.605	0.605	1.83
54	n2002	2.01	2.01	0.352	54.131	54.208	0.591	0.591	1.66
55	n2003	1.95	1.95	0.307	54.208	54.285	0.546	0.546	1.64
56	n2004	1.67	1.67	0.263	54.362	54.439	0.501	0.501	1.41
57	n2005	1.6	1.6	0.218	54.439	54.516	0.457	0.457	1.38
58	n2007	1.61	1.61	0.128	54.593	54.67	0.368	0.368	1.48
59	n2008	1.66	1.66	0.083	54.67	54.747	0.325	0.325	1.58
60	n2009	1.72	1.72	0.038	54.747	54.824	0.282	0.282	1.68
61	n2010	1.79	1.79	-0.007	54.824	54.901	0.242	0.242	1.8
62	n2011	1.81	1.81	-0.043	54.901	54.978	0.212	0.212	1.85
63	n2012	1.77	1.77	-0.059	54.978	55.055	0.199	0.199	1.83
64	n2013	1.87	1.87	-0.097	55.055	55.132	0.171	0.171	1.97
65	n2015	1.4	1.4	-0.143	89.243	89.32	0.061	0.061	1.54
67	n2338	23.06	23.06	21.87	0.231	0.308	21.885	21.885	1.19
68	n2339	23.25	23.25	22.06	0.154	0.231	22.073	22.073	1.19

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69	n2340	23.82	23.82	22.63	0.077	0.154	22.641	22.641	1.19
70	n2342	25.19	25.19	24	0	0.077	24.009	24.009	1.19
71	n2343	25.09	25.09	23.9	0.077	0.154	23.911	23.911	1.19
72	n2344	24.17	24.17	22.98	0.154	0.231	22.993	22.993	1.19
73	n2345	23.24	23.24	22.05	0.231	0.308	22.065	22.065	1.19
74	n2346	21.85	21.85	20.607	0.308	0.385	20.623	20.623	1.24
75	n2347	20.93	20.93	19.736	0.385	0.462	19.754	19.754	1.19
76	n2348	20.57	20.57	18.671	0.462	0.539	18.691	18.691	1.9
77	n2349	17.2	17.2	15.261	0.539	0.616	15.282	15.282	1.94
78	n2350	14.8	14.8	12.774	0.616	0.693	12.796	12.796	2.03
79	n2351	12.65	12.65	9.408	0.693	0.77	9.431	9.431	3.24
80	n2352	7.64	7.64	5.423	0.77	0.847	5.447	5.447	2.22
81	n2353	3.64	3.64	2.45	0.847	0.924	2.476	2.476	1.19
82	n2354	3.01	3.01	1.82	0.924	1.001	1.847	1.847	1.19
83	n2355	2.69	2.69	1.5	1.001	1.078	1.528	1.528	1.19
84	n2358	2.19	2.19	1	0.154	0.231	1.013	1.013	1.19
85	n2359	2.11	2.11	0.92	0.231	0.308	0.938	0.938	1.19
86	n2361	2.01	2.01	0.711	33.957	34.034	0.882	0.882	1.3
87	n2362	2.08	2.08	0.781	33.495	33.572	0.921	0.921	1.3
88	n2363	2.54	2.54	0.977	33.418	33.495	1.118	1.118	1.56
89	n2364	2.44	2.44	1.04	32.263	32.34	1.218	1.218	1.4
90	n2440	21.03	21.03	19.84	0.154	26.642	19.983	19.983	1.19
91	n2441	22.6	22.6	20.707	0.308	0.385	20.724	20.724	1.89
92	n2442	18.92	18.92	17.641	0.539	0.616	17.662	17.662	1.28
93	n2443	19.37	19.37	18.18	0.077	0.154	18.191	18.191	1.19
94	n2444	20.18	20.18	18.99	0	0.077	18.998	18.998	1.19
95	n2445	16.05	16.05	14.715	0.924	1.001	14.742	14.742	1.33
96	n2446	16.79	16.79	15.6	0.231	0.308	15.615	15.615	1.19
97	n2448	17.4	17.4	16.21	0.077	0.154	16.223	16.223	1.19
98	n2449	17.57	17.57	16.38	0	0.077	16.388	16.388	1.19
99	n2450	14.68	14.68	12.584	1.155	1.232	12.613	12.613	2.1
100	n2451	14.14	14.14	12.686	0.077	0.154	12.698	12.698	1.45
101	n2452	13.97	13.97	12.78	0	0.077	12.789	12.789	1.19
102	n2453	13.41	13.41	12.22	1.232	1.309	12.25	12.25	1.19
103	n2454	12.89	12.89	11.7	1.309	1.386	11.731	11.731	1.19
104	n2455	12.47	12.47	11.274	28.413	28.49	11.422	11.422	1.2
105	n2456	12.65	12.65	11.46	26.95	27.027	11.604	11.604	1.19
106	n2457	14.74	14.74	13.55	26.873	26.95	13.694	13.694	1.19
107	n2458	17.57	17.57	16.38	26.796	26.873	16.524	16.524	1.19
108	n2459	19.68	19.68	18.49	26.719	26.796	18.633	18.633	1.19
109	n2460	21.02	21.02	19.821	26.642	26.719	19.963	19.963	1.2
110	n2461	21.16	21.16	19.97	0.077	0.154	19.983	19.983	1.19
111	n2462	21.92	21.92	20.73	0	0.077	20.738	20.738	1.19
112	n2463	21.92	21.92	20.73	0	0.077	20.738	20.738	1.19
113	n2464	21.52	21.52	20.33	0.077	0.154	20.341	20.341	1.19
114	n2465	21.12	21.12	19.93	0.154	0.231	19.945	19.945	1.19
115	n2467	21.18	21.18	19.863	0.231	0.308	19.881	19.881	1.32
116	n2468	21.46	21.46	19.776	0.308	0.385	19.795	19.795	1.68
117	n2469	21.55	21.55	19.75	0.385	0.462	19.771	19.771	1.8
118	n2470	22.29	22.29	19.674	0.462	0.539	19.697	19.697	2.62
119	n2471	23.36	23.36	19.592	0.539	0.616	19.616	19.616	3.77
120	n2473	23.52	23.52	19.516	0.616	0.693	19.541	19.541	4
121	n2474	22.37	22.37	19.471	0.693	0.77	19.497	19.497	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)
122	n2476	20.99	20.99	19.423	0.77	0.847	19.448	19.448	1.57
123	n2477	20.25	20.25	19.06	0.847	0.924	19.086	19.086	1.19
124	n2478	19.58	19.58	18.39	0.924	1.001	18.417	18.417	1.19
125	n2479	18.31	18.31	16.941	1.001	1.078	16.968	16.968	1.37
126	n2480	17.02	17.02	15.83	1.155	1.232	15.86	15.86	1.19
127	n2481	15.43	15.43	14.24	1.232	1.309	14.27	14.27	1.19
128	n2482	14.97	14.97	13.78	1.386	1.463	13.812	13.812	1.19
129	n2483	14.25	14.25	13.06	1.463	1.54	13.093	13.093	1.19
130	n2484	12.16	12.16	10.166	1.54	1.617	10.2	10.2	1.99
131	n2485	8.38	8.38	6.508	1.617	1.694	6.543	6.543	1.87
132	n2486	4.72	4.72	3.53	1.694	1.771	3.566	3.566	1.19
133	n2487	3.34	3.34	2.074	31.647	31.724	2.216	2.216	1.27
134	n2488	8.78	8.78	5.899	0	0.077	5.907	5.907	2.88
135	n2489	4.13	4.13	2.94	0.077	0.154	2.951	2.951	1.19
136	n2490	2.79	2.79	1.6	0.154	0.231	1.613	1.613	1.19
137	n2491	2.47	2.47	1.113	32.186	32.263	1.294	1.294	1.36
138	n2492	2.45	2.45	1.151	31.878	31.955	1.33	1.33	1.3
139	n2493	2.6	2.6	1.334	31.801	31.878	1.476	1.476	1.27
140	n2495	2.97	2.97	1.704	31.724	31.801	1.846	1.846	1.27
141	n2497	3.71	3.71	2.444	29.799	29.876	2.582	2.582	1.27
142	n2498	3.88	3.88	2.614	29.645	29.722	2.751	2.751	1.27
143	n2500	7.01	7.01	5.82	0	0.077	5.828	5.828	1.19
144	n2501	6.1	6.1	4.744	0.077	0.154	4.755	4.755	1.36
145	n2503	5.16	5.16	3.97	0.154	0.231	3.983	3.983	1.19
146	n2504	5.03	5.03	3.764	29.26	29.337	3.929	3.929	1.27
147	n2505	5.56	5.56	4.37	29.183	29.26	4.52	4.52	1.19
148	n2507	5.86	5.86	4.67	29.106	29.183	4.819	4.819	1.19
149	n2508	6.64	6.64	5.45	29.029	29.106	5.599	5.599	1.19
150	n2510	7.46	7.46	6.27	28.952	29.029	6.419	6.419	1.19
151	n2511	7.74	7.74	6.55	28.875	28.952	6.699	6.699	1.19
152	n2512	7.96	7.96	6.77	28.798	28.875	6.919	6.919	1.19
153	n2513	8.88	8.88	7.69	28.721	28.798	7.838	7.838	1.19
154	n2514	10.09	10.09	8.9	28.49	28.567	9.048	9.048	1.19
155	n4461	17.7	17.7	16.416	1.078	1.155	16.444	16.444	1.28
156	n4463	15.16	15.16	13.97	1.309	1.386	14.001	14.001	1.19
157	n4467	9.98	9.98	8.79	28.567	28.644	8.938	8.938	1.19
158	n4469	9	9	7.81	28.644	28.721	7.958	7.958	1.19
159	n4471	5.16	5.16	3.745	29.568	29.645	3.882	3.882	1.41
160	n4472	3.76	3.76	2.494	29.722	29.799	2.632	2.632	1.27
161	n4476	17.41	17.41	16.2	0.154	0.231	16.212	16.212	1.21
162	n4478	24.75	24.75	23.56	0	0.077	23.568	23.568	1.19
163	n4557	2.3	2.3	1.084	0.077	0.154	1.096	1.096	1.22
164	n4558	2.29	2.29	1.1	0	0.077	1.109	1.109	1.19
165	n4560	2.02	2.02	0.824	0.308	0.385	0.882	0.882	1.2
166	n4561	2.04	2.04	-0.108	89.166	89.243	0.163	0.163	2.15
167	n4564	1.69	1.69	0.173	54.516	54.593	0.412	0.412	1.52
168	n4565	1.79	1.79	0.272	54.285	54.362	0.511	0.511	1.52
169	n4566	2.36	2.36	0.38	53.977	54.054	0.618	0.618	1.98
170	n4569	12.47	12.47	10.859	53.438	53.515	11.045	11.045	1.61
171	n4573	39.27	39.27	38.08	0	0.077	38.088	38.088	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	Raw Sewage Pump	30	22.38	2	1	24	537.12	196048.8	1372341.6	
2	Septage pump	1.5	1.119	2	1	24	26.856	9802.44	68617.08	
3	Air Blower	48	35.808	4	1	24	2578.176	941034.24	6587239.68	
4	Sludge Transfer to Thickner Pump	2	1.492	2	1	24	35.808	13069.92	91489.44	
5	Sludge Transfer to Centrifuge Pump	1	0.746	2	1	24	17.904	6534.96	45744.72	
6	Clarified water to ASF/PSF Pump	20	14.92	3	1	24	716.16	261398.4	1829788.8	
7	Mixer	3	2.238	2	1	24	53.712	19604.88	137234.16	
8	Clarifier to Sludge Sump Pump	2	1.492	2	1	24	35.808	13069.92	91489.44	
9	Centrate Sump to EQ Tank	2	1.492	2	1	24	35.808	13069.92	91489.44	
10	High Pressure Jet Pump	1	0.746	1	0	1	0.746	272.29	1906.03	
11	STP Ligting	20				24	480	175200	1226400	
<b>NET WORK</b>										
1	LS1	3	2.238	2	1	24	53.712	19604.88	137234.16	
2	LS-A	15	11.19	2	1	24	268.56	98024.4	686170.8	
3	LS2	0.5	0.373	2	1	24	8.952	3267.48	22872.36	
4	LS3	2	1.492	2	1	24	35.808	13069.92	91489.44	
5	LS4	6	4.476	2	1	24	107.424	39209.76	274468.32	
6	LS-B	37	27.602	2	1	24	662.448	241793.52	1692554.64	
7	LS5	2	1.492	2	1	24	35.808	13069.92	91489.44	
8	LS6	0.5	0.373	2	1	24	8.952	3267.48	22872.36	

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
9	LS-C	12	8.952	2	1	24	214.848	78419.52	548936.64	
10	Ligting-Well and Lifting stations		9			24	216	78840	551880	
								<b>2062472.65</b>	<b>14437308.55</b>	

PRICE

EST NO:

General Abstract

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

(Dsor year: 2018)

SI No	Heading Description	Amount
1	Network Estimate Including O&M (Estimate No.:2022/2038)	629759560.00
2	4MLD STP Estimate Including O&m(Estimate No.:2022/2197)	362572289.00
3	4 MLD STP Electro Mechanical Estimate(Estimate No.2022/2235)	73285253.00
	Total	<b>1065617102.00</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>1065617102.00</b>
	Lumpsum for round off	<b>0.00</b>
	<b>GRAND TOTAL Rs</b>	<b>1065617102.00</b>
	<b>Rounded Grand Total Rs 1,06,56,17,102</b>	
	<b>Rupees One Hundred Six Crore Fifty Six Lakh Seventeen Thousand One Hundred and Two Only</b>	

Kerala Water Authority  
**PRICE**

## General Abstract

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

(Dsr year: 2018)

SI No	Heading Description	Amount
1	RAW SEWAGE RECEIVING CHAMBER CUM WELL	1952608.93
2	SEPTAGE TANK	1020823.21
3	INLET CHEMBER/SCREEN CHANEL/GRIT CHEMBER/PARSHALLFLUME	3791860.59
4	EQUALISATION TANK	6530115.52
5	MBBR 1 & & & 2	11768516.73
6	SECONDARY CLARIFIER	4595615.60
7	SLUDGE SUMP	307473.43
8	SLUDGE THICKNER	1244270.67
9	THICKENED SLUDGE SUMP	663367.94
10	FILTER FEED TANK	928561.45
11	TREATED WATER TANK	1949079.11
12	Centrate Sump	658423.19
13	Administrative/Laboratory/Chemical House / Control Room Building	5098073.01
14	Security Cabin	297948.09
15	Air Blower Building	2616139.55
16	Chlorination Building	2010961.80
17	Transformer Building	3152274.57
18	Centrifuge Building	3117537.57
19	PSF/ACF Foundation	730840.44
20	Sludge Shed	644439.80
21	STP Land Development & Approach Road and internal Service Roads	18843801.83
22	Storm Water Drains	1407474.00
23	Compound wall and Gate	2555888.58
24	Operation and Maintenance cost for STP and Allied works - 1st year	6686478.06
25	Operation and Maintenance cost for STP and Allied works - 2nd year to 10th year	84249623.56
26	Landscaping and Greenbelt Formation around the STP compound	1000000.00
27	Electricity charges for 4 MLD STP for 10 Year	115437403.90
Total		<b>283259601.12</b>
Centage @		<b>10.0%</b>
Centage Amount		<b>28325960.11</b>



Provision for GST payments (in %) @	<b>18.0%</b>
Amount reserved for GST payments	<b>50986728.20</b>
Total & Centage	<b>362572289.44</b>
Lumpsum for round off	<b>0.00</b>
<b>GRAND TOTAL Rs</b>	<b>362572289.44</b>
<b>Rounded Grand Total Rs 36,25,72,289</b>	
<b>Rupees Thirty Six Crore Twenty Five Lakh Seventy Two Thousand Two Hundred and Eighty Nine Only</b>	



Kerala Water Authority

**PRICE**

## Detailed Estimate

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

(Dsr year: 2018)

Sl No	Description	No	L	B	D	CF	Quantity	Remark	
<b>1 RAW SEWAGE RECEIVING CHAMBER CUM WELL (Cost Index:33.05 %)</b>									
1	2.1.1 Earth work in surface excavation not exceeding 30 cm in depth but exceeding 1.5m in width as well as 10 sqm on plan including disposal of excavated earth up to 50 m and lift up to 1.5 m, disposed soil to be levelled and neatly dressed:All Kinds of soil								
		1	7.000	7.000			49.000		
		Total Quantity						49.000 sqm	
		Total Deducted Quantity						0.000 sqm	
		Net Total Quantity						49.000 sqm	
		Say 49.000 sqm @ Rs 106.91 / sqm						<b>Rs 5238.59</b>	
2	100.3.7.1 Earthwork open well excavation (above water) for wells of dia. above 6.0m and upto 9.0 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								
	For Collection well	3.14	3.500	3.500	1.500		57.698		
		Total Quantity						57.698 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						57.698 cum	
		Say 57.698 cum @ Rs 443.26 / cum						<b>Rs 25575.22</b>	
3	100.3.7.2 Earthwork open well excavation (above water) for wells of dia. above 6.0m and upto 9.0 m in all kinds of soil and conveying and depositing the spoil within initial lead of 50m and lift from 1.50m to 3.0 m including neat banking. NEW DATA								
	For Collection well	3.14	3.500	3.500	1.500		57.698		
		Total Quantity						57.698 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						57.698 cum	

	Say 57.698 cum @ Rs 487.56 / cum						<b>Rs 28131.24</b>	
4	100.3.7.13 Earthwork open well excavation (in or under water) for wells of dia. above 6.0m and upto 9.0 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							
	For Collection well	3.14	3.500	3.500	1.500		57.698	
	Total Quantity						57.698 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						57.698 cum	
	Say 57.698 cum @ Rs 638.31 / cum						<b>Rs 36829.21</b>	
5	100.3.8.14 Earthwork open well excavation (in or under water) for wells of dia. above 6.0m and upto 9.0 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							
	For collection well	3.14	3.500	3.500	1.000		38.465	
	Total Quantity						38.465 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						38.465 cum	
	Say 38.465 cum @ Rs 1770.30 / cum						<b>Rs 68094.59</b>	
6	5.7 Reinforced cement concrete work in well - steining excluding the cost of centering, shuttering, finishing and reinforcement, with 1:1.5:3 (1 cement : 1.5 coarse sand (Zone - III) : 3 graded stone aggregate 20 mm nominal size)							
	For steining up to Top	3.14	5.300	0.300	5.000		24.963	
	Total Quantity						24.963 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						24.963 cum	
	Say 24.963 cum @ Rs 8397.45 / cum						<b>Rs 209625.54</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)							
	Well Bottom portion	3.14	3.000	3.000	0.200		5.652	
	Total Quantity						5.652 cum	
	Total Deducted Quantity						0.000 cum	

		Net Total Quantity						5.652 cum	
		Say 5.652 cum @ Rs 6687.23 / cum						<b>Rs 37796.22</b>	
8	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							
	well base	3.14	2.650	2.650	0.300		6.616		
		Total Quantity						6.616 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						6.616 cum	
		Say 6.616 cum @ Rs 8914.95 / cum						<b>Rs 58981.31</b>	
9	4.15	Extra for laying concrete in or under water and or liquid mud including cost of pumping or bailing out water and removing slush etc. complete. Note for item No. 4.15 : - The quantity will be calculated by multiplying the depth measured from the sub-soil water level upto centre of gravity of concrete under sub-soil water level with quantity of concrete in cum executed under the sub-soil water. The depth of centre of gravity shall be reconed correct to 0.10 m 0.05 m or more shall be taken as 0.10 m and less than 0.05 m ignored.							
	Well bottom	3.14	2.650	2.650	0.300		6.616		
	Side wall	3.14	5.300	0.300	1.000		4.993		
		Total Quantity						11.609 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						11.609 cum	
		Say 11.609 cum @ Rs 917.85 / cum						<b>Rs 10655.32</b>	
10	5.22.4	Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Hot rolled deformed bars							
	@120kg/m3	1	24.963			120.0	2995.560		
		1	6.616			120.0	793.920		
		1	6.788			120.0	814.561		
		Total Quantity						4604.041 kilogram	
		Total Deducted Quantity						0.000 kilogram	
		Net Total Quantity						4604.041 kilogram	
		Say 4604.041 kilogram @ Rs 96.46 / kilogram						<b>Rs 444105.79</b>	
11	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, with 1:1.5:3 (1 cement : 1.5 coarse sand (Zone III) : 3 graded stone aggregate 20 mm nominal size).							
	Cover slab	3.14	2.500	2.500	0.300		5.888	
	Beam	2	5.000	0.300	0.300		0.900	
	Total Quantity						6.788 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						6.788 cum	
	Say 6.788 cum @ Rs 11277.58 / cum						<b>Rs 76552.21</b>	
12	od341049/2021_2022 Centering and shuttering including strutting propping etc and removal of form etc. Well Steining for circular works							
	steining up to Top - Outer	3.14	5.600		5.000		87.920	
	steining up to Top - Inner	3.14	5.000		4.700		73.790	
	Total Quantity						161.710 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						161.710 sqm	
	Say 161.710 sqm @ Rs 294.01 / sqm						<b>Rs 47544.36</b>	
13	5.9.5 Centering and shuttering including strutting, etc. and removal of form for: Lintels, beams, plinth beams, girders bressumers and cantilevers							
	for beam	2	5.000	0.900			9.000	
	Total Quantity						9.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						9.000 sqm	
	Say 9.000 sqm @ Rs 637.64 / sqm						<b>Rs 5738.76</b>	
14	5.9.3 Centering and shuttering including strutting, etc. and removal of form for: Suspended floors, roofs, landings, balconies and access platform							
	slab for working platform over the well and beam	3.14	2.500	2.500			19.625	
	Beam bottom	2	5.000	0.300			-3.000	
	Total Quantity						19.625 sqm	
	Total Deducted Quantity						-3.000 sqm	

	Net Total Quantity						16.625 sqm	
	Say 16.625 sqm @ Rs 800.50 / sqm						<b>Rs 13308.31</b>	
15	<p>19.16          Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 ( 1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design</p>							
	steps	1	4*14				56.000	
	Total Quantity						56.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						56.000 No	
	Say 56.000 No @ Rs 534.79 / No						<b>Rs 29948.24</b>	
16	<p>14.72          Providing and fixing double scaffolding system (cup lock type) on the exterior side, upto seven story hight made with 40 mm dia. M.S. tube 1.5 m centre to centre, horizontal &amp; vertical tubes joining with cup &amp; lock system with M.S. tubes, M.S. tube challies, M.S. clamps and M.S. staricase system in the scaffolding for working platform etc. and maintaining it in a serviceable condition for the required duration as approved and removing it there after. The scaffolding system shall be stiffened with bracings, runners, connection with the building etc wherever required for inspection of work at required location with essential safety features for the workmen etc. complete as per directions and approval of Engineer- in Charge. The elevational area of the scaffolding shall be measured for payment purpose. The payment will be made once irrespective of duration of scaffolding. Note:- This item to be used for maintenance work judicially, necessary deduction for scaffolding in the existing item to be done .</p>							
		1/2	3.140	4.000	5.000		31.401	
	Total Quantity						31.401 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						31.401 sqm	
	Say 31.401 sqm @ Rs 297.97 / sqm						<b>Rs 9356.56</b>	
17	<p>13.7.1          12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 ( 1 cement : 3 fine sand)</p>							
	Bottom of well	3.14	2.500	2.500			19.625	
	inside of steining	3.14	5.000		5.000		78.500	
	Cover slab Top	3.14	2.800	2.800			24.618	
	Steining out	3.14	5.600	0.600			10.551	

	beam	2	5.000	0.900			9.000	
	Total Quantity						142.294 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						142.294 sqm	
	Say 142.294 sqm @ Rs 393.69 / sqm						<b>Rs 56019.72</b>	
18	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							
	Bottom of well	3.14	2.500	2.500			19.625	
	inside of steining	3.14	5.000		5.000		78.500	
	Total Quantity						98.125 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						98.125 sqm	
	Say 98.125 sqm @ Rs 218.73 / sqm						<b>Rs 21462.88</b>	
19	od341050/2021_2022 Conveying disposing the excess earth and debries etc.by lorry up to 5Km s							
		3.14	2.500	2.500	5.000		98.125	
		3.14	6.100	1.400	5.000		134.078	
	Total Quantity						232.203 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						232.203 cum	
	Say 232.203 cum @ Rs 138.64 / cum						<b>Rs 32192.62</b>	
20	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)							
		1	5*0.746	30.000	4.000		447.600	
	Total Quantity						447.600 Kwh	
	Total Deducted Quantity						0.000 Kwh	
	Net Total Quantity						447.600 Kwh	
	Say 447.600 Kwh @ Rs 36.26 / Kwh						<b>Rs 16229.98</b>	
21	100.7.2 Bailing out water with engine and pumpset above 5 HP upto 10 HP 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)							
		1	10*0.746	30.000	4.000		895.200	
	Total Quantity						895.200 Kwh	
	Total Deducted Quantity						0.000 Kwh	
	Net Total Quantity						895.200 Kwh	
	Say 895.200 Kwh @ Rs 18.09 / Kwh						<b>Rs 16194.17</b>	
22	100.98.1008 Engaging Coolie							
		1	50.000				50.000	
	Total Quantity						50.000 Day	
	Total Deducted Quantity						0.000 Day	
	Net Total Quantity						50.000 Day	
	Say 50.000 Day @ Rs 862.30 / Day						<b>Rs 43115.00</b>	
23	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)							
		1	7.200	3.000	1.500		32.401	
	Total Quantity						32.401 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						32.401 cum	
	Say 32.401 cum @ Rs 545.11 / cum						<b>Rs 17662.11</b>	
24	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)							
		1	7.200	3.000	1.500		32.401	
	Total Quantity						32.401 cum	



		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					32.401 cum	
		Say 32.401 cum @ Rs 649.48 / cum					<b>Rs 21043.80</b>	
25	100.6.1 Providing steel sheet shoring to the sides of the trenches to depths of above 4.00 m but not exceeding 6.00m using 6 mm M.S. sheet 0.50 M wide stiffen on edges with 50 mm x 50mm x 6 mm M.S. angles driving down vertically on either side one after another in lines and levels with suitable pile driving equipments and accessories to a maximum depth of 0.50 M below the bottom of the proposed excavation 0.5 M above ground level suitably braced by horizontal walling pieces at 75 x 150 mm x 8 mm angles on either side at intervals not exceeding 1.50M and horizontal screw jack type struts at 1.50M intervals and maintaining the shoring till the pipes are laid and works are completed, dismantling, cleaning and restacking for reuse including all labour, hire charges and conveyance for equipments, tools and plants and sundries etc. complete.							
		1	7.2*2+3*2		3.000	0.5	30.600	
		Total Quantity					30.600 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					30.600 sqm	
		Say 30.600 sqm @ Rs 735.10 / sqm					<b>Rs 22494.06</b>	
26	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	6.600	2.150	0.200		2.838	
		Total Quantity					2.838 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					2.838 cum	
		Say 2.838 cum @ Rs 7229.54 / cum					<b>Rs 20517.43</b>	
27	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							
	Base slab	1	6.200	1.750	0.300		3.255	
	side wall	2	6.200	0.250	3.000		9.300	

		2	1.250	0.250	3.000		1.875	
	inner wall	1	3.700	0.250	3.000		2.776	
	Baffle wall	2*2	0.500	0.250	2.300		1.150	
	Landing slab	1	1.750	1.200	0.120		0.252	
	Total Quantity						18.608 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						18.608 cum	
	Say 18.608 cum @ Rs 9700.81 / cum						<b>Rs 180512.67</b>	
28	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 .							
	Total Qty of CC	1	18.608			330.0	6140.640	
	Total Quantity						6140.640 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						6140.640 kg	
	Say 6140.640 kg @ Rs 1.33 / kg						<b>Rs 8167.05</b>	
29	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	18.608			120.0	2232.960	
	Total Quantity						2232.960 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						2232.960 kilogram	
	Say 2232.960 kilogram @ Rs 96.46 / kilogram						<b>Rs 215391.32</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							
	Base PCC	2	6.600		0.200		2.640	
		2	2.150		0.200		0.860	
	Base slab	2	6.200		0.300		3.720	
	„	2	1.750		0.300		1.050	
	Well base	3.14	6.000		0.200		3.769	
	„	3.14	5.600		0.300		5.276	
	Total Quantity						17.315 sqm	
	Total Deducted Quantity						0.000 sqm	

	Net Total Quantity							17.315 sqm
	Say 17.315 sqm @ Rs 329.03 / sqm							<b>Rs 5697.15</b>
31	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.							
	side wall	2	14.900		3.000		89.400	
	innerwall	2	3.200		3.000		19.201	
	Baffle wall	4*2	0.500		2.300		9.200	
		4	0.500	0.250			0.500	
	Landing slab	2	1.200	0.500			1.200	
	Total Quantity							119.501 sqm
	Total Deducted Quantity							0.000 sqm
	Net Total Quantity							119.501 sqm
	Say 119.501 sqm @ Rs 703.77 / sqm							<b>Rs 84101.22</b>
32	13.1.1 12 mm cement plaster of mix:1:4 ( 1 cement : 4 fine sand)							
	side wall	2	14.900		3.000		89.400	
	innerwall	2	3.200		3.000		19.201	
	Baffle wall	4*2	0.500		2.300		9.200	
		4	0.500	0.250			0.500	
	Bottom	1	5.700	1.250			7.125	
	Landing slab	2	1.200	0.500			1.200	
	Total Quantity							126.626 sqm
	Total Deducted Quantity							0.000 sqm
	Net Total Quantity							126.626 sqm
	Say 126.626 sqm @ Rs 308.21 / sqm							<b>Rs 39027.40</b>
33	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							
	side wall - outer	1	15.900		0.600		9.540	
	Well outer	3.14	5.600		0.600		10.551	
	Total Quantity							20.091 sqm
	Total Deducted Quantity							0.000 sqm
	Net Total Quantity							20.091 sqm

	Say 20.091 sqm @ Rs 123.40 / sqm						<b>Rs 2479.23</b>	
34	<p>22.23.1</p> <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 vertical surface two coats @ 0.70 kg per sqm</p>							
	side wall	2	5.700		3.000		34.200	
		2	1.250		3.000		7.500	
	inner wall	2	3.200		3.000		19.201	
	Baffle wall	4*2	0.500		2.300		9.200	
	Total Quantity						70.101 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						70.101 sqm	
	Say 70.101 sqm @ Rs 559.61 / sqm						<b>Rs 39229.22</b>	
35	<p>22.23.2</p> <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>							
	Base slab	1	5.700	1.250			7.125	
	Landing slab	2	0.500	1.200			1.200	
	Total Quantity						8.325 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						8.325 sqm	
	Say 8.325 sqm @ Rs 431.28 / sqm						<b>Rs 3590.41</b>	

SI No	Description	No	L	B	D	CF	Quantity	Remark	
<b>2SEPTAGE 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	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							
	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	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	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	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	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	od341035/2021_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, buttersesses, 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 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							
		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</p> <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	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</p> <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	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	
	Say 54.000 Kilo litre @ Rs 182.79 / Kilo litre						<b>Rs 9870.66</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>3INLET CHEMBER/SCREEN CHANEL/GRIT CHEMBER/PARSHALL FLUME (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							

<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>								
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	
Pedestal column-Grit chamber	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		
	Reciving chamber column 250x400	4	0.250	0.400	2.550		1.020		
	Reciving and Distribution chamber column 250x450	6	0.250	0.450	3.000		2.026		
	Grit chamber Column250x500	6	0.250	0.500	2.200		1.651		
	Parshalflume and Distribution chamber column250x450	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		
	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		
	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	<b>Rs 1152531.09</b>	
7	od341035/2021_2022 Extra for providing sulphate resistant cement for the structures above plinth level.							

	Receiving chamber base slab	1	2.250	1.000	0.200		0.450		
	Receiving 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					<b>Rs 104166.97</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								
	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		
	Parshalflume 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		
	Pedastral column- Receiving chamber	4	1.300		0.400		2.080		
	Pedastral column- Receiving and Distribution chamber	6	1.400		0.400		3.360		
	Pedastral column- staircase	3	1.200		0.400		1.440		
	Pedastral column- Grit chamber	6	1.500		0.400		3.601		
	Pedastral column- Parshalflume 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, buttersesses, 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		
	Receiving chamber column 250x400	4	0.250*2+0 .4*2		2.550		13.260		
	Receiving 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		
	Parshall flume 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>4EQUALISATION 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	od341035/2021_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	od341038/2021_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



	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>5MBBR 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	od341035/2021_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	od341038/2021_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>6SECONDARY 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	od341035/2021_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	od341038/2021_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>7SLUDGE 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	od341038/2021_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	od341035/2021_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>8 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	od341035/2021_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	od341038/2021_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>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>9THICKENED 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	od341035/2021_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	od341038/2021_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>10 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	od341035/2021_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	od341038/2021_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>11TREATED 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	od341035/2021_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 levelThermo - 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	od341038/2021_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, butteresses, 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>12Centrate 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	od341035/2021_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	od341038/2021_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, buttersesses, 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>13 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	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							
	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	
						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>14Security 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	<p>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)</p>						
	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	<p>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</p>						
	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>15Air 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 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	<p style="text-align: center;"><b>Kerala Water Authority</b></p> <p>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>						
	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	<p>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.</p>						
	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>16Chlorination 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	
	Kerala Water Authority 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>17Transformer 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	<p>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</p>							
	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	<p>9.48.1  Kerala Water Authority  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</p>							
	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	<p>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</p>							

	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>18Centrifuge 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>19PSF/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>20Sludge 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>21STP Land Development &amp; 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	150.000	0.950	0.700		99.750		
	„	1	150.000	1.400	0.700		147.000		
	Total Quantity						246.750 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						246.750 cum		
	Say 246.750 cum @ Rs 291.38 / cum							<b>Rs 71898.02</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)								
	Road side Protection wall foundation	1	150.000	0.750	0.100		11.250		
	„	1	150.000	1.200	0.100		18.000		
	Total Quantity						29.250 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						29.250 cum		
	Say 29.250 cum @ Rs 6687.23 / cum							<b>Rs 195601.48</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	150.000	0.750	0.600		67.500		
	„	1	150.000	1.000	0.600		90.000		
	Total Quantity						157.500 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						157.500 cum		
	Say 157.500 cum @ Rs 7069.81 / cum							<b>Rs 1113495.08</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	150.000	$(0.75+0.50)/2$	1.000		93.750		

		1	150.000	$(1.00+0.50)/2$	1.500		168.750	
	Total Quantity						262.500 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						262.500 cum	
	Say 262.500 cum @ Rs 8721.89 / cum						<b>Rs 2289496.13</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	2	150.000	0.500	0.100		15.000	
	Total Quantity						15.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						15.000 cum	
	Say 15.000 cum @ Rs 8914.95 / cum						<b>Rs 133724.25</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*2	150.000		0.100		60.000	
	Total Quantity						60.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						60.000 sqm	
	Say 60.000 sqm @ Rs 637.64 / sqm						<b>Rs 38258.40</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	15.000			60.0	900.000	
	Total Quantity						900.000 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						900.000 kilogram	
	Say 900.000 kilogram @ Rs 96.46 / kilogram						<b>Rs 86814.00</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	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	od341034/2021_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.							
	,, Road Formation	1	150.000	5.000	1.0000		750.000	
	STP Site filling	1	100.000	80.000	2.000		16000.000	
		Total Quantity					16750.000 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					16750.000 cum	
		Say 16750.000 cum @ Rs 377.07 / cum					<b>Rs 6315922.50</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	150.000	5.000	0.300		225.000	
	STP Site	1	100.000	80.000	0.200		1600.000	
		Total Quantity					1825.000 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					1825.000 cum	
		Say 1825.000 cum @ Rs 543.16 / cum					<b>Rs 991267.00</b>	
12	od341039/2021_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	150.000	3.500	0.300		157.500		
	Internal Roads	1	200.000	3.500	0.200		140.000		
	STP Site	1	100.000	80.000	0.200		1600.000		
	Total Quantity						1897.500 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						1897.500 cum		
	Say 1897.500 cum @ Rs 3729.38 / cum						<b>Rs 7076498.55</b>		
13	od341041/2021_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	150.000	3.200			480.000		
	Internal Roads	1	200.000	3.200			640.000		
	Total Quantity						1120.000 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						1120.000 sqm		
	Say 1120.000 sqm @ Rs 59.03 / sqm						<b>Rs 66113.60</b>		
14	od341042/2021_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	150.000	3.200			480.000		
	Internal Roads	1	200.000	3.200			640.000		
	Total Quantity						1120.000 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						1120.000 sqm		
	Say 1120.000 sqm @ Rs 10.41 / sqm						<b>Rs 11659.20</b>		
15	od341043/2021_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	150.000	3.200			480.000	
	Internal Roads	1	200.000	3.200			640.000	
	Total Quantity						1120.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1120.000 sqm	
	Say 1120.000 sqm @ Rs 176.52 / sqm						<b>Rs 197702.40</b>	
16	od341046/2021_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	150.000	3.200			480.000	
	Internal Roads	1	200.000	3.200			640.000	
	Total Quantity						1120.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1120.000 sqm	
	Say 1120.000 sqm @ Rs 78.00 / sqm						<b>Rs 87360.00</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>22Storm 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 for: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>23Compound wall and 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 Piller 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 piller	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, buttereses, 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	
	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 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	
	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 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>		
SI No	Description	No	L	B	D	CF	Quantity	Remark	

24Operation and Maintenance cost for STP and Allied works - 1st year (Cost Index:33.05 %)								
1	od341843/2021_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	od341845/2021_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	od341846/2021_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>	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
25Operation and Maintenance cost for STP and Allied works - 2nd year to 10th year (Cost Index:33.05 %)								
1	od341852/2021_2022 Operation and Maintenance cost for STP and Allied works - 2nd year to 10th year							
	4MLD 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>26Landscaping and Greenbelt 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>27Electricity charges for 4 MLD STP for 10 Year (Cost Index:33.05 %)</b>									
1	od20771/2022_2023 Electricity charges for 4 MLD STP in korakodu for 10 year Rs.11543740.39/Year								
	Electricity charges for 4 MLD STP in korakodu zone Rs.11543740.39/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 11543740.39 / No								<b>Rs 115437403.90</b>	
Total								<b>283259601.12</b>	
Centage @								<b>10.0%</b>	
Centage Amount								<b>28325960.11</b>	
Provision for GST payments (in %) @								<b>18.0%</b>	
Amount reserved for GST payments								<b>50986728.20</b>	

Total & Centage	<b>362572289.44</b>
Lumpsum for round off	<b>0.00</b>
<b>GRAND TOTAL Rs</b>	<b>362572289.44</b>
<b>Rounded Grand Total Rs 36,25,72,289</b>	
<b>Rupees Thirty Six Crore Twenty Five Lakh Seventy Two Thousand Two Hundred and Eighty Nine Only</b>	



Kerala Water Authority

**PRICE**

## General Abstract

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

(Dsor year: 2018)

SI No	Heading Description	Amount
1	<b>MECHANICAL WORKS</b>	21969905.10
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>Provisions for Supplying and fixing Odour control system</b>	10000000.00
6	<b>Provision for supplying and fixing Solar panel with control unit</b>	2500000.00
7	<b>Provision for automating entire plant by SCADA</b>	2500000.00
	Total	<b>57254104.08</b>
	Centage @	<b>10.0%</b>
	Centage Amount	<b>5725410.41</b>
	Provision for GST payments (in %) @	<b>18.0%</b>
	Amount reserved for GST payments	<b>10305738.73</b>
	Total & Centage	<b>73285253.22</b>
	Lumpsum for round off	<b>0.00</b>
	<b>GRAND TOTAL Rs</b>	<b>73285253.22</b>
	<b>Rounded Grand Total Rs</b>	<b>7,32,85,253</b>
	<b>Rupees Seven Crore Thirty Two Lakh Eighty Five Thousand Two Hundred and Fifty Three Only</b>	



## Detailed Estimate

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

(Dsr year: 2018)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
<b>1MECHANICAL WORKS (Cost Index:33.05 %)</b>								
1	od340982/2021_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 Three phase Motor with IP 68 protection (1W 1S)"- Raw Sewage Transfer 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 1115040.00 / No	<b>Rs 2230080.00</b>
2	od340983/2021_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>	
<p>3 od340985/2021_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 mechnacial 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&lt;br&gt;</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 139380.00 / No		<b>Rs 278760.00</b>	
<p>4 od340987/2021_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//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 &amp; 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 &amp; high/ low level alarm. Electrical Control panel shall be supplied with the pump as per the specifications in the Electrical BOQ&lt;br&gt;Motor : three phase motor with IP 68 Protection"-Sludge Thickener Feed Pump &amp; Clarifier to sludge sump</p>										
		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>	
<p>5 od340990/2021_2022 Supply at site,erection, testing and commissioning of self priming, non clog centrifugal submersible</p>										

	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>	
6	od340992/2021_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>	
7	od340994/2021_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>
8	od340995/2021_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>
9	od340998/2021_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>
10	od341000/2021_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 Tank (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>	
11	od341001/2021_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>	
12	od341004/2021_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>	
13	od341005/2021_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>	
14	od341008/2021_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>		
15	od341010/2021_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>		
16	od341011/2021_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>		
17	od341012/2021_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 inlet 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>
18	od341013/2021_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>
19	od341014/2021_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>
20	od341015/2021_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>	
21	od341016/2021_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>	
22	od341017/2021_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>	
23	od341018/2021_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>
24	od341019/2021_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>
25	od341020/2021_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
	Kerala Water Authority 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>
26	od341021/2021_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>
27	od341022/2021_2022 "Wheel Barrow Supply of three wheel type wheel barrow of capacity 200litrs"							

		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>	
28	od341023/2021_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>	
29	od341024/2021_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>	
30	od341025/2021_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>	
31	od341026/2021_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>
32	od341027/2021_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>
33	od341028/2021_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>	
34	od341029/2021_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>	
35	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>	
36	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>	
37	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>	
38	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>	
39	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>	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
<b>2ELECTRICAL WORKS (Cost Index:33.05 %)</b>									
1	od340984/2021_2022 "250kVA Indoor Transformer and 11 kv indoor free standing cubicle 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	od340986/2021_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	od340988/2021_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	od340989/2021_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	od340991/2021_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	od340993/2021_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	od340996/2021_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	od340997/2021_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	od340999/2021_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 compartmentalised with hinge lock doors with Dust, vermi proof and powder coated with approved shade. The panel shall have enough size to accomadate 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 2323000.00 / L.S							<b>Rs 2323000.00</b>
10	od341002/2021_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
		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 1889258.73 / L.S							<b>Rs 1889258.73</b>
11	od341003/2021_2022 Brass Glands & Aluminium Lugs Supplying and making end termination with brass compression gland and aluminium lugs for required size of PVC insulated and PVC sheathed I XLPE aluminium conductor cable of 1.1 kV grade 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 251238.26 / L.S							<b>Rs 251238.26</b>
12	od341006/2021_2022 "Power Distribution Board (Control Room & Centrifuge Building) Supplying and fixing of following ways surface/ recess mounting, vertical type, 415 V, TPN MCB distribution board of sheet steel, dust protected, duly powder painted, inclusive of 200 A, tinned copper bus bar, common neutral link, earth bar, din bar for mounting MCBs (but without MCBs and incomer) as required. (Note : Vertical type MCB TPDB is normally used where 3 phase outlets are required.) 12 way (4 + 36), Double door								



	(i) Incoming - 63A MCCB & 63A , 100mA RCCB ii) Outgoing Feeders - 4Nos of 25A MCCB with 25A, 30mA RCCBs iii) Outgoing Feeders - 1Nos of 6A MCB iv) Outgoing Feeders - 2Nos Spares"									
		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 66073.09 / L.S							<b>Rs 66073.09</b>		
13	od341007/2021_2022 "Wiring & Lighting accessories :- Wiring for circuit/submain wiring along with earthwire with required sizes of FRLS PVC insulated copper conductor,supply and fitting of GI boxes along with modular base and cover plates,supplying and fixing following modular switch/ sockets,supply,installation,testing and commissioning of all accessories and fixtures as approved by dept.									
		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 274846.91 / L.S							<b>Rs 274846.91</b>		
14	od341009/2021_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 1000000.00</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>5Provisions for Supplying and fixing Odour control system</b>								
Lump-Sum Total							<b>Rs 10000000.00</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>6Provision for supplying and fixing Solar panel with control unit</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</b>								
Lump-Sum Total							<b>Rs 2500000.00</b>	
Total							<b>57254104.08</b>	
Centage @							<b>10.0%</b>	
Centage Amount							<b>5725410.41</b>	
Provision for GST payments (in %) @							<b>18.0%</b>	
Amount reserved for GST payments							<b>10305738.73</b>	
Total & Centage							<b>73285253.22</b>	
Lumpsum for round off							<b>0.00</b>	
<b>GRAND TOTAL Rs</b>							<b>73285253.22</b>	
<b>Rounded Grand Total Rs</b>							<b>7,32,85,253</b>	
<b>Rupees Seven Crore Thirty Two Lakh Eighty Five Thousand Two Hundred and Fifty Three Only</b>								

Kerala Water Authority  
**PRICE**

## General Abstract

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

(Dsr year: 2018)

SI No	Heading Description	Amount
1	Laying of sewer network	182119878.06
2	Road Restoration work of laying of sewers and pumping main.	23547474.78
3	Pumping mains	17525676.20
4	Construction of Man holes	80497467.11
5	Road Restoration - to PWD/NH	66201215.64
6	Lifting Stations and Allied work	16420923.43
7	Water Supply and Sanatory arrangements, Electrical wiring in pumping stations	400000.00
8	Line extension , Deposit to KSEB, etc	1000000.00
9	Operation and Maintanance cost for sewer networks and allied works- First year	2432892.60
10	Operation and Maintanance cost for sewer networks and allied works2 nd year to 10 th year	30654446.76
11	Sewer Connection Charges	30000000.00
12	Electricity charges for Sewer network portion for 10 Year	41199681.60
	Total	<b>491999656.19</b>
	Centage @	<b>10.0%</b>
	Centage Amount	<b>49199965.62</b>
	Provision for GST payments (in %) @	<b>18.0%</b>
	Amount reserved for GST payments	<b>88559938.11</b>
	Total & Centage	<b>629759559.92</b>
	Lumpsum for round off	<b>0.00</b>
	<b>GRAND TOTAL Rs</b>	<b>629759559.92</b>
	<b>Rounded Grand Total Rs 62,97,59,560</b>	
	<b>Rupees Sixty Two Crore Ninety Seven Lakh Fifty Nine Thousand Five Hundred and Sixty Only</b>	

## Detailed Estimate

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

(Dsor year: 2018)

SI 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 560mm	2	26184.700				52369.400	
	Inspection Chamber to Manhole	2	6960.000				13920.000	1160X6X2 ,50% BT/CC each
							Total Quantity	66289.400 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	66289.400 metre
							Say 66289.400 metre @ Rs 29.87 / metre	<b>Rs 1980064.38</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 225mm to 560mm	1	15145.000	1.000			15145.000	
	Inspection Chamber to Manhole	1	6960.000	1.000			6960.000	1160X6X2 50% cc/bt each
							Total Quantity	22105.000 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	22105.000 sqm
							Say 22105.000 sqm @ Rs 354.18 / sqm	<b>Rs 7829148.90</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 225mm to 560mm	1	11039.700	1.000	0.150		1655.956	
	Inspection Chamber to Manhole	1	6960.000	1.000	0.150		1044.000	1160X6X2 50%bt/cc each
	Total Quantity						2699.956 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2699.956 cum	
	Say 2699.956 cum @ Rs 2006.81 / cum						<b>Rs 5418298.70</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 560mm	1	11039.700	1.000	0.150		1655.956	
	Inspection Chamber to Manhole	1	6960.000	1.000	0.150		1044.000	1160X6X2 50%bt/cc each
	Total Quantity						2699.956 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2699.956 cum	
	Say 2699.956 cum @ Rs 8328.46 / cum						<b>Rs 22486475.55</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 560mm	1	26184.700			0.4	10473.881	
	Inspection Chamber to Manhole	1	13920.000			0.4	5568.000	1160X3X4
	Total Quantity						16041.881 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						16041.881 metre	
	Say 16041.881 metre @ Rs 95.04 / metre						<b>Rs 1524620.37</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 560mm	1	26184.700			0.6	15710.820		
	Inspection Chamber to Manhole	1	13920.000			0.6	8352.000	1160X3X4	
	Total Quantity						24062.820 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						24062.820 metre		
	Say 24062.820 metre @ Rs 27.66 / metre						<b>Rs 665577.60</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 225mm to 560mm (From calculation sheet)	1	29975.330			0.45	13488.899		
	Inspection Chamber to Manhole	1	13920.000	0.600	1.000	0.45	3758.400	1160X6X2	
	Bituminous portion								
	Sewer lines from 225mm to 560mm	1	15145.000	1.000	0.300		-4543.500		
	Inspection Chamber to Manhole	1	6960.000	1.000	0.300		-2088.000	1160X6X2 50% cc/bt each	
	Concrete Portion								
	Sewer lines from 225mm to 560mm	1	11039.700	1.000	0.150		-1655.955		
	Inspection Chamber to Manhole	1	6960.000	1.000	0.150		-1044.000	1160X6X2 50%bt/cc each	
	Total Quantity						17247.299 cum		

		Total Deducted Quantity					-9331.455 cum	
		Net Total Quantity					7915.844 cum	
		Say 7915.844 cum @ Rs 545.11 / cum					<b>Rs 4315005.72</b>	
8	100.1.5 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 225mm to 560mm	1	29975.330			0.4	11990.133	
	Inspection Chamber to Manhole	1	13920.000	0.600	1.000	0.4	3340.800 1160X3X4	
		Total Quantity					15330.933 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					15330.933 cum	
		Say 15330.933 cum @ Rs 791.65 / cum					<b>Rs 12136733.11</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 225mm to 560mm	1	29975.330			0.15	4496.300	
	Inspection Chamber to Manhole	1	13920.000	0.600	1.000	0.15	1252.800 1160X3X4	
		Total Quantity					5749.100 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					5749.100 cum	
		Say 5749.100 cum @ Rs 1316.46 / cum					<b>Rs 7568460.19</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 560mm	1	2594.540			0.45	1167.544	
	Total Quantity						1167.544 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1167.544 cum	
	Say 1167.544 cum @ Rs 649.48 / cum						<b>Rs 758296.48</b>	
11	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)							
	From calculation sheet- sewerline 225 to 560mm	1	2594.540			0.4	1037.816	
	Total Quantity						1037.816 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1037.816 cum	
	Say 1037.816 cum @ Rs 978.85 / cum						<b>Rs 1015866.19</b>	
12	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							
	From calculation sheet- sewerline 225 to 560mm	1	2594.540			0.15	389.181	
	Total Quantity						389.181 cum	
	Total Deducted Quantity						0.000 cum	



		Net Total Quantity						389.181 cum
		Say 389.181 cum @ Rs 1503.66 / cum						<b>Rs 585195.90</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	26184.700	3.000		0.2	31421.641	
		Total Quantity						31421.641 sqm
		Total Deducted Quantity						0.000 sqm
		Net Total Quantity						31421.641 sqm
		Say 31421.641 sqm @ Rs 187.73 / sqm						<b>Rs 5898784.66</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	26184.700	3.000		0.05	7855.411	
		Total Quantity						7855.411 sqm
		Total Deducted Quantity						0.000 sqm
		Net Total Quantity						7855.411 sqm
		Say 7855.411 sqm @ Rs 947.78 / sqm						<b>Rs 7445201.44</b>
15	od338601/2021_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 HDPE	1	1003.000				1003.000	
		Total Quantity						1003.000 metre
		Total Deducted Quantity						0.000 metre
		Net Total Quantity						1003.000 metre
		Say 1003.000 metre @ Rs 5013.17 / metre						<b>Rs 5028209.51</b>
16	od338603/2021_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	26184.700	0.600	0.100	0.7	1099.758	
	Total Quantity							1099.758 cum
	Total Deducted Quantity							0.000 cum
	Net Total Quantity							1099.758 cum
	Say 1099.758 cum @ Rs 2246.62 / cum							<b>Rs 2470738.32</b>
17	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	26184.700	0.600	0.100	0.25	392.771	
	Total Quantity							392.771 cum
	Total Deducted Quantity							0.000 cum
	Net Total Quantity							392.771 cum
	Say 392.771 cum @ Rs 7229.54 / cum							<b>Rs 2839553.66</b>
18	100.98.227 Supply of uPVC Pipe, IS 4985: 2000 , 8kg/cm <sup>2</sup> , 200mm Dia.							
	For house connection IC to MH	1	13920.000				13920.000	1160X3X4
	Total Quantity							13920.000 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							13920.000 metre
	Say 13920.000 metre @ Rs 1393.80 / metre							<b>Rs 19401696.00</b>
19	od338609/2021_2022 Conveying to site, lowering into trenches, laying to correct line and grade using CC holding clamps, 200mm PVC SN 8 (8 Kg/Cm <sup>2</sup> ) 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	13920.000				13920.000	1160X3X4
	Total Quantity							13920.000 metre

						Total Deducted Quantity	0.000 metre
						Net Total Quantity	13920.000 metre
						Say 13920.000 metre @ Rs 290.67 / metre	<b>Rs 4046126.40</b>
20	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>
21	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>
22	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>
23	od338610/2021_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	23147.400				23147.400

	Total Quantity							23147.400 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							23147.400 metre
	Say 23147.400 metre @ Rs 1336.89 / metre							<b>Rs 30945527.59</b>
24	od338611/2021_2022 Supply of PE Pipe PE 100 (IS 14333), 8kg, 250mm Outer Dia							
	HDPE Pipe PE 100 , 8kg, 250mm Outer Dia.	1	169.000				169.000	
	Total Quantity							169.000 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							169.000 metre
	Say 169.000 metre @ Rs 2079.09 / metre							<b>Rs 351366.21</b>
25	od338612/2021_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	649.500				649.500	
	Total Quantity							649.500 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							649.500 metre
	Say 649.500 metre @ Rs 2066.31 / metre							<b>Rs 1342068.35</b>
26	od338613/2021_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	1507.600				1507.600	
	Total Quantity							1507.600 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							1507.600 metre
	Say 1507.600 metre @ Rs 2624.99 / metre							<b>Rs 3957434.92</b>
27	od338614/2021_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	249.700				249.700	

	Total Quantity						249.700 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						249.700 metre	
	Say 249.700 metre @ Rs 3313.76 / metre						<b>Rs 827445.87</b>	
28	od338615/2021_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	397.400				397.400	
	Total Quantity						397.400 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						397.400 metre	
	Say 397.400 metre @ Rs 4215.86 / metre						<b>Rs 1675382.76</b>	
29	od338618/2021_2022 Supply of PE Pipe PE 100 (IS 14333/ sewerage pipe with latest IS), 8kg, 560mm Outer Dia.							
	HDPE Pipe PE 100,8kg, 560mm Outer Dia.	1	64.100				64.100	
	Total Quantity						64.100 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						64.100 metre	
	Say 64.100 metre @ Rs 8261.80 / metre						<b>Rs 529581.38</b>	
30	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							
	HDPE Pipe PE 100 , 8kg, 225mm Outer Dia	1	23147.400				23147.400	
	Total Quantity						23147.400 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						23147.400 metre	
	Say 23147.400 metre @ Rs 370.21 / metre						<b>Rs 8569398.95</b>	

31	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							
	HDPE Pipe PE 100 , 8kg, 250mm Outer Dia.	1	169.000				169.000	
	Total Quantity						169.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						169.000 metre	
	Say 169.000 metre @ Rs 433.54 / metre						<b>Rs 73268.26</b>	
32	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							
	HDPE Pipe PE 100, 8kg, 280mm Outer Dia.	1	649.500				649.500	
	Total Quantity						649.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						649.500 metre	
	Say 649.500 metre @ Rs 510.05 / metre						<b>Rs 331277.48</b>	
33	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	1507.600				1507.600		
	Total Quantity						1507.600 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						1507.600 metre		
	Say 1507.600 metre @ Rs 570.12 / metre						<b>Rs 859512.91</b>		
34	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	249.700				249.700		
	Total Quantity						249.700 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						249.700 metre		
	Say 249.700 metre @ Rs 643.30 / metre						<b>Rs 160632.01</b>		
35	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	397.400				397.400		
	Total Quantity						397.400 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						397.400 metre		
	Say 397.400 metre @ Rs 716.61 / metre						<b>Rs 284780.81</b>		

36	<p>100.10.16 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. 560 mm OD HDPE pipe NEW DATA</p>						
	560 mm OD HDPE pipe	1	64.100				64.100
	Total Quantity						64.100 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						64.100 metre
	Say 64.100 metre @ Rs 966.94 / metre						<b>Rs 61980.85</b>
37	<p>od338619/2021_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</p>						
	Inspection chambers of inside size 0.45x0.45x0.6 m	580					580.000 (1160X2)0.25=580
	Total Quantity						580.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						580.000 No
	Say 580.000 No @ Rs 7095.90 / No						<b>Rs 4115622.00</b>
38	<p>od338620/2021_2022 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</p>						



	resistant cement shall be used for the the construction of inspection chamber							
	Inspection chambers of inside size 0.45x0.45x0.45m	348					348.000	2320x0.15=348
	Total Quantity						348.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						348.000 No	
	Say 348.000 No @ Rs 3582.61 / No						<b>Rs 1246748.28</b>	
39	od338621/2021_2022 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							
	Inspection chambers of inside size 0.6 X 0.6 X 0.9 m	464					464.000	2320x0.20=464
	Total Quantity						464.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						464.000 No	
	Say 464.000 No @ Rs 7732.35 / No						<b>Rs 3587810.40</b>	
40	od338622/2021_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 0.6 x 0.6 x 0.6 m	464					464.000	2320x0.2=464
	Total Quantity						464.000 No	
	Total Deducted Quantity						0.000 No	

	Net Total Quantity						464.000 No	
	Say 464.000 No @ Rs 7287.07 / No							<b>Rs 3381200.48</b>
41	od338623/2021_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	464					464.000	2320x0.2=464
	Total Quantity						464.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						464.000 No	
	Say 464.000 No @ Rs 7496.45 / No							<b>Rs 3478352.80</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	od338577/2021_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	8845.000	1.500	0.300		3980.250	
	Inspection Chamber to Manhole	1	6960.000	1.500	0.300		3132.000	(1160X6X2)0.5
	Pumping main(100mm to 250mm DI)	1	1012.000	1.500	0.300		455.400	
	Total Quantity						7567.650 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						7567.650 cum	
	Say 7567.650 cum @ Rs 58.08 / cum							<b>Rs 439529.11</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	8845.000	1.500	0.150		1990.125		
	Inspection Chamber to Manhole	1	6960.000	1.500	0.150		1566.000	(1160X6X2)0.5	
	Pumping main(100mm to 250mm DI)	1	1012.000	1.500	0.150		227.700		
	Total Quantity						3783.825 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						3783.825 cum		
	Say 3783.825 cum @ Rs 543.16 / cum						<b>Rs 2055222.39</b>		
3	<p>16.79</p> <p>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 &amp; 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.</p>								
	Sewer lines from 225mm to 450mm	1	8845.000	1.500	0.150		1990.125		
	Inspection Chamber to Manhole	1	6960.000	1.500	0.150		1566.000	(1160X6X2)0.5	
	Pumping main(100mm to 250mm DI)	1	1012.000	1.500	0.150		227.700		
	Total Quantity						3783.825 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						3783.825 cum		
	Say 3783.825 cum @ Rs 3050.90 / cum						<b>Rs 11544071.69</b>		
4	<p>od338581/2021_2022</p> <p>Providing and applying primer coat with bitumen emulsion ( SS) on prepared surface of granular&lt;br&gt;Base including clearing of road surface and spraying primer at the rate of 0.70 - 1.0 kg/sqm using&lt;br&gt;mechanical means</p>								
	Sewer lines from 225mm to 450mm	1	8845.000	1.500			13267.500		
	Inspection Chamber to Manhole	1	6960.000	1.500			10440.000	(1160X6X2)0.5	
	Pumping main(100mm to 250mm DI)	1	1012.000	1.500			1518.000		
	Total Quantity						25225.500 sqm		

		Total Deducted Quantity				0.000 sqm	
		Net Total Quantity				25225.500 sqm	
		Say 25225.500 sqm @ Rs 59.03 / sqm				<b>Rs 1489061.27</b>	
5	od338583/2021_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	8845.000	1.800			15921.000
	Inspection Chamber to Manhole	1	6960.000	1.800			12528.000 (1160X6X2)0.5
	Pumping main(100mm to 250mm DI)	1	1012.000	1.800			1821.601
		Total Quantity				30270.601 sqm	
		Total Deducted Quantity				0.000 sqm	
		Net Total Quantity				30270.601 sqm	
		Say 30270.601 sqm @ Rs 10.41 / sqm				<b>Rs 315116.96</b>	
6	od338585/2021_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	8845.000	1.800			15921.000
	Inspection Chamber to Manhole	1	6960.000	1.800			12528.000 (1160X6X2)0.5
	Pumping main(100mm to 250mm DI)	1	1012.000	1.800			1821.601
		Total Quantity				30270.601 sqm	
		Total Deducted Quantity				0.000 sqm	
		Net Total Quantity				30270.601 sqm	
		Say 30270.601 sqm @ Rs 176.52 / sqm				<b>Rs 5343366.49</b>	
7	od338587/2021_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						

SI No	Description	No	L	B	D	CF	Quantity	Remark
B and Type C as per Technical Specification Clause 510A.By Manual Means:-Case - III : Type C								
	Sewer lines from 225mm to 450mm	1	8845.000	1.800			15921.000	
	Inspection Chamber to Manhole	1	6960.000	1.800			12528.000	(1160X6X2)0.5
	Pumping main(100mm to 250mm DI)	1	1012.000	1.800			1821.601	
Total Quantity							30270.601 sqm	
Total Deducted Quantity							0.000 sqm	
Net Total Quantity							30270.601 sqm	
Say 30270.601 sqm @ Rs 78.00 / sqm							<b>Rs 2361106.88</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>3Pumping 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 351-(100mmDI)	2	445.000			0.8	712.000	
	CW1 to MH-id 101(200mmDI)	2	810.000			0.8	1296.000	
	LS2 to MH-id 659(100mmDI)	2	110.000			0.8	176.000	
	LS3 to MH-id 125(100mmDI)	2	172.000			0.8	275.200	
	LS4 to MH-id 30(150mmDI)	2	440.000			0.8	704.000	
	CW1 to MH-id 30(250mmDI)	2	1700.000			0.8	2720.000	
	LS5 to MH-id 369(100mmDI)	2	315.000			0.8	504.000	
	LS6 to MH-id 195(100mmDI)	2	195.000			0.8	312.000	
	CW3 to MH-id 90(200mmDI)	2	850.000			0.8	1360.000	

	Total Quantity							8059.200 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							8059.200 metre
	Say 8059.200 metre @ Rs 29.87 / metre							<b>Rs 240728.30</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							
	LS1 to MH-id 351-(100mmDI) -445M	1	445.000	0.600			267.000	BMBC,NH AI-445M
	CW1 to MH-id 101(200mmDI)-810M	1	443.000	0.700			310.100	BT-443M,CC-367M
	LS3 to MH-id 125(100mmDI)-172M	1	32.000	0.600			19.200	PWD CC-140M,NH AI BMBC-32M
	LS4 to MH-id 30(150mmDI)-440M	1	440.000	0.700			308.000	PWD BMBC
	CW1 to MH-id 30(250mmDI)-1700M	1	1254.000	0.800			1003.200	M CC-446,M BT-254,PWD BMBC-1000M
	LS5 to MH-id 369(100mmDI)-315M	1	315.000	0.600			189.000	PWD BMBC
	LS6 to MH-id 195(100mmDI)-195M	1	195.000	0.600			117.000	M BT
	CW3 to MH-id 90(200mmDI)-850M	1	120.000	0.700			84.000	M BT-120,M CC-730
	Total Quantity							2297.500 sqm
	Total Deducted Quantity							0.000 sqm
	Net Total Quantity							2297.500 sqm
	Say 2297.500 sqm @ Rs 354.18 / sqm							<b>Rs 813728.55</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)							

	CW1 to MH-id 101(200mmDI)-810M	1	367.000	0.700	0.150		38.535	BT- 443M,CC- 367M
	LS3 to MH-id 125(100mmDI)-172M	1	140.000	0.600	0.150		12.600	PWD CC- 140M,NH AI BMBC- 32M
	CW1 to MH-id 30(250mmDI)-1700M	1	446.000	0.800	0.150		53.520	M CC- 446,M BT- 254,PWD BMBC- 1000M
	CW3 to MH-id 90(200mmDI)-850M	1	730.000	0.700	0.150		76.650	M BT- 120,M CC-730
							Total Quantity	181.305 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	181.305 cum
							Say 181.305 cum @ Rs 2006.81 / cum	<b>Rs 363844.69</b>
4	<p>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 :</p> <p>All kinds of soil (Ref. Item No. 2.10.1 of DSR)</p>							
	LS1 to MH-id 351- (100mmDI)	1	445.000	0.600	1.000	0.45	120.150	
	CW1 to MH-id 101(200mmDI)	1	810.000	0.700	1.000	0.45	255.150	
	LS2 to MH-id 659(100mmDI)	1	110.000	0.600	1.000	0.45	29.700	
	LS3 to MH-id 125(100mmDI)	1	172.000	0.600	1.000	0.45	46.441	
	LS4 to MH-id 30(150mmDI)	1	440.000	0.700	1.000	0.45	138.600	
	CW1 to MH-id 30(250mmDI)	1	1700.000	0.800	1.000	0.45	612.000	

	LS5 to MH-id 369(100mmDI)	1	315.000	0.600	1.000	0.45	85.050	
	LS6 to MH-id 195(100mmDI)	1	195.000	0.600	1.000	0.45	52.650	
	CW3 to MH-id 90(200mmDI)	1	850.000	0.700	1.000	0.45	267.750	
	LS1 to MH-id 351- (100mmDI) -445M	1	445.000	0.600	0.300		-80.100	BMBC,NH AI-445M
	CW1 to MH-id 101(200mmDI)-810M	1	443.000	0.700	0.300		-93.029	BT- 443M,CC- 367M
	LS3 to MH-id 125(100mmDI)-172M	1	32.000	0.600	0.300		-5.760	PWD CC- 140M,NH AI BMBC- 32M
	LS4 to MH-id 30(150mmDI)-440M	1	440.000	0.700	0.300		-92.399	PWD BMBC
	CW1 to MH-id 30(250mmDI)-1700M	1	1254.000	0.800	0.300		-300.960	M CC- 446,M BT- 254,PWD BMBC- 1000M
	LS5 to MH-id 369(100mmDI)-315M	1	315.000	0.600	0.300		-56.699	PWD BMBC
	LS6 to MH-id 195(100mmDI)-195M	1	195.000	0.600	0.300		-35.100	M BT
	CW3 to MH-id 90(200mmDI)-850M	1	120.000	0.700	0.300		-25.200	M BT- 120,M CC-730
	CW1 to MH-id 101(200mmDI)-810M	1	367.000	0.700	0.150		-38.535	BT- 443M,CC- 367M
	LS3 to MH-id 125(100mmDI)-172M	1	140.000	0.600	0.150		-12.600	PWD CC- 140M,NH AI BMBC- 32M
	CW1 to MH-id 30(250mmDI)-1700M	1	446.000	0.800	0.150		-53.520	M CC- 446,M BT- 254,PWD BMBC- 1000M



	CW3 to MH-id 90(200mmDI)-850M	1	730.000	0.700	0.150		-76.650	MBT- 120,M CC-730
	Total Quantity						1607.491 cum	
	Total Deducted Quantity						-870.552 cum	
	Net Total Quantity						736.939 cum	
	Say 736.939 cum @ Rs 545.11 / cum						<b>Rs 401712.82</b>	
5	<p>100.1.5 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 351- (100mmDI)	1	445.000	0.600	1.000	0.4	106.801	
	CW1 to MH-id 101(200mmDI)	1	810.000	0.700	1.000	0.4	226.800	
	LS2 to MH-id 659(100mmDI)	1	110.000	0.600	1.000	0.4	26.401	
	LS3 to MH-id 125(100mmDI)	1	172.000	0.600	1.000	0.4	41.280	
	LS4 to MH-id 30(150mmDI)	1	440.000	0.700	1.000	0.4	123.200	
	CW1 to MH-id 30(250mmDI)	1	1700.000	0.800	1.000	0.4	544.000	
	LS5 to MH-id 369(100mmDI)	1	315.000	0.600	1.000	0.4	75.601	
	LS6 to MH-id 195(100mmDI)	1	195.000	0.600	1.000	0.4	46.801	
	CW3 to MH-id 90(200mmDI)	1	850.000	0.700	1.000	0.4	238.000	
	Total Quantity						1428.884 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1428.884 cum	
	Say 1428.884 cum @ Rs 791.65 / cum						<b>Rs 1131176.02</b>	
6	100.2.7							

	<p>"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>Medium Rock (blasting prohibited)</p> <p>New Data derived from DAR</p>								
	LS1 to MH-id 351-(100mmDI)	1	445.000	0.600	1.000	0.15	40.050		
	CW1 to MH-id 101(200mmDI)	1	810.000	0.700	1.000	0.15	85.050		
	LS2 to MH-id 659(100mmDI)	1	110.000	0.600	1.000	0.15	9.900		
	LS3 to MH-id 125(100mmDI)	1	172.000	0.600	1.000	0.15	15.480		
	LS4 to MH-id 30(150mmDI)	1	440.000	0.700	1.000	0.15	46.200		
	CW1 to MH-id 30(250mmDI)	1	1700.000	0.800	1.000	0.15	204.000		
	LS5 to MH-id 369(100mmDI)	1	315.000	0.600	1.000	0.15	28.350		
	LS6 to MH-id 195(100mmDI)	1	195.000	0.600	1.000	0.15	17.550		
	CW3 to MH-id 90(200mmDI)	1	850.000	0.700	1.000	0.15	89.250		
	Total Quantity						535.830 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						535.830 cum		
	Say 535.830 cum @ Rs 1316.46 / cum						<b>Rs 705398.76</b>		
7	<p>100.8.1</p> <p>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.</p> <p>(Data Prepared based on PWD SDB - Item No.1009)</p>								
		1	5037.000			0.6	3022.200		
	Total Quantity						3022.200 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						3022.200 metre		
	Say 3022.200 metre @ Rs 27.66 / metre						<b>Rs 83594.05</b>		

8	100.98.115 Supply of DI K9 Pipe Conforming to IS 8329/2000, 100mm Dia.							
	DI K9 Pipe , 100mm Dia.	1	1237.000				1237.000	
	Total Quantity						1237.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1237.000 metre	
	Say 1237.000 metre @ Rs 1143.05 / metre						<b>Rs 1413952.85</b>	
9	100.98.116 Supply of DI K9 Pipe Conforming to IS 8329/2000, 150mm Dia.							
	DI K9 Pipe 150mm Dia.	1	440.000				440.000	
	Total Quantity						440.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						440.000 metre	
	Say 440.000 metre @ Rs 1673.35 / metre						<b>Rs 736274.00</b>	
10	100.98.117 Supply of DI K9 Pipe Conforming to IS 8329/2000, 200mm Dia.							
	DI K9 Pipe, 200mm Dia.	1	1660.000				1660.000	
	Total Quantity						1660.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1660.000 metre	
	Say 1660.000 metre @ Rs 2100.55 / metre						<b>Rs 3486913.00</b>	
11	100.98.118 Supply of DI K9 Pipe Conforming to IS 8329/2000, 250mm Dia.							
	DI K9 Pipe 250mm Dia.	1	1700.000				1700.000	
	Total Quantity						1700.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1700.000 metre	
	Say 1700.000 metre @ Rs 2811.20 / metre						<b>Rs 4779040.00</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	1237.000				1237.000
	Total Quantity						1237.000 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						1237.000 metre
	Say 1237.000 metre @ Rs 57.74 / metre						<b>Rs 71424.38</b>
13	100.14.2 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	440.000				440.000
	Total Quantity						440.000 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						440.000 metre
	Say 440.000 metre @ Rs 86.02 / metre						<b>Rs 37848.80</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	1660.000				1660.000
	Total Quantity						1660.000 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						1660.000 metre
	Say 1660.000 metre @ Rs 119.81 / metre						<b>Rs 198884.60</b>
15	100.14.4 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 250 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.18 in DAR						
	laying 250 mm dia Ductile Iron Class K-9 Pipes	1	1700.000				1700.000
	Total Quantity						1700.000 metre

							Total Deducted Quantity	0.000 metre
							Net Total Quantity	1700.000 metre
							Say 1700.000 metre @ Rs 159.99 / metre	<b>Rs 271983.00</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	248.000					248.000
							Total Quantity	248.000 joint
							Total Deducted Quantity	0.000 joint
							Net Total Quantity	248.000 joint
							Say 248.000 joint @ Rs 105.84 / joint	<b>Rs 26248.32</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	88						88.000 422/5
							Total Quantity	88.000 joint
							Total Deducted Quantity	0.000 joint
							Net Total Quantity	88.000 joint
							Say 88.000 joint @ Rs 173.10 / joint	<b>Rs 15232.80</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	332						332.000
							Total Quantity	332.000 joint
							Total Deducted Quantity	0.000 joint
							Net Total Quantity	332.000 joint
							Say 332.000 joint @ Rs 253.93 / joint	<b>Rs 84304.76</b>
19	18.70.4	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:250 mm dia pipes						
	250mm DI	340						340.000
							Total Quantity	340.000 joint
							Total Deducted Quantity	0.000 joint
							Net Total Quantity	340.000 joint
							Say 340.000 joint @ Rs 310.07 / joint	<b>Rs 105423.80</b>

20	18.83.2	Labour for cutting C.I. pipe with steel saw.100 mm diameter C.I. pipe							
	100 DI	30					30.000		
	Total Quantity						30.000	Each Cut	
	Total Deducted Quantity						0.000	Each Cut	
	Net Total Quantity						30.000	Each Cut	
	Say 30.000 Each Cut @ Rs 168.64 / Each Cut						<b>Rs 5059.20</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	30					30.000		
	Total Quantity						30.000	Each Cut	
	Total Deducted Quantity						0.000	Each Cut	
	Net Total Quantity						30.000	Each Cut	
	Say 30.000 Each Cut @ Rs 422.63 / Each Cut						<b>Rs 12678.90</b>		
23	18.83.6	Labour for cutting C.I. pipe with steel saw.250 mm diameter C.I. pipe							
		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 525.61 / Each Cut						<b>Rs 21024.40</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	25.000				25.000		
	Total Quantity						25.000	quintal	
	Total Deducted Quantity						0.000	quintal	

	Net Total Quantity						25.000 quintal	
	Say 25.000 quintal @ Rs 19744.62 / quintal						<b>Rs 493615.50</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	1237.000				1237.000	
	Total Quantity						1237.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1237.000 metre	
	Say 1237.000 metre @ Rs 22.92 / metre						<b>Rs 28352.04</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	440.000				440.000	
	Total Quantity						440.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						440.000 metre	
	Say 440.000 metre @ Rs 30.99 / metre						<b>Rs 13635.60</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	1660.000				1660.000	
	Total Quantity						1660.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1660.000 metre	
	Say 1660.000 metre @ Rs 39.20 / metre						<b>Rs 65072.00</b>	
28	100.35.4 Testing 250mm DI/CI pipeline with potable water to the required test pressure . 250 mm dia Observed Data derived from item no.1022 of PHED DATA							
		1	1700.000				1700.000	
	Total Quantity						1700.000 metre	

		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					1700.000 metre	
		Say 1700.000 metre @ Rs 50.02 / metre					<b>Rs 85034.00</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	
		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 : 11/2 coarse sand : 3 graded stone aggregate 20							

SI No	Description	No	L	B	D	CF	Quantity	Remark	
	mm nominal size)								
	CW1 to MH-id 101(200mmDI)-810M	1	367.000	0.700	0.150		38.535	BT- 443M,CC- 367M	
	LS3 to MH-id 125(100mmDI)-172M	1	140.000	0.600	0.150		12.600	PWD CC- 140M,NH AI BMBC- 32M	
	CW1 to MH-id 30(250mmDI)-1700M	1	446.000	0.800	0.150		53.520	M CC- 446,M BT- 254,PWD BMBC- 1000M	
	CW3 to MH-id 90(200mmDI)-850M	1	730.000	0.700	0.150		76.650	M BT- 120,M CC-730	
	Total Quantity						181.305 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						181.305 cum		
	Say 181.305 cum @ Rs 8328.46 / cum							<b>Rs 1509991.44</b>	
<b>4Construction of Man holes (Cost Index:33.05 %)</b>									
1	od338572/2021_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, embeded 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 1.5m ( internal dia-1200mm)								
	MH-up to 1.5m depth, 1.2m dia	855					855.000		
	Total Quantity						855.000 No		
	Total Deducted Quantity						0.000 No		
	Net Total Quantity						855.000 No		
	Say 855.000 No @ Rs 57046.57 / No							<b>Rs 48774817.35</b>	

2	od338575/2021_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, embeded 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 2.5m ( internal diameter 1200m)						
	MH- up to 2.5m depth, 1.2m dia	216					216.000
	Total Quantity						216.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						216.000 No
	Say 216.000 No @ Rs 75213.42 / No						<b>Rs 16246098.72</b>
3	od338576/2021_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, embeded 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 3.5m ( internal diameter - 1500mm )						
	upto manhole depth 3.5m ( internal diameter - 1500mm )	52					52.000
	Total Quantity						52.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						52.000 No
	Say 52.000 No @ Rs 150804.07 / No						<b>Rs 7841811.64</b>
4	od338578/2021_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, embeded 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)	25						25.000	
	Total Quantity							25.000 No	
	Total Deducted Quantity							0.000 No	
	Net Total Quantity							25.000 No	
	Say 25.000 No @ Rs 192105.61 / No							<b>Rs 4802640.25</b>	
5	od338579/2021_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)	7						7.000	
	Total Quantity							7.000 No	
	Total Deducted Quantity							0.000 No	
	Net Total Quantity							7.000 No	
	Say 7.000 No @ Rs 231093.65 / No							<b>Rs 1617655.55</b>	
6	od338580/2021_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)							
		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 242888.72 / No						<b>Rs 1214443.60</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>5Road Restoration - to PWD/NH (Cost Index:33.05 %)</b>								
1	od338569/2021_2022 PWD Berm Cutting(G. O (Ms)No.59/2020/PWD Dated, Thiruvananthapuram 30/ 07/2020) 							
	IC to MH Line -160mm	1	3480.000	1.500		0.1	522.000	6960x0.5
	Total Quantity						522.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						522.000 sqm	
	Say 522.000 sqm @ Rs 304.95 / sqm						<b>Rs 159183.90</b>	
2	od338571/2021_2022 PWD Road reformation Charges- BT Cutting(G. O (Ms)No.59/2020/PWD Dated, Thiruvananthapuram 30/ 07/2020) 							
	IC to MH Line -160mm	1	3480.000	1.500		0.6	3132.000	6960x0.5
	Total Quantity						3132.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						3132.000 sqm	
	Say 3132.000 sqm @ Rs 3692.36 / sqm						<b>Rs 11564471.52</b>	
3	od338573/2021_2022 Road restoration charges for BM & BC Tar Cutting(G. O (Ms)No.59/2020/PWD Dated, Thiruvananthapuram 30/ 07/2020) 							
	Sewer line -225 to 450 mm	1	6300.000	1.500			9450.000	
	IC to MH Line -160mm	1	3480.000	1.500		0.3	1566.000	6960x0.5
	Pumping main 100 to 250mm DI	1	2232.000	1.500			3348.000	
	Total Quantity						14364.000 sqm	

Total Deducted Quantity							0.000 sqm	
Net Total Quantity							14364.000 sqm	
Say 14364.000 sqm @ Rs 3448.73 / sqm							<b>Rs 49537557.72</b>	
4	od20641/2022_2023 Road restoration charges for Concrete road surface cutting(G. O (Ms)No.59/2020/PWD Dated, Thiruvananthapuram 30/ 07/2020) 							
	Sewer line	1	570.000	1.500			855.000	
	Pumping main	1	140.000	1.500			210.000	
Total Quantity							1065.000 sqm	
Total Deducted Quantity							0.000 sqm	
Net Total Quantity							1065.000 sqm	
Say 1065.000 sqm @ Rs 4638.50 / sqm							<b>Rs 4940002.50</b>	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
<b>6Lifting 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 5.56m	1	3.140	1.600*1.6 0	1.500		12.058	Depth 4.97m
	2m dia- LS2-depth 2.77m	1	3.140	1.600*1.6 0	1.500		12.058	
	2m dia- LS3-depth 2.94m	1	3.140	1.600*1.6 0	1.500		12.058	
	2m dia- LS4-depth 3.47m	1	3.140	1.600*1.6 0	1.500		12.058	
	2m dia- LS5-depth 2.77m	1	3.140	1.600*1.6 0	1.500		12.058	
	2m dia- LS6-depth 2m	1	3.140	1.600*1.6 0	1.500		12.058	
Total Quantity							72.348 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							72.348 cum	
Say 72.348 cum @ Rs 501.00 / cum							<b>Rs 36246.35</b>	
2	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 & 1085)								
2m dia- LS1-depth 5.56m	1	3.140	1.600*1.6 0	1.500		12.058	Depth 4.97m	
2m dia- LS2-depth 2.77m	1	3.140	1.600*1.6 0	1.500		12.058		
2m dia- LS3-depth 2.94m	1	3.140	1.600*1.6 0	1.500		12.058		
2m dia- LS4-depth 3.47m	1	3.140	1.600*1.6 0	1.500		12.058		
2m dia- LS5-depth 2.77m	1	3.140	1.600*1.6 0	1.500		12.058		
2m dia- LS6-depth 2m	1	3.140	1.600*1.6 0	1.000		8.039		
Total Quantity						68.329 cum		
Total Deducted Quantity						0.000 cum		
Net Total Quantity						68.329 cum		
Say 68.329 cum @ Rs 551.09 / cum						<b>Rs 37655.43</b>		
3	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 & 1084)							
2m dia- LS1-depth 5.56m	1	3.140	1.600*1.6 0	1.500		12.058	Depth 4.97m	
2m dia- LS2-depth 2.77m	1	3.140	1.600*1.6 0	0.270		2.171		
2m dia- LS3-depth 2.94m	1	3.140	1.600*1.6 0	0.440		3.537		
2m dia- LS4-depth 3.47m	1	3.140	1.600*1.6 0	0.970		7.798		
2m dia- LS5-depth 2.77m	1	3.140	1.600*1.6 0	0.270		2.171		
Total Quantity						27.735 cum		
Total Deducted Quantity						0.000 cum		
Net Total Quantity						27.735 cum		
Say 27.735 cum @ Rs 721.40 / cum						<b>Rs 20008.03</b>		

4	<p>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)</p>							
	2m dia- LS1-depth 5.56m	1	3.140	1.600*1.6 0	1.560		12.540	
	Total Quantity						12.540 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						12.540 cum	
	Say 12.540 cum @ Rs 2025.89 / cum						<b>Rs 25404.66</b>	
5	<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>							
	3m dia CW1, Depth 4.46	1	3.140	2.1*2.1	1.500		20.772	
	3m dia CW2, Depth 5.00	1	3.140	2.1*2.1	1.500		20.772	
	3m dia CW30, Depth 3.82	1	3.140	2.1*2.1	1.500		20.772	
	Total Quantity						62.316 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						62.316 cum	
	Say 62.316 cum @ Rs 461.35 / cum						<b>Rs 28749.49</b>	
6	<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>							
	3m dia CW1, Depth 4.46	1	3.140	2.1*2.1	1.500		20.772	
	3m dia CW2, Depth 5.00	1	3.140	2.1*2.1	1.500		20.772	
	3m dia CW30, Depth 3.82	1	3.140	2.1*2.1	1.500		20.772	
	Total Quantity						62.316 cum	



							Total Deducted Quantity	0.000 cum
							Net Total Quantity	62.316 cum
							Say 62.316 cum @ Rs 507.52 / cum	<b>Rs 31626.62</b>
7	<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>							
	3m dia CW1, Depth 4.46	1	3.140	2.1*2.1	1.500		20.772	
	3m dia CW2, Depth 5.00	1	3.140	2.1*2.1	1.500		20.772	
	3m dia CW30, Depth 3.82	1	3.140	2.1*2.1	1.320		18.279	
							Total Quantity	59.823 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	59.823 cum
							Say 59.823 cum @ Rs 664.32 / cum	<b>Rs 39741.62</b>
8	<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 including neat banking. NEW DATA (Prepared based on PHED SDB - Item No.1095</p>							
	3m dia CW1, Depth 4.46	1	3.140	2.1*2.1	0.460		6.370	
	3m dia CW2, Depth 5.00	1	3.140	2.1*2.1	1.000		13.848	
							Total Quantity	20.218 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	20.218 cum
							Say 20.218 cum @ Rs 1516.70 / cum	<b>Rs 30664.64</b>
9	<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>							
		9	200.000				1800.000	
							Total Quantity	1800.000 Kwh

		Total Deducted Quantity					0.000 Kwh	
		Net Total Quantity					1800.000 Kwh	
		Say 1800.000 Kwh @ Rs 36.26 / Kwh					<b>Rs 65268.00</b>	
10	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							
	2m dia- LS1-depth 5.56m	1	3.140	3.700	6.060		70.406	
	2m dia- LS2-depth 2.77m	1	3.140	3.700	3.260		37.875	
	2m dia- LS3-depth 2.94m	1	3.140	3.700	3.440		39.966	
	2m dia- LS4-depth 3.47m	1	3.140	3.700	3.970		46.124	
	2m dia- LS5-depth 2.77m	1	3.140	3.700	3.270		37.991	
	2m dia- LS6-depth 2m	1	3.140	3.700	2.500		29.045	
	3m dia CW1, Depth 4.46	1	3.140	4.600	4.960		71.643	
	3m dia CW2, Depth 5.00	1	3.140	4.600	5.500		79.442	
	3m dia CW30, Depth 3.82	1	3.140	4.600	4.320		62.399	
		Total Quantity					474.891 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					474.891 sqm	
		Say 474.891 sqm @ Rs 217.07 / sqm					<b>Rs 103084.59</b>	
11	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 5.56m	1	3.140	1.600*1.6 0	0.200		1.608	Depth 4.97m
	2m dia- LS2-depth 2.77m	1	3.140	1.600*1.6 0	0.200		1.608	
	2m dia- LS3-depth 2.94m	1	3.140	1.600*1.6 0	0.200		1.608	

	2m dia- LS4-depth 3.47m	1	3.140	1.600*1.6 0	0.200		1.608		
	2m dia- LS5-depth 2.77m	1	3.140	1.600*1.6 0	0.200		1.608		
	2m dia- LS6-depth 2m	1	3.140	1.600*1.6 0	0.200		1.608		
	3m dia CW1, Depth 4.46	1	3.140	2.1*2.1	0.200		2.770		
	3m dia CW2, Depth 5.00	1	3.140	2.1*2.1	0.200		2.770		
	3m dia CW30, Depth 3.82	1	3.140	2.1*2.1	0.200		2.770		
	Total Quantity						17.958 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						17.958 cum		
	Say 17.958 cum @ Rs 7076.06 / cum							<b>Rs 127071.89</b>	
12	<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 5.56 m- Bottom plugging	1	3.140	1.600*1.6 0	0.300		2.412	Depth 4.97m	
	well side wall	1	3.140*2.3	0.300	5.560		12.047		
	cover slab	1	3.140	1.3*1.3	0.250		1.327		
	2m dia- LS2-depth 2.77 m- Bottom plugging	1	3.140	1.600*1.6 0	0.300		2.412		
	well side wall	1	3.140*2.3	0.300	2.770		6.002		
	cover slab	1	3.140	1.3*1.3	0.250		1.327		
	2m dia- LS3-depth 2.94 m- Bottom plugging	1	3.140	1.600*1.6 0	0.300		2.412		

	well side wall	1	3.140*2.3	0.300	2.940		6.370		
	cover slab	1	3.140	1.3*1.3	0.250		1.327		
	2m dia- LS4-depth 3.47m- Bottom plugging	1	3.140	1.600*1.6 0	0.300		2.412		
	well side wall	1	3.140*2.3	0.300	3.470		7.519		
	cover slab	1	3.140	1.3*1.3	0.250		1.327		
	2m dia- LS5-depth 2.77m- Bottom plugging	1	3.140	1.600*1.6 0	0.300		2.412		
	well side wall	1	3.140*2.3	0.300	2.770		6.002		
	cover slab	1	3.140	1.3*1.3	0.250		1.327		
	2m dia- LS6-depth 2m- Bottom plugging	1	3.140	1.600*1.6 0	0.250		2.010		
	well side wall	1	3.140*2.3	0.300	2.000		4.334		
	cover slab	1	3.140	1.3*1.3	0.250		1.327		
	3m dia CW1, Depth 4.46-Bottom plugging	1	3.140	2.1*2.1	0.300		4.155		
	well side wall	1	3.140*3.3	0.300	4.460		13.865		
	Cover slab	1	3.140	1.8*1.8	0.300		3.053		
	3m dia CW2, Depth 5.00-Bottom plugging	1	3.140	2.1*2.1	0.300		4.155		
	well side wall	1	3.140*3.3	0.300	5.000		15.543		
	Cover slab	1	3.140	1.8*1.8	0.300		3.053		
	3m dia CW30, Depth 3.82-Bottom plugging	1	3.140	2.1*2.1	0.300		4.155		
	well side wall	1	3.14*3.3	0.300	3.820		11.875		
	Cover slab	1	3.140	1.8*1.8	0.300		3.053		
		6	0.500	0.500	0.250		-0.375		
		3	0.500	0.500	0.300		-0.224		
		Total Quantity						127.213 cum	
		Total Deducted Quantity						-0.599 cum	
		Net Total Quantity						126.614 cum	
		Say 126.614 cum @ Rs 9700.81 / cum						<b>Rs 1228258.36</b>	
13	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-12	1	126.614				126.614	
	Total Quantity						126.614 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						126.614 cum	
	Say 126.614 cum @ Rs 80.56 / cum						<b>Rs 10200.02</b>	
14	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-12*340	1	126.614	340.000			43048.760	
	Total Quantity						43048.760 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						43048.760 kg	
	Say 43048.760 kg @ Rs 1.33 / kg						<b>Rs 57254.85</b>	
15	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 5.56m- wall inside	1	3.140	2.000	5.560		34.917	Depth 4.97m
	well out side wall	1	3.140	2.600	5.560		45.392	
	2m dia- LS2-depth 2.77m- wall inside	1	3.140	2.000	2.770		17.396	
	well out side wall	1	3.140	2.600	2.770		22.615	
	2m dia- LS3-depth 2.94m- wall inside	1	3.140	2.000	2.940		18.464	
	well out side wall	1	3.140	2.600	2.940		24.003	
	2m dia- LS4-depth 3.47m- wall inside	1	3.140	2.000	3.470		21.792	
	well out side wall	1	3.140	2.600	3.470		28.330	
	2m dia- LS5-depth 2.77m- wall inside	1	3.140	2.000	2.770		17.396	
	well out side wall	1	3.140	2.600	2.770		22.615	
	2m dia- LS6-depth 2m- wall inside	1	3.140	2.000	2.000		12.560	

	well out side wall	1	3.140	2.600	2.000		16.329		
	3m dia CW1, Depth 4.46-inside wall	1	3.140	3.000	4.460		42.014		
	out side wall	1	3.140	3.600	4.460		50.416		
	3m dia CW2, Depth 5.00-inside wall	1	3.140	3.000	0.300		2.826		
	out side wall	1	3.140	3.600	5.000		56.520		
	3m dia CW30, Depth 3.82-inside wall	1	3.140	3.000	0.300		2.826		
	out side wall	1	3.140	3.600	3.820		43.182		
	Total Quantity						479.593 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						479.593 sqm		
	Say 479.593 sqm @ Rs 703.77 / sqm						<b>Rs 337523.17</b>		
16	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 5.56m- cover slab	1	3.140	1.3*1.3			5.307		
	cover slab edge	1	3.140	2.600	0.250		2.042		
	2m dia- LS2-depth 2.77m- cover slab	1	3.140	1.3*1.3			5.307		
	cover slab edge	1	3.140	2.600	0.250		2.042		
	2m dia- LS3-depth 2.94m- cover slab	1	3.140	1.3*1.3			5.307		
	cover slab edge	1	3.140	2.600	0.250		2.042		
	2m dia- LS4-depth 3.47m- cover slab	1	3.140	1.3*1.3			5.307		
	cover slab edge	1	3.140	2.600	0.250		2.042		
	2m dia- LS5-depth 2.77m- cover slab	1	3.140	1.3*1.3			5.307		
	cover slab edge	1	3.140	2.600	0.250		2.042		
	2m dia- LS6-depth 2m- cover slab	1	3.140	1.3*1.3			5.307		
	cover slab edge	1	3.140	2.600	0.250		2.042		

	3m dia CW1, Depth 4.46-Cover slab	1	3.140	1.800*1.8			10.174		
	cover slab side edge	1	3.140	3.600	0.300		3.392		
	3m dia CW2, Depth 5.00--Cover slab	1	3.140	1.800*1.8			10.174		
	cover slab side edge	1	3.140	3.600	0.300		3.392		
	3m dia CW30, Depth 3.82--Cover slab	1	3.140	1.800*1.8			10.174		
	cover slab side edge	1	3.140	3.600	0.300		3.392		
	Total Quantity						84.792 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						84.792 sqm		
	Say 84.792 sqm @ Rs 900.08 / sqm						<b>Rs 76319.58</b>		
17	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 - 1 2 Steel reinforcement @ 100Kg/ 1Cum of CC	1	126.614	100.000			12661.400		
	Total Quantity						12661.400 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						12661.400 kg		
	Say 12661.400 kg @ Rs 94.86 / kg						<b>Rs 1201060.40</b>		
18	od338596/2021_2022 Extra for providing epoxy coating for reinforcement bars.								
	Qty taken from item no - 1 2 Steel reinforcement @ 100Kg/ 1Cum of CC	1	126.614	100.000			12661.400		
	Total Quantity						12661.400 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						12661.400 kg		
	Say 12661.400 kg @ Rs 2.32 / kg						<b>Rs 29374.45</b>		
19	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, reserrior, 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>								
2m dia- LS1-depth 5.56m- wall inside	1	3.140	2.000	5.560		34.917	Depth 4.97m	
well out side wall	1	3.140	2.600	5.560		45.392		
2m dia- LS2-depth 2.77m- wall inside	1	3.140	2.000	2.770		17.396		
well out side wall	1	3.140	2.600	2.770		22.615		
2m dia- LS3-depth 2.94m- wall inside	1	3.140	2.000	2.940		18.464		
well out side wall	1	3.140	2.600	2.940		24.003		
2m dia- LS4-depth 3.47m- wall inside	1	3.140	2.000	3.470		21.792		
well out side wall	1	3.140	2.600	3.470		28.330		
2m dia- LS5-depth 2.77m- wall inside	1	3.140	2.000	2.770		17.396		
well out side wall	1	3.140	2.600	2.770		22.615		
2m dia- LS6-depth 2m- wall inside	1	3.140	2.000	2.000		12.560		
well out side wall	1	3.140	2.600	2.000		16.329		
3m dia CW1, Depth 4.46-inside wall	1	3.140	3.000	4.460		42.014		
out side wall	1	3.140	3.600	4.460		50.416		
3m dia CW2, Depth 5.00-inside wall	1	3.140	3.000	0.300		2.826		
out side wall	1	3.140	3.600	5.000		56.520		
3m dia CW30, Depth 3.82-inside wall	1	3.140	3.000	0.300		2.826		
out side wall	1	3.140	3.600	3.820		43.182		
Total Quantity						479.593 sqm		
Total Deducted Quantity						0.000 sqm		



		Net Total Quantity			479.593 sqm		
		Say 479.593 sqm @ Rs 559.61 / sqm			Rs 268385.04		
20	<p>22.23.2</p> <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>						
	2m dia- LS1-depth 5.56 m - cover slab & base slab	2	3.140	1.3*1.3			10.614
	2m dia- LS2-depth 2.77 m - cover slab & base slab	2	3.140	1.3*1.3			10.614
	2m dia- LS3-depth 2.94 m - cover slab & base slab	2	3.140	1.3*1.3			10.614
	2m dia- LS4-depth 3.47 m - cover slab & base slab	2	3.140	1.3*1.3			10.614
	2m dia- LS5-depth 2.77 m - cover slab & base slab	2	3.140	1.3*1.3			10.614
	2m dia- LS6-depth 2m - cover slab & base slab	2	3.140	1.3*1.3			10.614
	3m dia CW1, Depth 4.46 - Cover slab & base slab	2	3.140	1.800*1.8			20.348
	3m dia CW2, Depth 5.00 - Cover slab & base slab	2	3.140	1.800*1.8			20.348
	3m dia CW30, Depth 3.82 - - Cover slab & base slab	2	3.140	1.800*1.8			20.348

							Total Quantity	124.728 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	124.728 sqm
							Say 124.728 sqm @ Rs 431.28 / sqm	<b>Rs 53792.69</b>
21	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 5.56m- wall inside	1	3.140	2.000	5.560		34.917	Depth 4.97m
	well out side wall	1	3.140	2.600	5.560		45.392	
	2m dia- LS2-depth 2.77m- wall inside	1	3.140	2.000	2.770		17.396	
	well out side wall	1	3.140	2.600	2.770		22.615	
	2m dia- LS3-depth 2.94m- wall inside	1	3.140	2.000	2.940		18.464	
	well out side wall	1	3.140	2.600	2.940		24.003	
	2m dia- LS4-depth 3.47m- wall inside	1	3.140	2.000	3.470		21.792	
	well out side wall	1	3.140	2.600	3.470		28.330	
	2m dia- LS5-depth 2.77m- wall inside	1	3.140	2.000	2.770		17.396	
	well out side wall	1	3.140	2.600	2.770		22.615	
	2m dia- LS6-depth 2m- wall inside	1	3.140	2.000	2.000		12.560	
	well out side wall	1	3.140	2.600	2.000		16.329	
	3m dia CW1, Depth 4.46-inside wall	1	3.140	3.000	4.460		42.014	
	out side wall	1	3.140	3.600	4.460		50.416	
	3m dia CW2, Depth 5.00-inside wall	1	3.140	3.000	0.300		2.826	
	out side wall	1	3.140	3.600	5.000		56.520	
	3m dia CW30, Depth 3.82-inside wall	1	3.140	3.000	0.300		2.826	
	out side wall	1	3.140	3.600	3.820		43.182	
	2m dia- LS1-depth 5.56 m - cover slab & base slab	2	3.140	1.3*1.3			10.614	

	2m dia- LS2-depth 2.77 m- cover slab&base slab	2	3.140	1.3*1.3			10.614		
	2m dia- LS3-depth 2.94 m- cover slab&base slab	2	3.140	1.3*1.3			10.614		
	2m dia- LS4-depth 3.47 m- cover slab&base slab	2	3.140	1.3*1.3			10.614		
	2m dia- LS5-depth 2.77 m- cover slab&base slab	2	3.140	1.3*1.3			10.614		
	2m dia- LS6-depth 2m- cover slab&base slab	2	3.140	1.3*1.3			10.614		
	3m dia CW1, Depth 4.46-Cover slab&base slab	2	3.140	1.800*1.8			20.348		
	3m dia CW2, Depth 5.00-Cover slab&base slab	2	3.140	1.800*1.8			20.348		
	3m dia CW30, Depth 3.82 - - Cover slab&base slab	2	3.140	1.800*1.8			20.348		
	Total Quantity						604.321 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						604.321 sqm		
	Say 604.321 sqm @ Rs 393.69 / sqm						<b>Rs 237915.13</b>		
22	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 21	1	604.321				604.321		
	Total Quantity						604.321 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						604.321 sqm		
	Say 604.321 sqm @ Rs 105.38 / sqm						<b>Rs 63683.35</b>		
23	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 21	1	604.321				604.321	
	Total Quantity						604.321 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						604.321 sqm	
	Say 604.321 sqm @ Rs 122.47 / sqm						<b>Rs 74011.19</b>	
24	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	9					9.000	
	Total Quantity						9.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						9.000 No	
	Say 9.000 No @ Rs 2745.75 / No						<b>Rs 24711.75</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)"							
	2m dia- LS1-depth 5.56m	1	3.140	1*1	5.560		17.459	
	2m dia- LS2-depth 2.77m	1	3.140	1*1	2.770		8.698	
	2m dia- LS3-depth 2.94m	1	3.140	1*1	2.940		9.232	
	2m dia- LS4-depth 3.47m	1	3.140	1*1	3.470		10.896	
	2m dia- LS5-depth 2.77m	1	3.140	1*1	2.770		8.698	
	2m dia- LS6-depth 2m	1	3.140	1*1	2.000		6.280	
	3m dia CW1, Depth 4.46	1	3.140	1.5*1.5	4.460		31.510	
	3m dia CW2, Depth 5.00	1	3.140	1.5*1.5	5.000		35.325	
	3m dia CW30, Depth 3.82	1	3.140	1.5*1.5	3.820		26.989	
	Total Quantity						155.087 Kilo litre	
	Total Deducted Quantity						0.000 Kilo litre	

	Net Total Quantity						155.087 Kilo litre	
	Say 155.087 Kilo litre @ Rs 182.79 / Kilo litre						<b>Rs 28348.35</b>	
26	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.							
	2m dia- LS1-depth 5.56m	1	3.140*2.6	0.500	5.560		22.696	
	2m dia- LS2-depth 2.77m	1	3.140*2.6	0.500	2.770		11.308	
	2m dia- LS3-depth 2.94m	1	3.140*2.6	0.500	2.940		12.002	
	2m dia- LS4-depth 3.47m	1	3.140*2.6	0.500	3.470		14.165	
	2m dia- LS5-depth 2.77m	1	3.140*2.6	0.500	2.770		11.308	
	2m dia- LS6-depth 2m	1	3.140*2.6	0.500	2.000		8.165	
	3m dia CW1, Depth 4.46	1	3.140*3.6	0.500	4.460		25.208	
	3m dia CW2, Depth 5.00	1	3.140*3.6	0.500	5.000		28.260	
	3m dia CW30, Depth 3.82	1	3.140*3.6	0.500	3.820		21.591	
	Total Quantity						154.703 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						154.703 cum	
	Say 154.703 cum @ Rs 253.73 / cum						<b>Rs 39252.79</b>	
27	od338605/2021_2022 Pump set - Supply, Installation, Commissioning, testing and trial run of SUBMERSIBLE SLURRY HANDLING Type Pump Set							
	LS1 to MH-id 351	2	3.000				6.000	
	CW1 to MH-id 101	2	15.000				30.000	
	LS2 to MH-id 659	2	0.500				1.000	
	LS3 to MH-id 125	2	2.000				4.000	
	LS4 to MH-id 30	2	6.000				12.000	
	CW2 to MH-id 30	2	37.000				74.000	
	LS5 to MH-id 369	2	2.000				4.000	

	LS6 to MH-id 146	2	0.500				1.000		
	CW3 to MH-id 90	2	12.000				24.000		
	Total Quantity						156.000 Hp		
	Total Deducted Quantity						0.000 Hp		
	Net Total Quantity						156.000 Hp		
	Say 156.000 Hp @ Rs 29037.50 / Hp							<b>Rs 4529850.00</b>	
28	od338606/2021_2022 Supply and erection of Indoor Type Generator Suitable Capacity UP TO 15 KVA								
	LS 1 to MH-id 351(3.000*0.746)/0.8= 2.798	1					1.000		
	CW 1 to MH-id 101(15*0.746)/0.8=13. 98	1					1.000		
	LS 2 to MH-id 659(0.5*0.746)/0.8=0. 467	1					1.000		
	LS 3 to MH-id 125(2*0.746)/0.8=1.86 5	1					1.000		
	LS 4 to MH-id 30(6*0.746)/0.8=5.595	1					1.000		
	CW 2 to MH-id 30(37*0.746)/0.8=34.5	1				3.0	3.000	15 kva= 3 lakhs 34.5 kva take 3 time cost	
	LS 5 to MH-id 369(2*0.746)/0.8=1.86 5	1					1.000		
	LS 6 to MH-id 146(0.5*0.746)/0.8=0. 467	1					1.000		
	CW 3 to MH-id 90(12*0.746)/0.8=11.1 9	1					1.000		
	Total Quantity						11.000 Nos		
	Total Deducted Quantity						0.000 Nos		
	Net Total Quantity						11.000 Nos		

	Say 11.000 Nos @ Rs 348450.00 / Nos						<b>Rs 3832950.00</b>	
29	od338607/2021_2022 Automatic Control system							
		9					9.000	
	Total Quantity						9.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						9.000 No	
	Say 9.000 No @ Rs 100000.00 / No						<b>Rs 900000.00</b>	
30	od338608/2021_2022 Control Room and Generator Room							
		9					9.000	
	Total Quantity						9.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						9.000 No	
	Say 9.000 No @ Rs 320279.00 / No						<b>Rs 2882511.00</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>7Water 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>8Line 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>9Operation and Maintanance cost for sewer networks and allied works- First year (Cost Index:33.05 %)</b>								
1	od340300/2021_2022 Sewer line,well maintenance - Sewer cleaners including necessary accessories required for cleaning of sewer lines with safety equipment and vehicles							
	For first year	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 1808005.60 / L.S						<b>Rs 1808005.60</b>	
2	od340302/2021_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							
	For first year	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>
3	od340303/2021_2022 Consumables Fuel for generator,chemicals ,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>
Sl No	Description	No	L	B	D	CF	Quantity	Remark	
<b>10Operation and Maintanance cost for sewer networks and allied works2 nd year to 10 th year (Cost Index:33.05 %)</b>									
1	od340404/2021_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	
	9 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 2432892.60 / No							<b>Rs 30654446.76</b>	
SI No	Description	No	L	B	D	CF	Quantity	Remark
<b>11 Sewer Connection Charges (Cost Index:33.05 %)</b>								
1	od20695/2022_2023 Sewer Connection Charges- Including material,labour and connection deposite charges							
	Sewer Connection Charges-	3000					3000.000	
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>12 Electricity charges for Sewer network portion for 10 Year (Cost Index:33.05 %)</b>								
1	od20720/2022_2023 Electricity charges for Sewer net work portion Rs.4119968.16/Year							
	Electricity charges for sewernet work	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 4119968.16 / No							<b>Rs 41199681.60</b>	
Total							<b>491999656.19</b>	
Centage @							<b>10.0%</b>	
Centage Amount							<b>49199965.62</b>	
Provision for GST payments (in %) @							<b>18.0%</b>	
Amount reserved for GST payments							<b>88559938.11</b>	
Total & Centage							<b>629759559.92</b>	
Lumpsum for round off							<b>0.00</b>	
<b>GRAND TOTAL Rs</b>							<b>629759559.92</b>	
<b>Rounded Grand Total Rs 62,97,59,560</b>								
<b>Rupees Sixty Two Crore Ninety Seven Lakh Fifty Nine Thousand Five Hundred and Sixty Only</b>								